CHAPTER 1
INTRODUCTION

Food, clothing and shelter are among the basic needs for mankind. Further, among the three, food occupies the top most position as it is essential for the very survival of mankind. While, scarcity of clothing and shelter is likely to cause misery, absence of food or its insufficiency manifests itself in under nutrition and malnutrition and, in case of acute shortages, in sickness, starvation and premature deaths. The availability of minimum amount of food and nutrition are thus at the root of the survival and wellbeing of the individuals and the society at large. Food problem, arising from growing food requirements in the wake of a rapid growing population, therefore has been and continues to be, at the center stage of discussions among general masses and academia. The concept of ‘Carrying Capacity’ of the earth has always influenced the thinking on the ‘population-food’ dynamics. It is generally recognized that population growth and food availability are closely interrelated; even to the extent that at times the population problem has been identified as a food problem (UN, 1973:17). In fact, during the greater part of man’s history on the earth the number of people has been regulated by the availability of food, and for most of these times the balance between population and food has been a precarious one. The development of agriculture and increasing food supplies in the more recent times are among the main factors which made possible the accelerated growth in the population.

Owing to rapid population growth in recent decades and the prospects of its continuation in the future in most of the counties, coupled with the desire for improvement in the levels of nutrition has brought the ‘population-food’ problem again in the center of attention (Lenka, 2010:168). Up to the middle of 18th century, a large and expanding population was generally considered as a source of wealth and power of a nation. Towards the second half of the 18th century, the idea that an indefinite growth in population ultimately retards the process of economic development started getting currency (Hassan, 2005:78). And because of this understanding and growing population resource mismatch today population is seen as liability rather than an asset (Amin, 1966:33).

It is generally accepted that the publication of Malthus’ Essay on the Principles of Population in 1798 was the turning point in the evolution of present population-resource debate. And among the various viewpoints on-going debate, the one projecting food-population conflict is the most prominent one. A close analysis of existing literature on food supply and population relationship reveals that the problem has been approached in two
fundamentally different ways (Dube, 1990). The first one represents the work of scholars who have been interested in possible rates of growth in population as well as food production with a main focus on as to, whether or not the latter is able to keep the pace with former. This viewpoint is in the lines of Malthus’ arguments and, therefore, is widely known as the Malthusian School of thought. The second involves the work of researchers who have conversely tried to study the effects of population change on the enhanced functioning of agriculture. According to this school, any increase in population stimulates efforts among farmers to grow more food by introducing suitable changes in agricultural technology. This school of thought is in the line of the works of E. Boserup (1965), and hence is classified as the Boserup School of thought.

The basic difference between the two approaches is that while population is seen as a dependent variable in the former, in the later it is an independent variable. The reasoning of the Malthusian doctrine is based on the two principles. First, in the absence of any checks, human population has a tendency to grow at a geometric rate and thus it double itself every twenty-five years. Second, production from the land even under most the favorable conditions could at best increase at an arithmetic rate. Thus, the power of population to grow is infinitely greater that the power of land to provide subsistence to human beings and with passage of time the ratio between population and food production becomes highly imbalanced. Lack of food, Malthus and his followers argue, is the ultimate check on population growth (Belshaw, 1960:14). Therefore, means of subsistence is visualized as lagging far behind population growth, because of non-availability of land. And limits to the amount of food production are, therefore, supposed to check population growth. Malthus suggested preventive and positive checks as the two main ways by which population is deemed to be curbed once the carrying capacity of the land is reached (UN 1973:16). Therefore, food supply in Malthusian vision is considered as the power of regulating population size.

The Beserup’s viewpoint on ‘population and food relations’ is based on the reasoning that in a pre-industrial society an increase in population stimulated a change in agricultural techniques so that more food could be produced to support the increasing population. After examining different land use systems of the world, Boserup (1965) asserted that there is a close connection between agricultural technique and the type of land use system. Unless population increases the adoption of new agricultural technique is highly unlikely. Thus, according to this viewpoint growth in population, leads to agricultural development and augments food supplies to meet the demands of growing population (Dube, 1970).
The Neo-Malthusian and Boserupian perspectives dominate the current thinking on population resource dynamism even today, and the debate on their validity is still alive. The prevailing literature suggests that the concept given by Malthus is more popular among academia. Increased food crisis over time and the works of Baker (1928), Bansil (1958), and Ackerman (1959), have contributed to the growing popularity of Malthusian vision. The widespread popularity of Malthusian views was also endorsed by Meadows (1972) in his famous book *Limits to Growth*. While accepting Malthusian views Meadows attempted to analyze the principles under new evidences, and reiterated worries about mismatch between food and population.

Several studies by several scholars [for instance Ackerman (1959); Gurion (1970); Mei (1970); Li and Wang (2010)], have vindicated the conclusion drawn by Malthus in their studies on conditions prevailing in various countries of the world. The latter half of the last century witnessed a widespread revival of the concern regarding population growth and worsening food situations in the world primarily due to large famine in Sahel region in 1960s and 1970s leading to serious food shortages. Indecently, it was during 1960s that the rate of growth in world population had reached an all-time high (Hassan, 2005:355). The problem of food scarcity was instantly blamed on rapid growth in population. In the year 1968, Paul Ehrlich, a noted population biologist, claimed in his book *The Population Bomb* that “the battle to feed all humanity is over.” In 1990, again Ehrlich in his co-authored book entitled *The Population Exposition* warned the world community of the pressing problem of food supply in the wake of growing population (Hassan, 2005:350). These alarmist views were based on a very simplistic generalization, in line with the Malthusian viewpoint. Contrary to these views while following Boserup assumption, Colin Clark (1970) a noted economist, argued that growing population pressure in the long run results in a beneficial counter-pressure, which in turn, promote economic growth (Hassan, 2005:350). With regard to frequent occurrence of food scarcity and hunger in certain parts of the world, he commented that “the fact that so many people fall short of satisfactory livelihood must be blamed entirely upon human shortcomings and not upon the inadequacies of nature” (quoted on Overbeek, 1974).

Recently Shrivastava (1992) has explained food production in the world and concluded that most of the countries have successfully kept the pace in food growth with growing population barring some bad years when they are stuck with some form of calamities. In some developing countries during last quarter of 20\textsuperscript{th} century rate of food production was even greater than that of population growth rate. Dreze and Sen (1989) have, therefore, argued that “it seems unlikely that the real danger in the near future can lie in the prospect of food output falling
short of the growth of population.” Thus, the claims of Malthusian commentators like Lester Brown of World Watch Institute that “per capita cereal production has declined in all the major regions of the world” owing mainly to growing population is grossly misplaced. Decline in per capita output in food production, notably in Africa, has got more to do with institutional constraints, unfavorable grain prices and changing cropping patterns, than to growth in population (Hassan, 2005:351). Dreze and Sen (1989) concluded that, the decline in per capita output of food grains had occurred in areas outside Africa also, but the deficit was successfully met by import of the same from other countries. Africa, however, was not able to do this, because the non-food sectors were underdeveloped and there were no sufficient earnings for the import of food grains. According to UN, hunger in Africa has more to do with collapse of institutions than of population changes. Another, dimension of present global food problem pertains to a serious unequal distribution of resources. Therefore, it may be argued that food problem is not because of less production but problem is due to distributive inefficiencies. Along with civil wars, another apparent reason of frequent occurrence of food crisis in many African countries has been the dominance of cash crops for export. The governmental policies often on behest of foreign agribusiness corporations have throughout favored cash cropping at the cost of food crops resulting in frequent food crisis. Cash crops invariable occupy the best available lands while food crops are forced to marginal lands in terms of soil fertility. The globalization of the world economy and the related structural adjustment programmes has only exacerbated the crisis in several underdeveloped worlds during the recent past (Hassan, 2005:352).

Studies by Food and Agricultural Organization (2009), Alagh (1995) and many others have attempted to study the nature of changes in economy and its impact on the performance of food economy. Recent studies (Cornia et. al. 1987) on the impact of liberalization on agricultural sector in developing countries found that out of 55 countries where policies related to World Trade Organization and liberalization of economy were implemented during 1980-85, in as many as 43 actual food grains production has reduced and they are now dependent on heavy imports.

Under market forces growing emphasis on high value crops and resultant falling share of food crops accompanied by a general neglect by governments, agricultural economy has faced a serious setback at global level. While at the same time unabated population growth and changing income pattern has led to serious ‘demand-supply’ mismatch in food grains (Patnaik, 1997). According to Ahmad (2000), the present food crisis in Africa, Latin America and Asian countries are manifestations of above mentioned causes only. During the year 2000,
declaration of Millennium Development Goals (MDG’s) has forced governments to bring agriculture back to central stage. Under these goals present hunger levels have to be reduced by half by 2015 and studies have shown that without proper care of agriculture, achievement of this goal looks highly impossible (United Nations, 2010).

India is the second largest populous country in the world after China accounting for over 17 percent of the world’s populating on barely 2.4 percent of its geographical area. Demographic behavior of India shows four distinct phase in the population growth. In the first phase prior to 1921, Indian population was almost stable, due to high birth and high death rates. In this stage population and agricultural relationship was such that constrains of agriculture was acting as check on population growth rate. Due to a heavy dependence on monsoon which led to regular failure of crops, agriculture was unable to meet the growing demands of population. Heavy dependence on monsoon, along with poor productivity of all the crops was the chief characteristics determining low carrying capacity of agriculture (Swaminathan et al. 2004). Poor carrying capacity along with high population growth and urbanization rate pushed India to a situation, where food prospect entirely depend upon food imports. Import of food grains from USA under PL 480 scheme was the basic source of nutrition and feeding during this period. Resultantly, hunger deaths and malnutrition were common social phenomena in this phase in India.

After the great demographic divide of 1921, population growth rate of India picked up owning to rapid fall in death rate and persistent high birth rate. Expansion of medical facilities was the main factor underlying ‘steady growth phase’ of Indian population from 1921 to 1951. Growing control on epidemics, introduction of health care measures, better availability of food at least in urban centers were the main reasons of decline in death rate. In general, however, the situation of agriculture in this phase was still poor. Poor production capacity and productivity was causing regular mismatch between demand and supply of the food grains, leading to precarious food-population balance.

In terms of population situation during the third phase of demographic history (i.e. after 1951), India witnessed the fastest ever growth in population, due to a very low death rate but still very high birth rate. Apart from high population growth, high prices of agricultural commodities forced the policy makers to rethink about agricultural development. This rethinking resulted into green revolution in North-Western India. During third phase the situation of agricultural development improved greatly. Enhanced production and productivity of
cereals under green revolution led to significant improvement in availability of wheat and rice at least at macro level. Assured supply of food grains made India a self-sufficient country and led to a marked change in the status of the country from food importer to food exporter status.

Improvement in education and social values in India led to decline in population growth in the fourth phase of demographic history after 1981. This phase witnessed a fast the reduction in the gap between birth and death rates. In economic and political terms this phase was very transitory in nature (Table 1.1). Changes in economic policy at the national level during this phase led to alteration in agricultural and economic policies at various levels. Opening up of the economy for global players changed dimension of economic development in India. On, the one hand in demographic sense this phase was characterized by decline in population growth at national level, on the other, in terms of agricultural development this phase is once again marked with stagnation in agriculture. Agriculture reached to its plateau in terms of production and productivity. Most analysts and researchers feel that regular fluctuation in production and low growth rate in agriculture are due to policy negligence under liberalization.

India is a huge country with a large range of variation in socio-economic attributes across states. These variations lead to variations in demographic behavior and food-population relationship also. At meso level states with difficult geo-climatic conditions show somewhat different food-agricultural interrelation. Situation becomes even more difficult in water stressed regions, where regular struggles for water and food make life tougher for survival. In the context of Rajasthan, it may be noted that food-population association is governed mostly by geo-climatic conditions. Growth rate in population in the state has experienced more or less upward trends excepting the early decades of the last century, when it had shown a negative growth.

Demographic history of Rajasthan shows that the period prior to 1921 was marked with high birth and death rates resulting in a near stable population. This was the phase when the occurrence of drought was more frequent with its widespread effects. A highly erratic performance of agricultural sector was the chief regulating factor of population growth during this phase. During 1921-51, the onset of demographic transition becomes visible in Rajasthan, with rapid fall in death rate and nearly stable birth rate. This shift in demographic behavior can be attributed to increased health facilities and partial check on the intensity of hunger related deaths. Agriculture in the state was still performing below its potential, primarily due to poor agricultural base in the state.
The phase 1951-1981, in the history of Rajasthan was characterized by unprecedented growth in population. Low and stable death rate accompanied by slowly falling birth rate added population with the maximum pace. During this phase of high population growth, agriculture witnessed expansion toward the eastern and north-western parts of Rajasthan, where assured irrigation facilities were available. The diffusion of green revolution technology from its core spread over Haryana, Punjab and western Uttar Pradesh) was taking place in the wake of changing thrust in policy by central and state government towards expansion of agricultural activities. During the post 1981 period, Rajasthan reached to the third stage of demographic history. The growth rate in population witnessed a decline, albeit marginally. Agriculturally, food economy of state was marked with slight stability (Ahmad, 2000). The stability of agriculture during this phase can be attributed to further spread of green revolution technology and expansion of irrigation facilities to other parts of the state. As India decided for a major shift in its economic policy in the early 1990s and agriculture of Rajasthan could not remain isolated from the impact of these changes. Now, market forces are promoting farmers to switch over to high value exportable non-food crops which in turn are causing heavy stress on food-population balance of the state (Patnaik, 1997).

Given the uncertainty and high variability of rainfall, historically Rajasthan has always been categorized as famine affected state. Literary descriptions and government reports, pertaining about to droughts in Rajasthan, show that people and livestock suffer horribly at the time of droughts. As per description given by a study conducted by Central Arid Zone Research Institute (CAZRI) in 2005, in 2002 India was hit by a major drought that was widespread, affecting 21 out of the 36 meteorological subdivisions of the country, that led to a drop in food grain production by 24 million tons (12% less than the normal). Western Rajasthan was worst hit. Kharif rainfall was 69% less than that during normal years, as compared to 65% less than normal during the previous severe drought of 1987. About 80% of the tehsils received scanty rainfall during the same time Area under kharif crops declined by 56% from the 2001 level and production by 87%.

In the light of above, the present study endeavors to examine the dynamics of ‘population-food supply’ in India with a particular focus on Rajasthan.
<table>
<thead>
<tr>
<th>Time Period</th>
<th>Features of Population Growth</th>
<th>Features of Agricultural Growth</th>
<th>Food Status in Society</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prior to 1921</td>
<td>✓ High birth rate and High death rate.</td>
<td>✓ Very high monsoon dependence.</td>
<td>Un-balanced food status due to poor agricultural base</td>
</tr>
<tr>
<td>(Period of stagnation population)</td>
<td>✓ Almost stagnant population.</td>
<td>✓ Drought and regular failure of crops.</td>
<td></td>
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<tr>
<td></td>
<td>✓ Low production and productivity</td>
<td>✓ Low production and productivity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>✓ High level of malnutrition and hunger.</td>
<td>✓ High level of malnutrition and hunger.</td>
<td></td>
</tr>
<tr>
<td>1921-1951</td>
<td>✓ High birth but falling death.</td>
<td>✓ Policy thrust to agriculture through five year plans.</td>
<td>Pre-condition to accelerated agricultural growth rate</td>
</tr>
<tr>
<td>(Period of Steady Population)</td>
<td>✓ Steady growth in population.</td>
<td>✓ Regular mismatch in food grains supply and demand.</td>
<td></td>
</tr>
<tr>
<td>1951-1981</td>
<td>✓ Low death rate but high birth rate.</td>
<td>✓ Huge investment in agriculture in first five year plan.</td>
<td>Healthy food balance, with food sufficiency and the status of food exporter</td>
</tr>
<tr>
<td>(Period of rapid high population growth)</td>
<td>✓ Rapid population growth and conditions of population explosion.</td>
<td>✓ Achievement of self-sufficiency through green revolution.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>✓ India became major exporter of food grains.</td>
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<tr>
<td>1981-2011</td>
<td>✓ Reduction in gap between birth and death rate.</td>
<td>✓ Adoption of new economic policies and stagnation in agriculture.</td>
<td>Threat to food balance due to unequal and mismatched growth rate between agriculture and population.</td>
</tr>
<tr>
<td>(High growth with sure sign of slowing population growth rate)</td>
<td>✓ Low population growth due to social development.</td>
<td>✓ Plateau in terms of productivity and production in all crops.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>✓ Policy negligence towards agriculture.</td>
<td>✓ Policy negligence towards agriculture.</td>
<td></td>
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</tbody>
</table>

Source: Identified by researcher from the review of literature
Table: 1.2

Rajasthan: Features of Population and Agricultural Growth

<table>
<thead>
<tr>
<th>Time Period</th>
<th>Features of Population growth</th>
<th>Features of Agricultural growth</th>
<th>Food Status in Society</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prior to 1921 (Period of stagnation population)</td>
<td>Very low population growth due to very high birth and death rates.</td>
<td>Highly erratic agricultural growth, with fluctuation food grains availability at macro level.</td>
<td>Highly dominated by climatic factors i.e. droughts</td>
</tr>
<tr>
<td>1921-1951 (Period of Steady Population)</td>
<td>Rapid falling death and high birth rate, leading to slow growth in population.</td>
<td>Constantly poor performance of agriculture due to poor agricultural base.</td>
<td>Erratic behavior in growth of population and agriculture hence, food status was highly uncertain.</td>
</tr>
<tr>
<td>1981-2011 (High growth with sure sign of slowing population growth rate)</td>
<td>Slowly declining population with falling birth and death rates.</td>
<td>Slight stability in agriculture, with spread of green revolution technology in all most whole of Rajasthan.</td>
<td>Stability in food balance but treat of future mismatch. Highly level of unused wasteland can be future asset.</td>
</tr>
</tbody>
</table>

Source: Identified by researcher from the review of literature

1.1. A Review of Literature

Ensuring food for all has been one of the major goals of development policies in most of the countries including in India. The quest for attaining food sufficiency and accessibility to food for all has got wide coverage in literature related to agriculture and population, dealing different approaches to the food problems such as Malthusian Perspective, to Technological Determinism (Boserup, 1965) and the Structuralism to Marxist perspective (Patnaik, 1997). Ever since, Malthus (1798) propounded his principle, the debate has remained alive in the works of researchers including socialists and Marxists writers. The dimensions of population-food debate have changed with the adoption of new economic policy in the form of liberalization. This has led to introduction of new issues in food policies of many nations in past several years. This section of the chapter provides a review of literature related to various issues
pertaining to population growth and food prospects. This review of literature is presented under the following heads:

a) Food and agricultural policies in India.
b) Food production in India.
c) Demand and Distribution of food in society.
d) Agriculture under liberalization. And
e) Finally, studies on food status in drought prone regions.

1.1.1. Food and Agricultural policies in India

To understand the nature of food related issues in India it is obvious to look into the historical evolution of policies related to food and agriculture after independence. The evolution of development policies was mainly guided by the objectives of providing food to the rising population. According to Manjusha (1998) the present food system in India is the outcome of a mixture of policies formulated and implemented from time to time, each given weightage according to problem immediately at hand. At the time of achieving independence India was reeling under severe food shortage due to many factors, including low productivity (Vyas, 2000). The state’s role in meeting food requirement became crucial for ensuring availability of food and its access by the households, particularly poor. State interventions of direct and indirect nature at mass level were initiated. Indirect interventions included investment in agriculture, implementation of land reforms. On other hand, direct impact was exercised on agriculture by trading policies, price policies and public distribution system. Dreze and Sen (1989) have termed these policies as “growth mediated security”.

The initial food policy in the country has dealt with two aspects at the same time, the production aspect and distribution aspect. According to Dandekar (1967) while Food policy deals with the distribution aspect, agricultural policy revolves around production aspects. Up to 1940s food policy had three prime objectives of (i) self-reliance, (ii) equitable distribution and (iii) keeping prices of food stable. But, during this period food problem with the shortage of food grains became very serious with World War II, which created adverse food supplies in eastern states of India, mainly in Bengal (Dandekar, 1967).

During 1943 government of India appointed first Food Grains Policy Committee to make recommendations both for policy and administration. Chopra (1981) in his study concluded that during late 1940s there was a huge difference between demand and supply
of food grains and the gap used to be filled by imports. The imports though small in quantity, had significant bearing on food economy. Food Grain Policy Committee (1943) suggested remedies in the form of increased supplies through procurement in surplus areas and equitable distribution in deficient areas through rationing. Interestingly rationing however, was recommended only for urban India leaving rural areas out of preview of rationing (Gummandi, 2005). The recommendations of first Food Grains Policy failed to solve food problem of India as prices were ruling very high in late 1950s. In this light second Food grains Policy Committee was appointed which recommended imports to meet shortfall in domestic supplies. This committee also suggested a new approach, based on objectives of removal of dependency on food import and building up a buffer stock of 1 million tons’ of food annually (Dandekar, 1967).

High food prices and failure of monsoon caused a negative impact on food economy of India and led to failure of policies once again. The government had to decide to import food grains from United States under PL 480. One major mile stone in the food policy of India came into 1965 when Food Corporation of India (FCI) and agricultural price commission was setup. The FCI was expected to act as a countervailing force to the speculative activities of private trader (Gummandi, 2005).

During 1960s food economy of India was revolutionized by bumper food crop (wheat and rice) by adoption of a package of new seed-water-fertilizer technology, what is termed as ‘Green Revolution’ by William Gaude (1968). Introduction of green revolution enhanced production and productivity of wheat and rice changed food import status of India to food exporting country (Srivastava, 2003). Acharya (2000) in his paper concluded that agriculture and food policies adopted since the 1960s helped in achieving food grain sufficiency at macro level. This conclusion was also supported by Dev (2003) in his study on agricultural development in India. As, green revolution was concentrated in north-western India only, it had limited success that too in terms of wheat and rice. In meeting these challenges Public Distribution System (PDS) along with Targeted Public Distribution System (TPDS) in 1997, scheme was launched to distribution food from surplus to deficient regions at affordable price (Jha and Srivnvasan, 2003). Till the end of 1980s the overall economic policy reflected direct control of government. But with the opening up of Indian economy in the early 1990s, market forces have become more active than ever before (Tripathy, 2004). Under liberalized environment food policy and agricultural policy has greatly affected Indian agriculture.
Although economic reforms were not directed towards agriculture or food economy but being largest contributor to economy it was obvious that they had to accommodate changes (Bhalla, 1998). According to Chand (2002) the policies and strategies were modified during 1990s. The export and imports of agricultural commodities were gradually liberalized and level of protection to agriculture through import duties was brought down. But it was witnessed that lack of reforms in domestic markets put the domestic producers in a disadvantageous position. It became very difficult for them to compete with import facilitated by liberalization of external trade (Patnaik, 1997; Chand, 2002). Keeping in mind the challenges imposed by the new policy, a high-level committee for formulating a long term grains policy (2002) was constituted for suggestion for price stabilization and food for all.

The question of food sufficiency at macro level and malnutrition at meso and household level has as always remained in policies and this has been adequately shown in the works of Sharma and Mishra (2009), Vyas (2003) Patnaik (1996, 1997) and many others. The food policy also witnessed yet another shift when country led to ‘right’ based movement for food. The right to food and food security bill is the manifestation of this approach only (Dreze, 2005).

1.1.2 Food Production in India

Food availability is one of the core components of food economy affecting food prospects of any society. Recognizing that food production and its future predictability determines contours of food prospect in India several studies have been conducted on this theme. Rao and Radhakrishna (1999) in their study conducted on Indian food scenario concluded that up to mid-1960s agrarian economy of India was down and out. There were severe imbalances between the demand for food and its domestic supply. Food supplies were heavily dependent on PL480 to meet the food requirements of fast growing population (Gummandi, 2005).

After mid 1960s with the onset of green revolution India managed to achieve near self-sufficiency in the availability of food at least at macro level and experienced an improvement in effective food position by significant reduction in the incidence of poverty, especially during 1980s (Rao and Radhakrishna, 1999). The most important development was the extension of green revolution to the non-core areas and to the eastern region and rapid growth due to crop diversification in the central region. Another important dynamic character of Indian agriculture during this time was shift in cropping pattern away from coarse cereals towards oil and other commercial crops. This shift from coarse cereals to oil seeds was particularly strong in
the central region of India. And at the same time another shift was witnessed from coarse cereals to wheat-rice in the north-west and eastern regions (Kashyap, 2001), causing occasional shortage in food supplies. Bhalla and Singh (1998) concluded that supply of food grains in India has always remained volatile and low owning to heavy dependency on monsoonal rains and low yields. During 1980s crop diversification was rigorously pushed by the government of India to have more harmonious growth towards other crops. But this policy of diversification was in no way against the status of self sufficiency of India (Pandey and Sharma, 1996). Such changes, along with increasing levels of commercialization and changing cropping pattern caused shift in consumption behavior in favor of superior cereals i.e. wheat and rice (Suryanaryana, 1997).

Praduman and Mittal (2003) in their well-articulated study attempted to predict supply of food grains in India for near future. Taking into consideration of changing cropping pattern, trends in production of food grains and cost of production, the study predicts higher demand for food grains under 4 different economic and demographic scenarios. Their study concludes that maximum supply under all scenarios will not exceed from 268.8 million tons. The study further concludes that the demand of wheat will be met by domestic supplies but real challenge will be meeting the demand of pulses.

The study by Reddy (2009) attempted to give an overview of Indian agriculture since independence. While analyzing and comparing the production and the productivity trends in wheat, rice and fruits with U.K., Egypt and China, found that Indian agriculture has performed poorly in terms of productivity in all the crops. The study concludes that the real cause of low level of agricultural development is falling investment in agriculture and lack of knowledge among farmers about improved agricultural practices. Furthermore, the study suggest that a greater emphasis should be laid on livestock rearing and rain fed agriculture which hold the potential source of future supplies of food grains. In a similar attempt, Sharma (2010) looked at the agricultural performance and supply of food grains in achieving MDG’s by 2015. The study revealed that despite being largest producer in milk, pulses and fruits, India is witnessing decline in the per capita availability due to higher rate of growth in population as compared to that in food grains. The study in its prediction concluded that given the demographic and social behavior of Indian, Indian population will continue to grow hence need of the hour is to look for alternative supply and rationing of available stock.

The prediction of food supply holds the key for better directed policies in meeting demand for food. There are many studies at micro and meso level which attempt to look
into supply of food grains in near future. Ahmad and Zehra (2007) in their meso level study take 22 districts of northern Bihar and attempted to assess food status by converting food into numerical values using Indian Council of Medical Research (ICMR) norms for standard food requirement. The study recommended for extension of green revolution towards eastern Indian putting thrust on food grains. In similar type of study Munir and Rukshana (2008) attempted to study spatio-temporal variability in food grains of Jammu and Kashmir. This study concluded that low supply and low productivity of food grains is due to tough geo-climactic condition and low size of land holding along with high rate of urbanization.

The supply of food grains and its future prospect entirely depend up on ‘three vital institutions’ – state, market and society. State by ensuring availability of food and ensuring its access to all the households helps in food prospect. Market forces in term of demand and supply of food grains determines price of food, hence accessibility to poor sections of society at reasonable prices. But, the role of society has not been recognized in full and in a proper framework (Vyas, 2000).

Supply or the availability of food grains came under new challenges posed by new economic policy. Bhalla and Tyagi (1989), Reddy and Mishra (2008), Ahmad (2000) concluded that supply of food grains changed owning to shift in cropping pattern from food to non-food and commercial crops. Cropping pattern is another form of agricultural change which can lead to changes in food production. Cropping pattern in an area tends to change under the influence of various socio economic conditions from time to time. In order to determine population food relationship shifting cropping pattern is very important component. According to Ray (2010) India recorded an impressive growth in agricultural output since the mid-1960 as a result of green revolution and a noticeable feature of growth was the changing cropping pattern in favor of high value crops. According to him change in cropping pattern is influenced by several natural, technological, economic and institutional factors. Remarkably, changes in cropping pattern change after 1990 were primarily economic in nature. In yet another study, Ray (2010), in his well compiled study assessed the agricultural growth in India. According to him recent growth rate in agriculture is attributed to changes in cropping pattern and the better availability of credit facility. Using statistics on major states of India and on districts of West Bengal, he concludes that there has been a marked shifting cropping pattern in India after 1990s, especially under the influence of market forces. After 1990s better availability of farm credit has pushed for more commercialization in agriculture towards non-food high demand crops. The
study also identified ‘liberalization policies’ as one of the influencing factor in changing agricultural cropping pattern.

Although in Indian agriculture food crops hold a top position. But there has been a gradual shift from cultivation of food crops to the cultivation of non-food exportable commercial crops i.e. cotton sugarcane etc. (Patnaik, 1996). This has led to reduction in net sown area under cereals and pulses causing serious demand-supply mismatch of food grain at least at regional levels (Moss 2003). With the growing population in India, the decline in food production has put a big question mark over the country’s self-sufficiency in items of food. Competition for land between food crops and non-food crops will have a negative impact over food availability especially situation has worsened the condition of down trodden and deprived sections of the society (Patnaik, 1997).

Alagh (1995) recommended certain policy changes in India towards achieving food security in the wake of prevalent mass poverty. In his suggestion for better policy towards food security better identification of poor was one of the prominent suggestions. He also advocated critical evaluation of the concept of poverty line on the basis of inherent weaknesses in the concept of relative poverty.

Subrahmanyam and Sekhar (2003) have analyzed the pattern and prospects of agricultural growth in India using 44 years data in four sub-periods. The first sub-period extending from 1955-56 and 1969-70 is the pre-green revolution period. The second and the third sub-periods covering 1970s and 1980s representing first and second phases of green revolution the fourth sub-period of 1990s is the period is the period of economic liberalization. By comparing 18 crops grown in Andhra Pradesh they have identified different characteristics during different phase. The study concluded that during 1990s sub-group cropping pattern has shifted towards sugar and chilies from Jowar, Maize and Ragi, reflecting an intense competition for lands between food and commercialized non-food items. Bhalla and Singh (1997) have done a study on recent developments in Indian agriculture using state level data. It reveals that there was a marked acceleration in the growth rate of agricultural output in India during 1980-83 to 1992-95 as compared to that in the earlier periods and that the agricultural growth had become regionally much more diversified. The period 1980-83 to 1992-95 was also characterized by significance changes in cropping pattern away from coarse cereals towards rice and wheat and towards oil seeds.
The study made by A. Chattopadhaya and Das (1997) on the trends in crop output in west Bengal revealed that the performance of West Bengal’s agriculture during left wing government rule has also not been properly isolated by the impacts of liberalization. Their study also confirmed the result drawn by Bhalla and Singh. Nadkarni (1996) concluded that there are considerable evidences of an accelerated commercialization of Indian agriculture since 1980s and this commercialization has induced much more growth and dynamism in agriculture than ever in the past.

1.1.3. Demand and Distribution of Food in Society

Starting from Malthus the question of feeding the ever growing population has been engaging the attention of researchers and policy makers. At the global level history of carrying capacity estimates goes back to 1798 when Malthus presented his essay on population. Pfaundler (1902) was the first person in modern times to make an attempt to estimate future demand of food grains (Gummadi 2005). His study showed that for correct assessment of future demand, data regarding consumption and production trends are essentially required (Bansil, 2003).

In India base level data on demand estimation has been collected by National Sample Survey Office (NSSO) during 1950-51 to 1972-1973 annually and after 1972-73 survey was conducted every five years (Dandekar and Rath 1971; Ravallion 2000; Visaria 2000 and Gummadi 2005); have serious doubts over reliability of data given by these survey of NSSO. These surveys raise doubts about the state of food-sufficiency in India and its future trends. Therefore, the existing viewpoint on future demand can be divided into two groups. First group feels that in future Indian food grain demand will be much higher than that of today while the second group feels that change in lifestyle and present trend would lead to fall in food grain demand (Bansil, 2003).

Bansil (2003) in his study attempted to estimate demand and distribution of food grains by 2020 in India using consumption data from NSSO, FAO, and National Nutrition Monitoring Bureau for urban and rural population separately. His study concluded that up till now a major share of rural and urban income is spent on food, cloth and on rent but in future consumption pattern would change in favor of more expenditure on non-food items. The study concluded that by 2020, India would require 190 million tons of food grain, although this target is achievable but special attention is required. Bhalla and Hazell (1997) in their have attempted to derive estimates on food grain demand in India by 2020 under alternative income growth
scenario. These alternatives are realistic assumptions about continuation of current trend of 3.5% growth in per capita income, acceleration of growth in per capita income to 5.5 %, raising the entire poor above the poverty line, and ensuring that all are well fed in terms of calories. The results of their estimates show that with an anticipated rise in the growth rate of per capita income in India during 1991-2020 from 3 to 5.5 percent per annum, there would be an appreciable acceleration in the growth rate of demand in food grains. These results are contrary to the assertion of some scholars (Bansil; 2003) who have argued that with an expected acceleration in per capita income in coming decades, there would be a decline in demand for food grains. The demand estimates by Bhalla and Hazell are on the similar lines to the other demand projections that have been made for India by Radhakrishna and Ravi (1990), Rosegrant (1995), and Dyson (2000).

Several studies have predicted that total demand for cereals will exceed 200 million tons by 2020 (for instance Rao, 1975, National Commission on Agriculture 1976; World Bank 1980 and Radhakrishna and Ravi 1990) contrary to this, Bhalla and Hazell (1997) concluded that a slow population growth and decline in per capita cereal consumption would show somewhat lesser demand for food grains.

Dyson (2000), in his study has concluded that the future demand of food grains in India would depend primarily upon on rate of population growth of various regions, rate of urbanization, change in the peoples consumption behavior and, rise in income levels of consumers. Change in population, rate of urbanization and change in people’s consumption would lead to rise in food grains demand. Dyson (2001), in another study attempted to assess balance between population and food at global level. While giving an analytical account of Malthusian view about delegate balance, Dyson shows that although world population has grown faster after 1961, but food production has generally maintained pace with population growth rate. However, from the early 1980s to the late 1990s there was a modest fall in world per capita cereal output. According to Dyson this fall is interpreted by Neo-Malthusian writers in the context of changing global demographic growth and increasing environmental constrains especially in Sub-Saharan region and South Asian countries. Regarding, world food prospect over medium term for the coming two or three decades while using similar demographic projection and agricultural technology. Moreover, Dyson has concluded that of population growth is going to be the main element behind the expansion of world food demand over the time horizon, than yield growth will be the key to the future expansion of the world’s food supply.
Radhakrishna and Ravi (1990), estimated demand of wheat, rice and pulses in India by 2010, by assuming existing patterns of growth accompanied inequalities in expenditure and poverty. The study concludes that prevalence of poverty in India would not alter food grains demand in coming years but ‘consumption behavior’ of middle class would certainly lead to change in demand pattern of food grains in long run. In similar type of study while using different criterion of estimation, Maxwell and Smith (1992), Counihan (1997) Gerbens (2002) have supported conclusions drawn by Radhakrishna and Ravi (1990).

Dyson and Hachette (2000) in their paper entitled “India’s Demographic and Food Prospects” attempted to project the demand. This paper in its first half attempts to analysis various demographic indicators such as future fertility and mortality rates, rate of urbanization and economic growth to estimate the population growth by 2020. And in the later half the paper the authors attempt to analyse consumption behavior in terms of food and non-food crops in India. The study concludes that past projections regarding population growth are highly unrealistic and predicts that replacement level fertility for India as a whole can be reached by 2021-26. Furthermore, the study predicts that demand for food would not grow over 224 million tons by 2021. According to the researchers the main agricultural challenge in the period 2020 will not be in terms of food grains but it will be in roughly tripling levels of output of vegetables, fruits and milk. Recent fall in the production of wheat and resulting high wheat prices in the open market was studied by Economic and Political Weekly Foundation (2007). This study mentions that fall in wheat production but continuous rise in population has led in the reduction of per capita food availability at micro level. The study concludes that the due to lack of government incentives there is 7% fall in the availability of wheat and it proved even more costlier due to global market prices.

Swaminathan (1995) in his study on issues concerning Indian food security asserted that present food status of any society is determined by past demographic and agricultural development. According to Swaminathan growing imbalances between our ability to provide food with diminishing land and water resources causing hunger and famines is based on wrong notion. But presently there are no evidences of showing ‘positive checks’ in India as India has managed a technological shift in food production and furthermore, according to Swaminathan by adopting following strategies Indian food security of India can be maintained or improved:
(a) Bridging gap between potential and actual yields with the technologies that are currently available.

(b) Upgrading the biological potential of waste lands.

(c) Introduction of ecologically sound practices in agriculture and in capture of fisheries.

(d) Promotion of co-operation among families of small landholdings.

(e) A ‘New Deal’ for the self-employment through credit, technology, training and trade.

Along with studies that predict higher food grain demand in India there are other studies also (e.g. Kumar and Mather, 1996; Murty, 1995) which have drawn a reverse picture. According to NSSO data, per capita household demand for food grains has been declining (Rao; 2003). Since per capita income has been rising now people have more accessibility to costly refined food. Due to this despite factors favoring an increased demand for food grains the actual demand for food grains has being declining. There are many regional level studies also confirming that with the increase in per capita consumption behavior of Indian consumers will change (Bansil, 2003).

Availability or physical access to food grains at the national level and state level is not as difficult as access at household level owing to huge social and economic disparities in Indian society. The problem of access has two important dimensions namely the purchasing power and Intra-household access to food. A large number of studies have analyzed poverty and dynamics of poverty, which indirectly also looks as government intervention as a tool for providing access to food among weaker and deprived sections of society.

Among the studies concerning with access to food for weaker sections of society a study by Mohammad (1977) holds immense importance. Mohammad discussed the position of food and nutrition in India by taking sample village from Uttar Pradesh. While studying various issues that may have an impact on availability of food grains, he concluded that various problems related to agriculture and social developments are highly correlated and it would be highly beneficial to deal with them all together. In yet another study (1978), he made an attempt to identify food surplus and food deficient regions in Uttar Pradesh. While assessing productivity of various food grain crops in Uttar Pradesh, Mohammad concluded that food scarcity has become a normal feature of national life in India. There is permanent food shortage in some pockets in India especially due to low productivity. Secondly, in all the regions whether it is a high productivity or low productivity region, food disadvantage among women, children and poor is a common feature. Several scholars [for instance Patnaik 1997; Chand 1999; and
Tripathy 2004] have proved that conclusions drawn by Harris (1990) are very true. In Indian society SC, ST, women, the elderly and children particularly female children have become more vulnerable to food shortage. Intra-household gender based discrimination results in poor access to food, health care and education for women and girl children. This has been proved again and again by various phases of survey by National Family Health Survey, National Nutrition Monitoring Bureau Surveys. In one of shocking finding National Family Health Survey conducted in 2005-06 concluded that 46% of children below 3 years are under weight, 33% of women and 28% of men have Body Mass Index below normal; 79% of children aged 6-35 month have anemia. Moreover survey also accepted that the national averages however, do not reveal the entire truth about difference. And all these indicators are even worse in the backward states. According to Sharma and Mishra (2009) these findings denote poor access to food to many sections of the society.

Given the huge social and economic deprivation in Indian society Government of India have launched various affirmative schemes for providing food for all. Public Distribution System; food for work; Mid Day Meal Scheme; are schemes having dual objectives of making access to all and improving quality of nutrition in general masses (Radhakrishna, 2005). According to study by Vyas (2003) the situation is even worse in less developed and calamity prone regions of India. In a similar study, Radhakrishan and Ravi (2004), attempted to study trends and determinants of malnutrition in India. Using secondary data of NNMB and NFHS regarding child nutrition they concluded that:

(i) During the past two decades the improvements in nutritional status have not kept pace with reduction in poverty.

(ii) About half of the pre-school children are malnourished and are exposed to the risks of functional impairments.

(iii) Level of malnutrition is uneven across states in various social groups.

According to Reddy (2009) the main cause of low productivity is failing capital formation in agriculture and lack of knowledge about improved agricultural practices among Farmers. Paper suggests that there is an urgent need to raise productivity in rain-fed areas and also providing great flip to livestock rearing in the region.

Ahmad and Zehra (2007), in their meso level study attempted to study the status of food security in North Bihar plain. In their empirical study on 22 districts of north Bihar they have converted demand and supply of food grains in numerical value and have
identified food stability and food secure regions. The study calculated the food availability per head and converted it into calorific value so that actual food availability in caloric value can be comparable to the standard food requirement as per Indian Council of Medical Research norms. In the study found a stark regional imbalanced availability of food. The western and eastern halves of the Bihar plains enjoy a better availability than other regions. The study suggests that this shortage can be met if green revolution is extended to other regions also. In almost a similar kind of study, Munir and Rukhsana (2008) also attempted to study the spatio-temporal variability of food grains in relation to agricultural development of the western Uttar Pradesh. This study has brought out spatial pattern in the availability of pulses, cereals food grains and lives stock during 1971-2001 and has concluded that uneven availability of food grain is due to uneven agricultural development in the region. And also the food grains availability is found low owning to higher urbanization and low size of land holding. One more paper by Pattanayaka (2010) also looks with the issues related to the availability of food in the one of most backward states of India. The study found that productivity of agriculture has come availability down in Orissa over the different regions of the state i.e. plateau, plain coastal, forest etc. which in term is resulting in the poor availability of food at micro-level. While some of the projections in regard to the demand for food grains in India in the next 20 years have been mind boggling issues (Murty; 1998), scholars like Radhakrishna and Ravi (1992), Kumar and Mathur (1996), Murty (1999), Kennedy and Veluchamy (2011) in recent years have come out with studies concerning various dimensions and predictions related to demand for food.

1.1.4. Agriculture under Liberalization

In existing literature there are divergent views about the impact of economic policies on Indian agriculture. Although, all are in favor that the economic policies of 1991 will lead to changes in the behavior of agriculture in India. But they are not unanimous about nature and extent of impacts (Gummandi, 2005). The first group argues that market forces will boost production and productivity of agriculture by luring farmers for international trade. Changes in market and linkages between industries and agriculture will additionally beneficial for farmers (Singh, 1995). Hence first group of studies are in favor of more integration of Indian agriculture with world economies (Ahulwalia, 1996) (Bhagwati, 2004).

The second group prefers no changes in existing agricultural policies. They argue that present phase of opening up of economy may leave Indian agriculture prone towards newer international challenges of price fluctuations and fall in demand (Bhal, 1993 and Ghosh,
1997). The followers of second group are against reduction in agricultural subsidies as Indian agriculture is still a source of livelihood for millions hence agriculture has become a social obligation of government.

By taking a slight different view in policy changes for agriculture third type of studies are in favor of economic integration of Indian agriculture with global economies but at a very slow pace (Gummandi, 2001). They argues that liberalization provides huge scope for export of well diversified agricultural products of India, but these scope can be met only if Indian agricultural is on sound footing. This group seeks additional investment in food economy of India so that Indian agriculture can be self-supported for future population demand. And once sustained level of output is achieved fruits of integration can be transferred to farmers.

In 1991 Indian economy began to march toward a new path based on the philosophy of globalization, privatization and liberalization. The new economic policies were introduced aiming increased efficiency and higher growth rate. Laws and regulations were liberalized in such a fashion that India can become an integral part of world economic order. Where there would be no barriers to hinder integration at any level (Ahmad, 2000). According to Bhalla (1995) economic reforms were not directed towards agriculture but being biggest sector of economy it was bound to feel impact. His study concluded that globalization has positive and negative aspects on one hand inflow of money and technology in all the sectors will have to face intense composition from agriculture and products from developed nations.

Chand (1991) attempted to quantity the impact of easing up of polices on product surplus, and net social negligence with reference to four crops viz. rice, maize, chick pea and rapeseed mustard. The study concluded that the impact of globalization would vary from commodity to commodity. Drawing attention on one other aspect of global integration of India Kamat et al (2007) in their well-articulated paper reviewed the trends in India agriculture before and after the introduction of the economic regions and the advent of WTO regime. By employing Cobb-Douglas production function. Their study revealed that Indian agriculture has witnessed decreasing reforms. Moss (2003), Kalamkar (2008), Asif and Alam (2009) have also confirmed the conclusions drawn by Chand and Kamat et. al. showing similar kind of results study by Patnaik (1996) based on the experience of other developing countries over the last 15 years after adopting liberalization. According to her "as trade new liberalized from 1991, within a few years, 8 million hectares of food growing land was converted to exportable crops leading to fall in per head food grains output.
Ahmad (2000) in his study based on Rajasthan accessed status of food economy and agricultural in the lights of shifting agricultural policies using district as study unit study concluded a gradual shift in food and agricultural policies from food for consumption to food for export his study also concluded that after adopting these policies poverty in Rajasthan has increased and food consumption and access to food has rent down in poor section of the society. Study of Ahmed (2000) is just one step ahead from study by Patnaik (1996) which also look on shifting policy trust from food -first to an export- first policy. Patnaik (1996) has described the experience of developing countries over the last 15 years in terms of food security after they have adopted SAP policies. The author argues that the aim of Structural Adjustment Policies is to make available the resources of developing countries to developed countries. This occurs in the form of export of food items to developed countries and causing dearth in developing counties. According to her, “as soon as trade was liberalized from 1991, within a few years, 8 million hectares of food- growing land were converted to exportable crops leading to fall in per head Food grains output, however, farmers did not benefit since their exposure to steeply falling global primary prices from mid-decade has plunged them into spiraling farm debt and insolvency”. In another study Patnaik (1997), in her article ‘Political Economy of the State Intervention in Food Security’ assessed the position of food security in the context of new economic policies. According to her article India followed ‘Food-first policy’ up to 1950 but later on under New Economic Policy shifted to ‘Export first’ policy which has seriously hampered food security in India. Her articles also assess the impact of removal of quantitative restrictions (e.g. removal of quota etc.) on food security. Patnaik has also examined research article also assessed the role of Public Distribution System in achieving adequate availability of food grains in India.

Dutta and Ramaswami (2001) have attempted to analysis the Public distribution system in Andhra Pradesh and Maharashtra, in terms of its targeting and efficiency. They used NSSO data of 50th round on household consumption to examine difference in utilization, extend of targeting among various social groups, magnitude and cost-effectiveness of food subsidies. They have concluded that for achieving greater operational efficiency, reforms in favor of self-targeting are required. Kamat, et al. (2007), in their paper reviewed the trends in Indian agriculture before and after the introduction of the economic reforms, and the advent of World Trade Organization (WTO) regime. They have employed the Cobb Douglas Production Function to investigate in to the determinants of agricultural gross domestic product for the period 1970-71 to 2002-03, during pre and post economic reforms to document the impact of
policy change (post-1992) and India’s membership of the WTO (post-1995). Their finding reveals that Indian agricultural sector has witnessed decreasing returns to scale after the introduction of economic reforms, indicating that the input availability is under strain during the same period. In yet, another well-articulated study Dev (2003) attempted to analysis the issue of food security in the light of establishment of WTO. According to the study market forces have severely altered the long achieved balance between food and population. With the implementation of Agreement on Agriculture (AOA) the fate of food security of Indian became integrated to global markets. Dev (2003), study approves the conclusions drawn by Reddy (2001), Rao (2002) about changing contours of agricultural development under WTO after 1995.

Satish (2007), in his work has looked into the financial aspects of policy changes after 1991, towards Indian agriculture. According to the work, the negative policy on credit for agriculture and other priority sectors was followed prior to reforms but its impact became more evident in post reform period. In other similar studies Moss (2003), Kalamkar (2008), studied the past experiences of the Mexico and many other Latin American countries after adopting policies of liberalization. His paper conclude that polices must be fine-tuned in relation to local agriculture otherwise market forces can dilute their food security position.

Asif and Alam (2009) assessed the impact of globalization and opening up of Indian economy to global imports, on sugar and sugar industry. Their paper analyzes past trends of sugar in area, production and productivity for ten years (1997-98 to 2006-07) and concluded that demand of sugar would be exceeding to production but demand can be met by importing. They have also concluded that world over SAP is being used as a political tools causing severe damage to the sugar industry.

India is one of the largest producers of pulses but after liberalization pulses sector has also opened up for global fluctuations in the prices. Sathe and Agarwal (2004), examined the issues related to the opening up of Indian pulses sector. Paper strongly argues that as India is a global leader in pulses production hence there is no great threat in fall of prices due supply to huge inflow. So India should open up its pluses sector for global market so that stagnant domestic sector and boosted. Bhalla and Singh (2009) attempted to analysis the performance of Indian agriculture during 1962-2006 in 44 crops. The basic objective of the study was to analysis the impact of economic liberalization on the agricultural economy of various states. Study point out that liberalization in Indian economy was promoted with the sole objective of increasing performances of various sectors. But the Indian agriculture sector neither
experienced any significant growth subsequent to the initiation of economic reforms in 1991. Study concludes that when compare with the immediate pre-liberalization period (1980-83 to 1990-93) agricultural growth in India recorded a visible deceleration during the post-liberalization period (1990-93 to 2003-06). While identifying the causes of the deceleration Bhalla and Singh has pointed out following causes:

i. Limited expansion of Green Revolution technology due to deceleration in investment in irrigation and other rural infrastructure.

ii. The growth rates of both agricultural output and of land yields slowed down as compared with pre-liberalized period. Primary reason for this according to study is non-availability of yield raising and cost-reducing new technology.

iii. There are competing demands on area available for cultivation from increase in rural population urbanization and industrialization consequently net sown area in the country has registered a rapid deceleration in the growth overtime.

iv. Shifting of low value food grains with high value non-food grain crops in some parts of India i.e. Kerala, Maharashtra; Haryana; and Rajasthan etc.

Sharma and Mishra (2009) while attempting to conceptualize the issue of food security in a critical perspective give away the factors that are responsible for the agrarian crisis. According to them unfinished agenda in land regions: quality of water technology fatigue access to institutional credit and opportunities for assured and remunerative marketing are the main challenges which are resulting in dismal performance in terms of food prospects in India.

1.1.5. Food Status in Drought Prone Regions

As present study is based on Rajasthan which is one of biggest state of India having harsh climate with regular drought like conditions are very common. So to have idea about trends of agricultural dynamism in regions of worth climate and drought prone region present section looks on study on food status in dry and water stressed climate.

Amin (1966) in his study, entitled “food supply and economic development with spatial reference to Egypt” made an attempt to look into the states of food economy of Egypt which was one of the drought prone region of that time in world while looking on food export import and population growth and the demand for food his study concluded that Egypt food problems are associated with quality of food; and disparities in food consumption. But root to all these food related problems is harsh climate of about 70% of Egypt. Payne (2010) in similar type of study attempted to study farming systems and food security in Sub- Sahara Africa
Region. The study concluded that harsh climate with vast degraded land is pausing serious food security challenge to entire sub-Sahara region of Africa.

Li and Way (2010) argued for comprehensive management of nutrients in dry land soils of China for Li and Wang has compared production of wheat and soils of dry land are less capable to less sustained use for agriculture. Gurion(1970), while working on agricultural of Israel looked issues and challenges in agricultural development of drought prone region of Israel. According to study Israel has manage to develop agriculture owning to international cooperation and expansion of agriculture and Research. Mei (1970) looked in to the trends of maize beans and rise consumption in the countries of Central America. His study concluded that Latin American countries are facing severe protein deficiencies as poor food quality.

Apart from these studies at global level regarding drought prone and arid climate agriculture those are numerous studies about agriculture in desert or water stressed climate. Ahmad (2000), in his study on Rajasthan assessed the food security and position of poverty in the light of shifting agricultural policies. He has discussed about a gradual shift in agricultural policies from food for consumption to food for export. In district level analysis, paper discusses the causes of agricultural crisis which has cause food insecurity in Rajasthan. These includes fall in subsidies on agricultural inputs, decline in real investment by government, and non-availability of proper infrastructure. The study concludes that in Rajasthan poverty has increased, poor people’s food consumptions has went down and their access to food supplied at fair prices is also decline under reform period. In a similar study entitled “Crop Diversification in Andhra Pradesh”, Ratnam et al. (2008), have studied the temporal dynamism of agricultural sector of Andhra Pradesh. They found that performance of agriculture was not satisfactory in the late nineties and there have been many problems such as stagnation of crop yield, deceleration of the growth of output, increase in the input prices, and decline in farm incomes which have led to dismal performance of agriculture.

In yet, another study about the agriculture and food relation in harsh climates, Indrakant and Harikishan (2003), attempted to assess the status of food security in Andhra Pradesh, while looking at the trends in production and productivity of food grains. While classifying districts in to food surplus and food deficit, study concludes that during last four decades the production of both wheat and rice in the state has increased substantially. However, in per capita terms, the improvement is not substantial due to rise in population. In adverse geo-climatic situations agriculture entirely depends upon the mercy of rainfall. Drawing similar
conclusion by analyzing historical agricultural development in the agriculture of Rajasthan Sagar (2003) concludes that the state has so far been successful in meeting food demand but future challenges are formidable under depleting resource base and vastly growing population.

Murtaza, et al. (2009), in their study on food security of Kashmir valley and concluded that valley was ‘in surplus’ of food but in recent times due to tremendous increase in population it has become deficient in food articles. It is now dependent on imports from other parts of the country. The study also suggests that population growth rate should be brought down by spreading awareness among masses, especially among Muslims. Their study also reveals that with rise in income demand pattern is also changing. Sivakumar and Kerbat (2004) looked into the impact of droughts on the social and economic may of life in Rajasthan. The study is based on primary data collected during the peak of 2003 drought. Using data of extensive survey covering 122 hamlets in 56 panchayats across nine districts study presents a remarkable picture of sufferings of men, women and children during the shortage of food and water. In its conclusion paper conclude that even after the spending of huge money by government on relief measures shortage of food and water is most striking problems and these problems has led to deficiency, school drop outs and forced migration in many incidences. Study recommends for many more steps towards mitigating the suffering of people during droughts by having well planned strategy for human as well live stocks.

Ahmad (2000) attempted to analysis the issues of poverty and food security in Rajasthan after adoption of liberalization as a policy. Paper explains that under the guidance of IMF and other monetary organization, India adopted policies of economic liberalization. These policies lead to series of changes in agricultural polices of whole India. By taking example of Rajasthan, Ahmad has noted that decrease in subsidies; decline in government investment, low private investment has transformed India into “from food for consumption to food for export”. Papers shows that gradual fall in per capita availability of food, food inflation, increase in rural poverty, are few visible evidences of negative consequences of globalization on an arid economy. Which has further also resulted in detriments in the living conditions of deprived and marginal sectors of the society as food security of poor families got weaker in the decade of 1990.
1.2. Issues from Literature Review

1.2.1. Food Policies in India

A close analysis of studies related to food and agricultural policies in India shows three distinct phases, the first phase from the beginning of planning to mid-sixties was characterized by severe imbalances between demand for food and its domestic supply. Domestic supply of food grains was poor because of less developed agriculture. Heavy dependence on monsoon and non-availability of infrastructure facilities along with non-scientific ways of agriculture were prime cause of negative balance between agriculture and food. Frequent floods and drought was one of the basic underline characteristics of this phase. Therefore many a times in development related literature this phase is known as gamble of monsoon (Shaif; 2005).

During the second phase that began with the introduction of new package technology in the 1960s and lasted up to the close of 1980s, the country achieved near self-sufficiency in the availability of food and experienced an improvement in effective food availability at least at macro level (Primary by green revolution). Active participation by government in providing better seeds, assured irrigation and healthy infrastructure lead to quantum jump in production and productivity of wheat and rice north-western India, which later became the heartland of food security in India by providing bumper crops of wheat and rice. During late 1970s government also worked for expansion of the Green Revolution towards other regions but got limited success, as green revolution was water intensive technology and in regions where irrigational facilities were not available, green revolution did not succeeded.

The third phase is represented by the post-reform period of 1990s when a series of measures for macro-economic stabilization and structural adjustment were launched. This phase is marked by active role played by the market forces in determining contours of economic growth, including agricultural growth rate. Getting prices incentive and disincentive by government declaration of Minimum Support Price and market price, farmers shifted area under food-crop to non-food crops (Patnaik, 1997). This was the result of shift in government policies from food first to export first in the light of economic liberalization (Patnaik; 1997). The most important problem in this phase was related to food management in India. The achievement of distribution justice and maintenance of buffer stocks were the most common objectives of the food management during this phase (Gummandi, 2005). Apart from these three phases researchers also explain right to food movement in late 1990s and recent development in B.T. technology has potential to revolutionize the agriculture sector in big way.
1.2.2. Changing Approaches of Food Analysis

The debate about food-population relationship has witnessed many changes with time. The world food conference conceptualized these changes as consisting of three important and overlapping paradigms shifts (Alcantara, 1993; Sharma and Mishra, 2009).

According to Sharma and Mishra (2009) these paradigm shifts are:

(a) From the global and the national to the household and the individual level;

(b) From a food first perspective to a livelihood perspective and;

(c) finally, objective indicators (rising income leading to increase in purchasing power, lower prices of food grains leading to better consumption food grains) to subjective perspectives (Changing attitudes, food habits, gender and age equity in household etc.) (Gummandi, 2005).

In first approach from global and the national to household and the individual, it is accepted that wide spread hunger have co-existed with the presence of adequate food supply at the national and international level. And presence of the paradoxical situation in country likes India, where food adequacy at national level and hunger deaths at regional level is a serious issue for agricultural development. Hence under this paradigm the unit of analysis changed from national to household and individual level (Shift, 1989). Another issue in the same paradigm is the question of allocation of food without any biasness to female, girl child and elderly.

The second approach marks the shift from food first to a generalized livelihood perspective. The first shift took place largely in the period from 1975-85; the second shift took place mainly after 1985, stimulated by African famine of 1984-85 (Gummandi, 2005). This shift gives prominence of livelihood over just food.

The third approach marks shift in thinking to giving more prominence to subjective perception over objective indicators to access food status of any society. Under this approach objective, data based indicators were rejected for assessing food requirement of any society. Instead of these local food habits, cultural accessibility and human dignity were accepted are true indicators (Gummadri, 2005).

However, Patnaik (1997) considers the first two phases as one phase “Era of food first policies” which led to a rise in per capita food availability. The phase after the 1990s is termed by her as “export first era” which was marked by trade liberalization and investment reduction. Apart from these paradigms right to food is now being considered a ‘goal’ in food-
population struggle. The World Food Summit (1996) and FAO (1989) declaration has reaffirmed the right to quality and nutritive food without any discrimination as equivalent to human right (Dev, 2003).

1.2.3. Determinants of Food Prospects

On the basis of large literature review and historical experience of man environment relationship many determinates can be identified which draw contours of food prospects in any society. But, prior to looking at factors of food prospects a working definition of food prospect is must. Although there is vast literature on population and food relation, but most of studies skips any to the point definition of food prospect. Although on the bases of literature review for a common frame of reference in present study food prospects connotes healthy food population relation in future, which can be sustained on the basic of present technological knowhow. In other words food prospect has a futuristic view point about food population relationship.

In terms of factors determining future population-food relationship following factors are important:

a) Food Production
b) Population growth rate.
c) Distribution of food.
d) Government policies.
e) Changes in agriculture under the influence of economic policies.

An attempt has been made in this thesis to look into the above factors determining food prospect of the any society and changes in it.

1.3. Need and the relevance of the Study

While India has managed to achieve some success in producing surplus food grains (primarily through green revolution), but it has grossly failed to achieve equitable distribution. In states like Rajasthan, where, combined impact of harsh climatic conditions and poor topography has led to serious imbalances in food availability at micro and household level. The situation became even more complicated due to prevalence of extreme poverty and social discrimination of women and children. It is generally accepted, under new economic policies, the poor are likely to be exposed to risk of market uncertainties, leading to rise in their food inaccessibility. This inaccessibility may get reflected sharply at intra-household level. These
reforms have started many tendencies and under currents in our agriculture which needs further studies. There are numerous studies in India dealing with food dynamics in pre liberalization scenario but serious attempts are not made to review the situation in changing context at least in the discipline of geography. So, the proposed research would be a gap filling exercise and at same time would provide new guidelines to policy makers and regional planners for a long term objective of food availability and accessibility for all sections of the society.

1.4. Objectives of the Study

(i) To examine the trends and determinants of Indian agriculture with special emphasis on food grains production.

(ii) To examine the status of food grains production and availability in major states of India.

(iii) To study the recent trends in cropping pattern and food grain production in the study area.

(iv) To identify ‘highly food insecure’ areas and different vulnerable groups of population in Rajasthan.

(v) To recommend a set of policy guidelines for government interventions in order to solve the problem of food availability in Rajasthan.

1.5. Database and Methodology

It is difficult in a geographical study to depend exclusively on one individual source for data. The present study is based on both primary and secondary data sources. The secondary data is taken from the following sources:

- Census of India.
- NSSO Reports on food consumption.
- Statistical Abstract of Rajasthan.
- Various Government Reports on state interventions in providing food to general masses.
- Reports of National Nutrition Monitoring Bureau (NNMB) will be used.
- National Family Health Survey- I, II, III.

In addition to these secondary sources, a survey was also conducted in order to collect primary data in order to fill the gaps and to have first-hand information about ground realities. The primary survey was conducted for a selected sample of households in selected villages of the districts identified as food insecure districts of Rajasthan. In order to obtain data form field survey extensive random sampling survey was conducted. As this was mentioned earlier, in the thesis field survey was conducted in order to obtain first hand information about
ground realities in this survey. In this survey agro-climatic region has served as base for field survey which is spreaded into three stages. In 10 identified agro-climatic regions, 10 districts one each from one agro-climatic region was selected. For field survey districts were selected having highest Gross Cropped Area in agro-climatic region. From 10 selected districts, 10 tehsils were selected. Here also tehsils having highest area under Gross Cropped Area as selected.

At the third stage of sample survey from 10 identified tehsils 20 villages, 2 each from tehsils were selected. These villages were selected having 80 % households engaged in agriculture and related activities and also having 70 % or more area under Gross Cropped Area. Later on among these 20 villages 20 household (20*20 = 400) were identified taking cognizance of caste and social makeup of the society. The study is comparative in nature, while dealing with the research problem, study has compared data of pre-reform and post-reform periods so that temporal perspective of food status can be assessed. In order, to assess the composite demand for food grains, ICMR recommendations for daily food requirement is used for calculations. To assess the position of food security position, study has adopted systematic approach. Moreover, as agriculture is a dynamic phenomenon, which tends to vary from year by year depending upon numerous factors and in order to capture real dynamism triennial data is used for the study. Data is analysis by using various statistical techniques and the findings are displayed using appropriate cartographic techniques. Among statistical technique following are the details of techniques used:

➢ **Growth rate**

\[
\text{Growth rate} = \frac{(P1 - P0)}{P0} \times 100
\]

Here,

P1 Population of recent time

P0 Population of past

➢ **Z-score**

\[
Zi = \frac{(Xi-\theta)}{\text{Standard Deviation}}
\]

Here,

Zi Z-score

Xi Value of observation

\(\theta\) Mean of all values


- **Composite Score**

\[ CS = \frac{Z_{ij}}{N} \]

Here,

- CS: Composite Score
- Z_{ij}: Indicate Z score of an indicator J^{th} in district
- N: Number of variable

- **Population and Food-Production Concentration Index (Location Quotient)**

  (i) **Population Concentration Index**

\[
\text{Total Population of the state} \div \text{Total Population of India} \div \frac{\text{Total Cropped Area of the State}}{\text{Total GCA of India}}
\]

  (ii) **Food-Production Concentration Index**

\[
\frac{\text{Total food Production in the State}}{\text{Total GCA of the State}} \div \frac{\text{Total food production in India}}{\text{Total GCA of India}}
\]

1.6. Plan of the Study

The study is spread over seven chapters. Along with the general introduction of the topic under study, present chapter has also presented a detailed account of literature, taking into account of various issues related to research problem. The main objectives of the study, database and methodology along with the plan of study have been outlined in chapter 1.

Chapter 2 “Rajasthan: Land, People and Economy” presents the profile of the study area. The general account in the chapter includes geographical details of the study area. Emphasis has been given to the physical aspects ranging from relief, soil and climatic factors. This chapter also provides a broad overview of demographic and economic characteristics of the Rajasthan.

Chapter 3 entitled ‘Food Prospects in India: A Macro scenario’, presents macro analysis of the food prospects of India. This attempts to study the general cropping pattern, its changes and general food population relationship. Chapter 4 ‘Agriculture and Population dynamics of Rajasthan’ looks into the dynamics of food economy and population of the Rajasthan. This chapter also presents a temporal evolution of relationship between agriculture and population of the state. This chapter also deals with the analysis of the issues
present in the food economy of Rajasthan in relation to population growth using 2001 census of India data.

Chapter 5 ‘Intra Household Distribution of Food’, attempts to look into the intra household distribution of food in Rajasthan. Chapter 6 deals with the suggestions and policy recommendations for the government intervention in the problematic regions.

At last, Chapter 7 Summary and Conclusions is devoted to conclusion and main finding of the study.
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