

An analysis of income from crop diversification in Haryana

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Abstract

Objectives: The study aims to assess the status and magnitude of income generated from crop diversification and how it is impacted by various factors in different climatic conditions. It also examines the viability of crop diversification related to several household necessities and food security.

Methods: The analysis is done via secondary data from Ministry of Agriculture. The data covers crops and allied sectors to evaluate the income generated from crop diversification and its magnitude. The gross cropped area (GCA) is also examined for major crops in order to assess the change in area and how production and yield are affected. Both qualitative and quantitative techniques are comprised for an extensive analysis of the crop diversification issue to reach concluding remarks. The term crop diversification can be interpreted in several ways such as shift from agricultural to non-agricultural, shift from food grains to High Yielding Variety (HYV).

Findings: It was found that the share of forestry and logging has declined in agricultural income while fisheries and livestock have gained. Several crop groups have also gained. However there was a loss in fodder crops, pulses and cereals. Results of change in area, production and yield indicate gains for cotton, gram, sugarcane, wheat and maize. The percentage of GCA has only increased for certain major crops while the others are becoming negative. Crop diversification is intended to give a wider choice in the production of variety of crops in a given area so as to expand production related activities and lessen risk.

Application: The future strategy towards crop diversification should favor sustainable crop instead of water incentive crops. Dual objective of food and nutritional security along with higher income for farmers will not be a distant dream with proper implementation and execution of crop diversification.

Keywords: Crop-diversification, GCA, Agriculture, Yield, Income.

1. Introduction

India is a country of billion plus population. More than 70% of India's population lives in rural areas whose main occupation of the workers is in agriculture. Moreover, Indian agriculture is characterized by small farm holdings. The average farm size in the country is 1.57 hectares. In [1] around 93% of farmers have land holdings smaller than 4 hectares and they cultivate nearly 55% of the arable land. In [2] the other hand, only 1.6% of the farmers have operational land holdings above 10 hectares and they utilize 17.4% of the total cultivated land. Owing to diverse agro-climatic conditions in the country, a large number of agricultural items are produced. 'Self-reliance' in food grains has been the cornerstone of our policies in the past 50 years. As a result, around 63% of the gross cropped area is under food grain crops (cereals and pulses) [3]. With a vast population, agriculture has been increasing in India, but it still faces problem of under-nutrition. The pattern of crops is increasingly influenced by economic and technological factors [4]. This is due to expansion in irrigation, infrastructure development, penetration of rural markets, development and spread of short duration and drought resistant crop technologies [5] of late, high value crops such as fruits and vegetables have attracted the farmers and acreage under these crops is increasing continuously.

Crop diversification in northern states of India (i.e. Haryana) is generally viewed as a shift from traditionally grown less remunerative crops to more remunerative crops. The term crop diversification can be interpreted in several ways such as shift from agricultural to non-agricultural, shift from food grains to HYV. This study focuses on crop diversification from one crop to other crop. Agricultural diversification towards high-value crops can potentially increase farm incomes, especially in a country like India where demand for high-value food products has been increasing more quickly than that for staple crops.

In [6] the analysis in this article is based on secondary data collected from Agricultural Statistics at a Glance published by the Ministry of Agriculture, Government of India and Fertilizer statistics published by Fertilizer Association of India, New Delhi. The period covered for this study is from 2004-05 to the recent period.

The crop sub-sector has been steadily diversifying in northern states of India i.e. Haryana. Evidences show that the non-foodgrain crops have gradually replaced food grain crops. Non-foodgrain crops, like oilseeds, fruits, vegetables, spices and sugarcane are primarily substituted for coarse cereals in search of higher incomes. Post green-revolution wheat and rice growers have been experimental and ventured into crop diversification for higher income and returns. The study has covered a period from 2004-05 to 2011-12 because significant change in crop pattern has taken place after 2000. A comparison of changes in these two years 2004-05 and 2011-12 is expected to provide some useful insights for future sustainability of agriculture [7].

1.1. Objectives

On opposite to this background of traditional agricultural pattern, the present study has been concluded the outcome to analyze the impact, issues and major challenges as also to evaluate the success of diversification of agricultural crops i.e. HYV paddy and wheat in Haryana. The present study concluded the following major objectives keeping in view that the drastic and sudden shift in cropping pattern is derived to be determined by the effects of several factors:

1. To assess the status and magnitude of income generated from crop diversification in Haryana, India;
2. To analyze the impact of physical, socio-economic and technological factors on crop diversification in the context of different agro climatic zones;
3. To critically examine the viability of crop diversification related to various house hold necessities i.e. food and fodder self-sufficiency requirement, investment capacity in different agro climatic zones; training of farmers, storage and processing.

2. Methodology

2.1. Data collection

Secondary data were taken from the Statistical Abstract of Haryana 2014. The study comprised both quantitative and qualitative techniques in terms of methods for an extensive and latest analysis of the issue of crop diversification at hand, and to reach at the concluding remarks. The secondary information from various sources of Government of India was deployed with both open and closed ended type information used to gather both quantitative and qualitative data. The secondary search was conducted with the target population as mentioned above.

3. Results and Discussion

At the outset, here present income drawn from sub-sectors of agriculture. Table 1 indicates the share of income from sub-sectors of agriculture in India from 2004-05 and 2011-12.

Table 1. Agro-climatic, socio-economic cum geographic status in Haryana

State	District	Agro-climatic zone	Rainfall (mm)	Mean temperature (°C)	Main Crops	Literacy Rate (%)
Haryana	Jhajjar	Eastern Zone	532	34.4	W,P,M1,M,J	84.34
Haryana	Hisar	Western Zone	429	35.5	W,P,M1,C,M,J	75.00
Haryana	Sirsa	North-Western Zone	102	39.5	W,P,M1,C,M,J	68.00

*W-Wheat, P-Paddy, M1-Mustard, C-Cotton, M-Millet, J-Jowar

** Data taken from government agency of the respective states

These include (a) agriculture, (b) forestry & logging, (c) fishing. It may be observed that percent share of crops and livestock increased marginally between 2004-05 and 2011-12. It has increased from 84.30% of total agriculture in 2004-05 to 84.95% in 2011-12 as shown in Table 2.

Table 2 shows that there is, evidently, not a major shift. On the other hand, proportion of income from forestry and logging has declined through this period. Fisheries emerged as the rising sub-sector of agriculture. The higher growth in inland fisheries was basically attributed to the overwhelming progress in aquaculture, both in fresh and brackish waters.

Table 2. Share of income from sub-sectors of agriculture in India (2004-05 to 2011-12)

Year	Agriculture	Forestry and logging	Fishing	Agriculture, forestry and fishing
2004-05	476634(84.30)*	61640(10.90)	27152(4.80)	565426(100.00)
2005-06	502996(84.61)	62742(10.55)	28749(4.84)	594487(100.00)
2006-07	523745(84.59)	64795(10.46)	30650(4.95)	619190(100.00)
2007-08	556956(85.02)	65697(10.03)	32427(4.95)	655080(100.00)
2008-09	555442(84.71)	66932(10.21)	33315(5.08)	655689(100.00)
2009-10	557715(84.38)	68877(10.42)	34395(5.20)	660987(100.00)
2010-11	610905(85.11)	70509(9.82)	36400(5.07)	717814(100.00)
2011-12	643543(85.37)	71816(9.53)	38473(5.10)	753832(100.00)
2012-13*	649424(84.95)	73864(9.66)	41222(5.39)	764510(100.00)

Source: Government of India, 2014

* Denotes percentages of Total Agriculture

Base Year: 2004-05

Its share increased from 4.80 to 5.39% during this period. The remarkable progress in fisheries sector was the outcome of a well-knit strategy to accomplish multiple goals of augmenting production, enhancing export, and overcoming poverty of fisher men. Several production and development-oriented programs were launched in the potential areas. To sum up, some change in shares of sub-sectors could be observed but it cannot be termed as a major shift. After analyzing share of income from agriculture, forestry and fishing, the percentage share of important crop groups during 2004-05 and 2011-12 is examined.

Table 3. Percentage of GCA under important crops in India (2004-05 and 2011-12)

Crop	% share in 2004-05	% share in 2011-12	% change
Cereals	51.57	51.20	-0.72
Pulses	12.43	11.98	-3.62
Sugarcane	2.50	2.82	12.80
Spices	1.6	1.86	16.25
Fruits	2.04	2.03	-0.49
Vegetables	2.86	2.79	-2.45
Oilseed	15.89	14.43	-9.19
Fibers including cotton	4.92	6.73	36.79
Plantation crops	1.16	1.33	14.66
Fodder crops	5.01	3.96	-20.96
Others	0.2	0.87	335.00
All crops	100.00	100.00	0.00

Source: Fertilizer Statistics, FAI, 2013-14

Base Year: 2004-05

To further the study, important crop groups ranging from cereals (51.57%), pulses (12.43%) to fodder crops (5.01%) are included. Table 3 clearly indicates that cereals occupying an area of 51.57% of GCA in 2004-05 are dominant crops in India. Oilseeds and pulses were allotted 15.89 and 12.43% respectively. Fodder crops (5.01%) and fibers including cotton (4.92%) fall next. Vegetables (2.86%), sugarcane (2.50%) and fruits (2.04%) received more than 2% of cultivated area.

It may be observed that share of GCA under cereals (-0.72%) and pulses (-3.62%) declined in 2011-12 but the pattern remains by and large the same.

An analysis of percentage change in share of GCA under important crop groups between 2004-05 and 2011-12 indicates that highest percentage change could be noticed in case of fibers (36.79%) followed by spices (16.25%) and plantation crops (14.66%).

Nevertheless, percentage change under fodder crops (-20.96%), oilseeds (-9.19%) and pulses (-3.62%) was found negative. It could be due to variety of factors such as relative profitability, irrigation and availability of technology.

Table 4. Percentage of GCA under Important Food Grains in India (2004-05 and 2011-12) (Base Year: 2004-05)

Crop	% share in 2004-05	% share in 2011-12	% change
Rice	22.33	22.33	0.00
Jowar	4.76	3.17	-33.40
Bajara	4.86	4.51	-7.20
Maize	3.94	4.41	11.93
Wheat	13.89	15.41	10.94
Gram	3.52	3.37	-4.26
Tur	1.84	1.93	4.89

Source: FAI, 2013-14

It would be interesting to analyze differences of GCA in important cereal crops. Table 3 demonstrated percentage change in share of important cereal crops in gross cropped area during 2004-05 and 2011-12. In Table 4 major food grains such as rice, jowar, bajra, maize, wheat, gram and tur are included. An analysis of data for the years 2004-05 and 2011-12 indicates nil change in area under rice. Maize (11.93%) followed by wheat (10.94%) occupied the highest percentage of GCA in 2004-05 as well as in 2011-12. Among coarse cereals, bajra and jowar were found important.

Table 5. Percentage of area irrigated under important crops in India (2004-05 and 2011-12)

Crop	% share in 2004-05	% share in 2011-12	% change
Rice	52.60	58.70	11.60
Jowar	7.50	9.70	81.33
Bajara	6.30	8.5	96.83
Maize	19.1	25.30	31.94
Wheat	88.4	92.90	6.90
Barley	63.8	74.80	9.56
Total Cereals	49.1	57.70	12.42
Gram	30.2	33.50	20.20
Total Pulses	13.6	16.10	44.85
Total Food grains	42.2	49.80	14.45
Total Oilseeds	24.7	27.60	24.70
Sugarcane	92.3	94.30	6.61
Cotton	34.1	30.40	17.89
All Crops	40.3	45.80	15.14

Source: Fertilizer Statistics, FAI, 2013-14

Base Year: 2004-05

Further results depict a negative trend in percentage change of GCA for jowar (-33.40%) followed by bajra (-7.20%) and gram (-4.26%). After analyzing the GCA for major food grains, it is important to analyze the percentage of area irrigated under important crops in India during 2004-05 and 2011-12.

Table 5 indicates percentage change of area irrigated under important crops in India during 2004-05 and 2011-12 for fourteen major crops which show that sugarcane (92.3%) has the highest percentage share followed by wheat (88.4%), barley (63.8%), rice (52.60%) and total cereals (49.1%) during 2004-05. The same pattern of percentage share was found in the year 2011-12. Further, the analysis of percentage change of area irrigated indicates that the highest change occurred in bajra (96.83%) followed by jowar (81.33%) and total pulses (44.85%) whereas the least change in percentage area irrigated could be observed for sugarcane (6.61%), wheat (6.90%) and barley (9.56%).

For understanding of changes in the area, production and yield of important crops in India, it is important to calculate the percentage change in area, production and yield between 2004-05 and 2011-12. Table 6 demonstrates a percentage change in area, production and yield of major crops like rice, jowar, bajra, maize, wheat, barley, total cereals, gram, total pulses, total food grains, total oilseeds, sugarcane and cotton. An analysis of Table 6 clearly indicates highest percentage change in area during this period under sugarcane (36.53%) followed by cotton (36.31%), gram (26.91%) whereas there is a negative percentage change in jowar (-31.65%), bajra (-20.96%) and total oilseeds (-3.77%).

In terms of production, highest percentage change occurred in cotton (108.30%) followed by gram (61.49%), maize (57.06%) whereas there is a negative percentage change in production of bajra (27.09%). After analyzing area and production of these important crops, it is found that there is an increasing trend in the yield. A positive percentage change occurred in the yield of all major crops. The highest percentage change was recorded in the productivity of cotton (52.83%) followed by bajra (39.46%), and total pulses (36.74%); whereas the least percentage change could be observed in case of sugarcane (5.41%), jowar (6.65%) and wheat (22.10%).

Table 6. Percentage change in area, production and yield of important crops in India (2004-05 and 2011-12)

Crop							Area- '000 has		
							Production- '000 Tonnes		
							Yield- Kgs/ha		
	2004-05			2012-13			Percentage Change		
	Area	Production	Yield	Area	Production	Yield	Area	Production	Yield
Rice	41907	83131.7	1984	42753.90	105231.60	2461	2.02	26.58	24.04
Jowar	9092.30	7244.30	797	6214.40	5281.50	850	-31.65	-27.09	6.65
Bajara	9232.90	7931.30	859	7297.40	8742.00	1198	-20.96	10.22	39.46
Maize	7430	14172	1907	8672.6	22258.2	2566	16.72	57.06	34.56
Wheat	26383	68636.9	2602	30003.3	93506.5	3177	13.72	36.23	22.10
Barley	616.5	1207.1	1958	695.1	1752.4	2521	12.75	45.17	28.75
Total Cereals	97315	185233.3	1903	97518.9	238782.3	2449	0.21	28.91	28.69
Gram	6714.6	5469.4	815	8521.8	8832.5	1036	26.91	61.49	27.12
Total Pulses	22763	13129.5	577	23256.8	18342.5	789	2.17	39.70	36.74
Total Food grains	120078	198362.8	1652	120776	257124.7	2129	0.58	29.62	28.87
Total Oilseeds	27523	24353.5	885	26484.4	30939.7	1168	-3.77	27.04	31.98
Sugarcane	3661.5	237088.4	64752	4998.9	341199.7	68254	36.53	43.91	5.41
Cotton	8786.6	16428.6	318	11977	34220	486	36.31	108.30	52.83

Source: Fertilizer Statistics, FAI, 2013-14

Base Year: 2004-05

Table 7 shows the achievements of targets of production in major crops in India. After measuring the percentage change in GCA, irrigated area and area, production and yield for the major crops in India during 2004-05 and 2011-12 it is important to analyze achievement of the targets.

Table 7. Achievement of targets of production of major crops in India (2004-05 & 2011-12)

Item	2004-05			2011-12		
	Target	Achievement	% achieved	Target	Achievement	% achieved
Rice	93.5	83.13	88.91	102	105.3	103.24
Wheat	79.5	68.64	86.34	84	94.88	112.95
Coarse Cereals	36.8	33.46	90.92	42	42.01	100.02
Pulses	15.3	13.13	85.82	17	17.09	100.53
Food grains	225.1	198.36	88.12	245	259.29	105.83
Oilseeds	26.2	24.35	92.94	33.6	30.01	89.32
Sugarcane	270	237.09	87.81	350	361.04	103.15
Cotton	15	16.43	109.53	34	35.2	103.53
Jute & Mesta	11.8	10.27	87.03	12.3	11.4	92.68

*Source: Agriculture Statistics at a Glance MoA, Govt 2005-06 & 2013-14
Base Year: 2004-05*

Table 7 shows that production of cotton (109.53%) exhibited a commendable progress in terms of achieving the target followed by oilseeds (92.94%) and coarse cereals (90.92%) during 2004-05. During 2011-12 wheat has the best recorded for the achievement of the target (112.95%) followed by food grains (105.83%) and cotton (103.53%) [8-13].

4. Conclusions & Policy Implications

In view of climate change, problems of sustainability of agriculture and shift in pattern of food consumption by the population towards high value foods, it is essential to diversify the crop pattern in favor of these crops including pulses and oilseeds in which country is export dependent. The sector is already facing the problem in terms of improving food and nutritional security with declining share of cultivable area in India. There is a need for policies and public investments that promote agricultural productivity and sustainability. An investment in education, roads and research and extension that reduce resource degradation and encourage intensification of inputs is required.

In recent years, agriculture in the country has experienced significant shifts in area under commercial crops, fruits and vegetables. For this the government must improve the policies and make it necessary to make farmers partner in the agro-business development model initiated by state or MNCs. The crop diversification is also essential for small and marginal farmers who constitute four-fifths of the actual numbers of the operational holdings. There must be a larger crop mix for small and marginal farmers on land use among various crop groups like food grain and non-food grain.

These developments have significant implications for diversification of agriculture. Diversification is pivotal as for developing country like India basic staples such as cereals cannot alone support economic growth. Commercial crops are essential for increasing income of farmers and exports. Contract farming is also one efficient way development in agricultural diversification which leads to overall development of the economy. Judicious use of environmental resources such as water which is already scarce shall become significant in the further strategy through research and development in agriculture in India.

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The Publication fee is defrayed by Indian Society for Education and Environment (www.iseeadyar.org)

Cite this article as:

Vishal Dagar, Dr. Param Jit, Dr. Mahua Bhattacharjee, Manurut Lochav. An analysis of income from crop diversification in Haryana. *Indian Journal of Economics and Development*. Vol 6 (11), November 2018.