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CROP DIVERSIFICATION - AN ECONOMIC ANALYSIS

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ABSTRACT

Crop diversification is a necessity for agricultural based economy like Haryana since growing of staple food such as cereals alone cannot support the process of economic development and growth. Therefore, the study was done to measure the extent of crop diversification at district level in Haryana using diversification measures viz. Crop Diversification and Entropy Indices. The analysis concluded that more diversion of area towards vegetables, fruits and flowers in Sonepat, Rohtak and Gurgaon districts due to availability of market, increased demand of products and export facilities due to proximity of metropolitan city, Delhi. Crops were diversified in Bhiwani district with introduction of sprinklar-irrigation system. The other districts observed specialization in crops due to absence of proper markets, amount of risks involved, availability of irrigation facilities etc.

INTRODUCTION

The agrarian structure is dominated by small and marginal farmers not only in terms of number (78 % < 2 hectares) but also in terms of area cultivated (32% during 1990-91). Because of the small operational base, it will not be possible to improve the incomes of these households merely by raising existing crops yields and difficult for the farmer with meagre resources to sustain himself and his family and also to make investment on the farm.

Crop diversification is essential for an agricultural based economy like Haryana. The conventional wisdom of the farmer over years has forced him to diversify farm enterprises to meet the cash needs of the family as well as to combat risk associated with mono-cropping. The crop diversification is also receiving greater emphasis due to price response, market infrastructure, availability of resources, public interventions (price and credit policies, research and development), and globalization of agriculture. The judicious crop mix has led to utilization of under employed resources to mitigate seasonal and under unemployment of labour, increase farm incomes and to reduce risks and uncertainties in crops yields due to climatic and biological vagaries.

Thus the study was conducted to analyse the extent of crop diversification at district level in Haryana.

MATERIAL AND METHOD

Times-series data were collected from published sources during the period 1980-81 to 1996-97 regarding area under various crops in different districts of Haryana. To analyse the crop diversification level at district level, the following diversification measures were used :

Crop Diversification measures

To measure the extent and nature of crop diversification, two measures viz. Herfindahl and Entropy Indices were worked out.

$$P_i = \frac{A_i}{\sum_{i=1}^{n} A_i}$$

P_i = proportion of ith crop

A_i = area under ith crop (ha)

$\sum_{i=1}^{n} A_i$ = total cropped area (ha)

i = 1,2,3..... n (number of crops)

1. *Herfindahl Index

$$H = \sum_{i=1}^{n} P_i^2$$

Herfindahl index (H.I.) defined as the sum of squares of all n proportions is a mea-

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sure of crop concentration. This measure is used to measure crop diversification on acreage proportion. The value of 'H.I.' varies from zero to one. It takes the value of one when there is complete specialization and approaches zero when the number enterprises is more showing perfect diversification. But for direct interpretation of results. Crop diversification index was worked out:

2. *Crop Diversification Index

$$C.D.I. = 1-H.I.$$

where,

H.I. = Herfindahl index

The C.D.I. has direct relationship with diversification. The zero value of C.D.I. indicates specialization and moving towards one showing increase in number of enterprises. It is also measured on acreage proportion.

3. *Entropy Index

$$E.I. = \sum_{i=1}^{n} P_i^2 \log 1/P_i$$

Where,

P_i = proportion of i^{th} crop

Entropy Index is regarded as an inverse measure of crop concentration having logarithmic character. This measure is applied on acreage proportion to measure the crop diversification. The values of 'E' varies from zero to one. Zero value of E.I. indicates perfect specialization whereas value of one shows perfect diversification i.e. it has direct relationship with diversification.

These indices based on crops i.e. paddy, wheat and other cereals (bajra, jowar, maize, barley), gram, other pulses (mash, moong, massar, soybean, fieldpea, arhar, cowpea) , rapeseed and mustard, other oilseeds (castor, linseed, sesasum, sunflower, taramira) cotton, sugarcane, fruit and vegetables were calculated.

RESULTS AND DISCUSSION

Diversification indices at district level were given below :

1. Crop Diversification Index (C.D.I.): Crop Diversification Index on acreage proportion in different districts of Haryana State is presented in Table 1. It is clear from the Table that C.D.I. moved in narrow range over years in almost all the districts. In Ambala and Mohindergarh district it decreased to 0.6811 and 0.3620 from 0.7486 and 0.3842 during 1990-91 over 1980-81 showing movement towards specialization. However this trend got reversed during the period 1990-91 to 1996-97 indicating serving in favour of crop diversification. Kaithal, Karnal, Panipat, Faridabad, Rewari, Jind, Hisar and Sirsa districts exhibited declining values of C.D.I. during 1980-81 to 1996-97. The value of C.D.I. registered an increase from 0.5849, 0.6263, 0.6030, 0.5258, 0.5988 and 0.3327 to 0.6091, 0.6848, 0.6406, 0.6476, 0.6067 and 0.5608 in Kurukshetra, Sonepat, Rohtak, Gurgaon, Faridabad and Bhiwani districts, respectively during the same period indicating crops were diversified to more remunerative crops. The district Yamuna Nagar did not exhibit any change in cropping pattern.

2. Entropy Index (E.I.): Table 2 shows Entropy Index of crop diversification on acreage proportion in different districts of Haryana during 1980-81 to 1996-97. The results showed that value of E.I. varied from 0.7055 to 0.6121 in case of Ambala district during 1980-81 to 1990-91 indicating reduced diversification. However, during the years 1990-91 to 1996-97, E.I. increased to 0.6882 showing increased diversification. Same pattern was also observed in case of Mohindergarh district. Kaithal, Karnal, Panipat, Rewari, Jind, Hisar and Sirsa districts registered decline in the value of E.I. from 0.4792, 0.5755, 0.4822, 0.3741, 0.6410, 0.5989 and 0.5556 to 0.4350, 0.4218, 0.4456, 0.3187, 0.6041, 0.5697 and 0.4749, respectively over the period reflected that diversification among crops was declining.

Tabel 1. District-wise Crop Diversification index in Haryana : 1981-97

Sr. No.	District	Year			
		1980-81	1985-86	1990-91	1996-97
1.	Ambala	0.7486	0.7302	0.6811	0.7536
2.	Yamuna Nagar	-	-	0.7302	0.7283
3.	Kurukshetra	0.5849	0.5887	0.6008	0.6091
4.	Kaithal	-	-	0.5848	0.5604
5.	Karnal	0.6138	0.5801	0.5650	0.5562
6.	Panipat	-	-	0.5838	0.5672
7.	Sonepat	0.6263	0.5975	0.6458	0.6848
8.	Rohtak	0.6030	0.6396	0.6402	0.6406
9.	Faridabad	0.5988	0.5993	0.5968	0.6067
10.	Gurgaon	0.5258	0.5462	0.6380	0.6476
11.	Rewari	-	-	0.5287	0.4332
12.	Mohindergarh	0.3842	0.3889	0.3620	0.4133
13.	Bhiwani	0.3227	0.4233	0.5122	0.5608
14.	Jind	0.7022	0.7001	0.7018	0.6774
15.	Hisar	0.7114	0.6988	0.6793	0.6806
16.	Sirsa	0.6519	0.6464	0.6095	0.6044

Note : Yamuna Nagar, Kaithal, Panipat and Rewari districts were formed in year 1989.

Tabel 2. District-wise Entropy index in Haryana : 1981-97

Sr. No.	District	Year			
		1980-81	1985-86	1990-91	1996-97
1.	Ambala	0.7055	0.6749	0.6121	0.6882
2.	Yamuna Nagar	-	-	0.6367	0.6393
3.	Kurukshetra	0.4841	0.4716	0.4832	0.4963
4.	Kaithal	-	-	0.4792	0.4350
5.	Karnal	0.5155	0.4731	0.4321	0.4218
6.	Panipat	-	-	0.4822	0.4455
7.	Sonepat	0.5627	0.5601	0.6079	0.6706
8.	Rohtak	0.4888	0.5473	0.5629	0.5659
9.	Faridabad	0.4934	0.5418	0.5234	0.5084
10.	Gurgaon	0.3693	0.4273	0.4967	0.5118
11.	Rewari	-	-	0.3741	0.3187
12.	Mohindergarh	0.2618	0.2672	0.2567	0.2954
13.	Bhiwani	0.2904	0.3645	0.4304	0.4490
14.	Jind	0.6410	0.6381	0.6395	0.6041
15.	Hisar	0.5989	0.5977	0.5792	0.5697
16.	Sirsa	0.5655	0.5430	0.4837	0.4749

Note : Yamuna Nagar, Kaithal, Panipat and Rewari districts were formed in year 1989.

The value of E.I. indicated that in Kurukshetra and Faridabad districts, crop diversification increased marginally during the period under study. During the same period, cropping pattern of Yamuna Nagar district remained almost same. The district like Sonepat, Rohtak, Gurgaon and Bhiwani exhibited a positive trend in diversification.

The analysis revealed that in Ambala district, diversification among crops was reduced during 1971-91 because of increase in irrigation facilities, availability of large operational holdings and existence of sugar mills at Yamunanagar. The efficient marketing of sugarmills encourage farmers to divert more area under sugarcane crop. Similar trend was

observed in Mohindergarh district during 1971-91 on the account of widespread adoption of sprinkler-irrigation system, substantial increase in area under oilseeds and even under wheat was observed. During 1990-91 to 1996-97 diversification among crops was increased in Ambala district on account of creation of new districts Yamunanagar covering major sugarcane growing tract of erstwhile Ambala district. Mohindergarh district was also responsive to diversification in crops during 1991-97 on creation of new district Rewari covering more area under oilseeds. Wide spread adoption of sprinkler-irrigation system crops are diversified towards remunerative enterprises. Crops were also more diversified in Sonepat, Rohtak and Gurgaon districts on account of diversion of large area from common field crops to high value crops like vegetables, fruits and flowers crops due to its proximity to the metropolitan city, Delhi. Continuous paddy-wheat rotation resulted in infestation of weeds (especially *Phalaris minor*), multiplication of insects, pests and diseases and depletion of under groundwater in Kurukshetra district caused increase in area under sunflower, sugarcane and high value crops. The diversification among crop in Bhiwani district was observed because of introduction of sprinklar-irrigation system for growing irrigation oriented crops. The other districts indicated specialization in crops due to absence of proper markets, amount of risks involved, availability of irrigation, agro-climatic conditions etc.

CONCLUSIONS AND POLICY IMPLICATIONS

From the foregone analysis, it was was concluded crops were more diversified in Sonepat, Rohtak and Gurgaon districts towards high value crops like vegetables, fruits and flowers due to proximity to metropolitan city, Delhi. Infestation of weeds, multiplication of insect-pests and diseases, depletion of underground water in Kurukshetra district caused increase in area under sunflower, sugarcane and high value crops. While crop diversification was observed in Bhiwani district due to introduction of sprinklar irrigation system. The other districts indicated specialization in crops. So, Govt. should initiate the steps for expansion in irrigation facilities, availability of production technology especially for small farms. The transport, communication, market infrastructure and processing facility for high value crops should be strengthened in the state. The farmers are advised to avoid for adoption of same crop rotation over the years.

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