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## Patterns of crop diversification in Indian scenario

V. Kalaiselvi

Economics Wing, DDE, Annamalai University, Annamalai Nagar, India

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### ABSTRACT

*Patterns of crop diversification 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. 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 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 productions.*

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### 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 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 [1]. 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.

**Concept**

Crop diversification refers to a shift from traditionally grown less remunerative crops.

**Objectives**

1. To study Crop Production and Economics Scenario
2. To identify Crop Diversification in the Indian Perspective
3. To examine Pattern of Crop Diversification in India

**Earlier Studies on Diversification**

The study suggested the establishment of agro processing industries and infrastructural facilities, arrangement for crop protection, construction, maintenance and management of irrigation works, research prioritization, distribution of quality seeds and seed materials of the specific crops in the specific zone on the basis of cropping pattern and need of the people of the region.

The study suggested that for achieving the gains of diversification of farming, there is an urgent need for further strengthening the required infrastructure pertaining to input supply system [2] marketing system and the existing research and extension programmers to increase the adoption of advanced production technologies.

In their study on the impact of diversification on small farms economy district of Himachal Pradesh observed that the diversification of arable farming systems with commercial enterprises such as high yielding milk animals, poultry birds, bee-keeping, floriculture etc, resulted in a marked increase in the farm income from 6 to 138 per cent. Similarly the capital and credit requirement showed an increasing trend with the extent of diversification implying thereby that to diversify the existing farming systems with the most systematically, remunerative and technically feasible enterprises, adequate facilities should be made available by the financial institutions.

**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 [3] 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 [4].

### 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.

States	Number of Crops	States	Number of Crops
Jammu and Kashmir	13	Bihar	20
Punjab	14	Maharashtra	23
Haryana	15	West Bengal	23
Himachal Pradesh	18	Assam	24
Kerala	18	Orissa	24
Rajasthan	18	Tamil Nadu	24
Gujarat	19	Andhra Pradesh	25
Madhyapradesh	19	Karnataka	27
Uttar Pradesh	19	All India	30

### Pattern of Crop Diversification in India

The intensity of diversity is reflected by the number of crops produced in a state as well as by the aggregate level of spread or concentration. The state-wise pattern of diversity on the basis of 30 crops reveal that most of the states in the northern region fall under the category of states producing less number of crops and hence are less diverse, whereas almost all the eastern and southern states are highly diverse as they produce relatively more number of crops (Table 1). Interestingly, when we measure the level of spread across states in India, both the northern and eastern regions show higher levels of concentration (Table- 2). We have categorized the states on the basis of their movement towards spread and concentration over time in their cropping patterns, into three broad patterns. The first pattern includes states/regions that have shown almost no change in their concentration index. In the second pattern, we have states, which are moving towards higher level of concentration in their cropping pattern. The third category consists of the regions that are increasing their spread among the crops. On the whole, the regions that are showing stagnancy in their index of concentration or spread include Jammu and Kashmir, Kerala and Rajasthan. States from the northern and eastern regions are the ones showing increasing trend towards higher concentration including Punjab, Haryana and Uttar Pradesh, whereas most of the southern states fall under the category of increasing trend towards spread of cropping pattern. It is interesting to note that Assam, that has higher concentration index, over the period of time, is shifting towards more spread in the cropping pattern. However, it is not strictly the case that, states with large number of crops also have higher index of spread.

The pattern of diversification on the basis of area under various crop groups shows that most of the eastern and northern regions have higher areas fewer than two major crops i.e., rice and wheat, which is responsible for their higher index of concentration. In contrast, it is mostly the southern and western regions that have higher allocation of area under non-food grains (Table-3). The temporal picture of changing proportionate areas under these crop groups reveals a very interesting picture. It is found that Haryana and Uttar Pradesh (So-called specialized states in India), along with Rajasthan, Gujarat and Bihar, have increased their allocation of area under both the crop groups, i.e., rice/wheat and non-food grain crops. They have replaced other inferior food crops (like cereals), in order to

increase the overall allocation of non-food crops in their cropping pattern. However, this is not the case with Punjab, which has increased the allocation of specialized crops (rich and wheat) by reducing the proportion of area under other high value non-food crops. West Bengal, Tamil Nadu, Maharashtra, Jammu and Kashmir, Assam and Andhra Pradesh reduced the proportion of rice or wheat in order to increase the proportionate area under non-food crops [5].

**Table -2 Trend towards Specialization/Diversification in India**

States	1970s	1980s	1990s	2000	Change in Magnitude
<b>Static spread/ Concentration</b>					
Jammu and Kashmir	0.703	0.721	0.717	0.718	0.015
Kerala	0.780	0.798	0.792	0.782	0.002
Rajasthan	0.796	0.805	0.816	0.786	-0.011
<b>Increasing Concentration</b>					
Bihar	0.517	0.468	0.450	0.427	-0.090
Haryana	0.825	0.800	0.791	0.757	-0.068
Himachal Pradesh	0.711	0.644	0.646	0.645	-0.065
Madhya Pradesh	0.855	0.836	0.823	0.817	-0.038
Orissa	0.332	0.499	0.317	0.280	-0.052
Punjab	0.749	0.660	0.634	0.612	-0.137
Uttar Pradesh	0.833	0.799	0.760	0.735	-0.100
<b>Increasing Spread</b>					
Gujarat	0.834	0.863	0.875	0.863	0.028
Andhra Pradesh	0.801	0.802	0.798	0.838	0.036
Assam	0.425	0.489	0.458	0.460	0.034
Karnataka	0.874	0.873	0.888	0.904	0.031
Maharashtra	0.795	0.797	0.819	0.838	0.043
Tamil Nadu	0.768	0.767	0.785	0.819	0.052
West Bengal	0.385	0.434	0.417	0.476	0.090

**Table- 3 Proportionate Area under High Value Crops and Their Changing Patterns**

States	Proportion of area under rice and wheat (TE 2000)	Proportion of area under Non-Feed Grains (TE 2000)	Change in Proportion of Area Under Rice and Wheat 1971-2001	Change in Proportion of area under non-feed grains 1971-2001
Andhra Pradesh	32.43	42.81	-2.81	15.38
Assam	74.58	24.65	-2.69	2.72
Bihar	74.43	9.95	5.57	0.93
Gujarat	15.18	59.19	2.33	10.94
Haryana	59.83	24.27	25.67	10.92
Himachal Pradesh	55.34	3.84	4.08	-0.69
Jammu and Kashmir	55.21	7.90	-1.73	2.62
Karnataka	15.89	41.66	-1.80	8.09
Kerala	12.62	87.34	-21.17	21.25
Madhya Pradesh	45.58	14.35	6.81	-3.78
Maharashtra	14.87	40.83	-0.67	3.58
Orissa	84.83	9.59	3.49	-1.06
Punjab	86.62	10.49	28.07	-9.39
Rajasthan	16.77	22.36	0.71	9.55
Tamil Nadu	36.52	42.59	-5.42	10.78
Uttar Pradesh	68.49	15.65	15.34	2.39
West Bengal	76.58	22.18	-7.28	9.38

## CONCLUSION

India, being a vast country of continental dimensions, presents wide variations in agro climatic 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 of 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.

The results show that there is a mixed picture regarding the typology of diversification within the states. Some states exhibit more diversification, in there is no direct link between the number of crops and spread in the cropping pattern. The picture for states is completely diverse. In terms of relationship of different dimensions of diversification with income and risk, and inverse and positive relationship of increasing spread of the cropping pattern with income and risk, respectively is found.

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