



Study On Input-Output Relationship in Case of Paddy and Vegetables Under Crop Diversification

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Abstract

This study was aimed to clarify diversification of crops and cropping patterns, and to examine economic perspectives of diversification in two different ecological areas. Agriculture sector also plays a considerable role in the economy of Haryana and predominantly it is an agriculture economy. Haryana is one of the states in which green revolution has been experienced and in food production it has a long way. Earlier, the main focus in agriculture sector was to increase food production and to provide better livelihood to farmers but now the shift has been gradually moving towards making agriculture sector a technologically driven dynamic profession. This shows the statistical Analysis on for input-output relationship in case of paddy. In this, total 08 factors related to input relation have been studied. For this, average mean cost of paddy is Rs. 26468. The average mean cost of tomato is Rs. 76281. The average mean cost of tomato is Rs. 124492. Hence, Crop diversification is a practice that reduces monoculture and encourages farmers to produce multiple economic crops.

Index Terms- Crop Diversification, Paddy, Vegetables, Haryana etc.

1. INTRODUCTION

At the micro, meso, and macro levels, diversification can take place. Individual households diversify at the micro level to broaden and strengthen their sources of farm revenue. Regions engage agricultural endeavors where they have a competitive advantage at the regional level. At the macro level, diversification denotes a structural shift away from agriculture and towards non-agricultural pursuits in rural communities, urban centres, or both. Along with crop production, the process also comprises creative marketing strategies and agro-food-based industrial operations that have an impact on the whole rural economy. Therefore, significant infrastructure expenditures and institutional adjustments to support diversification in rural areas are required. Consequently, agricultural policies are crucial to the success of implementations at the farm level, where farmers' top worry is income vulnerability. This study was conducted in the given context to highlight the need to increase agricultural economic profits.

India's agricultural policy has been centered on boosting farmer income and food grain production. The result of this anxiety was the green revolution. However, it has recently been apparent that the green revolution's effects are plausibly contributing to the stagnation of the agricultural industry. As a result, new techniques have been developed, one of which is the diversification of food crops towards high value crops. This study aims to highlight the numerous opportunities for crop diversification towards vegetables as a substitute crop for paddy as well as the difficulties experienced by farmers. Crop diversity appears to be important for a variety of reasons as we look more closely at Haryana's agriculture and cropping patterns. The current study is focused on more general topics of challenges and opportunities for agricultural diversification in Haryana's irrigated areas. The current study sheds light on the undercurrents and changes occurring at the grassroots level, as well as the farmers' coping mechanisms for the new problems of stagnant employment income, crop sector output, and barriers to and implications of agriculture diversification.



2. CROP DIVERSIFICATION IN AGRICULTURE

Although agricultural diversification is an important engine of economic expansion, its success depends on farmers' willingness to embrace it. Technological advances, alterations in consumer demand or governmental policy, and improvements to irrigation, transportation, and other infrastructure development can all help to promote agricultural diversity. Contrarily, it can be constrained by hazards in crop management techniques, in markets and pricing, by the degradation of natural resources, and by opposing socioeconomic necessities or the potential of a given crop, livestock, fishery, or forest product to earn foreign cash.

The improvement of the economics of crop productivity for farmers depends on crop patterns in the farming system. Utilising resources and socioeconomic resources effectively through crop patterning techniques boosts the benefits of crop production. Additionally, socioeconomic analysis helped to explain the connection between local living standards and the degree of diversification. A farming method that provides farmers with a lucrative living while preserving agricultural resources and environmental quality is known as crop diversification. It reduces the requirement for commercially manufactured inputs by making efficient use of farm-generated resources.

Agriculture has gained three fundamental values as a result of crop diversification: (i) ecological soundness; (ii) economic viability; and (iii) social acceptability. Ecological soundness refers to the management and base of natural resources being safe and sound for the environment. Enhancing the productivity and profitability of crops and livestock is referred to as economic viability. Enhancing food security, egalitarianism, self-reliance, and meeting human needs are all examples of social acceptability. To meet the constantly rising need for cereals, pulses, vegetables, fruits, oilseeds, fibres, fodder and grasses, fuel, etc., regional production of a variety of crops is referred to as diversification in agriculture. It seeks to enhance the agro-ecosystem's dynamic equilibrium and soil health.

In terms of production alternatives around the world, agricultural diversification is unquestionably split into crops, livestock, fishery, and agro-forestry. To allocate the resources, each of these subsectorial producing activities has a unique set of input needs. Therefore, management of natural resources at the local and regional levels is the responsibility of human activity.

Crop diversity may help enhance crop productivity in various circumstances. Two methods can be used to approach crop diversity. The most prevalent and widely used method of horizontal diversification is the addition of new crops to the current cropping system. By incorporating more crops into the current cropping system using methods like multiple cropping techniques in conjunction with other effective management practises, crop diversification refers to the expansion of the system's base. Multiple cropping systems can boost the potential for food production, according to observations. Therefore, agricultural diversity is thought to reflect the financial benefits of various crops. Therefore, the idea of crop variety is essential to maximising crop profit.

Diversification has varied connotations for different people depending on their degrees of understanding. And finally, farm-level diversification will involve raising a variety of crops to achieve self-sufficiency. Then, crop diversification at the national level will necessitate the selection and management of a particular crop or a collection of crops that are sold fresh or with added value in order to maximise revenues. Crop diversification has several benefits, including relatively high net returns from crops, greater net returns per unit of labour, resource optimisation, increased land utilisation efficiency, and more job opportunities. The process of diversification needs to be changed from very basic crop rotations to intensive systems like relay cropping and intercropping, or specialisation by diversifying into new crops, where the output and processing, among other things, may be different.

In order to provide efficient resource management in agricultural production for the community, productive farms are required. Additionally, crop diversity in the production process is a crucial factor in boosting productivity since it protects the possibility of changing agricultural practises.



3. RESEARCH METHODOLOGY

It investigates the determinants of crop diversification on farm households' income and profitable crops in selected farm enterprises of households. Therefore, it would be helpful to suggest valuable inputs for the basic needs of farm households, by providing information for farmers' proper cropping patterns and suggestions for policy support in order to increase farmers' income. However, this study had some limitations on selecting target group of farm households emphasized only on annual crop grown regardless of perennial crops and livestock, due to the difficulty in physical accessibility to the studied areas and budget constraints for this academic study.

Research Design

The present study brings out the various possibilities of crop diversification towards vegetables as an alternative crop of paddy and constraints faced by the farmers. The present study would be applied descriptive-cum-analytical research design in nature to find out the above said objectives.

Selection of Crops

Based on literature review done in the second chapter the following vegetables are selected for the study.

1. Tomato
2. Okra
3. Bottle gourd

Data Collection: The study is compiled using primary & secondary data collection sources.

The study area is located in Haryana state. Haryana is a progressive state of India, which has tested the fruit of new agricultural technology and is on the threshold of industrialization. Therefore, to grasp the changes taking place in crop sector at the grassroots level and to evaluate the problems an uncertainty in agriculture diversification and to analyze the position and to explore the potentialities of income and employment in the context of agriculture diversification, micro level investigation were undertaken with village and household as the units of inquiry. The sample size required for this study was concentrated for farmers in 6 divisions of Haryana mainly Ambala, Gurugram, Faridabad, Hisar, Karnal & Rohtak, with people of various age groups and the general public. Quota sampling was used because of unavailability of exact data and presumed that all divisions have equal number of customers.

Profile of Haryana

On 1st November, 1966 Haryana attains statehood. The state consists of a less than of two per cent of the entire nation's population. It occupies nearly 1.37 per cent area out of total geographical area. The state of Haryana has an area of 44.2 thousand square kilometers the state has created a unique place for him within barely three decades into existence. Since 2000, the state has the largest recipient investment per capita in India and is one of the most economically developed and wealthiest states of the country. In 2016-17, per capita income of Haryana is Rs. 214,509 while the nation average is Rs. 112,432 and ranked third in terms of per capita income (Report on Haryana Agriculture and Welfare by ICFA). Since the capital of the country Delhi surrounds Haryana on three sides (south, west and north), consequently for purpose of development and planning the state has been included in economically vital National Capital Region (NCR). For administrative purposes Haryana is divided into six divisions namely; Ambala, Karnal, Rohtak, Hisar, Faridabad and Gurugram and within these divisions there are 22 districts, 72 sub-divisions, 93 tehsils and 140 community development blocks. Rural Haryana comprises 6841 villages and 6212, gram panchayats spread across 22 districts.



1. Cost and Return Analysis

For comparing the cost and benefits of paddy and vegetable crops, benefit cost ratio analysis has been used in the study.

The production cost includes following variable costs.

$$C_P = C_L + C_I + C_S + C_{LA} + C_M + C_F + C_P + C_O$$

Where

- C_P = Total production cost
- C_L = Land preparation cost
- C_I = Irrigation cost
- C_S = Cost of seeds
- C_{LA} = Labour cost
- C_M = Cost of machine and other tools
- C_F = Fertilizers cost
- C_P = Pesticides cost
- C_O = Transportation and marketing cost

Gross Returns = Total Production * Average Price

Net Returns = Gross Returns - Production Cost

2. Benefit Cost Ratio

To assess the economies of crops / farming system benefit cost ratio analysis is an important tool. It is the ratio of benefit with the cost. This ratio indicates the rate of gross returns from the use of an input.

$$BCR = \text{Gross returns} / \text{Total production cost}$$

4. DATA ANALYSIS

In data analysis, researcher has prepared charts and tables to analyze the data so that the data can be easily understood and used in the research. In this research, researcher has used the chi-square test technique and Reliability analysis with descriptive statistics to study reliability and overall mean value of all statements. Statistical data were analyzed using SPSS tool. Chi Square Test was used to analyze presence of association between demographic variables and statements influencing selection of cars by customers.

Objective: To analyze the input-output relationship in case of paddy and vegetables.

H_{00} : There is no significant relationship between the marketing behavior and observer’s responses.

Table 1: Statistical Analysis for input-output relationship in case of paddy (Rs.)

Report									
	Cost of Cultivation of Paddy: Land Preparation Cost	Irrigation cost	Cost of seeds	Labour cost	Cost of machine and other tools	Fertilizers cost	Pesticides cost	Transportation and marketing cost	Total Cost of Paddy per Acre (Rs.)
Mean	3192.64	3628.61	1759.00	4830.40	1442.46	7055.40	3374.00	1185.70	26468.21



N	500	500	500	500	500	500	500	500	500
STD	440.903	330.754	66.843	1677.672	186.395	634.757	120.678	133.815	1447.162

Source: Primary Data

This shows the statistical Analysis on for input-output relationship in case of paddy. In this, total 08 factors related to input relation have been studied. For this, average mean cost of paddy is Rs. 26468 that includes various types of input cost mainly irrigation cost, cost of seed, labor cost, cost of machine etc.

Table 2: Statistical Analysis for input-output relationship in case of paddy w.r.t area (Rs.)

Report										
Area for Agriculture		Cost of Cultivation of Paddy: Land Preparation Cost	Irrigation cost	Cost of seeds	Labour cost	Cost of machine and other tools	Fertilizers cost	Pesticides cost	Transportation and marketing cost	Total Cost of Paddy per Acre (Rs.)
large	Mean	2736.81	3386.81	1737.64	6129.67	1522.42	7136.26	3378.02	1066.21	27093.85
	N	182	182	182	182	182	182	182	182	182
	Std. Deviation	162.820	90.375	42.679	723.404	105.399	603.034	119.439	49.844	979.425
Medium	Mean	3270.35	3641.59	1788.72	4985.40	1516.59	7088.50	3355.09	1207.96	26854.20
	N	226	226	226	226	226	226	226	226	226
	SD	95.948	130.112	67.123	932.671	94.464	633.193	111.288	75.297	1085.927
Small	Mean	3903.48	4075.05	1728.26	1879.35	1102.17	6814.13	3412.50	1367.39	24282.34
	N	92	92	92	92	92	92	92	92	92
	SD	221.545	472.156	75.340	43.319	53.408	648.173	135.797	126.759	822.739
Total	Mean	3192.64	3628.61	1759.00	4830.40	1442.46	7055.40	3374.00	1185.70	26468.21
	N	500	500	500	500	500	500	500	500	500
	SD	440.903	330.754	66.843	1677.672	186.395	634.757	120.678	133.815	1447.162



This shows the statistical Analysis on for input-output relationship in case of paddy. In this, total 08 factors related to input relation have been studied w.r.t area category used. It consists of three type of category mainly small, medium and large.

Table 3: Statistical Analysis for input-output relationship in case of Tomato(Rs.)

Report									
	Cost of Cultivation of Tomato: Land Preparation Cost	Irrigation cost	Cost of seeds	Labour cost	Cost of machine and other tools	Fertilizers cost	Pesticides cost	Transportation and marketing cost	Total Cost of Tomato per Acre (Rs.)
Mean	3511.70	1352.65	4442.90	25524.81	.00	6559.10	9585.30	25304.78	76281.24
N	500	500	500	500	500	500	500	500	500
Std. Deviation	443.158	314.666	1583.647	11074.649	.000	608.031	259.584	2000.310	10703.820

Source: Primary Data

This shows the statistical Analysis on for input-output relationship in case of tomato. In this, total 08 factors related to input relation have been studied w.r.t area category used.

Table 4: Statistical Analysis for input-output relationship in case of Tomato w.r.t Area (Rs.)

Report									
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Area for Agriculture		Cost of Cultivation of Tomato: Land Preparation Cost	Irrigation cost	Cost of seeds	Labour cost	Cost of machine and other tools	Fertilizers cost	Pesticides cost	Transportation and marketing cost	Total Cost of Tomato per Acre
large	Mean	3398.63	1129.15	5347.53	35728.02	.00	6617.86	9515.38	23832.42	85568.98
	N	182	182	182	182	182	182	182	182	182
	Std. Deviation	120.935	383.682	318.069	1362.049	.000	838.933	194.353	1173.225	2384.975
Medium	Mean	3295.13	1391.15	3353.05	24530.97	.00	6707.52	9641.59	26952.65	75872.08
	N	226	226	226	226	226	226	226	226	226
	Std. Deviation	232.519	85.435	1806.137	7495.861	.000	364.156	130.112	959.498	7318.890
Small	Mean	4267.39	1700.22	5330.53	7781.58	.00	6078.26	9585.33	24169.46	58912.76
	N	92	92	92	92	92	92	92	92	92
	Std. Deviation	441.294	79.862	319.835	989.593	.000	64.324	484.628	2131.662	2565.045
Total	Mean	3511.70	1352.65	4442.90	25524.81	.00	6559.10	9585.30	25304.78	76281.24
	N	500	500	500	500	500	500	500	500	500
	Std. Deviation	443.158	314.666	1583.647	11074.649	.000	608.031	259.584	2000.310	10703.820

Source: Primary Data



This shows the statistical Analysis on for input-output relationship in case of tomato. In this, total 08 factors related to input relation have been studied w.r.t area category used.

Table 5: Statistical Cost Analysis based on CBR of Paddy

Particulars	Small	Medium	Large
Yield(qtl/acre)	23.31	22.95	22.84
Price (Rs. /qtl)	1832	1828	1825
Gross returns (Rs.)	42703.92	41952.6	41683
Total production cost (Rs.)	24282	26854	27093
Returns over cost (Rs.)	18421.92	15098.6	14590
Benefit cost ratio	1.75	1.82	1.53

Source: Primary Data

Above table shows the Statistical Cost Analysis based on CBR of Paddy that compares small, medium and large area respectively. It represents yield, price, gross returns, total production cost and CBR etc. The CBR of small area is 1.75 while of medium is 1.82 and large area is 1.53.

Table 6: Statistical Cost Analysis based on CBR of Tomato

Particulars	Small	Medium	Large
Yield(qtl/acre)	352	348	345
Price (Rs. /qtl)	900	870	840
Gross returns (Rs.)	316800	302760	289800
Total production cost (Rs.)	58912	75872	85568
Returns over cost (Rs.)	257888	226888	204232
Benefit cost ratio	5.37	3.99	3.38

Source: Primary Data

Above table shows the Statistical Cost Analysis based on CBR of tomato that compares small, medium and large area respectively. It represents yield, price, gross returns, total production cost and CBR etc. The CBR of small area is 5.37 while of medium is 3.99 and large area is 3.38.

Table 7: Statistical Cost Analysis based on CBR of Okra



Particulars	Small	Medium	Large
Yield(qtl/acre)	251	249	243
Price (Rs. /qtl)	1060	1025	1018
Gross returns (Rs.)	266060	255225	247374
Total production cost (Rs.)	98275	120913	142189
Returns over cost (Rs.)	167785	134312	105185
Benefit cost ratio	2.70	2.11	1.73

Source: Primary Data

Above table shows the Statistical Cost Analysis based on CBR of okra that compares small, medium and large area respectively. It represents yield, price, gross returns, total production cost and CBR etc. The CBR of small area is 2.70 while of medium is 2.11 and large area is 1.73.

5. CONCLUSION

Crop diversification is a practise that reduces monoculture and encourages farmers to produce multiple economic crops. Crop varieties are expanding in the larger area to lower the possibility of one crop failing. Crop diversification is typically understood to include switching from traditionally less lucrative crops to more lucrative ones. Crop shifting (diversification), which is a result of government policies or involvement, is practised in priority crops and areas. Diversifying agriculture typically entails moving away from cereal crops and towards other field crops or high-value crops. This article examines the difficulties farmers in Haryana who are attempting crop diversification confront. There are six analysis-relevant factors in it. Lack of skilled labour had the highest mean of all these issues, measuring 3.89 with a yes response. Based on the value of the land owned, High Input Cost has the highest mean. Accordingly, all of these claims might be viewed as limitations for farmers.

This shows the statistical Analysis on for input-output relationship in case of paddy. In this, total 08 factors related to input relation have been studied. For this, average mean cost of paddy is Rs. 26468. The average mean cost of tomato is Rs. 76281. The average mean cost of tomato is Rs. 124492.

It is observed that vegetable crops have no price protection scheme like MSP. While the cereals have MSPs. The prices of vegetable crops change day by day. So the government should fix the MSPs for vegetables so that the risk can be minimized and the farmers can take interest in growing vegetable crops. Development of high yielding varieties of vegetables may play an important role for diversification because traditional varieties are not capable to compete with the existing crops on the basis of input-output price structure.

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