CHANGING PATTERN OF CROP DIVERSIFICATION OF INDIAN AGRICULTURE

Mahesh Prasad
Associate Professor, Dept. of Economics
V.P. College, Bhabua, Kaimur, V.K.S. University, Ara (Bihar)

Ratikanta Dash
Associate Professor, P.G. Dept. of Economics
Magadh University, Bodhgaya

The agriculture sector at present employs 60 percent of the country's work force. With the development of alternative sources of employment in the rural areas, viz., agro industries, supportive infrastructure, etc., it is hoped that the share of population dependent on agriculture will come down, though not commensurately, by the year 2020. It is hoped that 45-50 per cent of the population will be dependent on agriculture by that time.

In spite of the impressive achievements, the Indian agricultural sector continues to face poor infrastructure conditions. Less than 36 per cent of the cultivated land is under any assured irrigation system.

Keywords: Agriculture, Diversification and Crops.

INTRODUCTION

India is a country of about one billion people. More than 70 percent of India's population lives in rural areas where the main occupation is agriculture. Indian agriculture is characterized by small farm holdings. The average farm size is only 1.57 hectares. Around 93 per cent of farmers have land holdings smaller than 4 ha and they cultivate nearly 55 percent of the arable land.

Crop diversification is intended to give a wider choice in the production of a variety of crops in a given area so as to expand production related activities on various crops and also to lesson risk. Crop diversification in India is generally viewed as a shift from traditionally grown less remunerative cops to more remunerative crops. The crop shift (diversification) also takes place due to governmental policies and thrust on some crops over a given time, for example creation of the Technology Mission on Oilseeds (TMO) to give thrust on oilseeds production as a national need for the country's requirement for less dependency on imports. Market infrastructure development and certain other price related supports also induce crop shift. Often low volume high-value crops like spices also aid in crop diversification.

Crop diversification and also the growing of large number of crops are practiced in rain fed lands to reduce the risk factor of crop failures due to drought or less rains. Crop substitution and shift are also taking place in the areas with distinct soil problems.

Crop Production and Economics Scenario

The agriculture sector at present employs 60 percent of the country's work force. With the development of alternative sources of employment in the rural areas, viz., agro industries, supportive infrastructure, etc., it is hoped that the share of population dependent on agriculture will come down, though not commensurately, by the year 2020. It is hoped that 45-50 per cent of the population will be dependent on agriculture by that time.

India has made tremendous progress in the agricultural sector over the last 50 years. From hand to mouth conditions in the early sixties, we have not only become self reliant in food grains but have acquired sufficient resilience to tide over the adverse conditions.

In spite of the impressive achievements, the Indian agricultural sector continues to face poor infrastructure conditions. Less than 36 per cent of the cultivated land is under any assured irrigation system.

As a result, the productivity levels of many major crops in India do not compare very favorably with the yield obtained in agriculturally advanced countries. Further, these factor coupled with high illiteracy constrain the farmer's ability to shift to more remunerative cropping patterns in response to market signals. Therefore, their capacity to take advantage of the opportunities presented by liberalization of trade is limited. The country's agriculture has gained in strength and resilience since independence, although growth in agriculture has gained in strength and resilience since independence, although growth in agriculture is highly skewed over regions and crops.

However, the agriculture sector in India is now faced with intense and external pressures arising from the impact of policies of economic liberalization. Efficient and effective management of agriculture will be crucial in the years to come for acquiring enduring self-reliance and ensuring sustainable growth with an emphasis on consideration of equity.

Crop Diversification in the Indian Perspective

With the advent of modern agricultural technology, especially during the period of the Green Revolution in the late sixties and early seventies, there is a continuous surge for diversified agricultural in terms of crops, primarily on economic considerations.

- Resource related factors covering irrigation, rainfall and soil fertility.
- Technology related factors covering not only seed, fertilizer, and water technologies but also those related to marketing, storage and processing.
- Household related factors covering food and fodder self-sufficiency requirement as well as investment capacity.
- Price related factors covering output and input prices as well as trade policies and other economic policies that affect these prices either directly or indirectly.
- Institutional and infrastructure related factor covering farm size and other economic

policies that affect these prices either directly or indirectly.

- Institutional and infrastructure related factors covering farm size and tenancy arrangements, research, extension and marketing systems and government regulatory policies.

Obviously, these factors are not watertight but inter-related. For instance, the adoption of crop technologies is influenced not only by resource related factors but also by institutional and infrastructure factors. Similarly, government policies- both supportive and regulatory in nature-affect both the input and output prices. Likewise, special government programmers also affect area allocation and crop composition. More importantly, both the economic liberalization policies as well as the globalization process are also exerting strong pressures on the area allocation decision of farmers, essentially through their impact on the relative prices of inputs and output.

Similarly, economic factors play a relatively stronger role in influencing the crop pattern in areas with a better irrigation and infrastructure potential. In such areas, commercialization and market networks co-evolve to make the farmers more dynamic and highly responsive to economic impulses.

Consequences of Crop Pattern Changes

Turning now to the Socio-economic and environmental consequences of crops pattern changes the Green Revolution technologies have fomented, among other things, an increasing tendency towards crop specialization and commercialization of agriculture. While these developments have positive effects on land/labor productivity and net farm income, they have also endangered a number of undesirable side effects like reduced farm employment and crop imbalances. Besides, crop pattern changes also lead to serious environmental consequences that take such forms as groundwater depletion, soil fertility loss and water logging and salinity- all of which can reduce the productive capacity and growth potential of agriculture over the long-term.

Agricultural policies in the past have witnessed a series of iterative changes following the economic reforms during the 1990s that marked a significant departure from the past. Though many of the reform processes were not initiated to directly affect the agriculture sector, it was affected indirectly (Chand, 2004). The mounting stock of food grains has partly been due to the weak purchasing power of the poor in the country. Nevertheless, the problem associated with buffer stock management and degradation of natural resources in some regions has triggered a debate to redefine the agricultural policies. As a remedial measure, it has been suggested that India should diversify its agriculture and get a foothold in the world market (Radhakrishna and Reddy, 2004). The diversified and accelerated agricultural growth would enhance the food security by improving the purchasing power of the poor in the perplexing situation of shrinkage in agricultural holdings, declining new investments in agriculture and increasing degradation of natural resources (Joshi et al., 2004).

Diversification is an integral part of the process of structural transformation of an economy. As in other developing countries, Indian economy is also diversifying at the macro level with the secondary and tertiary sectors becoming progressively more important in terms of their contributions to national income as well as disposition of the workforce.

Within the agriculture, some of the sub-sectors are progressively occupying a more significant place than the crop production, and within the crop-mix, the so-called superior cereals are progressing faster than the inferior cereals.

However, the factors promoting diversification and the speed with which the changes occur vary under different situations (Vyas, 1996). Moreover, before a sincere attempt is made to suggest policies with regard to diversification, a thorough probe into the pattern and mode of diversification needs to be attempted. The present study was planned to schematize the pattern and ways of diversification across various states/crops in India.

Further, it was also intended to decipher various determinants of diversification in India and their implications on agricultural economy and trade.

Diversification and Its Components

Diversification is basically understood as signifying the shift from the agricultural to the industrial domain. But, the intricacies underlying the diversification are many and need threadbare understanding. Though the former type of diversification indicates shift from one crop to another crop or from one enterprise/sub-sector to another enterprise/sub-sector, the other type of diversification may involve income-enhancing enterprises in addition to the existing ones. In essence, the diversification to commercial crops/commodities becomes an essential strategy that can increase incomes in agriculture, minimize risks due to crop failures and above all, earn foreign exchange. Planned diversification increases both individual and social gains (Haque, 1996). This diversification strategy can be designed to help alleviate poverty, generate employment and conserve environment (Hayami and Otsuka, 1995).

In India, diversification has occurred both across and within the crop, livestock, forestry and fishery sectors. Within the agriculture, the share of output and employment in the non-crop sectors, i.e. animal husbandry, forestry and fisheries, has been gradually increasing. Thus, diversification is taking place in terms of moving away from crop production to other agricultural activities. More significant changes are taking place within the crop sector, as is evident from the changes in cropping pattern, shown later.

Determinants of Diversification

Diversification offers a wider choice in the production of crops in the given area. The shift in cultivation from traditional, less-remunerative crops to higher-value crops leads to higher incomes for the producer. At the same time, cultivation of a variety of crops reduces risk. Several factors can induce a shift in the crops grown. These include government policies that promote specific crops, development of infrastructure like roads and markets, and relative profitability of crops.

The horizontal diversification is the increase in the number of crops grown given the economical rationality of this expansion. The extent of horizontal diversification can be gauged empirically through Simpson's index of diversification (SID). The Simpson index for major states was computed to evaluate the extent of diversification at two-points of time.

India is a country of about one billion people. More than 70 percent of India's population lives in rural areas where the main occupation is agriculture. Indian agriculture is characterized by small farm holdings. The average farm size is only 1.57 hectares. Around 93 percent of farmers have land holdings smaller than 4 ha and they cultivate nearly 55 percent of the arable land. On the other hand, only 1.6 of the farmers have operational land holdings above 10 ha and they utilize 17.4 percent of the total cultivated land. Due to diverse agro-climatic conditions in the country, a large number of agricultural items are produced. Broadly, these can be classified into two groups - foodgrains crops and commercial crops. Due to the challenge of feeding our vast population and the experience of food shortages in the pre-independence era, 'self reliance' in foodgrains has been the cornerstone of our policies in the last 50 years. Around 66 percent of the total cultivated area is under foodgrain crops (cereals and pulses). Concurrently, commercial agriculture developed for whatever reasons in the pre-independent phase also kept flourishing during the post independent period. Commercial agriculture not only catered to the domestic market but has also been one of the major earners of foreign exchange for the country.

Crop diversification is intended to give a wider choice in the production of a variety of crops in a given area so as to expand production related activities on various crops and also to lessen risk. Crop diversification in India is generally viewed as a shift from traditionally grown less remunerative crops to more remunerative crops. The crop shift (diversification) also takes place due to governmental policies and thrust on some crops over a given time, for example creation of the Technology Mission on Oilseeds (TMO) to give thrust on oilseeds production as a national need for the country's requirement for less dependency on imports. Market infrastructure development and certain other price related supports also induce crop shift. Often low volume high-value crops like spices also aid in crop diversification. Higher profitability and also the resilience/stability in production also induce crop diversification, for example sugar cane replacing rice and wheat. Crop diversification and also the growing of large number of crops are practiced in rainfed lands to reduce the risk factor of crop failures due to drought or less rains. Crop substitution and shift are also taking place in the areas with distinct soil problems. For example, the growing of rice in high water table areas replacing oilseeds, pulses and cotton; promotion of soybean in place of sorghum in vertisols (medium and deep black soils) etc.

CROP PRODUCTION AND ECONOMIC SCENARIO

The share of the agriculture sector in the total GDP has declined rapidly and this trend will continue. By 2020, the share of agriculture in the total GDP of the country is likely to be reduced to 15 percent due to faster development of non-agriculture sectors. The agriculture sector at present employs 60 percent of the country's work force. With the development of

alternative sources of employment in the rural areas, viz., agro industries, supportive infrastructure, etc., the share of population dependent on agriculture will come down, though not commensurately, by the year 2020. It is 45-50 percent of the population is dependent on agriculture by that time.

India's performance during the post-independence period has been a matter of pride and satisfaction. The agricultural sector has left behind the era of shortages and dependence on imports and arrived at a stage of self-sufficiency and occasional surpluses. The Green, White, Yellow and Blue revolutions have been landmarks that have been claimed and recognized the world over. India is now the largest producer of wheat, fruits, cashew nut, milk and tea in the world and second largest producer of vegetables and fruits. India is the largest producer, consumer and exporter of spices in the world and the largest exporter of cashew. Foodgrains production has increased four-fold since independence, from 51 million tonnes (Mt) during 1950/51 to 203 Mt during 1998/99. The scourge of severe food shortages is now a thing of the past as is the dependence on imports. India's agriculture has passed through four distinct phases of strategy: a) starting with the intensification of efforts in identified areas, using traditional technology and expansion of area during the pre-Green Revolution period; b) through a new strategy of use of modern inputs and high yielding varieties in irrigated areas during the late sixties and the seventies, (Green Revolution); c) further through a period of greater focus on management of linkages and infrastructure, such as, marketing, trade and institution building; and, d) to an era of liberalization and relaxation of controls during the nineties. The journey has been arduous but rewarding. The agriculture sector has been successful over the past five decades in keeping pace with the rising food demand of a growing population (already crossed one billion in May, 2000). This sector provides raw materials to the major industries of the country which are largely agro-based like cotton, sugar, etc. It contributes nearly 16 percent of the country's total export.

In spite of the impressive achievements, the Indian agricultural sector continues to face poor infrastructure conditions. Less than 36 percent of the cultivated land is under any assured irrigation system. Farmers on the remaining two thirds of the land are completely dependent on rainfall, which is also greatly characterized by large variations in terms of precipitation both spatially and in time. For a large majority of farmers in different parts of the country gains from application of science and technology in agriculture have yet to be realized. As a result, the productivity levels of many major crops in India do not compare very favourably with the yields obtained in agriculturally advanced countries. Further, these factors coupled with high illiteracy constrain the farmer's ability to shift to more remunerative cropping patterns in response to market signals. Therefore, their capacity to take advantage of the opportunities presented by liberalization of trade is limited. The country's agriculture has gained in strength and resilience since independence, although growth in agriculture is highly skewed over regions and crops. However, the agriculture sector in India is now faced with intense internal and external pressures arising from the impact of policies of economic liberalization. Efficient and effective management of agriculture will be crucial in the years

to come for acquiring enduring self-reliance and ensuring sustainable growth with an emphasis on consideration of equity.

PATTERNS OF CROP DIVERSIFICATION

Crop Diversification in the Indian Perspective

With the advent of modern agricultural technology, especially during the period of the Green Revolution in the late sixties and early seventies, there is a continuous surge for diversified agriculture in terms of crops, primarily on economic considerations. The crop pattern changes, however, are the outcome of the interactive effect of many factors which can be broadly categorized into the following five groups:

a) Resource related factors covering irrigation, rainfall and soil fertility.

b) Technology related factors covering not only seed, fertilizer, and water technologies but also those related to marketing, storage and processing.

c) Household related factors covering food and fodder self-sufficiency requirement as well as investment capacity.

d) Price related factors covering output and input prices as well as trade policies and other economic policies that affect these prices either directly or indirectly.

e) Institutional and infrastructure related factors covering farm size and tenancy arrangements, research, extension and marketing systems and government regulatory policies.

Obviously, these factors are not watertight but inter-related. For instance, the adoption of crop technologies is influenced not only by resource related factors but also by institutional and infrastructure factors. Similarly, government policies - both supportive and regulatory in nature - affect both the input and output prices. Likewise, special government programmes also affect area allocation and crop composition. More importantly, both the economic liberalization policies as well as the globalization process are also exerting strong pressures on the area allocation decision of farmers, essentially through their impact on the relative prices of inputs and outputs. Although the factors that influence the area allocation decision of farmers are all important, they obviously differ in terms of the relative importance both across farm groups and resource regions. While factors such as food and fodder self-sufficiency, farm size, and investment constraints are important in influencing the area allocation pattern among smaller farms, larger farmers with an ability to circumvent resources constraints usually go more by economic considerations based on relative crop prices than by other non-economic considerations. Similarly, economic factors play a relatively stronger role in influencing the crop pattern in areas with a better irrigation and infrastructure potential. In such areas, commercialization and market networks co-evolve to make the farmers more dynamic and highly responsive to economic impulses.

What is most notable is the change in the relative importance of these factors over time. From a very generalized perspective, Indian agriculture is increasingly getting influenced more and more by economic factors. This need not be surprising because irrigation expansion,

infrastructure development, penetration of rural markets, development and spread of short duration and drought resistant crop technologies have all contributed to minimizing the role of non-economic factors in crop choice of even small farmers. What is more, the reform initiatives undertaken in the context of the ongoing agricultural liberalization and globalization policies are also going to further strengthen the role of price related economic incentives in determining crop composition both at the micro and macro levels. Obviously, such a changing economic environment will also ensure that government price and trade policies will become still more powerful instruments for directing area allocation decisions of farmers, aligning thereby the crop pattern changes in line with the changing demand-supply conditions. In a condition where agricultural growth results more from productivity improvement than from area expansion, the increasing role that price related economic incentives play in crop choice can also pave the way for the next stage of agricultural evolution where growth originates more and more from value-added production.

Consequences of Crop Pattern Changes

Turning now to the socio-economic and environmental consequences of crop pattern changes, the Green Revolution technologies have fomented, among other things, an increasing tendency towards crop specialization and commercialization of agriculture. While these developments have positive effects on land/labour productivity and net farm income, they have also endangered a number of undesirable side effects like reduced farm employment and crop imbalances. Although the expansion of commercialized agriculture has fomented new sets of rural non-farm activities and strengthened the rural-urban growth linkages, it has also weakened the traditional inter-sectoral linkages between the crop and livestock sectors. Besides, crop pattern changes also lead to serious environmental consequences that take such forms as groundwater depletion, soil fertility loss and waterlogging and salinity - all of which can reduce the productive capacity and growth potential of agriculture over the long-term. A classical example is the rice-wheat system in Northwestern India replacing traditional crops like pulses, oilseeds and cotton.

CONCLUSION

India, being a vast country of continental dimensions, presents wide variations in agroclimatic conditions. Such variations have led to the evolution of regional niches for various crops. Historically, regions were often associated with the crops in which they specialize for various agronomic, climatic, hydro-geological, and even, historical reasons. But, in the aftermath of technological changes encompassing bio-chemical and irrigation technologies, the agronomic niches are undergoing significant changes. With the advent of irrigation and new farm technologies, the yield level of most crops-especially that of cereals-has witnessed an upward shift making it possible to obtain a given level of output with reduced area or more output with a given level of area and creating thereby the condition for inter-crop area shift (diversification) without much disturbance in output level. Besides, as agriculture become drought proof and growth become more regionally balanced, there has been a reduction in the instability of agricultural output.

Although these reverse area shifts actually took place in the mid-1970's as a part of the process of commercialization, they became more pronounced since the mid 1980's as a response partly to emerging supply deficit in edible oils and partly to the changing comparative advantage of crops. Since the recent trend in inter-crop area shifts has it origin in the price and trade policy changes of the 1980's, they indicate the increasing market influence on area allocation. The area under commercial crops has almost doubled in the last three decades. Among the foodgrain crops, the area under superior cereals, i.e., rice and wheat, is increasing; while that of coarse cereals (millets) is on decline. The area share of jute and allied fibres has also gone down substantially. Like any other economy, the share of agriculture in the GDP is also declining in India. Increase in income from the agriculture sector, further growth of non-crop sub-sectors within agriculture; faster growth of non-food grain crops; and faster growth of superior cereals among the food grains are all happening, but the pace of such change is far too slow. An accelerated pace of diversification to create positive import of higher income, higher employment and conservation and efficient use of natural resources emphasizes the need for efficient policies, especially in technological development, selective economic reforms and institutional change. A strategy of crucial importance is growth enhancing non-farm activities. This calls for investment in rural infrastructure and skill upgradation and it also implies a careful examination and adjustment of macro-policies, which influence the relative profitability of different activities and in turn determine the nature and pace of diversification. In order to ensure social equity, policies on structural adjustment and reforms must pay special attention to the band of marginal and small farmers and agricultural labourers. The direct benefits from diversification should reach these sections of the farmers.

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