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Farm Diversification in Haryana, India: Case Studies

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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Case Study

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ABSTRACT

In the late 1960s, the Green Revolution enabled India to overcome a severe food shortage and achieve food grain self-sufficiency, particularly in the case of wheat and paddy. Continuous mono cropping system threatens the sustainability of future agricultural production in terms of soil, water, climate and market parameters which warrants a diversified farming system enabling farmers to use their resources efficiently with its ecological benefits. Recent trends in crop farming witnessed a multifold shift towards paddy and wheat specialization in Haryana. So farm diversification is an important strategy to maintain the sustainability of state agriculture. The present study was undertaken to explore the potential of farm diversification in Haryana. Case studies were conducted among selected farmers from the three districts representing three agro ecological zones of Haryana (Kaithal from AEZ1, Hisar from AEZ2 and Bhiwani from AEZ3). The case study included parameters like area and number of enterprises and cost details and net returns from each diversified enterprise. The study concludes that, various methods utilized by the successful farmers specialized in a particular venture serve as the model for fellow farmers who are similarly interested in the same experience. Subsidies, incentives and training programmes of government

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agencies promoted the farmers to get involved in the allied enterprises. This study highlights the need for incentives and training programmes for further promoting farm diversification in the state.

Keywords: Mono-cropping; diversification; profit.

1. INTRODUCTION

Crop diversification improves food security and enables farmers to produce excess goods for market sales, which contributes to improved income for other household requirements [1]. Agriculture diversification was a solution to problems brought out by globalisation and liberalisation and a way to make agriculture more competitive internationally [2]. Diversification into commercial crops was considered a crucial tactic to boost agricultural income and reduce the risk of crop failure [3]. In the post reform period, agriculture diversification has occurred both across and within the crop, livestock, forestry and fishery sectors. Within agriculture, the share of output and employment in the non-crop sectors has gradually increased. Diversification and monocropping levels vary from state to state [4].

From being a state with a food shortage at its beginning, Haryana has advanced to become a significant provider of the national supply of food grains, mainly because of the state's dynamic political leadership, emerging science and technology, agricultural institutions, land reforms, generous central government assistance, robust infrastructure, improved grain varieties and production technologies [5]. The Green Revolution significantly increased output and brought the significant changes. Upto early 1990s, agriculture played a prominent role in the state economy. However, its contribution to the Gross State Domestic Product (GSDP) steadily dropped after that point. During post reform period, Haryana's cropping pattern underwent a quick transition, with wheat and rice both gaining significant percentages of the total cultivated land, while all other cereals, including pearl millet, sorghum, maize, and barley, were seen to lose ground as a share of the total cropped area [4]. The successful implementation of minimum support price (MSP) and assured procurement regulations, as well as the availability of free energy and affordable submersible pumps and fertilisers, provide a floor for the predominant wheat and paddy cropping pattern [6-8].

The sustainability of the future agricultural production system in terms of soil, water, climate, and market characteristics is threatened by continuous mono cropping and the rice-wheat cropping system. Therefore, special efforts are needed to support diversified farming systems to improve the ground water table, handle issues with procuring and storing farm products and address changes in food consumption patterns, particularly among middle-class and high-income groups [9].

There is a need to overcome the limitations presently existent for specific areas to improve Haryana's farming sector. A study related to commercial dairy farming shows that commercialization and diversification of dairy farming is vital which can be achieved if the constraints are minimized [10]. A study on wheat cultivation in Haryana revealed that extension agencies should demonstrate to the farmers the seed treatment process and keep them updated about recent HYVs [11]. Cultural and demographic attributes of the farmers play an important role in adoption/ rejection of new technologies/alternative methods [12]. A study related to Bajra reported that integrated nutrient management, weed management and moisture conservation practices should be on priority. Innovative / Indigenous / Traditional farmers practices may incorporated in agronomic requirements to sustain the yielding levels [13]. Study related to Bt cotton suggest that farmers should be motivated to adopt the recommended practices of Bt cotton production technology through all possible extension methods [14]. A study related to hi-tech vegetable farming shows that the majority of farmers got short duration trainings i.e. 3-7 days which is not sufficient for such hi- tech farming, so long duration vocational trainings should be organized at centre of excellence for vegetables and other research institutes [15]. Goyal and Goyal [16] reported that frequent fluctuation in prices was the most common constraint during the marketing of onion in Ambala district followed by non-availability of storage facility and lack of awareness of BBY/govt. procurement.

The objective of this study was to explore the potential farm diversification in the state of Haryana through various examples by

conducting a deep assessment of individual diversified farms through the case study method.

2. MATERIALS AND METHODS

A case study is an intensive study about a person, a group of people or a unit, which aims to generalize several units. The case study can also be described as an intensive, systematic investigation of a single individual, group, community or some other unit in which the researcher examines in-depth data relating to several variables. Data in case studies are often, but not exclusively, qualitative. In another way, case study is defined as a research strategy, an empirical investigation that investigates a phenomenon in its real-life context. Personal interviews, observation and records are some techniques that was used in case study.

The present study was conducted in three Haryana state agro ecological zones (AEZ). One district from each agro-ecological zone was chosen (Kaithal from AEZ1, Hisar from AEZ2 and Bhiwani from AEZ3). Case studies were done among selected farmers of the three districts that are representing Haryana's three agro ecological zones. The case study included parameters like area and number of enterprises; the details of cost and net returns from each diversified farm were represented separately by before and after diversification changes.

3. CASE STUDIES OF DIVERSIFIED FARMS

3.1 Case Study -1

Farmer 1 is a 52 year old farmer from Satrod-kalan village in Hisar first block of Hisar district. He has 20 years of experience in crop farming. He has 5 acres of cultivable land. In his farm, he cultivates bitter gourd and chilli from June to October and cauliflower- capsicum from November to March. During Zaid season he is not cultivating as he keeps the land as such to improve soil fertility.

3.1.1 Venturing into diversification

To make more profits on his farm, he started cultivating strawberries in 2 acres of land during Rabi season. Earlier this area was cultivating cauliflower and capsicum with one acre each. Exposure visit to strawberry growing areas of other states (Maharashtra and Punjab) motivated him to diversify the area for growing strawberries. He obtained seedlings from Pune at a rate of 25000-30000 seedlings/acre for strawberry cultivation. He is using both drip and sprinkler irrigation methods. In order to get better seedling growth, he is using sulpher and zinc as soil amendments at a rate of 2 packets/ acre (1 packet- 1Kg) each. He uses gibberellin and vestige as growth promoters and redomil and bavisitin as fungicides. The cropping pattern followed by farmer 1 is furnished in Table 1.

List 1. Details of cost and net returns from each diversified farms

Before diversification	After diversification
Total cost of cultivation (Labour cost, material cost, other cost) Gross return Net return	Total cost of cultivation (Labour cost, material cost, other cost) Gross return Net return

Net return= Gross return- Total expenses

Table 1. Cropping pattern followed by farmer 1

Season	Crop	Variety	Duration (months)	Area (acres)	Yield (Kg/acre)
Kharif (July-Oct)	Bittergourd	NA	5	3	3000
	Chilli	NA	6	2	1000
Rabi (Nov-March)	Cauliflower	NA	3	1.5	15000
	Strawberry	Chandler, Camarosa	6	2	10000
	Capsicum	Rasi 74	7	1.5	13000
Zaid (April-June)	Fallow				
	Fallow				

**NA-Not Available*

Table 2. Cost and profit analysis of diversification of farmer 1

Farming situation before diversification						Farming situation after diversification					
Enterprises	**Area (ac)**	**Production (Kg /ac)**	**Cost of cultivation (Rs/ac)**	**Gross income (Rs/ac)**	**Net income (Rs./ac)**	**Enterprises**	**Area (ac)**	**Production (Kg/ac)**	**Cost of cultivation (Rs/ac)**	**Gross income (Rs/ac)**	**Net income (Rs/ac)**
Bitter gourd	3	3000	25000	120000	95000	Bitter gourd	3	3000	25000	120000	95000
Chilli	2	700	20000	60000	40000	Chilli	2	700	20000	60000	40000
Cauliflower	2.5	12000	30000	150000	120000	Cauliflower	1.5	12000	30000	150000	120000
Capsicum	2.5	20000	50000	130000	80000	Capsicum	1.5	20000	50000	130000	80000
						Strawberry	2	8000	800000	1500000	700000
Total					335000						1035000

Table 2 depicts the pre- diversification period, during which he earned Rs.335000 /ac in a year. After diversification with strawberry he started earning Rs.1035000 /ac in a year with an additional profit of Rs. 700000/ac. He had to face hurdles from sparrows, peacocks, monkeys, cows, caterpillars, and weed menace from gajar grass, disease attack as leaf blight, fungus, and environmental problems in terms of difficulty in management of heat stress, and others include poor quality seedling and transportation problem. If problems are well managed, continuing with this cropping pattern is more convenient.

He is selling bitter gourd, chilli, cauliflower and capsicum to Hisar mandi which is 10 Km away from his farm. He is selling strawberries in Delhi-Azadpur mandi which is 160 Km away from his farm.

3.1.2 Plan of farmer 1

1. Expansion of area under protected cultivation of vegetables.
2. Attending more number of trainings related to commercial farming of fruit crops

3.1.3 Lessons from farmer 1

Farmer 1 is innovative, a risk bearer and willing to venture in to unconventional enterprises. He assumed that taking calculated risks would result in higher profits, prompting him to expand and diversify the ongoing activities.

3.2 Case Study 2

Farmer 2 is a 40 year old fish farmer, belonging to Siwana village of Bawanikhera block of Bhiwani district. He had 10 acres of land. He used to cultivate cotton and wheat during Kharif and Rabi season, respectively. In addition, he was keeping two buffaloes for daily milk requirements.

3.2.1 Venturing into fish farming

Due to the Haryana government support for promoting fish farming, Farmer 2 took up the said venture along with crop farming. He started fish farming in government pond, with coverage of 10 acres having lease rate of Rs. 1.6 Lakh/year. He has 5 years of experience in fish farming. He started rearing catla (bengal carp), rohu (carpo fish), muraki (mrigal carp), dokla and common carp in his pond. Additionally, he has received training in fish farming from the Department of Fisheries, Bhiwani for 10 days in 2016.

Cost and profit calculated before and after farm diversification in his farm as follows:

Table 5 depicts the income earned before diversification (Rs. 60000/ year/ acre) and after diversification (additional revenue of Rs. 15000/ acre/ year) of land. Thus, in totality he is getting an income Rs.75000 /acre /year. He sells fish directly to customers as well as to Delhi market. His plan is to incorporate different species of fishes in his pond additionally, as well as to gain further knowledge regarding scientific fish farming activities.

Cost and profit analysis of fish farming is described below:

3.2.2 Lessons from farmer 2

Farmer 2 utilizes the advantages of technical knowledge in fish farming. He makes uses of all benefits provided by the fisheries department, Bhiwani. His ability to analyse the local market trends adds to his success.

3.3 Case Study 3

Farmer 3 is a 35 year old farmer from Mallikpur village of Kaithal block, Haryana. He has 30 acres of land. He is cultivating paddy and maize during Kharif and wheat during Rabi. PR 126 is the promising variety of paddy for Kaithal district.

Table 3. Market prices of farm commodities grown by farmer 1

Commodities	Bitter gourd	Chilli	Cauliflower	Capsicum	Strawberry
Price/kg (Rs./Kg)	40	60	10	10	150

Table 4. Cropping pattern followed by farmer 2

Season	Crop	Variety	Duration	Area (acres)	Yield (Kg/acre)
Kharif (July-Oct)	Cotton	Rasi	180 days	10 acre	800
Rabi (Nov-March)	Wheat	HD 2967	150 days	10 acres	2000

Table 5. Cost and profit analysis of diversification followed by farmer 2

Farming situation before diversification						Farming situation after diversification					
Enterprises	**Area (ac)**	**Production (Kg/ac)**	**Cost of cultivation (Rs/ac)**	**Gross income (Rs/ac)**	**Net income (Rs/ac)**	**Enterprises**	**Area (ac)**	**Production (Kg/ac)**	**Cost of cultivation (Rs/ac)**	**Gross income (Rs/ac)**	**Net income (Rs/ac)**
Cotton	10	800	10000	40000	30000	Cotton	10	800	10000	40000	30000
Wheat	10	2000	80000	38000	30000	Wheat	10	2000	80000	38000	30000
Dairy	2 (no. of buffalo)	5L/ Buffalo	60000/ buffalo	House consumption		Dairy	2 (no. of buffalo)	5L/ Buffalo	60000/ buffalo	House consumption	
						Fish farming	10		35000	50000	15000
Total					60000						75000

3.3.1 Venturing to diversification

Owing to the promotion of diversification schemes such as Crop Cluster Development Programme and Bhavantar Bharpayee Yojana, he cultivates potatoes in 5 acres of land during rabi season and bottle gourd, watermelon and cucumber per acre each, during zaid season. He adopted ridge and furrow method of land preparation for water saving, for maintaining the water holding capacity of soil and aeration of the soil for promoting growth of microorganism. Also, for weed management and protection from extreme winter climatic conditions, he adopted plastic mulching. He availed subsidies like drip irrigation and structure making for vegetable plantation. He has attended vegetable seed production training from IARI and National Horticulture Development Foundation. In addition regarding potato development activities, he received training from CPRI, Shimla. He is giving trainings to other farmers too. He has received a state award for the best progressive farmer from Kaithal block. He is a member of societies such as Member of Kaithal vegetable farmer producer company Ltd., Pragathi sheel Kisan club etc.

Cost and profit analysis calculated before and after farm diversification in his farm is given below:

Table 9 depicts that a farmer's additional income of Rs. 263500 was earned through diversification by adopting horticultural crops like bottle gourd, water melon, cucumber and potato. He is selling his produce in Kaithal mandi which is 10 Km away from his farm.

3.3.2 Plans of farmer 3

1. Exposure visit to other areas of the country for better learning of farming activities.
2. Cultivation of fruit trees (Guava and lemon) on ridges of fields.

Table 6. Cost and profit analysis of fish farming of farmer 2

Cost of production of fish farming (10 ac)	Income from fish farming
a. Lease rate - Rs.1.6 lakh/ year (In the first year he received Rs. 75000 as a subsidy) b. Labour rate- Rs.1lakh/year c. Fingerlings- (8 lakh fingerlings/year, 8000 Rs. for 1 lakh fingerlings)- Rs. 65000/year d. Medicine – Rs.20000/year e. Fish pellet feed – Rs. 32000 (20 qtl/year, 16 Rs. /Kg) **Total cost of production**: Rs.3.5 lakh/year	**Gross Income**- Rs.500000 /year **Net Income**- Rs.150000/year **Rate of different fishes (Rs./Kg)** a. Rohu-115 Rs./Kg b. Catla- 115 Rs./Kg c. Dokla-115 Rs./Kg d. Muraki-105 Rs./Kg e. Common carp- 115 Rs./Kg

Table 7. Cropping pattern followed by farmer 3 in Kaithal district

Season	Crop	Variety	Duration	Area (acres)	Yield (Kg/acre)
Kharif (July-Oct)	Paddy	PR 126	120 days	25 ac	3500
	Maize	NA	100 days	2 ac	2000
Rabi (Nov-March)	Wheat	NA		25 ac	2000
	Potato	NA		5 ac	15000
Zaid (April-June)	Bottle gourd	NA	65 days	1 ac	20000
	Water melon	NA		1 ac	20000
	Cucumber	NA		1 ac	10000

NA-Not available

Table 8. Market prices of agricultural commodities as revealed by farmer 3

Commodities	Paddy	Maize	Bottle gourd	Water melon	Cucumber	Wheat	Potato
Price/kg (Rs./Kg)	19	15	6	6	10	19	10

Table 9. Cost and profit analysis of diversification followed by farmer 3

Farming situation before diversification						Farming situation after diversification					
Enterprises	**Area (ac)**	**Production (Kg/ac)**	**Cost of cultivation (Rs/ac)**	**Gross income (Rs/ac)**	**Net Income (Rs./ac)**	**Enterprises**	**Area (ac)**	**Production (Kg/ac)**	**Cost of cultivation (Rs/ac)**	**Gross income (Rs/ac)**	**Net Income (Rs./ac)**
Paddy	25	3500	30000	66500	36500	Paddy	25	3500	30000	66500	36500
Wheat	25	2000	30000	38000	8000	Maize	2	2000	30000	38000	8000
						Bottle gourd	1	20000	50000	120000	70000
						Water melon	1	20000	50000	120000	70000
						Cucumber	1	10000	50000	100000	50000
						Wheat	25	2000	30000	38000	8000
						Potato	5	15000	40000	150000	110000
Total					44500	Total					308000

4. CONCLUSION

Case studies represent intensive investigation of the individual farmers whose significant achievements in farm diversification would serve as role models for emulation by the other farmers of similar agro-economic and socio-economic milieu. Balance of agriculture and allied sectors is necessary for the sustainability and self sufficiency of farming in Haryana state. Adverse impacts of mono cropping trends can be rectified only by promoting alternate cropping patterns and other remunerative income sources from allied enterprises. Diversification has huge potential in the state. So, future planning and policy making should considered the changing trends in the state's farming sector. Study implies that, various methods utilized by the successful farmers specialized in a particular venture serve as the model for the fellow farmers who are similarly interested in the same venture. Subsidies, incentives and training programmes of government agencies promoted the farmers to getting involved in the enterprises other than traditional field crops. This study highlights the need for incentives and training programmes for further promoting farm diversification in the state.

COMPETING INTERESTS

Authors have declared that they have no known competing financial interests or non-financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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