Indian Agriculture – Trends in Food grains Production, Implications on Food Security in India – Post 1980's Study

A Dissertation Submitted to the University of Hyderabad in Partial Fulfillment of the Requirements for the Degree of

Doctor of PHILOSOPHY

In

ECONOMICS

BY

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Certificate

This is to certify that **Mr. Trinadh Nookathoti** has carried out the research embodied in the present dissertation entitled ***"Indian Agriculture – Trends in Food grain Production – Implications on Food Security – Post 1980's Study"*** for the full period prescribed under PhD ordinances of the University of Hyderabad. This dissertation is an independent work and does not constitute part of any material submitted for any research degree or diploma here or elsewhere.

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DECLARATION

I hereby declare that the work embodied in this dissertation entitled ***"Indian Agriculture – Trends in Food grain Production – Implications on Food Security – Post 1980's Study"*** carried out under the supervision of Dr. Nasir Ahmed Khan is an original work of mine and has not been submitted for the award of any research degree or diploma of any university.

Place: Hyderabad **Signature of the Candidate**

Date: (Trinadh Nookathoti)

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Abbreviations

AoA –Agreement on Agriculture

AP – Andhra Pradesh

APL – Above poverty Line

CV – Coefficient of Variation

BPL – Below Poverty Line

BMI – Body Mass Index

CED – Chronic Energy Deficiency

CPI – Consumer Price Index

CSO – Central Statistical organisation

EU – European Union

FAO – Food and Agricultural Organisation

FCI – Food Corporation of India

FG – Food grains

GATT – General Agreement on Trade and Tariff

GCF – Gross Capital formation

GDP – Gross Domestic Product

GNP – Gross National Product

GoI – Govt of India

GSDP – Gross State Domestic Product

Ha – Hectares

HH – Households

HP – Himachal Pradesh

HR – Haryana

HYV – High Yielding Variety

IARI – Indian Agricultural Organisation

ICAR – Indian Council for Agricultural research

ICDS – Integrated Child Development scheme

ICMR – Indian Council for Medical research

IFPRI – International Food Policy Research institute

IMF – International Monetary Fund

IMR – Infant Mortality Rate

IPCC – Inter Continental Panel on Climate Change

J&K – Jammu and Kashmir

KG – Kilograms

LDC – Lower Development Countries

M.Ha – Million Hectares

MDG – Millennium Development Goals

MH – Maharashtra

MMR – Maternal Mortality rate

MMS – Mid day Meals Scheme

MNC – Multi National Company

MoA – Ministry of Agriculture

MoH&FW – Ministry of Health and Family Welfare

MP – Madhya Pradesh

MSP – Minimum Support system

MT – Million Tons

NDA- National Democratic Alliance

NEHR – North East Hill Region

NFHS – National Family Health Survey

NFSA – National Food Security Act.

NFSM – National Food Security Mission.

NNMB – National Nutritional Monitoring Bureau

NNP – Net National product

NSSO – National Sample Survey Organisation

OBC – Other Backward Castes

OR – Orissa

PDS –Public Distribution System

QR – Quantity Restrictions

RBI – Reserve Bank of India

RJ – Rajasthan

RTF – Right to Food

SAP – Structural Adjustment Programme

SC- Scheduled Caste

SD – Standard Deviation

SSA – Sub Saharan Africa

ST – Scheduled Tribe

TFR – Total factor Productivity

TNC – Tran's National companies

TPDS – Targeted Public Distribution System

UNICEF – United Nations Children's Emergency Fund

UNO – United Nations Organisation

UNO – United Nations Organisations

UP – Uttar Pradesh

UPA – United Progressive Alliance

USA – United States of America

WB – West Bengal

WFP – World Food Program

WPI – Whole sale Price Index

WTO – World Trade Organisation

Synopsis

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Chapter I

Introduction

1.1 Definition of Food security:

The term Food Security, as understood today, implies both physical and economic access to balanced diet for each household and for all members in a household. The Rome Declaration on World Food Security and World Food Plan of Action 1996, defined food security in unambiguous terms as *"when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life"* (FAO-1996).

India is the only Asian country other than Bangladesh and Yemen that have been under severe food shortages in the world. The rest of the countries come from Africa. About 42 per cent of underweight children claim India as their home (UNO Hunger Force). 47 per cent of children under 5 years old are underweight, 45 per cent are stunted, and 46 per cent have severe malnutrition (wasting: disproportionate growth) (National Family Health Survey III 2005-06). India is also a home for a large number of people affected by malnutrient deficiency (iron, iodine, vitamin A. This hidden hunger contributes to low human capital through reduced cognitive ability of the people, and low productivity of labour.

We have bigger challenges ahead in future and we have to shoulder the responsibility of more than 380 million poor people that still remain undernourished while the global undernourished figure is 925 million[1], indicating that more than **1/3rd are in India.** 65 percent of the world's hungry live in only **seven countries** namely India, China, the Democratic Republic of Congo, Bangladesh, Indonesia, Pakistan and Ethiopia[2].

In today's world the poorest of the poor families in the world spend 80 per cent of their total income on food grains and inadequate purchasing power deprives them from availing food in sufficient quantity. The shocking news is that, today hunger is on the rise. It is surprising that in 21st century one child under the age of five years will die every five seconds from hunger related diseases. Hunger may kill more people than all wars fought in the coming years. But unfortunately there seems to be a very less serious war against this.

[1] FAO 2010
[2] Ibid

I.1 India's Global Rank in Major Agricultural Crops

Crop	Area	Production	Yield
Rice (paddy)	1	2	52
Wheat	1	2	38
Coarse Cereals	3	4	125
Pulses	1	1	138

Source: Food and Agriculture Organisation, Indian Horticulture Database, 2001. From "The Crisis in Indian Agriculture" by Mohan Guruswamy, Uma Natarajan and Shagun Khare (2008)

Table shows that, though India has the maximum area in the World for the production of Rice and Wheat, but ranks second in their production, unfortunately it also ranks at 52^{nd} and 38^{th} in terms of yield per hectare of rice and wheat respectively. Even areas in the cases of pulses (1st), India is ranking very much high in the World, but in terms of production and yields wise, we have been lagging very much behind many of the countries in the World.

1.2 Objectives:

1. To Study the trends in food grain production after 1980s at All India level and analyze the impact on Food security
2. To observe the trends in per capita availability of food articles and implications on food security.
3. To study the impact of Free trade environment over domestic food production and Food Security.
4. To examine the future demand projections of Food grains.

1.3 Methodology:

In order to establish these objectives, secondary data, we can compare the aggregate growth rates of food grain production during the prescribed period, in this process, as Rice and wheat are our primary ingredients in diet, we try and restrict ourselves mostly with the crops of Rice, wheat, and pulses. We also try to observe the direct and indirect factors that influenced their production over the said period. Along with these observations, we will also take into account the per capita availability of different food articles and minimum and maximum adequacy levels. Here we mostly confine ourselves to the study of aggregate or national indicators with the observation of major states performance. We also study the population and growth rates of food grains over the years, particularly in comparison with food grains growth rate.

1.4 Data Sources:

At the end we try to come up with some appropriate and practical suggestions with the help of interpreting and evaluating the related data in relation to our objectives. For this purpose various reliable and accurate secondary sources of data like Ministry of Agriculture and Statistics, GoI, Directorate of Economics and Statistics, GoI, Govt Andhra Pradesh, National Sampling Survey Organisation (NSSO) surveys of various rounds, Economic survey of India of various years, Reserve Bank of India (RBI) Agriculture Statistics, Food and Agricultural Organisation (FAO), World Food Programme (WFP), Central statistical organization (CSO) International Food Policy Research Institute (IFPRI), World Bank, Ministry of Agriculture and Distribution, Ministry of Consumer Affairs, Food and Public Distribution, Ministry of Health and Family Welfare, National Family Health Survey (NFHS), National Nutritional and Monitoring Bureau (NNMB) etc. ICAR, IARI.

1.5 Statistical Tools Applied:

In order to substantiate our objectives more emphatically, we take data pertaining to Rice, Wheat, Pulses and also Total food grains production as a whole since the year 1981-82 till 2009-10. In the same way we also take the data of per capita availability of different food grains, population data during our study period. This data is obtained for both at the National level and also of major important states. We analyse this data and calculate the Annual compounded growth rates, and also Standard Deviation and Coefficient of Variation. And in order to ascertain the mutual relationships regarding production we apply least squares method.

Chapter II

Literature Review

The chosen area of research for my doctoral study is ***"Indian Agriculture – Trends in Food grain Production and Implications on Food Security in India – A post 1980s Study"*** for which the following literature has been reviewed, comprising of 40 different papers, articles and books of various eminent authors. As I have taken most of the literature from different books, related to my study area, as they are very rich and vast in explanation, have tried the most to condense them in a way not miss the author's primary objective. Based on the dimension of the different authors' explanations, the review has been classified into different sections, like, 1.Literature that addressed the issue from the demand Point of view 2.Literature that addressed the issue from the Supply Point of view. 3. And the explanations

particularly related to some countries. 4. Food Security under Free Trade and Economic Reforms. 5. Presentation of the Intensity of Indian food security situation in general.

Chapter III

Composition and Conceptual Framework of Food insecurity – Prevailing Trends

In this chapter, we try to analyse and establish the extent of food insecurity in India through observation, presentation and analysis of various parameters. Though our objective is to analyse the role of production in determining Food security, it is also very pertinent and pre requisite to observe the symptoms of food insecurity through different prevailing facts at aggregate level in order to establish and analyse the issue of food insecurity.

The concept of food security in its wider connotation comprises of four entities: 1) Availability of Food 2) Household Entitlement to food 3) Stability in the supply of food throughout the year; 4) Protection against malnutrition.

Impartial agencies, such as UNICEF, have started that in the area of nutrition India's record is worse than that of some of the countries of Africa. With the rising income Engel's law starts operating, i.e., expenditure on food as a proportion of total income declines, and expenditure on food grains declines even faster. Also, so long as a vast number of people are below the poverty line the increase in their income up to certain threshold would fuel demand for food grains. Kumar[3] suggest that the demand for food grains by the year 2030 will range between 260 million tons to 264 million tonnes depending on the growth in per capita income. As is well known, India is now producing enough food, which if equitably distributed, can meet the calorie requirements of the citizens. However, the fact of the matter is that the available food is not equitably distributed and as a result the lower 30 per cent of the households do not have adequate intake of calories.

The continuing growth in population and incomes appear to lead to a clear danger of India becoming a food grains importing country. It is the State's obligation to subsidise the poor producers as well as poor consumers. This input subsidy is often known as *'cheap input-cheap output'* policy. Neither fertilisers, nor irrigation, nor for that matter, power, is an unfamiliar input. The increasing use of the subsidised inputs is not contributing to

4[3]Kumar; Praduman, Joshi P.K, Birthal S Pratap (2009): "Demand Projections for Foodgrains in India", from 'Agricultural Economics Research Review, Vol. 22 July – Dec 2009,pp 237-243.

productivity at the margin. Marginal productivity of fertilisers and water applications is declining, largely because of weakness in the organisation and functioning of the extension system. There are better ways of transferring incomes to the producers such as by improving the income terms of trade.

3.1 Alarming Hunger Rates:

It is also worth pointing out that the percent share of calories from cereals which was 83.4 for the lowest expenditure groups has declined gradually to 55.2 in the highest expenditure group. Taking different states in India, these percentages are varied between 28.5 - Kerala, 62.6 - Bihar. The IMR (Infant Mortality Rate) ranged between 23.8 in Kerala and 99.9 in Uttar Pradesh. And 51.9 per cent of rural consumers with monthly per capita expenditure of less than Rs.265 and as high as 67.7 per cent of the urban consumers with monthly per capita expenditure of less than Rs.490 had inadequate calorie intake and 53.3 per cent of rural households and 61.9 per cent of urban households belonged to the monthly per capita expenditure groups with below average levels of adequate calorie intake[4].

3.2 Climate change:

It has caused poor harvests in different ways ranging from droughts in Canada and Australia to excessive rain in parts of the USA. Gradual melting of glaciers in Asia will cause massive damage to China and India, where perennial rivers such as Yellow, Yangtze and Ganges are flowing from such glaciers. It will reject the all the necessary irrigation water for both wheat and rice cultivation during dry periods. This is of global significance since China and India together produce more than half of the World's wheat and Rice. Once again, official policy has been tardy in considering such problems, much lesser in addressing them.

This means that the number of hungry people actually increased in the world as a whole, and particularly for certain developing regions. The surprise is that the growing prevalence of hunger and food insecurity was associated with relatively high GDP growth in several regions, such as India and countries in Latin America. The contrast with east and south East Asia is a stark one, and points to the role of public policy in ensuring that aggregate income growth translates into better provision of basic needs such as food for the general population.

[4] George P.S : "Some Reflections on Food Security in India" (2006): From "Indian Agriculture – in the new Millennium (Vol –II), Changing perceptions and Developing Policy. Edited by NA. Majumdar and Uma Kapila. Indian Society of Agriculture Economics – AF – 2006.

Chapter IV
Growth of Agriculture and Concerns of Food Security

"India cannot prosper without the prosperity of Agriculture". In this chapter basically we try to examine the growth of agriculture during the period between 1981-82 and 2009-10, before and after liberal economic reforms, and also try study the prospective and challenges involved in today's political and physical environment with regard to the food security.

Rice *(65per cent) and wheat (35 per cent)* comprise majority of the Indian diet pattern[5]. The unfortunate and sad part of it is that, most of the Indian agriculture still remains the "Gambling in the Monsoon" (only 40 per cent of cultivated land is irrigated). After facing severe food insufficiencies soon after the independence due to problems like lower production, famines and occurrence of wars, which continued till mid 1960's. India could able to wake up from this menace and come up with innovative measures like Green revolution, which brightened the situation in terms of self sufficiency in food grain production to some extent. In any developing country it is natural that agricultural sector contributes major share in its GDP during the initial stages. But as the process of economic development starts making impact, gradually the dependence on agriculture both for livelihood as well as share in GDP would come down. But unfortunately the sad story in India is that though the share of Agriculture has come down in GDP, the amount of people who are dependent on agriculture has not come down significantly. Growth in Industry and Manufacturing sector has not been able to release the additional work force from agriculture. This kind of development cannot be termed as an inclusive mode of development. Before analysing the prospects and challenges involved in Indian agriculture as far as food security is concerned, it's imperative for us to examine the expansion, relevance and evolution of Indian agriculture over the years.

4.1 Decreasing Farmers' income and threat of Food Insecurity:

The main problem in the agriculture sector is not so much lack of production and productivity but assured and sustained increase in farmers' income. The present marketing system is not farmer friendly, Government support and intervention to provide remunerative prices is dwindling and over all government investment in capital information in agriculture has not

[5]Barah B.C (Aug 2007) : "Criticality of Rice and Wheat System in Sustainable Food Security in India – An Analysis". Agricultural Situation in India -.

been sufficient to generate economic activities in rural sector as was done vigorously during green revolution in 1970's and early 1980's. These macro level factors can be energised in favour of the farmers but there are certain inherent constraints of the agriculture sector of the economy that will need a new look and policy to introduce changes to correct these constraints. Since 1990-91 with the liberalisation of economic policies, WTO membership from 1995 and agri-produce surpluses arising in the farm sector coupled with less than adequate intervention by the government, small farmers in particular found it difficult to compete in the market. The economic limitation of small operation has surfaced as a critical factor to get adequate and sustained increase in income. That calls for structural, organisational and institutional changes in managing the farm sector in India. What India needs now is the incomes policy for farmers. Agriculture policy oriented towards production and productivity alone is not going to provide sustained increase in income to farmers. Hence, new frame work for sustained increase in income is to be evolved.

4.2 Rich Agriculture and Poor Farmers:

The current situation of the farm sector in India is one of rich agriculture but poor farmers. On the one hand small farmers have made India self sufficient in food grains but by the end of the 20th century the farmers have become poor. Their average per capita incomes in absolute and relative terms declined over the period. This is a serious issue for the economy as no progress will be worth the name if 72 per cent of India's population continue to face the grim situation of falling incomes.

Along with them in almost all the crops' cultivation (in terms of cultivated area), India stands top in the world for eg: Number one in total irrigated area, number second in wheat and Rice, third in cereals and 1st in pulses, second in oil seeds, second in fruits and second in sugar cane and first in tea, jute and milk cultivation and he total area under cultivation is 142 million hectares. Out of this, 100 million hectares is dependent on monsoons for water. Average area under operational holding is 2 hectares and the total farmers having this area are 86 per cent. If India is the largest producer of several crops, it is also the country that has *lowest yield per hectare for all crops.* For eg: per hectare yield of paddy is 6.2 tonnes in USA and it is 2.9 tonnes in India, and for wheat it is 3.9 tonnes in China and 2.5 tonnes in India[6].

[6]Pitale R.L (2007): "India: Rich Agriculture: Poor Farmers – Income policy for farmers", Daya Publishers House- Delhi.

It is very clear that India has become self sufficient in agri produce and can compete with rest of the world if developed countries reduce their subsidies to farmers. The area under irrigation has gone up during the last 30 years significantly and there is great potential to be tapped. Crop intensity[7] is singular factor that has offset the disadvantage of small size of the farmers. Production structure is quite diversified. In terms of production it ranks first and second in the world for number of commodities. The cost of production continues to be high and farm labour contributes much for the increase in production. Though productivity is nearly the half the productivity by world standards, there is great potential to tap it by increasing the intensity of production. It is also to be understood that indiscriminate use of fertilisers and other chemicals may increase the productivity but there is danger of contaminating the produce with the chemical substances. The developed countries have realised the perils of this increased chemical productivity and are now going in for more of organic production even if the productivity comes down.

Chapter V
Trends in Food grains Production and Self Sufficiency

In this chapter we try to present the performance of food grain production in India and try to analyse the attainment of self sufficiency and challenges involved in it. More importantly, we try to analyse the factors that have determined the fluctuations in productions. For this purpose, we take up the food grain production data since 1980s, especially Rice, Wheat, Pulses and also total food grains together and try to draw the inferences. Based on these inferences we will examine the trends as well as causes, opportunities and challenges, and make appropriate projections. Therefore, we take up the data at an aggregate level and also most of important food grain producing states.

Our calculations in the planning Commission suggest that this 8 per cent growth in GDP requires growth of agricultural GDP to be around 4 per cent. In the 15 years after 1980, growth of agricultural GDP was around 3.4 per cent. This was lower than the 4 per cent growth needed, but it was sufficiently close to it to believe that a little more effort within the same strategy would yield the growth results we want. Since the periods following 1996 growth of agricultural GDP has declined to around 1.7 per cent. Underlying this slow down is a slowing down in the growth rate of yields per hectare in almost all crops. To move from

[7] Cropping intensity = (Gross cropped area / Net sown area) x 100

this performance to the target growth rate of 4 per cent in the years ahead involves more than doubling of the existing underlying trend in agricultural growth.

5.1 Global Status of Indian Agriculture in Production:

Considering global context, after USA and China, India stands at 3rd place in the production of cereals. Considering the growth rate of population of 2.1 per cent between 1950-51 and 2006-07, the annual average growth rate of cereals was 2.5 per cent. To some extent, except occasionally, this has prevented food imports between 1976-77 to 2005-06. But unfortunately between 1990-2007, the growth rate of food grain production has come down to 1.2 per cent, during the same time the growth rate of population has increased to 1.9 per cent, showing a clear indication of decrease in food grain self sufficiency. At the same time, the per capita consumption of cereals had come down from a high point of 468 grams per day per person in 1990-91 to 444 grams per day per person in 2008-09, showing a clear decline of 05 per cent during this period.

5.2 Food Security in the post Liberalisation Era:

The developments that were taken place in the food security situation during post liberalisation period are... firstly, on the positive side, since the GDP and per capita income recorded fairly high growth rates during the 1990's, the economic access of the population to food has certainly increased, on an average. But the growth rate of agricultural GDP shows a visible deceleration at 1980-81 prices. Higher growth was mainly because of the assured contribution of fruits and vegetables, since the growth rate of crop production registered a significant decline.

Thus the food security situation has deteriorated on many counts. Coming first to availability, food grains output has registered a significant decline during 1990's. Therefore, the per capita availability of food grains has actually declined from an average of 485 grams/day during triennium ending (TE) 1990 to only 444 grams/day during TE 2008-09. But despite lower output, FCI accumulated huge stocks of food grains. The main reason for this is a perceptible decline in the demand for food grains is firstly because of diversification of food basket over time. *But an important reason for decline in demand during the 1990's is due to very large hikes given to rice and wheat prices under the pressure of surplus states*

and also perhaps under the influence of international agencies. The result is that many poor households have been priced out and thus pushed away from food secured position[8].

The tinkering with the PDS, making it targeted PDS and keeping the prices for the above poverty line (APL) public distribution beneficiaries very high (sometimes higher than the open market price) has contributed to a steep decline in off take. The exports of wheat and rice have also become unprofitable at the current price mainly because of the downward trend in international prices. On the other hand, the procurement of rice and wheat is increasing every year even during the years when aggregate output of wheat and rice has declined. The private sector also opted out because of higher prices and has depleted its stocks. All the emerging surpluses have, therefore to be procured by the FCI. The consequence is mounting stocks co-existing with unfulfilled demand for food grains.

The high price of food grains is the main cause of this disarray in the Indian food market is borne out by the fact that recently with the decision to reduce both BPL and APL prices in 2010; the off take has increased significantly. Further some, with the decision to give transport subsidy to exporters and allowing them to lift food grains at concessional prices, exports have also registered a notable increase. The result is that food stocks which had reached a level of 58.1 Million tonnes in Jan 2002 have come down by 48.2 MN tonnes in Jan 2003 and 25.2 MN tonnes in Jan 2004[9].

The lesson is that one of the most important components of food security is a reasonable price at which all sections of the population, including the poor, can afford to purchase sufficient quantities of food to meet their food security requirements. Finally the most serious aspect of food management during the recent period is a deliberate attempt to erode the credibility of the food management system. This applies to PDS as much as to the policy for minimum support which is sought to be replaced by insurance..etc., putting the Indian farmer once again at the mercy of the insurance agents and the food security at stake.

[8]Hanumantha Rao CH (2005): "Declining per capita Demand for Food Grains in Rural India- Causes and Implications", From 'Agriculture, Food Security, Poverty and Environment', Essays on Post Reform in India 2005.

[9] Sabnavis; Madan (2010): "Revamping Food Procurement and Pricing Policies", from Yojana Oct 2010.

5.3 Terms of Trade[10] in Agriculture:

On the other hand, imports of some agricultural commodities, in particular, edible oils have risen at a very rapid rate with adverse consequences for oil seed farmers in the dry land regions of India. While liberalisation is expected to benefit Indian farmers through increase in exports, the harmful effect of cheap imports on the income of the farmers in some regions can also not be ruled out in future.

Indian farmers did derive some gain from exports during 1990's. But, in this perspective, one has to remember that India's exports shared only 5 per cent of value of agricultural output and 6.1 per cent of agri GDP with imports sharing 2.6 per cent of GDP in the year 2000-01. Consequently, in absolute terms, the gains from exports are only limited and only a very small proportion of the farming community in some regions has benefited from them. However, India has a large potential to increase its agricultural exports in a liberalised world once the developed countries agree to eliminate their subsidies.

Chapter VI
Demand and Supply Projections for Food Grains

In the following analysis we try to examine and present the studies that have exclusively focussed upon the projected demand for food grains in future at an aggregate level in India. Various eminent economists have used different tools to these projections keeping in mind of the projected increase in population as well as the demand for food grains. They have also taken into account other parameters like projected increase in income growth and tried to project the possible gap between demand and supply of food grains during the stipulated future period.

VI.1 Per cent Annual Growth rate of projected supply and Demand in 2026

Food Items	Demand	Supply
Rice	1.55	1.01
Wheat	1.42	1.34
Total Cereals	3.17	1.45
Pulses	6.51	0.91

Note: Growth rates are between base year and 2026. Demand Scenario of GDP growth at 9% is considred here. Source: 'Demand – Supply Trends and Projections of Food in India – working paper No.209" by Surabhi Mittal, March -2008, Indian Council for Research on International Economic Relations (ICRIER)".

The table shows that the projected growth rates of demand and supply for Rice and wheat lesser compared to total cereals, pulses, edible oil and sugar. It only shows that there will be

[10] Terms of Trade is "*ratio of prices received by the farmers (for the products sold by them) to the prices paid by them (for inputs and consumption goods purchased by them) to the prices paid by them (for inputs and consumption goods purchased by them)*

supply shortages in response to demand. It indicates that there will of scope for food insecurity in future. Rice and Wheat falling short of demand marginally, but Pulses and Cereals have been subject to extreme differences in supply and demand in future by the year 2026, as their demand will be falling short of supply.

Chapter VII
Data Analysis and Interpretation

VII. 1 India's Population & Food grains: Compounded Annual Growthrates
(Between 1981-82 to 2009-10) (%)

year	Population	FG Production	Rice	wheat	Pulses	Cereals
1981-82 to 2009-10	1.93	1.87	2.17	2.62	0.62	2.06
1981-82 to 1994-95	2.10	2.79	3.49	3.71	1.27	2.89
1995-96 to 2009-10	1.71	1.24	1.36	1.16	0.71	1.40

The above data of growth rates presents us an answer to the question how the growth rate of food grain production, including Rice, Wheat, Pulses and Cereals has varied during our study period between 1981-82 and 2009-10 in relation to total population growth rate during the same period[11]. It shows that the overall food grain production growth rate (1.87 per cent) is slightly lesser than the overall population growth rate of 1.93 per cent. But if we observe the pre WTO and post WTO regime growth rates of food grains, they exhibit different picture. In the first sub period of pre WTO period, growth rate of food grain production (2.79 per cent) is significantly higher than the population growth rate of 2.10 per cent and on the other hand, the food grain growth rate in the second period of liberal WTO free trade, has drastically come down to 1.24 per cent which is very much lower than the growth of population during this period. It only suggests that, though the overall growth of food grain production is lagging behind the population growth rate during the total period and more so in the post liberal trade period of 1995-96 to 2009-10. It is a clear indication for the fact that our food grain production has not been able to grow so as to provide sufficient food grains to increasing population[12]. This trend is more prominent during latest period of WTO free agricultural trades regime, as higher food grain production growth in the pre WTO period has seriously dropped down below the population growth during the WTO regime. That only

[11]Hanumantha Rao CH (2005): "Declining per capita Demand for Food Grains in Rural India- Causes and Implications", From 'Agriculture, Food Security, Poverty and Environment', Essays on Post Reform in India 2005.
[12]Krishnakumar S (2004): "Agricultural Trade Liberalisation and Food Security-Theoretical Debates and Empirical Issues", from 'Poverty and Food security in India: Problems and Policies',edt by M.S.Bhatt, New Delhi 2004.

suggests that the food grain self sufficiency of India is more jeopardised during the WTO regime than in the pre WTO regime.

In the same way, the growth rate of Wheat, Rice, Pulses and Cereals has also been more positive in the pre WTO period as their respective growth figures 3.49, 3.71, 1.27 and 2.89 per cent in the first period have significantly come down to respective 1.16, 1.36, 0.71 and 1.40 per cent during the second sub period. It also again projects the same trends of insufficient production of Rice, wheat, Pulses and Cereals during the post WTO period of 1995-96 to 2009-10. This adverse growth, as far as food security of India is concerned, can be attributed to the restrictions that have been imposed on our farmers through WTO[13], in terms of opening up of the agricultural imports; reduction in import quotas, quantitative restrictions (QRs) imposing the strategy of export led growth and concentration on cash crops rather than the food grain crops[14]. Also due to the gradual depletion of public investments over agriculture and also exposing our labour intensive and antiquate high cost cultivation to the developed agricultural markets have all together pushed Indian farmer into a fragile situation. Ultimately these trends have led to deterioration of the viability of cultivation and finally led to the drastic decline in the food grain production during this reform period and effected country's food security at the aggregate level.

Firstly if we can observe the population during three periods, it's very clear that growth rate in the first sub period, i.e. during pre WTO period is higher (2.10 per cent) is higher than the second sub period i.e. 1.71 per cent. And the overall growth of population is 1.93 per cent. On the other hand, the per capita availability (PCA) of food grains is far lesser than the growth rates of population in all the periods, especially in the total period it is just -0.04 per cent. It only emphasises the fact that hardly there has been any increase in the PCA of food grains[15]. But this PCA of food grains is, to some extent, a positive in the first sub period of pre economic reforms with 0.35 per cent growth and in the second period it had declined to as low as -0.64 per cent negative growth rate. It only suggests that the per capita availability of food grains in India during our reference period has not grown on par with that of population growth[16]. It can be due to various combinations of factors. Apart from a rapid increase in

[13] Panda;Manoj, Kumar;Ganesh A (2008): "Trade Liberalisation, Poverty and Food Security in India", from 'IGIDR, Mumbai, WP-2008-013.

[14] Ibid

[15] Sharma; Alakh N (2010): "Food and Nutrition Security in India", from 'Agriculture, Food security and Rural Development', by Asian Development Bank, OUP-2010.

[16] Sharma; Devendar (2008): "Importing Food Insecurity", from Yojana –July 2008.

population, very placid and low production growth, especially during the post WTO period had severely affected the PCA of food grains. Because, under WTO regime a traditional Indian agriculture has been exposed to the developed country's' agriculture, during this period as there was rush of cheaper food grain imports, our high cost farming has not been able to withstand the competition from the affluent countries' food grain imports. Hence they had shifted away from food grains or they had been compelled to shift away food grain cultivation as there was gradual decline in the support structure to the farming from the Government.

VII.2 Population & Per Capita Availability of Food grains Compounded Annual Growth rates: (From 1981-82 to 2009-10) (kg/year %)

year	Population	F.Grains*	Rice	Wheat	Cereals	Pulses
1981-82 to 2009-10	1.93	-0.04	-0.14	0.49	-0.16	-0.65
1981-82 to 1994-95	2.10	0.35	1.04	1.40	0.58	-0.43
1995-96 to 2009-10	1.71	-0.64	-1.00	-0.78	-0.78	0.67

*Food grain production. Calculated by the researcher based on Raw data taken from ministry of Agriculture, economic survey of India and Ministry of Consumer Affairs, Food and Public Distribution, during Different referred time periods

In any economy, per capita availability of food grains is one of the important parameters that can be observed in order to assess the level food grain self sufficiency on the supply side at an aggregate level. In the case of Rice, Wheat, Pulses as well as Cereals in terms of compounded annual growth rates during all three periods. Only the Wheat has maintained positive growth rate (0.49 per cent), though lesser than the population growth rate of 1.93 per cent. But it had also put up as much as -0.78 per cent negative growth of PCA during the post WTO period, came down from the growth rate of 1.40 per cent during pre WTO period, between 1995-96 and 2009-10. Apart from Wheat, Rice PCA growth during the total referred period is -0.14 per cent, which is long way below the growth rate of population and also the growth rate of food grains. But it had a positive growth of (PCA of Rice) 1.04 per cent during the pre WTO period and later registered -1.00 per cent growth during the post WTO period with respect to PCA of Rice. In the same way same are the trends with PCA of Cereals (including coarse cereals) has had negative growth rate (-0.16 per cent) during overall period as well as well as second sub period (-0.78 per cent) despite maintaining positive growth of PCA with 0.58 per cent in the first sub period. But unlike Rice, Wheat and Cereals, Pulses PCA growth rate, despite its overall negative PCA growth of -0.65 per cent, has been positive in the second sub period of economic reforms with 0.67 per cent growth that was earlier negative at -0.43 per cent during the first sub period. This trend can be attributed to the

increase in area under cultivation for pulses as well as in crease in per hectare yield during the post liberalisation/ WTO period[17]. Though this growth is not sufficiently enough for the economy, but it had somewhat stood up with competition unlike Rice and Wheat.

Chapter VIII

Findings and Suggestions

"Food security is as important as National Security and every food grain saved is food grain produced, India can't prosper without agricultural prosperity**"**

Conclusions and Suggestions:

In India, chronic hunger rarely figures in public debates and electoral politics. In a recent count of these opinion articles over a period of 6 months, it was found that the health, nutrition, education, poverty, gender, human rights and related social issues combined accounted for barely 330 out of 300 articles. The neglect of social issues in general, and of chronic hunger in particular, is often attributed to lack of political will. *Indian economy has one minor flaw, namely that most people are unable to participate in it due to economic insecurity, lack of education, social discrimination and other forms of disempowerment*. In short, Indian democracy is trapped in a vicious circle of exclusion and elitism. Because underprivileged sections of the population are excluded from active participation in democratic politics, their aspirations and priorities are not reflected in public policy. The elitist orientation of public policy perpetuates the deprivations like poverty, hunger, illiteracy, discrimination etc. that disempower people and prevent them from participating in democratic politics.

On the global front, we posses more cultivable land than China, but our yield is much lower than China, for eg: Per hectare yield of Rice in China is 8 tonnes where as in India it is just 3 tonnes, which is due to low technology, low government investment and climatic conditions...etc. 56 per cent of our food grains come from the irrigated land and the remaining 44 per cent of food grains have to come from the unirrigated land. Therefore when the environment turns uneven, this 44 per cent of food grains production is at stake. Average area under operational holding is 2 hectares and the total farmers having this area are 86 per cent. If India is the largest producer of several crops, it is also the country that has **lowest**

[17]Srivastava S.K, Sivaramane N, Mathur V.C (2010): "Diagnosis of Pulses Performance of India", from 'Agricultural Economics Research Review, Vol.23 Jan-June pp 137-148.

yield per hectare for all crops. The per hectare yield of rice in India (metric tonnes) is *only 2.9, lagging behind many countries like Egypt 9.8, Japan 6.4, Korea 6.7, USA 7.8 and the world average is 3.9.* Even we find lot of differences with in India among our states in terms of production and per hectare yield. This is the gap that has to be tapped to enhance the food grain production levels, especially in the light of global warming and depleting water resources, so that food security can be attained in future. Agriculture is included under GATT for the first time in 1994 and the entire policy regime is geared to make poor countries' exports more primary products. Whether this process leaves more people in hunger or dead in these countries doesn't appear to concern the advanced countries today anymore than it did in the past. It's nothing but a decolonization[18].

We cannot depend on imports to maintain food security and mitigating the food inflation. According to some economists, inflation is nothing but a tax on the poor since food accounts for a relatively high proportion of their expenses which is bad news for ruling politicians, because it's the poor India that vote in much larger numbers than the rich[19]. If we remain as the food importer in the world market, international prices would increase sharply thus jeopardises our food security. In the second period, import growth rate of food grains has increased from -3.12 to 8.32 per cent; it only shows that the food grain imports have increased on a massive scale especially pulses, especially during second period involving liberal economic reforms and free trade that have affected our agriculture quite severely. *Taking edible oils and pulses together, India has emerged during the 1990s as the world's major importer of these commodities.*

8.8 Objectives Addressed

Therefore, after our analysis, here we can say that, with regard to our first objective i.e. trends in food grain production and impact on food security, it is observed that in Indian context, during the study period under consideration the food grain production has fluctuated during pre and post WTO period. Therefore the food grain production growth was more positive in the pre reform period than in post reform period. The second objective, i.e. per capita availability also shows that the overall growth of per capita availability growth has been negative (excluding variations within the group of cereals and pulses) due to both decrease in

[18]Patnaik; Utsa: (2007) - "The Republic of Hunger and other Essays – three essays collective" 2007.
[19] Paranjoy Guha Thakurta. "Is India, the World's Second Most Populous Nation, Facing a Food Crisis"? From (net) BBC – 2008-04-07, 06:53:40 GMT.

production and also due to other factors. These trends have led to the questions like emerging food insecurity in India.

Third objective, i.e. free trade environment and its effects on food insecurity, after our analysis throughout our research, we can observe that the both the growth of agriculture, exclusively the growth rate food grains and also the per capita availability of food grains have been positive and desirable during pre WTO period than in post WTO period. It only suggests that the WTO commitments of India have affected labour intensive Indian agriculture negatively, thereby food grain production and consequently our enlarged the scope for food insecurity. And finally our fourth objective, future demand and supply projections of food grains, based on reliable studies, it is clearly observed that by the year 2020 (and some studies by the year 2026) our food grain growth at aggregate level would be lagging behind the growth rate of income and also population. There will be a scope for probable and significant rift between projected demand and supply where in demand would be falling short of supply. These projections would only indicate us that unless we address the agricultural issues and increase the food grain production there would be every possible scope for India for landing up in a situation of insufficiency in food grains. If we do not have sufficient foreign exchange reserves to import food grains it would surely lead to a heavy prevalence of food security in India.

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Chapter I
Introduction

Dr. B.R.Ambedkar enshrined Directive principles of state policy, which envisaged the democratic notions of "Liberty, Equality and Fraternity". According to him, democracy is both the end and means of this ideal. It is the end because he ultimately considered democracy itself as synonymous with the realization of liberty, equality and fraternity'. At the same time, democracy was also the means through which this ideal was to be attained[1].

In Ambedkar's perspective, democracy is comprehensively geared to social transformation and progress of human society. In one of his famous and inspiring definitions, he elaborated democracy as "a form and method of government whereby revolutionary changes in the economic and social life of the people are brought about without bloodshed"[2]. In order to realize this vision *it is essential to link political democracy with economic and social democracy*. This is one of the basic objectives of the constitution. In Ambedkar's words "our object in framing the constitution is really twofold: To lay down the form of political democracy and To lay down that our ideal is economic democracy and also to prescribe that every government whatever is in power shall strive to bring about economic democracy. But in India, sixty four years down the line, economic democracy appears quietly buried as a tool of public service, and even the so called notion of political democracy is in no way in the pink of health.

India is a country with 1210 million population[3]. It's a federal parliamentary democratic country comprising of the diversified sections of people in terms of language, religion, region, custom, creed, climate, costume, colour, cuisine and dietary patterns. It's highly and densely populated nation standing next only to China at present in the World. It also claims to be one of the fast growing and emerging economies in the world. Ever since India became independent in the year 1947; it has been a developing country. In the past 60 years, though we have made reasonable strides into the economic progress, we have to say, this progress has been quite slow and low, and also not an inclusive progress at the grass root level. Ours' is still a developing country, with heavy dependence on agriculture, as still 58 per cent of the population find their livelihood in

[1] Dreze, Jean (2004): "Democracy and Right to Food". From 'epw, April 24th, 2004', pp 1723 to 1935.
[2] Ibid
[3] Census of India 2011.

agriculture and allied activities[4]. Though the share of agriculture in the nation's GDP has come down marginally to 18.5 per cent (2010), the population pressure on agriculture has not come down significantly. Three out of five people employed in India depend on agriculture for their livelihoods, as cultivators and agricultural labourers or both. Many of these people, a large share of who comprise the poorest continue to be bound to low value, low productivity agricultural activities.

The composition and charactersick of Indian population is very much diversified and unique. On the one hand we have number of creamy sections and multi millionaires and on the other, we have nearly 27 per cent (2011 census) of the population lying below the poverty line, who are even unable to get sufficient food every day. Even some of our human development indicators like human capital, expenditure on health, education and infrastructure lag behind many of the South Asian and African countries.

India is the only Asian country other than Bangladesh and Yemen that have been under severe food shortages in the world. The rest of the countries come from Africa. About 42 per cent of underweight children claim India as their home (UNO Hunger Force). 47 per cent of children under 5 years old are underweight, 45 per cent are stunted, and 46 per cent have severe malnutrition (wasting: disproportionate growth) (National Family Health Survey III 2005-06). India is also a home for a large number of people affected by malnutrient deficiency (iron, iodine, vitamin A. This hidden hunger contributes to low human capital through reduced cognitive ability of the people, and low productivity of labour.

1.1 Definition of Food security

The term Food Security, as understood today, implies both physical and economic access to balanced diet for each household and for all members in a household. The Rome Declaration on World Food Security and World Food Plan of Action 1996, defined food security in unambiguous terms as *"when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life"* (FAO-1996).

In Amartya Sen's words "A person is brought down to starvation if some change in his

[4] Economic Survey of India 2011

endowment., (eg: alienation of land, loss of labour power due to ill health), or in his exchange entitlement mapping (eg: fall in wages, rise in food prices, loss of employment, drop in the price of the goods he produces and sells), makes it no longer possible for him to acquire any commodity bundle with enough food".[5] Sen's analysis has also paved the way for the examination of intra-household distribution and allocation of food and has resulted in a shift of focus from national and household level food security to individual level food and nutritional security.

In Jean Dreze's view "It will direct attention to the various economic, political, social and cultural relations that determine the 'acquirement of food by individuals".

Today the notion of food security implies not only to physical and economic access to food but also access to biological utilization of food that they consume, e.g.: elements like environmental conditions, safe drinking water and sanitation and also nutrition aspect collectively would determine or hinder the food absorption of one human being. It means the Availability, Access and Absorption together would determine the holistic concept of food security.

World Bank (1986) report says that food security means "access by all people at all times to enough food for an active, healthy life". Its primary elements are not only the availability of food but also the ability to access it. The Bank also draws a distinction between chronic food insecurity and transitory food insecurity. Basically chronic food insecurity indicates "continuous insufficient diet due to inability to acquire grains. This affects poor households that persistently do not have the capacity to either buy or produce food on their own." The issue of transitory food insecurity is understood as short time decline in the household's access to sufficient food. This is the result of instability in price of food grain, household's income and food production. Sometimes it might even lead to the situations of famines. A country which is not self sufficient in food grain production may not be able to enjoy adequate entitlement for its domestic food security if it there is no economic and political strength in order to acquire its food requirements through exchange from the surplus countries.

The term Food Security has many Dimensions like:

Production: Determined by agriculture and food grain production

[5] Sen; Amartya (2008): "The Real Food Problem", from Yojana – July 2008.

Consumption: Determined by the Purchasing power of the people and prevailing food prices

Distribution: Determined by the food management of both Government agencies and Private Players. It assumes greater role when there exists a large difference between production and consumption.

It also is again determined by the Availability of food grains, Accessibility in terms of purchasing power and Absorption: related to the acceptance of the particular food to the people and also availability of other basic amenities like drinking water, sanitary conditions, hygienic conditions and medical and toilet facilities.

1.2 Scope of Food Security

On the other hand, 'Food Security can also be defined as stable availability of food grains at National, Regional and Household levels. National level food security can be explained through domestic production and through imports and also through changes in the food stocks. Food security at the regional level can be realized through inter regional food grain adjustments from the food surplus regions to the food deficit regions/states. Finally, food security at the household level can be realized through enabling all poor people with enough of purchasing power in order to acquire the minimum food requirements among all members of the family. The considerable achievements that we had in our past have been a matter of pride and feeling of accomplishment. But we have bigger challenges ahead in future and we have to shoulder the responsibility of more than 380 million poor people that still remain undernourished while the global undernourished figure is 925 million[6], indicating that more than **1/3rd are in India.** 65 percent of the world's hungry live in only **seven countries** namely India, China, the Democratic Republic of Congo, Bangladesh, Indonesia, Pakistan and Ethiopia[7].

The salient feature or indicators of food insecure people are, own poor quality of land or no land, sale of productive assets, taking small and informal loans from money lenders, rely heavily on wage work, migration, purchase staple grains more than once a week, suffer from physical disabilities or chronic illness, women who work for wages and possess young children, providing

[6] FAO 2010
[7] Ibid

dowries, buying gifts and fulfilling obligations to relatives…etc., Almost all these indicators are related to poverty. Therefore poverty is the major detriment of chronic food insecurity[8].

In today's world the poorest of the poor families in the world spend 80 per cent of their total income on food grains and inadequate purchasing power deprives them from availing food in sufficient quantity. The shocking news is that, today hunger is on the rise. There are now 925 million people across the globe suffering from undernourishment in a world that already grows more than required food to feed the global population. It is surprising that in 21st century one child under the age of five years will die every five seconds from hunger related diseases. Hunger may kill more people than all wars fought in the coming years. But unfortunately there seems to be a very less serious war against this. In fact, United Nations 'World Food Programme' (WFP) shows that the quantity of food produced is more than one and a half times what is needed to provide every person on earth with a nutritious diet. Yet, while the percentage of the world's population living with extreme food shortages has plummeted in recent decades, but the absolute numbers have grown. Nearly 875 of the 925 million who suffer from chronic undernourishment live in developing countries. The FAO (2009-10) describes it as *'continent of the hunger'* that overtakes the population of Latin America or even Sub Saharan Africa (SSA).' According to UNICEF 2010 analysis 42 per cent of the World's underweight children and 31 per cent of its stunted children are in India. When we observe the popular slogans like 'Incredible India' and 'India Rising', India's condition is not much better than that of the dark continent, Africa or specifically Sub Saharan Africa as far as the issue of food security is concerned.

1.3 Poverty and Gravity of Food Insecurity in India

Generally, demand for the food grains depends upon, income of the consumer, food habits of people and finally on the rate of urbanization and Growth of population. In the total World, India accounts for 16.7 per cent of the food consumers. During the time of independence in 1947, India was in the clutches of a severe food crisis, which was further exposed by the partition of the country. Then the demand for food exceeded the supply.

If we go by poverty numbers there are still around **380** million people who are food insecure in

[8]George P.S : "Some Reflections on Food Security in India" (2006): From "Indian Agriculture – in the new Millennium (Vol –II), Changing perceptions and Developing Policy. Edited by NA. Majumdar and Uma Kapila. Indian Society of Agriculture Economics – AF – 2006.

India .Trends in employment and real wages growth also provide some information regarding the purchasing power of the people. Even the coverage of **PDS**[9] **(**NSSO-1999-00**)** is about 30 per cent of rural households for rice and 17 per cent for wheat in India, which again differ from state to state. The total proportion of households reporting grain purchase from PDS in India is just 30 per cent. At all national level, the share of rice consumption was 9 per cent in 1993-94 due to PDS in rural areas, 5.6 per cent is the share of wheat consumption in rural areas; these percentages for urban rice and wheat were 14.2 per cent and 9.2 per cent respectively. The huge increase in population and reasonable growth in income demands an additional 2.5 million tons of food grains annually, besides there are significant increases needed in the supply of livestock, meat, eggs, fish and horticultural products[10].

As per the World Bank estimates, 34 per cent Indian people live on less than US$1 a day (extreme poor) and 80 per cent live on less than US $ 2 a day (moderate poor). National Commission for Enterprises in unorganised Sector (NCEUS 2009) estimates both percentage of people below poverty line (Rs.12 per day per capita consumption in 2004-05) and percentage of people vulnerable to poverty (per capita consumption expenditure of Rs.20 per day in the year 2004-05). As per its estimate, about 77 per cent people of the country are poor and vulnerable. This poor and vulnerable group constituted about 88 per cent of SC/ST, 80 per cent of OBCs and 85 per cent of the Muslim population. Most of them are socially discriminated, educationally deprived and economically destitute. The IFPRI (International Food Policy Research Institute) report on hunger published in 2009, ranks India at 65 out of 84 countries, slightly above Bangladesh and below all other South Asian countries. NFHS III- 2005-06 shows that the percentage of malnutrition children is higher in rural areas than in urban areas. According to NNMB, it is found that even today there is a deficit of over 500 calories in the intakes of children 1-3 years old and about 700 calorie among those 3-6 years old. Therefore there is clearly a gap in access to food (quality and quantity) and health services for children.

The per cent of women who are Anaemic (aging 15-49 years) has climbed up to 56.2 per cent in 2005-06 from 51.8 per cent in 1998-99. In the same way the National Family Health Survey (NFHS III 2005-06), shows that the percentage of anaemic married women in the age group 15-

[9] Public Distribution System
[10] Bansil P.C, (2003): "Demand for Food grains by 2020 AD", from 'Towards a food secure India-Issues and Policy' edt by Mahendra Dev S, Kannan K.P, Ramachandran Nira.

49 years has increased from 53.9 per cent in 1998-99 to 58.2 per cent in 2005-06 in rural areas and from 45.7 to 51.5 per cent in urban area. The per cent of anaemic children (aging 6 – 35 months) has increased from 74.2 per cent in NFHS II to 79.2 per cent in NFHS III. Similarly, percentage of anemic children has also increased from 75.3 to 81.2 per cent in rural areas and 70.8 to 72.7 per cent in urban area between the same periods. This indicates that undernourishment among women and children has increased quite alarmingly in India.

The human rights declaration of UNO (1948), recognizes the right to Food as a core element of an adequate standard of living. Considered as the best state in India, Kerala maintains a rate of malnutrition that is comparable to many African countries. In the year 1992-93 (NFHS I) the rate of malnutrition was 54 per cent, further rose to 46 per cent in 1998-99 (NFHS II) and ultimately to 46 per cent in 2005-06 (NFHS III). Here we can observe hardly any positive change but, to our dismay, during this same time economy was growing at about 6 per cent per annum.

I.1 Childhood (0-3 years of age) malnutrition in India (%)

Nutritional Parameter	1992-93 NFHS I	1998-99 NFHS II	2005-06 NFHS III
Stunted[11]	52.0	45.5	38.4
Wasted[12]	17.5	15.5	19.1
Underweight	53.4	47.0	45.9

Note: Figures of NFHS I above are for 0-4 years. However, NFHS I later generated data for below 3 years children with 51.5 per cent children being underweight. Source: NFHS Surveys, IIPS, MoHFW, GoI.

Though the per cent of stunted[13] has declined marginally, the per cent of wasted[14] has increased dismally. But the per cent of underweight children, though declined marginally, has been revolving at alarming rates. These are some of the basic indicators of prevailing high food insecurity and malnutrition in India. States like MP, Chhattisgarh, Bihar, and Jharkhand and UP are under the severe rates of malnutrition, which are well above the national average of 46 per cent.

I.2 Per capita Intake of CALORIE and Protein:

[11] Children who fall below the fifth percentile of the reference population in height for age are defined as stunted, regardless of the reason for their shortness.
[12] Wasted refers to low weight-for-height where a child is thin for his/her height but not necessarily short. Also known as **acute** malnutrition, this carries an immediate increased risk of morbidity and mortality. Wasted children have a 5-20 times higher risk of dying from common diseases like diarrhoea or pneumonia than normally nourished children.
[13] That has not been able to grow or develop as much it should
[14] Too thin, especially because of illness

Year	Calorie (K cal/day)		Protein (gm/day)	
	Rural	Urban	Rural	Urban
1983	2221	2089	62.0	57.0
1993-94	2153	2071	60.2	57.2
1999-00	2149	2156	59.1	58.5
2004-05	2047	2020	57.0	57.0

Note: 1983 – NSSO 38th round, 1993-94 – 50th round, 1999-2000 – 55th round, 2004-05 – 61st round. Source: NSS Report No. 513, Nutritional Intake in India 2004-05.

The table shows that, over 25 year period, the notable aspect is that the per capita intake of calories as well as protein has been coming down continuously. Here, the rural consumption of calories has come down from Kilo calories (K cal) 2221 to 2047 k cal showing an 8 per cent decline. Similarly the urban consumption of calories also has come down from K cal 2080 to K cal 2020 registering a 3.3 per cent decline. In the same way the rural protein consumption has declined by 8 per cent and the urban consumption has remained the same during the same time. All these figures for both rural and urban areas show us the levels are way below the prescribed levels of 2440 Kcal for rural and 2100 Kcal for urban areas. Though the data may not show the exact picture, the intra house hold differences in calorie and protein consumption especially of women and children are also worth considering which show a low quality and the prevalence of latent food insecurity.

1.4 Trends in Malnutrition

Malnutrition in India is one of the worst when compared to even south Asian countries like Nepal and Bangladesh. In this respect, in countries like China and Vietnam, between 1990-92 and 2001-03, amount of people suffering from hunger has come down from 194 million to 150 million in China and in Vietnam it has come down from 21 million to 14 million. But unfortunately in India, the official decline was very much negligible as it only decreased from 215 million to 212 million during the same period[15].

[15] Jose;Sunny, Navaneetham K (2008): "A factsheet on Women's Malnutrition in India", from EPW, August 16, 2008, pp 61 to 67.

I.3 State wise malnutrition rate and Anaemia of Children and Women in Various Age groups (%):

State	Children 0-5 months exclusively breast fed	Children under 3 years- underweight	Anaemia among women (15-49 yrs)
India	**46.3**	**45.9**	56.1
AP	62.7	36.5	62.0
Ar. Pradesh	60.0	36.9	48.9
Assam	63.1	40.4	69.0
Bihar	27.9	58.4	68.3
Chhattisgarh	**82.0**	52.1	57.6
Delhi	34.5	33.1	43.4
Goa	17.7	29.3	38.9
Gujarat	47.8	47.4	55.5
Haryana	**16.9**	41.9	56.5
HP	27.1	36.2	40.9
J & k	42.3	29.4	53.1
Jharkhand	57.8	59.2	**70.4**
Karnataka	58.0	41.1	50.3
Kerala	56.2	28.8	32.3
Maharashtra	53.0	39.7	49.0
MP	21.6	**60.3**	57.6
Manipur	61.7	23.8	39.3
Meghalaya	26.3	46.3	45.4
Mizoram	46.1	**21.6**	38.2
Nagaland	29.2	29.7	**30.8**
Orissa	50.2	44.0	62.8
Punjab	36.0	27.0	38.4
Rajasthan	33.2	44.0	53.1
Sikkim	37.2	22.6	46.8
Tamil Nadu	33.3	33.2	53.3
Tripura	36.1	39.0	67.4
UP	51.3	47.3	50.8
Uttaranchal	31.2	38.0	47.6
WB	58.6	43.5	63.8

Source: NFHS III (2005-06), IIPS, MoHFW, GoI. Note: For state level figures, Pro-rata reduction has been applied on the basis of targeted reduction at All India level.

Here the table clearly gives us a clear picture regarding the amount of severe negative health and nutrition indicators of different states as well as at the aggregate level. States like Chhattisgarh, Jharkhand, Bihar, Madhya Pradesh, Orissa, Rajasthan and West Bengal have been performing very badly on this account while the states like Kerala, Punjab and Himachal Pradesh and Haryana have been showing a relatively decent performance.

1.5 Alarming Hunger Rates

Emergencies like drought, cyclones and earth quakes account for less than 8 per cent hunger related deaths in India, the remaining 92 per cent is the result of chronic hunger which kills over 7000 Indians daily[16]. Though the food is available in India, it has to fight with the perennial problem of hunger. Nearly 380 million Indians remain chronically undernourished. Alarmingly, this is a massive increase from 1991, when only 215 million Indians were food insecure. Malnutrition among pre-school children is a cause of concern. Still half of them suffer from malnutrition, where it is only 33 per cent in Sub Saharan Africa. Adults whose growth has been stunted by childhood malnutrition are 2.9 per cent less productive than non stunted adults. Girls born into tribal and schedule caste families are far more likely to be poor and food insecure. Insufficient intake of these micro-nutrients often called as 'hidden hunger', affects vast number of people, with serious public health consequences.

Half of India's women and 70 per cent of children suffer from anemia. Based on 'National Nutritional Monitoring Bureau's (NNMB)' survey, 47.7 per cent of children (under 3 years) still suffer from malnutrition and the incidence of child malnutrition is higher in the rural areas. Even among adults the incidence of chronic energy deficiency (CED) is quite high, with 37.4 per cent of males and 39.4 per cent of females suffering from CED in 2000-01. The per capita net availability of food grains increased about 10 per cent only over the last 55 years since 1955.

It is a tale of two different people. In one version of the story, a country with a lot of poor people suddenly experiences fast economic expansion, but only half of the people possess share in the new prosperity. The favored ones spend a lot of their new income on food, and unless supply expands very quickly, prices shoot up. The rest of the poor now face higher food prices but no greater income, and begin to starve. Tragedies like this happen repeatedly in the world (Amartya Sen 2008)[17]. Agricultural crops like corn and soya beans can be used for making ethanol for motor fuel. So the stomachs of the hungry must also compete with fuel tanks. The global food problem is not being caused by a falling trend in world production, or for that matter in food output per person. It is the result of the accelerating demand.

[16] Jayant K.Bhugan and Suarna Karunakar (2004): "Private Sector Contribution towards a Hunger Free India". From "National Food Security Summit – 2004 – some selected Papers. Edited by M.S.Swaminathan, Pedro Medrano, Daniel Gustafood securityon and Pravesh Sharma – 2004.
[17] Sen; Amartya (2008): "The Real Food Problem", from Yojana – July 2008.

1.6 International Commitments

India is a signatory and member of many renowned international treaties or covenants like Universal Declaration of Human Rights (UDHR 1948), The International Covenant on Economic, Social and Educational Rights (ICES 1966) and specific conventions like the Convention in the Elimination of All Forms of Discrimination Against Woman (CEDAW 1979), Convention on the Rights on the Child (CRC 1989) and Genocide prevention, what we can decipher from these acts is that India has failed to live up to the norms of these treaties as it has also failed miserably to provide basic access of food to all its citizens.

The extent of food insecurity is more deeper and troublesome especially for the low income groups, land less labourers, agriculture workers, small and marginal farmers, SC/ST sections, women, people living in remote villages and hilly and forest regions, unorganised and daily wage workers. India accounts for about 1/5th of the world's poor[18]. Poorest of India doesn't have sufficient economic access to food despite India being self sufficient in food grain production at aggregate level. This is the phenomenon is a '*hunger amidst plenty'*. In this respect, India has violated right to food in its worst form. There have been starvation deaths in many other places such as in Kashipur in Orissa, Ananthapur and Mahabubnagar in AP. The KBK (Kalahandi-Bolangir-Koraput) region in Orissa, which is one of the highly food insecure regions in the country[19].

Food Consumption cannot be Post phoned[20], according to planning commission, between 1993-00, food grain prices rose by 76 per cent while the prices of manufactured articles went up by 33 per cent. Though the Government of India reduced the food grain issue prices, it only went to the food processing industry and exporters. And the highly subsidised wheat and rice only increased the private profit. There also exists a rapid and continuous decline of rain- fed based coarse cereals such as Jowar, Bazra, Ragi consumed by the poor. More interestingly, non food grain items of food now account for over 60 per cent of expenditure on food. India may be the second fastest growing economy in the world, happens to be the world's largest producer of milk and

[18] Suryanarayana M.H, Silva; Dimitri (2006): "Poverty and Food Security in India – A disaggregated Regional Profile", from 'India: Perspectives on Equitable Development', edt by Dev; Mahendra and Chandrashekar Rao, Academic Foundation.
[19] Vyas;V.S (2002): "Food security in India – Towards elimination of hunger and malnutrition", from 'Economic Developments in India – Vol.94', AF -2005.
[20] Reddy; amarendar A (2010): "Disparities in Agricultural Productivity Growth in Andhra Pradesh", from 'The Indian Economic Journal', Vol 58(1), April-June 2010.

edible oils and the second largest producer of wheat and sugar, but it fares far worse than lesser economies when it comes to taking care of its malnourished children.

1.7 Role of Indian Agriculture

In view of the deceleration of both public and private investment in agriculture, it is not surprising that in the last 15 years since 1990's, the rate of growth of agriculture production, especially food grains production has slowed down to the current figure of about 2.7 per cent from a little over 3 per cent in the fifties and 60's. This rate of growth while still being ahead of the rate of growth of population is clearly inadequate in relation to the rate of population growth combined with increase in incomes, given the observed income elasticity of demand for food grains ranging between 0.4 to 0.6 The requirement of food security suggests therefore that even to maintain the present average levels of consumption, we should aim at a significant step up of food grain production (which accounts for somewhat over 70 per cent of total agriculture output now) to well over 3 per cent per annum in the coming years to provide for larger domestic consumption needs. In India, the yield of rice and wheat has not altered much in the last 10 years since 2001. The yield of rice hovers around 1900 kgs/hectare while the yield of wheat is around 2600 kgs/hectare. Unless these yield levels are doubled in the next 10-15 years achieving food security through improving the income of the rural masses cannot be realized[21].

Nearly 58 per cent of the total employment and 73 per cent of rural employment is generated in the agricultural sector. The share of unorganized sector agricultural labour in the total agricultural workers was 98 per cent during 2004-05. Nearly 2/3rds of the agricultural workers (64 per cent) are self employed, or farmers as we call them, and the remaining, a little over one-third (36 per cent), wage workers. Almost all the wage workers (98 per cent) are casual labourers.

According to NSSO surveys, nearly 40 per cent of the farmers would love to get rid of agriculture provided an alternative. Moreover the average income of a farm household having 2 hectares was less than 80 per cent of their total consumption expenditure. More importantly, the agriculture sector grew merely at 2.5 per cent per annum in the years between 2000 to 2010,

[21] Swaminathan M.S (2006): "Science and Technology for Sustainable Food Security" From 'Indian Agriculture - in the new millennium (Vol – II), Changing Perceptions and Developing Policy.' Edited by N.A.Majundar and Uma Kapila (Indian Society of Agricultural Economics) AF – 2006.

average per capita growth of income of the farm households during the same period is shocking just above 1 per cent. Face of the Indian agriculture is female, but 85 per cent of women languish in primary sector without proper wages and inappropriate working conditions, and also possess very low health standards. In this context of food security, women are at the disadvantageous side without having proper access to the food and absolutely having no ownership rights over the land.

I.4 Plan-wise Trend of Growth of Total GDP and Agriculture GDP (Including allied sectors)

Plan	Average Growth Rate (% per annum)		Compound Growth Rate (% per annum)		Trend Growth Rate (% per annum)	
	GDP	Agri-GDP	GDP	Agri-GDP	GDP	Agri-GDP
1st Plan (1974-79)	4.9	3.6	4.8	3.4	5.3	4.0
6th Plan (1980-85)	5.7	5.7	5.6	5.6	5.1	3.8
7th Plan (1985-90)	6.0	3.1	5.9	3.0	6.3	4.0
2annualplans (1990-92)	3.5	1.3	3.4	1.2	-	-
8th Plan (1992-97)	6.7	4.7	7.0	4.7	6.9	3.8
9th Plan (1997-2002)	5.5	2.1	5.5	2.0	5.4	2.5
10th Plan (2002-07)*	7.6	2.3	7.6	2.1	8.2	4.2

*At 1999-2000 Prices. Source: Original data from National Accounts Statistics from "present status of Indian Agriculture" by Shambhu Ghatak.

The table clearly shows that the Compound annual growth of GDP of agriculture has been declining since 5th five year plan till 10th five year plan whereas the trend growth rate has increased from 4 per cent in 5th plan to 4.2 per cent in 10th plan. In the 10th plan, 7.6 per cent of normal GDP average growth rate has been far above the agr-GDP, which is hovering at mere 2.30 per cent. In the same way the trend growth rate of general GDP, 8.2 per cent, more than the agri-GDP which was merely 4.2 per cent during the same 10th plan. It only shows the pathetic growth deceleration of agriculture sector and there by ultimately effecting the availability of food grains.

I.5 India's Global Rank in Major Agricultural Crops

Crop	Area	Production	Yield
Rice (paddy)	1	2	52
Wheat	1	2	38
Coarse Cereals	3	4	125
Pulses	1	1	138

Source: Food and Agriculture Organisation, Indian Horticulture Database, 2001. From "The Crisis in Indian Agriculture" by Mohan Guruswamy, Uma Natarajan and Shagun Khare (2008)

Table shows that, though India has the maximum area in the World for the production of Rice and Wheat, but ranks second in their production, unfortunately it also ranks at 52nd and 38th in terms of yield per hectare of rice and wheat respectively. Even areas in the cases of pulses (1st), India is ranking very much high in the World, but in terms of production and yields wise, we have been lagging very much behind many of the countries in the World.

I.6 International Comparison of Yield of Rice, Wheat and Maize (2007)

Rice/Paddy		**Wheat**		**Maize**	
Country	Kg/Hect	Country	Kg/Hect	Country	Kg/Hect
Bangladesh	3488	Bangladesh	2164	China	5022
Egypt	9135	China	3885	Egypt	7789
India	**2915**	France	7449	France	8813
Japan	6582	**India**	**2770**	**India**	**1705**
Myanmar	3532	Iran	1905	Italy	9560
Pakistan	2882	Pakistan	2262	Pakistan	1769
Thailand	2597	UK	8043	Philippines	1803
USA	7372				

Source: Ministry of Agriculture and cooperation. From "The Crisis in Indian Agriculture" by Mohan Guruswamy, Uma Natarajan and Shagun Khare (2008).

It is very much clear from the above table that, among all the three crops, India's performance hasn't been very much desirable. In case of Rice, none of the mentioned countries is lagging behind India, while Egypt tops the list with 9135 kgs; even the Bangladesh and Pakistan have been showing better performance than India. When it comes to wheat, India is able to perform better than Bangladesh, Iran and Pakistan. In case of Maize, India is the least performing country among all the mentioned countries. These trends clearly indicate the backwardness of our agriculture and present the consequent upheavals in achieving the task of food security.

1.8 Food grains and Cereals Production

Rice is a staple food of nearly 65 per cent of the total population in India[22]**.** Cereals, especially the Rice and wheat, are the major sources of staple diet in India. The growth rate in the production of cereals declined from 4.13 per cent in the period 1984-85 and 1994-95 to 1.09 per

[22]Barah B.C (Aug 2007) : "Critcality of Rice and Wheat System in Sustainable Food Security in India – An Analysis". Agricultural Situation in India -.

cent between 1994-95 and 2004-05. Annual growth rate in the agriculture sector as a whole declined from 3.69 per cent in the period 1990-96 to 1.65 per cent during 1996-2005. Net sown area, gross cropped area, fertilizer use and electricity consumption also had declined considerably. Growth rate in terms of trade for agriculture had declined from 0.95 per cent per annum during 1990-96 to -1.63 per cent during 1996-2005. In Punjab, even farmers with over 3.00 hectares are unable to earn an income comparable to that of a class IV employee of the GoI. In India, this kind of small and marginal farmer households account for 84 per cent of all farmer households.

Food grains production grew at the annual rate of 2.5 per cent between 1950-51 and 2006-07, slightly higher than the 2.1 population growth rate. However, during 1990-2007, the food grain production grew only by 1.2 per cent per annum while population increased by 1.9 per year. Consequently, per capita annual consumption of cereals declined from a peak of about 171 kgs in 1990-91 to 150 kgs in 2005-06, indicating a decline of over 13 per cent during this period. The consumption of pulses also declined from 15.33 kgs to 12.05 kgs per capita per year during the same period. The area under food grains has also declined by 6 million hectares between 1990-91 to 2005-06. It is generally argued that as the consumption pattern of people is changing due to increase in per capita income, urbanization, convergence of food habits, and more availability of horticulture and livestock products.

Though the total production of food grains increased from 130 million tons in 1980 to 218 million tons in 2009-10, the growth rate has fallen considerably. The production of rice and wheat taken together registered an annual growth rate of 2.27 per cent in the 1990's against a much higher growth of 3.59 per cent in the 1980's. Production of pulses show a perceptible decline (-2.50 per cent) in the 1990's when compared to a growth rate of 2.98 per cent in the 1980's. The growth rate of total food grains slumped from 3.13 per cent in the 1980's to just 1.10 per cent in the 1990's.

I.7 Annual Production Growth rates (per cent)

Growth Rates	Rice	Wheat	Pulses	Total Food Grains
1980-90	3.31	4.27	2.98	3.13
1990-2000	1.35	2.37	-2.50	1.10
2000-2009	1.59	1.89	2.69	1.96

Source: Ministry of Agriculture, Government of India

The table clearly shows that the production growth rates of rice and wheat have been on the decline since 1980-90 period, especially the period between 2000-2009, rice and wheat have shown a dismal performance, where in the growth rates have come down drastically to 3.31 to 1.59 and 4.27 to 1.89 per cent respectively, this deceleration can be attributed to the neo economic reforms and structural changes in the agriculture support system. But the pulses have shown a stagnant progress as the growth rate has reached from 2.98 to 2.69 per cent during the observation period. Unsurprisingly the growth rate of total food grains came down from 3.13 per cent to 1.96 per cent.

1.9 Area and Yield Contributions

Apart from this, if we make an intense analysis, during 1967-1981 period, the partial contributions to production growth were, yield 48 per cent, area 21 per cent, cropping pattern 20 per cent and interactions 11 per cent. During 1982-96 the corresponding proportions were 57, 8, 22 and 13 percent. This underlines the importance of improving the yield of our agricultural commodities. The fall in productivity has been especially significant in the case of pulses, which actually showed a decline of 0.6 per cent annually in the past decade since 1990s. Also, since 1980 to 2003, it recorded a low rate of growth of 1.2 per cent. Coarse cereals are the staple food of the poor and it is considered an important source of nutrition of the large rural population. Even they have witnessed a fall in the rate of growth of productivity from the decade of 1980-90 to that of 1990-2000. Even the non food crops did not fare any better than food crops, as most of them did not record an impressive growth rate either. The average growth rate of productivity of non food grains was modest in the 1980-90 periods but it declined in the 1990-2000 period.

1.2.0 Impact of Green Revolution

On the supply side, India's food grain production increased with many ups and downs. While initial scarcity was met to some extent by the PL (public law) 480, later development of agricultural production with the green revolution technology has become a vastly improved situation. Although confined in specific states and also to specific crops, the green revolution has, by and large, revolutionized India's traditional agriculture. Supply of food grains and for that matter, agricultural production depends upon a number of factors. Besides prices and cost of production, availability of inputs like, water, fertilizer, credit are equally important. Different

states and regions are endowed with vastly different natural resources. Besides land and water resources, the geographical conditions and environment are also equally important. Agricultural production therefore is widely different in different states. The institutional arrangements like land reform, marketing organization and training are also equally limitedly available. Regional disparity in agricultural production and availability of food grains has therefore become an endemic feature of our economy.

Improving agricultural productivity and production helps to ease the problem of food security in two ways: firstly by making the food items affordable to the consumers and second by generating additional employment opportunities to rural work force in farm and non-farm activities. In recent years, food prices have significantly increased, making food items unaffordable to poor households, and at the same times, agricultural income has not increased in commensurate with the increase in the cost of cultivation, consequently increasing distress among farmers. Relatively faster growth rate in tertiary and secondary sectors has been instrumental in creating mismatch between demand and supply of food items. Increasing energy prices have made agricultural production more expensive via raising the production and transportation costs.

1.2.1 Population Growth and Food Production

From the late 1960's onwards, the production of staple cereals increased substantially, mainly contributed by productivity improvements. The dependence on 'food imports' has got decreased gradually and the country became a marginal net exporter of cereals. Between 1964/65 to 2003/04, the production of cereals has increased from 72.1 million tons to 186.4 million tons; increase in the production of staple food (cereals) has kept in pace with the population growth. The long term growth rate of cereals, which was 2.61 per cent per annum over the period 1967/68 to 1980/81 and 2.77 per cent per annum over 1967/68 to 2001/02 has exceeded the Indian rate of population growth. Population growth rate between 2001 to 2007-08 is 1.64 where as the growth rate of cereals is 1.2 per cent between 1994-95 to 2007-08, showing decrease in cereals production while the population growth has come down.

The pattern in the availability of food grains indicates that the six decades of economic planning has not been successful in ensuring sustainable food grain availability either through its

production and pricing policy or through its initiatives launched towards fair distribution of food grains to the vulnerable poor in the country. The affordability dimension of food security is influenced by the price movement of food grains in the country. The food inflation based on wholesale price Index (WPI) at 1993-94 prices during 1994-95 to 2009-10 indicates that the growth in the net availability of the food grains has not been able to influence the demand for the food grains as the same food grains over the years have become unaffordable. This upward price movement in food grains will pose a serious challenge to the food security in India.

I.8 Population and Food Grain Production Growth

Year	**Population** (Mn)	**Population Growth rate** (%)	**Cereal Production** (M.T)	**Growth rate of Food Grains** (%)	**Income Growth Rate** (%)
1951	361.1	1.26	45.8	----	-----
1961	439.2	1.98	69.6	4.3	3.9
1971	548.2	2.24	96.6	3.3	3.7
1981	683.3	2.23	119.0	2.1	3.2
1991	846.3	2.16	162.1	3.1	5.7
2001	1027.0	1.95	185.7	1.4	5.9
2011	1210.1	1.64	203.45	2.28	NA#
2020*	1300.0	1.19	279.0	4.2	6.0

#not available. *projected. Source: Registrar General of India, Ministry of Agriculture, Prospects for India's cereal supply and demand to 2020, by Bhalla et.al, India budget documents and World Development Indicators.

The table shows that, population of India has got almost more than tripled between 1951 and 2011. But the population growth rate during this period has increased to some extent from 1.26 per cent in 1951 to 1.95 per cent in 2001, 1.64 per cent in 2011 and is projected to have 1.19 per cent growth rate in 2020 and the total population might reach 1.3 billion. But unfortunately the growth rate of food grain production has been fluctuating quite negatively. It has come down from 4.3 per cent during 1960's to 1.4 per cent during the 1990's and 2.28 per cent in 2011, indicating alarming trends as far as food security is concerned. Though this growth rate is projected to rise up to 4.2 per cent by 2020, it would be greatly challenged by the increasing incomes and reasonable increase in population and changes in food habits.

The GNP growth rates of the past three decades have been 5.7 per cent and 5.9 per cent and 7.1 per cent respectively, while the food grain production has grown only at 3.1 per cent, 4.1 per cent and 2.28 per cent respectively. And the agricultural GSDP Growth rates for the respective periods have been 3.1 per cent, 2.2 per cent and 2.8 per cent respectively. The growth rate of the economy topped 8 per cent in the past few years, i.e. 2007, 2008 and 2009. This has not been

matched by a desired rise in food production. While the share of agriculture in GDP fell from 55.4 per cent in 1950-51 to 18.5 per cent in 2009-10, those dependent on it for sustenance have risen in absolute terms, indicating the income of the farmer and farm worker is declining in relative terms. There is vast underemployment and unemployment in rural India, which means low wages and wide spread poverty.

The rise in the support price also has an important impact on the food procurement by FCI as it had to buy more food grains than it could manage since the off take from PDS has declined due to upward revision of the issue price. This has also led to the increment of buffer stocks much beyond the recommended stock in a given year. The uneconomical rise in the stock of food grains with FCI has given rise to the overall economic cost of food grains to FCI and has had an adverse impact on the efficacy of the food based safety nets in India.[23]

The yield pattern in case of both food grains and non-food grains indicates that highest growth in yield level occurred during the 1980's. Much of the growth in agricultural production in India is yield driven as the growth in area is limited and marginal; however, Indian agriculture suffers from lower yield levels vis-à-vis major agricultural producers in the World, despite India being one of the largest producers of most of the major crops. Increase in area under food grain cultivation almost appears stagnant in the future. Betterment in the agriculture towards achieving the food security must come from the increase in the productivity and yield. If prices of food items increase faster than the income of poor households, they would not be able to have access to food even if the market has adequate supply of food items.

The availability of per day per capita food grains since independence is indicated in the following table.

[23] Radhakrishna R, (2005): "Food Security: Emerging Concerns" from 'Social and Economic Security in India' edt by Dev;Mahendra, Piyush; Antony, Gayatri V, Mamgain R.P, ihd-New Delhi.

1.9 Population and per capita per day net availability of Food grains

Year	Population (Million)	Per capita net availability per day (grams)		
		Cereals	**Pulses**	**Total**
1952-53	369.2	325.4	59.1	384.5
1962-63	452.2	398.9	62.2	460.9
1972-73	563.9	419.1	47.0	466.1
1982-83	703.8	415.6	39.2	454.8
1992-93	867.8	434.5	34.3	468.8
2002-03	1050.6	458.7	35.4	494.1
2003-04	1068.2	408.5	29.1	437.6
2004-05	1085.6	426.9	35.8	462.7
2005-06	1102.8	390.9	31.5	422.4
2006-07	1119.8	412.8	32.5	445.3
2007-08	1136.5	407.4	35.5	442.8
2008-09	1153.1	374.6	41.8	436.0

Source: Economic Survey, GoI 2008-09 & 2009-10.

The per capita availability of food grains was estimated to be 384.5 grams per day in 1952-53. The net per capita availability witnessed an upward trend till 1972-73. Thereafter, the trend did not have a specific pattern. One can see a fluctuation in the per capita availability of the food grains since 1972-73 till 2009-10. During 2008-09, the per capita food grain availability was 436 grams per day, which came down from 510.1 grams per day in 1990-91. The per capita availability of cereals went down from 458.7 grams per day during 2002-03 to 374.6 grams during 2008-09. However, the per capita per day availability of pulses increased from 35.4 grams during 2002-03 to 41.8 grams during 2008-09. The per capita per day availability of pulses has reduced drastically by 29.5 per cent from 59.1 grams during 1952-53 to 41.80 grams during the period 2008-09. It only shows that, due to various factors like increase in population or decrease in production or due to ineffective distribution system, the per capita availability of cereals, Pulses and Food grains has come down drastically or remained constant during the period from 1952 to 2009.

1.2.2 Bottlenecks in Agriculture

At present, from the agricultural point of view, the happening trend is that increasing commercialization of farming, the increasing reliance on technical change as the main source of growth, the growing importance of oil seeds and livestock products in global output and the growing agricultural trade deficits of developing countries (FAO 2002). These changes are both driven by and interact with rapid urbanisation and rapid industrialisation of the food industry.

At present Indian agriculture is not going towards a desirable path. Improper and populist policies over many years have resulted in problems that have become extremely complex and deep rooted. Productivity is poor, irrigation cover is low (38 per cent), infrastructure is inadequate and the size of the average landholding is rapidly declining (1.4 hectare). And the per hectare consumption of fertilizers is just around 135.3 kg per a hectare in 2009.

Investment on agriculture and state outlays have been falling. There was a decline in the share of agriculture's capital formation in GDP from 2.2 per cent in late 1990's to 1.7 per cent in 2004-05 and further marginally increased to 2.97 per cent in the year 2009-10[24]. The apparent withdrawal of the government from the sector, and a tentative move towards the free market has resulted in high input prices but low output prices. The terms of trade between the rural and modern economies are extremely adverse and only worsening. Moreover, since 1990-91, the growth of agriculture has settled at 2.7 per cent per year (Statistical survey of India, Dept of Economics and Statistics, Tata Economic Services Ltd). This stagnation in agriculture now appears to threaten our food security. It is predicted that with a reasonable rise of 50 per cent in use of fertilisers, expansion of irrigation and technological improvements, cereal production would be 260 million tons by 2020. This figure would be 242 million tones if land degradation intensifies and 279 million tones if it reduces further. Although agricultural production has increased substantially at aggregate level there is a regional variation at state level per capita availability is widely different. Hence food security and starvation persists at backward regions and also at the level of marginal income group.

1.2.3 Agriculture – Source Food Security

Agricultural sector in India has played a major role in the economic development of the country. And agriculture is the most important sector of the Indian economy from the perspective of poverty alleviation and employment generation. Agriculture accounts for about 18.5 per cent of India's national income (2010). It has been declining from 56.5 per cent in 1950-51 to 52.1 percent in 1960-61, 45.7 per cent in 1970-71, 39.6 per cent in 1980-81, 33 per cent in 1990-91, 26.3 per cent in 2001-02 and 20 per cent in 2005-06 and 18.5 per cent in 2010. And the workforce depended on agriculture has come down from 75.9 per cent in 1961 to 59.9 per cent in

[24] Economic Survey 2011

1999-2000 and 56 per cent in 2010. India has achieved self sufficiency in the Food Grain production, which has increased from 50.8 million tons in 1950-51 to 232 million tons in 2009-10. The major food grains have higher growth rate than the minor food grains. Against this achievement, production of pulses remains stagnant at 14.81 million tones except for few years. During the 50 years, wheat has shown maximum improvement in the productivity followed by rice in the major food grains. The productivity of food grains has jumped from 522 kg hectare in 1950-51 to 1798 kg/hectare in 2009-10. Rice and wheat also reached from 668kg/ha and 663 kg/ha to 2130 kg/ha and 2830 kg/ha respectively. Despite the PDS being in place for over half century, India alone accounts for over 400 million poor.

1.2.4 Importing Food Insecurity

The decision to bring the import duties on rice to zero and cut in duty on edible oils comes at a time when the import duty on wheat and pulses has already been reduced to zero. These four major agricultural commodities, including the three most important food crops, have now been left highly vulnerable to the vagaries of an unjust international trade. In any case, with the international prices of wheat and rice reaching the roof, there seems to be no justification for reducing the import tariff to zero. By the end of the 11^{th} plan, the target is to increase the production of rice by 10 million tones, wheat by 8 million tones and pulses by 2 million tones. But how can you increase the productivity of rice or wheat for instance in the next five years by keeping doors open for imports at the same time.

Setting up a time-bound Food Security Mission for enhancing production of wheat, rice, pulses and edible oils comes at a time when the government itself is lowering the custom tariffs thereby allowing cheaper imports. In case of edible oils, India was almost self-sufficient in edible oils in 1993-94. Ever since the government began lowering the tariffs, edible oil imports have multiplied turning the country into World's biggest importer. Due to cheaper imports, India has failed to raise productivity of oil seed crops. Small farmers growing oilseeds and that too in the rain-fed areas of the country had to abandon production in the light of cheaper imports. Cheaper imports have a tendency to destabilize livelihoods. Look at edible oil in 1997-98, the imports have reached a mammoth 5.98 million tones. In 1999-2000, India imported five million tons of edible oil thereby once again emerging as one of the biggest importer of edible oils. All these expensive imports of edible oil have directly affected the livelihoods of both farmers as well as

consumers.

The greatest 'real population pressure' emanates not from China or India but from the advanced countries. For e.g. – per capita energy use in North America was about 47.5 times higher compared to China, over 100 times higher compared to India. With only 4 per cent of world population, USA consumes some 40 per cent of the world's commercial energy, where as the two Asian giants account for less than 5 per cent of the world's commercial energy consumption The two Asian giants of population taken together thus account for a mere 1.6 billion real population, compared to a real population of much as 23.5 billion or nearly 15 times higher in the advanced world. There is continuous pressure on the developing world to export more even at the expense of lowering their own consumption, and to devalue their currency again and again to keep their exports cheaper[25].

1.2.5 Changes in Consumption and Dietary Patterns

In the recent past, consumption patterns in India indicate that there has been a slight decline in the cereal consumption. The decline in the consumption of cereals may be applied to diversification in food basket, but it needs to be examined intensely. Because, the decline in cereal consumption can be attributed to the increase in prices, decrease in the purchasing power of the poor and also partly due to the structural adjustment programmes. We can also refer to Bennett's law, which says that the with the increase in income the consuming quality of food will increase, as it shifts from low quality and traditional food items to more expensive, qualitative and modern food items like milk and milk products, fruits, fish, egg, bread, meat, vegetables and fast food. As Engel's law also says that, with the increase in income the share of income on food consumption will decline. So, the decline in the cereal consumption in rural India may not be an indicator of increase in either welfare or specifically due to change in the diet diversification, it requires more and further investigation.

Report of NSSO survey 2009-10 shows that the monthly consumption of all types of cereals and pulses has declined over the surveys of 1999-2000 and 2004-05. In rural areas, the consumption of total cereals declined from 12.72 kg in the year 1999-00 to 12.12 kg in 2004-05 and to 11.35 kg in 2009-10, while consumption of pulses declined from 0.84 kg to as low as 0.71 kg and

[25] Patnaik; Utsa: (2007) - "The Republic of Hunger and other Essays – three essays collective" 2007.

further to 0.65 kg in the year 2009-10, during the same period. Similarly, in urban areas, the consumption of total cereals declined from 10.42 kg to 9.94 kg to 9.37 kg and pulses from 1.0 kg to 0.82 kg and to 0.79 kg during the same period. In terms of expenditure also, the share of cereals in total food items has significantly declined. For instance, in rural areas, it went down from 40.99 per cent in 1987-88 to 37.31 per cent in 1999-00 and further to 31.59 per cent in 2006-07 and finally to 29.2 per cent in 2009-10. Similarly, in urban areas, it has declined from 26.46 per cent in 1987-88 to 25.70 per cent in 1999-00 and further to 22.97 per cent in 2006-07 and further to 22.3 per cent in the year 2009-10. However, the percentage share of expenditure on cereals is much higher in rural areas than in urban. Non-cereals food expenditure in urban areas constituted about 77 per cent of total expenditure on food items, while the corresponding percentage in rural areas was only 68.41 per cent. Between the period 1972-73 and 2004-05 (NSSO surveys), it is shocking that the share of cereal consumption in the overall consumer expenditure of food grains, has drastically come down from 41 per cent to 18 per cent in case of rural areas, for the urban it has come down from 23 per cent to 10 per cent.

A high growth in horticulture and livestock products may not improve national status of the common masses as they have little or no access to fruits and livestock products due to their low income high prices. Cereal consumption among the poor is the main source of protein, a decline in the per capita availability of cereals and pulses due to diversification may increase food insecurity among them. Increasing consumption of highly income-elastic food products, such as, meat and dairy products have also increased the demand for cereals for cattle feed-grains and thus increasing the cereals prices, affecting the poor households. It is a matter of great concern that if we fail to produce the food grain needed by the society we have to be ready to face the consequences that include importing of all agricultural commodities from other countries losing our pride that our forefathers have brought by their untiring efforts.

Roughly one out of four Indians lives on less than 1 dollar a day and three out of four earn 2 dollar or less. The Indian economy has been growing rapidly at an average of 8.5 per cent since the year 2005s. This growth has been mainly confined to manufacturing, industry and the burgeoning services. Agriculture, on the other hand, has grown by barely 2.5 per cent over the last 5 years and the trend rate of growth is even lower if the past decade and half is considered. Consequently, per capita output of cereals (wheat and rice) at present is more or less at the level

that prevailed in the 1970's.

1.2.6 Global trends: Changing Global Food Structure

Production of 1 kg of meat requires more quantity of grains than that is required when it is directly consumed by a consumer. Thus, if more quantity of grains is diverted towards production of meat and dairy products, less quantity would be available for common masses for direct consumption. Hence, appropriate output-mix is necessary to strike a right balance between "wage goods" and 'high value goods' for the point of view of food security. For instance, about 20 per cent of maize production in the USA is being used to produce ethanol. The increasing production of bio fuel reduces the availability of food grains for consumption and thus raises the prices. Increasing energy prices make agricultural production more expensive via raising the cost of mechanical cultivation, inputs like fertilizers and pesticides, and transportation of inputs and outputs. The high cost of cultivation deters the farmers, especially small and marginal ones, to use modern farm practices and inputs required to augment food production.

Firstly the increased use of bio-diesels globally, for which tones of cereals is being diverted to produce ethanol and millions of hectares of land being diverted to jatropha plantation. **Secondly**: The increased consumption of meat, which requires millions of tones of cereals to feed the cattle and poultry. Thus the cereals which could have fed humans are used for feeding cattle and poultry to produce meat. **Thirdly** the impact of climate on the crops, severe droughts, floods and untimely rains have destroyed crops in huge quantities.

Indian production hasn't declined till now (We might experience low production in the khariff, due to untimely rain), we hardly produce any bio fuel and our per capita meat consumption is below 1kg, which is one of the lowest in the world (USA-50kg). But in future we must ensure that there will not be any scarcity of food grains.

On the demand side, one of the key issues is bio fuels. Bio fuels, made from food crops such as maize, sugar cane, and palm oil are seen as easing the world's dependence on gasoline or diesel, with $1/4^{th}$ of the USA's harvest in 2007 diverted towards bio fuel production, the attendant rise in cereal prices has already had an impact on the cost and availability of food. Critics worry that the gold rush towards commercial crops might hinder the global food security in near future.

1.2.7 Impact of Free Trade

The developed world protects its agriculture and industry while preaching free trade in industrial goods and services, while so many in this world go hungry. Each cow in the OECD (Organisation for Economic Cooperation and Development) countries get a daily subsidy of 2 US $ and the developed world agriculture protection has the effect of reducing GDP in third world countries by 32 billion dollars[26].

In Indian context, from an earlier self sufficiency led growth policy, India has shifted its focus to export led growth during the post 1990s period. Another aspect of agriculture is the external trade or export which has become a focal issue under WTO agreements. The total agricultural exports were 20.4 per cent, out of total exports of the country in 1996-97 and declined to 14.6 percent in 1999-2000 and agricultural imports over the same period have increased from 3.7 per cent to 5.6 per cent out of the total imports of the country.

The first green revolution in the country introduced during mid 1960's succeeded for crops like wheat, rice, maize, jowar, bajra and partly for pulses and oilseeds..etc, in areas where assured irrigation was available along with application of improved seeds and chemical fertilisers. After mid 1990's the crop sector (excluding fruits and vegetables) has shown dismal performance due to sharp decline in growth rate of crop output. Particularly, the productivity growth in several commodities in irrigated areas has been languishing. Besides, cost price relationship is changing rapidly and making crop sector less profitable. Wheat is the staple food crop accounting for about 40 per cent of total cereals production in India. Though there was tremendous increase in its production after green revolution has transformed the crop production in the country. During 2005-06, government had to import 5.5 million tons of wheat in 2006 to handle the crisis. In addition to this, consumption of wheat has increased in past few years among urban households of southern states as well as processing industry has gained momentum. These reasons clearly justify exploring opportunities for further increasing wheat production in the country[27].

1.2.8 Research Gap

In the context of increasing population, decreasing efficiency in agriculture, changing global

[26] Jayant K.Bhugan and Suarna Karunakar (2004): "Private Sector Contribution towards a Hunger Free India". From "National Food Security Summit – 2004 – some selected Papers. Edited by M.S.Swaminathan, Pedro Medrano, Daniel Gustafood securityon and Pravesh Sharma – 2004.
[27] Sant Kumar (2007): "Exploring Possibility to bring Second Green Revolution in India: The Case of Wheat", Agricultural Situation in India Aug 2007.

environment, depleting natural resources, rapid industrialisation and changing global trade environment and physical environment have led to serious importance being given to the concept of food security. Whatever may be the factors, still in this 21st century most of the African Countries, some of the Latin American and Asian countries are unable to meet their food requirements. At present there around 925 (WFP 2010) million people all around the globe have been suffering from undernourishment, out of this 925 million, 850 million people are from the developing and underdeveloped countries. Food Insecurity is basically a concern of the poor and developing countries. Because, all the developed European and other rich countries across the globe, have either achieved self sufficiency in food production or able to import all the required food items. Poor countries are either unable to achieve self sufficiency in food grain production or do not have the sufficient purchasing power or foreign exchange reserves to acquire the required food items.

Coming to the Indian context, where agriculture is the dominant sector, accommodating nearly 58 per cent of the work force and contributing nearly 18.5 per cent to the GDP., despite the coming down of agriculture's share in GDP, the dependence on agriculture for livelihood has not come down. Though we have come a long way in terms of achieving self sufficiency in food grain production in the past 50 years, still we have the highest number of people lying below the poverty level in the world. There are nearly around 380 million people in India who are suffering from undernourishment.

In the past few years as the problem of food security assumed so much of importance, there has been lot of research and academic work going on all over the World and also in India. As I have chosen this area for my doctoral research, I have gone through appropriate literature relating to the study area. Most of literature that I have gone through has primarily brought out the following arguments.

On the global front food insecurity is basically the result of the dominance of global trade by the OECD (Organisation for Economic Cooperation and Development) and other rich countries. The developed countries have always been able to alter the rules and regulations and functioning of WTO according to their whims and fancies which would protect their domestic agriculture and consequently can dump their cheaper agricultural goods into the developing countries. At the same time, poorer nations are unable to voice their structural problems under WTO and are

unable to withstand the competition from the developed countries in the liberalized trade environment. And thereby losing their domestic efficiency in agriculture and consequently leading to scarcity of food grains.

At the same time, increase in fuel prices all over the globe has led to the search for alternative and cheaper fuel sources. In this process all the developed countries especially the USA, have started diverting the large amounts of food grains towards the alternative fuel creation, for eg: Maize. At the same time, commercial crops like Jatropha have been cultivated extensively at the cost of food grains. This led to the commercialization of agriculture towards cash crops and consequently led to the hike in the food grain prices and global scarcity of food grains and then leading to food insecurity. At the same time, global food basket has been drastically changing towards meat eating. This led to the large amounts of food grains diverting towards feeding the livestock and thereby leading to the scarcity of global food grains. Because feeding cattle requires more grains but it provides sufficient diet to lesser people than it would have directly fed with grains.

Coming to the Indian context, on the supply side, agriculture has not been performing desirably ever since these liberal reforms have been introduced. As the imports have been liberalized, the domestic agriculture has been unable to withstand the competition from the global market along with some other domestic structural and policy problems. It also led to the increase in food prices and pushed the food away from the poor people. Public investments in agriculture have also come down. Moreover the changes in environment and uneven rainfalls, rigid land structures in India, traditional practices of cultivation have led the further decline in the production.

On the demand front, most of the people in India do not possess the enough purchasing power to buy their food items. This is primarily because of higher underemployment and unemployment, lack of alternative and non agricultural employment opportunities in the rural sector and the prevalence of heavy poverty. Though there exists enough of food stocks, as per FCI, the poor is unable to access the food grains due to lack of purchasing power. Government social safety net programs like PDS, MSP and other poverty alleviation programs over the years, have failed to rectify this situation completely.

Therefore, there arises a little research attention, though it requires an integral approach to avoid

food insecurity or hunger but we confine ourselves to the prevailing trends in food grain production and necessity of increasing productivity in view of increasing demand, increasing population, changing food basket and fluctuating environment. Moreover most of the literature that has been examined has only shown that the persisting with existing growth rates in agriculture especially food grain would only deteriorate our food security situation. More importantly, if we consider the fact that the people who are lying BPL or suffering from hunger or malnutrition are brought above the poverty line, there would be serious repercussions where in it leads to a grave and dreadful situation of severe food grain shortages. In order to address this probable situation there is urgent need to revamp the current system of food grain production in complimentary with other structural and policy measures.

1.2.9 Objectives

1. **To Study the trends in food grain production after 1980s at All India level and analyze the impact on Food security**
2. **To observe the trends in per capita availability of food articles and implications on food security.**
3. **To study the impact of Free trade environment over domestic food production and Food Security.**
4. **To examine the future demand and Supply projections of Food grains**

1.3.0 Methodology

As the food security cannot be dealt separately without analyzing the agriculture, at first we observe and analyze the agriculture situation, especially the food grain production in India and its future prospects thereafter. Especially the structure, growth, purview, limitations and challenges can be observed especially since the 1980's and taking 1990 as the break period more importantly in the light of economic reforms and deepening food problems. We will also observe the evolution of food grain production and food problems in India and the present situation with respect to future food requirements and prevailing global trends. Time period for this particular study is the period between 1980s till 2009-10. And the target entity or region is, it studies the macro picture of agriculture with respect to food grain production and availability and implications on food security of India as a whole during the taken period.

For this purpose, with help of secondary data, we can compare the aggregate growth rates of food grain production during the prescribed period, in this process, as Rice and wheat are our primary ingredients in diet, we try and restrict ourselves mostly with the crops of Rice, wheat, and pulses. We also try to observe the direct and indirect factors that influenced their production over the said period. Along with these observations, we will also take into account the per capita availability of different food articles and minimum and maximum adequacy levels. Here we mostly confine ourselves to the study of aggregate or national indicators with the observation of major states performance. We also study the population and growth rates of food grains over the years, particularly in comparison with food grains growth rate.

1.3.1 Data Sources

At the end we try to come up with some appropriate and practical suggestions with the help of interpreting and evaluating the related data in relation to our objectives. For this purpose various reliable and accurate secondary sources of data like Ministry of Agriculture and Statistics, GoI, Directorate of Economics and Statistics, GoI, Govt Andhra Pradesh, National Sampling Survey Organisation (NSSO) surveys of various rounds, Economic survey of India of various years, Reserve Bank of India (RBI) Agriculture Statistics, Food and Agricultural Organisation (FAO), World Food Programme (WFP), Central statistical organization (CSO) International Food Policy Research Institute (IFPRI), World Bank, Ministry of Agriculture and Distribution, Ministry of Consumer Affairs, Food and Public Distribution, Ministry of Health and Family Welfare, National Family Health Survey (NFHS), National Nutritional and Monitoring Bureau (NNMB), ICAR and IARI.

1.3.2 Statistical Tools Applied

In order to substantiate our objectives more emphatically, we take data pertaining to Rice, Wheat, Pulses and also Total food grains production as a whole since the year 1981-82 till 2009-10. In the same way we also take the data of per capita availability of different food grains, population data during our study period. This data is obtained for both at the National level and also of major important states. We analyse this data and calculate the Annual compounded growth rates, and also Standard Deviation and Coefficient of Variation. And in order to ascertain the mutual relationships regarding production we apply least squares method.

1.3.3 Limitations

Basically food grains are comprised of Cereals and Pulses and Coarse Cereals. Rice and Wheat are the primary components of Cereals. Pulses constitute of Arhar, Lentil, Toor dal, Urad Dal, Blackgram, red gram, Millets, Black Chena, green gram and Yellow gram. Since Cereals and Pulses determine major part of food grains, here we have made a clear attempt to confine ourselves to the study of Cereals (Rice and wheat) and Pulses as a whole.

Food security is determined by the combination of factors at different levels. It has three dimensions like Production, Consumption and Distribution. Obviously the Production is on the demand side and Consumption is on the supply side of the food security. At the same time any rift or gap between production and consumption will have to be looked after by the mechanism of Distribution in order to eliminate hunger as well as to ensure food accessibility to the needy.
Each of these determinants of food security has been separately influenced by the various combinations of factors. Production is determined by the growth of agriculture, especially the production of food grains at sufficient quantities and also in sufficient time and also the effects of open trade in agriculture and the Consumption is also determined by the purchasing power of the people and also changes or fluctuations in the price level of food grains. And finally the Distribution also determined by the efficiency and extension of Public distribution System as well as other Government social safety and nutritious programs., it is again influenced by the procurement of important food grains like Rice and Wheat and leakages involved in the distribution and Minimum Support Price that is offered to the Farmers. Therefore in poverty stricken country like India mechanism Distribution assumes a crucial role in achieving the cause of Food security.

Thus, all these three mechanisms put together would be determining the food security of any society. But, since it is very difficult to study all these aspects in a stretch, we have decided to concentrate exclusively on one of those three areas, i.e Supply side dimension – Production. Therefore this can be major limitation of this research thesis. And secondly, in India Rice and Wheat comprise majority of staple food of the people across different regions while Rice is having a major share than the wheat. In this background, though there various minor food grains like Millets, Coarse cereals, we have decided to study majorly the production of Rice, Wheat and

Pulses and Total food grains as a whole. Apart from these, other limitations include, we only take food grain production as given i.e. Rice, wheat, pulses and Food grains, and we will not be much concentrating upon the comprehensive factors or structures or policies behind the fluctuations in production. We just observe the production trends since 1980s and mostly concentrate upon looking at the physical access of the food grains over these thirty year period and try to establish the prevalence of food security with respect to physical availability of food grains and also try to make future projections. And finally, we will be looking at only the food grain data of Rice, Wheat, Pulses and Food grains at an Aggregate level but not at either grass root level or state level. But, as a matter of establishing the objective more clear way, we would be presenting the production efficiency of different major agricultural states across India with respect to food grain crops. Thus our research would try and proceed further to establish our objectives with these above said limitations.

1.3.4 Organization of the Study

Chapter I: Introduction

It Covers the Statement of the problem, establishment of the research gap, Scope and Limitations of the study area, methodology – data sources – Statistical tools applied, Objectives and also the organization of the study.

Chapter II - Literature Review:

Literature has been reviewed, comprising of 40 different papers, articles and books of various eminent authors. Based on the dimension of the different authors' explanations, the review has been classified into five sections.

Chapter III - Composition and Conceptual Framework of Food insecurity – Prevailing Trends: In this chapter, we try to analyse and establish the extent of food insecurity in India through observation, presentation and analysis of various parameters. Though our objective is to analyse the role of production in determining Food security, it is also very pertinent and pre requisite to observe the symptoms of food insecurity.

Chapter IV - Growth of Agriculture and Concerns of Food Security: In this chapter basically we try to examine the growth of agriculture during the period between 1981-82 and 2009-10,

before and after liberal economic reforms, and also try study the prospective and challenges involved in today's political and physical environment with regard to the food security.

Chapter V: Trends in Food grains Production and Self Sufficiency: In this chapter we try to present the performance of food grain production in India and try to analyse the attainment of self sufficiency and challenges involved in it. More importantly, we try to analyse the factors that have determined the fluctuations in productions.

Chapter VI: Demand and Supply Projections for Food Grains:

In the following analysis we try to examine and present the studies that have exclusively focussed upon the projected demand for food grains in future at an aggregate level in India.

Chapter VII: Data Analysis and Interpretation:

In this chapter we calculate compounded annual growth rates and Standard Deviation and Coefficient of Variation of food grain production (including Rice, Wheat and Pulses) as well as per capita availability of both at the National as well as state level (between the period 1981-82 to 2009-10).

Chapter VIII: Findings and Suggestions:

In this chapter we will present our findings that have come out of our data analysis and thereby try to come up with appropriate suggestions in order to better the food security situation of India with respect to the production of food grains.

Chapter II
Literature Review

The chosen area of research for my doctoral study is ***"Indian Agriculture – Trends in Food grain Production and Implications on Food Security in India – A post 1980s Study"*** for which the following literature has been reviewed, comprising of 40 different papers, articles and books of various eminent authors. As I have taken most of the literature from different books, related to my study area, as they are very rich and vast in explanation, have tried the most to condense them in a way not miss the author's primary objective. Based on the dimension of the different authors' explanations, the review has been classified into five sections, like, 1.Literature that addressed the issue from the demand Point of view 2.Literature that addressed the issue from the Supply Point of view. 3. And the explanations particularly related to some countries. 4. Food Security under Free Trade and Economic Reforms. 5. Presentation of the Intensity of Indian food security situation in general.

Brief Outline of Literature

Salient and prominent issues that came up in this review comprise of various dimensions. Issues range from both demand and supply side that would influence or disturb Food insecurity and also other conceptual and policy interventions that relate to the food insecurity.

Major issues that that influence Food security in India are lower Purchasing Power of the people, inappropriate international trade measures that have negatively affected Indian farmers. Also the severe levels of poverty, less access to sanitary and hygienic environment and low access to safe drinking water and toilets would also affect food security negatively.

Also the lower public support to agriculture (especially in the post 1990s period) and lower productivity and lower per hectare yield had reduced the aggregate food grain production which in turn reduced the per capita net availability of food grains. Even the Social Safety Net Programmes like PDS, ICDS (Integrated Child Development Scheme), MDS (Mid day meals Scheme) etc., have been inadequate and

insufficient and low quality of delivery proved failure to eradicate food insecurity among poor people. Apart from this, on the Global front as well as in INDIA, off late there appeared to be a Change in Dietary patterns, as there is a more shift towards modern fast foods, fruits, vegetables, meat, fish from the traditional cereal foods. It had necessitated diverting large amounts of food grains towards feeding of cattle and thereby reducing the per capita availability to direct human consumption.

Export Led Growth that had been adopted in the post liberalization era had failed to release heavy work force that is engaged in agriculture and also affected Indian farmers severely as there is a shift from food grain cultivation towards commercial crops, thereby reducing the production of food grain production and led to increase in food prices and leading to deprival of access of food grains to poor people. Increase in the input costs and reduction in output prices have also led to the grave situation of food insecurity. Most of the Indian farming comprises of Small and Marginal Farmers, which is 80 per cent. Plight of these people is very much severe, as there has been not much focus on increasing their income as it has been given to increase the aggregate production.

Population Pressure also has led to increase in demand and thereby reduced the per capita availability of food grains and also increased the food prices. Along with low production and low purchasing power, there also exists Ineffective Food Management, which is making food distribution complicated and expensive. In the modern day, as far as food security is concerned, Role of Media and Local appropriate political will has been very much insufficient and disappointing. Even the attention towards implementing Land Reforms and also active role of local governments towards achieving food security has not been given much priority by the policy makers. Even the domestic restrictions to movement of food grains also not helping the cause either.

Environmental Degradation, uneven monsoon, increases in temperatures also taking a serious toll on food grain production and threatening food security in near future. Alarming Malnutrition Trends, prevalence of underweight and anemia among children and women and low Body mass Index also indicate a serious threat of food security in India. In this background there also concepts that have been suggested to establish food security like, Right to Food have gained momentum. It aims to provide legal entitlement to food grains to poor households at cheaper prices through an effective procurement and distributive mechanism.

Thus the review of literature enabled us to gain a clear picture regarding causes, composition, obstacles, perspectives and challenges and solutions that are there while dealing the concept of food security. It also

enabled us to identify the research gap and also to formulate our objectives. Following review would enable us to go through different views with regard to the complexion of food security in India.

I. Review Pertaining to the Demand Side of Food Security:

01. Per Pinstrup – Andersen (2004-05)

In this chapter the author tries to present the gravity of food security concern in India and also explains the progress and problems and defective policies engaged in Indian agriculture. And also tries to present the resolutionary measures in order to make agriculture viable, reliable in the context of changing food security system and existing WTO regime. He also highlights the importance of market structure in uplifting the agriculture.

Though the food availability in India might be a state of plenty, India also must grapple with the paradox of persistent hunger. **Still half of them suffer from malnutrition, where it is only 33 per cent in Sub Saharan Africa.** The problem is even more compounded for girls born into tribal and schedule caste families, who are far more likely to be poor and food insecure. Insufficient intake of these micro-nutrients often called 'hidden hunger' affects vast number of people, with serious public health consequences.

In order to counter these kinds of alarming situations, many state and central Governments have introduced many social beneficiary schemes like MDMS (Mid-day Meals Scheme), ICDS (Integrated Child Development Scheme) and TPDS (Targeted Public Distribution System), but their affect has been marginal. There are also number of factors which are responsible for this food insecurity of the people. Important among them all is the poverty, which prevents the poor people from purchasing required food grains in the form of low purchasing power. One of the important resolutionary measures to eradicate this condition is to invest in human resources, which will bring in more health, educational and employment opportunities, which ultimately lead to their income increases and economic growth.

The existing controls and subsidies created an era of scarcity and halted the creation of an integrated national food system. Because, these controls and subsidies have not really benefited rural poor, instead, at least half of the fertilizer subsidy goes to keep several inefficient domestic fertilizer farms in business, at high cost to the treasury. Irrigation subsidies promote excessive use of agricultural water and actually drain funds away from the maintenance of irrigation infrastructure. Power subsidies contribute to corruption and pilfering of supplies that are reported as agricultural uses. Subsidies also create regional inequalities by the way of keeping bigger agricultural states on the advantageous side. Therefore in order to protect the consumers from high input prices and the effects of liberalization, Government must run the appropriate safety net programmes. Here comes the major role, to be played by effective TPDS and FCI.

Trade liberalization must also take into account non trade concerns like 'food security, sustainable development and poverty alleviation'.

2. Hanumantha Rao.CH (2005)

Here the main focus of the author is to present the changing structure and composition of food basket both in rural and urban areas, especially he explains the decreasing rates of food grain consumption in rural areas, mainly the cereals, due to various economic and non economic factors.

Apart from tastes and preferences, higher prices of non food grains and non-food items like milk, meat, fish, textiles, modern cosmetics, furniture, medicine, cinema, entertainment…etc, showing a declining trend on cereal consumption in rural areas. Therefore, both the income and price variables do influence the per capita consumption of food grains in the expected direction, but their impact is more pronounced among the lower expenditure groups and their overall impact is wearing out over a period of time.

Cereals being a low cost source of energy the nutritional status of the poor can be improved through subsidized sale of food grains in the form of PDS. Given the expected population growth by 2020, this declining trend in per capita consumption on account of the development of rural infrastructure, mechanization, urbanization and other factors including changes in tastes and preferences, is likely to make a difference of about 20 million to the household demand for food grains in 2020. However, this may be neutralized by the increasing demand for cereals as animal feed to the extent of about 10 million tones. Despite this fall in per capita demand, the total demand for food grains will increase on account of population growth.

3. Mahendradev. S (2008)

The objective of this paper is to examine the dimensions of food insecurity and suggest that rights perspective would be important to improve public action. Firstly it examines the progress in availability, access and adequacy. Food and nutritional security implies the 'availability of food at all times, that all persons can have access to it, which is nutritionally sufficient in terms of quantity, quality and nature which is acceptable with in the given culture.' In terms of non cereal food items like fruits, vegetables, milk, meat and fish, India has not achieved self sufficiency in terms of per capita availability. In terms of food security, we need to take into account both adequacy and nutrition also.

Availability of physical access of food grains at the nutritional level isn't a problem. However it is a problem for the North Eastern States and other remote and tribal areas. Also, it is a problem of vulnerable groups such as old age population, pregnant and lactating women, children, tribals..Etc; there also exists an intra house hold disparity in consumption especially among rural poor. Food distribution isn't based on "need", breadwinner gets the sufficient food, where as the women and children are on the disadvantageous side. Even among the children mostly the boys are given primary importance than girl children. Of course these intra household disparities are not all pervasive. In this respect, India has violated right to food in its worst form. There have been starvation deaths in many other places such as in Kashipur in Orissa and Ananthapur and Mahabubnagar in AP. The KBK (Kalahandi-Bolangir-Koraput) region in Orissa, is one of the highly food insecure regions in the country.

Although it is difficult to make Right to Food fully justifiable, some interventions are possible to improve food and nutrition situation of the country. And Government also started many schemes like PDS and child nutrition programmes like, ICDS (1975) and Mid day Meal Scheme., these schemes also suffer from problems like leakages, poor infrastructure, low coverage, low expenditure per child, non accountability, poor monitoring system, financial allocation, meal infrastructure**,** low quality items and cooking, lack of kitchen facilities etc,.

Finally the Rights Based Approach must follow transparency, equity, accountability discrimination and equal participation. And the key elements like Political Will, Resources, Effective Implementation, Right to information, Social mobilization, Decentralization…etc; in the process of implementing any welfare program must be followed. In order to realize Right to Food, Other rights such as right to water, right to employment, right to health and right to education are very much important. Infact, right to employment is an important one for the fulfillment of right to food.

4. Swaminathan M.S (2007)

Here the author tries to explain the gravity of food grain insecurity in India and tries to suggest some measures to overcome the situation in future. Although, there are safety net measurements of GoI, the FAO has listed out India as one of the countries which ahs failed to achieve the targets of the 'World Food Summit – 1996', in terms of reducing the number of undernourished. Through concerted efforts of scientists and farmers, India could able to overcome the state of food deficit. In fact we are faced with the paradox of a huge buffer stock of food grains, while also having the largest population of undernourished in the world.

In India, the food is there but it isn't reaching the people. In order to ensure that the food is accessible to all, the primary issues of addressing the questions of access and affordability. There is every need to initiate 'job led economic growth'. There is a unique situation, where in there are mountains of grain while millions are suffering with hunger which is due to insufficient access or purchasing power. This situation can be addressed through various measures like… Establishing 'National Food Guarantee Scheme', Strengthening PDS, decreasing income inequalities and increasing purchasing power, job led economic growth and farm diversification, decentralized procurement and decentralized storage will help to minimize transport cost and transaction costs and establishing community food banks at local level. Attention should be focused on both production and consumption. Enhancing production through an evergreen revolution is a primary task. Therefore the future of food security depends upon population stabilization, preservation and sustainability of arable land by looking after soil health and replenishment of fertility and conservation and careful management of all water resources, so that more crops can be produced per drop of water

5. Gian Pierto Bordignon (2006)

On the eve of 60 momentous years of independence, the country is justifiably proud of its number achievements. But there is a long way to go before the ideal of food secure India is accomplished. In order to eliminate hunger and establish food security to the poor, WFP has been striving along with government of India. The sad part is that one person in every 5 Indians is suffering from some sort of hunger. 'Hunger' according to Jean Dreze and Amartya Sen, is that "intolerable in the modern world" in a way that never existed as it's 'so unnecessary and unwarranted".

India is the best case of how food self sufficiency at the national level hasn't got translated into household level. Disappointingly, large number of malnourished people ranging nearly 214 million who are chronically food insecure. And about 40 million people are exposed to natural calamities. And 50 per cent of children (majorly tribal and rural) are stunted and undernourished, people with low birth weight are 23 per cent and 68 children out of 1000 people die even before reaching the age of a year. It only shows that there is high prevalence of anaemia as well as micro nutrient deficiencies. (Courtesy U.N.Information Centre, New Delhi)

6. Maithreyi Krishnaraj (2006)

This paper attempts to show how the levels and quality of food consumption and nutrition for the poorer sections have connection to what is happening to agriculture. The current trends in India are that farm

incomes are decreasing, composition of food basket is rapidly changing along with the serious down fall in the consumption of cereals in rural areas.

At the house hold level, food security became a main problem due to the lack of purchasing power and also due to the increase in cost of production. In this context of food security, women are at the disadvantageous side without having proper access to the food and absolutely having no ownership rights over the land. Moreover, there is an increasing stress on farm incomes to meet non food needs. In this context, farming has been slowly switching over to the cash crops from the traditional food grains. Situation is far worse today with raising prices of pulses and low yields of pulses, the main protein source of India.

On the other hand, under the present imperfectly competitive markets, gains from terms of trade are limited. Agricultural production's response to favourable shifts in terms of trade is inelastic because of supply constraints. Trade reform is unlikely to help farmers in India gaining from higher international prices. If commercialization has to ensure food security, it must be accompanied by public intervention that modifies the rigors in the market. Cheaper food may available from abroad but their food is produced with enormous subsidies to their farmers. Loss of subsistence income was the far more damaging to food security than loss of income from market based self sufficiency. Quite alarmingly, in the recent past growth rate of employment lagged behind population growth rate.

Therefore in this context without any hesitation, we can say that Indian agriculture is in Doldrums. Time is ripe for launching a series of revolutionary measures on a war footing to uplift the agriculture totally by increasing the farm incomes and reducing the poverty levels with the only soul aim of achieving food security for all Indian downtrodden sections.

7. Ray; Shovan (2007)

Here the study primarily examines how the agriculture affects food security at the National and household level. Although the green revolution technology resulted in greater self sufficiency in food production and reduced import dependence, it didn't benefit uniformly farmers from different regions and different socio-economic backgrounds. Though it solved the food security problem at aggregate level, it was left to subsidy programmes such as the PDS to take care of food security at household level.

Despite increases in agricultural production and self sufficiency, we are at a paradoxical situation where huge food surpluses at the aggregate national level coexist with large undernourished and poor

population. Along with this, excessive use of green revolution technologies led to substantial use of arable land and environmental degradation, soil erosion, water logging and salinity. Green revolution also failed to benefit the farmers in unirrigated and marginal areas, where a large percent of the population continues to be poor. Though the post 1990's NSS data shows an increasing trend in per capita incomes and declining trend in poverty in India, but it was accompanied by fall in the per capita consumption of cereals.

And, the low levels of nutrient intake among the poor stresses the importance of keeping food prices low to these households with an effective PDS, as 90 per cent of the population consuming less than norm of calorie intake, appears to be increasing for rural India over different NSS rounds. And as much as 50 per cent of children continue to be malnourished and a large percent of adults chronically energy deficient. Therefore agriculture must be corroborated with high technology and other infrastructural facilities. And this technology must be able to reach the poor and must be in a position to increase the incomes of small and marginal farmers. Otherwise, very soon there arises a possibility that in future India could become dependent on imports for its requirements of food grains.

8. Acharya; Shabd S (2007)

Here the author tries to explain us the structure of Indian food grain production, availability, food policies over the years and current status of food security in India. Only India alone shares 16.7 per cent of world's food consumers.

Demand for food exceeded supply, food prices were ruling at high levels and more than half of the population was living below poverty line with inadequate purchasing power. With high levels of population of growth, the dependence on imported food increased further. Also, proportionately there was less area under cereal production. Emphasis was mainly on food imports, rationing and price controls.

Therefore the strategy to improve food security must encompass programs to uplift the agriculture through technology, research and development, investment, increase in rural infrastructure, advancing the production incomes of small and marginal farmers, creating non-agricultural employment opportunities, property rights of small farmers and fisherman must be secured, supply of farm inputs at lower prices, price support, maintaining price stability, building buffer stocks and strengthening PDS, environmental sustainability and improvements in food marketing system and implementation of direct food assistance programs and increase in the access to education and primary health care, must be focused heavily in order to achieve sustainable food security, as liberalization gradually and negatively effecting the food security in terms of decreasing purchasing power and economic access.

9. Kumar; Praduman (2005)

In this chapter, the author tries to present the depth of food security situation in India and also presents the possible future prospects, opportunities and challenges. He also emphasizes the necessity to empower the small and marginal farmers in order to achieve food security in the future. India has made impressive strides on the agricultural front during the last 3 decades.

Still about 25 per cent of children suffer from serious malnutrition and more than 50 per cent of the pre-school children and pregnant women are anaemic. The massive increase in population and substantial income growth demands an extra 2.5 million tons of food grains annually, besides significant increases needed in the supply of livestock, fish and horticultural products. Assuming growth in per capita GDP will be 3.5 per cent, the demand for food grains in the year 2020 is projected to be 256 million tones and also the demand for sugar, fruits, vegetables and milk and meat and eggs is also likely to increase substantially.

In the light of these challenges, the question is, who will feed India. And the possible answer is, the burden of feeding India heavily lies on the majority of small farmers of the country. Small farmers including marginal farmers, although they own only 35.5 per cent of the total cultivated land, their contribution to the overall national as well as household food security and hunger alleviation is proportionately much larger and has been increasing. Moreover, the number of small holdings and small farmers has steadily been increasing. By the year 2010, the holdings of marginal and small farmers will be about 119 million which will constitute about 82 per cent of the total holdings and 46 per cent of the total cultivated land.

Small farmers who constitute more than 50 per cent of the country's population also account for more than half of the number of hungry and poor people. Here the question is whether is the smallness of the majority of farm sizes, which is the main cause for perpetuating the hunger and poverty, what are the opportunities to improve the productivity of their land, which would liberate them from hunger and poverty. There is every need to increase the role of small farmers to fight against the hunger and poverty.

10. Swaminathan M.S (2002)

This food insecure atlas primarily focuses upon the severity that is prevalent across urban India. It reveals that more than 38 per cent of children under the age of 3 in India's cities and towns are underweight and more than 35 per cent of children in urban areas are stunted. Even the calorie intake of the urban poor is very low as per the specification of ICMR (Indian Council for Medical Research).

If we can observe the cereal consumption of urban people, it shows that the "cereal intake of the lowest 10 per cent of the population is negatively related to the extent of urbanization". This atlas shows that lowest income urban people in all states eat less than the state average. More interestingly, the diet of the lowest deciles in all states is barely diversified and hardly contains vegetables, fruits, pulses, meat, fish, milk and eggs. For the country as a whole, more than 14 per cent of the urban population is dependent on casual labour, for the lowest 10 per cent of urban population in India, 37.49 per cent are engaged in casual labour and 41.34 per cent are self employed, suggesting that vast majority of urban poor are vulnerable to undernourishment. It also says that discrimination (both caste and gender) at the social level translates into discrimination in livelihood access, food access, access to medical relief and access to education. And in case of urban India, as a whole, 47.5 per cent of the urban schedule caste population is in the four lowest monthly expenditure classes; in case of ST population proportion was 43.1 per cent.

An integrated approach that focuses on the provision of affordable food to the urban poor along with the development of employment and educational opportunities, improved access to permanent shelter, sanitation facilities, safe drinking water and improved medical care for impoverished sections of the population is vital in addressing the significant levels of urban economic deprivation.

11. Mahajan;Vijay (2004)

In this chapter the author, firstly presents the structure and composition of self employed poor in India and then tries to present the obstacles that these people are up against in meeting their food requirements. Total of 120 million persons are self employed, perhaps 80 per cent of whom are below the poverty line and others not too far above it. The typical self employed poor person in India is likely to be: rural, female, illiterate, a member of a ST or SC, living in a landless household and dependent on wage earnings. But these are all mostly vulnerable sections in the society.

In India there exists a large amount of buffer stocks and persistence of poverty and food insecurity as existing social safety nets and PDS' have not lived up to their expectations. Now the issue is to increase the incomes of the lower income group to provide food security. Therefore strategy must evolve to increase the income opportunities of these people and providing proper price for their agricultural and other self made and collected products. In addition to this, they must be given appropriate shares and facilities in resources like land, water and forests. Especially, land reform must be implemented strictly, but the thing is that, though we have launched them long back, but most of the poor has not reaped any benefits out of this. Therefore there should be a strategy that needs to come up, it's like 'making it more

expensive for the large land owners to cultivate, which is by increase in alternative wage employment opportunities for the landless whenever there is an increase in area under cultivation, as well as increase in cropping intensity, then there will be increased demand for labour and wage rates. Then the large land owners will be on the side of selling off part of their land. In this way land less labour can be given some share of land, leading to their income generation opportunities. Production also must be diversified from cereal crop production like paddy to other cereals like pulses, oil seeds, spices, vegetables, fruits, fodder, fuel wood and timber.

12. Gopal.K.S (2004)

In this paper the author primarily explains the functioning of a food assurance scheme that has been implemented in AP and he also gives us the brief picture of the existing plight of food insecurity in India.

"Food Consumption cannot be Post phoned", therefore the perfect food security, necessitates the elimination of chronic poverty. In the last 10 (between 1994-2004) years, our Governments have subsidized over Rs.23, 000 per household and yet hunger continues to increase with 42 per cent of Indian rural population receiving less than the accepted daily food requirement. Indian Governments are starved of cash, the bulk face competing demands on its financial resources and find themselves in misery when it comes to uplifting the poor. The bulk of the poor live in dry land and resource poor areas. There also exists a rapid and continuing decline of rain- fed based coarse cereals such as Jowar, Bazra, Ragi consumed by the poor.

The areas with highest incidence of hunger are chronically drought prone, food deficit, long unemployment periods, irregular agricultural incomes and falling public investment and backing of private investment due to scared risks and also go for migration. Therefore in addressing hunger, we must offer a stiff competition with non food items and make expenditure on food the household priority in our strategy. And the future well being of our farm produce can be advanced only by accessing the huge consumption potential among the poor and not just by catering to the tastes of the rich.

II. Review Pertaining to the Supply Side of Food Security:

1. Hanumantha Rao. CH (2005)

In this chapter, the author presents the trends in food grain self sufficiency of India since the independence and also tries to present the production trends and maintenance of food grains by FCI and

changing consumption patterns of the consumers over the years especially in the context of new economic reforms.

The rise in total factor productivity, the per head growth rate in the output of food grains was close to 1 percent in the first decade of the green revolution and accelerated further to just over 1.5 percent in 1980's. Consequently the dependence on imports declined in the first green revolution period. Net import of food grains were either negative or less than 1. The relative prices of food grains showed a decline after the mid 1970's and there was a rise in real wages of farm labour.

Later on, for four years in the first half of the 1990's, the rise in the prices of food grains being even higher. As such, there was a rise in poverty and inequality in the immediate post reform period and slower reduction in poverty thereafter. The most important problem concerning food management in India is to overcome chronic or long-term food insecurity by ensuring adequate nutrition to the whole population on a sustainable basis. As food basket is getting more and more diversified with changing tastes and preferences, food supplies have to be increased. The real challenge is to ensure adequate purchasing power in the hands of those suffering from chronic food insecurity. Reforms are expected to generate productive employment necessary to overcome chronic food insecurity. At the same time public support to poverty alleviation programs and subsidized food for the vulnerable sections will have to continue but only as a supplementary to the employment oriented growth.

2. Alternative Economic Survey- India - 2007-08.

Here the author elaborates the global tendencies of food prices which ultimately lead to the food problems. Global food shortages and steep rise in the prices of food products in the international market have become major concerns for developing countries. According to World Bank P.Robert B.Zheoellick, a doubling of food prices over the last three years could potentially push 100 million people in low income countries deeper into poverty and consequently to food insecurity.

Recent trends indicate that increasing energy prices have made agricultural production more expensive via raising the cost of mechanical cultivation, inputs like fertilizers and pesticides and transportation of inputs and outputs. The high cost always deters the marginal and small farmers to use modern farm practices and inputs to augment food production. If food prices are controlled through banning exports or reducing import duties, as being done by several countries, including India, farmers would get disincentive to produce more food grains that adversely affects the food supply.

The trade liberalization and the fast growing income of middle class households are the main causes of diversion of cultivated area from food grains to high value horticulture, floriculture and other cash crops.

The area under food grain has declined by 6 million hectares between 1990-91 and 2005-06 globally. He says that food security should not be linked only to the supply of food grains because the dietary pattern of people is changing due to increase in per capita income, urbanization and more availability of fruits/vegetables and livestock products. But the high growth in these products may not help the common masses to improve their nutritional status as they have little or no access to fruits and livestock products. The steady rise in the subsidy as percent of agriculture GDP crowded out the real investment in the agriculture. Therefore price stabilization should obviously come through rising food production and productivity that require increased investment in agriculture, in addition to providing incentives to farmers to grow more food.

3. Ray; Mukesh (2008)

Here the author tries to present and explain the causes and consequences of food price hike both at global and Indian context. Most parts of developing countries are reeling under severe stress of feeding its population. Record world prices for most staple foods have led to 18 percent food price inflation in China, 13 per cent in Indonesia and Pakistan and 10 per cent or more in Latin America, Russia and India according to the United Nation's FAO. Wheat has doubled in price, Maize is nearly 50 per cent higher than a year ago and rice is 20 per cent more expensive. According to FAO, this food crisis has three major reasons behind it.

Firstly the increased use of bio-diesels, for which tones of cereals is being diverted to produce ethanol and millions of hectares of land being diverted to jatropha plantation. Secondly: The increased consumption of meat, which requires millions of tones of cereals to feed the cattle and poultry. Thus the cereals which could have fed humans are used for feeding cattle and poultry to produce meat. Thirdly the impact of climate on the crops, severe droughts, floods and untimely rains have destroyed crops in huge quantities. According to him, Indian production hasn't declined till now (We might experience low production in the khariff, due to untimely rain), we hardly produce any bio fuel and our per capita meat consumption is below 1kg, which is one of the lowest in the world (USA-50kg).

Now the present Indian context requires Ever green revolution in Indian agriculture. As most of the land quality at present has deteriorated beyond repair, water levels have reached danger marks, farmers committing suicide and the input cost in farming has risen above output cost. The Green Revolution has died and has killed thousands of farmers with it and millions more are in a position to take their lives. Both the problems of access to food and low productivity could have been structurally resolved by successful land distribution.

4. Paranjoy Guha Thakurta (2008)

Here the main focus is on explaining how the increase in prices is leading to the food insecurity in India. In the capital Delhi, milk costs more than last four years, edible oil prices have climbed by a whopping 40 per cent over the same period. More crucially, rice prices have risen by 20 per cent and prices of certain lentils by 18 per cent. Rice and Lentils constitute the staple food diet for majority Indians. It is observed that one out of every four Indians lives with less than 1 dollar a day and three out of four people earn 2 dollars or less. Agriculture, on the other hand, has grown by hardly 2.5 per cent over the previous 5 years and the trend rate of growth is even lower if the past decade and half is considered. Consequently, per capita output of cereals (wheat and rice) at present is more or less at the level that prevailed in the 1970's.

Given the low power of India's poor, even a small increase in food prices contribute to a sharp fall in real incomes. The current crisis in Indian agriculture is consequence of factors like – low rise in farm productivity, unremunerative prices for cultivators, poor food storage facilities resulting in high level wastage, fragmentation of land holdings and a fall in public investments in rural areas, especially in irrigation facilities are also to be blamed. None of these populist initiatives will really work until India's rulers begin giving its ignored farmers the importance they deserve.

5. Kathleen Kingsbury (2007)

Here the main emphasis is on presenting the critical food problems that are prevailing globally. Countries like Mexico, India and Yemen have witnessed food riots this year. People have Argentina have boycotted tomatoes in the recent presidential elections when the prices became hyper expensive than meat and in Italy also, shop owners had organized a one day ban of 'Pasta' to protest hike in prices. In October, government of Russia, in order to erase apprehensions ahead of parliamentary election, announced a freezing of prices for bread, milk and other food items. According to FAO, at nearly 100 dollars a barrel and the oil prices have pushed the cost of food imports to sky level and thereby leading to global hunger and social unrest.

According to FAO, price increases are a result of record level oil prices, farmers switching out of cereals cultivation to grow more of bio fuel crops and also inconsistent climate and increasing demand from countries like India and China. Hardest hit will likely be Sub Saharan Africa, when many of the world's poorest nations depend on high cost energy as well as food imports and the cash poor governments have to choose one between two, and FAO says the former has almost always won out in the past, resulting in more people become malnourished. Moreover, the current record prices for freight shipping brought on

by record fuel prices have further exacerbated the problem. An estimated 854 million people or one in 6 in the world already doesn't have enough to eat according to WFP.

If we observe the demand side, one of the key issues is bio fuels that are produced from food crops such as sugar cane, corn and palm oil are seen as easing the world's dependence on gasoline or diesel, with $1/4^{th}$ of the USA's corn harvest in 2007 diverted towards bio fuel production, the resultant rise in cereal prices has already shown an impact on the cost and availability of food articles. Critics worry that the gold rushes towards. Bio fuels are taken away food from the hungry.

6. Barah. B.C (2007)

The paper attempts to analyse the changing pattern of food grain production system and derive certain policy interventions in view of its relative importance in achieving avowed growth rates envisaged in the XIth five year plan. Rice and wheat are the two most important staple crops which play a crucial role in food security in India. The per capita availability of rice as well as other food grains has been decreasing over the recent years. But any negligence of these two major food grain crops in future may cause huge damage to the entire economy.

As the area under wheat ceased to grow at desired rate, which has been covering around 26 million hectares, the continuation of decline in production is likely to be disastrous. A study shows that a rupee invested in paddy renders loss of 6 paise in 2001-02, while the return seems to have improved at a marginal increase of 23 paise to a rupee invested on wheat as compared to earlier years. This indicates that profitability of paddy is more at a stake than wheat. The pace of increase in production and productivity of rice has been uneven and the disparity is highly pervasive among the states and across the diverse eco systems. The cost of production has changed marginally in the past couple of years; the gross return is declining faster from Rs.29157 in 2000-01 to Rs.25487 in 2002-03. This has resulted to fast declining in profit margin of the farmers. If this situation persists, we may need to import more and more food further, it hardly provides solution to the looming food production crisis and food security.

Although wheat is comparatively a profitable crop the sustainability has become upper most concern among the wheat farmers of late. The declining trends in profitability across the regions support the fear factor. Assuming weaker link or disconnect between production and procurement volume, the current situation warrants more research attention and appropriate policy intervention to firm the production strategy. It may be mentioned that although the production variation is around 2 million tons during past 2 or 3 years, the import has a higher volume, which has already crossed 5 million tons in 2006 due to deficient procurement and stock. Therefore the integrated approaches like second green revolution,

reaching out to the target farmer groups for wider impact and also undertaking unified approach with the help of modern technology.

7. P.K.Joshi, Ashok Gulati and Ralph Cummings Jr. (2007)

Sustained rise in per capita income accompanied by rapid urbanisation, better infrastructural facilities and changes in tastes and preferences in South Asia are diversifying the consumption basket in favour of high value foods such as vegetables, eggs, meat, milk, fruits and fish. Even the poor prefer to buy these value items.

Interestingly, per capita consumption of cereals in South Asia is gradually declining, while that of high value commodities is rapidly rising. Such a shift in consumption pattern towards 'High Value Commodities (HVC's)' will have profound impact on agricultural production, marketing, processing and retarding the environment. Experiences from South East Asian and Latin American countries reveal that a shift in production portfolio opens growth opportunities that augment income, generate employment opportunities, alleviate poverty and improve sustainability of agriculture. South Asian countries are mostly dominated by small holders; they are confronted with high transaction costs, market risks and possess less marketable surplus in order to tap the opportunities emanating from high value agriculture. Therefore, to promote agricultural diversification towards HV (High Value) food commodities, especially benefitting small holders, there is a need to strengthen farm-firm linkages and integrate domestic and global markets through appropriate policies and institutional arrangements. The supply chain from production to market and consumer, 'from plough to plate' needs to be strengthened by reducing intermediaries and improving market efficiency through appropriate policy formulations, investment and institutional support.

8. Venkateswarulu.A (2005)

Here the author tries to explain the food grain production in India over the years, especially during the five year plans.

The Government initiative in capital formation was high during the early green revolution period, in the later period, the excessive subsidies in agriculture and diversion of funds from irrigation to anti-poverty programs were the hindrances in the growth of public capital formation in agriculture. Further, the Government had to spend huge sums on fertilizer subsidies, in addition to expenditure on extension services, agricultural universities and so on. Thus, the agriculture became a high cost economy and the increasing capital output ratio in this sector was an enduring reality.

The hall mark of the green revolution is that, by the late 1970's, India achieved self sufficiency in the food grain production, overcoming the painful memories of agrarian crisis of the mid 1960's. Then during the neo-liberal reforms, the agricultural GDP decreased from 3.08 per cent during 1981-82 to 1990-91 to 2.38 per cent during 1992-93 to 2003-04. Overall decline in agricultural growth is due to various factors like, WTO, oil crisis, increase in subsidy, farmer suicides, and increase in population, irrigation, low capital formation and open market operations.

9. George.P.S (2006)

In this chapter the author mainly tries to explain the composition of food security from point of view of various population groups and also presents production and availability trends in food grains over the years. He has also tried to present the challenges in view of the future increasing food requirements and comes up with some resolutionary policy measures. Food security at household and individual level must be taken care with intensely. Food security must also involve economic growth, especially access to resources, education, especially women, population programme, nutrition, lowered birth rates and increased child survival, sustainable environment democracy and participation and accountability must be the natural antidotes to starvation and malnutrition of food.

The 1990's has witnessed a sharp fall in the growth rate of production which was almost equal to population growth rate, implying a stagnant per capita production of land. The declining trend in the growth rate of food production during the 1990's has serious implications for national food security. It appears that major constraints are emerging in both dimensions of area expansion and steeping up yield through expanded coverage of HYV.

In order to counter these challenges and establish a food secured situation, there has to be institution and structural transformation in main areas like poverty alleviation, employment generation and introducing innovative agricultural policies. Along with the achievement of economic growth, there should be a proper trickle down mechanism in order to achieve distributional equity up to the ground level. Along with demand diversification of rural economy and creating non-farm employment opportunities are very eminent, which can increase the incomes of the rural poor and in that way their purchasing power can be increased.

10. Hanumantha Rao.CH (2005)

Here the author tries to explain the defects and disadvantages involved in the present single state zonal system for food grains. He also opines the importance of establishing free trade in food grains amongst

the states in order to march towards the goal of food security. The variety in soil climate condition in India has led to a substantial measure of regional specialisation in the production of crops. But in times of acute shortages of food, regions which specialise in the production of food crops are placed in an unduly favourable position at the expense of areas which specialise in non food crops and which earn valuable foreign exchange for the nation.

The exponents of this view also contend that increasing disparities in the market prices of food grains between different states do not reflect the inequitable character of distribution. But the ground realities are different, it's true that the cordoning off of surplus pockets would minimize the competition from traders and facilitate procurement by the state, but this approach has not been taking place at the ground level. Because, procurement could also be done through a system of levy on the cultivators while removing the ban on the free movement of food grains among states. Moreover, there are surplus and deficit pockets even within the surplus state.

The fact is that single state zones were the direct result of the anxiety on the part of surplus states to meet their own consumer needs first. If restrictions on free trade are removed, there will be a possibility of surplus states' food grains being transferred to deficit state. Because, consumption in the surplus states is being subsidized at the expense of the consumers of the deficit states, due to price disparities. Therefore Central Government can lessen its burden by allowing free trade, along with building up of stocks with itself and surplus states must also agree to share the distress equitably with the rest of the nation.

III. Review pertaining to the Free Trade and Economic Reforms-Food security:

1. Weis: Tony (2007)

Here the author primarily tries to focus upon the changing structure of global food basket, changing patterns and the future challenges in the process of reaching food security at global scale. According to UN and World Bank Poverty estimates, globally 2.8 billion people live on less than US 2$ a day, which is well over 2/5ths of the World's population and 1.2 billion people live in extreme poverty defined as less than US 1 $ a day.

In SSA, food insecurity is also deeply entwined with HIV/AIDS along with the factors like poverty, land degradation, fuel problems, social instability and violent and ethnic conflicts. Today, 12 per cent of Americans (roughly 35 million) are considered to be food insecure, 4 per cent 'with hunger' (over 2 million), while 65 per cent are considered 'overweight and obese" and 30 per cent obese, according to a surgeon, obesity would soon be responsible for killing as many Americans each year as smoking.

According to him, global diet is more and more getting inclined towards meat eating and livestock products which in turn is pressurizing the agriculture to produce more and more grains like maize and soya beans to feed the cattle. Crop research in the dominant cereals coupled with rising inputs brought a near tripling of the world's annual grain harvest between 1950-1990 (primarily due to increase in productivity). While the human population has more than doubled since 1950, meat production grew nearly fivefold by volume, implying a doubling of meat consumption in the average diet of every single person on Earth amidst a soaring human population. In the same way on a global scale, per capita egg production also doubled as did the per capita fish production. The depressed world agricultural prices created a serious problem for poor farmers in developing countries who must compete in global and domestic markets with these low priced commodities and lack safeguards against import surges. Increasing animal production expands not only agricultural land space but its demands on other resources such as water and energy and also requires more fertilizers and chemical waters, for e.g.: livestock in USA consume roughly 70 per cent of all domestic grains.

Interestingly, an edible unit of protein from factory farmed meat requires 100 times more fresh water and more than 8 times the fossil fuel energy than does an edible unit of protein from grain. Also, meat and dairy have higher refrigeration demands. The waste of farm animals also contribute to 16 per cent of the world's emission of methane, a greenhouse gas and which are projected to increase by 60 per cent in coming decades.

2. Basu; Nilotpal (2008)

In this article, the author tries to present the complexion of food Crisis in the context of speculative trading and ineffective political policies. Global food crisis is very much ubiquitous on the streets of several nations across Asia, Africa and Latin America. Numerically the present crisis will push an additional 100 million to go hungry along with the existing 845 million. Adding to the situation the price of wheat has gone up by 130 per cent over the last year, while that of rice has doubled in Asia in the first quarter of 2008 alone. If we can go into the causes for this situation, it reveals that the present crisis is not triggered by any sudden slump in production. In fact, farmers across the world have produced a record 2.3 billion tons of grain in 2007, up 4 per cent on the previous year.

The very notion of national food security was given a complete go by local food production for local requirements and was replaced by imperatives to approach the global market place to access their food needs. Therefore the crisis induced situation has fuelled speculative activities. Food crisis has also seen that in virtually all sectors associated with food economy, the global MNC's have made a severe impact.

From fertilizers to seeds, pesticides, food processing, retail food chains, in all the sectors the MNC's have (Monsantos, Nestles, Walmarts, Cargills) recorded super profits during the last few years, especially the last year.

Even the present sky rocketing food prices in India have global connections, including some misgoverning by Indian policy makers, like the NDA Government, which took all measures to align the Indian food economy with the global market. The question therefore is the political will, and that will has to be forced through exposure of the Government's inaction and wishing away the problem by citing global connection. If Governments or PM thinks otherwise, it will be a tragedy for our people and boon for the speculators.

3. Falendra K.Sudan (2003)

Here the author tries to explain the effect of defective agricultural policies in India and the impact of WTO's trade policies over India. From a food grain led growth during 1970's and 80's, pattern of growth is changing fast towards horticultural products, livestock products and fishery. Food grain growth was largely driven by technology, incentives by government in terms of support procurement prices and heavy investment in public sector, but the agriculture growth of 1990's seems to be demand and market driven.

This deceleration of growth in crop output is bound to adversely affect the poor people. In a study, its observed that in India 'a 10 per cent reduction in food supplies reduces the consumption of the wealthiest 5 per cent of the people by 8 per cent where as poorest 20 per cent people are forced to cut down their consumption by 40 per cent. Though India has moved from chronic food scarcity to food surpluses in the last few years, yet large section of our people still have one of the lowest per capita calorie consumption and 50 to 80 per cent increase in the income of rural poor is spent on food. But the integration into global market can be a two edged sword for farmers in developing countries, trying to take the advantage of the widening access to external trade by diverting resources and workforce to cash crops. But this means that the local food production declines and food dependence sets in.

4. Gulati; Ashok (2002)

Here an attempt is made to explain the effects of free trade in agricultural commodities from the Indian point of view. Especially from the Indian food security context, commitments under WTO may lead to severe food shortages.

Opening up of domestic agriculture to world agriculture would mean that domestic prices would be strongly influenced by world prices. This was feared to invite wide gyrations in domestic prices, as world prices are inherently more volatile. This will adversely affect the cultivators when prices fell and consumers, when prices increased. The crash in domestic prices of wheat in the post harvest period in 2000 was considered to be a direct result of this policy. There are apprehensions that in due course, it may adversely affect food security. And agreeing to contain subsidies to agriculture (domestic Support) or to consumers below a prescribed limit wasn't considered to be in India's interest from the viewpoint of ensuring food security to people.

Therefore, opening up of imports of agriculture without first creating a level playing field, could invite a deluge of subsidized imports hitting the very production base of agriculture in these countries. These developing countries often faced chronic shortage of foreign exchange which makes large scale purchases of basic food very vulnerable. Big countries like India also feel that with their entry into world markets, world prices of agricultural commodities would raise, which in turn mean greater hardship to the poor masses. Thus the creation of conditions for a level playing field becomes a sort of pre-requisite for the opening agriculture to world trade without putting food security in jeopardy, both at the national and household level.

5. Merlinda D.Ingco, Donald Mitchell and John D. Nash (2004)

Here an attempt is made to analyze several conceptual levels of food security and examine how they have been affected by multi lateral trade reforms. It also considers what alternatives might be useful to reduce vulnerability to shocks that threaten food security.

The export subsidy theory may not serve the purpose of economic development of developing countries, as it only reduces the export prices beyond domestic prices. The agriculture support prescribed in negotiations through green and blue box also will not give any positive boost to the developing countries' agricultural sector, as they are mostly expensive and difficult to administer. Even the amber box (Specific subsidies that support internal prices, are paid on the basis of prices, subsidize commodity specific inputs and otherwise distort the incentives to produce and consume specific products) also not appropriate for rural development, also extremely inadequate tools for poverty reduction.

Even the tariff food security (for domestic support) did not provide the developing countries sufficient flexibility. These Uruguay round negotiations imposed constraints on the ability of developing countries to push forward with policies and programmes that will promote agricultural growth improve agricultural

incomes and thus contribute to a significant increase in food security at the personal and family levels especially in rural areas.

6. Patnaik; Utsa (2007)

Here the author tries to present the negative aspects of free trade and the trade agenda of the developed countries and how it is negatively affecting the food security and economic development of food exporting developing countries. He also explains us about the concepts of real population and nominal population.

He says that there exists an inverse relation between primary exports and food grains availability in the developing agricultural countries. Poor developing countries have the capacity to produce a qualitatively different and quantitatively more extensive vector of outputs and their very richness of lad resources have made demand targets of the greed of developed countries.

As the land is scarce and limited, developing countries can only focus upon increase in productivity as most of the cultivable wastes have disappeared. Developing countries are being pushed under the impression that, with the increase in exports they would be able to increase their foreign exchange reserves and as a result, they would be able to import the required food grains or other required items. But unfortunately, their foreign exchange reserves have not increased due to the fact that there exists an immense competition among developing countries to export food products, which ultimately led to decrease in export prices and reduction in foreign exchange reserves. Moreover the domestic devaluationary trends and deflationary trends have not earned anything out of food grains' export. Generally India and China are the most populated countries in the world, but these two are basically still developing countries. The very term "population pressure" implies that population is so large as to make excessive demands on available resources.

7. Jayant K.Bhugan and Suarna Karunakar (2004)

Here the authors try to focus upon the necessity of private sectors role in dealing the problems of food security, especially in the context of globalization and decreased role of the state. In India there exists totally two extreme and opposite situations, on the one side there we have overflowing granaries but on the other side we have widespread poverty. Despite several social safety net initiatives taken so far, there still exist chronic poverty, hunger and undernourishment. On the other hand, India requires a shift in

public policy to the principles of market and competition from the traditional one of regulation and support, as the earlier socialism has not been successful in suppressing inequalities.

In India, according to NSS survey, while the actual food deprivation level in India is less than 2 per cent, the malnourishment figure is as high as 40 per cent & therefore it has to be dealt immediately. Looking at the counter argument, it is the inefficient distribution system and the improper pricing mechanism that has created the obvious distortion in the demand pattern of the country. In this context private sector assumes a greater role, as corporate India today is trying out new models of farmer – corporate consumer linkages. They will be able to invest in improving supply and logistic networks including cold chain and retailing infrastructure, supply chain improvements, building brands and developing markets, deliver market knowledge at affordable prices and facilitate the development of market friendly policies. Therefore the private sector can play an effective role by joining hands with the Government in capacity building, training progress and for training the trainers.

IV. Review Pertaining to Food Security in few Countries:

1. Lea Terhune (2008)

Here the author tries to examine the regional implications of a global food shortage especially in the South Asian Countries. The most affected by the current global food crisis are the poor, particularly in developing countries and more importantly a large number of people the steep food prices spell disaster live in South Asia. Globally rice is an important staple, is in short supply. The UNO reports that, Nepal, which imports much of its rice, has 2.5 million people in immediate need of assistance and 3.9 million more whose welfare may be compromised by rising prices.

Even in Afghanistan and Pakistan, people are protesting against high wheat prices, that many can't afford to buy flour to make bread. Bangladesh likewise is afflicted and its agriculture is greatly disrupted by frequent floods. In the light of these problems, US Government has asked these countries to implement food export bans. India, which is a regional leader and emerging global economic powerhouse, fails to deliver sufficient food to several hundred million of its people despite its 8per cent annual growth in its economy. Though India created enormous opportunities for accelerated human development, it has achieved only modest progress in poverty reduction. According to UNDP 2007/08 report due to the main reason of growing agriculture short falls resulting from inefficiencies in policies and infrastructure.

In this context, India needs to revitalize its policies through embarking upon modern green revolution. As the second largest rice growing nation in the world, India should play an important role in alleviating the global food crisis. Improving productivity of Indian agriculture can help mitigate both Indian and global food shortages and pressures on food prices.

2. Paul A. Dorosh (2004)

This article mainly explains about the domestic production of rice and wheat, and the achievement of self sufficiency and food security in Bangladesh. Rice is the major food commodity (both in production and consumption) for the 70 per cent of the people. Moreover food procurement was done more flexibly through price stabilization which ultimately paved the way for the smooth functioning of PFDS (Public Food Distribution System).

The major policy changes that the Government of Bangladesh adopted were, encouraged the private sector to import the food grains. Along with this, production also increased due to the liberalization of imports of diesel engines and pump sets for tube well irrigation, fertilizer application and planting of High Yielding Variety (HYV) rice and wheat, production increased from an annual average of 1, 00,000 tones in 1969-70 to an average of more than 1.8 million tons in 1999-00 due to sevenfold expansion in area and a doubling of wheat yields.

Along with the Government policy interventions like, in addition to investments in research and extension, input subsidies and credit programmes, government's food policy has also included market interventions and distribution programmes related to PFDS. Unlike in India, before its reforms in 1990's, where the state governments or FCI operated through monopoly procurement and levies on rice millers, domestic procurement in Bangladesh consists of voluntary sales by producers and millers. Moreover the procurement price isn't floor price or MSP, since the Government isn't committed to procure all grain offered for sale at that price, rather the volume of domestic procurement is effectively determined by quality, not by price considerations.

3. Zhang – Yue Zhou and Guanghva Wan (2007)

Here the authors try to compare the functioning of PDS's in India and China, and their role in resolving the food security problem. By the early 1990's, there were still more than 800 million people, mostly in developing countries, who didn't have enough food to meet basic nutritional needs.

The number of people undernourished in India and China, stands at 363 million (2/3rds are in India) accounting for 43 per cent of the world total (FAO-04). Both countries suffer from huge population, limited agricultural resources, unstable and predictable world markets, presenting potential threats to national system. Ever since India became independent and founding of the People's Republic of China in the late 1940's, both the countries encountered severe shortage of food. One of the important policy instruments is the use of the PDS's.

In China, Grain coupons were issued to the needy, which can be used in Government's grain stores, restaurants, manufactured food stores and so on. By the early 1990's, both the countries had spent huge amounts on food subsidies. They also tried to re orient the PDS towards more needy. But gradually, in this process China tried to reduce subsidy burden by cancelling the PDS.

Both countries took steps to involve the local/state Governments in the system in implementing PDS, China sought to establish a command position for Government organizations in the grain market and thus monopolized grain marketing. GoI has also tried the same thing but failed. Consequently, less than 10 per cent of the grain production in India is handled by Government and the rest is left to the private market. Indian PDS is intended to cover a certain minimum of the eligible groups coming to the fair price shops. But China, took the responsibility to feed the entire urban registered population. As a result, quantities handled by the Government of India are much lower than those handled by China.

4. Bhargava; Pradeep and Manju Balana (2007)

In this chapter, authors mainly focus upon the gravity of food security, in **South Asian countries** particularly through the concept of right to food. One of the basic freedoms is being able to avoid hunger, starvation and undernourishment. And also distress situations such as floods, drought and conflict compound the violation of the right to food. In this study we look at the food security situation in three countries namely Sri Lanka, Bangladesh and also India.

These South Asian countries have done well in the last three decades to increase their production by 100 per cent. Unfortunately the increases in production have not been matched by equal distribution. Both India and Pakistan have made great progress in food production and are almost self sufficient as far as cereals are concerned. But still the incidence of food poverty is very high. But increase in production or development doesn't necessarily ensure an over-all well being in a country. It depends upon how the increased income is distributed and how people have the access to the basic amenities like food and health.

In case of Sri Lanka, ethnic clashes and political instability are the primary causes effecting food security. Therefore the Government food benefits and medical facilities are kept away for these people. In case of Bangladesh, floods were a normal part of the economic system. The 1998 floods were dubbed as the floods of the century, but private markets and appropriate government investments and imports and policies were somewhat successful in managing the situation. Between 1998-99, private sector rice imports, equaling 2.42 million tones, supplemented domestic food supplies, this was made possible from the large stocks of food grains maintained by the Government-owned FCI. Moreover the PDS under the SAP, was placing significant pressure on the Government of Bangladesh to reduce the public food stocks. Many feeding programmes in Bangladesh had shown little impact in ensuring food security. The bottom deciles of population were worse off than the upper deciles in terms of calorie intake and higher level of indebtedness.

Author says that there has been a decent increase in the availability of food grains per capita during the last three decades in South Asian Countries, but the distribution of income and food has remained skewed and there is a high incidence of food poverty.

5. Swaminathan. M.S (2006)

In this chapter the author manly emphasizes the necessity of Science and Technology to be more public oriented and common good, with the sole aim of uplifting the agricultural productivity. He also briefly explains about the existing trends in food security both at national and global level and also puts forward the future implications in the light of existing challenges especially with reference to Asia Pacific region.

The productivity improvement associated with the green revolution is best described as 'Forest or Land Saving Agriculture'. Coming to the current Indian situation, population increase is on the raise and improved purchasing power among the poor will bring in more demand for food, since under nutrition and poverty go together. At the same time per capita availability of arable land is shrinking. And water use efficiency is still on the whole low and water markets and disputes are growing. Along with these various forms of biotic and abiotic stresses are spreading. There is still a widespread mismatch between production post harvest technologies, especially among perishable commodities like fruits, vegetables, flowers, meat and other animal products, affecting the interests of both consumers and producers.

Industrial countries are responsible for much of the global environmental problems such as changes in temperature, precipitation, sea level and incidence of ultra violet – B radiation, which throw serious challenges for the intensification and diversification of agriculture in developing countries. Importing

food and other agricultural commodities will hence have the same impact as importing unemployment. Therefore what we need now is an environmentally sustainable and socially equitable green revolution and can be termed as 'Ever Green Revolution.' food security implies livelihood security at the level of each household and all members within and involves ensuring both physical and economic access to balanced diet, safe drinking water, environmental sanitation, primary education and basic health care.

V. Review Pertaining to General Observations in recent Food Security:

1. Shahnawazul Islam, Hari Om Agarwal and Samir Farooq (2007)

Here the author tries to present the progress of Indian agriculture over the years and also tries to project the future challenges ahead for Indian agriculture. India has bigger challenges ahead and we have to shoulder the responsibility of more than 300 million people that remain undernourished. In the 21st century food needs of a population over billion people will have to be met. Moreover, the role of agriculture cannot be limited to fulfilling food requirements of the people, but would have to address the issue of providing enhanced incomes to farmers through higher value addition to their produce. Major environmental issues to sustainable agri-growth must be integrated into future development policies. New agricultural technologies such as those provided by bio technology, information technology and eco technology will need to be explored and harnessed.

It's estimated that by 2020, food grain requirement will be of the order of 340 million metric tons if we are to feed a population of about 1300 million. Future strategies to ensure a minimum growth of 4.5 per cent per annum will envisage implementing agriculture reforms through policy and institutional changes. We would need 120 million tons of rice, 92 million tons of wheat, 20 million tones of pulses, 11 million tons of edible oils, 165 million tones of milk and milk products and 113 million tones of fruits and vegetables. Therefore future India's population will not survive without new revolution, along with the conventional adoption of technology, we need to adopt technologies like, bio technology, eco technology, diversification, integrated pest management and of course information technology to a higher magnitude.

2. Oxford Economic Survey – 2007-08.

This chapter presents the growth of food grain production and availability over the years. The rift between the growth of agriculture and non agriculture began to widen since 1981-82 and more importantly since 1996-97, because of acceleration in the growth of industry and services sectors. However the growth in agriculture sector is lower than in the non-agriculture, but remained higher than the growth of population. As a result, India almost became self sufficient in food grains and hardly any food imports during the

period 1976-77 to 2005-06 except occasionally But there have been fluctuations in food grain crop productions, especially in the post liberalized era. Productivity of crops in India isn't only low relative to other countries; there is a considerable interstate variation too.

Climate variability caused by erratic rainfall patterns and increases in the severity of droughts, floods and cyclones and rising temperatures, has been the causes of uncertainty and risk resulting in huge losses in agriculture production and the livestock population in India. This mission aims at increasing the food grain production of above crops through area expansion and productivity enhancement as well, restoring soil fertility and productivity, creating employment opportunities and enhancing farm level economy to restore confidence of farmers of targeted districts. In order to live up to the future challenges agriculture needs to be given primary importance from all angles. For e.g. increasing farm incomes, domestic price stability, market access etc;

3. Thorat.S.K and Joel Lee (2005)

Here the author tries to explain the communal discrimination that has been hurting the right to food of Dalits in the process of implementing Government programs like MMS (Mid Day Meals Scheme) and PDS. Here the argument is based on the field survey done by the "Indian Institute of Dalit Studies" in 513 villages of Rajasthan, UP, Bihar, AP and TN. Firstly we will examine the argument from the point of view of the implementation of "Mid-Day Meal Scheme (MMS)".

In the process of implementation of this MMS scheme, Dalit children in schools are sometimes, made to sit out or barred or served less quality food or denied food. Sometimes teachers also discriminate Dalit children. Mostly or ideally the scheme is expected to be maintained in schools, but sometimes in some villages this is maintained in Hindu temples or elsewhere. This has completely forbidden the Dalits to avail the MMS benefits. When it comes to cooking, when a Dalit women cooks or prepares the food, it led to the opposition from upper caste students, parents and teachers. She has been made or compelled to withdraw herself from the cooking duties. Very rarely these MMS's are run in Dalit localities, mostly run in dominant caste localities. For example: MMS's run in Dalit areas, account for 12 per cent in Rajasthan, 19 per cent in TN, 46 per cent in AP and 10 per cent in UP. When it comes to the Dalit cooks in all the respondent villages Rajasthan accounts for 8 per cent, TN 31 per cent, and AP 49 per cent.

There also exists discrimination against dalits in terms of charging higher prices, giving less quality and quantity, sometimes made to wait for longer times. Some of the leaders even show caste biasedness towards their own castes. The study shows that 26per cent of PDS dealers practice untouchability. These

percentages are AP-11 per cent, TN-25 per cent, UP-35 per cent, and Bihar-59 per cent. All these trends have been depriving the Dalit from the right to food.

4. Raghavan. M (2006)

In this article, the author tries to put forward the exact causes and political misrule behind the import of wheat in first half of the year 2006. In Feb-2006, Government decided to import 5 lakh tones of duty free wheat, with the argument that the wheat prices in the South (Kerala & Karnataka) have to be brought down. It happened exactly during the time when there was a hardly a month and a half for the rabi harvest to commence. Again in April 2006, when the current harvest was in full swing, Government announced that it would import other 30 lakh tones of wheat, citing low procurement and falling stocks as reasons. Along with this, it has offered Rs.50 as bonus over the MSP which is fixed at Rs.650 per quintal for the season. As Government knew that the buffer stocks with the FCI were low, it should have acted more cautiously. But surprisingly FCI continued with the release of wheat under the open market sales scheme. It was reported that between Feb and April, the FCI sold out 7 lakh tones of wheat to private traders.

The ground reality is that these outputs were cornered in large quantities by flour mill owners and multinational operators like Cargil India, Continental and ITC (with consent of the Government) at lower than the prevailing market price. These operators have mostly contracted most of their purchases outside the registered Mandis, therefore it's difficult to estimate the extent of the arrivals. It's also very evident from the past experiences that procurement is not exceptionally sensitive to the volume of production.

Instead of resorting to productive utilization, the Government allowed the FCI to relax surplus stocks to private exporters at or below the BPL issue prices (under the nomenclature of 'transport subsidy') to escape action from the WTO. This led to the exports of wheat by the private exporters from the country, registered four and a half fold increase in the first five years of this decade to 32.2 lakh tones, as compared with 29.7 lakh tones reported in the corresponding period of 1990's.

If politics will over rule food security, the present wheat import programme need not necessarily end up here. In that case the repercussion could be far reaching. Dr. M. S. Swaminathan believes that, the decision to import wheat is the outcome of complacency that has implications for both food and nutritional security. Government also discarded the possible and dangerous plant diseases through the imports of wheat which ultimately could destroy the wheat crop.

5. Quraishi S.Y (2004)

In this chapter, the author emphasize the necessity of the media's role or communication in taking the ideas and fruits of developmental programmes to the ground level in order to achieve food security or avoiding malnutrition.

According to 'National Readership Survey 2003', in India TV viewership is 404.45 million, followed by Print media with 190.78 million, Radio with 167.88 million, C & S Channels with 152.62 million, Cinema with 53.42 million and finally Internet with 7.63 million users. But unfortunately there still exists 400 million people who are not exposed to any media at all. There are already some problems running with the media interventions, but the results and the progress of these programs is negligible and disappointing.

Therefore there is a need to establish social marketing approach in the process of implementing any developmental or public health programmes. The total annual advertising budget of the industry in 2003 was way above Rs.8000 crores in India. But, unfortunately most of these ads are over, pan masala, alchohol…etc; Now the modern slogan is that 'From Know-how to Do –How', which is a communication challenge. In India, media support especially needed for food production, technology management of agriculture, water management, post harvest technology, access to food, housing, sanitation and safe drinking water in various forms.

Why in India mostly the developmental programmes don't reach the poor and mostly turn out unsuccessful. The primary cause for this is, 'we have not been using right techniques to reach the people'. If a paan masala maker, soap maker and cigarette manufacturing can sell death to millions, why can't we sell life through our programmes like immunization, nutrition, family planning, housing, rural development, agricultural practices, water conservation, literacy, food grain production etc; Therefore we have to overcome these hurdles, through various innovative measures, especially involving both public and private media as the primary source of reaching poor while implementing any developmental programme.

6. Vyas V.S. (2002)

The main focus of the author in this chapter is to analyse the roles of state, market and civil society in solving the problems of food insecurity. On the worldwide basis average daily per capita dietary energy supply increased from less than 2300 k.calories in 1961-63 to 2440 in 1969-71 to 2720 in 1990-92 and is expected to reach a value of 2900 calories by 2010 AD. But still the larger number of people in developing countries may continue to face acute problem of food insecurity.

The main reason for the absence of nutritional security or even the narrowly defined food security (calorie based), is that we have taken a balanced view on the respective role of the state, markets and civil society in ensuring food security.

State interventions are of direct and indirect natures in taking up food insecurity. Indirect interventions are investment in R&D in agriculture or investment in infrastructure or institution of land reforms and in the same way direct measures are trade policies, price policies and by public distribution of food. Widespread move of LDC towards globalisation and free trade have pushed them to wean away from the policy of food self sufficiency and started to organise the production on the basis of comparative costs expenditure due to changes in international markets like heavy reduction of food grain prices. Moreover, these free trade policies push for frequent shifts in cropping pattern by domestic producers to suit the year to year changes in international prices.

Though the subsidy system exists in order to cover the price difference (between procurement and issue price), but most of these subsidies are accruing to richer farmers. Because the poor farmers do not possess much marketable surplus to benefit from high administrative prices, in fact, as net buyer of food grain they are the losers.

An efficient functioning *market* would be able to provide food grains in all seasons at stable prices only with the additional cost of storage. If the price in the off season is more than the storage cost, the market can be considered inefficient. In the same way, if the cost of food grains at different locations is more than the transport costs, or the prices in different locations are not moving in the same direction and with similar pace, the market is not performing its functions efficiently. And market imperfections mainly push back the poor in terms of unequal bargaining power of different economic agents, asymmetry of information and moral hazards. This again due to prevailing problems like illiteracy and lack of communications due to their isolated locations where the poor are concentrated. Apart from poverty, market imperfections make the poor more vulnerable in terms of food security.

Civil society in this context, the author means is the local body or village level administration Unit namely Panchayat Raj. He feels that they can ensure lower Transaction cost, assure greater transparency and cope with problem of free riders in the implementation of welfare programmes and even the PDS can be entrusted with this local unit, thereby minimising leakages and corruption. These units can also act as watch –dog as well as advocacy functions and point out the defects and fights the malpractices that prevail in the implementation of other welfare programmes at village level. And they can also play more ethical role in ensuring food security.

Chapter III

Composition and Conceptual Framework of Food insecurity – Prevailing Trends

"India wants to reach Moon but the question is whether it can reach its own starving children or not?"

In this chapter, we try to analyse and establish the extent of food insecurity in India through observation, presentation and analysis of various parameters. Though our objective is to analyse the role of production in determining Food security, it is also very pertinent and pre requisite to observe the symptoms of food insecurity through different prevailing facts at aggregate level in order to establish and analyse the issue of food insecurity.

3.1 Conceptual Scope

M.S.Swaminathan "Livelihood security for the households and all members within, which ensures both physical and economic access to balanced diet, safe drinking water, environmental

sanitation, primary education and basic healthcare"[28] thus providing drinking water for all has become an integral component of food security.

The only asset that poor have today is labour and the probable way of empowering the poor is to make them avail food grains through providing employment. According to A.K.Sen "unlike famines, chronic undernourishment receives very little political attention and also says that 'Alas, hunger in the non-acute form of endemic under-nourishment often turns out to be not particularly politically explosive."[29] Very often these issues find place in the political party's election agenda.

The concept of food security in its wider connotation comprises of four entities: 1) Availability of Food 2) Household Entitlement to food 3) Stability in the supply of food throughout the year; 4) Protection against malnutrition. Impartial agencies, such as UNICEF, have started that in the area of nutrition India's record is worse than that of some of the countries of Africa. With the rising income Engel's law starts operating, i.e., expenditure on food as a proportion of total income declines, and expenditure on food grains declines even faster. Also, so long as a vast number of people are below the poverty line the increase in their income up to certain threshold would fuel demand for food grains. Kumar[30] suggest that the demand for food grains by the year 2030 will range between 260 million tons to 264 million tonnes depending on the growth in per capita income. As is well known, India is now producing enough food, which if equitably distributed, can meet the calorie requirements of the citizens. However, the fact of the matter is that the available food is not equitably distributed and as a result the lower 30 per cent of the households do not have adequate intake of calories.

The continuing growth in population and incomes appear to lead to a clear danger of India becoming a food grains importing country. It is the State's obligation to subsidise the poor producers as well as poor consumers. This input subsidy is often known as *'cheap input- cheap output'* policy. Neither fertilisers, nor irrigation, nor for that matter, power, is an unfamiliar input. The increasing use of the subsidised inputs is not contributing to productivity at the margin. Marginal productivity of fertilisers and water applications is declining, largely because

[28] Swaminathan M.S, Research Foundation and WFP (2003): "Food Insecurity Atlas of Urban India"– 2002. From 'Frontline – Vol 20- issue 01, Jan 18-31 -2003.
[29] Sen; Amartya, Jean Drez, Athar Hussain (2011): "The Political Economy of Hunger", selected essays, by Oxford University Paper Backs.
4[30]Kumar; Praduman, Joshi P.K, Birthal S Pratap (2009): "Demand Projections for Foodgrains in India", from 'Agricultural Economics Research Review, Vol. 22 July – Dec 2009,pp 237-243.

of weakness in the organisation and functioning of the extension system. There are better ways of transferring incomes to the producers such as by improving the income terms of trade.

If we take poverty as an indicator of food security, we have in this country nearly one-third of the households who do not have adequate entitlement. The economic policies directed towards poverty alleviation have only been partially successful. Although these policies have been in place for the last 25 years or more, enough resources have been expended on poverty alleviation programmes. There are two other aspects, which impinge upon the entitlement for food in our country. One is the relative price of food grains in the market place, and other is their public distribution.

It was found that, for more than 70 per cent of population, energy intake level is estimated to be less than 2100 calories. And for the bottom 80 per cent of rural and bottom 40 per cent of urban households' possess a food expenditure share of more than 60 per cent[31]. To put it in other words, the level of food insecurity both in terms of energy intake norm and food consumption share criterion is almost more than the incidence of abject poverty in India.

3.2 Alarming Hunger Rates

It is also worth pointing out that the percent share of calories from cereals which was 83.4 for the lowest expenditure groups has declined gradually to 55.2 in the highest expenditure group. Taking different states in India, these percentages are varied between 28.5 - Kerala, 62.6 - Bihar. The IMR (Infant Mortality Rate) ranged between 23.8 in Kerala and 99.9 in Uttar Pradesh. And 51.9 per cent of rural consumers with monthly per capita expenditure of less than Rs.265 and as high as 67.7 per cent of the urban consumers with monthly per capita expenditure of less than Rs.490 had inadequate calorie intake and 53.3 per cent of rural households and 61.9 per cent of urban households belonged to the monthly per capita expenditure groups with below average levels of adequate calorie intake[32].

[31]Suryanarayana M.H, Silva; Dimitri (2006): "Poverty and Food Security in India – A disaggregated Regional Profile", from 'India: Perspectives on Equitable Development', edt by Dev; Mahendra and Chandrashekar Rao, Academic Foundation.
[32] George P.S : "Some Reflections on Food Security in India" (2006): From "Indian Agriculture – in the new Millennium (Vol –II), Changing perceptions and Developing Policy. Edited by NA. Majumdar and Uma Kapila. Indian Society of Agriculture Economics – AF – 2006.

It is very difficult to define or measure hunger. According to surveys conducted by NSSO, measurement of hunger is subjective, in the sense that what their record is the perception of the respondents regarding their households getting 'two square meals[33]' a day. On this count, there seems to be progressive reduction in the proportion of 'hungry' households among total households, both rural and urban, in every state. Even significant features revealed by the NSSO surveys is that some states such as Assam, Bihar, Orissa and West Bengal continue to record higher proportions of hungry people as compared to the national average. And the proportion of vulnerable groups, on this criterion, is higher among the Scheduled Tribe and the Scheduled Caste households. The survey also reveals that hunger is more pronounced in certain months. The period of acute hunger varies from state to state but, normally, it is the post-sowing and pre-harvest months of July, August and September. Naturally, the worst sufferers are those who get only seasonal employment, i.e., the *agricultural wage earners and marginal farmers* in rural areas of the Arid and semi arid regions. The plight of unskilled casual workers in urban areas is no better. The dry areas of Andhra Pradesh, Gujarat, Madhya Pradesh and Rajasthan show severe incidence of seasonal hunger.

Prevalence of hunger in rural India has declined from 18.5 per cent in 1983 to 1.6 per cent in the year 2002. In 1983, seasonal hunger (16.2 per cent) accounted for the bulk of total hunger. The level of seasonal hunger has been brought down to 1.1 per cent during the reference period 1983-2002. And the incidence of chronic hunger has decreased from 2.3 to 0.5 per cent between 1983 and 2002. The magnitude of Hunger in urban India was relatively low even in 1983 at 6.4 per cent. Out of this seasonal hunger has accounted for 5.6 per cent. These trends have declined to 0.4 per cent in 2002, with chronic hunger accounting for half of it. The evidence shows near elimination of hunger in India. However, when we examine the incidence of hunger across states and occupation categories, patterns of hunger achievements in alleviating it vary across states. Labour households; both within agriculture and outside it form the largest chunk of occupation class suffering from hunger, both chronic and seasonal. During 1999- 2000, 4.9 per cent of agricultural labour households and 3.9 per cent of other labour households suffered from seasonal hunger in rural India. In addition, 1.1 and 1.3 per cent of the agricultural labour and other labour households suffered from chronic hunger. As much as 2.2 per cent of casual labour

[33] A square meal is basically 'a culturally, socially and psychologically determined notion'

households suffered from seasonal hunger and another 0.9 per cent with chronic hunger in urban areas. For all other categories of urban households the incidence of hunger has been brought down to below 1 per cent. Since a large part of labour households is constituted by the backward castes, these social classes suffer most from hunger, both in rural and urban India. And in rural areas 6.0 per cent and 5.0 per cent in Urban India, there are 4.4 and 2.0 of the Scheduled Tribe and Scheduled Caste Households respectively suffering from total hunger.

3.3 Relevance of Food Security

The primary cause of concern was clearly identified by Dr.B.R.Ambedkar as there is urgent need for coinciding political democracy with economic and social democracy. He said on January 26, 1950, "We are going to enter into a life of contradictions, in politics we will have equality and in social and economic spheres we will have inequality. The contradiction is still with us today, and in some aspects at least, the problem is even intensifying at this time of growing inequality and elitism"[34]. India is in some danger of becoming a "business driven society" It is in this context that there is an urgent need to receive the concern with economic and social rights prescribed in the Directive Principles of the Constitution, including the right to food. Indeed, as mentioned earlier, the main motive of the Directive Principles was primarily to lay the foundations of "economic and social democracy".

Every person in a civilised society deserves to be food secure. India is also a signatory to international covenants to abolish hunger and malnutrition at the World Food Conference convened by FAO, and the conference on Millennium goals convened by the UNO. It has been endorsed as an important objective in our successive Five year plans. The concept of Food Insecurity as it is now understood universally goes beyond avoiding starvation. It implies availability of food in adequate quantities (from domestic production or imports) of requisite quality (from a nutritional point of view) and, entitlement to access the food (through production, labour, trade or transfer) by all the households. There are enough indicators to suggest that we are far behind in ensuring to the citizens of this country. Food security can be examined at three levels, viz., hunger verging on starvation, calorie deficiency verging on hunger and malnutrition with or without calorie deficiency. Nonetheless, it is useful to accept these categories of food

[34]Dreze, Jean (2004): "Democracy and Right to Food". From 'epw, April 24th, 2004', pp 1723 to 1935.

insecurity to distinguish the nature of deprivations faced by the households at these three levels and to arrive at appropriate remedial measures.

3.4 India Faces Urgent Hunger Situation

The state hunger focused index is an important instrument to bring awareness about the variations in hunger across India, as it has more hungry people than any other country in the world. With this Global Hunger Index, we can also observe how India is faring to the rest of the world in the fight against hunger. International Food Policy Research Institute (IFPRI 2008) analyzes hunger levels in 17 major states across India. State hunger index performances vary from serious to extremely alarming rates. Here hunger is measured based on three basic indicators and combines them into one index. This includes *prevalence of child malnutrition*, rates of *child mortality* and *calorie deficiency* among people. Madhya Pradesh has the highest level of hunger in the country, followed by Jharkhand and Bihar. At the same time, Kerala and Punjab maintained the best Index according to India State Hunger Index (IFPRI - 2008)[35]. Unfortunately it is found that not a single state in India falls under the 'low hunger' or even 'moderate hunger' categories. Twelve states fall in the 'alarming' category and one state namely Madhya Pradesh falls in the 'extremely alarming' category. Four states like Punjab, Kerala, Haryana and Assam fall in the 'serious hunger' category.

As per 2008 Global Hunger Index, India positioned at 66 out of 88 nations. Though we have been achieving higher economic growth in the recent past, India fared worse than nearly 25 Sub Saharan African countries and also South Asia excluding Bangladesh. Considering other two components of the Hunger Index namely child underweight and child mortality, India falls below Bangladesh.

3.5 State Hunger Index 2007

The food insecure people are disproportionately large in areas, such as economically backward states with high incidence of poverty, tribal and remote areas, regions more prone to natural disasters etc. In fact, the states of UP (eastern and south-eastern parts), Bihar, Jharkhand, Orissa, WB, Chhattisgarh, parts of MP and Maharashtra account for largest number of food insecure people in the country.

[35] International Food Policy Research institute (IFPRI)

If Indian states are compared to different countries in the 2008 Global Hunger Index, *Madhya Pradesh ranks between Ethiopia and Chad. Punjab, supposed to be a well off state, ranks below the African countries Gabon, Honduras and Vietnam.* This poor performance is driven by its high prevalence of child under nutrition and calorie inadequacy. Therefore the rates of child malnutrition are higher than most of the countries in Sub-Saharan Africa.

State hunger index in India also found that poorer Indian states have significantly higher levels of hunger rates than their relatively better off states. It suggets that '*strong economic growth did not translate into lower hunger levels'*. States with higher economic growth in recent years, such as Gujarat, Chhattisgarh, and Maharashtra, have alarming levels of hunger, while states with proportionately lower economic growth, such as Punjab, achieved a lower hunger level.

III.1 State Hunger index 2008

State	Calorie(%) Undernourishment	Underweight Children<5yrs(%)	Mortality rate<5yrs(%)	Hunger Index	Hunger Index Rank
Punjab	11.1	24.6	5.2	13.63	1
Kerala	28.6	22.7	1.6	17.63	2
AP	19.6	32.7	6.3	19.53	3
Assam	14.6	36.4	8.5	19.83	4
Haryana	15.1	39.7	5.2	20.00	5
Taminadu	29.1	30.0	3.5	20.87	6
Rajasthan	14.0	40.4	8.5	20.97	7
W.Bengal	18.5	38.5	5.9	20.97	7
UP	14.5	42.3	9.6	22.13	9

Maharshtra	27.0	36.7	4.7	22.80	10
Karnataka	28.1	37.6	5.5	23.73	11
Orissa	21.4	40.9	9.1	23.80	12
Gujarat	23.3	44.7	6.1	24.70	13
Chhattisgarh	23.3	47.6	9.0	26.63	14
Bihar	17.3	56.1	8.5	27.30	15
Jharkhand	19.6	57.1	9.3	28.67	16
MP	23.4	59.8	9.4	30.87	17
India	20.0	42.5	7.4	23.30	**67 (**122**)**

Source: International Food Policy Research Institute (IFPRI) 2008.

The India state hunger index in 2008 (IFPRI) shows very large differences across 17 major states, varying from 30.9 in Madhya Pradesh to 13.6 in the state of Punjab. States like Jharkhand and Bihar rank much lower than African countries like Zimbabwe and Haiti, and Madhya Pradesh falls between Ethiopia and Chad. With respect to hunger India's performance is disappointing, particularly in with respect to other developing countries like China, with only Bangladesh having a higher value of the index in Asia. Indeed, India's index value is close to that of Zimbabwe, a country which is in the throes of severe hyper inflation and collapse of domestic food markets. Supposed to be rapidly growing states like Karnataka, Maharashtra, and Gujarat, fare very poorly on the hunger index, which is much worse than Kerala and further worse than Asom. Among the major states, in terms of the hunger index, West Bengal is nearer to the middle place and slightly below the average at national level. West Bengal has the highest percentage of House Holds (HH) (10.6 per cent) not getting enough to eat during some months of the year as per report of NSSO survey 2004-05.There are low food grain producing states like Gujarat and Karnataka with low level of starvation, on the other hand there are high food grain producing states like Madhya Pradesh, UP and Chhattisgarh with some starvation and there are high food grain producing states with almost no starvation like Haryana Punjab. Therefore there is not much correlation between starvation and per capita food grain availability. Hence, at present, the problem is not of production but of distribution to some extent.

Ashok Gulati[36] says that Hunger and malnutrition are often rooted in poverty. Solution partially rests with increasing investments in agriculture and poverty alleviation schemes. Underweight

[36]Gulati; Ashok (2002.): "Trde Liberalisation and Food Security" by From "WTO agreement and Indian Agriculture" edt by Anwarul Hooda – 2002.

children accounts for the highest contribution to the India's State Hunger Index in most of the states, followed by child mortality and calorie deficiency. In States like Kerala and Tamil Nadu, calorie deficiency contributes as much as children underweight. India must use existing programs and policies to ensure that all women and children are facilitated with sufficient amenities during the first two years of life for children and also later, during, and immediately after pregnancy for women and it may lead to progress in decreasing child under nutrition.

3.6 Poverty – Definition and Purview

The nation has produced 49 dollar billionaires and about a 100,000 dollar millionaires in a decade. But it has no money to feed its hungry. So says a govt that tosses Rs.500,000 crore of tax exemptions to the wealthy in the budget under just three heads.

Poverty and food and nutrition security are intricately linked. Academicians like *Jean Dreze* says that, the poverty estimates of about 40 per cent given by the Tendulkar Committee to determine the number of poor in our country who will receive subsidized food under the forth-coming National Food Security Act is inadequate to our current situation of hunger, starvation and malnutrition. Arjun sen guptha committee (NCEUS 2004-09)[37] says that 77 per cent of India's adult population spent less than Rs.20 a day. N.C.Saxena says 50 per cent of Indians are below the poverty line if one takes into account the criterion of calorie intake.

This nearly doubles the BPL numbers, when the planning commission has said only 28.3 per cent of the population is BPL. If accepted this will bring a much larger number of the poor under the system of food subsidy. The Saxena committee report (2010) states that there has been a steady decline in the calorie intake, especially cereal consumption, among the poor between 1972-73 and 1999-2000. Ironically this has happened even as the number of people officially declared poor has steadily gone down over the same years. It also says that 61 per cent of households, poor on account of their consumption expenditure being less than the official poverty line, have been excluded from the net of BPL census.

As per the World Bank estimates (2009), 34 per cent Indian people live on less than US$1 a day (extreme poor) and 80 per cent live on less than US $ 2 a day (moderate poor). *This poor and vulnerable group constituted about 88 per cent of SC/ST, 80 per cent of OBCs and 85 per cent* of

[37] National Commission for Enterprises in Unorganised Sector (NCEUS)

the Muslim population. Most of them are socially discriminated, educationally deprived and economically destitute.

The division of the rural population between BPL and APL households, with PDS entitlements being effectively restricted to BPL households, is so pernicious. It undermines the notion that PDS entitlements are a matter of right, since no-one has a right to a BPL card. It is also weakens the ability of BPL households to enforce their rights, by destroying the solidarity between APL and BPL households, and sometimes even pitching one group against the other. The need of hour is to empower disadvantaged households vis-a-vis PDS dealers, but the present targeting system goes in the opposite direction. In this context we can observe some of the ongoing schemes to substantiate our argument. India, social issues are nowhere near getting the same attention in state policies. There is an obvious sense in which mass hunger is fundamentally incompatible with democracy in any meaningful sense of the term. But Right to Food (RTF), is nowhere being realised in India. The nutritious situation in India is like a silent emergency. RTF can be made successful through, legal action and through democratic practice and also through public perceptions. If RTF is to be achieved, it needs to be linked with other social and economic rights such as the right to education, the right to information and the right to health and also right to work as they all enforce one another.

The planning commission estimate of rural income poverty based on the NSSO 2004-05 was 28 per cent, but the same survey indicated calorie deficiency (at less than 2,200 kcal per day) among 70 per cent of the population, which is more than the double the poverty estimate. That is the reason we cannot equate poverty with hunger. Dealing with rampant hunger and under nutrition necessitates a more integrated policy that does not exclude the majority from the coverage of public provision. It is counterproductive to base public food provision on a pre defined group of the "poor", which would deprive a large number of others who are also food insecure. It is generally observed that mostly the universal public distribution schemes have been proved successful. Because they offer economies of scale like low transaction costs and avoid administrative complications involved in getting the target group and making sure the accessibility.

3.7 Purview of Poverty

The present concept of poverty line is based on the per capita consumption expenditure needed to attain a minimum amount of calorie intake out of food consumption along with a minimum amount of non-food expenditure in order to meet the requirements of clothing, shelter and transport, among other things. This is based on the methodologically suggested by the Lakdawala Committee in 1993 and population projections of the Registrar General of India as of March 01, 2000. Shockingly according to the current assessments, it works out to around Rs.11 an adult a day. Clearly, this is not a poverty line but a destitution line.

The state of BPL census on the basis of one set of calculations may be entirely at variance with that of the Planning Commission. According to its current estimates, such a large number of people are earning less than Rs.330 a month is shocking enough. But what is cruel is that anyone earning above this meagre monthly income is classified as APL and excluded from the right to subsidised food grains. The very words APL is misleading because they include a vast section of the poor who have been denied their entitlements through statistical fraud to serve a neoliberal agenda.

III.2 Composition of Food Consumption, All-India – Rural and Urban 1972-73 to 2004-05

Sector	Year	% share of major food groups in total expenditure								
		All food	Cereals	Pulses	Milk & Products	Edible oil	E F M*	Vgtbls#	Fruits& nuts	Sugar
Rural	72-73	72.9	40.6	4.3	7.3	3.5	2.5	3.6	1.1	3.8
	87-88	64.0	26.3	4.0	8.6	5.0	3.3	5.2	1.6	2.9
	93-94	63.2	24.2	3.8	9.5	4.4	3.3	6.0	1.7	3.1
	99-00	59.4	22.2	3.8	8.8	3.7	3.3	6.2	1.7	2.4
	04-05	55.0	18.0	3.1	8.5	4.6	3.3	6.1	1.9	2.4
Urban	72-73	64.5	23.3	3.4	4.9	4.9	3.3	4.4	2.0	3.6
	87-88	56.4	15.0	3.4	5.3	5.3	3.6	5.3	2.5	2.4

	93-94	54.7	14.0	3.0	4.4	4.4	3.4	5.5	5.7	2.4
	99-00	48.1	12.4	2.8	3.1	3.1	3.1	5.1	2.4	1.6
	04-05	42.5	10.1	2.1	3.5	3.5	2.7	4.5	2.2	1.5

*Eggs Fish Meat #Vegetables. Source: NSSO various rounds of respective years

The table shows that, in rural India, the share of vegetables has risen at 2.5 per cent. And at the same time the consumption of beverages, refreshments and processed food has risen by 2 per cent in the period since 1972-73. Later on the shares of sugar and pulses (especially between 1994 and 2004) had come down significantly along with the cereals. However the increase in the non cereal consumption cannot compensate for the decline in the cereal consumption of poor people. The share of cereal consumption has declined in both rural and urban sector out of total monthly expenditure, but this decline is more in the case of urban people. Because, poor does not have the enough of purchasing power to diversify their food consumption away from cereals.

The per capita cereal consumption during the time between 1993-94 and 2004-05, both in rural and urban areas have been declining continuously due to various factors like change in diet pattern towards modern fast foods and nutritious foods as well as non vegetarian diet, and also to some extent due to increase in cereal prices. This can be seen from the above table which clearly shows a declining trend in almost all 15 states. Between this mentioned periods, the total aggregate fall in cereal consumption was 73 to 55 per cent in rural and 64.5 to 42 per cent in urban areas. But in urban areas along with the fall in cereal and pulses consumption there is also a decline in the consumption of milk, milk products, edible oil and sugar, whereas in the case of rural areas, there is an increase in the consumption of these items to the minute level of 1 per cent, only the consumption of sugar had shown a declining trend.

3.8 Food Subsidy

Food subsidy is the difference between MSP plus handling/distribution expenses incurred by Food Corporation of India (FCI) and the issue prices of food grains under PDS.

III.3 Food Subsidy in India: (Rs.Billion)

Year	**Food Subsidy at Current Prices**	**Food Subsidy as per cent of GDP**
1990-91	24.5	0.43
2000-01	120.1	0.57

2001-02	174.9	0.77
2002-03	241.8	0.99
2003-04	251.6	0.91
2004-05	257.5	0.83
2005-06	230.7	0.66
2006-07	238.3	0.63
2007-08	254.2	0.62

Source: GoI (2007-08). "Food Security and Indian Agriculture: Policies, Production Performance and Marketing Environment" by Shabd S.Acharya, from 'Agricultural Economic Research Review, Vol. 22 Jan-Jun 2009 pp 1-19.

The table shows us that the food subsidies over the years have increased, but their share in total GDP has remained stagnant. Despite these subsidies there seems to be very little improvement in the food security of the poor people in India. Therefore these subsidies need to be utilised with long term policy visions and also need to be transparent in delivery mechanism. These are usually made available to specific target groups like marginal or small farmers and account for a small proportion of the total input subsidies. The indirect or implicit subsidies arise on account of the manner of determination of sale prices of inputs. There is no explicit payment of subsidy to the farmers. The inputs are supplied at a price or user charge lower than the cost of production, which amounts to implicit subsidisation. *Implicit or indirect subsidies on fertilisers, electricity for irrigation and canal water are the major input subsidies* in the Indian agriculture. The estimates of input subsidies during the past 13 years since 1996, as reported by Ministry of Agriculture (MoA), as per these estimates, the following table shows that the input subsidies to the Indian agriculture have increased from Rs.140.7 billion in 1993-94 to Rs.487.9 billion in the year 2004-05. Out of the total input subsidies, canal irrigation accounts for 27 per cent, fertilisers 32 per cent, electricity 32 per cent and other direct subsidies account for 9 per cent in 2004-05. Across farm size groups, the share of subsidies follows the share in operated land, with small farmers having relatively larger share. The subsidy per hectare works out to be Rs.3000 or US $75. Computation across crops shows that 96 per cent of the input subsidies go to the food crops. But, despite all these subsidies, the ultimate beneficiaries have been unable to yield the desired benefits as there exist many leakages in the delivery of these subsidies.

3.9 Functioning of PDS and Other Programmes

The off take in the Antyodaya system is around 90 per cent, showing the desperate need of people for cheap food grains, the off take for BPL has doubled in the past few years since 2004, from 73.67 lakh tonnes to 228.45 lakh tonnes in 2005-06 out of an allocation of 273.20 lakh tonnes which constitutes 83 per cent of the allocation. For several years there was not much difference in the govt issue price and the market price.

Public procurement has to be combined with public distribution. A law that ensures universal food access and assigns responsibility and culpability would force governments at both central and state levels to take up the entire gamut of issues; which relate not just to actual food distribution but also to its production and patterns of consumption, so as to eventually ensure genuine food security. The key point here is that such a law must guarantee universal access. The proposed Right to Food Bill (by National Advisory Council), is not going to work out successfully as there exist well known inherent errors in targeting, of unjustified exclusion of the genuinely poor and unwarranted inclusion of the non-poor.

3.1.0 Calorie Deprivation:

In India, the poverty line is based on a given quantity of calorie intake together with expenditure on other necessities accompanying the stipulated calorie intake. The base for calorie consumption for this purpose was suggested at 2400 calories per person in the rural areas and 2200 calories per person in urban areas. Right from the inception, this norm was challenged, basically on two grounds. Scholars do not consider a fixed calorie intake relevant indicator at all, as they insist that body's adaptation mechanism determines the calorie requirement. They are not in favour of a fixed calorie norm for poverty estimation. Many more scholars object to the relevance of the prevailing high norms. It has been suggested that, with the changing age structure, male-female composition, living standards, occupational diversification and availability of several facilities to minimise physical labour, all being reflected in the changes in the consumption basket, the norms suggested are too high. This is also borne out by the fact that calorie consumption, even by the richest deciles in some of the major states, is less than the stipulated norms.

According to NSSO, the average daily intake of calories of the rural population has dropped by 106 kilo.calories (4.9 per cent) from 2,153 k.cal to 2,047 k.cal from 1993-94 to 2004-05 and by

51 kilo.calories (2.5 per cent) from 2,071 to 2,020 k.cal in urban India. The average daily intake of protein by the Indian population decreased from 60.2 to 57 grams in rural India between 1993-94 and 2004-05 and remained stable at around 57 grams in the urban areas during the same period. Despite achieving impressive economic growth, 410 million people living in poverty should be a wakeup call for government to probe and work for it. On the basis of three leading indicators, 84 countries have been rated, prevalence of child malnutrition, rate of child mortality and calorie deficiency. Here, China is ranked at the ninth place ahead of India. Global Hunger Index 2009 says that, India ranked at 65 out of 88 countries, and plummeted down two positions in 2010[38].

Countries like Pakistan and China have been rated way ahead of India in this hunger index. Considering three major indicators like Prevalence of child malnutrition, rate of child mortality and the proportion of people who are calorie deficient, 400 million people in India are supposed to be undernourished which is the highest for any country across the Globe. Malnutrition accounts for nearly 50 per cent of child berths in India as every third adult (aged 15-49 years) is reported to be thin (Body Mass Index less than 18.5)[39]. According to the latest report, it is estimated that nearly 1.5 million children are prone to be malnourished due to surge in food prices. The most effected out of food insecurity are the *landless poor households in rural areas and people employed in ill paid occupations and casual labourers engaged in seasonal activities in the urban areas, SC/ST sections, girl children and wome*

3.1.1 Rural Food Insecurity

III.4 Percentage of Rural Population Consuming less than 1,890 Kcal/cu/day (1993-94, 1999-2000, 2004-05)

States	1993-94	1999-2000	2004-05
Andhra Pradesh	14.1	17.3	12.5
Assam	13.3	21.8	8.9
Bihar	14.1	13.7	10.0
Chhattisgarh	*	*	16.2
Gujarat	20.4	20.1	17.1

[38] Worl Bank Hunger Report 2010
[39] To calculate your BMI, you will need to divide your weight in pounds by your height in inches squared and multiply that by 703. The formula is: weight / [height (in inches)]^2 x 703. **BMI Categories:** Underweight = <18.5, Normal weight = 18.5–24.9, Overweight = 25–29.9, Obesity = BMI of 30 or greater

Haryana	8.7	7.2	7.8
Himachal Pradesh	5.3	2.5	2.8
Jammu&Kashmir	0.8	2.2	2.4
Jharkhand	**	**	13.8
Karnataka	17.4	21.7	20.5
Kerala	23.7	18.7	17.5
Madhya Pradesh	12.2	18.7	16.0
Maharashtra	21.9	17.9	19.7
Orissa	10.4	11.1	15.4
Punjab	6.3	7.1	6.4
Rajastan	4.2	4.6	5.2
Tamil Nadu	28.2	33.7	23.4
Uttar Pradesh	8.0***	8.5***	8.0
West Bengal	7.4	15.0	11.9
All-India	**13.4**	**15.1**	**13.2**

Notes: *Included in Madhyapradesh, **Included in Bihar, *** Includes present day Uttarakhand. Source: NSSO 50^{th} 55^{th} and 61^{st} Round.

The table shows that, in the year 2004-05, the states of Karnataka, Tamil Nadu, Maharashtra, Kerala, Madhya Pradesh, Gujarat and Orissa had registered alarming calorie intake rates that are higher than the national average of 13.2 per cent. In the same way between the years, 1999-2000 and 2004-05, eleven states namely AP, Assam, Bihar, Gujarat, Karnataka, Kerala, Madhya Pradesh, Punjab, Tamil Nadu, Uttar Pradesh and West Bengal exhibit a significant decline in terms of people consuming less than 1,890 Kcal per consumer with a marginal improvements in states like Bihar and Gujarat while that of Assam is only substantial. But to our dismay, some states like Karnataka, Madhya Pradesh and Orissa showed a dismal performance as their percentage of population suffering from acute calorie deprivation has increased between 1993-94 and 2004-05. In this sense, we can establish that the states of Chhattisgarh, Gujarat, Madhya Pradesh, Maharashtra, Karnataka, Kerala, and Orissa show reasonably high levels of food insecurity while the state of Tamil Nadu stands as the most food insecure state in terms of calorie consumption in rural areas. Along with these things, there are other amenities like access to drinking water which can also indirectly influence the level of food insecurity. Here, we can

observe that, at all-India level, 59 per cent of rural population do not have access to safe drinking water with in their domestic premises in the year 2007-8 (NSSO 65th Round).

There is substantial force in this argument. The threshold calorie intake suggested for defining poverty seems to be on the higher side. However, one can easily agree that there is minimum level of calorie intake for ensuring 'healthy and productive life' and that consumption below that level signals food insecurity. Food and Agricultural Organisation (FAO) uses a cut off norm of 1810 calories for India to represent the lower range of food requirements. In a recent paper, Meenakshi and Vishwanathan[40], have shown that if the measure of, say 1800 calorie per person per day is used, there were in 1999-2000 eight states in the country where more than 1/3rd of the population was consuming 1800 calories or less per person per day. These are Tamil Nadu, Kerala, Karnataka, Gujarat, Maharashtra, Madhya Pradesh, Andhra Pradesh and West Bengal. It should be recognised that there has been some improvement in the situation as compared to 1983 when only four states namely Andhra Pradesh, Karnataka, Madhya Pradesh and Maharashtra recorded a higher calorie gap ratio as compared to their record in 1983.

Many of these states are not 'poor' states in the Indian context. It has prompted some scholars to challenge these norms as indicators of poverty. Their objection may be valid. However, the overall record in poverty alleviation in a state may hide calorie deficiency in some sections in that state. *In any event, poverty and food insecurity are not the one and the same thing.* A large number of people in the country are not getting the minimum amount of energy necessary for good health is an unarguable fact. Assuming that the estimates of the number of people suffering from calorie deprivation are correct, such situation can arise possibly due to two main reasons. Poverty is an obvious explanation or the main sources of calories which the poor take recourse to have become too costly, and a higher expenditure has to be incurred on other necessities (health related expenditure), forcing people to cut on the intake of food at the margin. The other two more serious reasons clearly suggest policy and programmatic interventions. The relative prices of the foods which the poor consume for their sustenance have to be kept low, and the cost of availing of other necessities, particularly health services, has to be restrained. At present, the state is defaulting on both the counts.

3.1.2 Nutritional Security

[40]Viswanathan; Brinda and Meenakshi J.V (2006): The Changing Pattern of Under nutrition in India – A Comparative Analysis across Regions", from 'United Nations University, UNU-WIDER, Research Ppaer No. 2006/118, Oct 2006.

There is some evidence of progress towards eliminating hunger and, to an extent, even calorie deprivation. There are no such hopeful signs as far as nutritional insecurity is concerned. In fact, several indicators of health and nutrition suggest deterioration of the situation. Indicators, such as body mass index, number of stunted[41] and wasted children[42], maternal morbidity and mortality present a very discouraging picture. These surveys unambiguously suggest that incidence of malnutrition is extremely serious. What is more worrisome is the fact that, except for two states, Kerala and Tamil Nadu, there has not been any significant improvement in this regard. In some states such as Madhya Pradesh and Orissa, the situation has worsened.

Paucity of micronutrients, which is aptly described as 'hidden hunger', is equally glaring all across the country. In-depth reports on the plight of the poor in the areas which record alarmingly high child mortality point to the appallingly low nutritional status of children in these areas. Chronic Energy Deficiency (CED)[43] was as serious as child Malnutrition, again, with the exception of Kerala and Tamil Nadu. Madhya Pradesh, Maharashtra and West Bengal showed the worst performance in this respect. In a large number of states, incidence of malnutrition among females is higher. According to the India Development Report (2004-05), medium income states such as Gujarat, Maharashtra and West Bengal do not fare much better than the 'less developed' states such as Bihar, Madhya Pradesh and North Eastern States in this regard.

For ensuring nutritional security, special attention should be given to two groups: Children in the age group 0 to 2 years, and pregnant and lactating mothers and elderly persons who do not have any family support schemes such as Old age pension legislated in some in some of the states have not gone beyond tokenism. In a country which has been aspiring for decades to achieve Food and Nutritional Security these are very disheartening facts. If we have to redress this situation, review of the economic policies as well as the design and implementation of programmes to ensure Food Security is necessary.

3.1.3 Women Malnutrition:

[41] Children who fall below the fifth percentile of the reference population in height for age are defined as stunted, regardless of the reason for their shortness.
[42] Wasted refers to low weight-for-height where a child is thin for his/her height but not necessarily short. Also known as **acute** malnutrition, this carries an immediate increased risk of morbidity and mortality. Wasted children have a 5-20 times higher risk of dying from common diseases like diarrhoea or pneumonia than normally nourished children.
[43] A person's Body Mass Index (BMI) measures the weight to squared height w/h2), below 18.5 points indicates under nutrition, referred to as Chronic Energy Deficiency (CED).

Poverty can be termed as one of the basic causes of malnutrition, but also malnutrition is considered to be both an outcome and a manifestation of poverty. During the period of higher growth and a reasonable pace of reduction in poverty, malnutrition especially iron-deficiency - anaemia has increased among women from disadvantaged social economic groups. The adverse influence of maternal malnutrition extends beyond maternal mortality to causing intrauterine growth retardation, child malnutrition and an increasing prevalence of chronic diseases.

A person's Body Mass Index (BMI) measures the weight to squared height w/h2), below 18.5 points indicates under nutrition, referred to as Chronic Energy Deficiency (CED). By contrast, BMI above 25.0 and 30.0 refer to overweight and obesity respectively, which are also indicative of poor nutrition. Iron Deficiency Anaemia, one of the most widespread forms of women's malnutrition in developing countries, is indicated usually by 11.9 grams/decilitre of haemoglobin in the blood. Haemoglobin below 9.0 and 7.0 grams/decilitre indicates moderate and severe anaemia respectively.

III.5 Levels of Malnutrition among Women (15-49 years) (2005-06)

	All India		Rural		Urban	
	%	N	%	N**	%	N
BMI*						
CED	35.6	1,11,782	40.6	75,416	25.0	36,366
Obese	12.6		7.4		23.5	
Anaemia						
Any Anaemia	55.3	1,16,855	57.4	79,888	50.9	36,967
Moderate/Severe	16.8		17.5		15.1	
CED and Anaemia						
Both	21.6	1,09,414	25.0	47,186	14.3	35,228
Either	47.5		47.7		47.1	
Neither	30.9		27.3		38.6	

**Total number of people. Excludes women who were either pregnant at the time of , or who gave birth within two months preceding the survey. Source: Computed from NFHS – 3 data.

The table presents the levels of malnutrition among women (15-49 years) in India during 2005-06. While more than one-third of women suffer from CED, around 10 per cent are overweight or obese. Thus, close to 50 per cent of women in India suffer from malnutrition of one form or the other. CED persists as the dominant form of malnutrition in rural India affecting around 40 per cent of woman, which are about 15 per cent age points larger than the incidence among urban women. On the contrary, overweight or obesity, from which nearly one-fourth of urban women suffer, is slowly emerging as an important nutritional problem in urban India. Again, about 50

per cent of women in both rural and urban suffer from malnutrition, though its nature varies between rural and urban regions.

Equally, over half the women in the age group of 15-49 years suffer from iron deficiency anaemia. Unlike in CED where the gap between rural and urban regions is significantly large, the regional gap is relatively lower in anaemia. Thus, more than 50 per cent of woman, irrespective of their place of residence, are anaemic, whether mild, moderate or severe. The last two, the serious forms of anaemia, afflict more than 15 per cent of women in both rural and urban India. The incidence of anaemia among pregnant woman is even higher: nearly 59 per cent, of which moderate or severe forms of anaemia constitute more than half (33 per cent). The higher incidence of malnutrition among rural woman would imply that a substantially large proportion of malnourished women – more than 77 per cent with CED and 70 per cent with any anaemia live in rural India.

III.6 Women's Malnutrition among Social and Economic Malnutrition Groups (in %**)**

	BMI		**Anaemia**		**CED &Anaemia**		
Social Groups							
	CED	**Obesity**	**Moderate/severe**	**Any**	**Both**	**Either**	**Neither**
ST	46.6	3.5	23.7	68.5	33.5	47.8	18.7
SC	41.1	8.9	19.0	58.3	25.7	47.7	26.6
OBC	35.7	11.6	16.2	54.4	20.8	48.3	30.9
Others	29.2	18.6	14.2	51.1	16.8	46.6	36.6

ST/others**	1.60	0.19	1.67	1.34	1.99	1.03	0.51
Wealth Groups							
Lowest	51.5	1.8	20.7	64.3	34.0	47.5	18.5
Second	46.3	3.9	18.9	60.3	29.0	48.3	22.7
Middle	38.3	7.4	17.7	56.0	22.9	48.2	28.9
Fourth	28.9	15.4	15.3	52.2	16.4	48.2	35.4
Highest	18.2	30.5	12.1	46.1	9.4	45.5	45.1
Low/High**	2.83	0.06	1.71	1.39	3.62	1.04	0.41

*Excludes women who did not report any social group. **Indicates ratio of ST percentages to corresponding percentages of others and ratio of percentages of lowest quintile to that of highest quintile respectively. Source: Computed from NFHS-3 data. Source: "A fact sheet of Women's Malnutrition in India" by Sunny Jose and Navaneetham K, EPW August 2008.

The table suggests that presence of huge socio-economic differences in women's malnutrition in India. A major gap is seen between social groups nearly 47 and 68 per cent of women (15-49 years) from the scheduled tribes suffer from CED and Anaemia. More than one-third of them suffer from the double burden of CED and Anaemia together. The incidence of malnutrition declines with the so called rise in social status. By extension, such decline also means huge disparities between social groups: more than 15 percentage points difference is found between women from STs and Others. Thus, the proportion of women suffering from CED and Anaemia together among ST comes closer to double the proportion of the same among advantaged social groups.

Apart from that, more than 50 and 64 per cent of women from the poorest quintile suffer from CED and Anaemia. Also, about one-third of them suffer from both. As we have observed among social group, malnutrition among women goes down drastically with a rise in the household wealth status, creating equally large disparity between the wealth groups. The proportion of the poorest women suffering from CED and Anaemia together comes around to more than three times that found in the highest quintile. It is also important to add here that the proportion of women suffering from Anaemia is not low even within the richest quintile. This suggests that a substantially large proportion of women in India, irrespective of the household wealth status, suffer from iron deficiency anaemia.

III.7 Women's Malnutrition across Major States in India (2005-06 in %)

States	**BMI**			**Anaemia**		
	CED	**Rural CED**	**Obesity**	**Moderate/**	**% of Rural Anaemia**	**Any**

		(15-49yrs)		severe	(15-49 years)		
					1998-99	2005-06	
Kerala	18.0	14.30	28.1	7.1	23.40	63.90	32.8
Punjab	18.9	14.50	29.9	11.8	42.50	69.50	38.0
Tamil Nadu	28.4	30.00	20.9	15.8	59.10	68.20	53.2
Uttaranchal	30.0	*	12.8	14.8	*	*	55.2
Haryana	31.3	32.50	17.4	18.5	47.50	56.90	56.1
AP	33.5	37.50	15.6	23.9	50.60	63.70	62.9
Karnataka	35.5	38.20	15.3	17.1	46.00	52.50	51.5
UP	36.0	37.20	9.2	14.7	49.40	49.83	49.9
Mahrashtra	36.2	44.20	14.5	15.6	51.20	51.10	48.4
Gujarat	36.3	41.90	16.7	19.1	51.30	59.20	55.3
Assam	36.5	39.50	7.8	24.7	69.90	69.50	69.5
Rajastan	36.7	36.50	8.9	17.9	49.10	54.90	53.1
WB	39.1	44.90	11.3	17.4	64.20	65.50	63.2
Orissa	41.4	43.70	6.6	16.3	64.10	64.00	61.2
MP	41.7	44.98	7.6	15.1	57.00	61.00	56.0
Jharkhand	43.0	47.80	5.3	19.9	**	73.70	69.4
Chhattisgarh	43.4	45.70	5.6	17.6	***	59.40	57.5
Bihar	45.1	45.90	4.6	16.9	63.90	68.20	67.4
India	**35.6**	**38.80**	**12.6**	**16.8**	**53.90**	**58.20**	**55.3**

Source: Computed from NFHS-3. From "A fact sheet of Women's Malnutrition in India" by Sunny Jose and Navaneetham K, EPW August 2008. *not mentioned **included in Bihar ***Included in MP. From : Report on the State of Food Insecurity in Rural india by MSSRF and WFP 2008.

To begin with, Chronic Energy Deficiency (CED) affects close to half of the women in Bihar (45 per cent), which is followed closely by Chhattisgarh, Jharkhand (43 per cent), MP and Orissa (41 per cent each). West Bengal, with an incidence of around 39 per cent, is not far from these states. These states tend to have more than double the proportion of malnourished women of states such as Kerala and Punjab, which are at the other end of the spectrum. Rather than CED, what seems to be an important issue in these two states is overweight or obesity: nearly 30 per cent of women suffer from overweight. However, what these states have in common with the other states is that in all these states about 50 per cent of women suffer from malnutrition of one form or another.

Assam and Jharkhand, with nearly 70 per cent of women suffering from some form of Anaemia remain at the top among these states. Close on their heels come Bihar with 67 per cent, WB, AP

and Orissa. In Assam and AP, nearly 1/4th of women suffer from moderate and severe anaemia. Here too, Kerala and Punjab remain at the lower end: both in terms of overall incidence as well as moderate and severe anaemia. Thus, the incidence of anaemia in Assam is over two times that in Kerala. Over 30 per cent of women in both Bihar and Jharkhand suffer from CED and Anaemia together, with Orissa and WB (about 27 per cent) as close followers. Again, Kerala and Punjab, with much lower proportions, remain at the other end. It appears that, with a much higher incidence of malnutrition, the eastern states, mainly Bihar, Jharkhand, Orissa and West Bengal, emerge as the repository of women's malnutrition in India.

When it comes to rural anaemia among women, the states of Jharkhand, Assam, Bihar, West Bengal, Orissa, AP and Madhya Pradesh have been showing the alarming rates in the year 2005-06 showing the clear signs of malnutrition resulted out of food and calorie deficiency while the states of Himachal Pradesh, Punjab, Kerala have shown reasonably better trends. At the same time between the period 1998-99 and 2005-06, the states which had shown a negative performance from the earlier period are Karnataka, Kerala, AP, Bihar, Gujarat, Haryana, HP, MP, Rajasthan, UP and WB even the all-India level had shown a negative growth from 53.90 in 1998-99 to 58.20 in 2005-06.

Coming to the Rural CED, in the year 2005-06, states like Jharkhand, Bihar, Chhattisgarh, MP, WB, MH, Orissa and Gujarat have registered respective dismal growth performance while only the states like Kerala, Punjab, HP, J&K have performed a reasonable and comparatively lesser rates of CED among rural women. At the same time the states like Assam, Bihar, Haryana and MP had even failed to keep their earlier rates and registered a negative performance between 1998-99 and 2005-06. Taking anaemia among rural woman into consideration, the states like AP, Chhattisgarh, Gujarat, Haryana, MP, Rajasthan, Tamil Nadu fall into the category of highly prone to food insecurity while the states of Assam, Bihar, Jharkhand, Orissa and West Bengal fall into the category of states with very high rates of food insecurity. Here the states like Kerala, HP, and Punjab fall into the category of less prone to food insecurity. At the same time, considering CED among rural woman as the vital aspect of food security, the highly food insecure states are Bihar, Chhattisgarh, Jharkhand, Maharashtra, MP, Orissa and WB while the states like AP, Assam, Gujarat, Karnataka, Rajasthan and UP follow them in terms of higher prevalence of food insecurity.

III.8 Per cent of Rural Children with Anaemia (6-35 months)

States	1998-99	2005-06
AP	73.30	82.70
Assam	63.80	77.40
Bihar	81.30	89.00
Chhattisgarh	-	82.10
Gujarat	78.50	83.60
Haryana	83.00	83.30
HP	70.30	59.80
J&K	71.70	67.30
Jharkhand	-	80.50
Karnataka	72.70	84.30
Kerala	43.20	57.90
MP	75.40	84.90
Maharashtra	78.00	76.80
Orissa	72.70	75.80
Punjab	80.90	80.00
Rajastan	82.60	80.10
Tamil Nadu	70.50	71.00
UP	73.90	85.70
WB	81.50	71.90
All-India	**75.30**	**81.20**

Source: NFHS 2 and 3. From : Report on the State of Food Insecurity in Rural India by MSSRF and WFP 2008.

The table here clearly shows that the levels of child malnutrition, in terms of anaemia, among rural children (aging 6-35 months) is very high among the states of Bihar, UP, MP, Karnataka, Gujarat, Haryana, AP, Chhattisgarh. Most of the states fall above the national average level of 81.21 per cent. Only the states like Kerala, HP and JK have been doing well marginally on this front. Here the most worrying fact is that the states like AP, Assam, Bihar, Gujarat, Haryana, Karnataka, Kerala, MP, Orissa and UP had even registered a higher rates of anaemia when compared to the previous years. Even the national average has increased from 75.30 in 1998-99 to 81.20 per cent in 2005-06. Taking rural child anaemia into consideration as the determinant of food security, in the year 2005-06, the states of AP, Chhattisgarh, Bihar, Gujarat, Haryana, Jharkhand, Karnataka, MP, Punjab, Rajasthan and UP are on the side of higher prevalence of food insecurity and the states of Assam, Maharashtra, Orissa, Tamil Nadu and WB are in the

following position of lowest food security. Only the state of Kerala and HP are having the decent levels of food insecurity levels.

III.9 Percentage of Rural Children Underweight (age 6 – 35 months)

States	1998-99	2005-06
AP	40.7	40.4
Assam	36.6	41.1
Bihar	55.1	59.3
Chhattisgarh	-	54.2
Gujarat	49.3	50.0
Haryana	35.6	41.8
HP	44.8	36.4
Jammu&Kashmir	37.2	31.6
Jharkhand	-	63.1
Karnataka	46.4	45.1
Kerala	28.0	31.9
Madhya Pradesh	58.4	62.6
Maharashtra	53.2	43.5
Orissa	55.5	45.7
Punjab	31.8	29.9
Rajasthan	51.9	45.9
Tamil Nadu	38.3	34.8
Uttar Pradesh	53.6	45.2
West Bengal	52.6	46.7
All-India	**49.6**	**49.0**

Source: NFHS II and III, From: Report on the state of food insecurity in rural areas by MSSR WFP 2008.

The table clearly shows us the levels of under nutrition in majority of the states. Here, quite disappointingly, the states have deteriorated from their earlier trends in terms of reducing the under nutrition among the children, these states include Assam, Bihar, Gujarat, Haryana, Kerala and MP. At the same time if we can observe the prevailing trends of underweight among various states in the year 2005-06, states like Jharkhand, MP, Bihar, Chhattisgarh, Gujarat, WB, Rajasthan and Orissa have been lying at the last eight places. Only the states like Punjab, J&K, Kerala, Tamil Nadu and HP are reasonably maintaining lesser levels of children underweight percentage. As we have determined the levels of food security with the help of seven parameters

in the above section, here also we can do that with the inclusion of this element of child underweight in place of children stunted. It provides us the inferences as; Jharkhand remains as the severely suffering state with food insecurity and next come the states like Assam, UP, Rajasthan, AP, Tamil Nadu, Karnataka, WB and Maharashtra. While only few states like Kerala, Punjab, J&K and HP remain as the less affected by food insecurity.

3.1.4 Estimation of Food Insecurity across States

Taking all the food insecurity parameters, in rural areas, like percentage woman with any anemia, percentage woman with CED, percentage of children with an anaemia, percent of stunted children under 3 years, per cent of population consuming less than 1890 Kcal, per cent of households without access to safe drinking water and percent of households without toilets within premises (MSSRF WFP 2008)[44], the food security situation of major states has been estimated. Except for the drinking water and toilet facilities data, all other parameters' data is related to the 2005 -06 periods, but for those two elements 2001 data is taken.

INDEX= (Actual Value-minimum Value) ÷ (Maximum value – minimum value).

III.10 Index Value of Food Insecurity

Index Value of							
States	**% - anaemia woman**	**% - CED Women**	**% Children Anaemia**	**% Stunted Children**	**% Consumption <1890Kcal**	**% HHs* without Drinking**	**% HHs without Toilets**

[44] 'Report on the State of Food Insecurity in Rural india', by M.S.Swaminathan Research Foundation and World Food Programme (FAO - UNO), 2008.

						water	
	2005-06	**2005-06**	**2005-06**	**2005-06**	**2004-05**	**2001**	**2001**
AP	0.758	0.693	0.797	0.604	0.481	0.830	0.250
Assam	0.898	0.752	0.627	0.537	0.310	0.286	0.501
Bihar	0.867	0.943	1.000	0.843	0.362	0.885	0.135
CHH	0.654	0.937	0.778	1.000		1.000	0.384
GJ	0.649	0.824	0.826	0.914	0.700	0.784	0.250
HR	0.593	0.543	0.817	0.664	0.257	0.692	0.198
HP	0.213	0.343	0.061	0.209	0.019	0.704	0.118
J&K	0.513	0.352	0.302	0.269	0.000	0.519	0.525
JH	1.000	1.000	0.727	0.862		0.982	0.768
KA	0.487	0.713	0.849	0.828	0.862	0.840	0.205
Kerala	0.000	0.000	0.000	0.000	0.719	0.000	1.000
MP	0.692	0.893	0.868	0.765	0.648	0.951	0.443
MH	0.453	0.857	0.608	0.716	0.824	0.829	0.356
Orissa	0.765	0.878	0.576	0.672	0.619	0.967	0.425
Punjab	0.121	0.006	0.711	0.284	0.190	0.531	0.000
RJ	0.545	0.663	0.714	0.571	0.133	0.876	0.456
TN	0.521	0.469	0.421	0.123	1.000	0.879	0.145
UP	0.446	0.684	0.894	0.981	0.267	0.815	0.143
WB	0.804	0.913	0.450	0.534	0.452	0.714	0.124

Source: Report on the State of Food Insecurity in Rural india by MSSRF and WFP 2008. *Households. State Codes are AP=Andhra Pradesh, CHH=Chhattisgarh, GJ=Gujarat, HR=Haryana, HP=Himachal Pradesh, J&K=Jammu and Kashmir, JH=Jharkhand, KA=Karnataka, MP=Madhya Pradesh, MH=Maharashtra, RJ=Rajstan, TN=Tamil Nadu, UP=Uttar Pradesh, WB=West Bengal.

Based on the indexes given in the above table, the following table has been computed with respect to each state in terms of the degree of prevalence of food insecurity. Based on the above mentioned seven parameters, a single and direct index has been prepared.

III.11 Final Composite Index of Food Insecurity with seven indicators (for the period 2004-06 (Rural)):

States	**Index Value**	**Rank**
Andhra Pradesh	0.630	09

Assam	0.559	13
Bihar	0.719	04
Chhattisgarh	0.792	**02**
Gujarat	0.707	05
Haryana	0.538	14
Himachal Pradesh	0.238	**19**
Jammu&Kashmir	0.354	16
Jharkhand	0.890	**01**
Karnataka	0.683	07
Kerala	0.246	**18**
MP	0.751	**03**
Maharashtra	0.663	08
Orissa	0.700	06
Punjab	0.263	**17**
Rajasthan	0.565	12
Tamil Nadu	0.508	15
Uttar Pradesh	0.604	10
West Bengal	0.570	11

Source: Data from 61st round of the NSSO (2004-05), nfhs-3 and Census 2001 have been used in calculating the index values. In the text of the report, we designate this value as pertaining to the period 2004-06, since only the data on access to safe drinking water and access to toilets to 2001, and other data pertain to 2004-06.

Unlike our earlier states wise analysis, the above table shows us a slightly different picture. It shows that us a clear picture of food security in rural India, in this regard, here the states like Chhattisgarh and Jharkhand have been worst hit and are reeling under severe and acute food insecurity when we consider the above seven parameters as the determinants of food security. Along with these states, there are also states like AP, Bihar, Gujarat, Karnataka, MP, Maharashtra and Orissa are also subject to heavy food insecurity. On the other side, the states that are performing decently are Punjab, HP and Kerala and closely followed by Jammu and Kashmir. And the states of Assam, Haryana, Rajasthan, Tamil Nadu, UP and WB are showing moderate levels of food insecurity. But here the quite interesting finding is that the states like Gujarat and Karnataka which are showing higher levels of industrial development off late, unfortunately falling into the category of severe food insecurity. It shows the negligence of rural people and other basic amenities for the poor especially in rural areas.

Here, we can also infer that, during the liberal reforms era, a high growth in GDP has not witnessed a simultaneous improvement in the level of food insecurity. The reasons behind these trends can be attributed to the various factors like crisis in the rural and agrarian economy, cuts in the rural development expenditure, fall in the produce prices, reduction in public investment and cheap and institutional credit...etc.

3.1.5 Prices and Trade Affects

More exports by India can cause world trade prices to rise. When this effect is combined with that of the speculative forces, the result can be extremely adverse. In any case, the extreme volatility of global prices noted earlier makes it difficult and undesirable to base a national food security policy on even partial import dependence. Cracking down on hoarders is not enough. There must be a ban on futures markets in all essential commodities. This is especially important in the context of the recent price volatility in world food markets, which generated a global food crisis in 2007-08, and which threatens the world once again.

The claim that food grain prices have soared because of more demand from China and India as their GDP increases, is completely invalid[45], since both aggregate and per capita consumption of grain have actually fallen in both countries. Supply factors have been and are likely to continue to be more significant.

The intensity of the food crisis that hit many developing countries from 2008 was particularly on account of the very sharp global volatility in food prices. Food prices internationally had shown only a modest increase until early 2007. But thereafter they increased sharply, with an increase of around 40 per cent in world food prices over 2007. This trend accelerated in the first few months of 2008, but from mid 2008 prices fell sharply and only started to rise again from early 2009.

The present price policy, which has restored the adverse terms of trade for agriculture to a more equitable level, cannot be faulted. Another important pre-requisite at the policy level is ensuring a reasonable level of stability in the flow of food supply and also prices. Agricultural production being seasonal, some fluctuation in food availability and consequently in prices is inevitable and in fact, is even desirable. However, as food is demanded everyday and also accessed at frequent

[45]Ghosh, Jayati (2010): "The Political Economy of Hunger in 21st Century". From EPW October 30, 2010, Vol XLV NO 44.

intervals, if not daily, by the poorer sections of consumers, excessive fluctuation in prices takes its toll on food consumption. More so as the employment opportunities for a large section of the people are also seasonal. In the situation of comfortable supply at the overall level, a properly functioning market can even out sharp fluctuations quickly and efficiently.

3.1.6 Global Food Crisis

According to UNO and World Bank Poverty estimates, globally 2.8 billion people live on less than US 2$ a day, which is well over 2/5ths of the World's population and 1.2 billion people live in extreme poverty defined as less than US 1 $ a day[46]. On the Global front, Average prices of rice, wheat and maize have increased by 91 per cent, 44 per cent and 32 per cent respectively between 2007 and 2008. In the same way the price indices of cereals increased by 148 in April 2007 to 284 in April 2008, registering a twofold rise, similarly the price index of dairy products went up from 213 to 266 during the same period. The sugar price index also increased but relatively at a slower rate.

3.1.7 Global Changes in Grain Usage

Looking at the Global Scenario, 12 per cent of Americans (roughly 35 million) are considered to be food insecure, 4 per cent 'with hunger' (over 2 million), while 65 per cent are considered "overweight and obese" and 30 per cent obese, according to a surgeon, obesity would soon be responsible for killing as many Americans each year as smoking.

The 20 per cent of the world's population living in world's richest countries consume about 40 per cent of all meat or 80 kgs per person and it is projected to grow to 90 kgs per person. And for the developing world as a whole, over the last 3 decades of 20th century, the per capita consumption of meat increased by 150 per cent, from 10 kgs to 26 kgs, while the per capita consumption of milk and dairy products rose 60 per cent, from 28 kgs to 45 kgs and the per capita consumption of meat of the developing world is expected to reach 36 kgs by 2020 including Sub Saharan Africa (SSA) and China[47].

In this process, the global factor farming of livestock has increased immensely. The major components of this are cereals, meat, soybeans and dairy products, which collectively comprised

[46]Weis; Tony (2007): "The Global Food Economy : Contradictions and Crises", from ' The Global Food Economy – The battle for the future of farming' -2007. Zed Books – Fern wood Publishers.
[47] Ibid

45 per cent of the value of global agricultural trade in 2005. India and China account for 1 and 5 per cent of global agriculture imports and exports respectively. More than 60 per cent of traded maize is used for animal feed. As USA is the chief exporter of maize, accounting for about 2/3rds of the world's total. Maize exporting for feed stock goes hand in hand with soaring soya bean exports, which are almost entirely used for feed. The negative side of this highly mechanized temperate grain livestock production at the heart of global agri-trade is the fact that the overwhelming majority of the world's farming population living in Asia and Africa ($3/4^{th}$ and $1/5^{th}$, food import dependence is expected to continue growing in most of the Lower Developing Countries (LDC's).

3.1.8 Search for Alternative Fuel Resources

Bio Fuel factor: the impact of both oil prices and government policies in the United States (USA), Europe, Brazil and elsewhere that have promoted bio fuels as an alternative to petroleum. In 2007 the USA diverted more than 30 per cent of its maize production, Brazil used half of its sugar cane production and the European Union (EU) used the greater part of its vegetable oil seeds production as well as imported vegetable oils to make bio fuel. In addition to divert corn output into non food use, this has also reduced acreage for other crops and has naturally reduced the land available for producing food.

3.2.9 Climate change

It has caused poor harvests in different ways ranging from droughts in Canada and Australia to excessive rain in parts of the USA. Gradual melting of glaciers in Asia will cause massive damage to China and India, where perennial rivers such as Yellow, Yangtze and Ganges are flowing from such glaciers. It will reject the all the necessary irrigation water for both wheat and rice cultivation during dry periods. This is of global significance since China and India together produce more than half of the World's wheat and Rice. Once again, official policy has been tardy in considering such problems, much lesser in addressing them.

This means that the number of hungry people actually increased in the world as a whole, and particularly for certain developing regions. The surprise is that the growing prevalence of hunger and food insecurity was associated with relatively high GDP growth in several regions, such as India and countries in Latin America. The contrast with east and south East Asia is a stark one,

and points to the role of public policy in ensuring that aggregate income growth translates into better provision of basic needs such as food for the general population.

3.2.0 Right to Food (RTF)

We can also refer to international declarations and conventions on this matter, starting with the Universal Declaration of Human Rights. It is also possible to argue for the right to food as a moral and social right, independently of all these documents. One may argue that a child has a right to protection from physical punishment at school, whether or not physical punishment is legally permissible.

Hunger and under nutrition are intrinsic deprivations and severely diminish the quality of life. Under nutrition is associated with reduced learning abilities, greater exposure to disease, and other impairments of individual and social opportunities. *Only 55 per cent of adult women in India consume milk or curd at least once a week, only 33 per cent eat fruits at least once a week, and 28 per cent get an egg.* Another disturbing aspect of the nutrition situation in India is that it shows little sign of major improvement over time.

The right to food is, in some ways, a more complex right than the right to education or the right to information. In the case of right to food, matters are more complicated. Broadly speaking, the right to food can be interpreted as a claim of individuals on society. It is an entitlement to be free from hunger, which derives from the assertion that the society has enough resources, both economic and institutional, to ensure that everyone is adequately nourished. The term 'freedom from hunger', leads itself to several interpretations: getting two square meals a day, meeting specific calorie norms, avoiding nutrition-related ailments, and so on. Ideally the right to food should be seen as a right to 'nutrition', as per Article 47 of the Constitution. Not only just the adequate food intake but also clean water, basic healthcare, good hygiene, and so on. It is hard to translate the right to food into a specific list of entitlements.

The responsibility of protecting the right to food is a shared responsibility, involving not only the state, but also other institutions or individuals. Supposed that a girl is undernourished because she does not get a fair share of food within the family, clearly her right to food would be violated. These kinds of complications make the right to food abit complicated. The right to food is not always 'justifiable', in the sense of being enforceable in a court of law. If a girl is

undernourished because of discrimination within the family, we can't take her parents to court. But at the same time we can find other means of legal interventions. Even if the right to food is always not justifiable, some aspects of the right to food are amenable to legal enforcement. For eg: A Public Interest Litigation (PIL) by a civil liberties movement in Rajasthan in 2001, finally at last resulted in directing all the state governments to introduce cooked mid-day meals in primary schools.

One thing is for sure, there are some serious difficulties in making the right to food fully justifiable. Much of it ultimately belongs to the domain of democratic politics rather than the legal enforcement. Leaving it to the courts to settle this issue as and when it arises would be both risky and inappropriate. The need would therefore remain for additional legislation, framed through democratic processes, clarifying how the right to food is to be realised. And the Supreme Court itself has already clarified on various occasions that the "Right to Life implies the Right to Food". The reasons for the right to food to have a cutting edge is, Ambedkar in his defence of the directive principles, essentially, argued that in a democracy, legal action is not the only means of holding the state accountable to its responsibilities. *In cases where rights can't be enforced through the courts, they can be asserted through other democratic means, based for instance on parliamentary interventions, the electoral process, the media, international solidarity, street action, or even civil disobedience.*

These possibilities arise mainly from the growing participation of underprivileged groups in democratic politics, and the fact that food security is one of their main concerns. In this defence of the directive principles, Ambedkar focused on the electoral process as the principal means of holding the state accountable outside the courts. One reason why the PDS is not in very good shape today is endemic corruption. Now, recent analyses indicate that the extent of corruption in the PDS is much higher in North India than in South. Because, about half of the grain meant for the distribution, seems to end up in the black market, rising to 80 per cent in Bihar and Jharkhand. But these leakages are abit less in south India. If India's PDS is to be revitalised, close attention needs to be paid to the circumstances that shape people's perceptions of their rights as well as their ability to enforce them. Thus the concept of Right to Food can only be effectively brought into practice with only comprehensive co existence and cooperation of all the institutions in the economy as well as society.

3.2.1 Scope and Relevance of Right to Food (RTF)

The Right to Food can be seen from the perspective of the Indian Constitution, especially, the Directive Principles of state policy, which are chiefly due to B.R.Ambedkar, and they build on his visionary conception of democracy. In his vision a political democracy devoid of social and economic democracy is of no use. RTF is a right that comes by birth to all and it should be a part of the right to life as mentioned in Article 21 of the Indian Constitution, also in the Universal Declaration of Human Rights of 1948. As long as it is not enforced socially and legally the menace of Hunger is bound to continue. FAO in 1974 declared that "no child, woman or man should go to bed hungry and no human being's physical or mental potential should be stunted by malnutrition". India ranks at 126 out of total 177 countries in the UNDP hunger Index (2010). There is an instructive contrast here with the corresponding situation in the field of health care. Unlike elementary education, health care is yet to be widely accepted as a basic right of all Indian citizens. Because without right to health and without right to work, we can't imagine the practical implementation of Right to Food.

The denial of the right to food for a large section of the Indian population reflected in increased malnourishment, stunted growth, ill health and loss of energy. The UNO's UNICEF, report says that, one out of every two children in India is malnourished. In countries such as India where the majority of the people are in the unorganised sector with fluctuating incomes, targeting could become an instrument to exclude sections of the poor from the right to food. In the year 2007, according to Planning Commission, *57 per cent of the poor had been actually excluded from the BPL system under PDS.*

3.2.2 Conclusions

It's very essential to persuading farmers to increasingly shift to land-saving enterprises (live stock and fisheries) and high value crops (horticulture). Efficient system of entire chain of marketing activities from farm stage to consumers. Adequate investment in rural roads and marketing infrastructure. Continuously pursuing the policy of self sufficiency in staple cereals, which is a necessary condition for household and individual food-security.

The period of higher growth and onset of a reasonable reduction in poverty did not seem to improve women's nutrition significantly. Instead, we find an increase in malnutrition, especially anaemia. Poor women from almost all social groups find themselves at the receiving end of increasing malnutrition. Since higher incidence of malnutrition among poor women indicates the role of poverty. The trends emerging from analysis raise yet another set of questions. Why has women's malnutrition increased during the period of higher growth with a reasonable reduction in poverty? The increase in malnutrition among women in India, whether it is due to the failure of the market or the state or due to gender inequality or because of changing food habits, does not augur well for various reasons. Malnutrition amounts to deprivation in one of the most elementary and central aspects of well-being.

Procurement of major Food Grains at the minimum support price, coupled with an active buffer stock policy, also helps in assuaging large-scale deficits or surpluses in the availability of food grains. The situation can be further buttressed by a complementary trade policy. For the bulk of the rural poor, who are threatened with food insecurity, entitlement is synonymous with their current income, mainly the wage income or the income from their tiny land holdings. The model of development practiced in our country as well as in many other countries has led to "jobless growth". This is also true of agricultural growth, where, with the current production pattern, employment elasticity is coming virtually to zero. The compound annual rate of growth in employment in agriculture during the period 1983-84 to 1993-94 was 1.39 per cent; it came down to 0.05 per cent during 1993-94 to 1999-2000. In this context, the Employment Guarantee Scheme, if properly implemented, can prove a boon to the rural poor. Also, proper use and development of land and water resources and necessary institutional backing can lead to diversification to more labour intensive crops.

Chapter IV
Growth of Agriculture and Concerns of Food Security

"India cannot prosper without the prosperity of Agriculture". In this chapter basically we try to examine the growth of agriculture during the period between 1981-82 and 2009-10, before and after liberal economic reforms, and also try study the prospective and challenges involved in today's political and physical environment with regard to the food security.

4.1 Nature and Scope of Agriculture

India is home for diversified sections of population comprising of heterogeneous cultures, food habits, climatic conditions, natural resources and languages. Despite all these complications, our economy could able to make some inroads into the economic growth over the past 60 years. But the structural problems like poverty, unemployment, illiteracy, malnutrition, income inequalities, alarming health indicators and heavy dependence on agriculture and allied activities for the livelihood still very much prevalent at a large scale challenging our policy makers and academicians. Though our economy has been growing at around 7 to 8 per cent for the past six or seven years but still there is 52 per cent of the population who are dependent on agriculture and allied activities for their livelihoods. At the same time our agriculture still follows primitive methods and characterised by low productivity and remains a gambling in the monsoon. Most of the people engaged in agriculture are exposed to various apprehensions like poverty, ill health, lack of basic amenities, illiteracy, very low disposable income, ad hoc shelter arrangements and insufficient accessibility to food grains.

Rice *(65per cent) and wheat (35 per cent)* comprise majority of the Indian diet pattern[48]. The unfortunate and sad part of it is that, most of the Indian agriculture still remains the "Gambling in the Monsoon" (only 40 per cent of cultivated land is irrigated). After facing severe food insufficiencies soon after the independence due to problems like lower production, famines and occurrence of wars, which continued till mid 1960's. India could able to wake up from this menace and come up with innovative measures like Green revolution, which brightened the situation in terms of self sufficiency in food grain production to some extent. In any developing country it is natural that agricultural sector contributes major share in its GDP during the initial stages. But as the process of economic development starts making impact, gradually the dependence on agriculture both for livelihood as well as share in GDP would come down. But unfortunately the sad story in India is that though the share of Agriculture has come down in GDP, the amount of people who are dependent on agriculture has not come down significantly. Growth in Industry and Manufacturing sector has not been able to release the additional work force from agriculture. This kind of development cannot be termed as an inclusive mode of

[48]Barah B.C (Aug 2007) : "Criticality of Rice and Wheat System in Sustainable Food Security in India – An Analysis". Agricultural Situation in India -.

development. Before analysing the prospects and challenges involved in Indian agriculture as far as food security is concerned, it's imperative for us to examine the expansion, relevance and evolution of Indian agriculture over the years.

IV.1 Major Characteristics of Indian Agriculture (Unit=Million Hectares**)**

	1950/51	**1970/71**	**1990/91**	**2000/01**	**2007-08**
1.Geographical area	328.7	328.7	328.7	328.7	328.7
2.Reporting area	284.3	303.8	304.9	306.2	305.6
3.Net Sown Area	118.8 41.8*	140.3 46.2	143.0 46.9	141.1 46.1	140.86 46.10
4. No of Holdings	----	70.49	106.6	120.8	1.20
5.Farm Size: (Ha)	----	2.30	1.55	1.32	0.14
6.NetIrrigated Area	20.8 (17.5)*	31.1 (22.2)	48.02 (33.6)	55.08 (39.0)	62.29
7. Area Sown more than Once	13.1 (11.0)*	25.5 (18.2)	42.7 (29.9)	46.8 (33.2)	54.97

*per cent out of the figure. Source: Agricultural Statistics at A Glance, Various issues, MoA-GoI. Think India Quarterly, July-Sep 2010

It shows that, despite major increase in major and minor irrigation facilities, only about 40 per cent of the cultivated area is irrigated and the rest remains dependent on rainfall. And another feature is that, only one crop is cultivated on most of the area. More than one crop is raised only on a third of the cultivated area. And also the availability of cultivated land per worker remains low which has actually declined from 1.22 hectare during 1950-51 to 0.7 hectare in 1990-91 and to 0.60 hectare during 2000-01 and further to 0.14 hectare in 2007-08 it can be attributed to the increasing population pressure on agriculture. Consequently, the proportion of marginal holdings of the size below 1 hectare reached 63 per cent of the total holdings during 2000-01 while 82 per cent holdings were below 2 hectare.

IV.2 Changing Profile of Agriculture Production in India in Value Terms

Group/commodity	**1970-71**	**1980-81**	**1990-91**	**2000-01**	**2007-08**
Share in Total Agricultural Output %					

Crop Sector	85.14	82.65	76.93	73.30	73.10
Livestock Sector	14.86	17.35	23.07	26.70	26.90
Share in Crop Output %					
Cereals	43.90	37.86	34.92	31.94	29.94
Rice	24.08	19.39	18.86	16.81	14.54
Wheat	10.06	10.53	10.71	11.09	10.95
Pulses	5.30	6.34	6.69	4.41	4.71
Chickpea	2.12	2.64	2.44	1.60	1.72
Oil Seeds	9.88	8.70	13.27	7.02	10.58
Groundnut	4.92	3.29	4.77	2.17	3.46
Sugarcane	5.51	8.00	6.73	6.88	5.15
Cotton	3.68	3.28	3.35	2.47	4.88
Fruits & Vegetables	15.55	16.89	18.04	25.58	25.77

Source: National Account Statistics, CSO, GoI. Various issues. Think India Quarterly, July-Sep 2010

The table shows that the share of livestock has increased significantly from 14.86 to 26.90 per cent during the mentioned period of 1970-71 to 2007-08. In the same way Cereals continue to dominate crop output though their share has followed a sharp decline from close to 44 per cent during 1970-71 to 30 per cent during 2007-08. And the share of fruits and vegetables in the total value of crops has increased from 15.55 per cent to 25.77 per cent in the same period. Production of pulses in India has recorded low growth over the years. Due to the supply constraints, prices of pulses have been rising at faster rate compared to those of other crops. It led to the increase in the share of pulses in the value of crop output during 1970-71 and 1990-91. The share of oil seeds showed an increase from 8.7 per cent in 1980-81 to 13.27 per cent in 1990-91 at this decade experienced almost doubling of the oilseeds production in the country. The share of fruits and vegetables has shown an improvement and gains were recorded during 1990-91 to 2000-01 with the contribution of fruits and vegetables to crop output witnessing an increase from 18.04 per cent to 25.58 per cent. The productivity and production of rice and wheat have shown constant increases even though the area under respective crops is nearly stable since the last 3-4 decades. It also shows that, though the share of Rice has come down in total crop output, from 24.08 to 14.54 per cent, the share of wheat has almost remained stable during this period, as it remained between 10.95 and 10.06. It shows that the cropping pattern has been negative for Rice (source diet for 65 per cent population) while it remained stagnant for Wheat, only showing the

depleting condition of our food grain self sufficiency in the light of increasing challenges out of physical and political environment[49].

4.2 Evolution of Indian agriculture

Soon after attaining independence we were up against many upheavals like partition of the country, prevalence of droughts, wars and the lower production in agriculture. During this period we were not self sufficient in food grain production and we had to import food grains (eg: Public Law 480). Even our five year plans have also given greater importance to the development of agriculture, but the self sufficiency in food grain production could not be achieved due to various structural problems in the agriculture. This situation of food insufficiency had continued till mid 1960's. Then policy makers have decided to launch a series of reforms, in the light of deteriorating situation, which ultimately resulted in the bringing of "Green Revolution" in the mid 1960's, with the introduction of HYV seeds of Rice and Wheat in north-western parts of the country, later on it has percolated down to the other parts of the country. Thus, the growth in rice and wheat production took place due to the sustained and significant growth in productivity. Though it had not shown instant results in agriculture, gradually it had started leading agriculture towards somewhat closer to the self sufficiency in food grains. The successful evolution of this Green Revolution period offered the country both agricultural growth and food security over a period of more than two decades at an aggregate level.

IV.3 Share of Agriculture in GDP and Employment

Year	**Share of Agriculture in GDP**	**Share in Employment**
1980-81	35.7	60.5
1990-91	29.2	59.0
2000-01	23.3	58.4
2008-09	15.7	52.01

Source: Agricultural Statistics at A Glance 2009, Directorate of Economics and Statistics, Think India Quarterly, July-Sep 2010.

[49] Singh; Karan (2010): "Sustainable Development in the 21st Century", from 'Think India Quarterly Vol 13, No 3, Sep 2010.

Agriculture's contribution to total GDP during 1950-51 was more than 55 per cent. During 1980-81 and 2000-01 the share of agriculture in National Income has come down from 3.7 per cent to 23.3 per cent. And the work force engaged in agriculture witnessed a very small decline, from 60.5 per cent to 58.4 per cent in the same period. This is in contrast to the experience of the developed countries where the share of agriculture in employment declined much more sharply with the decline in agriculture's share in GDP. During the last decade, some adverse trends have emerged in Indian agriculture.

The per capita income for the population dependent on agriculture has not been growing. Disparities between per worker income in agriculture and non agriculture are widening. Inter-regional variations in agriculture productivity are high and have been rising. Moreover, the natural resource base of agriculture is shrinking and there are signs of degradation of land and over exploitation of water in the country. Food security of the country, achieved through hard labour of the last four decades, is also seems to be under threat.

The state-wise Agri-GDP shows that UP, Maharashtra, A.P. and W.B contribute one-third of Agri-GDP to total Agri-GDP of country in 2001-02. The agricultural intensity is better measured by percentage share of Agri-GDP in total GDP of the State and not by the absolute amount. Punjab is more agri-intensive (38.7 per cent), followed by UP and Haryana in the North and A.P., Karnataka, M.P. and W.B. in the South, Central and East respectively. These agri intensive states contribute 68 per cent to total all- India Agri-GDP. India's agri sector performance depends on the production in these agri-intensive states.

IV.4 Growth Rate in GDP Agriculture and non –Agricultural Sectors in different periods, at 1993-94 prices: percent/year

	Period	Total Economy	Non Agriculture	Agriculture
1	Pre green Revolution 1950/51 to 1964/65	3.95	5.59	2.66
2	Green Revolution Period 1965-66 to 1979/80	3.62	4.40	2.76
3	Wider Technology Dissemination Period 1980/81	5.37	6.56	3.33

	to 1994/95			
4	Post Reforms 1995/96 to 2007/08	6.61	7.80	2.64

Source: India's Agricultural Challenges and their implications for Growth and Equity. By Ramesh chand: from "Silver Jubilee Seminar (1980-2005) on – perspectives on Equitable Development: International Experience and what can India Learn? (2005)

Growth rates in the table clearly indicate that the total economy has been reasonably growing positively even during the liberalisation period. Even the non agriculture sector, except during the green revolution period, has been growing at a positive rate as it has increased from 5.59 per cent during pre green revolution period to 7.80 per cent during the post reform period, that is mainly due to the growth in industrial sector especially manufacturing and service sector. But when it comes to agriculture sector, though the growth rate has been positive until the launching of neo economic reforms, it has been very much minimal and negligible considering the extent of dependence on agriculture. But unfortunately during post reform period, especially since the middle of the 1990's, the performance and growth rate of agriculture sector has been dismal. The growth rate has come down to mere 2.64 per cent comparing with the earlier rate of 3.33 per cent[50]. This has been far below targeted growth rate of 4 per cent in agriculture, which is very much required to achieve the task of food security. *The grave situation of the country side has been highlighted by the recent farmer suicides. As the debts mount and the monsoon fails, many farmers seem to be resorting to suicide as a solution*.

Green revolution had resulted in further acceleration in growth of agricultural output, which improved considerably around late 1960's. In 1979-80 India faced very severe drought which caused a dip in agricultural output. Since 1980-81 improved technology spread to several other regions and agricultural economy diversified. After that, agricultural output followed accelerated growth trend till 1995-96 after which agricultural output again moved on a lower growth trajectory.

4.3 Food Grain Self sufficiency in India

Unlike most of the countries elsewhere, India is known for diversified cultures, varied geographic regions, languages, life styles, religions and dietary patterns. In the same way our economy is also up against various chronicle and structural problems like rampant poverty, unemployment, heavy population, illiteracy, hunger and predominantly dependant on agriculture

[50]Kumar;Praduman (2005): "Empowering the Small Farmers towards a Food Secure India". From 'Indian Agricultural Challenges – Reflections on Policy, Technology and other Issues'. Centre for Trade and Development (CENTAD), edited by Ramesh Chand – 2005.

and allied activities for livelihoods and low productivity is the hallmark in agriculture. When India attained its independence, there were many macroeconomic hurdles. One of the primary hurdles was shortages in food grains which were further exposed after the partition of the country when there was a large influx of population as a migration from neighbouring countries. This has resulted in large scale shortages in food grains and even at one point of time country resorted to food imports from USA. Since then various policies have been adopted to achieve self sufficiency in food grains. For eg: Green Revolution. Though the shortages situation continued till late 1970's, sooner we could able to achieve some sort of self sufficiency soon after[51].

IV.5 Food Grains Area, Yield and Irrigation Coverage and Compound Annual Growth Rates

Year	**Area(Mn.Hect)** (GrowthRate %)	**Yield Kg/Hect** (GrowthRate %)	**%CoverageUnder Irrigation(**Growthrate%**)**
1950-51	97.32	522	18.1
1960-61	115.58 (1.73)	710 (3.12)	19.1 (0.54)
1970-71	124.32 (0.73)	872 (2.08)	24.1 (2.35)
1980-81	126.67 (0.19)	1023 (1.61)	29.7 (2.11)
1990-91	127.84 (0.09)	1380 (3.04)	35.1 (1.68)
2000-01	121.05 (0.54)	1626 (1.65)	43.4 (2.15)
2008-09	123.22 (0.22)	1898 (1.95)	45.5 (0.47)

Source: Ministry of Agriculture –Government of India.

The table presents us how the production of food grains has evolved with respect to area under cultivation, yield per hectare and percentage of land under irrigation. We can clearly observe that the area growth rate has not been that much progressive in comparison to yield growth rate. Over the 50 year period, the growth rate of area under food grains has been continuously declining from 1.73 per cent in 1950/51 - 1960/61 to 0.22 per cent in 2000/01 – 2008-09. Even the yield per hectare had shown a positive growth rates till 1990's, ever since it came down from 3.04 per cent to 1.95 per cent in the year 2000/01 – 2008/09, this has played a major role to whatever food grain production increase in the last 3 decades.

[51]Hanumantha Rao CH (2005): "Declining per capita Demand for Food Grains in Rural India- Causes and Implications", From 'Agriculture, Food Security, Poverty and Environment', Essays on Post Reform in India 2005.

Coming to the cultivable land under irrigation, it was only 18.1 per cent in 1950-51 and it only reached 45.5 percent in the year 2008-09, particularly between the period 2000/01-2008/09 we have not succeeded in bringing more land under irrigation, it clearly shows that *still 54.5 per cent of cultivable land does not have assured water facility*, it only depends upon timely monsoons and therefore remains as the extremely climate sensitive segment[52]. *On the global front, we posses more cultivable land than China, but our yield is much lower than China, for eg: Per hectare yield of Rice in China is 8 tonnes where as in India it is just 3 tonnes,* which is due to low technology, low government investment and climatic conditions...etc. 56 per cent of our food grains come from the irrigated land and the remaining 44 per cent of food grains have to come from the unirrigated land. Therefore when the environment turns uneven, this 44 per cent of food grains production is at stake.

4.4 Area and Productivity

In the pre green revolution period, net area under cultivation increased from 118 million hectare to 138 million hectare. Despite large expansion in area, agriculture GDP experienced 2.66 per cent average annual growth rate. Adoption of high yielding varieties during late 1960's led to substantial increases in productivity of two principal crops grown in India, i.e., Wheat and Paddy, which rose output growth to 2.76 percent during 15 years following onset of the green revolution. Initially, adoption of green revolution technology remained concentrated in North West plains and some areas in southern India, both of which had assured water supply for irrigation[53].

During the first fifteen years following the adoption of green revolution technology the output of Paddy and Wheat has registered a growth rate of 2.76 percent. The period of 1980's also experienced acceleration in the growth of agri output but after the 1990's the situation was altered and it caused a severe impact on the income of those who dependent on agriculture.

IV.6 Compound Growth Rates of Area Production and Yield (As per cent per annum with base T.E 1981-82=100)

Crops	1949-50 to 1964-65			1967-68 to 2008-09		
	Area	P#	Yield	Area	P#	Yield
Rice	1.21	3.50	2.25	0.50	2.46	1.99

[52] Datta T.N, (2009): "Report on Urbanisation and Farm production", from Indian Journal of Agricultural Economics, Vol.64, no.3, July-Sept. 2009.

[53] Acharya; Shabd S (2009): "Food Security and Indian Agriculture: Policies, Production Performance and marketing environment", from Agricultural Economics Review, Vol.22 Jan –June 2009 pp 1-19.

Wheat	2.69	3.98	1.27	1.20	3.69	2.46
C*cereals	0.90	2.25	1.23	-1.41	0.67	1.99
Pulses	1.72	1.41	-0.18	0.01	0.75	0.72

*Coarse Cereals. #Production. Source: Economic Survey of India 2009-10. Department of Agriculture and coperation. Note:Growth rates are based on 4th advance estimates for 2008-09.

Any increase in the food grain production can mostly be achieved through increase in the yield and production since the scope for the cultivatable area expansion is limited and expensive. However, the index of area under rice shows negative growth during the above period, which came down from 1.21 per cent during first period to 0.50 per cent during second period and the rice production growth rate also has come down from 3.50 to 2.46 per cent. The compound growth index of rice yield has shown a growth of 1.9 per cent per annum during 2001-08 compared to the 1990s leading to an increase in growth in production. In the same way the area under wheat cultivation has decreased from 2.69 to 1.20 per cent and the production also has shown a marginal decline. But unlike the rice yield, wheat yield has increased from 1.27 to 2.46 per cent. Though the yield of the coarse cereals has increased, but its area growth rate has been negative and the production growth rate has also come down.

The area under wheat that was around 25 million ha in 2002-03 increased to 26.4 million ha in 2005-06 and further to 28 million ha in 2008-09. The compound growth indices of area, production and yield during 1991-2000 and 2001-08 have shown perceptible decline. Growth index of area during 2001-08 improved compared to the 1990s. The growth index of yield increased significantly, leading to an increase in growth in production. In the same way, the pulses, despite the drastic come down in the growth rates of area and production, its yield per hectare has shown a positive trend. These trends in growth rates of major food grains clearly suggest that the post liberalisation period onwards the progress in food grain self sufficiency is not looking assuring from the future perspective especially in the light of food insecurity situation.

IV.7 India's Imports and Exports of Cereals: (Million Tons per year**)**

Period	Imports	Exports	Net Export
1980-81to 1984-85	1.58	0.54	-1.04
1985-86 to 1989-90	0.70	0.48	-0.22
1990-91 to 1994-95	0.39	0.92	0.53
1995-96 to 1999-00	1.10	3.72	2.62

2000-01 to 2004-05	0.01	6.44	6.43
2005-06 to 2007-08	2.66	3.72	2.06

Source:Acharya (2007),updated from GoI (2007-08) and GoI (2007)."Food Security and Indian Agriculture: Policies, Production Performance and Marketing Environment" by Shabd S.Acharya, from 'Agricultural Economic Research Review', Vol. 22 Jan-Jun 2009 pp 1-19.

In 1966, the net import of cereals (mainly wheat) was at 10.3 Million Tons (MT) represented 19 per cent of the net domestic production of cereals. India has emerged as the net exporter of cereals, mainly owing to the exports of Rice, both Basmati and non-Basmati. India's net exports of cereals were 0.53 MT/year during1990-95, 2.62 MT/year during 1995-00 and 6.43 MT/year during 2000-05. Out of the total cereal area under cultivation, irrigated area increased from 23.1 per cent in 1964-65 to 50.6 per cent by 2004-05. The share of more stable grains (wheat) increased while that of unstable grains (coarse cereals) decreased. Wheat, which had accounted for 15.2 per cent of total cereals in TE 1964-65, increased its share to 36.3 per cent in TE 2007-08. And the share of coarse cereals has come down from 34.1 per cent to 17.7 per cent in the same period. Another noteworthy feature of India's advancement in macro food security is that 96.5 per cent of the incremental output of cereals between TE 1964-65 and TE 2006-07 was due to improvements in the per hectare productivity; and area expansion, accounting for only 3.5 per cent. And also the area under cereals increased from 93.7 Million hectare (Mha) to 99.0 Mha and the average yield went up from 770 kg/hectare during TE 1964-65 to 1962 kg/ha during TE 2006-07. The improvement in yield resulted from advancements in technology, irrigation, and the diversion of low-yielding crops to high-value produce.

If we observe the trends, Farmers have shifted from the low-yielding coarse cereals to non-cereal food products since the middle of 1980's, a fact which has helped to increase production and availability of sugar, fruits, vegetables, spices, milk, eggs, meat and fish/fruit products. The decline in consumption has been sharper with respect to coarse cereals, and it has occurred even among the lowest 30 per cent of consumer class, reflecting a shift towards more nutritive foods like fruits, vegetables and live stock products. Long term data from National Sample Survey Organisation (NSSO) has also indicated a declining trend in the per capita consumption of cereals in both rural and urban areas, accompanied by a decrease in the proportion of expenditure on cereals and an increase in that on milk, meat, eggs, fruits and vegetables[54].

4.5 Small & Marginal Farmers

[54]Hanumantha Rao CH (2005): "Declining per capita Demand for Food Grains in Rural India- Causes and Implications", From 'Agriculture, Food Security, Poverty and Environment', Essays on Post Reform in India 2005.

In case of wheat, 76 per cent of total wheat growing farmers are marginal and small farmers cultivating 46.7 per cent of the area under wheat. For Paddy, 83 per cent of farmers are marginal and small farmers and cultivate 51.5 per cent of area under paddy. Due to small scale operation these farmers are vulnerable to any adverse climatic conditions or fall in prices. Due to small size of the farm, diminishing returns seem to have commenced. The smallness of the farm could not be substituted by more irrigation or fertiliser or new varieties beyond a certain limit.

It is observed that the percentage of marginal farmers went up from nearly 38 per cent in 1953-54 to 70 per cent in the year 2002-03. The share of marginal and small farmers in owned land went up from 16.3 per cent in 1953-54 to 43.5 per cent in 2002-03. By 2002-03, the marginal and small farmers accounted for nearly 80 per cent of operational holdings as compared to about 60 per cent of 1960-61. In 12 out of 27 states marginal and small farmers constitute the overwhelming majority of farmers, accounting for 90 per cent or above[55].

In 17 out of 27 states they also account for more than 50 per cent of the land possessed for cultivation. Within the group of marginal and small farmers, marginal farmers outnumber small farmers ranging from 2:1 in states with low incidence of marginal and small farmers to as high as 18:1 in Tripura, 12:1 in Uttarakhand and 10:1 in West Bengal and Kerala and close to 8:1 in Bihar. It is further important to note that the smallholders' contribution to the total value of crop output exceeds 50 per cent nationally although the share of land possessed is somewhat lower at 46 per cent.

Only ten states show the contribution of marginal and small farmers at less than 50 per cent output. It varies widely across the states, ranging from about 19 per cent in Punjab to 86 per cent in WB. It is less than half the total output in only a handful of states in the North-West (Punjab, Haryana, and Uttarakhand), Centre-west (Rajasthan, Gujarat, Maharashtra and MP) and South (AP and Karnataka). And the other notable thing is that the percentage of women engaged in cultivation in the year 2004-05 was 36.1 per cent[56].

4.6 Farmers of Different Social groups

Socially deprived groups like SCs and STs, their access to credit, information, publicly provided

[55]Kumar;Praduman (2005): "Empowering the Small Farmers towards a Food Secure India". From 'Indian Agricultural Challenges – Reflections on Policy, Technology and other Issues'. Centre for Trade and Development (CENTAD), edited by Ramesh Chand – 2005.
[56] Pitale R.L (2007): "India: Rich Agriculture: Poor Farmers – Income policy for farmers", Daya Publishers House- Delhi.

inputs and extension services is lower, indicating that they possibly suffer from discrimination in the delivery of these public services. A few studies have also shown that socially deprived groups also suffer from market based discrimination, which one hopes that state policy and programs would help to compensate. Together, these factors account for the lower levels of living of farmers belonging to these groups, pointing to the need for concerted and multi faceted action.

IV.8 Poverty Ratios among Farmers by Socio-Religious Groups and Land (Possessed) size Classes, Rural 2004-05

Land Size (ha)	Hindu STs	Hindu SCs	Hindu OBCs	Hindu Uppercastes	Muslims	Other Religions	All
<0.01	68.4	29.1	18.1	1.6	4.7	26.6	22.0
0.01–0.4	41.5	24.8	18.8	10.3	23.1	10.2	20.2
0.4-1.0	34.4	21.5	17.5	6.4	19.5	17.6	18.1
1.0-2.0	33.2	18.0	12.3	6.9	12.1	16.8	14.8
>2.0	29.7	14.5	6.8	6.1	7.1	6.4	9.8
all	33.3	20.8	13.0	6.9	16.4	12.6	15.2

Note: Poverty ratios are computed for workers in the unorganised sector, Cases unspecified land possessed have not been included in any class but in All. Source: NSSO 61st Round Survey on Employment-Unemployment. From: "The Challenge of Employment in India – An informal economic perspective" Report I, Report of the National Commission for enterprises in the unorganised sector, GoI-2009.

The above table clearly shows us the trends related to the severe rates of poverty among various land holding sizes related to the existing social groups in India. It is a clear indication that most of the small and marginal farmers, belonging to SC/STs are reeling under severe poverty conditions with very less amount of per head land holdings.

The size-wise classification of farmer households shows that farmers with land size up to 0.01 hectare get their income mainly from monthly wages (Rs.1075) and very little from cultivation which is just Rs.11. The income from cultivation increases for households with a land size of 1 to 2 hectares and above. This is very interesting to note that at the all India level, the income from all the four sources for estimated 89.4 million farmers households (88.2 per cent) with a farm size up to 2 hectares falls much short of the their total consumption expenditure. Hence most of the small and marginal farmers are indebted and remain in economic misery and thereby in food insecurity.

4.7 Decreasing Farmers' income and threat of Food Insecurity

The main problem in the agriculture sector is not so much lack of production and productivity but assured and sustained increase in farmers' income. The present marketing system is not farmer friendly, Government support and intervention to provide remunerative prices is dwindling and over all government investment in capital information in agriculture has not been sufficient to generate economic activities in rural sector as was done vigorously during green revolution in 1970's and early 1980's. These macro level factors can be energised in favour of the farmers but there are certain inherent constraints of the agriculture sector of the economy that will need a new look and policy to introduce changes to correct these constraints. Since 1990-91 with the liberalisation of economic policies, WTO membership from 1995 and agri-produce surpluses arising in the farm sector coupled with less than adequate intervention by the government, small farmers in particular found it difficult to compete in the market. The economic limitation of small operation has surfaced as a critical factor to get adequate and sustained increase in income. That calls for structural, organisational and institutional changes in managing the farm sector in India. What India needs now is the incomes policy for farmers. Agriculture policy oriented towards production and productivity alone is not going to provide sustained increase in income to farmers. Hence, new frame work for sustained increase in income is to be evolved.

Farmers gave food security to the country but in turn did not get income security for themselves. Therefore, in all future policies and programs, farmer's income is to be at the centre stage of development. The Indian farmers residing in 6.38 lakhs villages producing 18 per cent of GDP have to carry burden of 1210 million people under these economic conditions. The income level in the farm sector is then the function of volume of agri-GDP produced, size of the agriculture and total rural population and the return that he gets for his produce and the flow of resources, if any, from urban to rural areas. For India, whose 72 per cent of population resides in rural areas, India requires high volume of agri-GDP to sustain and increase the standard of living in rural areas because India cannot afford to depopulate its rural population. The answer lies in generating incomes by locating and shifting agro-based and other related economic activities at the farm gates of cluster of villages. The circular flow of income to rural areas through public-private partnership needs a big boost and price support to farmers has to be sustained so that their incomes do not fall. Unless this mechanism is placed on a sound footing farmers will be in misery and no amount of increase in productivity is going to provide any relief to farmers. The

chemical input based increase in production and productivity of the farmer in the green revolution is not a guarantee that farmers' income will increase. Specific strategies and policy and programs focussing on farmers' income are required to be implemented without any delay. In the 1970's the focus was shifted from "land economics" to "production economics" and self sufficiency in food grains was achieved in a short period of time. *Now the focus has to be "farmers' income" that is to be increased on a sustained basis in certain time frame*[57].

The physical dimension of India's rural sector is unique and highly complicated. The average population per village at the all India level as per 2001 population census is 1,181 people and 80 per cent farmers are marginal and small farmers. This situation is more or less true for most of the states. It is in tiny villages and cluster of such villages that jobs are to be created primarily on farms and agro-based activities on a sustainable basis. If the agri-GDP falls proportionately to total GDP and increases at a snail's pace of 1.5 per cent or sometimes negative as has been witnessed during the last three years since 2006, how can the employment and income of the farmers in particular and rural people in general can be raised.

To bring about this change farmers have to unite themselves under the banner of commodity that they produce. Commodity boards for different agri-produce set up and managed by the farmers themselves as is being done by the farmers in developed countries will be permanent institutional mechanism that will safeguard their incomes in future. The palliatives of government programs and weak crop insurance and other schemes is hardly an answer for eradicating farmers' economic misery.

4.8 Plight of Small and Poor Farmers

Over the years, small farmers of India have competed well with the large farmers of developed countries in increasing the agricultural production and especially of food grain. They proved that if the requisite inputs and technologically improved crop varieties are provided they are capable of improving the performance of Indian agriculture. But there is limit to small scale operation. In the last five years since 2005, the Indian farmers are facing the income crisis. It is interesting to observe that since 1950, the number of cultivators have gone up from 69.9 million to 127.3 million in 2001 indicating thereby, the fragmentation of land due to pressure of population on

[57] Swaminathan M.S Research Foundation (2007): "Agriculture and Rural Development – Mesearues of impact of Science and Technology in India", from 'M.S.Swaminathan research foundation, 2007., 'Office of the Principal Scientific Adviser to the GoI.

land. Apart from this, many cultivators with small land holdings seem to have sold off their land to meet their needs adding to number of agricultural labourers that has increased from 27.3 million in 1950 to 106.8 millions in 2001. The proportion of cultivators in active agriculture population (cultivators plus-labourers) which was 71.9 per cent in 1950 decreased to 54.4 per cent in 2009 while proportion of agricultural labour increased from 28.2 per cent to 45.5 per cent. This indicates to large extent the fragmentation of land that took place due to pressure of population on agriculture land as reflected in increased number of cultivators from 69.9 million in 1950 to 127.3 million in 2001. The proportionate decrease in cultivators also shows some shift of this group to land less labourers whose number increased from 27.3 million in 1951 to 106.8 million besides the increase in landless labour. The ratio of cultivators to agriculture labour which was 2:7 in 1951 has fallen down to 1:2 Thus comparatively there are less number of cultivators to support agriculture labour in 2009 compared to 1951.

As detailed earlier, 80 per cent of the farmers are marginal and small farmers (up to 2 hectares) who cultivate just 36 per cent of the area. The major limitation to earn higher and increasing income is the very small size of the land which he cultivates. Another factor is the very small size of the rural economy at the disaggregated level. In that case the entire economy is at subsistence level. With very little infrastructure of irrigation, roads, electricity etc the overall economic activity is very low. The financial institutions serving such areas do not have such business nor can they generate much activity in such areas. Marginal and small farmers' income virtually remains stagnant for years together continuously. With very low or virtually no marketable surplus generated by marginal and small farmers the money income of these farmers continues to be low. The present marketing mechanism under Agriculture Produce Marketing Act (APMA) is neither costsaving nor providing better prices for his produce. The MSP only provides actual costs of production without providing for his managerial service and normal profits.

IV.9 Level and Growth in per worker farm Income at 1993-94 prices (Annual)

Period	**Agricultural income Per worker** (Rs.)	**Growth rate in income in previous 10 years,** %/year
1968/69 to 1973/74	8947	-
1978/79 to 1983/84	9961	1.06

1988/89 to 1993/94	11179	1.16
1998/99 to 2003/04	11496	0.28

Source: Chand S (2008). Think India Quarterly, July-Sep 2010.

This slow down in income of those who are dependent on agriculture is evident in the level and growth in per worker farm income during the last 5 years centred on 1971, 1981, 1991 and 2001, per worker farm income increased annually by 1.08 percent during the 1970's. The growth rate accelerated to 1.16 percent during 1980's. However, during the period between 1998/99 to 2003/04, income per farm worker has increased just by 0.28 percent. This only exhibits their menial levels of purchasing power that would never allow them to fetch enough of food grains.

IV.10 Per Worker Income in agriculture and non agriculture sectors at 1993/94 prices (annual)

Period	Income per worker Rs.		Ratio of Agri to Non Agri Income
	Agri	Non Agri	
1978/79 to 1983/84	9961	28430	2.85
1988/89 to 1993/94	11179	39355	3.52
1998/99 to 2003/04	11496	59961	5.22

Source: Chand S (2008). Think India Quarterly, July-Sep 2010.

Slow growth in agriculture, with no significant decline in labour force, has created a serious disparity between agriculture and non agriculture and urban and rural India. The magnitude of this can be seen from per worker income in agriculture and non agriculture sectors. During the two decades after 1980/81, per worker income in non agriculture sector has got more than doubled whereas in agriculture this increase is less than 12 percent. As a consequence, one worker in non agriculture sector earned more than the income of five workers in agriculture. This disparity is causing lot of concerns in the people engaged in agriculture and thereby causing people to have less purchasing power and pushing them into the trap of food insecurity.

4.9 Rich Agriculture and Poor Farmers

The current situation of the farm sector in India is one of rich agriculture but poor farmers. On the one hand small farmers have made India self sufficient in food grains but by the end of the 20th century the farmers have become poor. Their average per capita incomes in absolute and

relative terms declined over the period. This is a serious issue for the economy as no progress will be worth the name if 72 per cent of India's population continue to face the grim situation of falling incomes.

Along with them in almost all the crops' cultivation (in terms of cultivated area), India stands top in the world for e.g. Number one in total irrigated area, number second in wheat and Rice, third in cereals and 1st in pulses, second in oil seeds, second in fruits and second in sugar cane and first in tea, jute and milk cultivation and he total area under cultivation is 142 million hectares. Out of this, 100 million hectares is dependent on monsoons for water. Average area under operational holding is 2 hectares and the total farmers having this area are 86 per cent. If India is the largest producer of several crops, it is also the country that has *lowest yield per hectare for all crops.* For eg: per hectare yield of paddy is 6.2 tonnes in USA and it is 2.9 tonnes in India, and for wheat it is 3.9 tonnes in China and 2.5 tonnes in India[58].

It is very clear that India has become self sufficient in agri produce and can compete with rest of the world if developed countries reduce their subsidies to farmers. The area under irrigation has gone up during the last 30 years significantly and there is great potential to be tapped. Crop intensity[59] is singular factor that has offset the disadvantage of small size of the farmers. Production structure is quite diversified. In terms of production it ranks first and second in the world for number of commodities. The cost of production continues to be high and farm labour contributes much for the increase in production. Though productivity is nearly the half the productivity by world standards, there is great potential to tap it by increasing the intensity of production. It is also to be understood that indiscriminate use of fertilisers and other chemicals may increase the productivity but there is danger of contaminating the produce with the chemical substances. The developed countries have realised the perils of this increased chemical productivity and are now going in for more of organic production even if the productivity comes down.

4.1.0 Food Insecurity among Small and Marginal Farmers

In spite of rich agriculture sector the gains to the farmers have not been insufficient and especially since the beginning of 21st century. Farmer finds himself economically poor and most

[58]Pitale R.L (2007): "India: Rich Agriculture: Poor Farmers – Income policy for farmers", Daya Publishers House- Delhi.
[59] Cropping intensity = (Gross cropped area / Net sown area) x 100

of the gains of rich agriculture have been appropriated by the few sections of the community. Not much attention has been paid to the income that accrues to farmers and especially marginal farmers. With the increased production, the surpluses in agriculture produce have been arisen resulting in fall in prices. The regulated agri markets have increased his cost of marketing. Under the liberalised free trade regime under WTO he is exposed to market forces which are detrimental to his welfare. The reduction in input subsidies have resulted in increased operational cost of production. The farmer has been caught in treacherous situation of rising cost of production and falling prices for his produce. It is travesty of facts that rich agriculture has led to more poor farmers rather than making them rich. The income and fiscal policies of the government have widened the gap between the farmers and others in absolute and relative terms. No economic indicators have been constructed to measure the income of the farmers/rural people and no monitoring mechanism to divert the income to farmers.

There is virtually no monitoring of increase in farmers' income on the pattern of schemes and programmes for increasing produce. The fall out effect of increased production and productivity in agriculture has not been particularly positive for marginal and small farmers as also for agriculture labour as revealed from the following explanation. This is mainly due to the fact that the proportionate share of Agri-GDP in total GDP has decreased but the burden of rural population on the farmers continues to be the same or increasing. The volume of absolute increase in Agri-GDP falls much short of population pressure due to lack of agro-related activities. There is only one way passage of production from rural areas to urban areas but there is not much of return flow of incomes to farmers. The agro-processing activities are not available to farmers and movements of agri produce to urban regulated markets are not friendly. With surplus production of agri-produce vis-a-vis current demand the result is fall in prices which further affect his income adversely as can be seen during the years between 2001 and 2005. Farmer is caught in increased yields, surplus and low prices.

IV.11Selected state wise cost of production of Rice (1983-84 to 2007-08) (Rs/Quintal) excluding 1998-99 to 2004-05

Year	AP	BR	Haryana	Madhya Pradesh	Punjab	UP
1983-84	141.53	133.76	-	102.93	122.32	118.95
1984-85	139.66	-	138.93	142.52	137	110.09

1985-86	-**	-	127.41	130.24	125.74	109.72
1986-87	148.44	158.31	143.97	162.07	129.23	122.51
1987-88	167.87	175.77	146.01	171.35	149.19	160.74
1988-89	177.96	-	150.67	193.04	159.55	174.81
1989-90	-	-	188.85	208.87	147.18	177.26
1990-91	216.13	221.36	212.89	230.54	194.69	203.13
1991-92	-	-	241.09	328.93	206.77	233.88
1002-93	-	-	300.49	295.41	224.38	260.7
1993-94	-	-	-	-	266.87	-
1994-95	341.74	-	413.38	331.09	290.36	-
1995-96	363.6	-	-	327.45	330.81	-
1996-97	405.82	377.16	424.68	389.44	344.81	309.2
1997-98	436.72	-	477.12	444.77	356.4	337.91
2005-06	540.96	497.44	618.45	689.92	487.28	559.19
2006-07	557	519	609	695	477	615
2007-08	638.56	435.48	676.86	783.31	505.92	600.73

**Not Available. Source: Ministry of Agriculture Research, Government. of India. (12919) and Agricultural Research, Data Book 2002.

The table shows that the average cost of Rice per quintal in some major states. It shows that the state of AP had Rs.141.53 per quintal in the year 1983-84. At that time, as per our data, the state of had the highest cost of production (CoP) of Rice per quintal while the state of MP had the lowest cost of cultivation of Rice with Rs.102.93. And these trends have varied through the years, and by the year 2007-08, state of MP had the highest CoP with Rs.783.31 and Bihar emerged as the least CoP state with Rs.435.48. These fluctuations have been quite significant as far as food security is concerned because all these states have undergone a drastic increase in their cost of production. It can be attributed to the increase in input costs, antiquated practices of cultivation, and decline in the state support structure to farming and also to some extent due to unfavourable climatic conditions. Higher CoP leads to higher prices of Rice and thereby pushes the poor people away from accessing sufficient food grains at stipulated periods.

IV.12 Selected state wise cost of production of Wheat

(1983-84 to 2007-08) (Rs/Quintal) excluding years 1998-99 to 2004-05

Year	Haryana	Himachal Pradesh	Madhya Pradesh	Punjab	Rajasthan	UP

1983-84	140.93	160.55	140.18	137.47	136.02	135.53
1984-85	141.31	-**	142.7	136.33	140.61	-
1985-86	125.55	-	153.72	129.29	126.07	131.33
1986-87	138.31	148.06	166.79	151.49	114.03	130.91
1987-88	139.64	214.32	178.11	139.95	157.43	167.77
1988-89	127.99	-	222.45	150.01	178.53	192.19
1989-90	135.86	-	232.11	164.24	174.83	192.24
1990-91	155.44	-	256.86	190.79	-	220.23
1991-92	168.41	-	317.17	210.41	-	-
1992-93	217.52	-	343.69	250.72	233.64	-
1993-94	246.72	-	-	268.32	-	-
1994-95	263.3	383.11	384.15	306.58	282.53	-
1995-96	292.26	434.26	377.02	342.83	299.63	328.02
1996-97	336.13	-	492.09	362.5	393.67	362.56
1997-98	391.85	-	475.25	411.97	393.02	-
2005-06	577.41	720.55	720.77	556.27	528.7	654.22
2006-07	589	779	730	617	568	636
2007-08	673.46	866.86	779.37	647.95	649.77	651.14

**Not available. Source: Ministry of Consumer Affairs and Food and Public Distribution, GoI (12515) and Ministry of Finance GoI, (12367).

This table also presents us the CoP of Wheat during the period between 1983-84 and 2007-08 (excluding the years from 1998-99 to 2004-05). It shows that during the period 1983-84, UP had lowest CoP with Rs.135.53 per quintal of wheat and Himachal Pradesh (HP) had the highest CoP with Rs.160.55 per quintal of wheat. And by the year 2007-08, HP still emerged as the highest CoP state with Rs. 866.86 per quintal of wheat. At the same time, Punjab maintained the lowest CoP with Rs.647.95 and closely followed by the Rajasthan and UP. Natural endowments, quality of production, available markets and local government support also would play a significant role in determining the CoP. In this respect, Punjab has been able to utilise its natural resources like water and fertile soil to maximum extent and succeeded in reducing its CoP and same inferences can be applied to the state of UP which also a major wheat producing state in India. Despite all these trends, wheat prices over the years at all India level and even had to import wheat during 2006-07 and 2007-08 years due to heavy decline in the production and further pushed prices higher and higher and thereby made the wheat very expensive for the poor.

IV.13 Economic Cost of Rice and Wheat at All India Level
(1994-95 to 2009-10) (Rs/Quintal)

Year	Rice	Wheat
1994-95	694.71	551.17
1995-96	762.82	583.95
1996-97	858.06	662.53
1997-98	937.28	797.84
1998-99	995.23	800.34
1999-00	1074.8	887.51
2000-01	1180.47	858.26
2001-02	1097.96	852.94
2002-03	1165.03	884
2003-04	1236.09	918.69
2004-05	1303.59	1019.01
2005-06	1339.69	1041.85
2006-07	1391.18	1177.78
2007-08	1549.86	1311.75
2008-09	1732.48	1384.42
2009-10	1873.58	1457.3

Source: Ministry of Consumer Affairs and Food and Public Distribution, GoI (12515) and Ministry of Finance GoI, (12367).

This table provides us the data related to all India level economic cost of important food grains Rice and Wheat between the years 1994-95 to 2009-10. This is the period of economic reforms where India had comprehensively implemented the free trade regulations in agriculture under WTO. And the Rice and wheat (Rs/Quintal) Economic cost has got almost tripled during this period. Rice economic cost has increased from Rs.694.71 to 1873.58 during the sixteen year period showing an exponential annual growth rate of **5.88** per cent. And it has increased from Rs.551.7 to Rs.1457.3 for wheat showing an exponential annual growth rate of **6.00** per cent during the 16 year period. These two grains constitute the majority of Indian India. But the cost of production of these two main staple grains has increased enormously and thereby increased their market prices. It only finally lead to higher food grain prices and lower food security of the poorer sections as they will have very meagre purchasing power to purchase these high cost food grains.

IV.14 Compounded annual growth rates of Minimum Support Price (MSP)
between 1980-81 and 2009-10: (%)

Period	Rice MSP	CoP* of Rice	Wheat MSP	CoP* of wheat
1980-81 to 2009-10	7.69	-#	7.91	-
1980-81 to 1994-95	8.25	-	7.65	-
1995-96 to 2009-10	5.93	5.88	6.42	6.00

*Cost of production, Rs per quintal at all india level. #Not available. Source: Compiled by the researcher from the adopted data from: Ministry of Agricultutre, GoI and Economic Survey of India 2009-10, GoI.

Here, if we observe the second period the growth of CoP production of Rice during the second period has increased by 5.88 per cent, but MSP growth has increased by 5.93 per cent. MSP that is offered by the Government will always be lesser than the market price and it will not include the minimum profits to the farmers that would allow them sustain in cultivation. Therefore, the growth MSP always must be higher than the growth of CoP if at all we have to protect farmers as well as to increase production to achieve food security. But in the case of Rice though growth of MSP is slightly higher than the growth of CoP, but as MSP does not include the minimum profits, this would no way help the farmers during crises times. At the same time if we observe the case of Wheat, its MSP growth during the second period, i.e. 6.42 per cent, is little higher than the growth of CoP of wheat per quintal which is at 6.00 per cent. It suggests that the government support to food grains especially is not growing on par with the cost of production though there is a marginal increase. This is one trend which emphasises the fact that the state has been moving away from protecting or investing on agriculture more so during the free trade regime under WTO. Therefore, this is the period, during which our country's food grain self sufficiency as well as per capita availability of food grains has been jeopardised.

4.1.1 Macro Indicators for Poor Farming:

1. Declining average per capita agri-GDP (Ratio of agri-GDP to rural population). As it was Rs. 3802 (Rs.318 per month) and later went down to Rs.3732 (Rs.311 per month) in the year 2002-03. Here we can observe the absolute fall in per capita rural income by Rs.72 over the 12 years period.
2. Rural-Urban Income Differential: Average rural real income of Rs.3732 is lower by 10 times the urban average real per capita GDP of Rs.34,660.
3. Fall in share of Agri GDP: In 1993-94 the share of agriculture in GDP was 31 per cent and came down to 22 per cent in 2003-04. Comparatively lower volume of income generated in agri sector with high proportion of rural population. The average per capita

agricultural GDP was lowest in Bihar standing at Rs.1503 (Rs.125.3 per month) and highest in Punjab with Rs.10,284 (Rs.857 per month). Bihar rural farmers' income is one third of national average, clearly indicating extremely poor farmers.

4. Terms of Trade (ToT 1990-91) statistics: Ratio of index of prices received by agri-sector and prices paid to non-agri sectors in 1994-95 were 106.2, in 2000-01 they were 102.8 and in 2002-03 it reached 106.8. Over period of ten years ToT is virtually static and decreased in 2002-03 showing adverse impact of farmers' income[60].

4.1.2 Micro Indicators of Poor Farmers

1. Associated with Low Monthly Per Capita Expenditure (MPCE) of farmer households: In 2003 (NSSO 59th Round) the MPCE was Rs.502.83 which is lower by 9.3 per cent compared to all rural Households. It is lowest in Orissa with Rs.341.75, close to poverty line expenditure of Rs.327.56 per month estimated by the Planning Commission.
2. Low and Falling Income of Farmers: Farming unpopular occupation: According to NSSO 59th Round data in 2003, 40 per cent prefer to quit farming, 27 percent consider farming unprofitable and 9 per cent consider it as risky proposition.
3. Indebtedness of Farmers (NSSO 59th Round): Out of 89.35 million farmers 43.42 million are indebted. 1 acre or less land households accounted for 66 per cent of all farmers. 36 per cent loans from banks and 26 per cent from money lenders.
4. Falling prices of agri-produce (WPI 1993-94=100): Per cent variation: Food grains: 2002-03: 3.3 per cent; 2003-04: -0.1, sugar: 2002-03: 5.9 per cent.
5. Government MSP covers only cost of Production: No profit/return to farmer over his cost of cultivation. Family labour and rent of the land account about 1/3rd to ½ of cost of cultivation. Imputed value of labour in the cost of production is surviving limit of farmer.
6. Market Prices also fall below MSP: No assured intervention purchases by procurement agencies especially in North –East States for Wheat. This has been experienced for other commodities. Open market auction price of onions fell to lowest level at Rs.10 per quintal in 2004-05 in Nasik market of Maharashtra.

[60] Pitale R.L (2007): "India: Rich Agriculture: Poor Farmers – Income policy for farmers", Daya Publishers House- Delhi.

7. And also Static agri-labour real wages during the last three years since 2004, in most of the states.

While the agriculture production over the period between 1951 and 2001 increased almost four times during the period, the proportionate balance between cultivators and agri-labour virtually reversed between 1951 and 2001. The production of food grains and other commercial crops except oil seeds compared to the current domestic demand being higher, has resulted in fall in prices or remained static as seen in the whole sale price index of agriculture commodities during the last 5 years and it led to less income to farmers. The average size of farm also decreased from *1.57 to 1.41* hectares indicating further uneconomic size of land. The GDP of agriculture sector and population in the rural sector can give a reasonable and reliable figure of per capita GDP in agriculture sector. The comparative figures of agri-sector GDP (Excluding value of income from livestock) and rural population in 1991-92 and 2002-03 shows that the per capita GDP in real terms (1993-94 prices) of farm sector was Rs.3802 (Rs.318 per capita per month) in 1991-92 compared to Rs.3,372 (Rs.311 per capita per month). This shows that over the 12 years period since 1991-92, the per capita GDP of farm sector population on a point to point base decreased in absolute terms by Rs.70. In the absence of separate estimates for income profile of the farmers the average per capita GDP of the farm sector is good bench mark to start with. The poverty line in 1999-2000 at all India level as estimated by the Planning Commission is Rs.327.56 per month (Rs.3936 per annum). This is the grim situation of farm sector population and there is no wonder that farmers are committing suicides.

The information given in the above paragraphs shows that number of economic indicators pointing out clearly that production, prices and markets have not been favourable to farmers. This has resulted in falling incomes and making farmers poor. *Increased production and productivity in the farm sector is no guarantee that farmers economic status is improving.* The gains of increased production and productivity have to pass to farmers in higher incomes. This does not seem to have happened by the turn of the century. Alternatively, it is evident that market for agriculture and current scheme of regulated markets have increased the cost of the marketing for the farmers. In the supply chain farmer has become a weak link. The recent studies (2008) of the federation of Indian Chambers and Commerce and Industry (FICCI) and the Asian

Development Bank (ADB) illustrate this aspect very clearly forecasting the possible severe food insecurity situation.

4.1.3 Fluctuations in production

In the recent past, we have observed, despite being predominantly an agrarian country, we had experienced severe fluctuations in wheat production especially during the years 2006-08. In this background we have decided to briefly present the growth and challenges of wheat production over the years India was highly deficit in wheat production before the introduction of high yielding varieties during the late 1960's. Average level imports exceeded 6.5 MT during 1964-65 to 1967-68 which constituted more than 35 per cent of domestic demand for wheat. At least 50 per cent more production was required to banish imports in those years. This appeared to be a formidable task and the country faced a gloomy picture of food security. High yielding strains of wheat which became available around 1965 changed the scenario completely. This growth in wheat production in turn helped in reducing the heavy dependence on wheat imports to meet the domestic demand. However, the growth in production was never large enough to eliminate imports and to meet the domestic demand on a sustained basis. Wheat production often fell short of the demand, while in some years production exceeded the effective demand. Because of this, imbalances in domestic demand and supply of wheat are a recurrent phenomenon and they have become more acute in recent years and thereby stability of wheat prices has also been affected.

After the mid 1990's, India has emerged as a major exporter of rice but wheat supply continues to face occasional shocks. *India imported over 6 million MT of wheat in 2006-07 followed by a further import of 1.8 million MT during 2007-08.* Wheat also has faced lot of uncertainties in prices and attempts to liberalise the wheat market have been rolled back due to high sensitivity of prices to fluctuation in the production. Wheat prices and supply has remained a subject of intense debate during last 10 years, sometimes due to excess stock, sometimes due to shortage and many a time due to price fluctuation that necessitated tightening of government control over wheat market. Abnormal increase in global food prices experienced during 2007-08 has added to the urgency of understanding the trend in wheat production and prices, thereby the severity of possible food insecurity in near future.

4.1.4 Technology and Instability in Production:

Instability in production affects price stability and the consumer, and it increases vulnerability of low income households to market. Stability in agricultural and food production is also an important aspect for food management and macroeconomic stability. The impact of new technology on instability in agricultural and food production has not been quite clear and has remained a matter of concern. *Most of the studies which covered two years since the adoption of new technology concluded that instability in agricultural production had increased with the adoption of new technology*. Instability in Indian agriculture, extended over a longer post-green revolution period, or covering the recent years, appeared recently. One of these studies conclude that green revolution has been instrumental in increasing production of food grains and other crops in India but this has come at a cost of greater instability in production and yield.

No attempt has been made to examine whether instability in production, which increased in the initial years of green resolution according to most of the studies, witnessed and significant change with its spread to more farmers, more areas and to more crops. This contradiction between what was observed at the state level and country level indicate that it could be too early to attribute increase in instability in food production, at the country level to new technology.

The magnitude of production instability is essentially a function of the environment which can be considerably moulded through human efforts. It is suggested that the causes for increase in production in instability after adoption of green revolution technology were increase in the variability of rainfall and prices and increase in sensitivity of production to variation in rainfall, not the growth in production. The study concluded that since wheat benefited to be greatest extent from green revolution technology the observed increase in variability in food grains and all crops output cannot be attributed to green revolution technology as such. There is no consensus in the literature on change in instability in agriculture production in different periods and there is a complete gap in research about the changes in instability of agricultural production in relation to progress in spread of new technology in the country.

The pre-green revolution period (1951-1965) is marked by major policy initiatives like land reforms and development of irrigation infrastructure. Legislations for the abolition of zamindari were enacted by all the states. The tenancy reforms also provided for regulation of rent and security of tenure, beside conferment of ownership on tenants. Another land reforms measure

was the legislation to impose ceilings on the maximum land that a household could own. Apart from these, efforts were also made to minimise the exploitation of cultivators by money lenders and traders by expanding the co-operative credit system.

Since the middle of 1960s, described as green revolution period, focus of policies shifted to adoption of new agricultural technology. It was considered vital to provide remunerative prices to the farmers to encourage use of modern inputs and adoption of new technology. In order to achieve this, new institutions like Food Corporation of India and Agricultural prices Commission later renamed as Commission on Agricultural costs and prices (CACP) were created. This period also witnessed strong emphasis on agricultural Research &Development, expansion of institutional credit, and creation of modern input manufacturing industry[61].

After mid-1980s, policy intervention became more and more price centric. This period witnessed a major surge in subsidies and a sharp fall in public investments in agriculture[62]. Another significant policy change in this period relates to liberalisation of agriculture trade. The coverage of HYV (High Yielding Variety) seeds across states was just 17 per cent in 7 major states whereas it was more than 75 per cent in Punjab, Haryana and Tamil Nadu. After 1987-88 new agriculture technology spread to wider areas. By the year 1996-97, 14 out of 17 states cultivated HYVs of cereals on more than 70 per cent of area. The major expansion took place in those states where area under HYVs remained low in the first phase of green revolution.

[61]Ramesh chand, Raju S.S (2009): "Instability in Indian Agriculture During different phases of Technology and Policy", from 'Indian Journal of Agricultural Economics', Vol. 64, No. 2, April-June 2009.
[62]Ramesh chand, Raju S.S (2008): "Instability in Andhra Pradesh Agriculture-A disaggregate Analysis", from 'Agricultural Economics Research Review', Vol.21 July – Dec 2008 pp 283-288.

IV.15 Spread of New Technology in India Agriculture as Prevailed by Area under HYV's and Fertiliser Use

State	Area Under HYV's of Cereals (%)		Fertiliser Use: NPK (Kg/ha)	
	1987-88	1996-97	1987-88	2005-06
Andhra Pradesh	56.2	82.5	92.3	247.2
Assam	39.1	58.9	8.8	71.1
Biahr	71.2	83.1	65.0	140.8
Gujarat	40.8	72.8	47.0	129.9
Haryana	79.7	78.1	121.8	320.0
HP	51.8	76.1	43.9	88.7
J&K	63.5	83.3	53.2	122.7
Karnataka	35.0	75.3	52.9	145.2
Kerala	41.1	92.2	82.5	93.9
Madya Pradesh	38.6	63.4	26.3	66.6
Maharshtra	61.0	85.5	40.8	112.5
Orissa	38.1	67.0	25.5	68.8
Punjab	92.4	96.9	267.4	397.6
Rajasthan	28.2	42.4	18.6	53.3
Tamilnadu	75.7	100.7	117.5	215.7
Uttar Pradesh	61.7	83.4	99.8	204.5
West Bengal	51.9	77.5	105.1	207.7
C.V (%)	33.1	18.3	81.6	60.8
	ALL INDIA			
Year	Area under HYV (%)		NPK(kg/ha)	
1967-68	6.1		11.0	
1987-88	54.4		65.6	
1996-97	75.6		100.2	
206-07	N.A		153.0	

Source: Agricultural Statistics at a Glance, MoA, GoI. Indian Agriculture in Brief, MoA.GoI. Indian Journal of Agricultural Economics. Vol. 64, No. 2, April-June 2009

At the national level, area under HYVs of cereals increased from 54 million hectares during 1987-88 to 76 million hectares during 1996-97. During these 10 years the percentage area under HYVs increased from 55 per cent to 76 per cent of total area under all cereals. Another important indicator of technology is the use of inorganic fertiliser. Per hectare use of fertiliser (NPK) increased by mere 0.28 kg per year in the pre-green revolution period. During the two decades of first phase of green revolution (1967-68 to 1987-88), fertiliser use of per hectare of net sown area increased by 55kg or 2.75 kg per year. The next 19 years shows increase of 87 kg or 4.58 kg per year. Like HYVs, growth in fertiliser use after 1987-88 was much higher in those states where fertiliser use was low. This is indicated by decline in coefficient of variation in per hectare fertiliser use across states from 81.6 to 60.8 per cent between 1987-88 and 2005-06. The progress

of area under HYV and fertiliser shows that improved technology spreads much wider areas after 1987-88.

The following table contains two sets of results, one covering all years of the three sub-periods and the second excluding two extreme years 1979-80 and 2002-03 which experienced very serious droughts. Crop output in these two years dropped by 13 and 12 per cent over the previous year respectively. Droughts were experienced in some other years also, like 1987-88, but their intensity was moderate.

4.1.4 Production Instability in Different States

And the instability in crop production is expected to vary across regions and states. There is lot of variation in climatic conditions, natural resource endowments, institutions, infrastructure, population density and several other factors across states. Because of this variation, the pattern of agricultural growth and development and response to various stimulus and inducements vary greatly across states.

The area under food grains shows high instability in the first phase of green revolution in Gujarat, Karnataka, Rajasthan and Tamil Nadu. Out of these states, year to year variation followed a decline in Gujarat and Karnataka but it witnessed small increase in Tamil Nadu and a very high increase in Rajasthan. The other states which witnessed increased in variation in area under food grains are Andhra Pradesh, Orissa, Kerala, Jammu and Kashmir and Uttar Pradesh. Despite the increase, instability in food grains area was quite low in Uttar Pradesh and Jammu and Kashmir. The states which show below 4 per cent year to year deviation from growth trend are Bihar, Kerala, Himachal Pradesh, Punjab, Uttar Pradesh and West Bengal. Compared to area, variations in yield were much larger. Instability in yield of food grains exceeds 20 per cent in Gujarat, Maharashtra, Orissa and Rajasthan in both the periods. It varied around 10 per cent in Andhra Pradesh, Bihar, Himachal Pradesh, Jammu and Kashmir. Yield variability in food grain in Haryana, Uttar Pradesh and West Bengal reduced to less than half after 1988. Large increase in yield instability is shown in Andhra Pradesh, Assam, Madhya Pradesh, Orissa and Rajasthan.

IV.16 State wise Instability in Food grains Production During 1968-2006

State	Period*	Area	Production	Yield
Andhra Pradesh	I	5.99	12.94	8.87
	II	8.04	16.82	9.61
Assam	I	4.87	12.16	9.69
	II	4.11	11.22	11.97
BR&JH	I	4.66	16.43	12.92
	II	3.33	14.16	11.77
Gujarat	I	12.49	40.47	30.41
	II	9.76	35.54	27.66
Haryana	I	10.23	17.54	12.68
	II	5.68	8.57	6.67
HP	I	1.98	13.73	12.95
	II	1.39	13.04	12.79
J&K	I	1.60	12.19	11.78
	II	2.31	8.73	9.68
Karnataka	I	10.15	22.27	14.11
	II	4.95	17.80	14.75
Kerala	I	3.20	6.07	4.61
	II	3.56	7.56	5.48
MP &CHH	I	2.54	18.70	17.55
	II	5.61	23.85	19.05
Maharashtra	I	8.21	27.45	20.89
	II	4.28	23.16	20.76
Orissa	I	5.97	25.34	20.42
	II	7.61	32.87	28.38
Punjab	I	3.56	5.00	5.09
	II	1.92	5.57	4.68
Rajasthan	I	10.97	27.89	21.33
	II	18.35	38.92	23.12
Tamil Nadu	I	10.19	25.97	18.35
	II	11.22	20.15	13.97
UP &Uttaranchal	I	1.98	14.77	13.77
	II	2.46	7.78	6.46
West Bengal	I	4.69	15.46	12.55
	II	3.90	6.66	5.48

*Period I = 1968-88 and Period II = 1989-2006. Source: Agricultural Statistics at a Glance, MoA, GoI. Indian Agriculture in Brief, MoA.GoI. Indian Journal of Agricultural Economics. Vol. 64, No. 2, April-June 2009

Yield instability was the major source of instability in food grain production in most of the states. Production was most stable in the state of Punjab followed by Kerala, Haryana, Uttar Pradesh and West Bengal were able to bring down instability in food grain production sharply in

the second period., instability in production remained very high in Maharashtra and Tamil Nadu despite reduction over time. Apart from sharp grain production in the second period, instability in production remained very high in Maharashtra and Tamil Nadu despite reduction over time. Apart from these two states, instability exceeded scale of 20 per cent in Orissa, Madhya Pradesh, Rajasthan and Gujarat. Though Orissa is located in high rainfall eastern region but its agriculture shows high instability like states in the dry- land arid region. Changes in instability and changes in area, production and yield of food grains in different states show mixed pattern.

4.1.5 Factors behind Instability

The main factor for interstate variations in instability in area, production and yield seems to be the variation in access to irrigation. Instability in food grain production during 1989 to 2006 was less than 9 percent in Uttar Pradesh, Punjab and Haryana, where more than 70 per cent area under food grains is irrigated. In contrast Instability in food grain production exceeded 23 per cent in Maharashtra, Orissa, Madhya Pradesh, Rajasthan and Gujarat where less than 40 per cent area under[63].

The role of technology in increasing agricultural and food production in the country is well known. However, adequate, clear and convincing evidence on the impact of new crop technologies and policies followed during different periods since 1951 in reducing variation in production and resulting risk has been lacking. *Most of them conclude that adoption of new technology had increased instability in food grain and agricultural production in India*[64]. When a longer period is taken into consideration, which witnessed spread of improved technology to large area, the inference on increase in instability due to adoption of new technology gets totally refuted at country level. Yield variability in food grain crops as well as in non-food grain crops was much lower in the first phase of green revolution extending up to 1988 as compared to pre-green revolution period. Deviation in yield, away from trend, witnessed further decline during 1989-2007. Beside larger spread of high yielding varieties, expansion of irrigation, development of crop varieties resistant to insects and pests and technologies to mitigate effect of weather on yield appears to be the other major factors in reducing yield variability.

[63]Ramesh chand, Raju S.S (2009): "Instability in Indian Agriculture During different phases of Technology and Policy", from 'Indian Journal of Agricultural Economics', Vol. 64, No. 2, April-June 2009.
[64] Ibid

Instability in production across crops is found to depend significantly on irrigation coverage of a crop. Crops like wheat, sugarcane and paddy are grown mostly under irrigated condition which imparts lot of stability to their production. It may be noted that area covered under irrigation is more than 90 per cent for sugarcane, around 88 per cent for wheat and 53 per cent for Rice. In contrast, irrigation coverage of bajra is below 10 per cent, for maize around 20 per cent for gram around 31 per cent and for groundnut 17 percent. These bottlenecks had never allowed for the free mobility of factors and thereby arrested the growth of production.

4.1.6 Sustainability

Production of non-food grains shows increase in instability during the last two decades (since 1980's) but production of food grains and total crop sector was much more stable in the recent period compared to pre green revolution and the first two decades of green revolution in the country. This indicates that Indian agriculture has developed resilience to absorb various shocks in supply caused by climatic and other factors. Food grain production remained more unstable as compared to production of group of non food grain crops. Instability in yield of cereal and pulses declined over time. However, the opposite holds true for oil seeds. Oilseed production is also found more risky as compared to cereals and pulses. The pattern in area, yield and production instability of food grain differs widely across states. Yield instability was the major source of instability in food grain production in most of the states. Production was most stable in the state of Punjab followed by Kerala, Haryana, Uttar Pradesh and west Bengal have brought down instability in food grain production sharply. Food grain production is highly unstable in the states of Maharashtra, Tamil Nadu, Orissa, Madhya Pradesh, Rajasthan and Gujarat. The food grain area under irrigation in all these states except Tamil Nadu is less than 40 per cent as against national average of 44 per cent.

4.1.7 North East Hill region

Here we briefly try to observe the kind of agriculture that is leading to food grains productions and complications involved in it and also prospective and challenges. This region encompasses 8 states and occupy the 8 per cent of the total area of India and 3 per cent population and 3.3 per cent of area under food grain crops. This region is endowed with diverse features like marginality, cultural and communal heterogeneity, ethnicity and rich biological diversity. And as much as 82 per cent of the population live in rural areas. Here the production pattern and

cropping intensity are very low (114 per cent) and confined to subsistence level. But the interesting thing is that the per capita land availability is 2.5 hectare, while the national figure is 0.69 hectare (2005), it also includes the topologically imperfect land for cultivation. Since land use pattern is not effective, the loss of annual top soil is as much as 46 tons/ha where as it is 16 ton/ha at the national level. And also due to poor water management and less irrigation facilities, only 0.88 mhm[65] water is used out of total 42.5 mhm. Due to all these obstacles instead of producing the required around 7.4 million tons (ICMR norms), it just producing 5.8 million tons.

Out of all the 8 states, the state of Assam accounts for 70 per cent of food grain production with 74 per cent of area. We can observe the decadal change in the areas of all these 8 states, we can observe a clear negative trend, as Tripura with 6.8 per cent, Meghalaya with 1.9 per cent, Manipur 0.2 per cent and Mizoram 7.6 per cent and it is positive for the states like Assam with 5 per cent, Nagaland 15.7 per cent and Arunachal Pradesh with 0.7 per cent during the decade between 1991-92 to 2000-01. Here the maximum change in yield has been observed for Mizoram with 48.7 per cent with a production enhancement of 38 per cent despite losing 7 per cent area between the periods of same decade.

Per capita per day deficit of production of food grains in North eastern Hill Region fluctuates from 287 grams in Meghalaya to 11 grams in Tripura in the year 2010 and projected or estimated gap is widening to the level of 67 grams in Arunachal Pradesh to 514 grams in Meghalaya in 2020 (Annual Report, ICAR-RC NEHR, 2004-05). It shows the fact that in near future there appears a clear threat of food insecurity in this region due to various reasons, especially the state of Meghalaya. The reasons for fluctuating production trends in this region can be attributed to tough geographical terrain and imperfect perspective planning.

This region has various gifted natural resources like horticulture, medicinal and aromatic herbs and bamboo, water, wind power and also minerals, these can be harnessed effectively in order to bring in the situation of food security through different forms and also to diversify the income sources of the rural people. After observing all these trends, the NEHR shows that, during the decade between 1991-92 to 2000-01, there was an increase in food grain production to the tune of 20 per cent with the yield growth of 16 per cent., though it's not a huge improvement, can be termed as satisfactory as there is only little change in area i.e. 3.6 per cent. *But the frightening*

[65] Million Hectare Meters (MHM), 1 MHM=1000 **Million Cubic Metre (MCM)**

thing is that, if the state of Assam is excluded, the whole picture takes up a total negative and downward growth.

The projection of total food grains production of this region are estimated to be of 8549, 9817 tons and 11315 thousand tons for the years 2015, 2020 and 2025 respectively (Basic Statistics of NER 2002 - Annual Report, ICAR-RC NEHR, 2004-05). In the same way, the projected requirement of food grains (as per ICMR norms) have been projected to the levels of 9165, 10178 and 11326 thousand tons, it is including Assam[66]. Since most of the PDS and other government intervention food secure programmes of poor are not performing up to the mark. Most of the FPSs (Fair Price Shops) only exist on paper as most of them are found to be not economical in operation. Since most of the cultivation source is rain water, the extent of food insecurity is looking very dangerous in near future of NEHR. A study shows that 74 per cent of people here in NEHR do not possess access to required calories for healthy life. Due to geo graphical terrain, income sources of many people in this region are very much uneven, subject to unforeseen shifts and uneconomical movements along with the uncertainties in productivity. It establishes the very necessity to diversify both employment opportunities of people as well production trends to see to it that it does not land up in food insecurity or hunger. It also requires the instrumental role of the state.

4.1.9 Global Challenges and Initiatives

The food security of vulnerable, sustainable use of natural resources and unity between rural and urban or farm and nonfarm population became the issues of dominant discourse related to agricultural development. The United Nations Organisation (UNO) Millennium Declaration of 2000 set eight Millennium Development Goals (MDG's), the first of which was to reduce the proportion of hungry (from a base level of around 20 per cent) to half by 2015. Other seven MDG's were also closely linked to the first goal of reducing hunger (reducing Malnutrition, Infant Mortality Rate (IMR) and Maternal Mortality Rate (MMR); increasing school enrolment; improving gender equality; increasing access to safe drinking water and sanitation; and combating HIV/AIDS, malaria and other diseases. This spurt in food prices since the year 2006 has aggravated the situation of hunger across the Globe. The number of hungry in 2007 went up

[66]Datta K.K, Mandal S, Tripathi K, Singh S.B, Verma M.R & Mohanty S (2007): "Retrospect and Prospect of Food Security in North Eastern Hilly Region of India", from 'Agricultural Situation in India', August 2007.

to 923 million (75 million plus over 2003-05 figure) and is likely to have increased further currently as the food price rise was much steeper in the early 2008. The proportion of hungry people is reported to have increased further currently as the food price rise was much steeper in the early 2008. The proportion of hungry people is reported to have also increased to 17 per cent in 2007. Thus, meeting the internationally agreed hunger-reduction goals in the few years remaining to 2015 is becoming an enormous challenge.

The two regions combined (Asia and Sub Saharan Africa - SSA), already accounted for 750 million, or 89 per cent, of the hungry people in the World in 2003-05. The rising food prices have driven an additional 41 million in Asia and 24 million in SSA below the hunger threshold. Long term structural trends and underlying growth in demand for food have coincided with short-term cyclical or temporary factors affecting food supply. On the supply side, while cereals stocks were at the lowest levels in three decades, as a result of unfavourable weather, cereals production fell by 3.6 per cent in 2005 and 6.9 per cent in 2006, before recovering slightly in 2007. Further, the rapid rise in petroleum prices exerted an upward pressure on food prices as fertiliser prices nearly tripled and transport costs doubled during 2006-08. On the demand side, increasing use of sugar, maize, cassava, oil seeds and palm oil by the emerging bio fuels industry has been the leading factor behind the increase in their prices. About 100 MT of cereals (4.7 per cent of Global Production) were used in the production of bio fuels in 2007-08. These apart, adoption of export restrictions by some countries, speculative re-stocking or pre-stocking by large importers, entry of new types of investors in derivatives markets based on agricultural commodities, and increased speculative initiatives have been the factors that exacerbated the rise in food prices globally. It is being predicted that while global rise in food prices may abate slightly, these may not come down to the levels of 2004. It is in this context that India's situation of food security and policy response to the global challenges assumes added importance[67].

In some international quarters, one of the major factors pointed out for rise in global food prices was increase in demand by the middle class in India (and also China), leading to food shortages. India's dietary pattern at least cannot substantiate this argument. During 2004-06, *the average per capita consumption of cereals in India was 175kg per year as against 953 kg in USA, 288 kg in China, and 316 kg in the World* as a whole. Simplistic calculation would show that if the

[67]Edward J Clay (2004): "Responding to Change: WFP and the Global Food Aid System chapter XII", from 'Food Policy Old and New' edited by Simon Maxwell and Rachel Slater – Overseas Development Institute (ODI).

World adopts India's dietary pattern, only 56 per cent of the existing global cereals output is enough to feed the world[68].

4.2.0 Post 1990s Scenario

It is observed that there was a significant decline in the rate of growth of agricultural production during nineties, which decelerated to 2.2 per cent from 3.2 per cent during the eighties. In case of food grain production, there was an encouraging performance in the 1980's (2.85 per cent growth rate, which later came down to 2.02 per cent in 1990's and reached to 0.68 per cent between 2000-01 and 2004-05)[69], this can be attributed to the spread of new technology. The special programmes for the cultivation of rice and oil seeds and the increasing attention paid on the dry farming and to the less developed states. This was also corroborated by the increase in the consumption of fertiliser during the eighties at a faster rate in the eastern and western regions than in northern and southern regions. The increase in food grains output in the eighties therefore can be attributed also to the improved utilisation of the available infrastructure and from the increase in yield per hectare.

Even the non food crops did not fare any better than food crops, as most of them did not record an impressive growth rate either. The average growth rate of productivity of non food grains was modest in the 1980-90 periods but it declined in the 1990-2000 period. This recent decline in food grain growth rate may be due to sharp decline in government spending on agriculture and irrigation infrastructure. The combined share of agriculture and irrigation in total plan outlays *has come down from the high of 31.04 per cent in the fourth plan to just 10.63 per cent in the 10th plan.*

The decline in the growth rates of food grains production during the nineties was felt more in case of khariff crop than Rabi crop. Of late, food grains production during the rabi season was almost equal to the level of production during the khariff season. This has reduced the dependence of food grains production on monsoons and in turn, imparted some element of stability to agricultural production in India. But the problem is the lack of desired growth momentum in this sector.

[68] Lea Terhune (2008): "South Asia's Food crisis despite India's High Productivity – Changes in India's Policies could help mitigate shortages". 30th June 2008.
[69] Buragohan;Tarujyoti (2007): "Agricultural Development and Sources of Growth of Output: An analysisof major Crops in India", from 'Agricultural Situation in India', Sep 2007.

4.2.1 Agriculture and Environment

In India, On the demand side, food or food grains must come from agriculture which is very much dependent on environment either directly or indirectly, like availability of water, prevailing temperatures, occurrence of cyclones and floods, hail storms, timely monsoons etc. As the civilisations flourished further, as per the global scenario that stands on today, some countries could become developed through various means, which mostly lie on the northern hemisphere, which were mostly erstwhile colonial rulers, and they are able to produce enough of food grains, not only would they meet their domestic requirements but also remain with some surplus which could be exported to other deficit countries at profitable rates.

At the same time, there have been other countries, that lie mostly in southern hemisphere of the globe, that were mostly colonies earlier, still remain as developing countries. These are naturally agro based economies and they are mostly from Africa, South Asia and Latin America. Though these economies are basically agrarian in nature, their cultivation methods still remain primitive and therefore they are unable to generate larger amounts of marketable surplus in agriculture. And thereby, whatever they produce would only be sufficient to meet their domestic consumption and sometimes they may even have to import some food items from developed countries. In the light of changing global environmental conditions, these developing countries are exposed to the severe shortages in food grains and thereby pushing large sections of poor people away from accessing food grains and leading to the grave situation of food insecurity.

In the recent past this concept of food insecurity has extracted so much attention from academicians and policy makers as the current environmental trends showing drastic degradation that pose greater threats to the global food security especially of developing countries. In this context, as India is also a developing country, was earlier a colony until 60 years back and second largely populated country and off late exposed to deteriorating agricultural productivity and projecting a possible threat of food insecurity in near future.

According to Saikadatta Mazumdar (Chief Operating Officer of NutriPlus Knowledge Programme – ICRISAT 2011), due to variations in climate change, area of dry land would increase by 11 per cent in the World, in coming years; 1.8 billion people would live in countries with absolute water scarcity and hardest hit would be the rain-fed agriculture which covers 96

per cent of all cultivated land in Sub-Saharan Africa, 87 per cent in South America and 61 per cent in Asia. These climate changes would affect the productivity of land quite severely and negatively.

4.2.2 Land Degradation

The degraded wastelands accounted for 20.16 per cent of India's total geo graphical area in 2000. They include several types of lands such as gullied and/or ravenous land, water-logged and marshy land, land affected by salinity and/or alkalinity, degraded pastures/grazing land, degraded notified forest land, mining industrial waste land, eroded steep sloping land, sandy and desert lands and barren rocky/stony wastelands. In 1994, out of the 1888 million hectares (MH) of degraded land, about 149 million hectares was affected by water erosion, 13.5 MH by wind erosion, about 14 million hectare by chemical deterioration and 11.6 MH by water-logging. This land erosion has significant adverse impacts on crop productivity and the environment. More importantly the water logging and salinity would seriously obstruct the crop yields in future[70].

4.2.3 Degradation of water resources

India processes the 4 percent of total global water resources and 17 percent of global population. Water resources of India are under great biotic and abiotic pressure. Most of the rivers, tanks, ponds, and lakes are polluted and the ground water aquifers are being over exploited in most of the arid and semi arid regions and are on the verge of complete exhaustion/depletion due to over extraction and degraded due to leaching of fertilisers and pesticide residues from cultivated fields. In many areas the groundwater aquifers have been polluted or contaminated. The surface water is hardly fit for drinking. The natural and manmade disasters have been a bane of India's economy since time immemorial.

The more serious conflict is seen in the case of use of water in agriculture. In the case of groundwater this conflict is reflected in present V/s future use of water and in the case of surface water (River water) the conflict is seen in inter-state disputes over sharing of water. These kinds of incidences are expected to increase in future. And the availability of ground water for irrigation would emerge as a critical bottleneck for self sufficiency in food grain by the year

[70]Singh;Katar (2009): "Environmental Degradation and measures for its Mitigation with Special Reference to India's Agricultural Sector" from 'Indian Journal of Agricultural Economics', Vol.64, No. 1, Jan –March 2009.

2020[71], as demand for irrigation would exceed its availability by nearly 30 percent. Similarly, National Commission for Water Resource Development Plan has projected that the requirement for irrigation water in India would grow by more than 50 per cent by 2050. Based on various assessments it is concluded that even after fully exploiting available water resources, water supply can match the demand only if there is a big improvement in the efficiency of irrigation. While demand for water is rising rapidly, the water resource in rivers is also declining. This is happening because of siltation in rivers and degradation of water sheds due to deforestation and increased human activities.

If we can observe the per capita availability of water per year, it has declined from 5000 cubic meters in the early 1950s to 2000 cubic meters at the end of 2002. The usable quantity is around 1,122 cubic meters per year, showing an inappropriate and over use of water. Agriculture on the whole accounts for 80 per cent of water usage or withdrawal, but the estimates suggest that water availability for agriculture is going to decline by 20 per cent by the year 2020[72]. Therefore the daunting challenge in future arises from the over and inappropriate exploitation of water resources and rain-fed eco system.

There is a serious concern and concerted efforts need to be explored to plug the demand-supply mismatch and increase the per capita food availability. Climatic changes and increasing climatic variability are likely to further aggravate the problem of future food security by exerting pressure on agricultural systems. Inadequate and irregular rainfall has been responsible for many droughts, famines, rural poverty and mass migration in different parts of India. Besides floods, cyclones, heat and cold stresses are other climatic extremes adversely affecting food production.

For Indian Region (South Asia), the IPCC (Inter Continental panel on Climate Change) has projected 0.5 to 1.2 degree Centigrade rise in temperature by 2020, 0.88 to 3.16 degree centigrade by 2050 and 1.56 to 5.44 degree centigrade by 2080, depending on the scenario of future development. Overall, the temperature increase is likely to be much higher in the winter (Rabi) season than in the rainy (Khariff) season. Precipitation is likely to increase by 15-40 per cent by the end of the century. They clearly indicate that there will be an overall increase in the

[71]International Food Policy Research Institute (2002): 2020 Vision for Food, Agriculture and the Environment – "Sustainable Food Security for All by 2020 – Proceedings of an International Conference" held on Sep 04-06, 2001, Bonn – Germany.
[72]Pant K.C. (2003): "India's Development Scenario: Next Decade and Beyond.", From 'Indian Agriculture in the changing environment – Vol I', edited by Raj Kapila and Uma Kapila – AF – 2002.

highest one day rainfall over major part of the country, which might lead to a greater probability of flood, cyclones and drought events in many parts of India. *Increase in temperature can reduce crop duration, increase crop respiration rates, affect the survival and distributions of pest populations thus developing new equilibrium between crops and pests, decrease fertiliser use efficiencies, and increase evaporate-transpiration*. Indirectly, there may be considerable effects on land use due to snow melt , availability of irrigation, frequency and intensity of inter and intra seasonal droughts and floods and availability of energy. All of these can have tremendous impact on agricultural production and further on food security.

A loss of 4-5 million MT in wheat production is estimated with rise of 1degree centigrade temperature throughout the growing period even after considering carbon fertilisation[73]. Global warming could increase water, shelter and energy requirement of livestock for meeting projected milk demands. Climate change is likely to aggravate the heat stress in dairy animals, adversely affecting their productive and reproductive performance. All these trends only indicate us that the danger of food insecurity is looming large in the light of unforeseen climatic conditions which seriously can jeopardise our food grain sufficiency.

4.2.4 Environmental Challenges to Food Security

Environmental changes like global warming, green house gas emissions, hail storms, droughts, and precipitation can seriously affect the global climatic conditions that can result in uneven monsoons; unexpected and devastating floods could easily damage or even wipe out the so much of agricultural produce across the globe. At some times, there can be even situations at some places where in you will find no symptom of rains that would result in failure of crops and shortages of food grains either way. Sometimes, despite having evenly rainfall, due to the factors like land and forest degradation, loss in soil fertility due to disasters like tsunamis may cause the decrease in production. In the recent past, on the global front, there has been a overall increase in the food grain demand due to increase in population, increase in incomes, also due to the needs of seed, industrial purposes and also due to the diversion of larger amount of food grains towards cattle feed and alternative bio-fuels like ethanol -blended petrol from cassava, corn and sugarcane, bio-diesel from rapeseed, jatropha, palm-oil, etc. are being looked upon as the new

[73]Hanumantha Rao CH (2005): "Declining per capita Demand for Food Grains in Rural India- Causes and Implications", From 'Agriculture, Food Security, Poverty and Environment', Essays on Post Reform in India 2005.

centres for global warming, the effect of the diversion of arable land to bio-energy crops on food production and food security becomes topical.

All these factors have suddenly resulted in a situation like food shortages and increase in prices especially in developing countries. In north India it is observed that a 2 degree rise in mean temperature reduced potential yields of both rice and wheat by about 15 to 17 per cent[74]. In the same way, in Tamil Nadu, during the kharif season, the rice yields are expected to reduce by 10-15 percent by 2020 due to temperature and precipitation changes[75]. The magnitude of yield decline might aggravate further to 30-35 per cent by 2050.

The wheat output is expected to reach 75 million tonnes in 2020 after adopting the climate change effect (against projection of 100 million tonnes without considering climate change impact), if no new technological interventions and adaptation mechanisms are brought into place. Beyond 2020, the yield increases that have been projected on the basis of input growth are unlikely to materialize and then production would come down sharply. In the same way the high temperatures would also effect directly the production of vegetables and pulses, along with this, due to high temperatures, ground water level also might go down and also can result in the loss of soil fertility. As most of the developed countries are diverting large parts of their food grains to feed the cattle, in desperation to non vegetarian diet, would also lead to severe food shortages in future. On the other way, extreme temperature conditions would also curtail the life of small animals in future. High temperature and global warming would not only effect food security through reducing production, it also effect the health conditions of normal human beings and thereby reduces his or her working capabilities and it finally reduces his purchasing power to buy food, especially of poorer sections like SC/ST's. In future, due to heavy increase in population, land resources would be in more demand and cultivalable lands will be turned into inhabitant lands and thereby reducing the land available for cultivation that could endanger our food security.

[74]Hundal S.S. and Kaur Prabhjyot (2007) Climatic variability and its impact on cereal productivity in Indian Punjab: a simulation study. Current Science, 92 (4): 506-511.
[75]Geethalakshmi V. and Dheebakaran Ga. (2008). Impact of Climate Change onAgriculture over Tamil Nadu. Chap IV. In: Rao Prasada, G.S.L.H.V., Rao, G.G.S.N., Rao, V.U.M. and Ramakrishna Y.S. (eds.). Climate Change and Agriculture over India, CRIDA, Hyderabad, pp.80-93.

Moreover, roughly around 17 units of cereal feed are used globally to provide 1 unit of livestock product protein output. According to US estimates, production of 1kg beef requires the input of 16 kgs of grain and soya feed. *In these terms, poultry appears more efficient. The growth of animal agriculture and the meatification of diets require more land to be cultivated per person than would be required for more plant based diets*. Roughly half of all cropland worldwide is used for animal feed led by large percentages of maize and soya beans. Increasing animal production expands not only agricultural land space but its demands on other resources such as water and energy and also requires more fertilizers and chemical waters, for e.g: livestock in USA consume roughly 70 per cent of all domestic grains. Interestingly, an edible unit of protein from factory farmed meat requires 100 times more fresh water and more than 8 times the fossil fuel energy than does an edible unit of protein from grain. Also, meat and dairy have higher refrigeration demands. The waste of farm animals also contribute to 16 per cent of the world's emission of methane, a greenhouse gas and which are projected to increase by 60 per cent in coming decades[76].

4.2.5 Current Trends in Agriculture – Implications

One side the disposable income and urbanisation are on the rise. On the other side domestic market is loosening and agriculture is slowly integrating with the global economy which is not a very encouraging trend towards achieving self sufficiency in food grain production, as our agriculture cannot with stand with the competition from global agricultural goods, there is every need to protect our vast number of farmers. It is a fact that cost of cultivation of the important crops has increased owing to rising prices of inputs and slow growth in yields. And the absence of corresponding mechanism to ensure the desirable prices paid by the consumers to farmers has affected the viability of farming. This trend seriously impairs the possibility of reaping economies of scale in the agricultural sector, even if capital investments are made.

*Role of Subsidies

Almost 14 per cent of the total expenditure of the government is on subsidies to the agricultural sector while the share of capital expenditure is around 13 per cent. This indirect support to agriculture in the form of subsidies has gone beyond Rs.1, 00,000 crores annually in the forms of

[76]Weis; Tony (2007): "The Global Food Economy: Contradictions and Crises", from 'The Global Food Economy – The battle for the future of farming' -2007. Zed Books – Fern wood Publishers.

food, fertiliser and power subsidies (Rs.46, 906.68 crores of annual food subsidies in 2009-10, Economic survey 2009-10). More interestingly these misguided agricultural subsidies towards electricity, fertiliser and procurement have also played a major role in distorting popular perceptions about the quantum of the state's spending on agriculture. To our dismay, these subsidies have mostly benefited the relatively well off farmers and have left the vast majority with little or nothing to survive, just like the recently announced loan waiver scheme of the UPA government in the year 2007. *This is clearly at the expense of expanding the irrigation system, and improving the rural infrastructure like roads, transportation and storage facilities, which have the potential to increase the agricultural productivity in the long run*

This trend in favour of subsidies is clearly at the cost of long term investments in the all round well being of the agricultural sector. Moreover the government's pricing and procurement system also defective, which is expected to intervene actively through the FCI and PDS in order to keep the prices low. But the role of the middlemen only further aggravates the situation. Government's food grains procurement policy is lopsided and clearly reveals a bias towards certain states while the others are languishing in the need of procurement policies.

***Investment in Agriculture**

The investment in the agricultural sector declined during the past two decades, particularly from the public sector. The share of agriculture in total Gross Capital Formation in agriculture **(GCF**) was *just 8.39 per cent in 2008-09 against 16.3 per cent in 1980-81*. Unfortunately the GCF in the agriculture sector by the public sector declined at annual average rate of 4 per cent and 1.9 percent during the 1980's and 1990's respectively. The share of public sector in GCF fell from 51.3 per cent in 1980 to 17.6 per cent in 2008-09 and the remaining 82.4 per cent investment is from the private sector. It led to an increase in the private investment in agriculture, which led to the commercialisation of agriculture disregarding the necessity of food grain production. This kind of low attention by government towards agriculture has led to the further deterioration in agricultural productivity and more importantly food grains, during the post liberalisation period. This has made vast number of small and marginal farmers to quit agriculture or their lives at times, as it became unviable. These trends have led to increase in food prices, which again hit the lives of small and marginal farmers and other poorer and weaker sections quite heavily and

negatively, as they were pushed away from accessing food items as they became expensive. It can be evident from the fact that the malnutrition (380 million suffering from malnutrition) has increased more rapidly during the post reform period.

***Structural Complications**

Almost 60 per cent of India's cultivable area continues to be rain fed. This vast un-irrigated cropped area of 135.6 million hectares (192.6 million hectares is the total cropped area - 1999) is also the place where the majority of the 193.2 million rural poor lives. Even most of the 67.1 million who live below the official poverty line in urban India are the migrants from rural India.

Even when we compare our production levels globally, unfortunately find ourselves way behind many developing countries. The per hectare yield of rice in India (metric tonnes) is *only 2.9, lagging behind many countries like Egypt 9.8, Japan 6.4, Korea 6.7, USA 7.8 and the world average is 3.9.* Even we find lot of differences with in India among our states in terms of production and per hectare yield. This is the gap that has to be tapped to enhance the food grain production levels, especially in the light of global warming and depleting water resources, so that food security can be attained in future.

This inability to buy enough food will not be mitigated by just producing more. The problem of food insecurity arises out of low productivity along with low purchasing power, inadequate infrastructure, a gross inequality of state conferred benefits and a perceptible withdrawal of the state from the agricultural sector.

It's the strong historical attachment to farm land and its ownership it is virtually difficult to increase the farm size directly by expecting the farmers to surrender their land. It is only through intensity of cultivation through irrigation and high yielding varieties that the size of the land can be increased implicitly. Another limitation is subsistence agriculture of large number of farmers especially of food grains and very little marketable surplus that they generate. Their holding capacity is very weak and hence in the post harvest period due to increased supplies they get lower prices for their produce. It is the Income Revolution Policy that central government will have to evolve in co-operation with state governments with initiatives on marketing agri-produce, institutionalising the Commodity Boards managed by the farmers and finally by activating the agro-processing at the farm gates that will help increase the volume of agri-GDP

commensurate with the burden of rural population in each state in order to better their conditions as well as to enhance the production effectively.

***Land Use Pattern**

In India area under crops dominates the land-use pattern by accounting for 142 Mha (43 per cent of total area), followed by area under forest (67 Mha) and wastelands (72 Mha). Dryland agriculture accounts for nearly 60 per cent of the cropped area and irrigated area accounts for the rest. Generally the perception is that Indian agriculture and food production is highly prone to fluctuating monsoons. In the recent times, according to Forest Survey of India (FSI, 2007), the area under forest cover seems to have got stabilized or increased slightly. It can be attributed to the fact that conversion of forest land for crop cultivation and other commercial uses is controlled under the Forest Conservation Act of 1980. India is also implementing a large afforestation and reforestation program at a rate of around 1.32 Mha per year during the period 1980–2005[77]. According to estimates made by NRSA (National Remote Sensing Agency 2005) the area under wastelands is estimated to be 55 Mha consisting of 18 categories of degraded lands. According to Ministry of Rural Development the area under barren and uncultivated land, permanent pastures and grazing land, cultivable wasteland and fallow land is 72 Mha during 2007[78].

4.2.6 Conclusion

As the spread of improved technology is found to be associated with decline in variability in production there is a need to pay special attention to production and distribution of seed of improved varieties to bring stability in production. Expansion of area under irrigation, development of water shed, and development of varieties resistant to insects, pests and climate stress are the other major factors for reducing variability in area, yield and production. There is also a need for large scale promotion of stabilisation measures like crop insurance to face the consequences of production fluctuations.

[77]Chinmoyee mallik (2009): "Urbanisation and the peripheries of Large Cities in India: The dynamics of Land Use and Rural Work", from Indian Journal of Agricultural Economics, Vol.64, no.3, July-Sept. 2009.
[78]Acharya; Shabd S (2009): "Food Security and Indian Agriculture: Policies, Production Performance and marketing environment", from Agricultural Economics Review, Vol.22 Jan –June 2009 pp 1-19.

Adequate per capita availability of food is a function of the balance between food production on the one hand, and growth in population and purchasing power, on the other. Urbanisation enhances the consumption of animal products and thereby increases the demand for feed grains and fodder. In spite of the success of the population stabilising efforts in many developing countries, the UNO projections indicate that the global population may range from 8 to 10 billion by 2050. It projects and refreshes the additional challenges continuously through different means. Since land and water are shrinking resources for agriculture, there is no option except to produce more food and other agricultural commodities from less per capita arable land and the irrigation water.

Higher demand for food can only be met through higher yields per unit of land, water, energy and also duration. Therefore there is a need to examine how science can be utilised for increasing biological productivity without harming the sustainable development. It will be appropriate to refer to the emerging scientific progress on the farms as an "ever-green revolution" With increasing globalisation of economies, it will be necessary to agree at the international level that safe guarding and strengthening the livelihood security of the poor should be a major goal of liberalised trade. The current trend of increasing rich-poor divide will have to be stopped, if social conflicts are not to increase.

According to the Asian Development Bank (2011), *over 900 million out of the 1.3 billion persons currently living on a per capita daily income of less than 1 us dollar are in Asia*. It is observed that one person out of three in Asia is poor. Poverty is the main cause of food insecurity at the level of individuals today. Most of the new jobs or livelihood opportunities in Asia will have to come from the on-farm and rural non-farm sectors. Macro-economic policies at the national and global levels should ensure that they help to strengthen micro-enterprises supported by microcredit. Technology and trade should become allies in the movement for a more equitable world. It would be useful if it could organise a virtual College together with WTO on the theme "Trade as an instrument for poverty eradication". This will help to strengthen the livelihood security of the poor, so very essential for food security. Through appreciate blends of technologies and public polices we now have opportunities for achieving the human quest for a hunger-free world by the year 2020.

Agricultural development should be considered as an inclusive concept: for instance, animal husbandry, horticulture, dairy development, fisheries, forestry and wild life, plantations, soil and water conservation, food processing, storage and warehousing, drainage and flood control-all these impinge directly or indirectly, over agricultural development. Diversification of agriculture should be viewed as part of the wider objective of rural diversification. The livestock sector is particularly important because its development would facilitate many marginal farmers; they form 60 per cent of operational holdings, crossing the threshold of economic viability. The new strategy of agricultural growth and diversification of agriculture from traditional crop cultivation to horticulture etc... requires investment in cold storage, rural roads, communication, marketing network facilities and warehouses etc. Simultaneously they should be made to revitalise agriculture through the introduction of bio technology and other innovations. Exporting food grains on a massive scale, we must realise, is a development atrocity.

Chapter V
Trends in Food grains Production and Self Sufficiency

In this chapter we try to present the performance of food grain production in India and try to analyse the attainment of self sufficiency and challenges involved in it. More importantly, we try to analyse the factors that have determined the fluctuations in productions. For this purpose, we take up the food grain production data since 1980s, especially Rice, Wheat, Pulses and also total food grains together and try to draw the inferences. Based on these inferences we will examine the trends as well as causes, opportunities and challenges, and make appropriate projections. Therefore, we take up the data at an aggregate level and also most of important food grain producing states.

Agriculture is often described as the bedrock of our economy and the most commonly cited reason is that almost 58 percent of the labour force derives their livelihood primarily from agriculture and this segment of population, where incomes are generally lower than in the rest of the country and in the short run, increased income generation in agriculture will clearly help increase incomes in this segment. This shift from agriculture to non agriculture is not meant to be a consequence of any neglect of agriculture. On the contrary, it is necessary if we want to ensure that the productivity gap between agriculture and non agriculture is not widened further. If we want to bring about a rise in income levels for the population and also to create the additional jobs needed to absorb the new entrants into the labour force, we need to achieve a growth rate of GDP of around 8 per cent per year. Our calculations in the planning Commission suggest that this 8 per cent growth in GDP requires growth of agricultural GDP to be around 4 per cent. In the 15 years after 1980, growth of agricultural GDP was around 3.4 per cent. This was lower than the 4 per cent growth needed, but it was sufficiently close to it to believe that a little more effort within the same strategy would yield the growth results we want. Since the periods following 1996 growth of agricultural GDP has declined to around 1.7 per cent. Underlying this slow down is a slowing down in the growth rate of yields per hectare in almost all crops. To move from this performance to the target growth rate of 4 per cent in the years ahead involves more than doubling of the existing underlying trend in agricultural growth.

5.1 Global Status of Indian Agriculture in Production:

Considering global context, after USA and China, India stands at 3rd place in the production of cereals. Considering the growth rate of population of 2.1 per cent between 1950-51 and 2006-07, the annual average growth rate of cereals was 2.5 per cent. To some extent, except occasionally, this has prevented food imports between 1976-77 and 2005-06. But unfortunately between 1990-2007, the growth rate of food grain production has come down to 1.2 per cent, during the same time the growth rate of population has increased to 1.9 per cent, showing a clear indication of decrease in food grain self sufficiency. At the same time, the per capita consumption of cereals had come down from a high point of 468 grams per day per person in 1990-91 to 444 grams per day per person in 2008-09, showing a clear decline of 05 per cent during this period.

V.1 Changes in the Per Capita Net Availability of Food grain per day

Period	Average(grams per capita per day)	% change from previous Period
1951-1960	429.83	-
1961-1970	447.53	4.12
1971-1980	442.20	-1.19
1981-1990	464.20	4.98
1991-2000	475.51	2.44
2001-2005	454.20	-4.50
2006-09	442.22	-2.6

Note: The net availability of food grain is estimated to be gross production less seed, feed and wastage and ex[ports plus imports and drawdown of stocks. Source: Agricultural Statistics at a glance. From Report on the food insecurity in Rural India (MSSRF – WFP 2008).

Through the period from 1950s till 1990s, the per capita net availability of food grains had increased steadily, with rare fluctuations as the role of imports decreased steadily since 1960s. But the above table shows that the food grain availability has declined by 4.5 per cent between the period 1991 and 2005, after registering a low level of increase in the period 1991-2000 as we compare it with the period of 1981-90. It is still on the declining trend.

5.2 Complications in Agrarian System

There has been a loss of dynamism in the agriculture and allied sectors in recent years. A gradual degradation of natural resources through over use and inappropriate use of chemical

fertilisers has affected the soil fertility resulting in stagnation in the yield levels. Public investment in agriculture has declined and this sector has not been able to attract private investment because of lower/unattractive returns. New initiatives for extending irrigation potential have had a limited success during the 10th five year plan and only a little over 8 million hectare could be brought under irrigation and only three fourths of that could be utilised. The agricultural extension system has generally not succeeded in reducing the gap between crop yields that could have been obtained through improved practices. The government of India has launched a *National Food Security Mission* and *Rashtriya Krishi Vikas Yojana* to rejuvenate agriculture and improve farm income. Since these programmes are in the budding stage, it is not possible to assess their impact. A second green revolution, particularly in the areas which are rain fed, may be necessary to improve the income of the persons dependent on the agriculture sector.

5.3 Input Growth

Growth of input use in agriculture also decelerated after 1996-97, to about 2 per cent per annum from over 2.5 percent during 1980-97. The second, mainly after 1997-98, when reversing an earlier trend, output prices began to fall relative to input prices. Part of the deceleration in agricultural growth can, therefore, be attributed to lower profitability leading to slower increase in input use. But, in addition, growth of input productivity (defined as difference between output and input growth) fell from about 1 per cent per annum prior to 1991and negligible thereafter[79].

The poor performance is more worrying in view of the fact that the underlying trend of rice and wheat production was already less than population growth by the end of the 9th plan. Yield rate decelerated throughout the 1990's to only about 1 per cent per annum from 3 per cent during the 1980's, indicating a potentially serious exhaustion of technological progress. The huge stocks that emerged at the end of the 1990's have so far masked this. But, since large exports at below domestic prices and subsequent poor monsoons have now reduced stocks to almost normal, a significant production effort is necessary to meet the requirement. For this, it will be essential to tap potential of the eastern region ensuring adequate price support and removing

[79]Singh, Sukhpal (2009): "Implications of Corporate Entry into Agricultural Input Output Markets and Its Impact on Small Producers and Consumers", from Indian Journal of Agricultural Economics, Vol.64, no.3, July-Sept. 2009.

distortions that have recently depressed prices in this region because of sale from stocks built up from traditional surplus areas through high Minimum Support Prices (MSP).

5.4 Food Grain production in the Post Reform Era

If we analyse the per hectare agricultural yield we find a very dismal figure in its growth in the post liberalisation period. The compound growth rates for food grains, non food grains and all crops in the period 1991-92 to 2000-05 were only 1.53, 1.41 and 1.49 percents per annum respectively as against the figures of 2.77, 3.08 and 2.89 percents per annum respectively during the period 1951-52 to 1990-91. Though the mean yield for the period for food grains (116.09 kg/hactare) is higher than the non-food grains (107.20), the yield growth has shown more fluctuations for food grains (Coefficient of Variation (CV) is 6.79) than non food grains (C.V. is 4.89). However, the average yield for all crops has increased with highest degree of consistency (C.V. is 4.72). If we can look at the yield figures in terms of kg. /hectares, the highest mean value is obtained for wheat (2584.71) to be followed by rice (1900.5). Further the average productivity for cereals is more than that for the food grains. However, highest degree of variability is being found in case of cereals to be followed by food grains category. The variability is slightly larger in case of rice (C.V. is 6) than wheat (CV 5.81).

Following the trade liberalization, it was expected that difference between domestic and international prices would reduce, whereas the domestic prices of food grain in the country has been deliberately kept at low level for the poor. It is often feared the soaring agricultural prices would deprive them of essential food ingredients, there by jeopardising food security. Thus, the concern for food security at micro level appears genuine in a globalized world. This assumes even greater importance for a country with more than 300 millions of poor, more so when there are studies to report that poverty increased in the early years of 1990's following liberalization. During the early 1990's exports restrictions for a larger number of agricultural commodities were removed, while imports largely remain restricted. As a consequence, exports of agricultural commodities increased during the 1994-95. Subsequently, domestic prices of exportable commodities increased and consumers were at disadvantage position.

The situation would not have been so, had liberalization in exports been accompanied with that imports. In the earlier years of trade liberalization, restrictions in imports continued on the

ground of supporting domestic farmers. But small and marginal farmers constituting ¾th of farming population are also net purchases of food grains. The higher prices of agricultural commodities had also shown affect on them which ultimately led to the incidence of food insecurity.

5.5 Agriculture and Trade Liberalisation:

As part of the neo liberal reforms and structural adjustment programmes from the 1990s, there started a gradual reduction in public investment and other support system for agriculture and there was also a decline in the amount spent on rural development per year, which came down from 3.8 per cent (per cent in NNP) in 1985-90 and later came down to 1.9 per cent of NNP in 2000-01 and it had increased little bit to 2.3 per cent in 2004-05 and 3 per cent in 2008-09.

Trade theorists believe that trade brings about a great deal of flexibility in the matter of food security for developing countries**.** Trade helps in augmenting availability in developing countries, it helps in smoothening very large fluctuations in domestic output, and is also expected to increase access of the poor to food, as free trade is expected to foster growth and increase the employment opportunities of the poor in labour intensive export activities. But the pre requisites are that developing countries should have enough foreign exchange resources for the import of food grains. The second condition is the reliability of international markets as a source of affordable food supplies. There can be serious problems on both these accounts.

A detailed review of trade and food availability shows that many of the benefits expected from trade liberalisation have not accrued for several reasons. First regarding availability the WTO (World Trade Organisation) AoA (Agreement on Agriculture) envisaged that the developing countries would reduce their support to agriculture. The consequent rise in prices would induce greater production in developing countries. But this has not happened as the developed countries have failed to reduce their domestic support to agriculture. Furthermore, for the same reason, there has been no reduction in the volatility of international prices and price stability has so far eluded the developing countries. The slowdown in the world economy since 1997-98 has resulted in income growth in all the developing countries. The policy makers have realised that food security can only be provided through increased production of food grains, stability of supplies, and more access through rise in income levels of population. *The main policy*

instruments for augmenting growth were land reforms, large investment in rural infrastructure, and the introduction of better technological practices.

5.6 Food Security in the post Liberalisation Era

The developments that were taken place in the food security situation during post liberalisation period are... firstly, on the positive side, since the GDP and per capita income recorded fairly high growth rates during the 1990's, the economic access of the population to food has certainly increased, on an average. But the growth rate of agricultural GDP shows a visible deceleration at 1980-81 prices. Higher growth was mainly because of the assured contribution of fruits and vegetables, since the growth rate of crop production registered a significant decline.

Thus the food security situation has deteriorated on many counts. Coming first to availability, food grains output has registered a significant decline during 1990's. Therefore, the per capita availability of food grains has actually declined from an average of 485 grams/day during triennium ending (TE) 1990 to only 444 grams/day during TE 2008-09. But despite lower output, FCI accumulated huge stocks of food grains. The main reason for this is a perceptible decline in the demand for food grains is firstly because of diversification of food basket over time. *But an important reason for decline in demand during the 1990's is due to very large hikes given to rice and wheat prices under the pressure of surplus states and also perhaps under the influence of international agencies. The result is that many poor households have been priced out and thus pushed away from food secured position*[80].

The tinkering with the PDS, making it targeted PDS and keeping the prices for the above poverty line (APL) public distribution beneficiaries very high (sometimes higher than the open market price) has contributed to a steep decline in off take. The exports of wheat and rice have also become unprofitable at the current price mainly because of the downward trend in international prices. On the other hand, the procurement of rice and wheat is increasing every year even during the years when aggregate output of wheat and rice has declined. The private sector also opted out because of higher prices and has depleted its stocks. All the emerging surpluses have, therefore to be procured by the FCI. The consequence is mounting stocks co-existing with unfulfilled demand for food grains.

[80]Hanumantha Rao CH (2005): "Declining per capita Demand for Food Grains in Rural India- Causes and Implications", From 'Agriculture, Food Security, Poverty and Environment', Essays on Post Reform in India 2005.

The high price of food grains is the main cause of this disarray in the Indian food market is borne out by the fact that recently with the decision to reduce both BPL and APL prices in 2010; the off take has increased significantly. Further some, with the decision to give transport subsidy to exporters and allowing them to lift food grains at concessional prices, exports have also registered a notable increase. The result is that food stocks which had reached a level of 58.1 Million tonnes in Jan 2002 have come down by 48.2 MN tonnes in Jan 2003 and 25.2 MN tonnes in Jan 2004[81].

The lesson is that one of the most important components of food security is a reasonable price at which all sections of the population, including the poor, can afford to purchase sufficient quantities of food to meet their food security requirements. Finally the most serious aspect of food management during the recent period is a deliberate attempt to erode the credibility of the food management system. This applies to PDS as much as to the policy for minimum support which is sought to be replaced by insurance…etc. putting the Indian farmer once again at the mercy of the insurance agents and the food security at stake.

5.7 Trade Liberalisation and the state of Indian Farmer

Economic liberalisation introduced in India during 1991 brought about a significant change in the macro-economic policy framework that has directly and indirectly influenced overall and sectoral patterns of growth of the Indian economy through macro-economic policies in general, and through exchange rate adjustments and tariff policy changes, in particular. The condition of the farmer is determined first and foremost by the growth of the economy in general and growth of agriculture in particular; growth in exports and imports consequent to economic liberalisation; the distribution of gains of growth; availability of farm and nonfarm rural employment, poverty, food security nutrition situation; and terms of trade for agriculture vis-a-vis non agriculture.

Under WTO-AoA, all member countries have made commitments regarding market access, domestic support, export subsidisation and Sanitary and PhytoSanitary (SPS) measures. At present, India has no reduction commitments regarding export subsidies. But, in the matter of domestic support, there is an exemption from reduction commitment only up to a de minimum

[81] Sabnavis; Madan (2010): "Revamping Food Procurement and Pricing Policies", from Yojana Oct 2010.

level of 10 percent both in the matter of product specific and more so in the matter of non product specific support. At present, India's product specific support is highly negative, but its non product support was 8.6 percent of value of agricultural output (as against a de minimum level of 10 per cent of agricultural output) during 1999-00. However, total AMS (aggregate minimum support) support to agriculture is highly negative and well below the de minimum levels. Further, India cal also undertakes any amount of expenditure for infrastructure development under the green box and provides support to the resource poor farmers under the SDT.

Market access provisions were meant to benefit developing countries and India was expected to gain from agricultural markets of developed countries. Indian agriculture has not been able to derive large benefits from trade liberalisation under the provision of market access. This is mainly because the developed countries made access difficult for some high value diary and meat products through high tariff ceilings and tariff escalation. More importantly, huge domestic and exports subsidies given by the developed countries inhibited exports from developing world. Very high SPS standards also acted as barriers to their exports. Hence, despite competitive edge in many agricultural commodities, the gains to farmers from agricultural exports were much lower than expected.

5.8 Obstacles to Farming

An obvious example of the policy shift from people centred concerns to trade and corporation-centred concerns is the fact that while farmers are not allowed by law to take their produce beyond their state borders, traders can pick them up anywhere and take them anywhere. In fact, the government is building super highways, after forcibly taking away land from farmers and communities to connect centres of agricultural production to airports and ports, so that corporations can quickly transport these commodities for export.

The policy changes induced by trade liberalisation include: dismantling the Food Corporation of India (FCI) and reduce its role in procurement from farmers; removal of QRs (quantitative restrictions) on imports of food and agricultural products; the amendment of the Public Distribution System, to cater only to the BPL category of the population; increase in the central issue price, from Rs. 450/quintal in April 1995, to Rs. 682 quintal in April 1999, and to Rs.

900/quintal in 2000; and increased price of food available through the targeted PDS to the BPL as a result of transferring 50 per cent of the procurement and distribution costs of the government to this category. These changed policies have had disastrous impacts for both farmers and consumers.

5.9 Complications for Farmers

- Government procurement centres refusing to purchase food grains from farmers.
- The refusal of the government to enforce MSP on private traders and corporations, forcing
- Farmers into distress and sale of food grains at far below production costs.
- Dumping of cheap, subsidised agricultural products by other countries in the Indian market
- Made their products unworthy and uncompetitive.
- Higher increase in price of farm inputs, cost of production including seeds, low govt investment led to the worsening of situation.
- Liberalising seed regulations to allow private seed companies to sell uncertified seed led to the spurious and impotent production.
- Also led to deepening of farmers' debt, increased mortgages and land alienation, increased destitution, suicides and sale of body parts among farmers.

The prosperity that globalisation was suppose to spread is fast proving to be elusive. Trade liberalisation and globalisation has resulted in thousands of farmers sacrificing their lives and livelihoods. In fact, the most prosperous state, also called the breadbasket of India, Punjab, has left behind Andhra Pradesh in the notorious distinction of farmers' suicides.

5.2.0 Complications in Consumption Pattern

- There arose a situation of massive reduction in the number of people accessing food from the targeted PDS due to the inability of the government to identify the BPL category of people.
- Also led to the inability of the majority of even the few BPL identified to purchase food-grain from Fair Price Shops due to increased prices.

- Led to the drastic increase in food prices by over 60 per cent since the initiation of trade liberalisation measures and over 200 per cent in commodities like pulses. Reduced PDS off take by states due to increased issue prices.

The shift from PDS for all to Targeted PDS was justified on grounds of reducing government expenditure. However, with trade liberalisation, the PDS costs to government have risen from Rs. 5,166 crores in the mid 1990s to Rs. 9300 in 1999–2000. While the government blames farmers for this increased expenditure, but the primary reason is the increased cost of food to consumers as a result of policy changes, resulting in a drastic decline in purchases from the Fair Price Shops.

5.2.1 Declining food production

Export-oriented agricultural policies that push the small farmer to destitution on the one hand, and promote cash cropping on the other, have resulted in a steady decline in food production since the early 1990s. The collapse of domestic support for food production (through dismantling the MSP, rising costs of inputs, crop failure due to uncertified seeds) in the late 1990s has intensified this shift, as farmers are desperate to recover their losses. For instance, there has been a decline in food production to the order of 12.8 per cent in just one year i.e between 2000 –2001.

On the supply side the factors responsible for shortage in food grains are reduction in food grain production, diversion of food for non food use, an increase in the cost of inputs such as a rise in prices of crude oil and other sources of energy. The demand side factors on are higher use of food, which could be the result of growth in population, improvement in purchasing power, shifts in dietary patterns give to an increase in incomes or changes in tastes. Prices can also increase due to speculative investments in commodity markets and artificial scarcities created by business firms or other entities. All these factors helped in to create a situation of food insecurity.

V.2 Per Capita Production of Food grains, kg/year: 1971-2009.

Year	Cereals	Pulses	Food grains
1971-75	164	19	183
1976-80	172	18	190
1981-85	179	17	196
1986-90	182	16	198
1991-95	192	15	207
1996-2000	191	14	205
2001-05	177	12	189
2006-09	174	13	184

Source: Economic Survey of India, GoI, Various Issues. Think India Quarterly, Vol 13, No 03.

India achieved impressive growth in food grain production after the adoption of green revolution technology. Per capita production of food grains, per year, increased from 183kg during the early 1970's to 207 kg by mid 1990's despite the increase in population by 50 percent. However, after the mid 1990's food grain production did not keep pace with population growth. Per capita production of cereals has declined by 17kg and the production of pulses by 2 kg during the last decade. In contrast to foodgrains, production of all other food items like fruits, milk, eggs, meat, fish and sugar has remained much higher than the population growth which has resulted in considerable improvement in per capita production and per capita consumption of livestock, horticultural and fishery products. It is interesting and ironical to point out that the decline in per capita production of cereals has coincided with a sharp increase in the export of cereals from the country. This underscores the need for improving purchasing power of the low-income consumers along with an increase in the production of cereals and pulses with the growth in population of the country.

5.2.2 Decline in Consumption

A major impact of trade liberalisation policies has been a general lowering of food consumption. It can be seen from the per capita cereal consumption that has declined from 17 kg per capita per month in the 1950s to 13.5 kg per capita per month in the 1990s, 11.42 kg in 1999-2000, 11.36 kg per month in 2003-04 and 10.65 kg per month in the year 2006-07. The National Nutrition Monitoring Bureau (NNMB) 1997 data shows a declining trend in consumption in rural India, particularly in cereal and millets, the main source of energy for the poor, from 1990–1995.

The most important reasons for the decline are: rising food prices, destruction of livelihoods, destruction of the PDS system and shift to export oriented crops. The reduced consumption on the one hand, and decline in production and procurement on the other are directly linked through the food and agricultural policies of the government. Colonialism had destroyed the food sovereignty of the country, forcing changes in cropping from food for local and regional food security to commercial crops. Rice particularly had become a commercial crop even within the country.

V.3 Share of Monthly Per Capita Expenditure on Food Items (%)

Year	Rural Cereals		Urban Areas	
	Cereals	Non-cereals	Cereals	Non-cereals
1972-73	55.7	44.3	36.12	63.88
1977-78	51.01	48.99	34.17	65.83
1983-84	49.24	50.76	32.83	67.17
1987-88	40.99	59.01	26.46	73.54
1993-94	38.3	61.7	25.69	74.31
1999-00	37.31	62.69	25.7	74.3
2000-01	35.58	64.42	25.13	74.87
2001-02	34.55	65.45	24.3	75.7
2002 (July-Dec.)	33.1	66.9	23.42	76.58
2003 (Jan-Dec)	33.41	66.59	23.76	76.24
2004 (Jan-June)	33.55	66.45	23.92	76.08
2004-05 (July-June)	32.72	67.28	23.65	76.35
2005-06 (July-June)	31.91	68.09	23.47	76.53
2006-07 (July-June)	31.59	68.41	22.97	77.03

Source: Various NSSO Rounds and Ministry of Agriculture, GoI (11349).

Cereals are the main sources of protein for rural poor people of India. But if we observe the above table, it clearly shows that the share of monthly expenditure of rural people in India over cereals has been on the decline showing a decline from 55.7 per cent to 31.59 per cent during the period 1972-73 to 2006-07, showing an aggregate decline of 24 per cent. At the same time the share of expenditure on non food items has increased from 44.3 per cent in 1972-73 to 68.41 per cent in the year 2006-07, again showing an increase of 24 per cent.

Coming to the urban areas, we will find a slight variation in these figures. Usually the people in urban areas spend less percentage of income on cereals and more on non cereals compared to rural areas. Therefore there is an expenditure decline on cereals, but this rate of decline has not been as high as in the case of rural areas. It has come down from 36.12 to 22.97 per cent during the study period. At the same time, the expenditure on non food items has increased from 63.88 to 77.53 per cent. This table clearly shows that the expenditures of both rural and urban people on cereals have come down and expenditure on non cereals has increased. But this rate of changes is more prominent in rural areas than in urban areas. Reasons for decline in cereal consumption can be attributed to the change in dietary pattern as people started shifting away from traditional cereals to other items like meat, fish, eggs, fruits, vegetables etc., This may be true to some extent, but we cannot generalise this trend to the whole population especially to the rural poor., because most of the rural poor in India still depend on cereals heavily for their daily diet. Other factors that are responsible for this decline in this cereal consumption are the decline in area, production and yield of cereals, change in climatic conditions and increase in prices due to fluctuations in political and physical environment. Therefore this decline in cereal consumption can be termed as the increase in food insecurity in India more so in rural areas.

5.2.3 Terms of Trade[82] in Agriculture

On the other hand, imports of some agricultural commodities, in particular, edible oils have risen at a very rapid rate with adverse consequences for oil seed farmers in the dry land regions of India. While liberalisation is expected to benefit Indian farmers through increase in exports, the harmful effect of cheap imports on the income of the farmers in some regions can also not be ruled out in future.

Indian farmers did derive some gain from exports during 1990's. But, in this perspective, one has to remember that India's exports shared only 5 per cent of value of agricultural output and 6.1 per cent of agri GDP with imports sharing 2.6 per cent of GDP in the year 2000-01. Consequently, in absolute terms, the gains from exports are only limited and only a very small proportion of the farming community in some regions has benefited from them. However, India

[82] Terms of Trade is "*ratio of prices received by the farmers (for the products sold by them) to the prices paid by them (for inputs and consumption goods purchased by them) to the prices paid by them (for inputs and consumption goods purchased by them)*

has a large potential to increase its agricultural exports in a liberalised world once the developed countries agree to eliminate their subsidies.

V.4 Exponential Growth rate of Pulses and Food grains Imports (Between 1980-81 and 2007-08)

	Pulses	**Foodgrains**
1980-81 to 2007-08	9.37	2.50
1980-81 to 1994-95	10.17	-3.12
1995-96 to 2007-08	18.39	8.32

Source: Calculated on the data derived from Ministry of Agriculture, GoI

Since ours is predominantly an agrarian economy, at least during this 30 year period, naturally we did not have to import food grains. Considering the fact that we have a vast agrarian structure, instead of emerging as a dominant exporter of food grains in the world, we have just managed to produce enough to feed our population though we have started exporting at a decent amount in the later period. That way we have not had to be that much dependent on food grain imports. But off late i.e in the year 2007-08 as we had landed up in a peculiar juncture due to various structural, climatic and environmental factors, we had no option but to import a huge amounts of wheat to the tune of 5.85 million tonnes from international markets. Another fact that emerges out of the above table is that the import of pulses has been on the rise during this 27 year period, showing exponential growth rates of 9.37 per cent. If we observe the first period of 1980-81 to 2007-08, the growth of pulses' imports was 10.17 per cent in the first period and it has reached to the level of 18.39 per cent in the 2nd period. It only shows that we have not been able to attain self sufficiency in pulses production despite the fact that we cultivate pulses extensively.

Coming to the imports of total food grains, though we have not had to import much of cereals, due to poor production performance of pulses, the import growth rate during the entire period was 2.50 per cent and if we observe the first period exclusively, the growth has been negative i.e -3.12 per cent, showing that we became self sufficient and have not had to import food grains. But surprisingly in the second period, import growth rate of food grains has increased from -3.12 to 8.32 per cent; it only shows that the food grain imports have increased on a

massive scale especially pulses, especially during second period involving liberal economic reforms and free trade that have affected our agriculture quite severely.

V.5 Exponential Growth rate of Food grains Exports between 1980-81 and 2005-06 (%)

	Rice	Cereals	Pulses	Food grains
1980-81 to 2005-06	12.71	14.04	27.40	14.27
1980-81 to 1994-95	3.95	4.77	33.77	5.11
1995-96 to 2005-06	2.69	8.09	16.35	8.30

Source: Calculated on the data basis of Ministry of Agriculture, GoI

Table presents the exponential growth rates of food grain exports involving Rice, Cereals, Pulses and Food grains. Our cereals primarily comprise of Rice and Wheat, but as we cultivate and consume more of Rice and less of wheat, we have just managed to produce wheat that would be just sufficient enough to meet our domestic demands. Therefore, as far as food grain exports are concerned, mostly we will not be extensively talking about wheat. Table shows that the Rice export Growth rate between 1980-81 to 2005-06 is 12.71 per cent, but in the first period this was just 3.95 per cent and it has come down to 2.69 per cent in the second period between 1995-96 to 2005-06, indicating a decline in the exports. In the same way though the total Growth rate of cereals is 14.04 per cent, it was just 4.77 per cent in the first period and has increased to 8.09 per cent in the second period. In contrast to Rice, here the export growth rate of cereals has increased in the later period; it can be due to good performance of other cereals.

In case of pulses, the growth rate in the total period is 27.40 per cent, and it has decreased from 33.77 per cent in the first period to 16.35 per cent in the second period exhibiting a large decrease in the exports of pulses in the second period which is clear indication of either decrease in production or increase in demand of pulses. In case of total food grains, the total growth rate is 14.27 per cent, and it has increased to 8.30 per cent in the second period from the rate of 5.11 per cent between 1995-96 and 2005-06. This increase in the export of food grains can be attributed to the strategy, export led growth, which has been adopted as part of liberal trade policy. This increase in exports is in no way can reflect the ground reality of either self

sufficiency or food security. Because it is during the second period that food insecurity situation in India has got deteriorated much deeper than the earlier period.

V.6 Proportion of Agriculture Trade to Total Trade

year	% of Agri Imports to National Imports	% of Agri Exports to National Exports
1990-91	2.79	18.49
1991-92	3.09	17.80
1992-93	4.54	16.84
1993-94	3.18	18.05
1994-95	6.60	15.99
1995-96	4.80	19.18
1996-97	4.76	20.33
1997-98	5.70	19.09
1998-99	8.17	18.25
1999-00	7.45	15.91
2000-01	5.29	14.23
2001-02	6.63	14.22
2002-03	5.92	13.58
2003-04	6.12	12.70
2004-05	4.55	11.08
2005-06	3.26	10.78
2006-07	3.53	10.92
2007-08	2.95	12.05
2008-09	2.71	10.22

Source:- Director General of Commercial Intelligence & Statistics, Ministry of Commerce,Kolkata.

The table presents us the how agriculture is faring in comparison with total economy with respect to the external trade that will be presented in terms of exports and imports since the period 1990. Though the share of agri imports show a decline during entire period, but if we observe deeply, this share has been stable till 1993-94, since then it started increasing strongly until the year 2003-04, and off late it has reduced relatively and remained at the earlier rates of 2.71 per cent. In case of exports, the share of agricultural exports out of total exports show an increment from the beginning period which has increased from 18.49 to 10.22 per cent. Here, its highest share was registered in the year 1996-97 where it had share of 20.33 per cent, this can be considered as a break period as the open trade policies have started showing impact on Indian agriculture. Since that period the agriculture has been affected quite negatively and the production performance of agriculture and allied activities has been poor and therefore their

share in exports has come down marginally. It indicates that though we are an agrarian country, we have just been able to produce to be self sufficient and thereby our share has been negative in the exports. This strategy of export led growth has not been able to augur well for the agriculture sectors as it has failed to support agriculture and maintain sustainable growth.

5.2.4 Imports and Exports of Agri Products

We find that edible oils (HS15) have been India's major agricultural import since the mid-1990s, and these have comprised over 40 per cent of India's total agricultural imports since 1998. The major products within this commodity group in 2003 were palm oil (71 per cent of total imports of HS15 – the principal suppliers were Indonesia and Malaysia) and soybean oil (22 per cent of HS15 imports - Argentina and Brazil were the main suppliers). The other major import commodity group has been pulses (lentils, chickpeas, dry peas etc). *Taking edible oils and pulses together, India has emerged during the 1990s as the world's major importer of these commodities.* Cereal imports have declined dramatically from the mid-1990s surge where they accounted for over 10 per cent of total imports in the 1980s. Over that period India increased wheat imports in particular in response to the domestic production and stocks situation. Imports of cereals had fallen to almost nothing since 2000. Non-food agricultural commodities accounted for around 20 per cent of India's agricultural imports in recent years, with cotton being the major single commodity in this group.

5.2.5 Index Numbers of Food grains

If we look at the production index of food grains and non food grains in the post-liberalisation era we find a modest compound growth rate of 1.8 per cent in the case of food grains, 1.6 per cent for non-food grains; showing a marginally higher rate of growth for food grains. One of the reasons for the lower rate of growth has been the drought in the year 2002 as a result of which the overall agricultural growth rate was negative at -7 percent in the year 2002-03. The co efficient of variation (CV) for both food grains as well as non food grains is similar which shows no major divergence in the production of two major categories of agricultural products. However wheat confirms a high C.V. value (14.92) reflecting a larger degree of fluctuation in the production as against a lower value for rice (5.09). Further, the average production of rice spanning over a period of fourteen years (1991-92 to 2004-05) is also higher than that of wheat. This has resulted in frequent import of wheat by government to meet the buffer stock

requirement. The average production of food grains is higher than the mean of non food grains production over the same period.

5.2.6 Assessment of 10th Plan

Though 10th five year plan had targeted gross domestic product (GDP) growth in agriculture and allied sectors at 4 percent per annum, aiming to reverse a sharp deceleration in the second half of the 1990's from 3.2 per cent per annum in the period 1980-81 to 1995-96 to 1.8 per cent per annum during 1996-97 to 2001-02, this has not been achieved. Drought conditions caused agriculture GDP to fall by 7 percent in first year of the 10th plan (2002-03) and despite a decent rebound by 9.6 percent in the second year (2003-04), growth in the first two years of 10th plan averaged only 0.9 percent per year. On this basis, GDP growth in agriculture and allied sectors during the first three years of the 10th plan averages only 1 per cent per annum. The 10th plan target of 4 per cent growth is therefore far from being realised. In fact, per capita agricultural GDP shows no significant upward trend after 1996-97, only fluctuations. The erratic monsoon in recent years has once again underlined concerns that led the 10th plan to lay emphasis on irrigation, water conservation and land management, but actual growth outcomes during the 9th plan and in the 10th plan so far suggests deeper problems as well. It requires a comprehensive re examination of the agricultural strategy.

5.2.7 Affect on Employment

An adverse effect of deceleration of total employment and collapse of employment in agriculture was that despite slowing in the growth of labour force, there was visible increase in open unemployment during 1993-94 to 1999-2000. According to the NSSO, the number of unemployed in India increased from 3.98 million in 1973-74 to 7.49 million by 1993-94 and to as much as 9.15 million by 1999-2000. The higher growth of employment in the non-agricultural sectors has not been sufficient to compensate for the decline in agricultural employment. The employment scenario during the 1990's has become a matter of great concern. It is the deceleration in agriculture growth that is responsible for many of the adverse consequences for the farmer.

5.2.8 Role of Government and Green Revolution

Following independence, the Government's priority was to ensure that farmers would produce food and thus government procurement (to ensure both that farmers produced food, and got just price for it) and the public distribution system (to ensure that consumers got adequate food at affordable prices) were designed. The need for government involvement in food production and distribution became even more necessary with the Green Revolution that firstly, destroyed regional food security based on diverse cereals and replaced it with just wheat and rice; secondly, concentrated upon the production of these cereals in just two states i.e., Punjab and Haryana and thirdly, forced the farmer into the vicious treadmill of costly input (seeds, chemicals water) intensive agriculture.

5.2.9 Fluctuations in Rice Production in India

Rice is one of the important crops cultivated in India; production in 2008-09 is estimated to be 99.15 million tonnes. During triennium ending 2005-06, the major rice producing states in the India were namely West Bengal (17 per cent), Uttar Pradesh (12.6 per cent), Andhra Pradesh (11.7 per cent), Punjab (11.5 per cent), Orissa, Madhya Pradesh and Bihar (7.5 per cent). These seven states together accounted for about 75 per cent of total rice production in the country. Indian agriculture continued to be dominated by smallholders, and rice is no exception. At all-India level, small holders' share in rice area was 56 per cent in 2001-02, which has increased from 46 per cent in 1981-82. Within smallholders' crop portfolio, rice area share fluctuated between 33 and 39 per cent during the above period[83].

Further, growth in area operated by small holders both under the irrigated and non-irrigated conditions was positive in the majority of states during 1981-82 to 2001-02. Moreover, under the irrigated condition, very high growth in smallholder's rice area was noticed in UP, Haryana, West Bengal, Madhya Pradesh, Karnataka and Punjab. This trend reflects marginalisation of holdings due to sub-division and fragmentation of holdings and land reforms.

Apart from area, the growth in rice production at all-India level was 3.76 per cent and was mainly contributed by yield growth (3.00 per cent). Also, states like Haryana, Orissa, Punjab, Uttar Pradesh and West Bengal have performed better as compared to all-India figure of

[83]Barah B.C (Aug 2007) : "Criticality of Rice and Wheat System in Sustainable Food Security in India – An Analysis". Agricultural Situation in India -.

production. This was mainly led by growth in yield in the case of Orissa, UP and West Bengal and by growth in area in the case of Haryana and Punjab.

Analysis has revealed that share of small holders in both total rice and irrigated rice area has increased with time and across states, except in Assam, Gujarat and Punjab. The maximum change has been recorded in West Bengal, and it has been attributed to land reform operations followed in the state. Also, highest growth in rice yield (6.23 per cent) was recorded in West Bengal. In other states, the progress is low. With the structural change, there was associated change in rice area treated with fertilisers across size-groups at all-India level.

During 1981-82 to 2001-02, the share of rice area treated with fertilisers under irrigated condition increased by nearly 10 per cent across farm-size categories, while under non irrigated conditions, it increased between 20 and 25 per cent at all-India level. It is evident from the fact that growth in rice area treated with fertilisers under irrigated conditions increased at the rate of 5.3 per cent on smallholders and about 1.60 per cent on other farms. Similarly, growth in fertiliser consumption on smallholders' irrigated area was about 14 per cent and nearly 6 per cent on other farm categories. Further, rice area under HYVs (High Yield Variety seeds) across all farm sizes is above 90 per cent in irrigated conditions and 50-70 per cent in non-irrigated conditions. Fertilisers use in HYVs of rice under irrigated conditions was 179 kg/ha in 2001-02. Therefore, it can be inferred that HYVs and irrigation facilities are the driving factors in increasing use of fertilisers in rice.

The small holders' share of irrigated rice area increased from 45 per cent to 56 per cent at the country level during 1981-82 to 2001-02. Their share in HYVs area increased from 53 per cent to 58 percent during 1996-97 to 2001-02. Beside these factors, the policy on fertiliser subsidy and minimum support prices for rice contributed to the increased adoption of fertilisers. Still by 2001-02, about 17 per cent of rice area operated by small holders remained untreated with fertilisers and a significant proportion of small holders have not been able to have access institutional credit. This implies that the existing policies are not conducive to address the market imperfections, thereby creating situation where structural inequity (more specifically land inequity) has a negative effect on agricultural productivity. It has been confirmed by the analysis of land inequity effects on rice yield.

The range of variation in the productivity is far wider than that in wheat because rice is grown under more diverse agro climatic conditions. The difference in the actual and obtainable yields, therefore, ranges from 35 per cent in the rain fed (up land) fields in Jharkhand to a whopping 222 per cent in the irrigated tracts of UP and Bihar, which together account for over 20 per cent of the country's total paddy acreage. These two states together can throw up additional 25 to 30 million tonnes of rice every year.

V.7 Potential increase in Production of Rice if yields within state rise to best within that state (yield in Tonnes per hectare 2002-03 to 2004-05)

State	**Improved Practice**	**Actual 2003-04**	**Yield Gap %**
A) Rainfed (Upland) Rice			
Chattisgarh	3.74	1.45	1.57
Jharkhand	2.29	1.69	35.2
Manipur	4.27	-	-
Uttar Pradesh	3.62	1.94	86.4
B) Rainfed (Shallow lowland)/ Boro Rice)			
Assam	4.52	1.53	194.7
Chattisgarh	3.55	1.45	144.2
Jharkhand	3.48	1.69	105.3
Tripura	1.36	-	-
Uttarpradesh	3.65	2.18	67.2
C) Irrigated Rice			
Chattisgarh	3.91	1.45	169.4
Bihar	4.88	1.51	222.1
Gujarat	5.58	1.89	195.3
J&K	7.48	1.94	285.8
UP	7.05	2.18	222.4
Uttaranchal	3.85	1.94	98.2

Source: "Food Crisis" by Surinder Sud from Yojana July 2008.

Opportunities for scaling up rice production are the maximum in the irrigated areas of most paddy-growing states, barring Punjab and Haryana, where productivity is already quite high. While the average paddy production can be increased by nearly 170 per cent in the irrigated areas of Chattisgarh, it can be catapulated by 195 per cent in the irrigated tracts of Gujarat. In the case of rainfed paddy grown on elevated lands where the rainwater does not stay in the fields for long, improved agronomic practices can help push up per hectare yields by over 86 per cent in Uttarpradesh and 157 per cent in Chhattisgarh[84].

[84]Sud; Surinder (2008): "Food Crisis", from Yojana July 2008.

Similarly, in paddy grown on shallow lowlands and also the "boro paddy" planted in north eastern states, including West Bengal and Assam, crop productivity can be more than doubled in most places with better farming practices. The yield gap is about 195 per cent in Assam, 144 per cent in Chhattisgarh and 105 per cent in Jharkhand. In UP, where some lowland unirrigated areas are sown paddy, especially in the eastern region, the per-hectare crop output can be stepped up by 67 per cent. But for that, several factors that have kept the crop productivity low in the agriculturally backward areas would have to be addressed.

Significant among them are the collapse of the state extension agencies resulting in poor technology dispersal, improper choice of crop varieties and non-renewal of their seeds at short intervals, inadequate use of manures, inefficient and imbalanced application of fertilisers, and poor water management. Through the schemes like Rashtriya Krishi Vikas Yojana and the current programme of '50,000 pulses and oil seeds villages' exclusively in rain fed areas being funded in 2010-11 budget, needs to be implemented appropriately. It can help to arrest the increasing protein cost and provide hunger free situation.

5.3.0 Fluctuations in Wheat Production

In the case of wheat, the crop in news in recent years, the productivity in Punjab, Haryana, western Uttar Pradesh and parts of Rajasthan is already very high, around 3.5 tonnes to 4.5 tonnes a hectare, which is comparable to China's 4.25 tonnes and better than that in the USA with 2.9 tonnes per hectare. But, there is a further room for increase in wheat production in this Indian fertile belt, because the actual average yield of the region as a whole still falls short of the possible obtainable level by around 1.7 tonnes a hectare.

The differences in the present average wheat yields and those that can be had with improved practices vary from 6 per cent in Punjab to a whopping 50 per cent in UP, the state with the largest area under this crop in the country. UP alone, with 9 million hectares under wheat, can add over 12 million tonnes to the country's total wheat output. In Haryana, the wheat output can be pushed up by about 20 per cent and in Rajasthan, by over 40 per cent.

V.8 Potential increase in Production of Wheat If yields within state rise to best within that state (yield in Tonnes per hectare 2002-03 to 2004-05).

State	Improved Practice	Actual 2003-04	Yield Gap %	Tons/ha	Area (Mn Ha)	Possible Additional Production (Mn Tns)
UP	4.20	2.79	50.5	1.41	9.00	12.69
Bihar	3.65	1.78	104.8	1.87	2.03	3.79
Punjab	4.46	4.20	6.1	0.26	3.48	0.90
Haryana	4.75	3.96	19.8	0.79	2.32	1.83
Rajasthan	3.94	2.79	41.3	1.15	2.01	2.31
Gujarat	4.03	2.68	50.5	1.35	0.73	0.98
MP	3.29	1.78	84.3	1.51	4.14	6.25
Maharashtra	3.41	1.33	155.5	2.08	0.76	1.58
HimachalPradesh	2.61	1.38	89.6	1.23	0.36	0.44
West Bengal	2.76	2.31	19.4	0.45	0.40	0.18
Uttarakhand	3.38	1.87	80.5	1.51	0.39	0.58
Total		26.87				31,53

Source: "Food Crisis" by Surinder Sud from Yojana July 2008

The maximum increase in area under cultivation took place in the sixties (41 per cent) followed by seventies (23 per cent). However, after 1971, there was a slowdown in growth to just around 8.5 per cent in the succeeding two decades after which the increase was just over 1 per cent in the 5 years between 2002- 2007.

In areas outside this key wheat bowl the scope for production surge is, in fact, several times higher. In Madhya Pradesh, the state having the second largest area under wheat (over 4 million hectares), wheat productivity can be pushed up by over 84 per cent. Elsewhere, it can be enhanced by 100 per cent (Bihar) and much more (155 per cent in Maharashtra) through better farm practices. Thus Madhya Pradesh can increase the country's wheat kitty by over 6 million tonnes, Bihar by another 3.8 million tonnes and Maharashtra also by an additional 1.5 million tonnes on average. These three states together can provide over 11 million tonnes of additional wheat.

5.3.1 Pulses Production

India ranks 1st in the World in Pulses, both in terms of Area (35 per cent) and Production (26 per cent). Madhya Pradesh stands first in India in pulses production with 21.45 per cent of area and 23.50 per cent of production. And the rest of the following Pulse producing states are Rajasthan, Maharashtra, UP, Orissa, Karnataka and AP. And the states of TN, Bihar, Gujarat, Haryana and West Bengal possess a significant considerable cultivating area.

States like MP, UP, Maharashtra, Rajasthan and Orissa are some of the major pulses producing states, accounting for 73 per cent of country's production and 72 per cent of area. Highest productivity usually comes from the states of Haryana, UP, WB, Bihar, MP, Gujarat, Orissa, MH and Karnataka. India's present per hectare yield of Pulses is far beyond the levels of world average, i.e ours is 595 kg hectare and World average is 796 kg hectare. And we are the largest importers of Pulses in the World.

5.3.2 Coarse Cereals and Pulses

Unlike Rice and Wheat, yield growth of coarse cereals was maintained at about 2 per cent per annum through 1990's, mainly because of good performance in maize, area shifted from coarse cereals to other crops and, as a result, there was no growth in total coarse cereals output. Pulses yields continued to stagnate although these crops have been under a technology mission since early 1990's, and the area under cultivation has also shrunk. Despite some promising new varieties and proven benefits from micro nutrients and sprinkler irrigation, there is as yet no breakthrough at the farm level. Although the MSP of pulses have been increased recently to encourage technology adoption, it is view of the Commission for Agricultural Costs and Prices (CACP) that a sharp increase in imports has blunted this effort.

V.9 Position of Food Grain Stocks at Central pool by FCI and State Agencies in India (Lakh tons)

	Wheat		Rice		Total	
YEAR	Actual Stocks	Minimum Buffer Norms	Actual Stocks	Minimum Buffer Norms	Actual Stocks	Minimum Buffer Norms
2001	250.41	84	206.99	84	457.4	168
2002	324.15	84	256.17	84	580.32	168
2003	288.3	84	193.72	84	482.02	168
2004	126.87	84	117.27	84	244.14	168

2005	89.31	84	127.63	84	216.94	168
2006	**61.88**	**82**	126.41	118	**188.29**	**200**
2007	**54.28**	**82**	119.77	118	**174.05**	**200**
2008	**77.12**	**82**	**114.75**	**118**	**191.87**	**200**
2009	182.12	82	175.76	118	357.68	200
2010	230.92	112	243.53	138	474.45	250

Source: Ministry of consumer affairs, Food and Public Distribution, GoI (11409) (12139) and (12515) and Lok sabha Unstarred Question No 3071, 08-12-2009.

The above table clearly shows that the procurement by FCI and other state agencies since the period 2001. In case of Rice, in all the ten years, the actual stocks are always higher than minimum required buffer stocks except during the years 2006, 2007 and 2008. These was the time during which India had to import wheat from abroad, as there existed severe shortages in production as well is in grain management. It had seriously affected the minimum buffer norms of wheat and it had consequently reduced wheat that is required for the distribution programs and in a way affected the food security of the country.

In case of Rice, only during 1 year, that the level of minimum buffer stocks had exceeded the actual available procurement stock i.e. in the year 2008 subject to fluctuations in the monsoon as well as due to other climatic conditions. Like in the case of wheat, during the same years of 2006, 2007 and 2008, the total minimum buffer procurement stocks were higher than the actual stocks which had severely affected the distribution system as well increased the prices of food grains and thereby led to the food insecurity situation.

5.3.4 Irrigation and Water Challenges

In any cultivation, the seeds needed to reflect the availability of water and farmers must be taught to adopt scientific farming practices appropriate for the new seeds. The per capita availability of water, 1700 mhm is regarded as the borderline for water stress. Per capita availability was 5200 mhm in 1951 and had declined to 1820 mhm in 2001. Since the

availability level varies widely across the country, large parts of the country are already water stressed. With population projected to rise, availability per capita will fall further to 1340m in 2025 and as low as 1140m in 2050[85]. At present only 40 percent of our total cultivable area is under irrigation. This could increase to 70 per cent at full potential, but investment in irrigation is grossly inadequate. At the present rate of adding to irrigation, it will take thirty years to complete all ongoing irrigation projects. Maintenance of existing irrigation systems is also very poor, leading to very low levels of irrigation efficiency. Water users at the head of canal networks use up all the water leaving very little for tail end users.

Part of the reason for this poor performance is that water rates charged by the irrigation departments are very low. In most states they cover only about 20 percent of the maintenance expenditure. Under-pricing of water also leads to excessively water intensive cropping patterns at the upper end of canal networks which are difficult to charge as the network expands. Ground water exploitation in many parts of the country has become a classic example of irrational over use. Cheap electricity encourages over drawl of water which is leading to falling water tables which has adverse distributional effects. Rich farmers who can afford deeper bore wells over-draw water, which lowers the water table hurting poorer farmers who rely on shallow wells. We need to charge a reasonable price for canal water which will discourage wasteful over-use and also generate financial resources to help maintain the system. We also need to bring in much more participatory irrigation management so that farmers have a say and stake in the running system. There are examples in some states of water user associations improving effectiveness of water use and management of irrigation system. In order to achieve this, we may need to consider changes in the law to make property rights on ground water more rational and community oriented.

While there are problems in irrigated areas, there are even larger problems in rain fed areas where water management is even more critical. If corrective steps are not taken we will rapidly move to a crisis situation. Deforestation and other forms of environmental stress have endangered traditional water collecting structures. A major effort is needed to harness the available water in these rain fed areas through water conservation and ground water recharge.

[85] Acharya; Shabd S (2009): "Food Security and Indian Agriculture: Policies, Production Performance and marketing environment", from Agricultural Economics Review, Vol.22 Jan –June 2009 pp 1-19.

There are many examples of watershed management based on NGO activity and active community involvement that have worked well and led to very positive results. But they need to be scaled up to apply to much larger areas. This will require considerable resources and also community participation.

Since a very large part of our cultivable area is rain fed, and will remain rain fed, even when full irrigation potential is achieved, it is especially important that our scientists focus on the need to develop seeds capable of higher yields in rain fed conditions. We have had very good success in developing high yielding varieties for situation where irrigation is assured. We have been less successful in dealing with situations where water is scarce. This is partly because this is scientifically a more challenging problem. But it is reassuring that there have been important successes in this area also. We need to focus on this as a strategic area for research support. Advances in bio technology greatly enhance the scope for developing crops which may be more suited to water stress conditions and also more resistant to press. However, we can ill afford to neglect the tremendous opportunity which scientific advance provides for increasing productivity and thereby affecting the lives and welfare of ordinary farmers.

5.3.5 Role of Technology

We also will have to ensure that our farmers are sufficiently aware of what is needed to reap maximum benefit from the new technology. There is evidence that such knowledge is lacking at present. It is well known that in areas where water is plentiful it is excessively used as compared to other areas. There is also excessive use of nitrogenous fertiliser as compared to other types of fertilisers, partly because subsidy on urea is greater than on the other fertilisers, but also because farmers are also not aware of the need for more balanced fertiliser application. Micro-nutrient deficiencies are also ignored because of lack of knowledge. It calls for an effective extension system which can bring the necessary scientific knowledge to the farmers[86]. Agricultural universities should play a role to providing scientific approach to the extension system. This has to be the responsibility of the states, and this is another area where performance is weak in most of the states.

5.3.6 Creating a hunger free, farmer suicide free India

[86]Ramaswamy C. (2004): "(Presidential Address) Constraints to Growth in Indian Agriculture: Needed Technology, Resource Management and Trade Strategies", from Indian Journal of Agricultural Economics, Vol.59, No.1, Jan-March 2004.

***Future Challenges:**

The future of food and agriculture in India appears dismal under the rules of globalisation which promote corporate control. The corporate future will ensure that landlessness will grow, farmers will be transformed from owner-cultivators to serfs controlled by contracts, seed and water will be the private property of global corporations who will sell it at high cost to farmers. In the future based on WTO rules, hunger will grow, and governments will fail to guarantee their people the right to food and their farmers the right to food sovereignty. But this future need not be inevitable. Other futures are to be explored, based on alternative. Principles and practices which will over time bring policy shifts. Farmers have the right to seed and to be free of seed monopolies. Biodiversity must be conserved and protected as a commons[87]. Corporations are liable for seed failure and genetic pollution. The polluter pays' principle must be applied to genetic contamination of crops and food.

5.3.7 MSP and Repercussions

When the surpluses arose in Food Grains (FG) production the prices started decreasing. In order to avoid food scarcity and encouraging the farmers to retain land for FG production and also to give support to farmers that will cover their cost of production and to build adequate stock of food grains, government evolved mechanism of Minimum support Prices (MSP) for selected 25 commodities. To protect the farmers' income from falling especially of FGs government entered in the market to purchase FGs at Minimum Support Prices and ensured food safety. MSP is a mechanism to cover the cost of production incurred by farmers. It does not provide any additional income even for his managerial services. MSP is the cost related subsistence price. Essential Commodities Act is hampering free movement of agri-products. Government financial resources are falling short of required purchases of surplus production especially of FGs at MSP from all the areas to give relief to farmers. It is leading to a heavy distress among farmers and making them to either shift to other cash crops or to quit the agriculture totally thereby leading to the overall reduction in food grain production.

5.3.8 Small and Marginal Farmers – Food Security

The government's policies, programmes and research continue to focus on increase in agriculture production and not on the farmers' income primarily. There is a talk *to double the*

[87]Panda;Manoj, Kumar;Ganesh A (2008): "Trade Liberalisation, Poverty and Food Security in India", from 'IGIDR, Mumbai, WP-2008-013.

FG production from 200 million tonnes to 400 million tonnes but not much attention to double the farmers' income from the present level in a given time frame[88]. Farmers' income is implicitly considered to be the fall out of increased production. But that is not the case as revealed by the income crisis of the farm community in India in the recent past. General agricultural growth does not seem to be an answer for sustained increase in farmers' income. While the macro level policy and schemes and programmes to increase agriculture production and productivity do have positive effect but the filtering of such benefits becomes weak for marginal and small farmers. This is mainly due to costs of marketing, virtually no margin of profit in MSP, open market prices sometimes being less than MSP and inadequate support of procurement by public agencies. In case of surplus production the farmer is the sufferer as during the last many years. Due to liberalisation of trade and reduction in input subsidies, farmers' income has been declining. It is in this context that for marginal and small farmers a sustainable income kit needs to be designed. There are two aspects to this design: first is the per capita Agri-GDP of the states and the commodity specific measures that will benefit the farmers directly.

5.3.9 Low Yield and Low Income

The per hectare yields of wheat and rice, which are the major crops of Punjab, are the highest in the country. Both these crops are commercial crops for the Punjab farmers and an effective price support system is in place. The average farm size in Punjab is 3.8 ha, which is 2.5 times the average size of Indian farms. In spite of these favourable factors, an average Punjab farmer (with 3.8 ha land and growing two crops of rice and wheat) is able to earn an income for his labour and management that is less than the starting salary of a class IV employee in the government sector. The situation of farmers in other agri poor states can be easily visualised from this fact. Unemployment among agricultural labour households has sharply increased from 9.5 per cent in 1993-94 to 15.3 per cent in 2004-05 (Planning Commission 2006);

The perception about the level of staple food prices for consumers has continued to be outdated. Whether the price is higher or not, should be seen in relation to the consumers' income. *In the early 1970's, the average retail price of one quintal of Rice/wheat was equivalent to 16 per cent*

[88] Joshi P.K., Ashok Gulati and Ralph Cummings Jr (2007).: "Agricultural Diversification in South Asia: Beyond Food Security.". From "Agricultural Diversification and Small Holders in South Asia.." Edited by P.K.Joshi, Ashok Gulati and Ralph Cummings Jr – AF 2007.

of the India's average per capita income and One-day's wages of rural labourer fetched one kg of rice or wheat. The real prices of rice and wheat have continued to decline since then. Approximately, 100 kg of rice or wheat can be bought by paying only around 4 or 5 per cent of average per capita income and one day's rural wage fetches 5 or 6 kg of rice or wheat. However, we should not forget the plight of staple food producers. Undoubtedly, there is a need to pay a higher price to Indian farmers producing food and maintain a high degree of macro level food security of the country[89]. Another aspect of current agricultural crisis pertains to the unfinished agenda of the marketing system improvement. The main objective of the marketing system improvements is to enhance its efficiency by saving nearly Rs.50000 crores to Rs.80000 crores that are annually lost and is an avoidable national wastage.

Another aspect is that, there has been considerable increase in the imports of edible oils and pulses since mid-1990. The import of edible oils, which accounted for around 13 per cent (1.2 Mt) of total consumption in 1995-96, has sharply increased to 37.5 per cent (4.7 Mt during 2006-07). The imports help in keeping consumer prices low, but adversely affect the producer-farmers, who are mostly resource poor and operate in dry land or rain fed areas. While the net social gain from imports is insignificant, there is considerable redistribution of income from dry land resource poor farmers to consumers. A study has observed that inequity in distribution of land across states in India has led to inequity in distribution of accessibility to minor and ground water irrigation resources.

5.4.0 Production Performance and Trade Affect

Concerns related to the production performance are of various types. The first is the reasons for sharp deceleration in the growth of agricultural sector since the early-1990. It can be attributed to the following arguments

- Growth rates of net sown area, gross cropped area, and electricity use in agricultural turning negative
- Deceleration occurring in growth of fertiliser-use in agriculture.
- Growth of terms of trade for agriculture turning negative
- Decline in the growth rate of total factor productivity in agriculture.

[89] World Bank – Directions and Development (2005): "The Rapidly changing context for Agriculture: Challenges and Opportunities", from 'Agricultural Growth for the Poor – An Agenda for Development.' edited by Raj Kapila and Uma Kapila – AF – 2002.

Thus there was nothing favourable to the agricultural sector during mid-1990 to 2004-05. The second aspect of the current agricultural crisis is the weakening of macro food (cereals) security during TE 1994-95 to TE 2004-05. It was mainly owing to a sense of complacency in the matter of cereal production that prevailed since mid-1990.

The current aspect of agricultural crisis relates to declining profitability of agriculture and consequently the loss of farmers' faith in farming activities. A slowdown in the growth of TFP is bound to slow down the rate of decline in cost of production. In the case of rice and wheat the growth rate of TFP in Punjab and Haryana has turned negative. As a consequence, the cost of production has tended to increase. *The terms of trade for agriculture, which is the ratio of prices received by the farmers (for the products sold by them) to the prices paid by them (for inputs and consumption goods purchased by them) to the prices paid by them* (for inputs and consumption goods purchased by them) has turned against the farmers. The average income of Indian farmer vis-a-vis those engaged in other occupations has continued to be substantially lower and has deteriorated further during the past decade. This is because of the factors like growth of agricultural sector has been substantially lower than that of non-farm sector, whereas agricultural sector sustains more than 50 per cent of population. The incidence of rural poverty is substantially higher in land-owning households than landless households. The production of staple food is turning out to be less profitable relative to other competing enterprises.

5.4.1 Global Production

The per capita per year annual production of cereals in the world increased from 271 kg during 1961-65 to 295 kg during 1966-70, which were the initial years of green revolution. The upward trend continued for about 2 decades and per capita cereals production peaked by the mid 1980's at a level of 334 kg per person per year. The growth rate of cereal production decelerated two 1.09 after the mid 1980's, compared to 2.51 percent in 1961-1985. The recent growth rate turned out to be lower than the growth rate in population even though the growth rate in population is coming down. The per capita production of cereals declined to less than 315 kg in the first eight years of the 21st century. Though there is some improvement in per capita availability of cereals during the years between 2003-07, this increase has not been available for use as food and feed,

due to diversion of food grain for the production of bio-fuel. This shows the shortage of staple food has been building up for several years and became quite large in the recent period.

5.4.2 The global food crisis and Prices

Global food crisis witnessed a very sharp increase in 2007 and they continued to rise. Initially it was thought that the increase in food prices was a part of their cyclical nature, aggravated by the adverse impact of weather on production in some parts of world. However, the continuing surge and the high level of global food prices seen till 2008 made it abundantly clear that the recent trend cannot be attributed to any volatility of international prices, and there are fears that food prices may stay at these levels or may raise even more. This was causing worldwide concerns. The severity of the problem can be seen from the fact that food prices based on the International Monetary Fund (IMF) food price index increased by 9.5 per cent between April 2006 and April 2007 and by 45.6 percent for the next 12 months[90]. The increase has been particularly very sharp for staple foods. Rice prices doubled in the 5 months between November 2007 and march 2008, wheat prices increased more than two fold in the 12 months after march 2007 and maize prices doubled in one and half year after august 2006.

These increases in prices of staple foods have let to emergencies and rationing in a large number of countries and there are frequent reports of food riots from various parts of the globe. The picture is turning gloomier day by day. The factors are : 1) diversion of food grains for bio fuel 2) adverse weather and climate change 3) increase in crude oil prices 4) dietary shifts in china and India following an improvement in income and living standards.5) neglect of agriculture for a long time.

5.4.3 Globalisation and the creation of hunger

Agribusiness is harvesting both the stocks and agricultural subsidies to gain through agricultural exports. *The same companies that gained through deregulated imports are now also gaining through deregulated exports*. Millions of Indians go to bed hungry, as the mismanagement has dismantled the PDS system, and taken affordable food out of the reach of millions. Food grain export is liberalisation's answer to the problem of ''over-procurement'' from farmers while it

[90] Weis; Tony (2007): "The Global Food Economy: Contradictions and Crises", from ' The Global Food Economy – The battle for the future of farming' -2007. Zed Books – Fern wood Publishers.

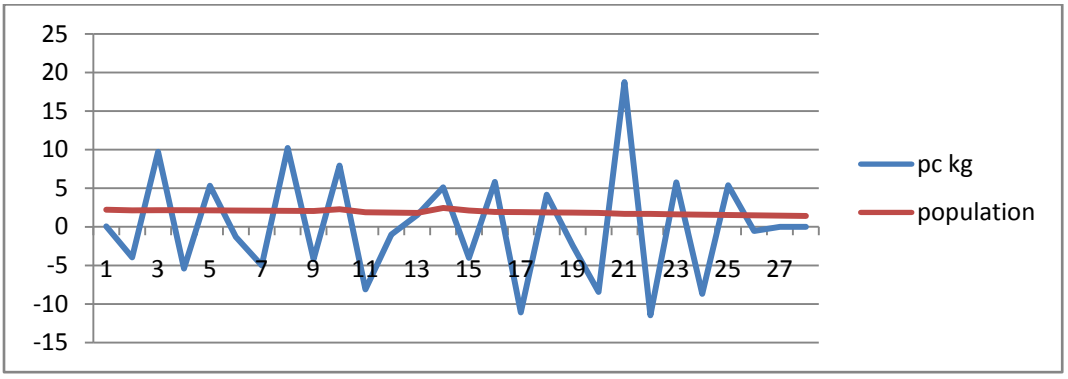
will bring in much needed foreign exchange. However, ever since Indian agriculture was subjected to liberalisation, both the share of agriculture exports in India's total exports as well as their value in hard cash has actually declined. The share of agricultural exports in India's total exports declined from 20.33 per cent in 1996–1997 to 18.25 per cent in 1998–1999 and further to 14.04 per cent in 2001–2002 and 10.22 in 2008-09. *Food grain exports did not benefit the national exchequer each period of large exports has been followed by acute food shortage, and India has had to import the same grain again, often at higher prices.*

For instance, India exported 2.5 lakh tonnes of wheat during 1987–1988, followed by an import of 18 lakh tonnes in 1988–1989. Food grain exports did not benefit the farmer. Wheat exports had an inflationary impact on domestic prices, although this did not benefit the farmers, as during the harvesting period the prices are kept low, and even MSP rates are not enforced. *As far as food grain exports are concerned, it's only a form of redirecting subsidies from farmers to traders.* The push towards exports is neither aimed at helping farmers or the nation's finances; rather, in accordance with the impetus of WTO's Agreement on Agriculture, it is a way of diverting support away from farmers towards traders. While the government dismantles procurement and public food distribution because they are considered subsidies to the people of the country, and are supposed to distort trade, it allows traders to buy bulk grains from its goodowns at prices even lower than those offered to the poorest of the poor. Moreover, the annual budgets since liberalization having been adding to the subsidies for the corporate sector– tax holidays for building silos and cold storages, incentives for exporting, subsidized transportation to the ports of the traders' choice. The experience of the 2001 wheat export, for instance, reveals this. As against an economic cost of Rs.8300 per tonne to the FCI and an open market price of Rs 7000 per tonne, India was offered a price of Rs 4300 per tonne in international market in May 2001. The government allowed FCI to charge any price for exports, as long as it is not below the below poverty line' (BPL) rate.

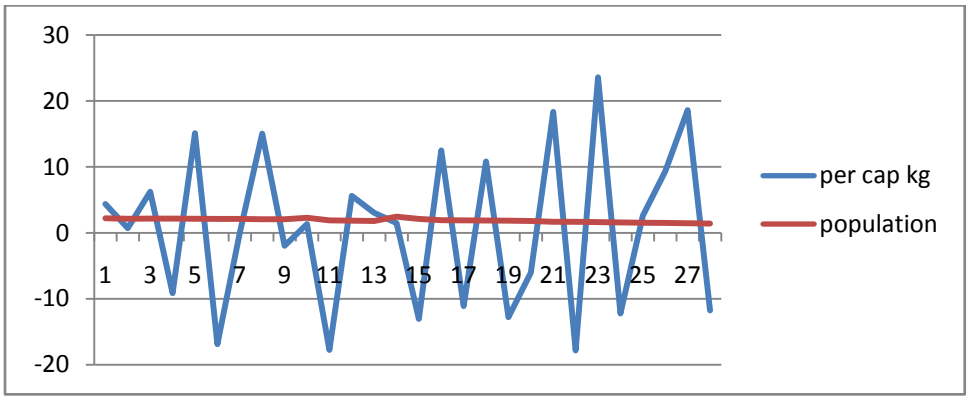
In this scenario, Cargill has emerged as the biggest buyer of subsidised wheat being pushed by India into world markets. The off take price of wheat for export has also been allowed to fall below the BPL price of from Rs. 4150 per tonne, to Rs. 3960 per tonne. At the same time, it has increased the above poverty line' (APL) issue prices of wheat to Rs. 610 per quintal, and for

rice to Rs. 830 per quintal. This price increase will only ensure that PDS off take will be even lower, so that buffer stocks for exports will be maintained. Globalisation, as directed by the World Bank/IMF structural adjustment programmes and the WTO has seen a return of famine. The intensification of hunger over the last five years, even while grains are overflowing from the good downs cannot be attributed to drought and climatic conditions alone, but to the policies that govern people's access to food.

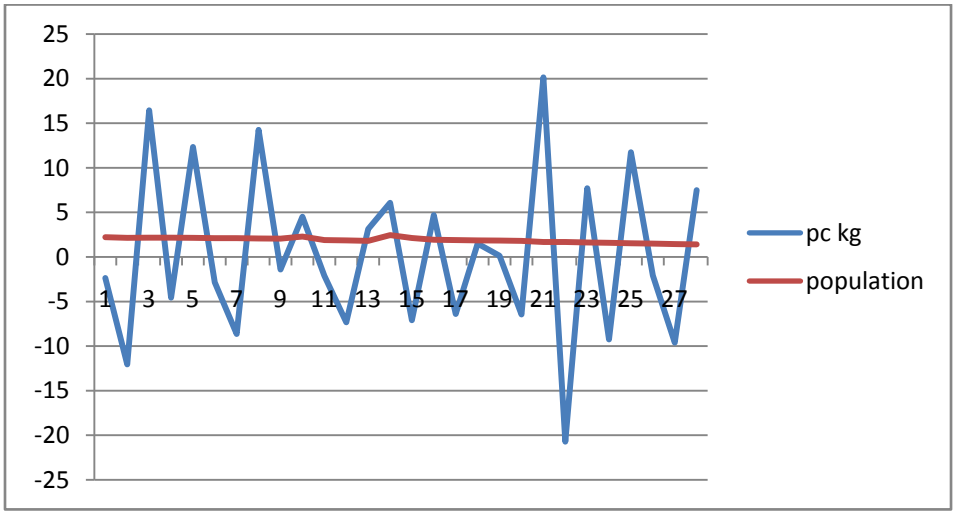
5. a. Average growth rate of Per capita availability of food grains and Population between 1981-82 and2009-10.



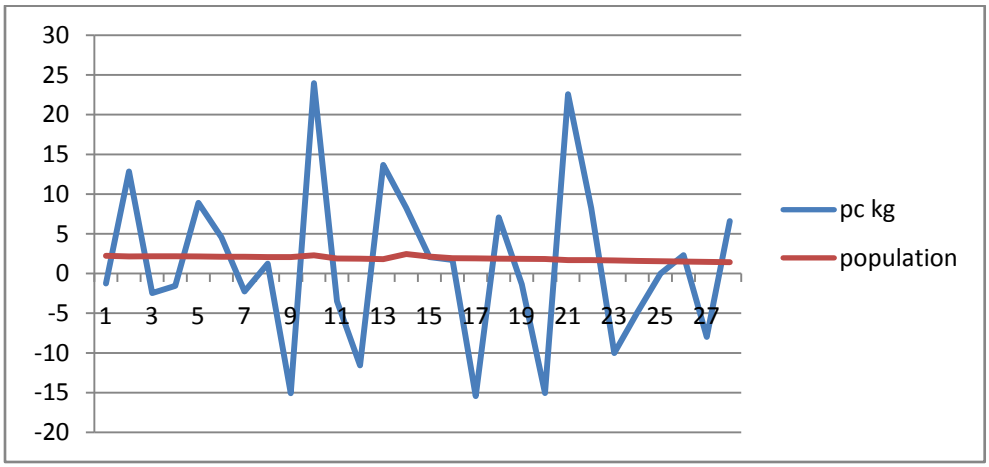
5.b. Average growth rate of Per capita availability of Pulses and Population between 1981-82 to 2009-10.



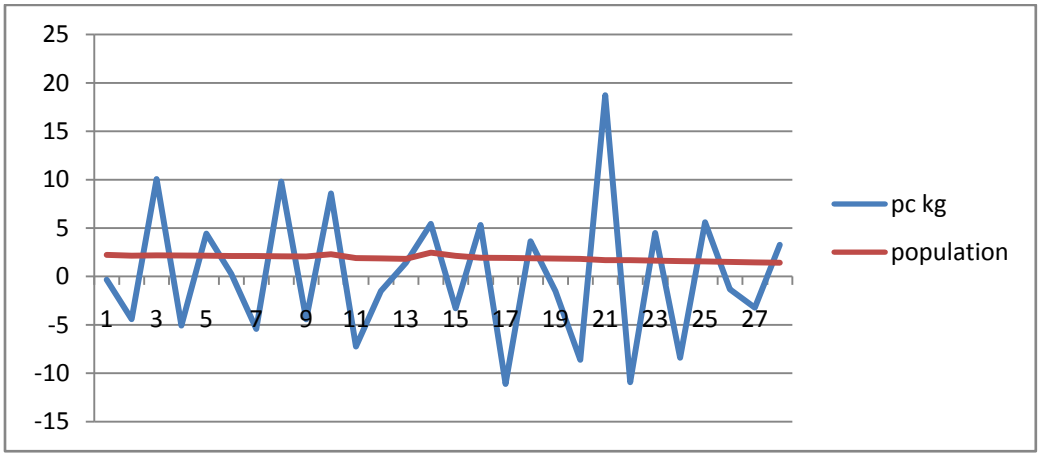
5.c. Average growth rate of Per capita availability of Rice and Population between 1981-82 to 2009-10.



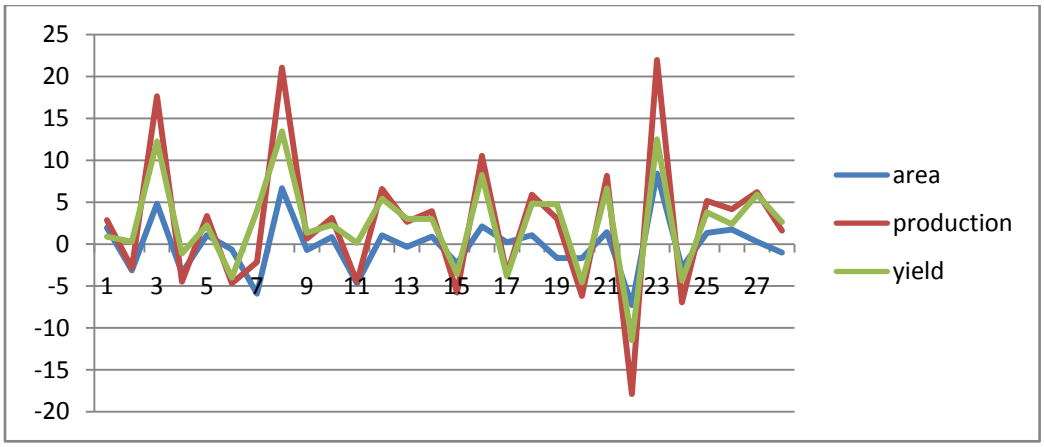
5.d. Average growth rate of Per capita availability of Wheat and Population between 1981-82 to 2009-10.



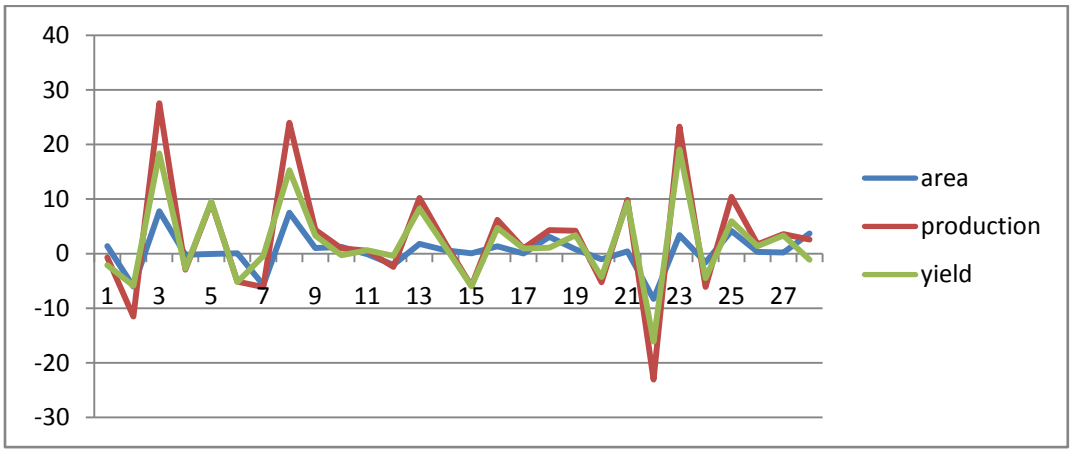
5.e. Average growth rate of Per capita availability of Cereals and Population between 1981-82 to 2009-10.



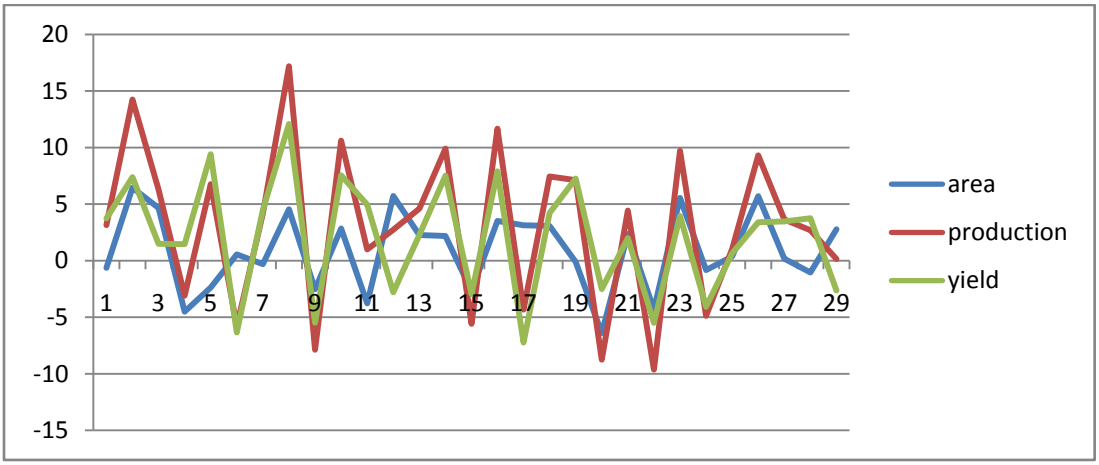
5.f. Average Growth rates of (All India) Food Grains Area Production Yield between 1981-82 to 2009-10



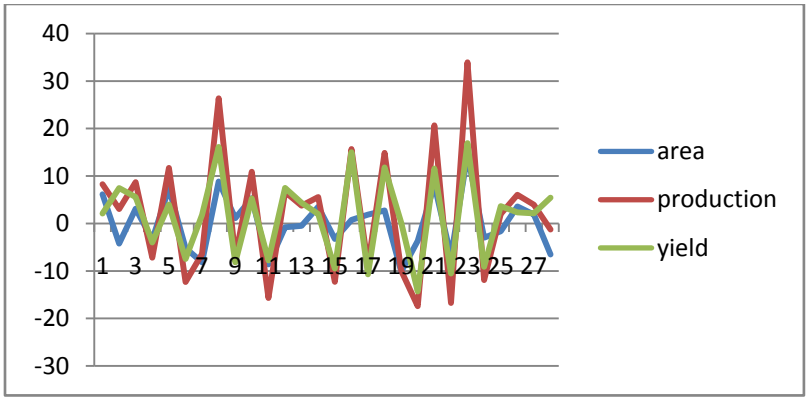
5.g. Average Growth rates of (All India) Rice Area Production Yield between 1981-82 to 2009-10



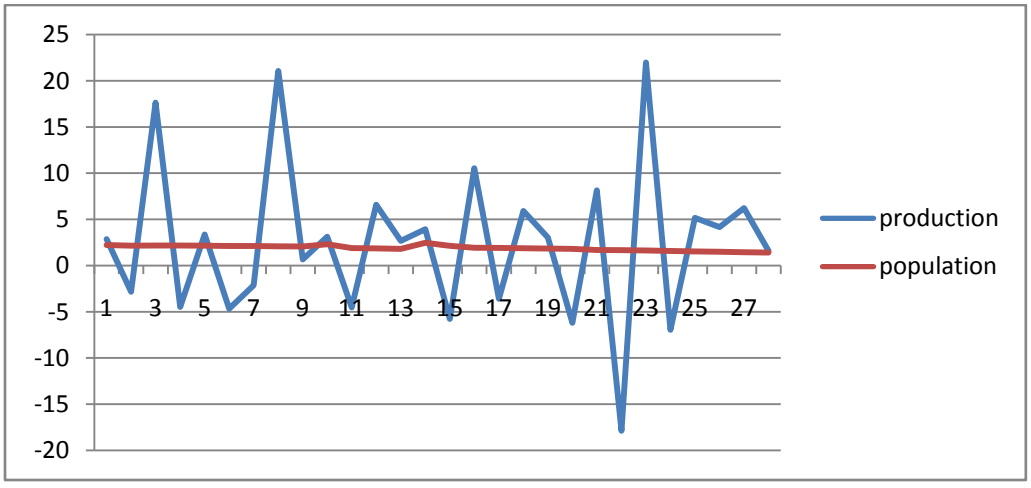
5.h. Average Growth rates of (All India) Wheat Area Production Yield between 1981-82 to 2009-10



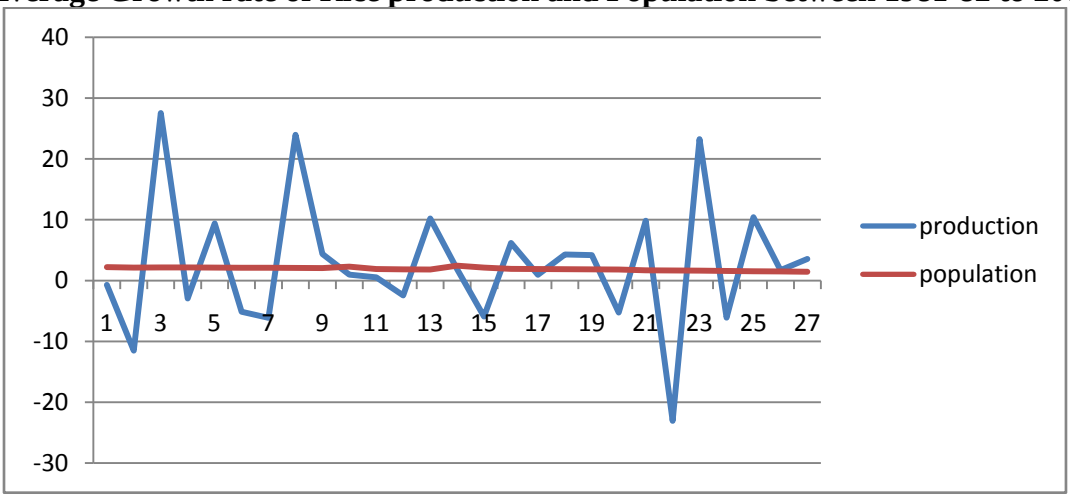
5.i. Average Growth rates of (All India) Pulses Area Production Yield between 1981-82 to 2009-10



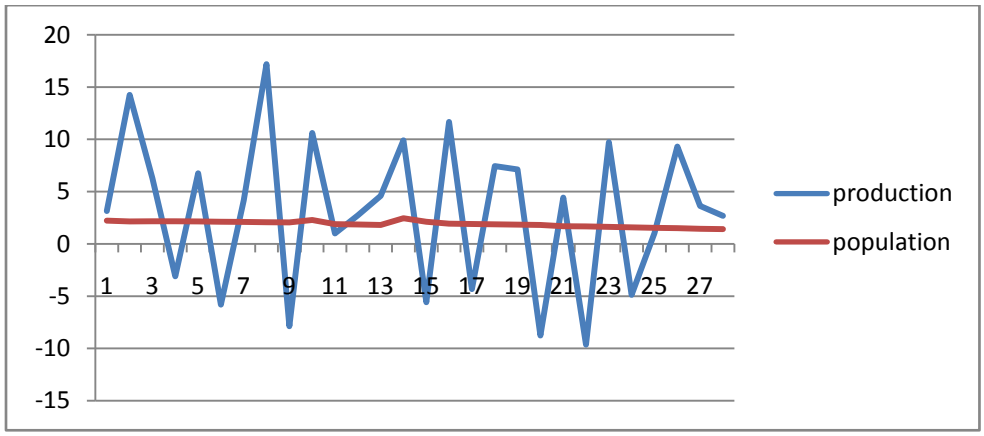
5.j. Average Growth rate of Food grain production and Population between 1981-82 to 2009-10



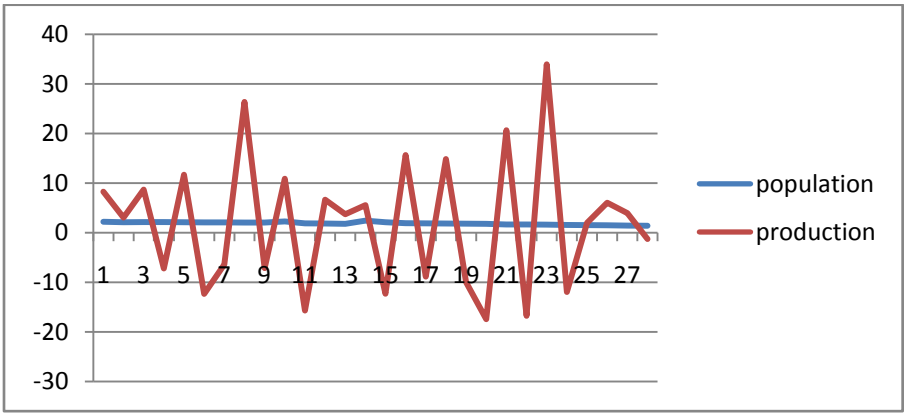
5.k. Average Growth rate of Rice production and Population between 1981-82 to 2009-10



5.l. Average Growth rate of Wheat production and Population between 1981-82 to 2009-10



5.m. Average Growth rate of Pulses production and Population between 1981-82 to 2009-10



5.4.4 Conclusion

In the world today, Rice, wheat and maize contribute to the 60 per cent of the food of the mankind. India's national wheat production can be increased by 30 mn tons or 40 per cent and can double the rice production with the existing technology, which can be done through bridging the gap between actual and potential yields, both in irrigated and rain fed areas, by removing technological, environmental and economic constraints and utilising the funds available.

It has to be underlined that globalisation offers both opportunities and challenges. The opportunities consist of availing of the benefits of world trade and growth. The challenges lie in enabling the sharing of these benefits not by a small minority of elite population but by the majority of working people in rural and urban India. Increase in Foreign Exchange (Vyas 2005) reserves, food grain surpluses and inclination towards free trade environment all have pushed the urge to bring in food self sufficiency on back burn. The policy changes have consistently attempted to decrease the government's role in ensuring food security and livelihood security for farmers in particular by calling measures meant to aid people as 'trade distorting' and demanding that these be scrapped'.

The anomaly of the co-existence of burgeoning food stocks and mass starvation is today, as in the late 19th century, the direct consequence of trade-driven agricultural policies. The 1877 Deccan famine killed over a million people; the trade liberalisation of the last decade of the 1990s has seen India step into the new millennium with over 50 million starving people and millions more with drastically decreasing access to food. Saving of huge avoidable losses would provide higher price to farmers, lower price to consumers and create new employment opportunities along the supply chain.

We also need to bring in much more participatory irrigation management so that farmers have a say and stake in the running system. A major effort is needed to harness the available water in these rain fed areas through water conservation and ground water recharge. Therefore, unless we increase the growth rates of production, especially the yield growth rates, it is going to highly difficult either to attain food security or to maintain 8 per cent growth rate, Because

Food security should be considered as important as national security. Along with measures to enhance the production, simultaneously there must also measures be taken to enhance the purchasing power of the vast poor people through generation of employment opportunities.

Chapter VI
Demand and Supply Projections for Food Grains

In the following analysis we try to examine and present the studies that have exclusively focussed upon the projected demand for food grains in future at an aggregate level in India. Various eminent economists have used different tools to these projections keeping in mind of the projected increase in population as well as the demand for food grains. They have also taken into account other parameters like projected increase in income growth and tried to project the possible gap between demand and supply of food grains during the stipulated future period.

Significant economic growth, increasing population and changing lifestyles in India are causing significant changes in Indian food basket, away from staple Food grains towards high-value horticulture and animal products. While per capita consumption of Food grains has declined, their total consumption has increased due to increasing population. Also, changes in the dietary pattern towards animal products have led to an increased demand of Food grains as feed. Nonetheless, Food grains particularly Rice and Wheat continue to be the pillars of India's food security. After mid 1990's, per capita food grain production started declining due to deceleration in the total factor productivity (TFR) growth. It is a matter of concern for Indian food security. This changing scenario of consumption and production will have a significant influence on the demand and supply prospects of food.

Demand for Food grains has been increasing over the years accounting for the factors like urbanisation, regional variations in consumption pattern and income distribution, limit on energy requirement and changes in tastes and preferences of consumers for food varieties. Indirect demand including 'home away demand' has also been considered in working out this food grain projections.

Rice is the main staple food in the eastern, north eastern and southern regions, while wheat is the main staple grains in the northern, northern hills and western regions. Coarse cereals appear as important food in the western and southern regions. Therefore the food consumption patterns and demand parameters vary across regions, locations (rural, urban) and income groups. Income growth is another important factor in demand projections. Growth rates in per capita income were obtained by subtracting population growth rate from economic growth and were used in predicting the per capita consumption. Estimated per capita consumption was multiplied by population, and aggregated by regions, income groups and lifestyles to obtain the total demand.

Though there exists a decline in per capita direct consumption of food grains, the total demand is projected to increase by 2 per cent per annum in the medium term on account of an increase in the population and also as the need for grain as feed and related uses. It indicates that the growth rate in food grains production needs to be enhanced to four fold in order to protect the people from food insecurity. If we observe the per capita production of food grains, it has increased from 183 kg per year during the early 1970s to 207 kg by the mid-1990's, despite the fact that

country's population has increased beyond 50 per cent. Unfortunately after the mid 1990's, food grains production could not grow on par with the growth of population. Whereas the per capita production of cereals has declined by 17kg and pulses production by 3kg during the last decade, between 1990-2000. These trends would appear to jeopardise the food security[91].

6.1 Shifts in Dietary Pattern

If we can observe the trends in the recent dietary patterns across India, the long term trend in the consumption pattern at the household level shows that per capita direct consumption of food grains has been decreasing and that of livestock products, fruits and vegetables has been increasing for a fairly long time. Despite the shift in the dietary pattern, *food grains are considered to be of paramount importance for household food and nutrition security*. It can be attributed to the fact that, cereals and pulses are generally staple foods in India and there is no perfect substitution between staple foods and other foods and also due to the inadequate level of intake of almost all foods, increased consumption of other foods, in most cases, fulfils the dietary deficiency. And also due to, food grains are the cheapest source of energy and protein, compared to other foods and are thus vital for food nutrition security of the low income classes. More importantly, increased production and consumption of livestock products resulting from rising per capita income require high growth in the use of grain as feed for livestock. Because of these reasons, *food grains continue to be the main pillars of food security in the country* and any deficit in their production translates into a price shock and will have an adverse impact on common people. Factors behind this dietary shift are...1. Increases in per capita income 2. Changes in preferences due to changes in taste, lifestyle and occupation structure and increase in urbanisation and also the prices.

6.2 Rationale behind Demand Projections

Demand for food grain can be classified into two categories: 1) Food grains consumed by the household at house hold level in different forms, referred as 'Direct demand' or food demand 2) Food grains used as feed for cattle, as seeds in agriculture and used in industry and also the quantity that goes as waste and this termed as 'Indirect Demand for Food'.

[91] Ramesh Chand and Raju, S.S. (2007): "Risk in Indian Agriculture – A Case study of Six Major Crops", from 'Agricultural Situation in India – Oct – 2007.'

Here the NSSO Survey on Consumer Expenditure in the year 2004-05, has been utilised as the base period to make demand projections. *Projections are made based on the changes observed on different spheres between 1993-94 and 2004-05, and by also taking into the account the income elasticity of demand for different food grains*. The total change in per capita food grains consumption between 1993-94 and 2004-05 was considered to be the total of two elements, they are A) Changes occurred due to growth in per capita income B) Changes in demand due to dietary shifts in tastes and preferences of consumers. This is measured by taking the difference between the *total change in demand for food grains and change in demand due to increase in incomes*. The increase in demand due to the increase in incomes is estimated by multiplying growth in per capita income (during 1993-94 to 2004-05) by the income elasticity of demand.

Per capita demand in future period (t_n) was estimated from per capita demand in base year (to), as:

$Dt_n = Dt_0 [(1+ n_y *Yg)**^{(n)} + \Delta P_R]$;

Where Dtn is the per capita demand in future year (tn);

Dt0 is per capita demand in the base year;

çy is income in the base year;

çy is income elasticity of demand;

Y_g is growth rate in per capita income; and

Δ PR is rate of change in demand due to shift in preferences and taste.

VI.1 Projected Growth rates in Income

	1993-94 to 2004-05	2004-05 to 2011-12	2011-12 to 2020-21
NNP at factor cost	6.85	9.00	9.00
Growth rate of Per capita income			
Rural	2.27	3.46	3.58
Urban	7.75	11.81	12.19
Total	4.97	7.57	7.81

Source: National Accounts Statistics CSO and 'Population projections for India and the states 2001-06', report of the technical group on population projections, National Commission on Population.

It is observed that, during the 10 year period between 1993-94 and 2004-05, per capita income in the country has increased at the trend rate of 4.97 per cent. And it is also assumed that in the next

five to 15 years, the Indian economy might grow at an average rate of 9 per cent, which implies that there will be a 7.57 per cent growth in per capita income during the 11th plan and a 7.81 per cent growth rate beyond that. And obviously the growth rate of urban income would be more than three times the growth rate of the per capita income of rural people. Recent studies have arrived at a conclusion that income elasticity of demand for cereals is either close to zero or negative.

6.3 Direct Demand for Food

In India, the per capita consumption of cereals in rural areas registered a slight decline between 1973-74 and 1983-84. Later on, cereal intake exhibits a sharp decline in rural as well as urban areas. We can also observe that the per capita consumption of cereals is much lower in urban areas than in rural areas. At the all India level, per capita consumption of cereals has declined from 154.24 kg per person per year in 1973-74 to 132.58 kg in 2004-05. Disaggregated data shows us that the per cent of decline was much larger for coarse cereals in comparison to Rice and Wheat. But in later periods, we can observe the gap between wheat and rice consumption getting narrowed down.

VI.2Total Demand (Projected) for Food grains as Household (million tonnes)

Commodity	1993-94	2004-05	2011-12	2020-21
Rice	71.3	80.0	84.7	89.1
Wheat	48.7	58.0	62.7	67.5
C.Cereals#	17.6	13.7	11.8	10.1
T.Cereals##	137.6	151.7	159.1	166.6
Pulses	8.5	9.8	11.8	12.5
Foodgrains	146.1	161.5	169.9	179.1

Source: Population projections for India and the States 2001-06', report of the technical group on population projections, National Commission on Population. And Population projections for India and States 2001-26, office of the Registrar General and Census Commissioner, India. From "Demand for Foodgrains" by Ramesh Chand, EPW Dec 29 2007.

Based on the above projections and population projections, the demand for food grains is expected to increase to 84.7 million tonnes for rice and 62.7 million tonnes for wheat towards the end of 11th plan. But the food demand for coarse cereals is projected to decline from 13.7 million tonnes in the base year to 11.8 million tonnes by 2011-12 and 10.1 million tonnes by 2020-21. Direct demand for all cereals for food is projected to be 159.1 million tonnes by the year 2011-12 and 166.6 million tonnes by 2020-21. The total demand for food grains is projected to be 179 million tonnes by 2020-21. These projections require around 0.95 per cent annual growth in food grains used as food at household level.

VI.3 Per capita Supply and Demand for Cereals since 1983-84 (kg/yr)

5yr ending Quinquennium Survey	Domestic Supply	Direct Food Consumption	Other Users	Share of other uses in domestic supply
1983-84 to 1987-88	181.6	165.3	16.2	9.0
1989-90 to 1993-94	187.8	158.6	29.2	15.5
1995-96 to 1999-00	185.7	150.4	35.3	19.0
2000-01 to 2004-05	178.1	140.2	37.9	21.3

Source: Computed Using data from 'level and pattern of consumer expenditure', NSSO Household Consumer Expenditure Survey, Various Rounds. Agricultural statistics at a glance, MoA GoI. From "Demand for Foodgrains" by Ramesh Chand, EPW Dec 29 2007.

The per capita domestic supply of cereals (derived from production adjusted for change in food stocks and export and import) during 1983-84 to 1987-88 was 181.6 kg, out of this, 165.9 kg was consumed as food and the rest went into other uses. During 1995-96 to 1999-2000, direct food consumption declined by 15 kg, over 1987-88, but demand in other uses increased by almost 20 kg. Thus between 1987-88 and 1999-2000, the share of other uses in domestic supply has increased from 9 per cent to 19 per cent. The average of the recent five years shows that *21.3* per cent of food grains production was going into other uses. And this is taken as the base situation and through this; the future demand for food grains into other uses is also estimated using the long-term growth rate that was estimated to be 4.08 per cent per annum.

According to these estimates, indirect demand for food and demand for other uses for cereals would be around 60 million tonnes by the end of the 11th plan and 101 million tonnes by 2020-

21. The demand for pulses for other uses is projected to remain at the level of the base year during the 11th plan but it would increase to 0.7 million tonnes by 2020-21. These projections involve around 5 per cent growth in demand for food grains in other uses.

VI.4 Demand for Food grains as Household Food and Other Uses: (million tonnes)

Food Item/Demand Type	**Base year 2004-05**	**End of 11th plan**	**By 2020-21**
CEREALS			
Direct food Demand	151.7	159.1	166.6
Indirect demand	41.1	59.8	94.9
Total Demand	192.8	218.9	261.5
PULSES			
Direct Demand	9.8	11.8	12.5
Indirect Demand	4.4	4.3	6.6
Total Demand	14.2	16.1	19.1
Total Food Grains direct demand	161.5	172.5	187.4
Total Indirect-Food demand and other uses	45.5	64.1	101.5
Total Demand	207.0	235.0	280.6

Source: From above tables. From "Demand for Foodgrains" by Ramesh Chand, EPW Dec 29 2007.

The table shows that the total demand for cereals is projected to grow to 218.9 million tonnes by the end of the 11th plan and it would reach 261.5 million tonnes by the year 2020-21. In the same period the demand for pulses would grow to 16.1 and 19.1 million tons in the respective projected years of 11th plan ending and 2020-21. Domestic demand for food grains is projected to reach 235.4 million tonnes by the end of 11th plan and 280.6 million tonnes by the year 2020-21. It is also important to mention that these projections do not include export demand. *Meeting the projected demand for food grains would require 1.86 per cent annual growth in food grain production during the 11th plan.* Beyond that, the growth rate in food grain demand would increase to 2 per cent despite a slowdown in population growth. As compared to these growth rates, India's food grain production during last 10 years (1997-98 to 2006-07) increased annually by a meagre 0.48 per cent.

6.4 Surabhi Mittal Study

The study by Surabhi Mittal[92], projects the supply and demand for rice, wheat, total cereals, pulses, edible oil/oil seeds and sugar/sugarcane during the years 2011, 2021 and 2026. Projections have been based on *levels of productivity, changes in price, growth of population and income.* It is observed that an increase in demand is primarily due to growth in population and growth in per capita income. Here it is observed that supply side production is dented by low per hectare yield growths. This is clearer with regard to total cereals and sugarcane. If at all if we want to meet these demands the country will have to increase food grain production or import them.

Naturally the mismatch between production and demand influences the prices and profitability. Therefore the projections on demand side and supply side assume importance to make policy initiatives. In the coming decades, India is projected to emerge as the most populous country in the World. Therefore the demand and supply analysis of food grains will be the essential indicators to the food security concerns. If we observe the consumption of per capita cereals, it declined from 140.3 kg per annum in 1983 to 138.2 kg per annum in 2004-05. This can be, to some extent, attributed to diversification in food consumption and easy access to supply of other high value modern agricultural commodities and also due meat diet for which large amounts of grains have been diverted to feed cattle instead of directly feeding the people.

Changes in tastes and preferences, and also change in relative prices of food items, higher economic growth and per capita incomes have led to reduction in per capita demand for cereals. Though the annual per capita consumption of rice, wheat and pulses changed marginally between 1983 and 2004-05, the per capita consumption of edible oil has got doubled almost. Sugar consumption also rose significantly from 9.7 kg per annum in 1983 to 12.1 kg annum in 1999-2000.

Both in the 1980's and 1990's, the total consumption of cereals pictures a negative growth rate; also in the two decades, growth in annual per capita consumption of edible oil has registered a significant rise. In the 1990's, sugar also shown a higher rate of growth in per capita consumption. And this is followed by decent increase in the consumption of pulses and rice.

[92] Mittal, Surabhi (2008): "Demand and Supply trends and Projections of Food in India" From 'Indian Council for Research on International Economic Relations', Working Paper No. 209.

Engel's law also says that, an increase in income leads to a fall in per capita consumption of food and this will act as an improvement in the overall welfare of people.

6.5 Demand Projections of Food grains

Under different situations, the growth in per capita income, for computing demand projections, is calculated by subtracting the population growth from income growth. Growth in demand for cereals and pulses can be attributed to population growth and also rise in demand for cultivation seeds, animal feed as well as industrial use.

In this background the total cereal demand projected in 2011 is, if the economy grows at the rate of 8 per cent per annum, 187.8 million tons (mt) and 188.5 mt if the GDP growth rate is 9 per cent. And the projected cereal demand by the year 2026 will be to the tune of 272.5 mt and 277.2 mt in the other scenarios, respectively. In the same way, demand for rice, wheat and pulses is expected to be 102.1 mt, 65.9 mt, respectively, under scenario 2 (9 per cent GDP growth rate).

VI.5 Projected annual per capita domestic demand for selected food items (kg/annum)

Food Items	**Scenario 1** (8 % GDP Growth)			**Scenario 2**(9% GDP Growth)		
	2011	**2021**	**2026**	**2011**	**2021**	**2026**
Population Projected## (Millions)	1178.90 (1.39)*	1345.63 (1.33)	1414.00 (0.99)	1178.90 (1.39)	1345.63 (1.33)	1414.00 (0.99)
Rice	80.2	72.0	72.3	80.1	71.9	72.2
Wheat	51.0	49.6	48.9	50.0	47.8	46.6
T.Cereals#	159.3	180.4	193.4	159.9	182.2	196.0
Pulses	19.5	28.8	36.1	20.4	31.6	40.8
Edible Oil	13.3	19.8	25.0	14.2	22.4	28.9
Sugar	22.6	40.9	57.4	24.9	48.8	71.2

Population projected remains same for both the scenarios. *It is the Average annual rate of growth (%). #Total Cereals. Note: Scenario1: GDP is 8%; Scenario 2: GDP is 9 %. From 'Demand – Supply Trends and Projections of Food in India – working paper No.209" by Surabhi Mittal, March -2008, Indian Council for Research on International Economic Relations (ICRIER)"

The table shows that the projected demand for different food grains in terms of kilo grams per annum. We can observe that with the given population growth rate the projected growth for Rice is expected to reach 72.3 kg/annum (1st scenario) and 72.2 kg/annum (2nd scenario) per head by the year 2026, showing a marginal decline, and the same figures for wheat, cereals and pulses are 48.9 and 46.6, 193.4 and 196.0, 36.1 and 40.8 respectively. These trends are exhibiting a gradual decline except in the case of total cereals, which can be attributed to the increase in the demand

for coarse cereals. Sugar and edible oil demand projections also have shown a drastic rise from the earlier periods in both the scenarios.

6.6 Projections of Food grains Supply

Here the medium and long term food supply projections have been done in a more accurate method. These projections have been calculated assuming the yield growths to be constant or same as in the past decade. Area expansion is also assumed to take place in future. Therefore in the following table food Supply prospects have been presented for selected food items namely Rice, Wheat, total cereals, pulses, oil seeds and sugarcane, for the years 2011, 2021 and 2026, using the yield growth for the most recent period of 1993-2003 and taking 2004 as the base year for area and production. The projected yield figures for different crops, used in computation of future supply have been presented.

6.7 Supply Projections by Other Studies – A comparison:

Supply projections of food grains have also been made based on the assumptions of yield growth, cropping pattern shift, technological change, impact of input and output prices etc.

VI.6 Projected Food Supply for India by Different Studies (MT)

Source	Year	Rice	Wheat	T.Cereals#	Pulses	Oilseeds	Sugarcane
Mittal.S '97	2011	95.7	80.2	209.7	16.1	29.9	245.0
	2021	105.8	91.6	242.2	17.6	36.9	255.2
	2026	111.2	97.9	260.2	18.4	41.1	260.5
Kumar'98	2010	109.3	96.0	248.4	-	-	-
	2020	134.0	127.3	309.0	-	-	-
Mittal'00	2010	112.7	94.8	-	-	-	289.0
	2020	149.3	128.5	-	-	-	298.1
Kumar & Mittal'03	2010	107.8	95.4	236.8	13.9	-	-
	2020	127.0	111.5	274.0	15.2	-	-
Hanchate & Dyason'04	2026	-	-	265.8	23.7	-	-

#Total Cereals. From 'Demand – Supply Trends and Projections of Food in India – working paper No.209" by Surabhi Mittal, March -2008, Indian Council for Research on International Economic Relations (ICRIER)".

Total projected supply of total cereals according to Surabhi Mittal in different years (1997 and 2000) for the future years of 2011, 2021 and 2026 range around 209.7 million tons (MT), 242.2 and 260.2 Million tons and pulses projected supplies are 16.1, 17.6 and 18.4 Million tons (1st study) and according to second study, only projected supplies are estimated to only for Rice and wheat, for the years 2010 and 2020, quantities stand at 112.7 and 149.3 MT for Rice and 94.8

and 128.5 for Wheat. And coming to Kumar stuies in both years of 1998 and 2003, for the projected supply years of 2010 and 2020, they are only estimated for Rice, Wheat, Total Cereals and Pulses. Observing the 1st study in the year 1998, projected supply Quantity figures for total cereals are 248.4 and 309.0 million tons for the respective projected years of 2010 and 2020. As per the 2nd study in the year 2003, projected supply Quantity figures for total cereals are 236.8 and 274.0 million tons for the same projected years 2010 and 2020.

Hanchnte and Dyson (2001) have calculated supply projections using area and yield projections for total cereals and pulses for the year 2026. According to him, domestic supply in 2026, for total cereals, will be to the level of 265.8 Mt and 23.7 mt for pulses with 1996-98 as the base year. Kumar (1998) and Kumar & Mittal (2003) study present us the estimates on future supply under the assumptions of input and output prices, Total Factor Productivity (TFP) growth and supply elasticity. The results in above table for these studies are under the assumptions of constant TFP growth. These studies project a supply of 309 mt and 274 mt of total cereals, respectively in 2020. Estimated supply of pulses in 2020 by Kumar and Mittal (2003) study is 15.2 mt with 2000-01 very close to the 17.6 mt estimate of pulses production by present paper for 2021. Future supply estimates for oil seeds and sugar cane have not been given by other studies except Mittal (2000). The estimates in the present paper for sugarcane are lower than that of Mittal (2000) because sugarcane yields are showing a declining trend in present years.

If we observe these trends closely, as these projections are made quite some years back, excluding the projections for the years 2020 and 2026, it is very clear that, projections that have been made for the year 2011 are lagging long way behind the reality. Because the projected supply of Rice in the year by above four studies are 107.8, 109.3, 112.7 and 95.7 million tons, but the actual realised production in the year 2011 is just 80.41 mt. In the same way the projections for wheat were 95.4, 96.0, 94.8, 80.2 million tons, except the last study, all other studies have lagged behind as there existed big gap between the projection and actual production, actual realised production is only 85.93 million tons.

In the same way the pulses projections by the above three studies for the year 2011 are 23.7, 13.9 and 16.1 million tons, but the actual realised production in the year 2011 is that 18.09, here while two studies have projected less supply than the real production, one study has over

estimated the projection when compared to the actual production. It only shows that the pulses' have been showing a decent performance when compared to other cereals. Therefore if India has to achieve the food security, it really needs to increase the production of staple cereals especially the Rice and Wheat in order to meet the increased demand in future.

These Demand and supply projections of food grains act as indicators to policy makers to formulate their medium and long term agricultural policies. The study shows that the increase in total demand can be attributed to growth in population and per capita income. As far as supply is concerned, production is constrained by low yield growth.

VI.7 Projected Supply-Demand gap for Selected food Items (MT)

Food Items	**Gap** (Supply-Demand)		
	2011	**2021**	**2026**
Rice	1.26	8.98	9.13
Wheat	21.21	27.33	32.04
T.Cereals#	21.19	-2.94	-16.97
Pulses	-8.05	-24.92	-39.31

#Total Cereals. Demand scenario of GDP growth at 9% is considered here. Source: 'Demand – Supply Trends and Projections of Food in India – working paper No.209" by Surabhi Mittal, March -2008, Indian Council for Research on International Economic Relations (ICRIER)".

Here table shows that there exist negative growth rates in case of all food items except Rice and Wheat. Total cereals falling short of supply with respect to demand by 16.97 million tons in the year 2026 which would be just only 2.94 MT in 2021. The projected demand supply gap would be very huge for pulses as supply will be falling short of demand by 24.92 MT in 2021 and by 39.31 by the year 2026. A negative gap indicates that the demand of the commodity is more than its supply and this implies a deficit of the commodity in future. The gap between supply and demand is narrowing down over the years for all the food items. The supply-demand gap for total cereals is expected to be 21.19 mt in 2011 whereas it is projected at -16.96 mt in 2026. The gap in supply and demand for pulses, edible oil and sugar is expected to be negative in future. This implies that in the years to come, the country will have to rely on imports of these food items to meet the domestic requirement. Thus, we need to have necessary policy initiatives to increase the supply in future.

Rate of the growth of projected demand for the selected food items is much more than projected supply growths for these. The following table shows that in future, for cereals the demand grows

at a much higher rate than the domestic supply. This difference in growth rates is much higher for pulses, edible oil and sugar.

VI.8 Per cent Annual Growth rate of projected supply and Demand in 2026

Food Items	Demand	Supply
Rice	1.55	1.01
Wheat	1.42	1.34
Total Cereals	3.17	1.45
Pulses	6.51	0.91

Note: Growth rates are between base year and 2026. Demand Scenario of GDP growth at 9% is considred here. Source: 'Demand – Supply Trends and Projections of Food in India – working paper No.209" by Surabhi Mittal, March -2008, Indian Council for Research on International Economic Relations (ICRIER)".

The table shows that the projected growth rates of demand and supply for Rice and wheat lesser compared to total cereals, pulses, edible oil and sugar. It only shows that there will be supply shortages in response to demand. It indicates that there will of scope for food insecurity in future. Rice and Wheat falling short of demand marginally, but Pulses and Cereals have been subject to extreme differences in supply and demand in future by the year 2026, as their demand will be falling short of supply.

VI.9Projected Growth Rates in Income: (% per annum)

Particulars	2004-11	2011-16	2016-21
NNP at factor price	9.0	9.0	9.0
Per capita Income			
Rural	3.46	3.52	3.58
Urban	11.81	12.01	12.19
All India	**7.57**	**7.75**	**7.91**

Source: "Demand Projections for Food Grains in India" by Praduman Kumar, P.K.joshi and Pratap S.Birthal, NCAP-N.Delhi. Agricultural Economics Research Review, Vol.22 July-Dec 2009 pp 237-243.

Based on recent trends, it was assumed that the Indian Economy would grow at an average rate of 9 per cent per year over the next 15 years. Netting out the population growth rates during different five year plans from the GDP, growth provides us a growth rate of 7.57 per cent in per capita income during the XIth plan, 7.75 per cent during 2011-16 and 7.91 per cent during 2016-21. Rate of growth in per capita income of urban population is likely to be 3 times of the growth in per capita income of rural population.

6.8 Projection of Food Grains Consumption:

Per capita consumption of food grains (as direct demand) in 2004-05 by region and income group separately for rural and urban population was used as baseline consumption for projecting the future per capita consumption. Cereal consumption has shown a decline in both rural and urban areas. Per capita consumption of coarse cereals has shown much steeper decline than by rice and wheat. Per capita consumption of cereals has been projected to decline from 139.9 kg (per year) in 2004-05 to 125.3 kg in 2011-12 and 122.6 kg in 2021-22. Consumption of pulses is likely to be around 9.5 kg during the XIth plan and would increase only marginally afterwards. *By multiplying the projected per capita consumption with projected population*, we arrive at the direct household demand for food grains as 181.2 million tonnes (Mt) towards the end of XIth plan, with a grain mix of 87.4 Mt of rice, 67.2 Mt of wheat, 14.2 Mt of coarse grains, and 12.5 Mt pulses. The direct household demand for food grains would increase to 202 Mt by 2021-22, comprising 97.4 Mt of rice; 73.5 Mt of wheat; 15.1 Mt of coarse grains and 16.1 Mt of pulses.

Now if we can observe the Projections of future food grain consumption, we can derive some interesting inferences. For rural areas, in the coming years of 2011-12, 2016-17 and 2021-22, the per capita consumption of Rice is expected to remain exactly at 72.4kg/yr during all three projected periods. Coming to wheat consumption, it is expected to range between 47.9 and 48.1 kg/year exhibiting a marginal decline.

Even the coarse cereals also going to register a marginal decline from 14.9 kg/yr to 14.5 kg/yr during the same years. But the consumption of total cereals is going to fluctuate between 135.2 to 135.1 kg/yr. Only the pulses consumption is expected to grow from 8.7 kg/yr to 9.5 kg/yr while the total consumption of food grains is projected to grow slightly from 143.9 kg/yr to 144.6 kg/yr.

But in the case of urban areas, the consumption of Rice, wheat, coarse cereals, total cereals and total food grains have been projected to decline significantly. Only the consumption of Pulses is expected to grow from 11.0 kg/yr to 13.5 kg/yr. And the all India trends of projections are also showing the same trends of reduction in consumption of all the cereals except Pulses. Factors behind this can be attributed to the increase in population, decrease in Food grain production or increase in prices and to some extent due to changes in the tastes and preferences of the consumers.

6.9 Policy Scenario to meet Future Demand:

Given the recent trends in production, meeting future demand for food grains through domestic production alone appears to be difficult, but not impossible. The incremental demand and thereby production has essentially to come from productivity improvements as the potential for area expansion, by and large, has exhausted. Besides, increasing demand for high-value food commodities like fruits and vegetables is likely to cause a shift in area from staple food crops. Also agricultural lands are being increasingly diverted towards non-agricultural uses. To meet the future demand, the required levels of yield targets were estimated for the years 2011, 2016 and 2022 and have been presented in the following table.

VI.10 Yield target Projections for the years 2011-12, 2016-17 and 2021-22

Commodity	**Base Year TE 2005-06**		**Required Yield Level (kg/ha)**		
	Area (M.Ha)	**Yield** (kg/ha)	**2011-12**	**2016-17**	**2021-22**
Rice	42.7	2056	2368	2500	2651
Wheat	26.5	2645	3063	3282	3380
C.Cereals*	29.6	1183	993	1015	1046
Cereals	98.8	1952	2141	2262	2364
Pulses	22.9	604	677	765	853
Foodgrains	121.7	1698	1866	1981	2080
Increment Required to meet future demand					
Rice	**42.7**	**2056**	**15.2**	**21.6**	**29.0**
Wheat	**26.5**	**2645**	**15.8**	**24.1**	**27.8**
Pulses	**22.9**	**604**	**12.1**	**26.8**	**41.2**

Source**:** "Demand Projections for Food Grains in India" by Praduman Kumar, P.K.joshi and Pratap S.Birthal, NCAP-N.Delhi. Agricultural Economics Research Review, Vol.22 July-Dec 2009 pp 237-243. *Coarse Cereals.

To meet the food grain demand in 2011-12, the yields of different commodities must be raised to a minimum of 2.37 tons/hectare (t/ha) for rice, 3.07 t/ha for wheat, and 0.68 t/ha for pulses. By 2021-22, yields must further be improved to 2.65 t/ha for Rice, 3.38 t/ha for wheat and 0.85 t/ha for pulses. In terms of percentage increase, *by 2011-12 the average yield of rice and wheat must increase by 15-16 per cent and of pulses by 12 per cent.* By 2021-22, further improvements are required in yields of rice and wheat by 28-29 per cent and of pulses by 41 per cent. Improving yield levels would require serious efforts to sustain and improve the total factor productivity through research and development efforts.

VI.11 Projected food demand for India, by different studies. (million tonnes)

Source	Year	Rice	Wheat	T.Cereals#	Pulses	Foodgrains

Mittal*2008 under scenario 2 (9%GDP growth)	**2011**	94.4	59.0	188.5	24.1	212.6
	2021	96.8	64.3	245.1	42.5	287.6
	2026	102.1	65.9	277.2	57.7	**334.9**
Surabhi Mittal (2006)	**2010**			175.5	18.8	194.3
	2020			215.7	27.2	**243.9**
Ramesh Chand (2007)	**2011**			218.9	16.1	235.0
	2021			261.5	19.1	**280.6**
Rosegrant et al 1995	**2020**	-	-	**237.3**	-	
Kumar 1998	**2010**	103.6	85.8	223.7	23.0	246.7
	2020	122.1	102.8	265.7	30.9	**296.6**
Kumar et al (2007)	**2015**	98.1	74.7	210.2	17.8	228.0
	2025	106.6	79.9	226.1	20.2	246.3
Kumar et al (2009)	**2011**	101.1	81.1	211.6	15.5	**227.1**
	2016	106.8	86.9	223.6	17.5	241.2
	2021	113.3	89.5	233.6	19.5	**253.2**
Bhalla2001	2020	-	-	**374.7**	-	
Thamarajakshi 2001	2020	-	-	**274.0**	-	
Hanchate & Dyson 2004	2026	-	-	217.6	16.0	**233.6**
P.C.Bansil (1996)	2020					**241.4**
GoI, Pln Com*	2011			224.0	20.0	**244.0**

*Planning Commission. #Total Cereals. Compiled from: Source: From 'Demand – Supply Trends and Projections of Food in India – working paper No.209" by Surabhi Mittal, March -2008, Indian Council for Research on International Economic Relations (ICRIER)". The base year considered for most of these studies is 1993-94. Source**:** "Demand Projections for Food Grains in India" by Praduman Kumar, P.K.joshi and Pratap S.Birthal, NCAP-N.Delhi. Agricultural Economics Research Review, Vol.22 July-Dec 2009 pp 237-243.

Surabhi Mittal, in the year 2008, projected the demand for food in India for future times, assuming that there will be 9 per cent GDP growth rate. In the year 2021, it is projected to be 287.6 million tons (MT) and 334.9 MT by the year 2026 including total cereals and pulses. The same economist had earlier projected, in the year 2006) the total demand for food grains to be just 243.9 MT by the year 2020. In the same way, Ramesh Chand has also projected these trends to be around 280.6 MT by the year 2021. Another study by Kumar says that (in the year 2009), the projected food demand would be 253.2 MT by the year 2021 against his own projection where he projected this figure to be around just 227.1 by the year 2025 and higher projection was made in the year 1996, which is around 296.6 MT by the year 2020. Though there are other studies, other two important projections are by Hanchate & Dyson (2004) and P.C.Bansil (1996), which say that the projected demand for food grains in India 233.6 and 241.4 MT by the year 2026. And unfortunately the projection by Planning commission and Govt of India projected as

high as 244.o mT of food grains including cereals and pulses, but the actual realised production in this year is just around 218 MT.

These projections only indicate us the required levels of food grains growth in the coming years. But considering the kind of structural, financial and policy obstacles that our agriculture is up against, it is not going to be easy to achieve these growth rates. Especially the light of changing climatic conditions, changing dietary patterns, changing dietary patterns and also the liberalised trade regime in agriculture and also in the light of decreasing poverty rates and increasing incomes of the poorer sections in India, there needs to be sufficient and required policies initiated as early as possible.

6.1.0 Conclusion:

Despite dietary diversification involving a sharp decline in per capita direct consumption of food grains, the demand for cereals and pulses is projected to grow at about 2 per cent per year on account of the increase in population and growth in indirect demand. This growth rate is almost four times the growth rate experienced in the domestic production of food grains during the last decade. This has created serious imbalances between domestic production and demand which for sometime was met by liquidating stocks and cutting down on exports. If the growth rate in the domestic production of food grain fails to rise to the required level, it would result in a decline in the export of rice and eventually lead to increased dependence on the import of wheat and rice and pulses to meet the domestic demand for food grains.

If we want to meet the domestic demand of food requirements, we must increase production or depend on imports. As agricultural growth is limited, imports will help improve the supply situation in the short turn where as in the long term, we will need to focus on productivity increase, through public capital formation in irrigation, research and efficient use of water, plant nutrition and other necessary inputs. Policy initiates must lead for efficiency and help in maintaining balance between domestic production and demand. If we strive to achieve these potential yield levels, then the increasing demand requirements of the country can be met in future.

Chapter VII

Data Analysis and Interpretation

All India Compounded Annual Growth rates of Food grains, Rice, Wheat and Pulses

(between 1981-82 to 2009-10) (%)

The study period is from 1980-81 to 2009-10.The total period is divided into two sub periods. One is the period of India before entering into the GATT (General Agreement on Trade and Tariff), i.e 1980-81 to 1994-95 and 2nd period is related to the regime under GATT, subsequently WTO (World Trade Organisation) 1995-96 to 2009-10. **1980-81 to 2009-10=Total Period, 1980-81 to 1994-95= First sub period and 1995-96 to 2009-10= Second sub period.**

VII.1 All India Compound Growth Rates Food Grains Annual: (%)

Food Grains	Area	Production	Yield
1980-81 to 2009-10	-0.20	1.87	2.13
1980-81 to 1994-95	-0.29	2.79	3.09
1995-96 to 2009-10	-0.02	1.24	1.36
Rice			
1980-81 to 2009-10	0.37	2.17	1.79
1980-81 to 1994-95	0.52	3.49	2.96
1995-96 to 2009-10	0.44	1.36	1.32
Wheat			
1980-81 to 2009-10	-0.99	2.62	1.85
1980-81 to 1994-95	0.68	3.71	3.01
1995-96 to 2009-10	0.57	1.16	0.66
Pulses			
1980-81 to 2009-10	-0.15	0.62	0.77
1980-81 to 1994-95	-0.12	1.27	1.40
1995-96 to 2009-10	0.21	0.71	0.50

Source: Calculated on the basis of raw data taken from Ministry of Agriculture during different years between 1981-82 and 2009-10.

The above table explains us the compounded annual growth rates of determinants of Food grains, Rice, Wheat and Pulses at all India level. If we observe the growth rates of food grains, area (under cultivation) growth rate has been negative at -0.20 per cent during the total period, and this is more disappointing in the first period at -0.29 per cent and it has slightly improved in the second period reaching to -0.02 per cent. It only suggests that area's contribution to the production of total food grain production has been negligible during the whole period. In the same way, the total growth rate of food production, total period growth rate (1.87 per cent) is

much lesser than the first period growth rate of 2.79 per cent and marginally above the second period growth rate of 1.24 per cent. It shows that production performance has been far better in the pre WTO period than the post WTO period; it can be attributed to the effects of green revolution in the first period and to the not so pro farmer policies during the WTO regime in the second period. And also due to other structural factors that we have discussed in our earlier chapters[93]. And the higher production in the first period is more contributed by the yield growth rate of 3.09 per cent, which is much higher than the growth rates prevailed in the total period (2.13 per cent) and second period (1.36 per cent).

If we observe the growth rates of Rice, though the area (under cultivation) is positive at 0.37 per cent, its first period growth rate is (0.52 per cent) slightly higher than the second period growth rate of 0.44 per cent. And the Rice production growth rate (3.49 per cent) during the first period is not only higher than the second period (1.36 per cent) but also higher than the total period growth rate of 2.17 per cent. This growth is more supported by the increase in the yield during the second period (2.96 per cent growth rate) which higher than the both total period (1.79 per cent) as well as second period (1.32 per cent).

Coming to the case of wheat, unlike Rice, its area under cultivation growth rate has been negative at -0.99 per cent during the total period, but its growth rate during the first and second period has been slightly positive at 0.68 per cent and 0.57 per cent, despite this the wheat production growth rate has been very high during the 1st period at 3.71 per cent which higher than the total period growth rate of 2.62 per cent and more higher than the second period growth rate of 1.16 per cent. This can be again due to the higher growth rate in the yield which is 3.01 per cent, higher than the both total period (1.85 per cent) and second period growth rates. Particularly the wheat performance during the WTO regime has been quite dismal due to both reduction in area as well as yield per hectare and also due to other insufficient policies and support structure to the farmers. These trends only had led to the even trends of importing wheat during the years 2006 and 2007.

In the case of Pulses, unlike Rice and Wheat, it's Area and production growth rates have been positive during the second period. But only the growth rate of yield during the second period has been lesser than the first period[94]. Hence these trends only indicate us that the production performance of food grains with respect to area and yield has been much better during the pre

[93] Hanumantha Rao CH (2005): "Food Grain Surpluses - Causes and Policy Implications." From 'Agriculture, Food Security, Poverty and Environment'. Essays on Post Reform in India 2005.
[94]Krishnaraj;Maithreyi (2006): "Food Security – Agrarian Crisis and Rural Livelihoods – Implications for Woman." Epw (5376 – 5387)– Dec 2006.

WTO period than the post WTO period, and thereby we can say that the food grain availability and food insecurity have increased have increased during the WTO regime period[95].

VII.2 State wise Compounded Annual Growth rates of Food grains (From 1981-82 to 2009-10)

(%)

Rajasthan	Area	Production	Yield
1980-81 to 2009-10	0.13	4.89	2.64
1980-81 to 1994-95	-0.58	9.32	2.54
1995-96 to 2009-10	0.42	0.23	1.33
West Bengal			
1980-81 to 2009-10	0.32	3.20	2.88
1980-81 to 1994-95	0.99	5.53	6.00
1995-96 to 2009-10	-0.23	1.36	1.64
Punjab			
1980-81 to 2009-10	0.09	2.58	0.12
1980-81 to 1994-95	-0.49	4.55	-0.62
1995-96 to 2009-10	0.79	1.86	1.07
Andhra Pradesh			
1980-81 to 2009-10	-0.77	2.09	2.99
1980-81 to 1994-95	-2.65	0.92	3.71
1995-96 to 2009-10	0.01	-0.56	2.89
Karnataka			
1980-81 to 2009-10	1.06	1.09	0.41
1980-81 to 1994-95	1.27	2.24	0.97
1995-96 to 2009-10	0.57	1.04	1.15
Maharashtra			
1980-81 to 2009-10	-0.58	0.97	1.59
1980-81 to 1994-95	-0.28	2.42	2.71
1995-96 to 2009-10	-0.72	0.42	1.22
Uttar Pradesh			
1980-81 to 2009-10	-0.20	0.15	2.13
1980-81 to 1994-95	-0.05	-0.63	3.98
1995-96 to 2009-10	-0.47	0.33	0.84
Madhya Pradesh			
1980-81 to 2009-10	-0.11	0.00	0.1
1980-81 to 1994-95	3.76	3.62	-0.24
1995-96 to 2009-10	-3.35	-2.36	0.88
ALL INDIA			
1980-81 to 2009-10	-0.20	1.87	2.13
1980-81 to 1994-95	-0.29	2.79	3.09
1995-96 to 2009-10	-0.02	1.24	1.36

Source: Calculated on the basis of raw data taken from Ministry of Agriculture during different years between 1981-82 and 2009-10.

[95]Krishnakumar S (2004): "Agricultural Trade Liberalisation and Food Security-Theoretical Debates and Empirical Issues", from 'Poverty and Food security in India: Problems and Policies',edt by M.S.Bhatt, New Delhi 2004.

The above table presents us the state wise performance of 8 major states involved in food grain production. These states have been selected only on the basis of aggregate area under cultivation in terms of thousand hectares.

***States with Higher Growth rates than National Growth Rate:**

It is clear that, in terms of food grain production state of Rajasthan, which is basically a pulses producing state has registered higher production growth rates during the three periods, 4.89 per cent, 9.32 and 0.23 9.32 per cent respectively. As expected in the second period, its production performance is also very dismal. But its area growth rate has turned out to be positive (0.42 per cent) from an earlier rate of -0.58 per cent. Even its yield growth rates have been better in the first period (2.54 per cent) than in the second period (1.33 per cent).

Next the state of WB has performed consistently well during the total period (3.20 per cent), more in the first period at 5.53 per cent and slightly decreased to 1.36 per cent in the second period. WB is predominantly a Rice producing state; its better performance is more helped by the increase in the yield rates during the referred period at 2.88 per cent, and as high as 6 per cent in the first period. Its Area growth has not been positive, which had even turned out to be negative in the second period to -0.23 per cent from the earlier 0.32 per cent.

And the next better performing state, Punjab has also registered higher production growth rates than the national rates, at 2.58, 4.55 and 1.86 per cent during the respective three periods. Though its performance is higher in the pre WTO period, despite the fact that both the Area (-0.49 per cent) and Yield (-0.62 per cent) growth rates turning negative. The state of AP also maintained higher growth rate than the national average during the total period 2.09 per cent, it is lesser in the first period at 0.92 per cent and had turned out to be negative in the second period -0.56 per cent. Its area growth rates in the first two periods are negative and slightly improved in the second period. It has also maintained decent yield growth rates on par with the states like WB and UP and Rajasthan.

***States below National Growth Rate:**

And the State of Karnataka also performed decently in all the periods. All its production, Area and Yield growth rates have been positive in all the three periods, as usually the pre WTO period has shown far better performance than the rest of the two periods. States like Maharashtra,

another major pulses producing state, despite registering nominal production growth rates (0.97, 2.42 and 0.42 per cent) during respective three periods, its more contributed by the increase in the yield growth rates (1.59, 2.71 and 1.22 per cent) as Area had registered negative growth rates (-0.58, -0.28 and -0.72 per cent) in all the three periods. And the state of MP, the leading producer of pulses in India, its overall production growth is 0.00 per cent and increased to 3.62 per cent in the first period, which is more due to increase in the area from -0.11 to 3.76 per cent while the yield growth turning negative at -0.24 per cent. And in the second period of post WTOs, production registered a massive negative growth rate of -2.36 per cent, which can be attributed to the decrease in area by -3.35 per cent, despite yield registering a positive growth rate of 0.88 per cent in the second period. And finally the state of UP, performed very disproportionately and disappointingly. As its overall production growth has been just at 0.15 per cent and surprisingly it had registered a negative growth rate in the pre WTO period and posted positive growth rate in the post WTO period despite the fact that the area growth rate turning negative, from -0.05 to -0.47 per cent. Its yield growth has been higher in the pre WTO period (3.98 per cent) and drastically declined to 0.84 per cent during the post WTO period.

So it can be drawn from the above table that, during the overall period, the states of RJ, WB, Punjab, Rajasthan and AP have performed well above the national performance as far as food grain production is concerned. The states like Maharashtra and Karnataka also performed relatively better while the states like Madhya Pradesh and Uttar Pradesh (UP) performed very poorly as far as food grain production is concerned.

These trends can only indicate us that, in almost all the states, as reflected in the national level as well. The food grain performance is either low or negative during the reform period/WTO free trade regime[96]. Factors that are behind this can be traced back to the measure of State gradually moving away from the agriculture during this reform period, which is evident from our analysis as there was reduction in state support to agriculture by way of reducing gross capital formation in agriculture and concentrating on commercial crops in order to lead a export led growth. Apart from the above, other structural, seasonal and climatic fluctuations also had led to the decrease in food grain production in the second period of reforms.

[96]Kumar., Praduman and Mittal; Surabhi (2003): "Productivity and Supply of Food grains in India", from 'Towards a food secure India-Issues and Policy' edt by Mahendra Dev S, Kannan K.P, Ramachandran Nira.

VII.3 State wise Compounded Annual Growth rates of Rice (From1981-82 to 2009-10) (%)

Punjab	**Area**	**Production**	**Yield**
1980-81 to 2009-10	2.66	3.72	1.03
1980-81 to 1994-95	4.47	5.71	1.18
1995-96 to 2009-10	1.50	3.33	1.80
West Bengal			
1980-81 to 2009-10	0.48	3.19	2.62
1980-81 to 1994-95	1.26	5.60	4.44
1995-96 to 2009-10	-0.23	1.75	1.59
Uttar Pradesh			
1980-81 to 2009-10	0.35	2.47	2.15
1980-81 to 1994-95	0.40	4.83	4.55
1995-96 to 2009-10	-0.14	-0.08	0.06
ASOM			
1980-81 to 2009-10	0.21	1.72	1.51
1980-81 to 1994-95	0.77	2.62	1.87
1995-96 to 2009-10	-0.45	0.63	1.09
Orissa			
1980-81 to 2009-10	0.20	1.71	1.50
1980-81 to 1994-95	0.58	4.05	3.45
1995-96 to 2009-10	-0.13	2.41	2.55
Andhra Pradesh			
1980-81 to 2009-10	0.00	1.70	1.70
1980-81 to 1994-95	0.13	2.17	2.04
1995-96 to 2009-10	-0.24	1.64	1.90
Bihar			
1980-81 to 2009-10	-1.83	-0.33	1.42
1980-81 to 1994-95	-0.51	1.57	2.10
1995-96 to 2009-10	-3.65	-4.88	-0.98
ALL INDIA			
1980-81 to 2009-10	0.37	2.17	1.79
1980-81 to 1994-95	0.52	3.49	2.96
1995-96 to 2009-10	0.44	1.36	1.32

Source: Calculated on the basis of raw data taken from Ministry of Agriculture during different years between 1981-82 and 2009-10.

Rice is the major staple food of India. Nearly 65 per cent of the Indian diet is associated with rice consumption. The above data shows us the performance of major Rice producing states with respect to production, area under cultivation and also per hectare yield during the period since 1980-81 to 2009-10.

***States above National Growth rate:**

Above table shows that, out of all the states, the state of Punjab has been showing significant growth in Rice production with 3.72 per cent overall growth rate which is higher than the national growth rate of 2.17 per cent. It's the state with greater Rice production as it is endowed with requisite structural as well natural agricultural support system. And Punjab's growth in the first period is much higher than any other state at 5.71 per cent and later it came down to 3.33 per cent in the second period of liberal trade. This higher growth in production of Punjab is helped by the higher growth rates in area under cultivation (2.66, 4.47 and 1.50 per cent) and also consistent yield growth rates (1.03, 1.18 and 1.80 per cent). West Bengal is the highest Rice producing state in India for the past many years[97]. After Punjab it is the state of WB which has shown significant performance with 3.19 overall growth rate and even higher growth rate in the pre WTO period (5.60 per cent). But at the same time this growth was not maintained in the second period as it came down to 1.75 per cent, it can be attributed to the negative growth rate (-0.23 per cent) in the area under cultivation and also lower yield growth rate of 1.59 per cent. One of the reasons for the better performance of the WB can be attributed to the yield growth rates which are at 2.62 per cent during the overall period. After the west Bengal, the state of Uttar Pradesh has maintained higher growth rate (2.47 per cent), but unfortunately its robust performance in the pre WTO period (4.83 per cent) has not been continued in the second period as it has come down to a dismal negative rate of -0.08 per cent. This can be due to the lower growth rate in yield (0.06 per cent) as well as area growth rate of -0.14 per cent. Thus the states of Punjab, WB and UP have maintained higher production growth rates of Rice than the National growth rates during the overall period.

***States below the National Growth rate:**

Apart from these three states, other better performing states are Asom, Orissa and AP which have maintained the identical growth rates of 1.72, 1.71 and 1.70 per cent respectively during the overall period. Out of these three states, Orissa has maintained consistent growth rates during the two sub periods with 4.05 and 2.41 per cent. This performance of Orissa is more helped by the decent growth rates in the yield, with 1.50, 3.45 and 2.55 per cent despite the very low and also

[97]Bipasha Maity and Bani Chatterjee (2007): "Effects of Modern Inputs on Foodgrains Productivity: A Macro Analysis in West Bengal", from 'Agricultural Situation in India – Oct – 2007.'

negative growth rates in the area under cultivation (0.20, 0.58 and -0.13 per cent), during the three respective periods. And the state of Asom also maintained the overall growth rate of 1.72 per cent despite the lower growth (0.63 per cent) in the second period, it was due to the lower area growth rate (-0.45 per cent) in the second period. Therefore it is evident that its growth in production is more supported by the desirable yield growth rates (1.51, 1.87 and 1.09 per cent). And next, the State of AP, which is basically a Rice growing state – contributing majority share to the national Rice production, also has shown an identical growth rate on par with the states of Orissa and Asom, with overall growth rate of 1.70 per cent. But its area growth rate has been very insignificant and unwarranted during the three periods with respective growth rates 0.00 per cent, 0.13 and -0.24 per cent. It's the yield growth rate (1.70, 2.04 and 1.90 per cent) that has contributed more to the production growth rate.

And finally it's the state of Bihar that has shown a very disappointing and dismal growth in production during the overall period with -0.33 per cent and it had even deteriorated to to whopping -4.88 per cent in the second period of reforms from an earlier growth rate of 1.57 per cent. This discouraging growth of Bihar can be attributed to the very high negative growth rates in area (-1.83, -0.51 and -3.65 per cent).

Hence these trends would indicate us that the performance of all major Rice producing states has been desirable and positive in the pre WTO period of 1981-82 to 1994-95 and simultaneously they all had shown either very low or negative production growth rates during the post WTO period. Only the states like Punjab, WB and UP have shown higher growth rates than the national growth rates. This can be attributed to the increase in the yields on the one hand and also due to other structural support structures like irrigation, soil fertility, crop intensity and also partly due to partly congenial political and physical environment[98]. But at the same time, their Rice production growth was severely hampered by the liberal trade regime during the post WTO period as there started a gradual decline in the support structure to food grain crops and also due to heavy food imports, domestic farmers had failed to withstand the competition from cheap imports from developed and developing countries. Since Rice crop is grown in more wet lands, the irregular rainfall and also floods have negatively impacted the food grain production in the second period of liberal trade regime. This is more prominent in the states like Bihar, AP, Orissa

[98]Paul A.Dorosh: (2004)"Trade, Food Aid and – Evolving Rice and Wheat Markets." Epw, Sep 04 – 2004, 4033 – 4042.

and UP, as the cultivation in these states is more labour intensive, traditional and thereby leading to higher cost of cultivation. These trends have led the farmers either to quit the cultivation or to stand on the unviable and unsustainable position as they could no longer survive on this cultivation. This finally had led to the decrease in the relative Rice production which finally led to either increase in prices or also lesser availability to the consumers[99].

VII.4 State wise Compounded Annual Growth rates of Wheat (between 1981-82 to 2009-10) (%)

Rajasthan	**Area**	**Production**	**Yield**
1980-81 to 2009-10	1.23	3.45	2.19
1980-81 to 1994-95	1.06	3.93	2.84
1995-96 to 2009-10	-0.47	0.92	-0.98
Madhya Pradesh			
1980-81 to 2009-10	0.50	2.56	2.05
1980-81 to 1994-95	0.98	5.00	3.97
1995-96 to 2009-10	-0.77	-0.38	0.41
Uttar Pradesh			
1980-81 to 2009-10	0.53	2.39	1.84
1980-81 to 1994-95	0.79	3.59	2.78
1995-96 to 2009-10	0.23	1.09	0.85
Maharashtra			
1980-81 to 2009-10	0.01	2.27	1.76
1980-81 to 1994-95	-3.39	0.27	2.26
1995-96 to 2009-10	2.66	4.46	3.79
Punjab			
1980-81 to 2009-10	0.58	2.12	1.52
1980-81 to 1994-95	0.96	3.67	2.67
1995-96 to 2009-10	0.60	1.01	0.40
Bihar			
1980-81 to 2009-10	0.67	1.92	1.23
1980-81 to 1994-95	1.38	4.34	2.92
1995-96 to 2009-10	0.06	-0.88	-0.94
Haryana			
1980-81 to 2009-10	1.63	-1.69	2.01
1980-81 to 1994-95	1.68	5.40	3.65
1995-96 to 2009-10	1.44	-14.67	0.79
ALL INDIA			
1980-81 to 2009-10	-0.99	2.62	1.85
1980-81 to 1994-95	0.68	3.71	3.01
1995-96 to 2009-10	0.49	1.16	0.66

Source: Calculated on the basis of raw data taken from Ministry of Agriculture during different years between 1981-82 and 2009-10.

[99]Prasanna; Lakshmi P.A, Kumar; Sant and Aruna Singh (2009): "Rice Production in India – Implications of Land Inequity and Market Imperfections", from 'Agricultural Economics Research Review', Vol.22 (Conference Number) 2009 pp 431-442.

The above table shows that the performance of major seven wheat producing states in India during study period from1980-81 to 2009-10. These states are also chosen on the basis of are under cultivation in terms of thousand hectares. Wheat is the major staple diet of most of the people in India after Rice. Out of all the referred states, Rajasthan's performance has been significant in terms of wheat production which is evident in its growth rate during the overall period with 3.45 per cent, which is even higher than the national growth rate. Though it had higher growth during the first sub period (3.93 per cent) than the second period (0.92 per cent), it is partly due to the lower growth rate in area. But its robust growth can be attributed to the higher growth in the yield which is at 2.19 per cent during the total period.

Apart from Rajasthan all other states have registered lesser growth rate than the national growth i.e. 2.62 per cent. Madhya Pradesh (MP) has shown an optimum growth with 2.56 per cent, though it is slightly lesser than the national growth rate of 2.62 per cent. But, as in the case of Rajasthan, it had also shown better performance in the first sub period (5.00 per cent) than the second sub period (-0.38 per cent) of reforms. Its higher production growth of wheat is contributed by the increase in the yield per hectare and lesser by the area growth rate (it had turned negative in the second period with -0.77 per cent). After MP, its the state of UP which had shown relative better performance with overall production growth rate of 2.39 per cent, and it had come down to 1.09 per cent in the second sub period from earlier sub period growth rate of 3.59 per cent. Here also production growth is more contributed by the yield growth rates of wheat which stood at 1.84, 2.78 and 0.85 per cent during the respective periods. UP is the highest wheat producing state in India with an extensive cultivated area, therefore, production fluctuations in UP will have severe repercussions in the aggregate country's wheat self sufficiency.

If we observe the state of Maharashtra, it is also has been showing relatively better performance in wheat production with 2.27 per cent growth rate during the overall period. But here the interesting finding is that, unlike other states, it had performed very well during the second sub period of liberal trade regime with 4.46 per cent which was just 0.27 per cent during the first sub period. This is more influenced by the higher growth rate in area (2.66 per cent) in the second period and also due to the higher yield growth rate (3.79 per cent) in the same period. The

agriculturally rich state like Punjab has followed Maharashtra with 2.12 per cent production growth rate and this was more in the first period with 3.67 per cent and came down to 1.01 per cent in the second period. This growth of Punjab partly contributed by both area and yield with respective growth rates of 0.58 per cent and 1.52 per cent. And also the state of Bihar, which is more often prone to uneven monsoon and floods had not been able to perform well in Wheat production as it just registered 1.92 per cent aggregate growth rate in the overall period. But its growth rate in the pre WTO period was as high as 4.34 per cent, more contributed by the yield growth rate of 2.92 per cent and partly by the 1.38 per cent, but unwarrantedly it had drastically came down to a disappointing growth rate of -0.88 per cent, which is the result of lower area growth rate (0.06 per cent) and also lower negative yield growth rate of -0.94 per cent.

And finally the state of Haryana, which is again a major agriculturally better endowed state with well structured and extensive irrigation network had failed to register a significant wheat production growth rate as it registered a negative growth rate of -1.69 per cent during the overall period. But the same Haryana had performed exceptionally well during the first period with 5.40 per cent which is higher than any other state in that period, contributed mostly by the yield growth rate (3.65 per cent) and also by area growth rate (1.68 per cent). But unfortunately its production performance had been quite disappointing with a negative growth rate of 14.67 per cent which is majorly contributed by the decrease in yield growth to 0.79 per cent and also decrease in area under cultivation growth rate to 1.44 per cent from an earlier figure of 1.68 per cent. This discouraging and alarming performance of Haryana in wheat production is influenced by the factors like urbanisation, moving away to non food crops, decreasing support from the government and also due to heavy and cheap imports from other developed countries under liberal trade regime.

Hence the above analysis will enable us understand the fact that, during the second period except Maharashtra, the production performance of all the referred states has been either low or negative. This was very evident when India had to import wheat from countries like Australia to the tune of 6 million tons 2006-07[100]. There may be various factors behind this uneven trend, but the major causes can be found in the ill effects and the unfavourable atmosphere that had been created out of the conditions under WTO. Therefore, for an agricultural country like India unless

[100]Ramesh Chand (2006): International Trade Food Security and the response to the WTO in South Asian Countries". Research Paper No. 2006/124. United Nations University- UNU –WIDER. World Institute for Development- Economic Research.

we find an equivalent and appropriate alternative mechanism that would protect our farmers as well as our consumers with better production wheat self sufficiency from the unfavourable clauses of WTO[101], we will not be able to produce enough and thereby fail to protect both our farmers and consumers, especially in the light of increasing population, urbanisation, climate change and global warming, food habits and tastes and preferences, it is very essential to protect the food grain production with structural support system in order to bring in the food grain self sufficiency and thereby food security.

VII.5 State wise Compounded Annual Growth rates of Pulses:

(between 1981-82 to 2009-10) (%)

Andhra Pradesh	**Area**	**Production**	**Yield**
1981-82 to 2009-10	1.36	3.87	2.43
1981-82 to 1994-95	1.18	2.85	1.64
1995-96 to 2009-10	1.79	6.76	4.87
Maharashtra			
1981-82 to 2009-10	0.99	2.76	1.62
1981-82 to 1994-95	2.07	4.63	2.07
1995-96 to 2009-10	0.49	1.96	1.46
Karnataka			
1981-82 to 2009-10	1.30	2.18	0.87
1981-82 to 1994-95	0.24	0.47	0.23
1995-96 to 2009-10	2.52	3.52	0.98
Madhya Pradesh			
1981-82 to 2009-10	-0.62	0.68	1.59
1981-82 to 1994-95	-0.19	2.31	2.50
1995-96 to 2009-10	-1.45	1.69	0.96
Rajasthan			
1981-82 to 2009-10	0.02	0.02	0.00
1981-82 to 1994-95	-0.70	-0.74	0.00
1995-96 to 2009-10	-0.34	-1.47	-1.13
Orissa			
1981-82 to 2009-10	-4.59	-6.09	-1.56
1981-82 to 1994-95	-3.92	-5.39	-1.52
1995-96 to 2009-10	0.40	1.86	1.46
ALL INDIA			
1980-81 to 2009-10	-0.15	0.62	0.77
1980-81 to 1994-95	-0.12	1.27	1.40
1995-96 to 2009-10	0.21	0.71	0.50

Source: Calculated on the basis of raw data taken from Ministry of Agriculture during different years between 1981-82 and 2009-10.

[101]Kumar; Praduman, Joshi P.K, Birthal S Pratap (2009): "Demand Projections for Food grains in India", from 'Agricultural Economics Research Review, Vol. 22 July – Dec 2009,pp 237-243.

The above table of compounded annual growth rates exhibit us a clear picture as to how the pulses production has evolved since 1981-82 across 6 major pulses producing states in India based on their area under cultivation. Pulses in India comprise of grains like Arhar, Gram, Greengram, Khesari, Masoor, Moong, moth, Black chena, yellowgram, Urad dal and Tur dal. Since all the these pulses play a very crucial role in determining the day to day diet pattern and quality of consumption of many people we take into account all the pulses as an integrated bundle and try to analyse the production fluctuations and repercussions. Here it is very clear that, aprt from the states of Orissa and Rajasthan all other states had shown higher growth rates than the national growth rate i.e. 0.62 per cent during the overall period 1981-82 to 2009-10.

If we analyse the above data, it is very clear that the state of Andhra Pradesh, predominantly agriculture based economy, has maintained higher growth (3.87 per cent) in pulses production than the national growth figure of 0.62 per cent. This higher growth of pulses of AP is more contributed by the increase in yield growth rates throughout the period which is at 2.43 per cent. This yield growth rate is more in the second sub period (4.87 per cent) than in the first sub period (1.64 per cent). These yield growth rates of AP are higher than any other state under our consideration and also far higher than the national growth rates. Following AP, the state of Maharashtra has also maintained higher growth (2.76 per cent) than the national growth rate during the overall period. Unlike AP, its growth rate is more higher in the 1st sub period (4.63 per cent) than in the second sub period (1.96 per cent), which can be primarily attributed to the increase in both area (2.07 per cent) and yield growth rate (2.07 per cent). In the same way the state of Karnataka also has put up a good performance with 2.18 per cent growth rate in pulses production during the overall period between 1981-82 and 2009-10. Like AP and Maharashtra, in Karnataka also the growth in production is lesser in the first sub period (0.47 per cent) than in the second period (3.52 per cent). This is clearly due to the higher growth of area at 2.52 per cent in the second sub period and also partly by the yield growth rate of 0.98 per cent.

If observe other states involved in pulses production, leading pulses producer in the country, Madhya Pradesh[102], has not been able to perform up to the mark in terms of pulses production during the period between 1981-82 to 2009-10, as it just managed to maintain 0.68 growth rate.

[102]Bhartiya K.C, (2009): "Pulses: Growth Trajectory, Missed Opportunities & State Interventions", from 'India Commodity Year Book 2009', by National Collateral Management Services Ltd, Mumbai, edt by Sanjay Kaul.

But unlike our above mentioned states, Madhya Pradesh has shown better growth (2.31 per cent) during the first sub period than in the second sub period (1.69 per cent) of economic reforms and liberal trade regime. This variation can be due to the higher growth of per hectare yield in the first sub period (2.50 per cent) and due to various factors it had come down to 0.96 per cent during the second sub period. At the same time during all the periods, area growth rates of Madhya Pradesh (under pulses cultivation) has been negative throughout the three periods, as it just -0.62 per cent during the overall period (came down from -0.19 per cent to -1.45 per cent in the second sub period).

Rajasthan is also one of the major pulses producing state in India, but unfortunately it had also not managed to maintain desirable growth rate as it just made mere 0.02 per cent growth in pulses production during the total period under consideration. Its production growth in first sub period is as low as -0.74 per cent per cent and it got further worsened and reached a level of -1.47 per cent in the second sub period. Its yield growth rates during the total period is stagnant with 0.00 per cent growth and also remained so in the first period, and finally it turned negative in the second sub period with -1.13 per cent growth rate in yield. This worse performance of Rajasthan, apart from other structural and climatic factors, also can be attributed to the lower growth rates in the area under cultivation of pulses with just 0.02 per cent growth in the total period. Finally it's the state of Orissa which had shown the lowest performance in the pulses production during our study period as its growth has collapsed to as low as -6.09 per cent during the total period. This can be primarily attributed to the very low growth of production in the first sub period (-5.39 per cent) because the growth in the second sub period has turned positive with 1.86 per cent growth in production. This disappointing performance of Orissa in pulses production can be found in the lower or even negative growth rates of area (-4.59 per cent, -3.92 per cent and 0.40 per cent) and also yield (-1.56 per cent, -1.52 and 1.46 per cent) during the three respective sub periods.

Thus it is very clear from the table that the growth of pulses production during our sub periods has not been identical like in the case of either total food grains or rice or wheat. The states like Madhya Pradesh, Rajasthan and Maharashtra have performed very positively in the first sub period of pre economic reforms than the second sub period of post liberal trade regime like in the case of national growth rates. Apart from these states, the rest of the states like AP, Karnataka

and Orissa have performed better during the second sub period of liberal free trade under WTO than in the pre liberal trade regime between 1981-82 and 1994-95. This trend can be due to, apart from various other government policy initiatives, the shift in the cultivation pattern from food grains towards more of pulses and also due to the increase in the per hectare yield of these three referred states[103].

VII. 6 India's Population & Food grains: Compounded Annual Growthrates (Between 1981-82 to 2009-10) (%)

year	Population	FG Production	Rice	wheat	Pulses	Cereals
1981-82 to 2009-10	1.93	1.87	2.17	2.62	0.62	2.06
1981-82 to 1994-95	2.10	2.79	3.49	3.71	1.27	2.89
1995-96 to 2009-10	1.71	1.24	1.36	1.16	0.71	1.40

Source: Calculated on the basis of raw data taken from Ministry of Agriculture, MoA, and Census of India 2011, during different years between 1981-82 and 2009-10.

The above data of growth rates presents us an answer to the question how the growth rate of food grain production, including Rice, Wheat, Pulses and Cereals has varied during our study period between 1981-82 and 2009-10 in relation to total population growth rate during the same period[104]. It shows that the overall food grain production growth rate (1.87 per cent) is slightly lesser than the overall population growth rate of 1.93 per cent. But if we observe the pre WTO and post WTO regime growth rates of food grains, they exhibit different picture. In the first sub period of pre WTO period, growth rate of food grain production (2.79 per cent) is significantly higher than the population growth rate of 2.10 per cent and on the other hand, the food grain growth rate in the second period of liberal WTO free trade, has drastically come down to 1.24 per cent which is very much lower than the growth of population during this period. It only suggests that, though the overall growth of food grain production is lagging behind the population growth rate during the total period and more so in the post liberal trade period of 1995-96 to 2009-10. It is a clear indication for the fact that our food grain production has not been able to grow so as to provide sufficient food grains to increasing population[105]. This trend is more prominent during latest period of WTO free agricultural trades regime, as higher food grain production growth in the pre WTO period has seriously dropped down below the population

[103]Srivastava S.K, Sivaramane N, Mathur V.C (2010): "Diagnosis of Pulses Performance of India", from 'Agricultural Economics Research Review, Vol.23 Jan-June pp 137-148.
[104]Hanumantha Rao CH (2005): "Declining per capita Demand for Food Grains in Rural India- Causes and Implications", From 'Agriculture, Food Security, Poverty and Environment', Essays on Post Reform in India 2005.
[105]Krishnakumar S (2004): "Agricultural Trade Liberalisation and Food Security-Theoretical Debates and Empirical Issues", from 'Poverty and Food security in India: Problems and Policies',edt by M.S.Bhatt, New Delhi 2004.

growth during the WTO regime. That only suggests that the food grain self sufficiency of India is more jeopardised during the WTO regime than in the pre WTO regime.

In the same way, the growth rate of Wheat, Rice, Pulses and Cereals has also been more positive in the pre WTO period as their respective growth figures 3.49, 3.71, 1.27 and 2.89 per cent in the first period have significantly come down to respective 1.16, 1.36, 0.71 and 1.40 per cent during the second sub period. It also again projects the same trends of insufficient production of Rice, wheat, Pulses and Cereals during the post WTO period of 1995-96 to 2009-10. This adverse growth, as far as food security of India is concerned, can be attributed to the restrictions that have been imposed on our farmers through WTO[106], in terms of opening up of the agricultural imports; reduction in import quotas, quantitative restrictions (QRs) imposing the strategy of export led growth and concentration on cash crops rather than the food grain crops[107]. Also due to the gradual depletion of public investments over agriculture and also exposing our labour intensive and antiquate high cost cultivation to the developed agricultural markets have all together pushed Indian farmer into a fragile situation. Ultimately these trends have led to deterioration of the viability of cultivation and finally led to the drastic decline in the food grain production during this reform period and effected country's food security at the aggregate level.

[106]Panda;Manoj, Kumar;Ganesh A (2008): "Trade Liberalisation, Poverty and Food Security in India", from 'IGIDR, Mumbai, WP-2008-013.
[107]Panda;Manoj, Kumar;Ganesh A (2008): "Trade Liberalisation, Poverty and Food Security in India", from 'IGIDR, Mumbai, WP-2008-013.

Standard deviation

It is a statistical measure of spread or variability. And it is the root mean square (RMS) deviation of the values from their arithmetic mean. Its also a measure of the dispersion of a set of data from its mean. The more spread apart the data, the higher the deviation. Standard deviation is calculated as the square root of variance.

Standard deviation of the sample is denoted by the symbol σ and also denoted by s_N and defined as follows:

$$s_N = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(x_i - \overline{x})^2}.$$

∑ = Summission

$(x_i - \bar{x})^2$**= square of Mean deviations**

N= Number of Variables

Coefficient of Variation

The coefficient of variation (abbreviated CV) is a way to quantify scatter. It is defined as the standard deviation of a group of values divided by their mean. Often that ratio is multiplied by 100 to express the coefficient of variation as a percent (abbreviated %CV). The coefficient of variation (CV) is defined as the ratio of the standard deviation σ to the mean Coefficient of Variation measures how much individual variable differs from the mean

$CV = (\sigma \div \mu)*100$

σ = Standard Deviation

μ = Mean

VII.7 All India Food Grains, Rice, Wheat, Pulses : Area Production and Yield- ***Standard Deviation (SD) and Coefficient of Variation (CV)*** (%) Between 1981-82-2009-10
(area '000 hectares, Production '000 tons and Yield kg/ha)

Food grains

Period	**SD**			**CV**		
	Area	Produxn*	Yield	Area	Produxn	Yield
1980-81-2009-10	3.4	30.73	264.36	2.74	16.9	17.97
1980-81-1994-95	3.05	20.75	175.96	2.42	13.16	14.02
1995-96-2009-10	2.68	16.54	117.96	2.19	8.03	6.99
RICE						
Period	**SD**			**CV**		
	Area	Produxn	Yield	Area	Produxn	Yield
1980-81-2009-10	1.76	14.3	278.62	4.16	18.73	15.56
1980-81-1994-95	1.36	10.7	215.17	3.30	16.34	13.62
1995-96-2009-10	1.31	7.35	140.48	3.01	8.43	7.02
Wheat						
Period	**SD**			**CV**		
	Area	Produxn	Yield	Area	Produxn	Yield
1980-81-2009-10	1.86	13.42	376.33	7.35	22.11	15.81
1980-81-1994-95	1.01	8.35	281.01	4.24	16.9	13.54
1995-96-2009-10	1.07	5.53	121.64	4.0	7.69	4.53
PULSES						
Period	**SD**			**CV**		
	Area	Produxn	Yield	Area	Produxn	Yield
1980-81-2009-10	1.0	1.28	49.41	4.41	9.79	8.62
1980-81-1994-95	0.87	1.12	41.71	3.76	8.9	7.67
1995-96-2009-10	1.05	1.26	37.71	4.69	9.32	6.25

*Production. Source: Calculated on the basis of raw data taken from Ministry of Agriculture, MoA, and Census of India 2011, during different years between 1981-82 and 2009-10.

The above table we have calculated Standard Deviation (SD) and Coefficient of Variation (CV) for Area, Production and per hectare yield. SD and CV enable us to identify, observe and analyse the degree of variability or deviations that had occurred during respective periods in area under cultivation, total production and also yield per hectare. Here SD and CV have been calculated for Food grains, Rice, Wheat and Pulses at All India level.

We have adopted this method of calculating SD and CV in order to ascertain the level of instability or variations involved in the production, area and yield. As this method has been already adopted by an earlier study namely "**Grain Production and Food Security in Arab Countries"[108] (1988).** In this study author has calculated SD and CV in order to establish the level of instability, thereby food security, involved in the food grain production including Area under cultivation as well as per hectare yield. Therefore, we have tried to adopt this method in our study to observe the instability/variations in food grain production (including area and yield per hectare) at all India level only to establish extent of food insecurity/food insecurity exists in India with respect to supply side of production.

In case of food grains, the instability in production is higher in the total period with SD of 30.73 tons and CV of 16.9 per cent, while it was just SD 20.75 tons in the first sub period had declined to SD 16.54 tons in the second sub period. Same is the case with CV as it declined from 13.16 per cent in the first period to 8.03 per cent during the same periods. The instability was more in the first period; it means annual production has deviated more.

In case of Rice also the SD of Production has declined from 215.17 tons in the first period to 140.48 tons during the second period of WTO period, while SD during the overall period has stood at 278.62 tons. Similar inferences can be drawn through CV as it came down from 16.34 per cent to 8.34 per cent while maintaining overall CV of 18.73 per cent. So, like in the case of total food grains, for Rice also there is more instability during the first sub period of pre WTO period of 1981-82 to 1994-95, that are evident through SD and CV, where in there happened a more increment in production reflecting a clear and near fulfilment of self sufficiency in Rice production in Indian context. There existed lesser instability in the second period but the levels of instability and growth rate of production are altogether different trend indicators. These same

[108] By Mieczyslaw Adamowicz (1988), from 'Agri-Economics (2) (1988) – 39-56. Elsevier Science Publishers B.V., - Amsterdam – Printed in Netherlands.

trends can also be found with regard to the Area under cultivation of Rice as well as the Yield per hectare of the Rice.

Coming to the production of Wheat, SD and CV indicate us, like in the case of Rice, that there involved a higher instability during the first sub period than in Second sub period. It is very clear as SD has come down from 281.01 tons in first period to 121.64 tons in the second sub period while the overall SD is at 376.33 tons. Same is the case with CV where in it has come down from 16.9 per cent to 7.69 per cent while overall CV is at 22.11 per cent. But here the rate of decline of instability is higher than that in case of Rice, except in case Area under cultivation of wheat that shown a marginal increase of SD 1.07 hectares.

If we also observe the SD and CV of Pulses production, they clearly indicate slightly different figures than that of Rice and Wheat. It can be observed from the data that its production SD of pulses has increased marginally from 1st sub period (1.12 tons) to 1.26 tons during second sub period while the aggregate SD remained at 1.28 tons. Similar findings can be seen with CV where in it had increased from 8.9 per cent to 9.32 per cent while aggregate CV remained at 9.79 per cent. Similar trends can be found for Area (both SD and CV) where as the yield per hectare of pulses at all India level has declined from 1st sub period (SD 41.71 hectares, CV 7.67 per cent) to second sub period (SD 37.71 hectares, CV 6.25 per cent). These trends would indicate us that the production performance of Pulses at All India level has been positive during the post WTO period unlike in the case of Rice and Wheat[109]. This can be due to the fact that the area under cultivation has increased during the second sub period despite there was marginal increase in the per hectare yield.

These SD and CV of Food grains, Rice, Wheat during our referred period at an aggregate level, would only reveal the trend that there was gradual decline in production performance of Food grains as well as Rice and Wheat. Major reason that can be seen for this negative and unwarranted performance, apart from other structural complications, deficiency in Govt spending on farming, shift away from commercial crops, uneven monsoons, also can be attributed to the imposed restrictions that India committed by way of becoming a member of WTO[110].

[109]Srivastava S.K, Sivaramane N, Mathur V.C (2010): "Diagnosis of Pulses Performance of India", from 'Agricultural Economics Research Review, Vol.23 Jan-June pp 137-148.
[110] Ramesh Chand (2006): International Trade Food Security and the response to the WTO in South Asian Countries". Research Paper No.

VII.8 INDIA's Population & Per Capita Availability of Food grains Compounded Annual Growth rates: (From 1981-82 to 2009-10) (kg/year %)

year	Population	F.Grains*	Rice	Wheat	Cereals	Pulses
1981-82 to 2009-10	1.93	-0.04	-0.14	0.49	-0.16	-0.65
1981-82 to 1994-95	2.10	0.35	1.04	1.40	0.58	-0.43
1995-96 to 2009-10	1.71	-0.64	-1.00	-0.78	-0.78	0.67

*Food grain production. Source: Calculated on the basis of raw data taken from Ministry of Agriculture, MoA, and Census of India 2011, during different years between 1981-82 and 2009-10.

In any economy, per capita availability of food grains is one of the important parameters that can be observed in order to assess the level food grain self sufficiency on the supply side at an aggregate level. Hereby we have calculated compounded annual growth rates of per capita availability of total food grains as a whole and also exclusively Rice, Wheat, Pulses and Cereals during our opted reference period between 1981-82 and 2009-10. At the same time we have also calculated the compounded growth rates of population during the same period only in order to emphasise and examine the mutual fluctuations in the growth rates so that we can establish the level of requisite production in the light of increasing population with the sole aim of establishing food security at the aggregate level.

The above table provides us the clear view about these developments. Firstly if we can observe the population during three periods, it's very clear that growth rate in the first sub period, i.e. during pre WTO period is higher (2.10 per cent) is higher than the second sub period i.e. 1.71 per cent. And the overall growth of population is 1.93 per cent. On the other hand, the per capita availability (PCA) of food grains is far lesser than the growth rates of population in all the periods, especially in the total period it is just -0.04 per cent. It only emphasises the fact that hardly there has been any increase in the PCA of food grains[111]. But this PCA of food grains is, to some extent, a positive in the first sub period of pre economic reforms with 0.35 per cent growth and in the second period it had declined to as low as -0.64 per cent negative growth rate. It only suggests that the per capita availability of food grains in India during our reference period has not grown on par with that of population growth[112]. It can be due to various combinations of factors. Apart from a rapid increase in population, very placid and low production growth,

2006/124. United nations University- UNU –WIDER. World Institute for Development- Economic Research.
[111] Sharma; Alakh N (2010): "Food and Nutrition Security in India", from 'Agriculture, Food security and Rural Development', by Asian Development Bank, OUP-2010.
[112] Sharma; Devendar (2008): "Importing Food Insecurity", from Yojana –July 2008.

especially during the post WTO period had severely affected the PCA of food grains. Because, under WTO regime a traditional Indian agriculture has been exposed to the developed country's' agriculture, during this period as there was rush of cheaper food grain imports, our high cost farming has not been able to withstand the competition from the affluent countries' food grain imports. Hence they had shifted away from food grains or they had been compelled to shift away food grain cultivation as there was gradual decline in the support structure to the farming from the Government.

Exactly similar trends can be found in the case of Rice, Wheat, Pulses as well as Cereals in terms of compounded annual growth rates during all three periods. Only the Wheat has maintained positive growth rate (0.49 per cent), though lesser than the population growth rate of 1.93 per cent. But it had also put up as much as -0.78 per cent negative growth of PCA during the post WTO period, came down from the growth rate of 1.40 per cent during pre WTO period, between 1995-96 and 2009-10. Apart from Wheat, Rice PCA growth during the total referred period is -0.14 per cent, which is long way below the growth rate of population and also the growth rate of food grains. But it had a positive growth of (PCA of Rice) 1.04 per cent during the pre WTO period and later registered -1.00 per cent growth during the post WTO period with respect to PCA of Rice. In the same way same are the trends with PCA of Cereals (including coarse cereals) has had negative growth rate (-0.16 per cent) during overall period as well as well as second sub period (-0.78 per cent) despite maintaining positive growth of PCA with 0.58 per cent in the first sub period. But unlike Rice, Wheat and Cereals, Pulses PCA growth rate, despite its overall negative PCA growth of -0.65 per cent, has been positive in the second sub period of economic reforms with 0.67 per cent growth that was earlier negative at -0.43 per cent during the first sub period. This trend can be attributed to the increase in area under cultivation for pulses as well as in crease in per hectare yield during the post liberalisation/ WTO period[113]. Though this growth is not sufficiently enough for the economy, but it had somewhat stood up with competition unlike Rice and Wheat.

[113]Srivastava S.K, Sivaramane N, Mathur V.C (2010): "Diagnosis of Pulses Performance of India", from 'Agricultural Economics Research Review, Vol.23 Jan-June pp 137-148.

VII.09 Food grains, Rice , Wheat, Pulses and Cereals (kg/year) -All India Per capita Availability -Standard Deviation (SD) and Coefficient of Variation (CV %) (Between 1981-82 to 2009-10)

FOOD GRAINS		
Period	**SD**	**CV**
1981-82-2009-10	8.49	5.03
1981-82-1994-95	6.89	4.03
1995-96- 2009-10	9.51	5.71
RICE		
	SD	**CV**
1981-82-2009-10	5.26	7.21
1981-82-1994-95	5.1	6.92
1995-96- 2009-10	5.5	7.6
WHEAT		
	SD	**CV**
1981-82-2009-10	5.13	9.12
1981-82-1994-95	4.41	8.22
1995-96- 2009-10	4.59	7.81
Pulses		
	SD	**CV**
1981-82-2009-10	1.4	10.45
1981-82-1994-95	1.02	7.18
1995-96- 2009-10	1.25	9.9
CEREALS		
	SD	**CV**
1981-82-2009-10	7.95	5.12
1981-82-1994-95	6.45	4.11
1995-96- 2009-10	9.15	5.95

Source: Calculated on the basis of raw data taken from Ministry of Agriculture, MoA, and Census of India 2011, during different years between 1981-82 and 2009-10.

The above calculations of SD and CV would enable us understand the fluctuations or instability involved in the per capita availability of food grains as well as Rice, Wheat, Pulses and Cereals during the overall reference period as well as two sub periods of pre and post WTO regime.

Here, unlike in the case of instabilities involved in the Area, Production and Yield that we have examined earlier, we consider more instability, which is shown in form of higher SD and CV, would reflect in lesser and lesser per capita availability (PCA) and also decline in food grain self sufficiency. If we observe the instability in Per Capita Availability (PCA) of Food Grains, it has shown more instability in the second sub period (SD 9.51 tons) which is even higher than the overall instability of SD 8.49 tons. Even CV of PCA is much higher in the second sub period, i.e. 5.71 per cent which is lesser than the first period CV of 4.03 per cent and over all CV is 5.03 per cent. These higher instabilities of PCA of food grains in the second sub period (under WTO regime) would only emphasise the fact that the food grain availability per head has either remained stagnant or very low. It only emphasises the fact that the growth of food grain production has been very low during this period and resulted in lesser availability for the consumers.

Like in the case of total food grains, even the instabilities in the PCA of Rice also has increased marginally during the free trade period from the earlier lesser instability during the 1st sub period of pre free trade period. It is evident when we observe SD and CV, as SD of PCA has increased to marginal rate of 5.5 tons in the reform period from an earlier rate of 5.1 tons while the overall SD of PCA is also remained at 5.26 tons and CV also has also increased marginally to 7.6 per cent from 6.92 per cent. And the PCA availability of Wheat also has shown more instability during the free trade period, it is shown through SD as it has marginally increased to 4.59 tons from earlier 4.41 per cent while the aggregate instability is with 5.13 tons which is even higher than the both periods. But in case of wheat, the CV of PCA has slightly declined during the second period to 7.81 per cent from an earlier figure of 8.22 per cent, while the overall instability is even higher at 9.12 per cent. These inferences would only indicate us that the PCA of both Rice and Wheat have remained either stagnant or decreased during the free trade regime under WTO commitments of India.

Coming to the PCA of Pulses, it has also shown more instability during the reform or free trade period, as SD has increased from 1.02 tons to 1.25 tons while the overall instability/SD is at 1.4 tons. And same is the case with CV where in it increased from 7.18 per cent to 9.9 per cent while the aggregate CV of PCA has remained at as high as 10.45 per cent which is considered very high as far as instability is considered. And it shows that the overall PCA of pulses during the

total period has had severe instability, reflecting in lesser amount of pulses production and thereby leading to the deficiency of availability. And the same trends also can found in case of PCA of Cereals where in its SD and CV have stood at 7.95 tons and 5.12 per cent respectively. And this instability is higher in the second sub period with 9.15 tons of SD and 5.95 per cent of CV from earlier rates of 6.45 tons of SD and 4.11 per cent of CV.

Finally it can be inferred that the overall PCA instability is very high in case of pulses with 10.45 per cent under CV while Total food grain has the lesser instability in terms of CV and if take SD into consideration instability is higher for total food grains with 8.49 tons while pulses possess the lesser instability. For these higher instabilities, though there are many factors like increase in population, changes in tastes and preferences, reduction in area under food grains and it's particularly due to agriculture gradually becoming unviable to the Indian farmers due to cheaper imports under free trade [114]. And these developments all together have pulled down the production of food grains and thereby led to the lesser per capita availability and also to the grave situation of food insecurity[115].

[114]Acharya; Shabd S (2009): "Food Security and Indian Agriculture: Policies, Production Performance and marketing environment", from Agricultural Economics Review, Vol.22 Jan –June 2009 pp 1-19.
[115]Bhargava (2007); Pradeep and Manju Balana: "Realising the Right to Food in Asia". From 'Food Insecurity, Vulnerability and Human Rights Failure' Edited by Basudeb Guha, Khasnobis, Shabd S.Acharya and (ICSSR) Benjamin Davis – 2007.

VII.10 State wise AREA- PRODUCTION -YIELD of Food grains Standard Deviation and Coefficient of Variation (%), from 1981-82 to 2009-10 (Area '000 Hectares. Production '000 tons, Yield Kg/Ha)

Andhra Pradesh	**STANDARD DEVIATION**			**Coefficient of Variation**		
	AREA	***PRODUXN***	***YIELD***	***AREA***	***PRODUXN***	***YIELD***
1981-82-2009-10	724.12	3571.68	438.45	9.83	28.32	24.64
1981-82-1994-95	800.03	2824.14	200.87	10.34	27.41	14.10
1995-96-2009-10	428.48	2787.72	322.90	6.11	18.87	15.30
Karnataka						
1981-82-2009-10	1186.67	2482.58	251.18	16.54	30.00	21.86
1981-82-1994-95	1666.4	953.83	141.89	24.05	13.44	14.67
1995-96-2009-10	348.18	2963.49	208.85	4.70	31.60	15.84
Maharashtra						
1981-82-2009-10	770.12	1832.24	145.45	5.74	16.17	17.15
1981-82-1994-95	399.03	1950.57	131.75	2.85	18.17	17.20
1995-96-2009-10	655.01	1580.43	115.34	5.08	13.30	12.48
Madhya Pradesh						
1981-82-2009-10	2889.22	2795.06	158.78	18.39	18.13	15.92
1981-82-1994-95	447.44	2220.33	128.61	2.88	14.27	14.59
1995-96-2009-10	2901.78	3317.64	96.22	21.03	21.71	8.71
Punjab						
1981-82-2009-10	451.41	4174.47	457.22	7.73	19.73	12.731
1981-82-1994-95	289.46	2620.81	322.45	5.29	14.83	10.027
1995-96-2009-10	248.78	2215.04	221.19	4.02	9.07	5.611
Rajasthan						
1981-82-2009-10	2336.01	21532.31	215.00	19.69	131.54	25.00
1981-82-1994-95	3175.88	20802.53	129.43	28.21	151.54	18.77
1995-96-2009-10	914.13	22626.26	144.64	7.35	120.13	14.20
Uttar Pradesh						
1981-82-2009-10	635.40	6206.10	314.26	3.17	16.73	16.99
1981-82-1994-95	444.51	4372.85	212.98	1.39	13.71	13.46
1995-96-2009-10	754.88	2653.56	130.03	3.80	6.33	6.19
West Bengal						
1981-82-2009-10	260.79	3029.38	431.54	4.10	23.61	21.51
1981-82-1994-95	256.75	2271.91	316.42	4.13	22.05	19.20
1995-96-2009-10	178.98	1102.57	178.07	2.75	7.26	7.61

Source: Calculated on the basis of raw data taken from Ministry of Agriculture, MoA, and Census of India 2011, during different years between 1981-82 and 2009-10.

The table explains us the instabilities involved in the food grain production of major food grain producing states, i.e. Area under cultivation and yield per hectare over the reference period

between 1981-82 to 2009-10 in terms of Standard Deviation (SD) and Coefficient of Variation (CV). If we take CV as measure of instability, states of Rajasthan, Karnataka and Andhra Pradesh (AP) have shown more instability during the overall period with respective CVs of 131.54, 30.00 and 28.32 per cent. And the states of AP and Rajasthan have shown more instability in the first sub period unlike Karnataka as it had shown more instability in the second sub period. At the same time, states of Maharashtra, UP and MP have shown lesser instability as their CV of production is lesser than other states with respective CVs of 16.17, 16.73 and 18.13 per cent. Here also except MP states of Maharashtra and UP have shown more CV during the first sub period than in second sub period.

These rates of instabilities may not exactly the aggregate growth rates of production; they would only enable us to understand the kind of fluctuations that had occurred in that particular state. Because, states with higher CV that we have just analysed, Rajasthan, Karnataka and AP, have in fact performed reasonably well in comparison with other states. Therefore, these instabilities that are based on CV may not exactly reflect the aggregate growth in production of concerned states.

Taking SD deviation as the unit of instability, out of all the states, Madhya Pradesh (MP) has shown higher instability of area under food grain production, which is evident in higher SD of 2889.22 hectare followed by the Rajasthan with SD 2336.01 hectare and Karnataka with 1186.67 SD hectare and the state of West Bengal (WB) has shown the lesser instability with SD of 260.79 hectare followed by Punjab with 451.41 SD hectare and Uttar Pradesh (UP) with 635.40 SD hectare and if we observe the Production instability of Food grains in all the referred states, Rajasthan has the highest instability with SD of 21532 tons , followed by UP with SD of 6206.10 tons and Punjab with SD of 4174.47 tons and the state of Maharashtra has the lowest instability in food grain production with SD of 1832.24 tons , followed by MP with SD of 2795.06 tons and Karnataka with SD of 2482.58 tons .

And the analysis of yield per hectare shows that the level instability is very high in the state of Punjab with SD of 457.22 kg, followed by Andhra Pradesh (AP) with SD of 438.45 kg and WB with SD of 431.54 kg. At the same time the state of Maharashtra has the lowest instability in with SD of 145.45 kg, followed by MP with SD of 158.78 kg and the state of Rajasthan with the SD of 215.00 kg.

In total period, states of Maharashtra, UP and MP and PB had the lowest instability in food grain production while states of Rajasthan, Karnataka and AP had the highest instability in food grain production during the overall period. Likewise, as we have observed earlier more instability may not exactly reflect the accurate and aggregate growth in production or Area or Yield as it just only helps us to identify the instabilities involved in the particular period in the concerned states.

VII.11 State wise AREA- PRODUCTION -YIELD of Rice: Standard Deviation and Coefficient of Variation (%), between 1981-82 to 2009-10 (Area '000 hectares. Production '000 tons, Yield Kg/Ha)

West Bengal	STANDARD DEVIATION			Coefficient of Variation		
	AREA	PRODUXN	YIELD	AREA	PRODUXN	YIELD
1981-82-2009-10	331.51	3118.89	450.29	5.89	26.54	22.01
1981-82-1994-95	336.20	2294.69	340.65	6.19	24.64	20.15
1995-96-2009-10	175.44	1465.77	183.75	3.01	10.33	7.65
UP						
1981-82-2009-10	335.33	2309.55	349.73	6.06	23.46	19.81
1981-82-1994-95	269.94	1806.76	303.57	5.05	22.25	20.15
1995-96-2009-10	301.00	1186.73	135.30	5.27	10.26	6.69
Orissa						
1981-82-2009-10	137.96	1253.38	261.69	3.14	22.59	20.82
1981-82-1994-95	158.60	1134.98	225.86	3.66	22.44	19.47
1995-96-2009-10	73.27	1202.37	266.24	1.64	19.90	19.67
AP						
1981-82-2009-10	409.28	1985.22	404.03	10.93	20.63	15.75
1981-82-1994-95	322.39	1272.90	240.58	8.64	15.08	10.65
1995-96-2009-10	492.60	1883.82	280.38	13.11	17.43	9.76
Bihar						
1981-82-2009-10	830.04	1365.77	248.79	18.29	25.05	20.86
1981-82-1994-95	329.29	1080.36	189.57	6.46	20.25	18.17
1995-96-2009-10	806.16	1633.25	210.53	20.26	29.33	15.68
Punjab						
1981-82-2009-10	476.53	2269.80	354.28	22.18	30.46	10.40
1981-82-1994-95	337.77	1393.90	235.09	19.16	24.63	7.39
1995-96-2009-10	191.50	1356.77	308.82	7.55	14.68	8.50
Asom						
1981-82-2009-10	116.33	561.66	188.51	4.79	17.51	14.35
1981-82-1994-95	102.21	391.30	118.19	4.28	13.99	10.13
1995-96-2009-10	116.99	372.38	113.26	4.73	10.29	7.75

Source: Calculated on the basis of raw data taken from Ministry of Agriculture, MoA, and Census of India 2011, during different years between 1981-82 and 2009-10.

The table of SD and CV will enable us to understand the instabilities associated with the production of Rice during our reference period between 1981-82 and 2009-10. Instability is calculated for Production as well as for Area under cultivation and Yield per hectare of seven major Rice producing states.

If we consider CV as the indicator of instability, states with higher production instability are Punjab, WB and BR with the respective CV values of 30.46, 26.54 and 25.05 per cent. Except the state of Bihar, Punjab and WB have had more CV value in the first sub period than in the second sub period of reforms under WTO.

By taking SD as measure of Production instability of states, West Bengal has the highest instability with SD of 3118.89 tons , followed by UP with SD of 2309.55 tons and the state of Punjab with the SD of 2269.80 tons . Despite these higher instabilities in production these three states have maintained higher growth rates of Rice production during the total period and all had shown higher instability in the first sub period than in the second sub period. At the same time the states of Asom has maintained lesser instability in Rice production with SD of 561.66 tons , followed by Orissa with SD of 1253.38 tons and Bihar with SD of 1365.77 tons and understably these states have also maintained lower growth rate in Rice production during the overall period between 1981-82 to 2009-10

Now if we observe the SD of area under the cultivation of Rice, state of Bihar has maintained higher SD with 830.04 hectare, exhibiting higher instability. And Bihar is followed by the Punjab with SD of 476.53 hectare and also AP with SD of 409.28 hectare. These higher instabilities in Area under cultivation Rice reflected in more area being brought under rice cultivation and in a way helped in increasing the production in these three states. At the same time, the states with lower instability or lower SD are Asom with SD of 116.33 hectare, followed by Orissa with SD of 137.96 hectare and West Bengal with SD of 331.51 hectare. Then if we look at the instability of Yield per hectare of Rice, the state of WB has had highest SD with 3118.89 kg, followed by AP with SD of 404.03 kg and Punjab with SD of 354.28 kg. On the other hand, state with lowest instability in yield per hectare of Rice, is Asom with SD of 188.51 kg, followed by the Bihar with SD of 248.79 kg and next comes the state of Orissa with SD of 261.69 kg. As we have observed earlier more instability may not exactly reflect in the aggregate growth or decrease in production or Area or Yield as it just only helps us to identify the instabilities involved in the particular period in the concerned states.

VII.12 State wise AREA- PRODUCTION -YIELD of WHEAT Standard Deviation (SD) and Coefficient of Variation (CV %), between 1981-82 and 2009-10**.** (Area '000 hectares, Production '000 tons, Yield Kg/Ha)

UP	**SD**			**CV**		
	AREA	***PRODUXN***	***YIELD***	***AREA***	***PRODUXN***	***YIELD***
1981-82-2009-10	450.69	4372.05	385.66	5.09	20.70	16.29
1981-82-1994-95	337.14	2822.71	260.08	3.96	16.14	12.69
1995-96-2009-10	197.78	1834.99	154.99	2.15	7.41	5.77
PUNJAB						
1981-82-2009-10	177.38	2372.37	548.17	5.41	18.59	14.17
1981-82-1994-95	145.35	1767.14	425.74	4.61	16.21	12.36
1995-96-2009-10	96.92	1044.13	235.12	2.85	7.14	5.48
HARYANA						
1981-82-2009-10	293.50	2723.35	621.99	14.44	44.73	17.62
1981-82-1994-95	144.03	1279.38	501.58	8.08	23.33	16.48
1995-96-2009-10	158.27	3598.10	205.42	6.94	53.77	5.11
MADHYA PRADESH						
1981-82-2009-10	398.75	1600.86	288.61	10.392	27.64	19.39
1981-82-1994-95	264.52	1178.98	233.86	7.248	25.07	18.32
1995-96-2009-10	428.92	1174.77	145.74	10.657	17.08	8.57
RAJASTHAN						
1981-82-2009-10	352.67	1584.24	471.21	16.73	31.36	20.02
1981-82-1994-95	239.45	880.39	340.23	12.83	23.69	17.16
1995-96-2009-10	274.64	776.31	222.01	11.69	12.15	8.15
BIHAR						
1981-82-2009-10	140.29	771.54	281.91	6.99	20.91	15.47
1981-82-1994-95	134.22	644.47	235.86	7.02	20.33	14.33
1995-96-2009-10	53.54	488.40	206.05	2.54	11.60	10.31
MAHARASHTRA						
1981-82-2009-10	179.00	354.67	266.29	20.10	33.74	22.67
1981-82-1994-95	169.34	190.11	223.69	19.28	21.95	22.34
1995-96-2009-10	193.33	388.60	180.13	21.41	31.43	13.36

Source: Calculated on the basis of raw data taken from Ministry of Agriculture, MoA, and Census of India 2011, during different years between 1981-82 and 2009-10.

The table of SD and CV will enable us to analyse the instabilities occurred in the production of Wheat during our reference period between 1981-82 and 2009-10. SD and CV are calculated for Production as well as for Area under cultivation of Wheat and Yield per hectare of 7 major wheat producing states. Both SD and CV are almost provide us similar kind of inferences, they both reveal the instability involved in the referred variables, while CV has little more accurate than SD.

If we observe the CV of Production of Wheat in major states during the total period, state of Haryana has the highest CV reflecting more instability (CV 44.73 per cent), followed by Maharashtra with CV of 33.74 per cent and also Rajasthan with CV of 31.36 per cent. Except in the state of Rajasthan, the CV in the first period is lesser than the second sub period. That means there exists more instability in the second sub period of free trade in the states of Haryana and Maharashtra. Coming to the Area CV during total period, states of Maharashtra (MH), Rajasthan and Haryana possess the higher instability, where as the states of UP, Punjab and Bihar maintained the lower instability respectively that is measured in CV. On the other hand, if we observe the instability in yield per hectare of Wheat during over all period, states of MH, Rajasthan and MP had the highest CV respectively and thereby higher instability. And at the same time, states of Punjab, Bihar and UP had lesser CV respectively and thereby lesser instability in per hectare yield.

If we take SD as unit of instability, if take wheat production, state of UP has maintained more instability and closely followed by Haryana and Punjab with respective SD tons of 4372.05, 2723.37 and 2372.37 tons during the total period. And out of these three states, UP and Punjab possess the highest instability in the first sub period than in the second sub period. At the same time, the states of MH and Bihar had the higher SD/instability with respective values of 354.67 and 771.54 tons. Thus these instabilities in a way have enriched us identify the fluctuations in wheat production across major wheat producing states.

VII.13 State wise AREA- PRODUCTION -YIELD of Pulses
Standard Deviation (SD) and Coefficient of Variation (CV %), from1981-82 to 2009-10
(Area '000 hectares. Production '000 tons, Yield Kg/Ha)

Madhya Pradesh	**SD**			**CV**		
	Area	**Production**	**Yield**	**Area**	**Production**	**Yield**
1981-82-2009-10	402.63	648.87	106.88	8.59	22.14	16.52
1981-82-1994-95	217.68	362.61	67.52	4.49	13.10	11.83
1995-96-2009-10	478.72	817.86	85.67	10.55	26.53	11.93
Rajasthan						
1981-82-2009-10	645.99	543.15	102.71	19.20	38.18	24.97
1981-82-1994-95	541.87	410.88	86.69	16.47	29.87	21.10
1995-96-2009-10	742.44	654.97	118.84	21.62	44.66	28.86
Maharashtra						
1981-82-2009-10	330.29	506.38	109.43	10.06	29.74	21.30
1981-82-1994-95	298.18	394.29	91.96	9.68	28.31	20.29
1995-96-2009-10	235.09	427.42	94.96	6.77	21.45	16.65
Karnataka						
1981-82-2009-10	268.43	196.52	61.17	14.72	27.63	15.86
1981-82-1994-95	72.66	65.60	36.80	4.44	11.26	10.33
1995-96-2009-10	265.46	202.71	67.38	13.28	24.37	16.30
Andhra Pradesh						
1981-82-2009-10	231.42	332.55	134.53	13.81	37.79	26.24
1981-82-1994-95	97.58	88.19	42.67	15.25	13.78	10.06
1995-96-2009-10	205.30	320.41	139.00	11.19	29.75	23.34
Orissa						
1981-82-2009-10	563.05	360.26	81.14	47.27	60.88	17.47
1981-82-1994-95	435.25	269.25	48.45	26.03	29.83	9.11
1995-96-2009-10	105.68	74.40	47.33	14.24	24.66	11.78

Source: Calculated on the basis of raw data taken from Ministry of Agriculture, MoA, and Census of India 2011, during different years between 1981-82 and 2009-10.

The table of SD and CV will help us to understand the instabilities occurred in the production of Pulses during our reference period between 1981-82 and 2009-10. SD and CV are calculated for Production as well as for Area under cultivation of Wheat and Yield per hectare. If we observe the CV of Production of Wheat in 6 major pulses producing states during the total period, state of Orissa has the highest CV/instability (60.88 per cent) followed by the states of Rajasthan and AP with respective CV value of 38.18 and 37.79 per cent. Out of these three, except the state of Orissa, in other two states the SD/instability is higher in the second sub period than in the first period. Then, if we take, are into consideration, states of Orissa, Rajasthan and Karnataka have the highest CV/instability with respective CV values of 47.27, 19.20 and 14.72 per cent. And if we observe Yield CV, states of AP, Rajasthan and Maharashtra have the highest CV/instability with respective CV values of 26.24, 24.97 and 21.30 per cent. And at the same time the states of Karnataka, MP and Orissa maintained the lowest instability rates with the respective CV values

OF 15.86, 16.52 and 17.47 per cent And if we consider the SD as the measure of instability in pulses production during the overall period, state of MP, Rajasthan and MH have the highest rates of instability with the respective SD values of 648.87, 543.15 and 506.38 tons, while the states of Karnataka, AP and Orissa have the lowest SD/instability with the respective SD values of 196.52, 332.55 and 360.26 tons. And if we observe area SD/ instability, Rajasthan, Orissa and MP have possessed the higher instabilities with respective SD values of 645.99, 563.05 and 402.63 hectare. On the other hand states with lower area instability/SD are AP, Karnataka and Maharashtra with respective SD values of 231.42, 268.43 and 330.29 hectare.

The Yield instability/SD, states of AP, Maharashtra and MP had the highest instability rates with respective SD values of 134.53, 109.43 and 106.88 kg. And the states of Karnataka and Orissa have the lowest instabilities in the yield of pulses with respective SD values of 61.17 and 81.14 kg. Unlike in our earlier analysis of Food grains, Rice and Wheat, where in there was mostly higher instability in the first sub period, here in case of pulses, in both SD and CV observations of production, in most of the states instability is found more in the second sub period of free trade. It can be understood as we have seen in our compounded growth rate analysis where in the pulses production has shown some resilient progress during the second sub period. Here also more instability in the second sub period can be understood as leading to aggregate increase in production despite seasonal fluctuations in production as well as area and yield per hectare[116]. The better performance of Pulses during the second sub period can also be attributed to the changes in the area under cultivation of pulses.

[116]Bhartiya K.C, (2009): "Pulses: Growth Trajectory, Missed Opportunities & State Interventions", from 'India Commodity Year Book 2009', by National Collateral Management Services Ltd, Mumbai, edt by Sanjay Kaul.

Chapter VIII
Findings and Suggestions

"Food security is as important as National Security and every food grain saved is food grain produced, India can't prosper without agricultural prosperity"

8.1 Production growth at All India level

Food grains: The total growth rate of food production, total period growth rate (1.87 per cent) is much lesser than the first period growth rate of 2.79 per cent and marginally above second period growth rate of 1.24 per cent. It shows that production performance has been far better in the pre WTO period than the post WTO period; it can be attributed to the effects of green revolution in the first period and to the not so pro farmer policies during the WTO regime in the second period. And also due to other structural factors that we have discussed in our earlier chapters[117]. And the higher production in the first period is more contributed by the yield growth rate of 3.09 per cent, which is much higher than the growth rates prevailed in the total period (2.13 per cent) and second period (1.36 per cent). It only suggests that area's contribution to the production of total food grain production has been negligible during the whole period.

Rice: Production growth rate (3.49 per cent) during the first period is not only higher than the second period (1.36 per cent) but also higher than the total period growth rate of 2.17 per cent. This growth is more supported by the increase in the yield during the second period (2.96 per cent growth rate) which higher than the both total period (1.79 per cent) as well as second period (1.32 per cent).

Wheat: Production growth rate has been very high during the 1st period at 3.71 per cent which higher than the total period growth rate of 2.62 per cent and higher than the second period growth rate of 1.16 per cent. This can be again due to the higher growth rate in the yield which is 3.01 per cent, higher than the both total period (1.85 per cent) and second period growth rates. Particularly the wheat performance during the WTO regime has been quite dismal due to both

[117] Hanumantha Rao CH (2005): "Food Grain SurPulses - Causes and Policy Implications." From 'Agriculture, Food Security, Poverty and Environment'. Essays on Post Reform India 2005.

reduction in area as well as yield per hectare and also due to other insufficient policies and support structure to the farmers. These trends only had led to the even trends of importing wheat during the years 2006 and 2007.

Pulses: Unlike Rice and Wheat, its Area and production growth rates have been positive during the second period. But only the growth rate of yield during the second period has been lesser than the first period[118]. Hence these trends only indicate us that the production performance of food grains with respect to area and yield has been much better during the pre WTO period than the post WTO period, and thereby we can say that the food grain availability and food insecurity have increased have increased during the WTO regime period[119].

8.2 Instability in Area, Production and Yield (All India Level)

Food grain: In case of food grains, the instability in production is higher in the total period with SD of 30.73 tons and CV of 16.9 per cent, while it was just SD 20.75 tons in the first sub period had declined to SD 16.54 tons in the second sub period. Same is the case with CV as it declined from 13.16 per cent in the first period to 8.03 per cent during the same periods. The instability was more in the first period; it means annual production has deviated more.

Rice: CV has come down from 16.34 per cent to 8.34 per cent while maintaining overall CV of 18.73 per cent. So, like in the case of total food grains, for Rice also there is more instability during the first sub period of pre WTO period of 1981-82 to 1994-95, These same trends can also be found with regard to the Area under cultivation of Rice as well as the Yield per hectare of the Rice.

Wheat: CV indicate us, like in the case of Rice, that there involved a higher instability during the first sub period than in Second sub period. It is very clear as SD has come down from 281.01 tons in first period to 121.64 tons in the second sub period while the overall SD is at 376.33 tons. Same is the case with CV where in it has come down from 16.9 per cent to 7.69 per cent while overall CV is at 22.11 per cent. But here the rate of decline of instability is higher than that in

[118]Krishnaraj;Maithreyi (2006): "Food Security – Agrarian Crisis and Rural Livelihoods – Implications for Woman." Epw (5376 – 5387)– Dec 2006.
[119]Krishnakumar S (2004): "Agricultural Trade Liberalisation and Food Security-Theoretical Debates and Empirical Issues", from 'Poverty and Food security in India: Problems and Policies',edt by M.S.Bhatt, New Delhi 2004.

case of Rice, except in case Area under cultivation of wheat that shown a marginal increase of SD 1.07 hectares.

Pulses: SD and CV of Pulses production, clearly indicate slightly different figures than that of Rice and Wheat. It can be observed from the data that its production SD of pulses has increased marginally from 1st sub period (1.12 tons) to 1.26 tons during second sub period while the aggregate SD remained at 1.28 tons. Similar findings can be seen with CV where in it had increased from 8.9 per cent to 9.32 per cent while aggregate CV remained at 9.79 per cent.

These SD and CV of Food grains, Rice, Wheat during our referred period at an aggregate level, would only reveal the trend that there was gradual decline in production performance of Food grains as well as Rice and Wheat. Major reason that can be seen for this negative and unwarranted performance, apart from other structural complications, deficiency in Govt spending on farming, shift away from commercial crops, uneven monsoons, also can be attributed to the imposed restrictions that India committed by way of becoming a member of WTO[120].

8.3 State Level growth rate of Area, Production and Yield

Food Grains: It is clear that, in terms of food grain production state of Rajasthan, which is basically a pulses producing state has registered higher production growth rates during the three periods, 4.89 per cent, 9.32 and 0.23 9.32 per cent respectively. Next the state of WB has performed consistently well during the total period (3.20 per cent), more in the first period at 5.53 per cent and slightly decreased to 1.36 per cent in the second period. its better performance is more helped by the increase in the yield rates during the referred period at 2.88 per cent, and as high as 6 per cent in the first period.

Punjab has also registered higher production growth rates than the national rates, at 2.58, 4.55 and 1.86 per cent during the respective three periods. Though its performance is higher in the pre WTO period, despite the fact that both the Area (-0.49 per cent) and Yield (-0.62 per cent) growth rates turning negative. The state of AP also maintained higher growth rate than the national average during the total period 2.09 per cent, it is lesser in the first period at 0.92 per

[120] Ramesh Chand (2006): International Trade Food Security and the response to the WTO in South Asian Countries". Research Paper No. 2006/124. United nations University- UNU –WIDER. World Institute for Development- Economic Research.

cent and had turned out to be negative in the second period -0.56 per cent. Its area growth rates in the first two periods are negative and slightly improved in the second period. It has also maintained decent yield growth rates on par with the states like WB and UP and Rajasthan.
So it can be drawn from the above table that, during the overall period, the states of RJ, WB, Punjab, Rajasthan and AP have performed well above the national performance as far as food grain production is concerned. The states like Maharashtra and Karnataka also performed relatively better while the states like Madhya Pradesh and Uttar Pradesh (UP) performed very poorly as far as food grain production is concerned.

The food grain performance is either low or negative during the reform period/WTO free trade regime[121]. Factors that are behind this can be traced back to the measure of State gradually moving away from the agriculture during this reform period, which is evident from our analysis as there was reduction in state support to agriculture by way of reducing gross capital formation in agriculture and concentrating on commercial crops in order to lead a export led growth. Apart from the above, other structural, seasonal and climatic fluctuations also had led to the decrease in food grain production in the second period of reforms.

Rice: Trends would indicate us that the performance of all major Rice producing states has been desirable and positive in the pre WTO period of 1981-82 to 1994-95 and simultaneously they all had shown either very low or negative production growth rates during the post WTO period. Only the states like Punjab, WB and UP have shown higher growth rates than the national growth rates. And the states of Asom, Orissa, AP and Bihar have registered less growth rates than the national growth rates. This can be attributed to the increase in the yields on the one hand and also due to other structural support structures like irrigation, soil fertility, crop intensity and also partly due to partly congenial political and physical environment[122]. But at the same time, their Rice production growth was severely hampered by the liberal trade regime during the post WTO period as there started a gradual decline in the support structure to food grain crops and also due to heavy food imports, domestic farmers had failed to withstand the competition from cheap imports from developed and developing countries.

[121]Kumar., Praduman and Mittal; Surabhi (2003): "Productivity and Supply of Food grains in India", from 'Towards a food secure India-Issues and Policy' edt by Mahendra Dev S, Kannan K.P, Ramachandran Nira.
[122]Paul A.Dorosh: (2004)"Trade, Food Aid and – Evolving Rice and Wheat Markets." Epw, Sep 04 – 2004, 4033 – 4042.

These trends have led the farmers either to quit the cultivation or to stand on the unviable and unsustainable position as they could no longer survive on this cultivation. This finally had led to the decrease in the relative Rice production which finally led to either increase in prices or also lesser availability to the consumers[123].

Wheat: Analysis will enable us to understand the fact that, during the second period except Maharashtra, the production performance of all the referred states has been either low or negative. This was very evident when India had to import wheat from countries like Australia to the tune of 6 million tons 2006-07[124]. There may be various factors behind this uneven trend, but the major causes can be found in the ill effects and the unfavourable atmosphere that had been created out of the conditions under WTO. Therefore, for an agricultural country like India unless we find an equivalent and appropriate alternative mechanism that would protect our farmers as well as our consumers with better production wheat self sufficiency from the unfavourable clauses of WTO[125], we will not be able to produce enough and thereby fail to protect both our farmers and consumers, especially in the light of increasing population, urbanisation, climate change and global warming, food habits and tastes and preferences, it is very essential to protect the food grain production with structural support system in order to bring in the food grain self sufficiency and thereby food security.

Pulses: Pulses in India comprise of grains like Arhar, Gram, Greengram, Khesari, Masoor, Moong, moth, Black chena, yellowgram, Urad dal and Tur dal. Since all these pulses play a very crucial role in determining the day to day diet pattern and quality of consumption of many people we take into account all the pulses as an integrated bundle. Here it is very clear that, aprt from the states of Orissa and Rajasthan all other states had shown higher growth rates than the national growth rate i.e. 0.62 per cent during the overall period 1981-82 to 2009-10.

Thus it is very clear from the table that the growth of pulses production during our sub periods has not been identical like in the case of either total food grains or rice or wheat. The states like Madhya Pradesh, Rajasthan and Maharashtra have performed very positively in the first sub

[123]Prasanna; Lakshmi P.A, Kumar; Sant and Aruna Singh (2009): "Rice Production in India – Implications of Land Inequity and Market Imperfections", from 'Agricultural Economics Research Review', Vol.22 (Conference Number) 2009 pp 431-442.
[124]Ramesh Chand (2006): International Trade Food Security and the response to the WTO in South Asian Countries". Research Paper No. 2006/124. United Nations University- UNU –WIDER. World Institute for Development- Economic Research.
[125]Kumar; Praduman, Joshi P.K, Birthal S Pratap (2009): "Demand Projections for Foodgrains in India", from 'Agricultural Economics Research Review, Vol. 22 July – Dec 2009,pp 237-243.

period of pre economic reforms than the second sub period of post liberal trade regime like in the case of national growth rates. Apart from these states, the rest of the states like AP, Karnataka and Orissa have performed better during the second sub period of liberal free trade under WTO than in the pre liberal trade regime between 1981-82 and 1994-95. This trend can be due to, apart from various other government policy initiatives, the shift in the cultivation pattern from food grains towards more of pulses and also due to the increase in the per hectare yield of these three referred states[126].

8.4 State wise Instability in Area Production Yield (SD and CV)

These rates of instabilities may not exactly the aggregate growth rates of production; they would only enable us to understand the kind of fluctuations that had occurred in that particular state Therefore, these instabilities that are based on CV may not exactly reflect the aggregate growth in production of concerned states.

Food grains: Andhra Pradesh has shown more instability during the overall period with respective CVs of 131.54, 30.00 and 28.32 per cent. And the states of AP and Rajasthan have shown more instability in the first sub period unlike Karnataka as it had shown more instability in the second sub period. At the same time, states of Maharashtra, UP and MP have shown lesser instability as their CV of production is lesser than other states with respective CVs of 16.17, 16.73 and 18.13 per cent. Here also except MP states of Maharashtra and UP have shown more CV during the first sub period than in second sub period. In total period, states of Maharashtra, UP and MP and PB had the lowest instability in food grain production while states of Rajasthan, Karnataka and AP had the highest instability in food grain production during the overall period.

Rice: If we consider CV as the indicator of instability, states with higher production instability are Punjab, WB and BR with the respective CV values of 30.46, 26.54 and 25.05 per cent. Except the state of Bihar, Punjab and WB have had more CV value in the first sub period than in the second sub period of reforms under WTO.

[126]Srivastava S.K, Sivaramane N, Mathur V.C (2010): "Diagnosis of Pulses Performance of India", from 'Agricultural Economics Research Review, Vol.23 Jan-June pp 137-148.

Now if we observe the SD of area under the cultivation of Rice, state of Bihar has maintained higher SD with 830.04 hectare, exhibiting higher instability. And Bihar is followed by the Punjab with SD of 476.53 hectare and also AP with SD of 409.28 hectare. These higher instabilities in Area under cultivation Rice reflected in more area being brought under rice cultivation and in a way helped in increasing the production in these three states. At the same time, the states with lower instability or lower SD are Asom with SD of 116.33 hectare, followed by Orissa with SD of 137.96 hectare and West Bengal with SD of 331.51 hectare. Then if we look at the instability of Yield per hectare of Rice, the state of WB has had highest SD with 3118.89 kg, followed by AP with SD of 404.03 kg and Punjab with SD of 354.28 kg. On the other hand, state with lowest instability in yield per hectare of Rice, is Assom with SD of 188.51 kg, followed by the Bihar with SD of 248.79 kg and next comes the state of Orissa with SD of 261.69 kg.

Wheat: If we observe the CV of Production of Wheat in major states during the total period, state of Haryana has the highest CV reflecting more instability (CV 44.73 per cent), followed by Maharashtra with CV of 33.74 per cent and also Rajasthan with CV of 31.36 per cent. Except in the state of Rajasthan, the CV in the first period is lesser than the second sub period. That means there is more instability in the second sub period of free trade in the states of Haryana and Maharashtra. Coming to the Area CV during total period, states of Maharashtra (MH), Rajasthan and Haryana possess the higher instability, where as the states of UP, Punjab and Bihar maintained the lower instability respectively that is measured in CV. On the other hand, if we observe the instability in yield per hectare of Wheat during over all period, states of MH, Rajasthan and MP had the highest CV respectively and thereby higher instability. And at the same time, states of Punjab, Bihar and UP had lesser CV respectively and thereby lesser instability in per hectare yield.

Pulses: If we observe the CV of Production of Wheat in 6 major pulses producing states during the total period, state of Orissa has the highest CV/instability (60.88 per cent) followed by the states of Rajasthan and AP with respective CV value of 38.18 and 37.79 per cent. Out of these three, except the state of Orissa, in other two states the SD/instability is higher in the second sub period than in the first period. Then, if we take, are into consideration, states of Orissa, Rajasthan

and Karnataka have the highest CV/instability with respective CV values of 47.27, 19.20 and 14.72 per cent. And if we observe Yield CV, states of AP, Rajasthan and Maharashtra have the highest CV/instability with respective CV values of 26.24, 24.97 and 21.30 per cent. And at the same time the states of Karnataka, MP and Orissa maintained the lowest instability rates with the respective CV values OF 15.86, 16.52 and 17.47 per cent

Unlike in our earlier analysis of Food grains, Rice and Wheat, where in there was mostly higher instability in the first sub period, here in case of pulses, in both SD and CV observations of production, in most of the states instability is found more in the second sub period of free trade. It can be understood as we have seen in our compounded growth rate analysis where in the pulses production has shown some resilient progress during the second sub period. Here also more instability in the second sub period can be understood as leading to aggregate increase in production despite seasonal fluctuations in production as well as area and yield per hectare[127]. The better performance of Pulses during the second sub period can also be attributed to the changes in the area under cultivation of pulses.

8.5 Growth of Per capita availability

In any economy, per capita availability of food grains is one of the important parameters that can be observed in order to assess the level food grain self sufficiency on the supply side at an aggregate level.

Food grains: The per capita availability (PCA) of food grains is far lesser than the growth rates of population in all the periods, especially in the total period it is just -0.04 per cent i.e. 1981-82 to 2009-10. It only emphasises the fact that hardly there has been any increase in the PCA of food grains[128]. But this PCA of food grains is, to some extent, a positive in the first sub period of pre economic reforms with 0.35 per cent growth and in the second period it had declined to as low as -0.64 per cent negative growth rate. It only suggests that the per capita availability of food grains in India during our reference period has not grown on par with that of population growth[129]. It can be due to various combinations of factors. Apart from a rapid

[127]Bhartiya K.C, (2009): "Pulses: Growth Trajectory, Missed Opportunities & State Interventions", from 'India Commodity Year Book 2009', by National Collateral Management Services Ltd, Mumbai, edt by Sanjay Kaul.
[128] Sharma; Alakh N (2010): "Food and Nutrition Security in India", from 'Agriculture, Food security and Rural Development', by Asian Development Bank, OUP-2010.
[129] Sharma; Devendar (2008): "Importing Food Insecurity", from Yojana –July 2008.

increase in population, very placid and low production growth, especially during the post WTO period had severely affected the PCA of food grains. Because, under WTO regime a traditional Indian agriculture has been exposed to the developed country's' agriculture, during this period as there was rush of cheaper food grain imports, our high cost farming has not been able to withstand the competition from the affluent countries' food grain imports. Hence they had shifted away from food grains or they had been compelled to shift away food grain cultivation as there was gradual decline in the support structure to the farming from the Government.

*Rice, Wheat, Cereals and Pulses:

Only the Wheat has maintained positive growth rate (0.49 per cent), though lesser than the population growth rate of 1.93 per cent. But it had also put up as much as -0.78 per cent negative growth of PCA during the post WTO period, came down from the growth rate of 1.40 per cent during pre WTO period, between 1995-96 and 2009-10. Apart from Wheat, Rice PCA growth during the total referred period is -0.14 per cent, which is long way below the growth rate of population and also the growth rate of food grains. But it had a positive growth of (PCA of Rice) 1.04 per cent during the pre WTO period and later registered -1.00 per cent growth during the post WTO period with respect to PCA of Rice. In the same way same are the trends with PCA of Cereals (including coarse cereals) has had negative growth rate (-0.16 per cent) during overall period as well as well as second sub period (-0.78 per cent) despite maintaining positive growth of PCA with 0.58 per cent in the first sub period. But unlike Rice, Wheat and Cereals, Pulses PCA growth rate, despite its overall negative PCA growth of -0.65 per cent, has been positive in the second sub period of economic reforms with 0.67 per cent growth that was earlier negative at -0.43 per cent during the first sub period. This trend can be attributed to the increase in area under cultivation for pulses as well as in crease in per hectare yield during the post liberalisation/ WTO period[130]. Though this growth is not sufficiently enough for the economy, but it had somewhat stood up with competition unlike Rice and Wheat.

8.6 Per capita Availability – Instability (SD & CV)

[130]Srivastava S.K, Sivaramane N, Mathur V.C (2010): "Diagnosis of Pulses Performance of India", from 'Agricultural Economics Research Review, Vol.23 Jan-June pp 137-148.

Food grains: The instability in Per Capita Availability (PCA) of Food Grains has shown more instability in the second sub period (SD 9.51 tons) which is even higher than the overall instability of SD 8.49 tons. Even CV of PCA is much higher in the second sub period, i.e. 5.71 per cent which is lesser than the first period CV of 4.03 per cent and over all CV is 5.03 per cent. These higher instabilities of PCA of food grains in the second sub period (under WTO regime) would only emphasise the fact that the food grain availability per head has either remained stagnant or very low. It only emphasises the fact that the growth of food grain production has been very low during this period and resulted in lesser availability for the consumers.

Rice: PCA of Rice also has increased marginally during the free trade period from the earlier lesser instability during the 1st sub period of pre free trade period. It is evident when we observe SD and CV, as SD of PCA has increased to marginal rate of 5.5 tons in the reform period from an earlier rate of 5.1 tons while the overall SD of PCA is also remained at 5.26 tons and CV also has also increased marginally to 7.6 per cent from 6.92 per cent.

Wheat: PCA availability of Wheat also has shown more instability during the free trade period, it is shown through SD as it has marginally increased to 4.59 tons from earlier 4.41 per cent while the aggregate instability is with 5.13 tons which is even higher than the both periods. But in case of wheat, the CV of PCA has slightly declined during the second period to 7.81 per cent from an earlier figure of 8.22 per cent, while the overall instability is even higher at 9.12 per cent. These inferences would only indicate us that the PCA of both Rice and Wheat have remained either stagnant or decreased during the free trade regime under WTO commitments of India.

Pulses: It has also shown more instability during the reform or free trade period, as SD has increased from 1.02 tons to 1.25 tons while the overall instability/SD is at 1.4 tons. And same is the case with CV where in it increased from 7.18 per cent to 9.9 per cent while the aggregate CV of PCA has remained at as high as 10.45 per cent which is considered very high as far as instability is considered. And it shows that the overall PCA of pulses during the total period has had severe instability, reflecting in lesser amount of pulses production and thereby leading to the deficiency of availability.

Finally it can be inferred that the overall PCA instability is very high in case of pulses with 10.45 per cent under CV while Total food grain has the lesser instability in terms of CV and if take SD into consideration instability is higher for total food grains with 8.49 tons while pulses possess the lesser instability. For these higher instabilities, though there are many factors like increase in population, changes in tastes and preferences, reduction in area under food grains and it's particularly due to agriculture gradually becoming unviable to the Indian farmers due to cheaper imports under free trade [131]. And these developments all together have pulled down the production of food grains and thereby led to the lesser per capita availability and also to the grave situation of food insecurity[132].

8.7 Growth Rate of Population and Food grain (Rice, Wheat, Pulses and Cereals)

The overall food grain production growth rate (1.87 per cent) is slightly lesser than the overall population growth rate of 1.93 per cent. But if we observe the pre WTO and post WTO regime growth rates of food grains, they exhibit different picture. In the first sub period of pre WTO period, growth rate of food grain production (2.79 per cent) is significantly higher than the population growth rate of 2.10 per cent and on the other hand, the food grain growth rate in the second period of liberal WTO free trade, has drastically come down to 1.24 per cent which is very much lower than the growth of population during this period. It only suggests that, though the overall growth of food grain production is lagging behind the population growth rate during the total period and more so in the post liberal trade period of 1995-96 to 2009-10. It is a clear indication for the fact that our food grain production has not been able to grow so as to provide sufficient food grains to increasing population[133]. This trend is more prominent during latest period of WTO free agricultural trades regime, as higher food grain production growth in the pre WTO period has seriously dropped down below the population growth during the WTO regime. That only suggests that the food grain self sufficiency of India is more jeopardised during the WTO regime than in the pre WTO regime.

[131]Acharya; Shabd S (2009): "Food Security and Indian Agriculture: Policies, Production Performance and marketing environment", from Agricultural Economics Review, Vol.22 Jan –June 2009 pp 1-19.
[132]Bhargava (2007); Pradeep and Manju Balana: "Realising the Right to Food in Asia". From 'Food Insecurity, Vulnerability and Human Rights Failure' Edited by Basudeb Guha, Khasnobis, Shabd S.Acharya and (ICSSR) Benjamin Davis – 2007.
[133]Krishnakumar S (2004): "Agricultural Trade Liberalisation and Food Security-Theoretical Debates and Empirical Issues", from 'Poverty and Food security in India: Problems and Policies',edt by M.S.Bhatt, New Delhi 2004.

In the same way, the growth rate of Wheat, Rice, Pulses and Cereals has also been more positive in the pre WTO period as their respective growth figures 3.49, 3.71, 1.27 and 2.89 per cent in the first period have significantly come down to respective 1.16, 1.36, 0.71 and 1.40 per cent during the second sub period. It also again projects the same trends of insufficient production of Rice, wheat, Pulses and Cereals during the post WTO period of 1995-96 to 2009-10. This adverse growth, as far as food security of India is concerned, can be attributed to the restrictions that have been imposed on our farmers through WTO[134], in terms of opening up of the agricultural imports; reduction in import quotas, quantitative restrictions (QRs) imposing the strategy of export led growth and concentration on cash crops rather than the food grain crops[135].

8.8 Objectives Addressed

Therefore, after our analysis, here we can say that, with regard to our first objective i.e. trends in food grain production and impact on food security, it is observed that in Indian context, during the study period under consideration the food grain production has fluctuated during pre and post WTO period. Therefore the food grain production growth was more positive in the pre reform period than in post reform period. The second objective, i.e. per capita availability also shows that the overall growth of per capita availability growth has been negative (excluding variations within the group of cereals and pulses) due to both decrease in production and also due to other factors. These trends have led to the questions like emerging food insecurity in India.

Third objective, i.e. free trade environment and its effects on food insecurity, after our analysis throughout our research, we can observe that the both the growth of agriculture, exclusively the growth rate food grains and also the per capita availability of food grains have been positive and desirable during pre WTO period than in post WTO period. It only suggests that the WTO commitments of India have affected labour intensive Indian agriculture negatively, thereby food grain production and consequently our enlarged the scope for food insecurity. And finally our fourth objective, future demand and supply projections of food grains, based on reliable studies, it is clearly observed that by the year 2020 (and some studies by the year 2026) our food grain growth at aggregate level would be lagging behind the growth rate of income and also population. There will be a scope for probable and significant rift between projected demand and supply where in demand would be falling short of supply. These projections would only indicate

[134]Panda;Manoj, Kumar;Ganesh A (2008): "Trade Liberalisation, Poverty and Food Security in India", from 'IGIDR, Mumbai, WP-2008-013.
[135]Panda;Manoj, Kumar;Ganesh A (2008): "Trade Liberalisation, Poverty and Food Security in India", from 'IGIDR, Mumbai, WP-2008-013.

us that unless we address the agricultural issues and increase the food grain production there would be every possible scope for India for landing up in a situation of insufficiency in food grains. If we do not have sufficient foreign exchange reserves to import food grains it would surely lead to a heavy prevalence of food security in India.

8.9 Conclusions and Suggestions

In India, chronic hunger rarely figures in public debates and electoral politics. In a recent count of these opinion articles over a period of 6 months, it was found that the health, nutrition, education, poverty, gender, human rights and related social issues combined accounted for barely 330 out of 300 articles. The neglect of social issues in general, and of chronic hunger in particular, is often attributed to lack of political will. *Indian economy has one minor flaw, namely that most people are unable to participate in it due to economic insecurity, lack of education, social discrimination and other forms of disempowerment*. In short, Indian democracy is trapped in a vicious circle of exclusion and elitism. Because underprivileged sections of the population are excluded from active participation in democratic politics, their aspirations and priorities are not reflected in public policy. The elitist orientation of public policy perpetuates the deprivations like poverty, hunger, illiteracy, discrimination etc. that disempower people and prevent them from participating in democratic politics.

On the global front, we posses more cultivable land than China, but our yield is much lower than China, for eg: Per hectare yield of Rice in China is 8 tonnes where as in India it is just 3 tonnes, which is due to low technology, low government investment and climatic conditions...etc. 56 per cent of our food grains come from the irrigated land and the remaining 44 per cent of food grains have to come from the unirrigated land. Therefore when the environment turns uneven, this 44 per cent of food grains production is at stake. Average area under operational holding is 2 hectares and the total farmers having this area are 86 per cent. If India is the largest producer of several crops, it is also the country that has **lowest yield per hectare for all crops.** The per hectare yield of rice in India (metric tonnes) is *only 2.9, lagging behind many countries like Egypt 9.8, Japan 6.4, Korea 6.7, USA 7.8 and the world average is 3.9*. Even we find lot of differences with in India among our states in terms of production and per hectare yield. This is the gap that has to be tapped to enhance the food grain production levels, especially in the light of global warming and depleting water resources, so that food security can be attained in future.

Agriculture is included under GATT for the first time in 1994 and the entire policy regime is geared to make poor countries' exports more primary products. Whether this process leaves more people in hunger or dead in these countries doesn't appear to concern the advanced countries today anymore than it did in the past. It's nothing but decolonization[136].

We cannot depend on imports to maintain food security and mitigating the food inflation. According to some economists, inflation is nothing but a tax on the poor since food accounts for a relatively high proportion of their expenses which is bad news for ruling politicians, because it's the poor India that vote in much larger numbers than the rich[137]. If we remain as the food importer in the world market, international prices would increase sharply thus jeopardises our food security. In the second period, import growth rate of food grains has increased from -3.12 to 8.32 per cent; it only shows that the food grain imports have increased on a massive scale especially pulses, especially during second period involving liberal economic reforms and free trade that have affected our agriculture quite severely. *Taking edible oils and pulses together, India has emerged during the 1990s as the world's major importer of these commodities.*

On the other hand if procurement, distribution, trade and management of agricultural commodities are concentrated in the hands of corporate agri-business companies, they can follow speculative and hoarding practices and thereby create fluctuations in the market. Hence the govt policy should be oriented towards removing the supply-side and demand-side complications of the food economy. Adopting modern information technology could help significantly in this regard.

Increase in agricultural productivity would improve small and poor farmer livelihood and consequently affordability of food items. Develop such a supply chain system for agricultural products that benefits both farmers and consumers. Therefore, effective linkage between farmers groups and consumer groups need to be established to eliminate the multi layers of intermediaries between farmers and consumers. Though productivity is nearly the half the productivity by world standards, there is great potential to tap it by increasing the intensity of production. It is also to be understood that indiscriminate use of fertilisers and other chemicals

[136]Patnaik; Utsa: (2007) - "The Republic of Hunger and other Essays – three essays collective" 2007.
[137] Paranjoy Guha Thakurta. "Is India, the World's Second Most Populous Nation, Facing a Food Crisis"? From (net) BBC – 2008-04-07, 06:53:40 GMT.

may increase the productivity but there is danger of contaminating the produce with the chemical substances. The developed countries have realised the perils of this increased chemical productivity and are now going in for more of organic production even if the productivity comes down.

In 2006-07, the NSSO reported that 6.5 per cent of the operated area was under tenancy. States such as Punjab, Orissa, WB, Bihar, UP and AP recorded higher than average tenancy. Issues like Land Reforms & Land Rights; improving women's access to land assets is also connected to other cultural norms and practices, which need to be simultaneously addressed. Agriculture can be made competitive through providing an apt Minimum Support price (MSP) to the farmers which will enable them to boost up the productivity and also increase in the share of profit margin that facilitate to utilise capital intensive and yield maximising inputs. . National Farmers commission's suggestion of providing the MSP equivalent cost of production plus the extra 50 per cent should be implemented.

8.8.1 Grain Management

As there exists a poor and inadequate post-harvest infrastructure, about 10 per cent of the food grain produce (about 20 million tonnes) goes as waste every year. Saving of 20 million tonnes of food grains through efficient supply chain management and creating better storage and distribution infrastructure can help to release about 6 million hectares of land under food grain cultivation for other remunerative crops or can produce additional 20 million tonnes of food grain. Every food grain produced in our country has to be stored safely, sufficiently and within the time limit. In order to make these storages effective and cost effective, all across the country govt needs to open up grameen grain banks and also rural good downs. In the year 2007-08, out of the storage capacity of 217.41 lakh tons, out of this 129.48 lakh tons are stored in govt good downs and 87.93 lakh tons in hired good downs. At the same time the Central Warehousing Corporation has the capacity for 193.42 lakh tons in its own good downs. In all the govt good downs the capacity is 509 lakh tons, but the storage facilities are required for 250 million tons for food grains and 300 million tons of fruits and vegetables in order to reduce post-harvest losses and enhance food safety. We can take the example of China, where it procures 150 to 200 million tons annually and stores them perfectly. It's not just the agricultural production, but also

the total factor productivity, post harvest technology, investment in irrigation facilities and infrastructure in rural areas, are all have been on the decline in India[138].

8.8.2 Poor Farmers

The information shows that number of economic indicators pointing out clearly that production, prices and markets have not been favourable to farmers. This has resulted in falling incomes and making farmers poor. *Increased production and productivity in the farm sector is no guarantee that farmers economic status is improving. Farmers gave food security to the country but in turn did not get income security for themselves*. Therefore, in all future policies and programs, farmer's income is to be at the centre stage of development. The Indian farmers residing in 6.38 lakh villages producing 18 per cent of GDP have to carry burden of 1210 million people under these economic conditions. Though the Government of India reduced the food grain issue prices, it only went to the food processing industry and exporters. And the highly subsidised wheat and rice only increased the private profit[139].

8.8.3 Ground water Management

And the availability of ground water for irrigation would emerge as a critical bottleneck for self sufficiency in food grain by the year 2020[140], as demand for irrigation would exceed its availability by nearly 30 percent. Similarly, National Commission for Water Resource Development Plan has projected that the requirement for irrigation water in India would grow by more than 50 per cent by 2050. Based on various assessments it is concluded that even after fully exploiting available water resources, water supply can match the demand only if there is a big improvement in the efficiency of irrigation. Land and water care, water harvesting, restoration of degraded and wasted lands, all need focused attention.

If we can observe the per capita availability of water per year, it has declined from 5000 cubic meters in the early 1950s to 2000 cubic meters at the end of 2002. The usable quantity is around 1,122 cubic meters per year, showing an inappropriate and over use of water. Agriculture on the

[138] Swaminathan M.S. (2007): "Dichotomy between Grain Surplus and Widespread Endemic Hunger" from 'Agriculture can not Wait – New Horizons in Indian Agriculture' (National Academy of Agricultural Sciences) 2007.
[139] Gopal; K.S (2004): "Addressing Hunger : Food Assurance in Andhra Pradesh". From "National Food Security Summit – 2004 – some selected Papers. Edited by M.S.Swaminathan, Pedro Medrano, Daniel Gustafood securityon and Pravesh Sharma – 2004.
[140]International Food Policy Research Institute (2002): 2020 Vision for Food, Agriculture and the Environment – "Sustainable Food Security for All by 2020 – Proceedings of an International Conference" held on Sep 04-06, 2001, Bonn – Germany.

whole accounts for 80 per cent of water usage or withdrawal, but the estimates suggest that water availability for agriculture is going to decline by 20 per cent by the year 2020[141].

We need to charge a reasonable price for canal water which will discourage wasteful over-use and also generate financial resources to help maintain the system. We also need to bring in much more participatory irrigation management so that farmers have a say and stake in the running system. There are examples in some states of water user associations improving effectiveness of water use and management of irrigation system. In order to achieve this, we may need to consider changes in the law to make property rights on ground water more rational and community oriented.

For Indian Region (South Asia), the IPCC (Inter Continental panel on Climate Change) has projected 0.5 to 1.2 degree Centigrade rise in temperature by 2020, 0.88 to 3.16 degree centigrade by 2050 and 1.56 to 5.44 degree centigrade by 2080, depending on the scenario of future development. Overall, the temperature increase is likely to be much higher in the winter (Rabi) season than in the rainy (Khariff) season. Precipitation is likely to increase by 15-40 per cent by the end of the century. They clearly indicate that there will be an overall increase in the highest one day rainfall over major part of the country, which might lead to a greater probability of flood, cyclones and drought events in many parts of India.

A loss of 4-5 million MT in wheat production is estimated with rise of 1degree centigrade temperature throughout the growing period even after considering carbon fertilisation[142]. Global warming could increase water, shelter and energy requirement of livestock for meeting projected milk demands.

8.8.4 Global trends in Grain Diversion

In the recent past, most of the developed countries are diverting large parts of their food grains to feed the cattle, in desperation to non vegetarian diet; it would also lead to severe food shortages in future. On the other way, extreme temperature conditions would also curtail the life of small animals in future. High temperature and global warming would not only effect food security

[141]Pant K.C. (2003): "India's Development Scenario: Next Decade and Beyond.", From 'Indian Agriculture in the changing environment – Vol I', edited by Raj Kapila and Uma Kapila – AF – 2002.
[142]Hanumantha Rao CH (2005): "Declining per capita Demand for Food Grains in Rural India- Causes and Implications", From 'Agriculture, Food Security, Poverty and Environment', Essays on Post Reform in India 2005.

through reducing production, it also effect the health conditions of normal human beings and thereby reduces his or her working capabilities and it finally reduces his purchasing power to buy food, especially of poorer sections like SC/ST's. Coming to the global trade in agriculture, around 62 per cent of the world's agro exports in 2004 came from countries that together comprise only 15 per cent of the World's population and only about 4 per cent of global agricultural population and this same group accounted for 40 per cent of the world's agriculture imports, predominantly the EU and USA.

Roughly 17 units of cereal feed are used globally to provide 1 unit of livestock product protein output. According to US estimates, production of 1kg beef requires the input of 16 kgs of grain and soya feed. *In these terms, poultry appears more efficient. The growth of animal agriculture and the meatification of diets require more land to be cultivated per person than would be required for more plant based diets*. Roughly half of all cropland worldwide is used for animal feed led by large percentages of maize and soya beans

In future, due to heavy increase in population, land resources would be in more demand and cultivalable lands will be turned into inhabitant lands and thereby reducing the land available for cultivation that could endanger our food security. *The growth of animal agriculture and the meatification of diets require more land to be cultivated per person than would be required for more plant based diets*. Interestingly, an edible unit of protein from factory farmed meat requires 100 times more fresh water and more than 8 times the fossil fuel energy than does an edible unit of protein from grain. Also, meat and dairy have higher refrigeration demands. The waste of farm animals also contribute to 16 per cent of the world's emission of methane, a greenhouse gas and which are projected to increase by 60 per cent in coming decades[143].

8.8.5 Indian Agriculture during Liberalisation

In order to maintain the aggregate annual GDP growth at rates greater than 8.5 per cent on a sustainable basis, it will be difficult if agricultural growth itself does not exceed 4 per cent per annum. It is a fact that cost of cultivation of the important crops has increased owing to rising prices of inputs and slow growth in yields. And the absence of corresponding mechanism to

[143]Weis; Tony (2007): "The Global Food Economy: Contradictions and Crises", from ' The Global Food Economy – The battle for the future of farming' -2007. Zed Books – Fern wood Publishers.

ensure the desirable prices paid by the consumers to farmers has affected the viability of farming. This trend seriously impairs the possibility of reaping economies of scale in the agricultural sector, even if capital investments are made.

The share of agriculture in total Gross Capital Formation in agriculture **(GCF**) was *just 8.39 per cent in 2008-09 against 16.3 per cent in 1980-81*. Unfortunately the GCF in the agriculture sector by the public sector declined at annual average rate of 4 per cent and 1.9 percent during the 1980's and 1990's respectively. The share of public sector in GCF fell from 51.3 per cent in 1980 to 17.6 per cent in 2008-09 and the remaining 82.4 per cent investment is from the private sector. It led to an increase in the private investment in agriculture, which led to the commercialisation of agriculture disregarding the necessity of food grain production. This kind of low attention by government towards agriculture has led to the further deterioration in agricultural productivity and more importantly food grains, during the post liberalisation period. Diversification of agriculture should be viewed as part of the wider objective of rural diversification. The livestock sector is particularly important because its development would facilitate many marginal farmers; they form 60 per cent of operational holdings, crossing the threshold of economic viability.

In the early 1970's, the average retail price of one quintal of Rice/wheat was equivalent to 16 per cent of the India's average per capita income and One-day's wages of rural labourer fetched one kg of rice or wheat. The real prices of rice and wheat have continued to decline since then. Approximately, 100 kg of rice or wheat can be bought by paying only around 4 or 5 per cent of average per capita income and one day's rural wage fetches 5 or 6 kg of rice or wheat. However, we should not forget the plight of staple food producers. Undoubtedly, there is a need to pay a higher price to Indian farmers producing food and maintain a high degree of macro level food security of the country[144]. In India the agricultural incomes are mostly accruing to managerial profits and salaries of upper classes, which in turn demand only white and luxury goods. Moreover, on the other side, both the share in gross cultivated area under food grains and value added has been on the decline[145].

[144] World Bank – Directions and Development (2005): "The Rapidly changing context for Agriculture: Challenges and Opportunities", from 'Agricultural Growth for the Poor – An Agenda for Development.' edited by Raj Kapila and Uma Kapila – AF – 2002.
[145] Krishnaraj;Maithreyi (2006): "Food Security – Agrarian Crisis and Rural Livelihoods – Implications for Woman." Epw (5376 – 5387)– Dec 2006.

The permanent resolution to the problem of food insecurity can be implemented through sustainable livelihoods, which can be through the enactment of policies like land reforms and distribution of other natural resources among poorer sections and also creating alternative employment opportunities in rural areas in order to enable to have sufficient purchasing power. For wheat, rice, and pulses the crops that are considered crucial for food security, the import duties are already zero. Therefore, India must restore the import duties on these four crops if it intends to maintain food security. Otherwise in a way, the govt appears very keen to import food insecurity[146].

The increase in food grain production by providing supply incentives to farmers by raising MSP is neither an effective nor an appropriate solution to the food grains' growth problem in India. Burgeoning input costs lead to burgeoning support prices that result in food being even further out of reach for many of our lower income citizens[147].

8.8.6 Effect of Trade Liberalisation:

Global trade negotiations can affect the food security in two ways. One, if the agreements result in a structural supply shift that increases the average price of food , leading to the food insecurity by reducing the purchasing power of the poor or making them spend major part of their income on food. It also increases the budgetary requirement of the Government towards food. Secondly, already some of the Governments in developing countries are associated with spending more on poverty alleviation and safety net programmes. But coming under trade negotiations may not allow then to continue those programmes[148].

The reasons behind these trends can be attributed to the various factors like crisis in the rural and agrarian economy, cuts in the rural development expenditure, fall in the produce prices, reduction in public investment and cheap and institutional credit...etc[149].

So long as large proportion of the work force, currently accounting for nearly 57 per cent,

[146]Ramachandran; Nira (2006): "Women and Food Security in South Asia – Current Issues and Emerging Concerns", from 'United Nations University UNU-WIDER', Research Paper No. 2006/131, Nov 2006.
[147]Falendra K.Sudan (2003): "WTO, IPR's and Indian Agriculture". From 'Indian Economy Under Globalisation' edited by Sham Bhat -2003.
[148] Merlinda D.Ingco, Donald Mitchell and John D. Nash.(2004) "Food Security and Agricultural Trade Policy Reform" From "Agriculture and WTO – Creating a trading system for Development - 2004".
[149] [149] 'Report on the State of Food Insecurity in Rural india', by M.S.Swaminathan Research Foundation and World Food Programme (FAO - UNO), 2008.

depends on agriculture and to a large extent on Food Grain's production, and a sizable share of consumer's budget goes for the purchase of food, it is imprudent to slacken our efforts to raise productivity in agriculture in general and Food Grains production in particular. Any premature withdrawal from this policy at this stage will jeopardise the food grain of a large number of poor producers as well as substantial section of poor consumers. Direction in which we should move is higher investment in land and water along with strengthening the support system of research, extension, credit and marketing. An equitable price policy also plays an important role. And the new technology would also increase employment and also can generate alternative sources of nonfarm employment.

The growth of total food grains, in the light of economic reforms, drastically declined to 1.24 (between 1995-96 and 2009-10) per cent compared to 2.79 per cent between 1981-82 and 1994-95. Main reasons for these trends can be sharp the decline in government spending on agriculture and irrigation infrastructure. The combined share of agriculture and irrigation in total plan outplays has come down from the high of 31.04 per cent in the fourth plan to just 10.63 per cent in the 10^{th} plan. India requires a shift in public policy to the principles of market and competition from the traditional one of regulation and support, as the earlier socialism has not been successful in suppressing inequalities.

This kind of low attention by government towards agriculture has led to the further deterioration in agricultural productivity and more importantly food grains, during the post liberalisation period. This has made vast number of small and marginal farmers to quit agriculture or their lives at times, as it became unviable. These trends have led to increase in food prices, which again hit the lives of small and marginal farmers and other poorer and weaker sections quite heavily and negatively, as they were pushed away from accessing food items as food grains became expensive. It can be evident from the fact that the malnutrition (380 million suffering from malnutrition) has increased more rapidly during the post reform period.

Green revolution also failed to benefit the farmers in unirrigated and marginal areas, where a large percent of the population continues to be poor. Therefore agriculture must be given primary importance along with increased research and development & extension, pesticides, fertilizers, price stabilization, universalisation of PDS, increase in the pulses' production, increase in nonfarm employment opportunities, striking a balance between positive and negative

externalities in agriculture, increase in the small and marginal farmers' income, proper procurement and better utilization of WTO rules, improvements in food marketing system and implementation of direct food assistance programmes and increase in the access to education and primary health care, must be focused heavily in order to achieve sustainable food security, as liberalization gradually and negatively effecting the food security in terms of decreasing purchasing power and economic access. Social discrimination and exclusion still play, unfortunately, large roles in determining both livelihood and access to food buy different social categories, and this too needs to be reckoned with. Malnourishment is closely linked to poor sanitation and other unhealthy practices, so that the provision of clean drinking water, sanitation and access to other basic amenities as well as knowledge about correct or desirable eating habits, are all necessary. In order to achieve these goals, a high level focus must be given to the key issues like, education, livestock, irrigation-which will directly account upon reducing poverty, increase the efficiency of the agriculture,

Therefore what we need in India is to protect our farmers as well as consumers from vicious repercussions arising under WTO regime, to make sure that food is accessible both economically and quantitatively to the poor people. For this purpose, the government must initiate policies which increase the support system to agriculture in terms of imposing heavy import duties on agro goods and quality controls, providing sufficient credit and storage faculties.

Thus, unless and until we undertake these measures instantly, we will not be able to survive our agriculture from the clutches of biased regulations under WTO, as it has become a necessary evil, which are inherently framed suiting the interests of developed countries. Otherwise in very near future there is every chance for leading into a situation, as we already entered into it partly, where in we will fall short of producing required food grains to feed our domestic population and land up in rampant hunger.

8.8.7 Price Stabilisation

Naturally the mismatch between production and demand influences the prices FOR consumers and profitability of farmers. Therefore, the price stabilization should come through raising food production and productivity that require increased investment in agriculture, in addition to providing incentives to farmers to grow more food. As land water are scarce inputs and have

competitive uses in agriculture as well as in non-agricultural activities, future enhancement in the food grains production to meet out the rising demand can be possible through mostly through improving the resource-use efficiency and productivity[150]. The national food security mission has targeted to increase the production of rice, wheat and pulses by 10, 8 and 2 million tons by the end of the 11th plan.

The food grains production targets can be met by reducing gaps between actual and the potential yields through improved practices. *India is in a position to increase production of wheat by about 40 per cent and double paddy production by bridging the existing gap in the actual and potential crop yields*. For instance, four states namely UP, Bihar, MP and Rajasthan together have potential of 25.04 million tons of additional wheat production than what are producing now.

8.8.8 Biodiversity

Biological diversity of farms and agro-ecosystems and cultural diversity of food systems and cuisines produces more, better and healthier food and richer cultures. The industrialised globalised food system is creating food hazards and unhealthy foods. Food safety and food quality requires ecological production, decentralisation and diversity, instead of chemical production, centralisation and monocultures. The chemical input based increase in production and productivity of the farmer in the green revolution is not a guarantee that farmers' income will increase[151].

8.8.9 Rural Development

In this context, agricultural diversification can help to increase the income of small and marginal farmers and agricultural labourers by creating more gainful employment. More employment opportunities could also be created through non-farm activities via multiplier effect. The development of infrastructure in terms of roads, markets, storage, processing, land availability, technology advancement, and increase in human capital are the major supply side factors and urbanization, income growth, convergence of food habits as demand –side factors in the agricultural diversification. The policy driven factors, such as input subsidy, reform in tenancy and lease laws, promotion of contract farming and incentives to food processing sector may also

[150]Dhankhar J.N, (2009): "Futures Market in Indian Agriculture and Its Impact on Production and Prices", from Indian Journal of Agricultural Economics, Vol.64, no.3, July-Sept. 2009.
[151] Swaminathan M.S (2006): "Science and Technology for Sustainable Food Security" From 'Indian Agriculture - in the new millennium (Vol – II), Changing Perceptions and Developing Policy.' Edited by N.A.Majundar and Uma Kapila (Indian Society of Agricultural Economics) AF – 2006.

attract corporate investment in the hi-tech commercial crops.

8.8.10 Role of Local Bodies

The food security can be efficiently tackled by active and effective gram sabha, it is expected to be in a front role in implementation mechanisms regarding the proposed national food security act. The investigation of BPL families by the local bodies and analyse the BPL list is the main responsibility of locally elected bodies[152]. The regulation of Fair Price Shops (FPS) and making them accountable to the govt as well as people are the duties of gram sabha or panchayat, can perform effectively and the aspect of right to food to the people. But there is every need to educate these local bodies.

8.8.11 Future Demand Projections and Challenges

It is projected that by the year 2026, the difference between projected supply and demand Growth rates of different food grains looks alarming as far as Indian food security is concerned. In case of Rice Demand growth rate will be 1.55 per cent while supply growth would be just at 1.01 per cent. For Rice these figures are 1.42 per cent demand and 1.34 per cent, though the gap is lessened but looks alarming. In the same way pulses, they are at 6.51 per cent and 0.91 per cent which is going to be a major challenge. In case of total cereals, the total demand growth would be at 3.17 per cent and while demand growth remaining at insufficient rate of 1.45 per cent[153]. The direct household demand for food grains (excluding indirect demand[154]) would increase to 202 Mt by 2021-22, comprising 97.4 Mt of rice; 73.5 Mt of wheat; 15.1 Mt of coarse grains and 16.1 Mt of pulses.

Another study[155] estimated that by 2020, in India, food grain requirement will be of the order of 340 million metric tonnes if we are to feed a population of about 1300 million. Future strategies to ensure a minimum growth of 4.5 per cent per annum will envisage implementing agriculture reforms through policy and institutional changes. Despite having self sufficiency in food grains at present, we have to look forward towards the future where we have to feed 1.3 billion people

[152] Somkuwar; Awanish (2011): "Food security- Role of Gram Sabha is Crucial", from 'Kurukshetra – Journal on Rural Development', Vol. 59, No. 5. , March 2011.
[153]'Surabhi Mittal, March -2008: Demand – Supply Trends and Projections of Food in India – working paper No.209" by, Indian Council for Research on International Economic Relations (ICRIER)".
[154] Conventionally, the indirect demand is assumed to be 12.5 per cent of the total food grain production, an assumption being used since 1950's for all official estimates.
[155]Shahnawazul Islam, Hari Om Agarwal and Samir Farooq (2007): "Need of a Revolution in Agriculture". From 'Agricultural Situation in India – Aug 2007.'

in next 15 years time. We would need 120 million tonnes of rice, 92 million tonnes of wheat, 20 million tonnes of pulses, 11 million tonnes of edible oils, 165 million tonnes of milk and milk products and 113 million tonnes of fruits and vegetables. Therefore, future India's population will not survive without new revolution, along with the conventional adoption of technology, we need to adopt technologies like, bio technology, eco technology, diversification, integrated pest management and of course IT to a higher magnitude. At the prevailing trends, India will require 374.7 million tonnes of cereals in 2020. This drastic increase in demand will be due to the resultant higher per capita consumption of cereals and of livestock products. Then there would be situation, where in we will be at a possible cereal deficit of 115 to 142 million tonnes[156].

These projections only indicate us the required levels of food grains growth in the coming years. But considering the kind of structural, financial and policy obstacles that our agriculture is up against, it is not going to be easy to achieve these growth rates. Especially the light of changing climatic conditions, changing dietary patterns, changing dietary patterns and also the liberalised trade regime in agriculture and also in the light of decreasing poverty rates and increasing incomes of the poorer sections in India, there needs to be sufficient and required policies initiated as early as possible.

In China the productivity of food grains is currently at 5,332 kg a hectare while it is 1,909 kg a hectare in India[157]. To meet the projected demand in the year 2020, the country also has to attain a projected per hectare yield of 2.7 tonnes for rice, 3.1 tonnes for wheat, 2.1 tons for maize, 1.3 tonnes for coarse cereals, 2.4 tonnes for cereals, 1.3 tonnes for pulses, 22.3 tonnes for potato and 25.7 tonnes for vegetables and 24.1 tonnes for fruits. The production of livestock and poultry products must be increased by 61 per cent for milk, 76 per cent for meat, 91 per cent for fish and 169 per cent for eggs by the year 2020 over the base year 1999. Along with them, in order to increase the per hectare yield, emphasis must also be given on increasing irrigation facilities, timely delivery of manures and quality seeds, offering Minimum Support Price (MSP) to the farmers' produce and offering modern agro techniques to the at affordable prices. And the public investment on agriculture and "Research and Development" activities must be enhanced.

Therefore we need to move a quite distance for to ensure physical as well as economic access to

[156]Bansil P.C, (2003): "Demand for Food grains by 2020 AD", from 'Towards a food secure India-Issues and Policy' edt by Mahendra Dev S, Kannan K.P, Ramachandran Nira.
[157] Swaminathan M.S., (2010): "Land rush and sustainable food security", from 'THE HINDU' English daily, Dt. 14-09-2011.

many of these non-food grain items of food, especially for the poor and purchasing power also must be ensured to the poor through the generation of alternative employment opportunities outside agriculture. The technology should be made accessible cheaper to make small and marginal farmers viable.

As long as the vast majority of people, who live in the rural rain fed areas, are ignored by the policy makers, the problems of Indian agriculture especially the food grains insufficiency will continue to persist irrespective of the higher GNP growth rates. Therefore it has been suggested that due to limited scope for expansion of area under cultivation, there is a need to enhance the per hectare yields to the technically highest level through appropriate investment in basic infrastructure, human development, and research and extension services so that rural poor would be in a position to convert the agriculture into a viable entity or can find some alternative sources of employment apart from agriculture.

8.8.12 Revival of Agriculture

The FAO (Food and Agricultural Organisation) recently recognised the traditional agricultural system of Koraput in Orissa, as a globally important agricultural Heritage system. This is because the system provides an outstanding contribution to promoting food security, bio diversity, indigenous knowledge and cultural diversity for sustainable and equitable development. The future of food security will depend on a combination of ecological prudence of the past and the technological advances of today.

The first and fore most important task is to revive the growth process in Indian agriculture by accelerating public investment in agriculture. Second, India is bound to undertake further economic reforms in agriculture. These would include removal of barriers to both external and internal trade in agricultural commodities through tariff reduction, abolition of internal restrictions to trade, opening future markets, and protecting patent rights etc. India should not only try to improve its bargaining position in ongoing negotiations on agriculture after Doha, it should also try to improve its competitiveness in many agricultural commodities through increase in their productivity. India also has to take steps to reverse those policies like continuous hike in administered prices that make its exports non competitive. Finally there is a need to undertake some important institutional reforms like the consolidation of holdings and gradually

reforming the lease market after carefully registering the present tenants, keeping in mind the interests of existing occupancy tenants.

Further, innovative institutions like integrated cooperatives such as the mother dairy and other service co-operatives; contract farming, etc. should be encouraged to involve the small farmers in the process of production processing and diversification. Special efforts should also be made to develop new technologies for the farming sector and reach to the small farmers. The efforts on the production front should be supplemented by the creation of institutions like trading houses, market intelligence services and the creation of a network of information on national and international prices and creating necessary infrastructure in processing, marketing and grading of produce. A market driven liberalisation process in agriculture is invariably strongly biased towards rich farmers and prosperous regions.

Since a very large part of our cultivable area is rain fed, and will remain rain fed, even when full irrigation potential is achieved, it is especially important that our scientists focus on the need to develop seeds capable of higher yields in rain fed conditions. We also will have to ensure that our farmers are sufficiently aware of what is needed to reap maximum benefit from the new technology. There is evidence that such knowledge is lacking at present.

Public provision of different inputs for cultivation and government regulation of private input provision have been progressively reduced, leaving farmers to the mercy of large seed and fertiliser companies and input dealers. As a result, prices for seeds, fertilisers and pesticides have increased quite sharply. There have also been attempts in most developing countries to reduce subsidies to farmers in the form of lower power and water prices, thus adding to cultivation costs.

8.8.13 Small and Marginal Farmers

Small holding farmers are subject to many obstacles like low purchasing power, low calorie intake and undernourishment and malnutrition. A farm household is both a producer and a consumer. Their consumption decisions are based on the nature and quantity of produce, market prices, farm size, and income and so on. Mostly their food needs are met through self production, but their cereal consumption has always been deficient, basically due to their limited holding

size, marginal and sub marginal farmers are net buyers of crop based food for which they need cash. Moreover the poverty levels are very high among small holding farmers and 60 per cent of the poor and 55 per cent of undernourished persons in the rural area belong to farm households having less than one hectare land. Agricultural labour accounts for 23 per cent of the poor and 19 per cent undernourished rural population. $1/10^{th}$ of the rural poor and 13 per cent of the undernourished are from small land holding families[158].

The results reveal that agriculture labour and marginal farm families with less than 1 hectare net crop area constitute more than 80 per cent of the total poor and 74 per cent of the undernourished population and most disturbingly, their number is growing. It requires highest attention to be given to the labour and the marginal farm group for raising their income and employment. In order to achieve these goals, a high level focus must be given to the key issues like, education, livestock, irrigation-which will directly account upon reducing poverty, increase the efficiency of the agriculture, increase the incomes and provide the employment and increase the purchasing power and production. More importantly, total factor productivity must be increased, as it happens, the cost of production decreases and the prices also decrease and stabilize. Both consumer and producer will share the benefits. Fall in food prices will benefit the urban and rural poor more than the upper income group. And low input use and location specific technologies must be developed.

Science and policies must have human face as the marginal and small farmers don't want charity, they want the opportunity to build from within and dream of a future, enriched by knowledge freedom and equity. Given the increase in role of small farmers in food security, development efforts must be geared to meet the needs and potential of such farmers through their active participation in growth process of prosperous India.

8.8.14 Environmental Challenges

Industrial countries are responsible for much of the global environmental problems such as changes in temperature, precipitation, sea level and incidence of ultra violet B radiation, which throw serious challenges for the intensification and diversification of agriculture in developing countries. *Importing food and other agricultural commodities will hence have the same impact*

[158]Kumar; Praduman, Mruthyunjaya, Madan M Dev (2007): "Long-term Changes in Indian Food Basket and Nutrition", from EPW, Sep 01, 2007, pp 3567 to 3572.

as importing unemployment[159]. Though India cannot reduce all the ill effects of environment on its own, it should make all necessary steps like.., increasing public investment, water management programmes, MSP, storage facilities...etc. Therefore what we need now is an environmentally sustainable and socially equitable *green revolution* and can be termed as '***Ever Green Revolution***.' Food security implies livelihood security at the level of each household and all members within and involves ensuring both physical and economic access to balanced diet, safe drinking water, environmental sanitation, primary education and basic health care. The heartland of main green revolution area comprising of Punjab, Haryana and Western UP is in ecological crisis, as a result of the over-exploitation of the ground water and spread of salinity. This region will also suffer the most if mean temperature rises by 1 degree to 2 degree centigrade as a result of global warming. Conservation and climate resilient farming will help check ecological hazards.

One in every 5 Indians suffers from overt or covert hunger. 'Hunger' stated by Amartya Sen and Jean Dreze, is "intolerable in the modern world" in a way it couldn't have been in the past, because it's 'so unnecessary and unwarranted[160]". On the global front, the greatest 'real population pressure' on natural resources emanates not from China or India but from the advanced countries. *For e.g. the per capita energy use in North America was about 47.5 times higher compared to China, over 100 times higher compared to India. With only 4 per cent of world population, USA consumes some 40 per cent of the world's commercial energy, where as the two Asian giants account for less than 5 per cent of the world's commercial energy consumption*

As *Amartya Sen* says "It's not the lack of food stocks, it's the mismanagement of food that is causing hunger[161]". In the same way in India there are enough of buffer stocks and there is a food self sufficiency at the aggregate level, but at the same time there are about 380 million people in India who are malnourished and nearly 27 per cent people below the poverty line. The amount of food subsidy that the government is allocating, i.e. Rs.46, 906.68 crores (2009-10) must be properly utilised to increase the purchasing power of the poorer sections by embarking

[159]Swaminathan M.S (2006): "Science and Technology for Sustainable Food Security" From 'Indian Agriculture - in the new millennium (Vol – II), Changing Perceptions and Developing Policy.' Edited by N.A.Majundar and Uma Kapila (Indian Society of Agricultural Economics) AF – 2006.
[160] Gian Pierto Bordignon (2006): "The Challenge of Food Security in India". Online edition of India's National News Paper-Tuesday- Oct 24-2006.
[161]Sen; Amartya, Jean Drez, Athar Hussain (2011): "The Political Economy of Hunger", selected essays, by Oxford University Paper Backs.

upon long term measures.

Along with them, maintenance of stable food prices, increase in rural incomes and employment, and the provision of **food and increasingly of nutritional security** must be a primary objective. The requirement of food security suggests therefore that even to maintain the present average levels of consumption, we should aim at a significant step up of food grain production (which accounts for somewhat over 70 per cent of total agriculture output now) to well over 3 per cent per annum in the coming years to provide for larger domestic consumption needs.

8.8.15 Green Revolution

Although confined in specific states and also to specific crops, the green revolution has, revolutionised India's traditional agriculture. Different states and regions are endowed with vastly different natural resources. Besides land and water resources, the geographical conditions and environment are also equally important. Agricultural production therefore is widely different in different states. These trends in agriculture give the signals to a more science based and demand driven agriculture. The institutional arrangements like *land reforms, marketing organisation and training* are also equally limitedly available. Regional disparity in agricultural production and availability of food grains has therefore become an endemic feature of our economy. Interstate, inter zonal and intra regional scarcities in food grains must be avoided by stringent laws so that the deficit regions will be supplied with required food stocks from the surplus states.

8.8.16 Green revolution Environment

More importantly, past and current agricultural policies have also had a negative environmental impact and poor resource management and excessive use of agricultural chemicals in the green revolution areas have led to soil salinisation, fertilizer and pesticide contamination of waterways, pesticide poisoning of farmers and labours and declining water tables. These problems have implication for agriculture growth, overall economic growth and in India agriculture is still extremely significant and is a potential driver of both overall economic growth and poverty reduction.

Therefore the process of economic policy reform needs to extend much more thoroughly into the food and agricultural sector. Measures like more market oriented agriculture and also keeping and continuing the social safety nets for those who are adversely affected by the reforms must be initiated. And input subsidy mechanism to be re-oriented, input price reform must go hand in hand with institutional reform. Reform must introduce market forces into the production and marketing of fertilizers, which should lead to lower costs for farmers as protection from import competition is removed. As the fertilizer subsidy structure is pushing domestic industry into inefficiency and non-competitive.

Prime Minister, Dr.Manmohan Singh, in his address to the "Indian National Science Congress in Hyderabad in January- 2006" called for a ***second green revolution***, with a main focus on raising farm incomes and food security. He called for a fresh emphasis on fruits, vegetables and new plant varieties that would command higher prices in export markets. He also insisted upon measures to harvest, use of rain water more efficiently, improve the soil fertility and spread the benefits of agricultural technology, including genetically modified seeds. At an aggregate level, he suggested that *agriculture to grow at 4 per cent per annum in order to continue the overall economy growth and also to meet the future food requirements.*

The adverse impacts of uncertain weather and possible crop failure need to be mitigated by extending crop insurance, though these measures are not new and have been impacting agriculture for past decades but problems of agriculture still remain unaddressed. Because, India cannot imagine coming out from the clutches of poverty unless its agriculture becomes viable, competitive, sustainable and self sufficient.

The National Food Security Mission (NFSM) that was launched in the year 2007 with the aim of increasing the Rice, Wheat and Pulses production by 10, 8 and 2 million tonnes respectively should work towards its goal to ensure self sufficiency in food grains in the upcoming years. The era of green revolution is over but the policy makers aren't ready to accept the fact that they can't hide anymore behind the curtains of technological solutions for problems that need more of mass social changes and political will. Any trader, including Multi National Companies (MNC) must not be allowed to stock huge piles of grains and the control should be taken by the Food Corporation India (FCI). As a long term solution *land re-distribution and organic farming* are

the way forward towards a sustainable farming as they can provide gainful livelihood to millions and healthy food to the nation. The supply chain from production to market and consumer, 'from plough to plate' needs to be strengthened by reducing intermediaries and improving market efficiency through appropriate policy formulations, investment and institutional support[162].

8.8.17 Direction of Subsidies

In case of water and power subsidies, the public supply agencies need to become much more transparent and accountable in their operations and institutional reform can be achieved by engaging agricultural water and power users directly in operations, maintenance and expansion of water and power systems. Such a participatory approach can make short term price increases due to removal or reduction of subsidies more palpable and are likely to facilitate improvements in the quality of service. Increased input prices that reflect true costs offer farmers incentives for better management of inputs and natural resources.

On the output front, in the context of liberalization, there has been a direct reduction of protection for India agriculture. On the other hand, reduction in input subsidies will free up public funds that can be used instead for investment purposes like, research and development and public investment. Among the all investment expenditures, it's always desirable to invest on roads, agricultural research and development as the major win-win strategies as they exert more positive impact on both growth and poverty reduction. Along with demand, investment must also be spent on education, as it leads to decrease in poverty and also increases the rural employment and wages.

It's also more optimal to invest on rain fed areas, rather than irrigated areas, as it shows highest marginal impact on agricultural production and poverty alleviation. As the food basket of the people (even the rural) is gradually shifting towards non food grain products like vegetables, livestock products like egg, meat, milk, fruits, Government must shift its focus towards the higher production of these commodities by the way of diversifying agriculture. Especially innovative marketing methods and strategies are required for minimizing the diseconomies of scale in marketing of such goods and services in rural areas have a great potential for reducing

[162]Joshi P.K., Ashok Gulati and Ralph Cummings Jr (2007).: "Agricultural Diversification in South Asia: Beyond Food Security.". From "Agricultural Diversifiaction and Small Holders in South Asia.." Edited by P.K.Joshi, Ashok Gulati and Ralph Cummings Jr – AF 2007.

their cost to the consumers and thus inducing them to exchange part of the food grains for non-food grain items of food and other urban goods and services[163].

8.8.18 Public Distribution System

Though Govt initiated Public Distribution System (PDS) as a remedial measure, which is one of the biggest social safety nets in the world with 4,62,000 fair Price shops (FPS's)- Spending Rs.300 billion annually to about 160 million families. But this has failed to serve the purpose completely due to many leakages and structural problems, as it officially covers only 28 per cent of the population. But insecure households may be much higher than the official poverty ratios[164]. Programmes like PDS, FFWP (Food for Work Programme) and ICDS, which have failed to live up to their expectations over the years. Unfortunately, the issue prices of FCI are almost equal to the market prices due to the storage problems and transaction costs. The prices of cereals have been growing at faster rate compared to other commodities. The rising trend in procurement prices of wheat and rice led to increases in food prices from the whole sale to retail level[165].

It is evident that genuine food security among a population requires a wide range of features. Ensuring adequate supplies of food requires increases in agricultural productivity, possibly changes in cropping patterns and certainly the sustained viability of cultivation, all of which would be necessary at both local and national levels. Cracking down on hoarders is not enough. There must be a ban on futures markets in all essential commodities. This is especially important in the context of the recent price volatility in world food markets, which generated a global food crisis in 2007-08, and which threatens the world once again.

In the year 2007, according to Planning Commission, *57 per cent of the poor had been actually excluded from the BPL system under PDS*. If we consider the pros and cons of a Universal PDS or its workability, we can understand it in a better way. If all households in the country are provided with 35 kg of food grain per month, that would come to around 90 million tonnes. At current levels of subsidy this would cost around Rs.1,20,000 crores. This seems like a huge task, but the existing food subsidy is already ranges around Rs.50,000 crore, and this is an additional

[163]Hanumantha Rao CH (2005): "Declining per capita Demand for Food Grains in Rural India- Causes and Implications", From 'Agriculture, Food Security, Poverty and Environment', Essays on Post Reform in India 2005.
[164]Dev M.S and Chandrasekar Rao: (2009) 'India: Perspectives on equitable development' 2009.
[165] Srinivasan P.V: "Agriculture and Food Security" (2007). From "Handbook of Agriculture in India", OUP- edt BY Shovan Ray – 2007.

amount of Rs.70,000 crore or 1.5 per cent of total GDP. This may not ne huge amount in order to full fill the aim of total food security in the country. If we compare this amount of Rs.70,000 with that of, nearly Rs.3,00,000 crore, that has been waived as tax benefits and other concessions to corporate world over the past few years, task of universal PDS is not going to be an herculean task[166].

8.8.19 Population Pressure and Production

Following *Malthus,* increased population will place higher demand for food and with the rate of production of food grain being as at present there will be high demand for grains; there will be scarcity of food and even the occurrence of famine is on the cards if the supply does not pick up by higher production or imports.

India's population explosion is still a cause of concern, which increased from 846.3 million in 1991 to 1040 millions in 2001 and to 1210 millions in 2011. If all the people who are below the poverty level have decent per capita income, then India definitely will require a much higher amount of food grain than it is now capable of producing. The interesting aspect of the demand for the food is that food demand for the people and food demands for livestock are both important for decent living. With higher income, there will be more demand for non-cereal items like egg, meat, milk and more cereals and pulses will be required in order to feed the live stock. Given the supply side situation, even with 1/3rd of population being BPL, India is failing to provide food security to all the people, the situation is likely to be alarming with the reduction of the people below the poverty line. In fact at present the rate of reduction of people below the poverty level and the rate of increase in food grain production hardly match together, leaving the looming fear of scarcity all along.

8.8.20 Labour Force

As our total population growth, and therefore labour force growth, is likely to grow at around 1.5 per cent per annum, over the next ten 10 years, an 8 per cent growth in GDP means that productivity per person in the economy as a whole would increase at the rate of 6.5 per cent per annum. Therefore, if we want to maintain the relative productivity per worker in agriculture with productivity in the rest of the economy, it is necessary for productivity per worker in agriculture

[166] Ghosh, Jayati (2010): "The Political Economy of Hunger in 21st Century". From EPW October 30, 2010, Vol XLV NO 44.

to also enhance by 6.5 per cent. However, if agricultural GDP can only grow at 4 per cent at best, an increase in productivity per man of 6.5 per cent can only occur if the population dependent on agriculture actually declines by around 2.5 per cent per year.

As long as RTF is not enforced socially and legally the menace of Hunger is bound to continue[167]. *In cases where rights can't be enforced through the courts, they can be asserted through other democratic means, based for instance on parliamentary interventions, the electoral process, the media, international solidarity, street action, or even civil disobedience.*

Government also must initiate a 2nd green revolution by way of stringent measures to support the agriculture like providing easy and cheaper access to technology, manures, pesticides, high breed variety seeds, avoiding middlemen in procurement, water conservation, maintaining soil fertility, bringing abrupt and apt cropping pattern changes, appropriate MSP, providing institutional credit and marketing facilities and protecting domestic agriculture from liberalised imports.

It can be concluded by saying that food security is although not exclusively determined by the food grain production alone, but at the same time without desirable levels of production we will not be have a healthy consumption and distribution systems which are other components of food security. At present, at all India level though seem to have sufficient buffer stocks of food grains, food security insecurity at grass root level appears rampant that is reflected in exorbitant rates of poverty and ill health conditions. At the same time, even our growth rate of food grains does not seem to be encouraging especially in the context of increasing population – demand, increasing income growth, fluctuating environment and unfavourable trade environment. If at all we have to lead eight per cent economic growth and also to ensure food security it is very imperative that we aim at 4 per cent growth in agriculture. Otherwise in the coming fifteen to twenty years we will be falling short of food grain supply with respect to prevailing demand and thereby leading to food insecurity.

[167] Dreze, Jean (2004): "Democracy and Right to Food". From 'epw, April 24th, 2004', pp 1723 to 1935.

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