

**CROP DIVERSIFICATION- IS IT A KEY FOR REVIVING
INDIAN FARM SECTOR?**

by

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DECLARATION

I, Tomson K. S. (2018–11– 050) hereby declare that the seminar report titled ‘Crop diversification- Is it a key for reviving Indian farm sector?’ has been prepared by me independently after going through the reference cited at the end and I haven’t copied any information from fellow students or previous seminar reports.

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CERTIFICATE

This is to certify that seminar report titled ‘Crop diversification- Is it a key for reviving Indian farm sector?’ for the course AG ECON. 591 has been solely prepared by Tomson K. S. (2018-11-050) under my guidance, and he has not copied from seminar reports of seniors, juniors or fellow students.

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Crop diversification- Is it a key for reviving Indian farm sector?

INTRODUCTION

India, since its independence, had to go through a hard time ensuring the food security of its population. The Indian economy had to face severe discrepancy in the balance of payments due to increasing food grain imports. The food grain production in the country was no match to the ever-increasing population

1.1 Food grain production after independence

The food grain production in the year 1951 was 55.01 million tonnes and it increased to 72.3 million tonnes in 1966. This increase was nowhere near the food grain requirement of the country. As a result, there was an increase in food grain imports to the country from 0.7 million tonnes in 1955 to 10.4 million tonnes in 1966.

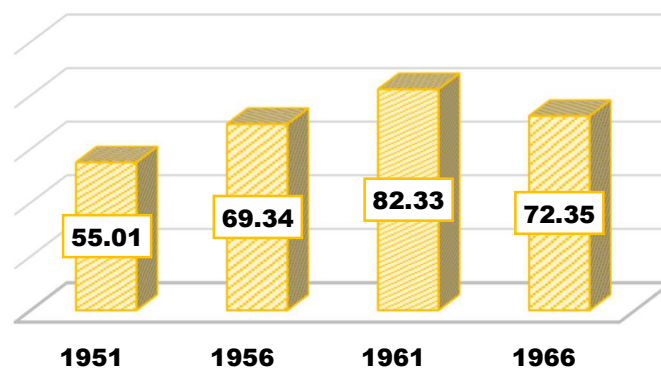


Fig. 1.1. Food grain production in India (Million Tonnes)

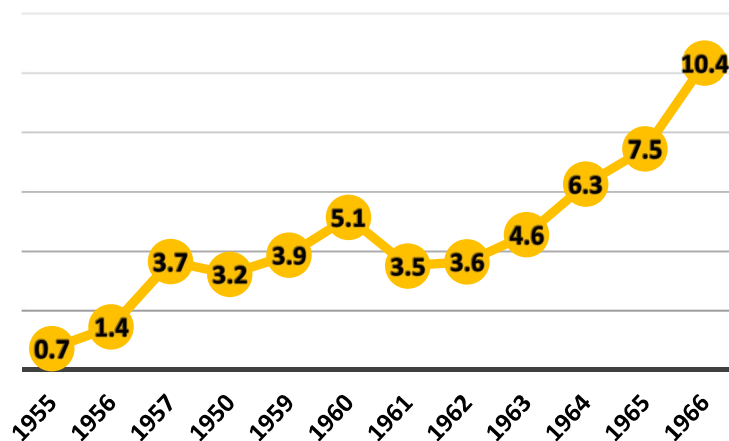


Fig. 1.2. Food grain imports to India (Million Tonnes)

1.2 Impact of green revolution

Green revolution changed the scenario, making the country self-sufficient by late 1980s. The food grain production in the country started picking up quickly, crossing the 100 million mark in 1970 and reaching up to 176.4 million tonnes in 1991. Subsequently, the import of food grains fell after 1966 and touched the zero mark in 1991. When sustainability of the green revolution tracts became a concern owing to plateauing of yields, land degradation, ground water exploitation and indiscriminate use of fertilizers and pesticides, crop diversification was proposed as a way out (Jha, 1995).

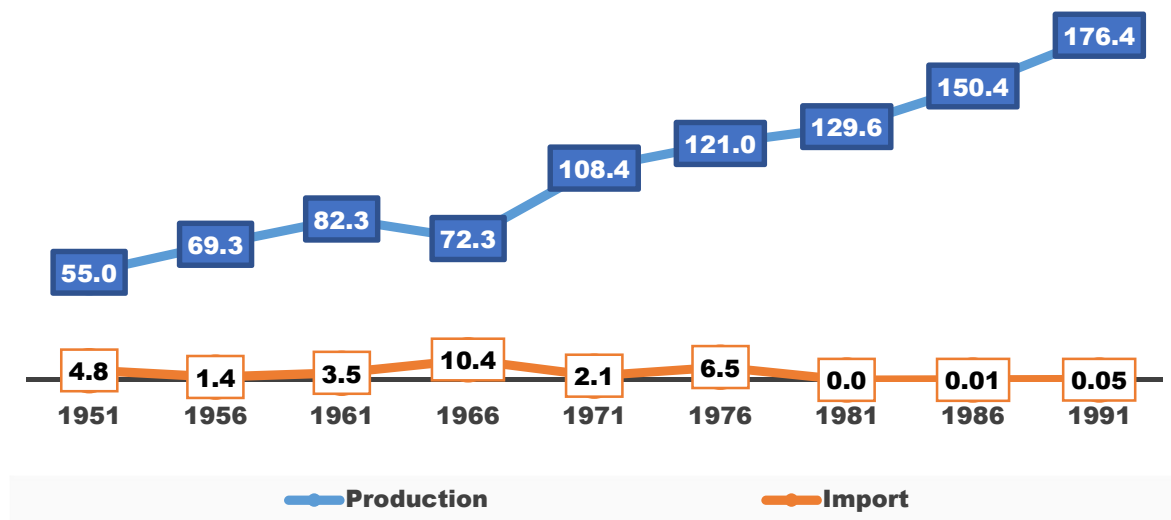


Fig. 1.3. Food grain production and import of India

1.3 Crop diversification

Crop diversification refers to the addition of new crops or cropping systems to agricultural production on a particular farm taking into account the different returns from value added crops with complementary marketing opportunities (Khanam *et al.*, 2018). Crop diversification, therefore is not mere addition of any crop into a crop production system, but a crop that is remunerative for the farmer.

2. STUDIES ON CROP DIVERSIFICATION IN INDIA

Studying the crop diversification pattern of India, Saha (2013) reported that the northern and eastern states showed increasing trend towards crop specialization, whereas the southern and

western states showed increase in crop diversification. He assessed the nature and trend of agricultural diversification at the State level from 1990-91 to 2008-09 using Herfindahl-Hirschman's Index. He stated that high crop diversification had taken place in western and south western states whereas crop specialization had occurred in states of West Bengal, Assam, Manipur, Mizoram etc. Oilseeds, pulses, rice and fruits & vegetables had come out as 'emerging crops' (in terms of cropped area).

Singh (2015) contradicted the earlier findings and reported that the states like Punjab, Bihar, Jharkhand, Odisha, Assam and West Bengal showed moderate level of crop diversification. He analysed the spatial variation and temporal perspective of the changing pattern and level of crop diversification in Indian agriculture between 2002-03 and 2012-13. He used Bhatia's method, Herfindahl's method, Gibb's and Martin's methods for measuring the level of crop diversification. He revealed that the higher level of crop diversification has been found in Karnataka, Jammu and Kashmir, Rajasthan Gujarat, Maharashtra, Andhra Pradesh, Himachal Pradesh, Tamil Nadu and Uttar Pradesh in both the years. Less diversification was found in Chhattisgarh and Tripura. Punjab, Bihar, Goa, Jharkhand, Odisha, West Bengal, Kerala and Assam state had moderate level of crop diversification.

Kalaiselvi (2012) studied the pattern of crop diversification and found that most of the states in northern region and eastern region produced a smaller number of crops and hence were less diverse, whereas almost all the western and southern states were highly diverse as they produced relatively a greater number of crops. She expressed that most of the eastern and northern regions had higher index of concentration as fewer than two major crops i.e., rice and wheat were cultivated. In contrast, the southern and western regions that had higher allocation of area under non-food grains which resulted in diversification.

Singh et al. (2006) studied the pattern of crop diversification across states in India through Simpson's index of diversification (SID) and various determinants of diversification was deciphered. They reported that the Simpson index ranged from 0.47 (West Bengal) to 0.90 (Karnataka) in 1990-91 and from 0.40 (Orissa) to 0.92 (Karnataka) in 2000-01. They substantiated that the increase in diversification Index signified a shift towards non-food grain crops. It was found that the presence of electricity and road density were negatively associated with the diversification.

3. VARIATION IN STUDY RESULTS

The different studies cited above as well as several other studies had different results for diversification of various states. A deep look into this reveals the possible causes of variations.

3.1 Causes of variation

- **Data source**

The data source used for analysis by different researches might be different which can lead to a variation in the findings between various researchers.

- **Number of crops**

More the number of crops one uses for analysis, the better picture you get about diversification. Using a lesser and larger number of crops to study the diversification of one state can give two different results.

- **Number of states**

To explain the extent of crop diversification in one particular part of the country, sufficient representative states should be chosen for the analysis. A smaller number of states is enough to represent the northern part of the country, while a larger number of states is required to represent the east.

- **Period of study**

Same study conducted at two different time periods for the same state can give different result as the state might diversify or specialize over those years.

3.2 Need for separate analysis

To get a better and clearer picture about the diversification of various states and to facilitate the comparison among them over years, we require diversification of all the states computed from same data source using same diversification tool. So, the need for a separate analysis to find out the crop diversification was felt.

4. ANALYSIS OF CROP DIVERSIFICATION

The extent of crop diversification in all the Indian states were estimated using the data on area under different crops published by Ministry of Agriculture & Farmers Welfare, Government of India using Herfindahl-Hirschman index (H.I) for a period of 18 years from 2000-01 to 2017-18. A total of 43 crops were used for this analysis.

4.1 Herfindahl Index (H.I)

$$H.I = \sum_{i=1}^n \left(\frac{a_i}{A}\right)^2$$

a_i - Area under i^{th} crop

A - Total cropped area

H.I ranges from a value of 0 to 1, the more it is close to 0, the more diversified a state is and vice-versa.

4.2 H.I of Indian states

NORTH

YEARS	Haryana	H.P	J&K	Punjab	Uttarakhand	U.P
2000-01	0.254	0.289	0.236	0.382	0.215	0.253
2001-02	0.238	0.290	0.231	0.370	0.224	0.255
2002-03	0.249	0.293	0.234	0.378	0.238	0.257
2003-04	0.239	0.293	0.231	0.385	0.234	0.262
2004-05	0.238	0.295	0.227	0.384	0.226	0.263
2005-06	0.233	0.294	0.233	0.381	0.225	0.260
2006-07	0.246	0.290	0.226	0.375	0.223	0.258
2007-08	0.258	0.293	0.223	0.375	0.217	0.260
2008-09	0.257	0.290	0.221	0.386	0.226	0.266
2009-10	0.266	0.286	0.222	0.392	0.228	0.269
2010-11	0.260	0.288	0.222	0.395	0.225	0.264
2011-12	0.258	0.265	0.212	0.391	0.205	0.266
2012-13	0.269	0.255	0.207	0.391	0.202	0.265
2013-14	0.269	0.255	0.207	0.393	0.200	0.266
2014-15	0.277	0.246	0.193	0.395	0.198	0.266
2015-16	0.279	0.249	0.222	0.405	0.206	0.266
2016-17	0.271	0.247	0.214	0.410	0.208	0.260
2017-18	0.259	0.243	0.220	0.409	0.207	0.265

H.P- Himachal Pradesh, J&K- Jammu & Kashmir, U.P- Uttar Pradesh

Table 4.1. Herfindahl Index of northern states of India

SOUTH

YEARS	A.P	Karnataka	Kerala	T.N
2000-01	0.185	0.082	0.209	0.204
2001-02	0.173	0.083	0.222	0.208
2002-03	0.135	0.081	0.204	0.182
2003-04	0.128	0.081	0.204	0.158
2004-05	0.137	0.079	0.203	0.196
2005-06	0.162	0.080	0.202	0.208
2006-07	0.164	0.075	0.205	0.201
2007-08	0.159	0.073	0.206	0.185
2008-09	0.170	0.075	0.204	0.198
2009-10	0.144	0.072	0.207	0.205
2010-11	0.188	0.073	0.218	0.208
2011-12	0.173	0.072	0.215	0.202
2012-13	0.154	0.074	0.225	0.172
2013-14	0.172	0.074	0.234	0.168
2014-15	0.176	0.071	0.204	0.184
2015-16	0.161	0.073	0.209	0.209
2016-17	0.168	0.073	0.212	0.171
2017-18	0.186	0.074	0.216	0.209

A.P- Andhra Pradesh, T.N- Tamil Nadu

Table 4.2. Herfindahl Index of southern states of India

WEST

Years	Goa	Gujarat	MH	Rajasthan	M.P
2000-01	0.468	0.129	0.134	0.190	0.170
2001-02	0.524	0.128	0.140	0.194	0.169
2002-03	0.477	0.129	0.130	0.175	0.166
2003-04	0.467	0.124	0.118	0.213	0.164
2004-05	0.463	0.127	0.123	0.179	0.169
2005-06	0.465	0.124	0.119	0.182	0.165
2006-07	0.447	0.127	0.109	0.184	0.171
2007-08	0.450	0.129	0.105	0.180	0.178
2008-09	0.443	0.129	0.114	0.177	0.176
2009-10	0.443	0.139	0.113	0.178	0.180
2010-11	0.443	0.132	0.108	0.171	0.178
2011-12	0.421	0.133	0.112	0.162	0.187
2012-13	0.449	0.128	0.116	0.149	0.193
2013-14	0.417	0.128	0.110	0.154	0.190
2014-15	0.417	0.141	0.116	0.153	0.180
2015-16	0.464	0.145	0.119	0.153	0.181
2016-17	0.433	0.133	0.113	0.151	0.170
2017-18	0.446	0.146	0.118	0.152	0.159

M.H- Maharashtra, M.P- Madhya Pradesh

Table 4.3. Herfindahl Index of western states of India

EAST

YEARS	Meghalaya	A.P	Bihar	Mizoram	Nagaland	Odisha	Sikkim	W.B	Assam	Tripura	Jharkhand	Chattisgarh	Manipur
2000-01	0.252	0.359	0.339	0.444	0.357	0.580	0.205	0.485	0.514	0.585	0.641	0.719	0.774
2001-02	0.263	0.355	0.337	0.460	0.310	0.572	0.196	0.512	0.502	0.628	0.626	0.702	0.787
2002-03	0.260	0.372	0.337	0.505	0.292	0.602	0.194	0.504	0.508	0.629	0.620	0.703	0.770
2003-04	0.260	0.375	0.333	0.499	0.269	0.582	0.188	0.494	0.506	0.605	0.570	0.685	0.743
2004-05	0.270	0.382	0.319	0.460	0.250	0.558	0.185	0.499	0.502	0.603	0.540	0.678	0.746
2005-06	0.249	0.369	0.324	0.436	0.242	0.556	0.188	0.501	0.508	0.598	0.550	0.670	0.770
2006-07	0.236	0.342	0.327	0.370	0.275	0.546	0.188	0.478	0.468	0.577	0.475	0.676	0.738
2007-08	0.252	0.360	0.316	0.492	0.308	0.545	0.204	0.473	0.493	0.563	0.466	0.668	0.769
2008-09	0.251	0.293	0.322	0.287	0.312	0.543	0.194	0.500	0.512	0.546	0.467	0.673	0.746
2009-10	0.237	0.355	0.305	0.288	0.238	0.537	0.198	0.483	0.500	0.493	0.437	0.654	0.756
2010-11	0.264	0.368	0.284	0.274	0.298	0.601	0.211	0.480	0.507	0.576	0.358	0.663	0.533
2011-12	0.248	0.331	0.303	0.205	0.280	0.585	0.195	0.497	0.496	0.494	0.343	0.641	0.520
2012-13	0.213	0.284	0.298	0.165	0.265	0.584	0.183	0.478	0.476	0.445	0.335	0.640	0.389
2013-14	0.236	0.269	0.290	0.165	0.285	0.596	0.176	0.455	0.480	0.473	0.336	0.624	0.458
2014-15	0.223	0.257	0.299	0.162	0.283	0.601	0.205	0.445	0.479	0.450	0.377	0.616	0.473
2015-16	0.225	0.253	0.295	0.156	0.288	0.601	0.170	0.448	0.478	0.448	0.391	0.598	0.492
2016-17	0.219	0.259	0.301	0.159	0.280	0.596	0.175	0.450	0.478	0.434	0.340	0.594	0.478
2017-18	0.220	0.258	0.304	0.158	0.278	0.599	0.192	0.429	0.475	0.426	0.326	0.606	0.482

A.P- Arunachal Pradesh, W.B- West Bengal

Table 4.4. Herfindahl Index of eastern states of India

4.3 Interpretation of H.I of Indian states

From the analysis of extent of crop diversification in various Indian states, it was clear that the western and southern states were diversified from the beginning of the current century and continued to be diversified over the years. The eastern states showed mixed results with a few states moving towards crop diversification and a few states moving towards crop specialization. In the north, except Punjab, all other states show diversified nature but Punjab continued to be specialized over the years.

4.4 Factors contributing to diversification

The following factors were correlated with H.I to identify their possible relation with diversification:

- **Total value of output per hectare**

It was found that diversifying states show more increased value of output/ha.

e.g., Chhattisgarh, $r = -0.955$

The net return per unit of cultivated area are about 28 percent higher on diversified farms.

- **Cropping intensity**

Crop specializing states show increased cropping intensity.

e.g., Uttar Pradesh, $r = 0.684$

High diversification index- low cropping intensity- perennial horticultural crops (Kumar *et al.*, 2018).

- **Size of land holding**

Crop diversifying states- lesser land holding size- shrinks faster compared to specializing states. It is the external infrastructure determines extent of diversification- not the size of land holding (Chand, 1995).

- **Gross Cropped Area (GCA)**

Crop specializing states show more increase in gross cropped area.

e.g., Punjab, $r = 0.546$

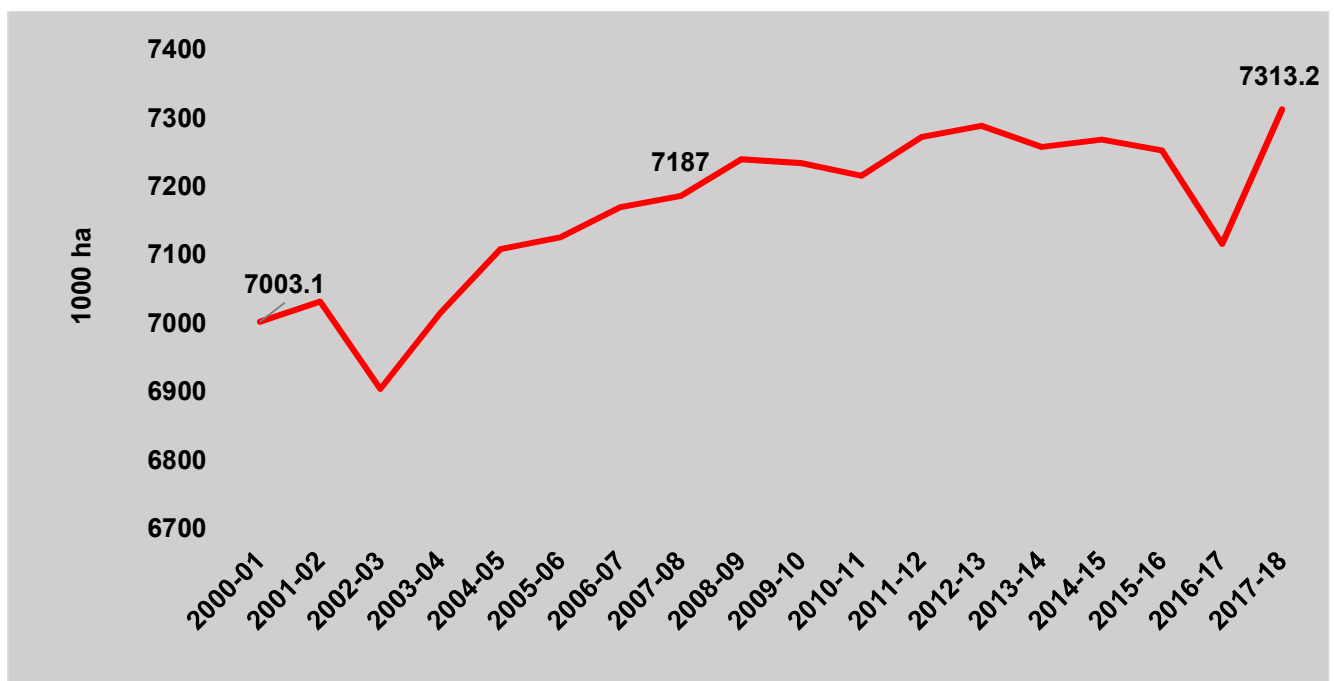


Fig. 4.1. Gross Cropped Area of Punjab from 2000-01 to 2017-18

- **Net Sown Area (NSA)**

Crop diversifying states show an increase in net sown area.

e.g., Manipur, $r = -0.915$

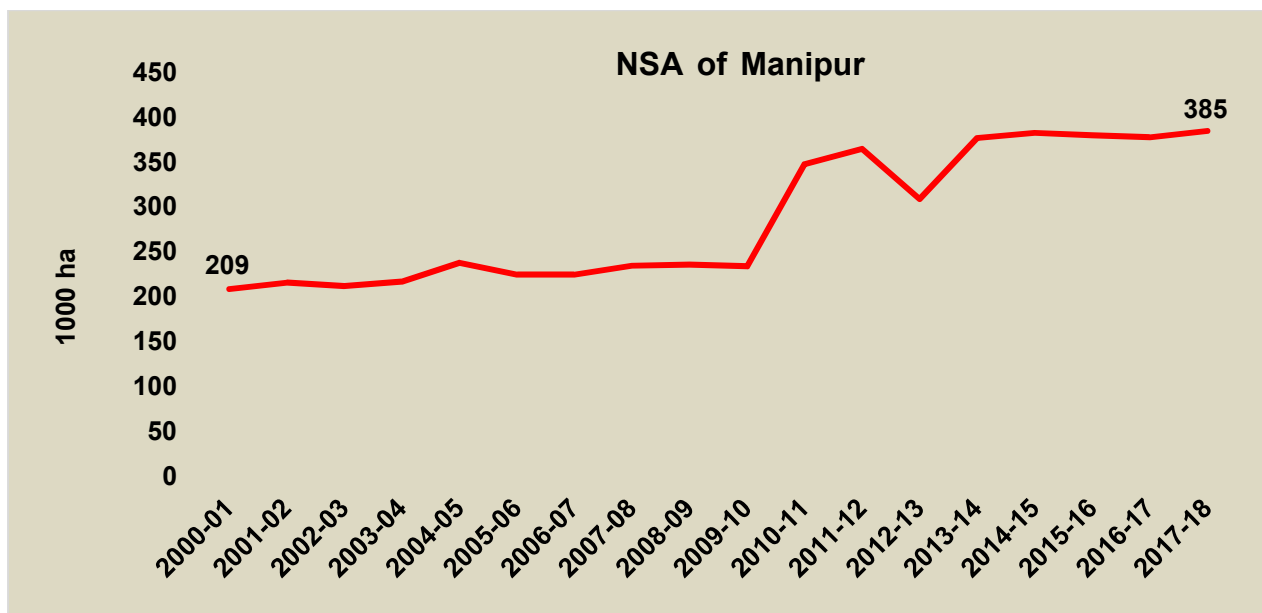


Fig. 4.2. Net Sown Area of Manipur from 2000-01 to 2017-18

4.5 Results

The results of the analysis showed that Karnataka was the most diversified state followed by Gujarat, while Chhattisgarh and Odisha were found to be the least diversified states. The most diversifying and most specializing states were Manipur and Punjab respectively.

As a whole, states with increased crop diversification showed more value of output per hectare, lower land holding size and lower cropping intensity. The Gross Cropped Area tends to be increasing at a greater pace in crop specializing states, while the Net Sown Area was increasing in crop diversifying states. Kumar *et al.* (2018) used Gibbs Martin Index for analysing the extent of crop diversification in Himachal Pradesh and they found moderate correlation (0.48) between diversification and per capita income.

5. SCENARIO OF KERALA

Over the years, from 2003-04 to 2017-18, Kerala showed a relatively stable value of H.I (Kalaiselvi, 2012) with a slight increase from 0.209 to 0.216. Among all the factors correlated with H.I in the analysis, only value of output per hectare showed an increasing trend in Kerala.

Factor under consideration	2000-01	2017-18
Cropping intensity	137%	128%
Land holding size	0.24ha	0.18ha
Gross Cropped Area	3.02 M ha	2.62 M ha
Net Sown Area	2.20 M ha	2.04 M ha
Value of output/ha	₹35383.95	₹133501.9

Table 5.1. Change in factors contributing to diversification in Kerala over years

Districts in Kerala

YEARS	KLM	EKM	WYD	KNR	KSRD	TCR	KTM	KKD	MLPRM	PTNM	ALPY	IDUKKI	PLKD	TVM
2003-04	0.23089	0.22821	0.23467	0.21999	0.23917	0.30929	0.38507	0.40692	0.26903	0.30318	0.32208	0.22181	0.26697	0.31042
2004-05	0.22434	0.22945	0.22743	0.21946	0.23857	0.29254	0.37635	0.40089	0.27425	0.29978	0.32155	0.21099	0.26634	0.30804
2005-06	0.22838	0.23069	0.22463	0.2185	0.23748	0.30095	0.37514	0.40038	0.27719	0.3091	0.32803	0.21485	0.2686	0.31305
2006-07	0.23814	0.2358	0.2121	0.24116	0.2543	0.32304	0.37447	0.40631	0.29738	0.33958	0.32388	0.21003	0.25081	0.31685
2007-08	0.23843	0.249	0.15623	0.24746	0.26065	0.33122	0.39524	0.42161	0.30197	0.36017	0.32265	0.18149	0.2439	0.31562
2008-09	0.24358	0.25739	0.23641	0.24453	0.26213	0.31259	0.39577	0.44614	0.30957	0.37086	0.31581	0.16353	0.24123	0.30118
2009-10	0.24896	0.26346	0.2499	0.24686	0.27683	0.3182	0.42458	0.43804	0.31869	0.37341	0.31761	0.19958	0.24731	0.32106
2010-11	0.24966	0.26678	0.25718	0.24892	0.27328	0.33383	0.42868	0.44685	0.31632	0.3822	0.32011	0.2228	0.23445	0.31691
2011-12	0.25244	0.27572	0.26993	0.27348	0.28514	0.35926	0.4154	0.46154	0.32818	0.39233	0.31819	0.16137	0.23058	0.32383
2012-13	0.25634	0.29592	0.26806	0.26471	0.28658	0.35553	0.43553	0.45771	0.32237	0.4064	0.322	0.16032	0.22649	0.32428
2013-14	0.27735	0.2983	0.25342	0.27092	0.2903	0.35931	0.44727	0.46125	0.32484	0.40373	0.31985	0.16122	0.22491	0.3158
2014-15	0.25678	0.29505	0.25983	0.27501	0.30132	0.34577	0.44135	0.45682	0.3112	0.39823	0.3118	0.15901	0.22649	0.31639
2015-16	0.25788	0.2932	0.2458	0.28005	0.29569	0.34033	0.44023	0.44829	0.31265	0.39809	0.29807	0.15848	0.22902	0.31638
2016-17	0.25883	0.29779	0.27073	0.28105	0.30055	0.34473	0.44027	0.45039	0.31645	0.39785	0.30064	0.15961	0.21356	0.31799
2017-18	0.25569	0.29413	0.26976	0.27502	0.30588	0.34483	0.4349	0.43814	0.32031	0.39028	0.31708	0.15976	0.23218	0.30919

KLM- Kollam, EKM- Ernakulam, WYD- Wayanad, KNR- Kannur, KSRD- Kasargod, TCR- Thrissur, KTM- Kottayam, KKD- Kozhikode, MLPRM- Malappuram, PTNM- Pathanamthitta, ALPY- Alapuzha, PLKD- Palakkad, TVM- Trivandrum

Table 5.1. H.I of districts in Kerala

Over the years, Kerala remained as a crop diversified state with a very slight increase in H. I value. Idukki, with an H.I value of 0.160, was found to be the most crop diversified district in Kerala whereas Kozhikode was the least diversified district (0.438).

6. BENEFITS OF CROP DIVERSIFICATION

- **Increased income**

Crop diversification is found to increase the per-capita income as well as the value of output/ha (Kumar *et al.*, 2018)

- **Nutritional security**

The more number and variety of crops a farmer has in his home, the less he has to buy from the market and thereby he gets more access to better nutrition (Ittyerah, 2013).

- **Self sufficiency**

The more crops a farmer produce, the more self-sufficient he is (Bazaz and Haq, 2013).

- **Manage price risk**

It is based on the assumption that not all crops will suffer low market price simultaneously and the loss in price of one crop will be covered up by other (Khanam *et al.*, 2018).

7. LIMITATIONS OF CROP DIVERSIFICATION

- **Farm resource**

The resources available with the farmer like capital may limit him from going towards high value crops which require more capital input.

- **Size of farm**

It is easy for a farmer with small land holding size to diversify than for a farmer with larger holding owing to labour and other requirements.

- **External infrastructure**

Production of variety of crops is not enough for a farmer. The availability of marketing facilities is conducive for him to sell what he has produced.

- **Wrong selection of crops**

Selecting crops which has a positive or negative correlation in its price can be detrimental to the farmer in the long run.

- **Agro-climatic conditions**

Even though there exist crops with uncorrelated prices, agro-climatic conditions may limit the practical extent of diversification among such crops.

8. CONCLUSION

The study tried to analyse the extent of crop diversification in various Indian states starting from the dawn of the century till 2017-18. A total of 43 crops was considered to get a wider picture of the extent of crop diversification in the country.

The analysis of extent of crop diversification across Indian states over the years and its possible relation to the contributing factors, an inference could be drawn that crop diversification is a key for reviving Indian farm sector. The extent of diversification and selection of crops should be determined considering the land holding size, price of crops, input requirements, agro-climatic conditions and other regional factors.

However, it could also be seen that in states like Punjab, the farmers are moving towards crop specialization. The major reason for this move can be the assured procurement of the rice and wheat produced in these states by the government at minimum support price. This guarantees a market as well as fixed price for the farmers which stops them from moving towards other crops. Crop diversification can be used as a key for reviving Indian farm sector as diversified farms give more value of output/ha, increase in demand for high value crops, as it reduces the price risk and in the present era of increased marketing options.

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10. DISCUSSION- QUESTIONS AND ANSWERS

1. A few of the north eastern states are diversifying over the years. Do you really think diversification is the way forward for those states?

States diversify for a number of reasons. As seen from my study, there are a number of benefits of crop diversification for the farmer, particularly if he is a small or marginal land holder. North eastern states are now more diversifying towards high value horticultural crops, so I think that is a good move.

2. What will be the impact on food security of the country if the food grain producing states tend to diversify?

Food security doesn't merely mean consumption of food grains. Recent studies show that the food consumption pattern of Indians is changing and more fruits and vegetables are being added into the daily diet. Also, India produces enough food grains for the country's population and the need of the hour is availability of nutritious food, which could be fulfilled by diversifying to high value horticultural crops.

3. Why have you used 43 crops for the analysis?

I tried to include as many crops as possible. I could get the data on area under crops from 2000-01 to 2017-18 for 43 crops from a single source, so I went for that.

4. What all are the crops you could suggest for Kerala to diversify into?

Kerala is already a diversified state, still there is scope for promotion of new fruit crops in Kerala like dragon fruit, avocado, etc.

5. Don't you think Kerala should increase the area under food crops instead of going for commercial crops?

If the farmers are better off by cultivating commercial crops, there is no need to press them towards cultivating food crops. They could just buy them.

6. What might be the reason for Karnataka to be the most diversified state?

Karnataka has 10 agro-climatic zones and a rich variety of topographical as well as climatic conditions which allow the state to grow a wide variety of crops.

KERALA AGRICULTURAL UNIVERSITY
COLLEGE OF HORTICULTURE, VELLANIKKARA
Department of Agricultural Economics
AG ECON 591: Masters Seminar

Name : Tomson K. S.

Venue : Seminar hall

Admission No. : 2018-11-050

Date : 21-12-2019

Major advisor : Dr. Anil Kuruvila

Time : 10.45 am

Crop diversification- Is it a key for reviving Indian farm sector?

Abstract

India went through a hard time ensuring the food security of its population after independence. The Indian economy had to face severe discrepancy in balance of payments due to increasing food grain imports. The green revolution changed the scenario, making the country self-sufficient by early 1990s. When sustainability of the green revolution tracts became a concern, owing to plateauing of yields, land degradation, ground water exploitation and indiscriminate use of fertilizers and pesticides, crop diversification was proposed as a way out (Jha, 1995).

Crop diversification refers to the addition of new crops or cropping systems to agricultural production on a particular farm taking into account the different returns from value added crops with complementary marketing opportunities (Khanam *et al.*, 2018). Studying the crop diversification pattern of India, Saha (2013) reported that the northern and eastern states showed an increasing trend towards crop specialization, whereas the southern and western states were towards crop diversification. Singh (2015) contradicted the earlier findings and reported that the states like Punjab, Bihar, Jharkhand, Odisha, Assam and West Bengal showed moderate levels of crop diversification.

The extent of crop diversification in the Indian states were estimated for a period of 18 years from 2000-01 to 2017-18 using the data on area under different crops published by Ministry of Agriculture & Farmers Welfare, Government of India. Herfindahl-Hirschman index (H.I) was used to elicit the extent of diversification. The results showed that Karnataka was the most diversified state followed by Gujarat, while Chhattisgarh and Odisha were found to be the least diversified states. The most diversifying and most specializing states during this period were Manipur and Punjab respectively.

The analysis showed that those states with increased crop diversification had more value of output per hectare, lower land holding size and lower cropping intensity. The Gross Cropped Area increased at a greater pace in crop specializing states, while the Net Sown Area increased in crop diversifying states. Kumar *et al.* (2018) used Gibbs Martin Index for analysing the extent of crop diversification in Himachal Pradesh and they found a moderate correlation ($r = 0.48$) between diversification and per capita income.

Kerala showed relatively stable values of H.I (Kalaiselvi, 2012) with a slight increase (0.209 to 0.216) during the period from 2003-04 to 2017-18. Among all the factors correlated with H.I in the analysis, only value of output per hectare showed an increasing trend in Kerala. Idukki, with an H.I value of 0.160, was found to be the most crop diversified district in Kerala, whereas Kozhikode was the least diversified district (0.438).

The analysis of extent of crop diversification across the Indian states over the years and its relationship with the contributing factors affirms that crop diversification is one of the key factors in reviving Indian farm sector. The extent of diversification and selection of crops should be determined considering the land holding size, price of crops, input requirements, agro-climatic conditions and other regional factors.

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