

Diversification through Vegetable Cultivation

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ABSTRACT Crop diversification has been perceived as the only alternative to end the problems arising due to paddy-wheat rotation. The present study was aimed at quantifying the shift in area between the year 2002-2006 from paddy and wheat to other crops in general and to vegetables in particular. The data collected personally on a structured interview schedule from six agro-climatic zones of Punjab reveals that majority of the vegetable growers were growing vegetables in less than 3.5 acres of the land and the share of vegetable crops was maximum in the area under diversification. However, area under vegetable crops increased by 0.08 per cent and 2.66 per cent during and Rabi season respectively. With vegetable cultivation emerging as major alternative preferred by farmers, the extension personnel and the policy makers should address the problem areas in vegetable cultivation and its marketing.

I. INTRODUCTION

A stage has reached where agricultural production and crop yield in Punjab have reached the point of stagnation. Land and water, the two most important resources on which Punjab's rural economy is built, have sharply deteriorated over time. Agriculture growth rate which was five per cent per annum in 1980's has declined to 1.9 per cent in 2003-04 (Anonymous 2005).

The intensive paddy-wheat rotation has led to serious repercussions in the form of resource depletion, soil degradation, nutrient deficiency, and fall in ground water table. The multiplication of insects/pests and diseases and intensive use of energy are some of the other consequences of paddy-wheat rotation faced by the agricultural sector. Heavy doses of fertilizers and chemicals are further causing environmental degradation.

In the wake of these constraints the need was felt to propagate crop diversification in Punjab. The cropping pattern which had become over-specialized in the favour of paddy-wheat rotation required diversification. Therefore, multiple cropping systems were recommended by the scientists. Diversification improves the quality of food security mainly because of more availability of fruits and vegetables (Satyasai and Vishwanatan 1996).

In view of the given agricultural scenario of the State, Padam-Shri Dr. Johl in his report submitted for the approval to the Planning Commission, had proposed transfer of one million hectare of land from paddy- wheat rotation to

other less water consuming crops (Anonymous 2002). Punjab Government in this context has set-up 'State Farmer's Commission' to examine and review the status of agriculture and to suggest the measures for economically viable and ecologically sustainable agricultural development.

One of the recommendations of the Commission was with regard to increasing the area under vegetable farming which has number of advantages. The role of fruits and vegetables in improving health and providing quality food security cannot be denied. The intake of vegetables in an average rural family of Punjab is far below the ICMR (Indian Council of Medical Research) recommendations (Kaur et al. 2005). These alarming findings are matter of concern in light of decreasing trend of growing vegetable crops for family consumption. Growing of vegetable crops at household level not only help to increase the quantity and quality of food intake, but also contribute towards decrease in the area under paddy wheat rotation beside reducing family expenditure. Nature and extent of crop diversification does not lead to any conflict with self sufficiency in food grain (Pandey and Sharma 1986). In any case, diversification results in greater food security at household level (Bruan 1995).

Importance of vegetables in human diet has been recognized since long but more recently, their significance has grown manifold in Punjab because of depletion of underground water resources particularly for water thirsty crops like paddy. Shrinking landholdings and massive

youth unemployment are some other reasons for increased stress on cultivation of vegetable crops. Vegetable cultivation employs more number of persons and produce, more tonnage per unit of area as compared to traditionally grown crops. It was estimated that labour use in vegetable cultivation is between 126-400 man - days / ha, as compared to 78-153 man days / ha in cereals. One hectare shift of cereal to vegetable crops in one season generates more than one year round full time employment (Sharma 2005).

In this regard it is imperative to study the status of vegetable farming in Punjab where in the year 2005-06 the total production was 2.47 million tones from an area of 1.63 lacks hectares with productivity of 15.1 tones per hectare (Anonymous 2006). Therefore the data generated from this study will provide basis for planning, evaluating, suggesting medium and long term strategies for encouraging vegetable cultivation as a means of crop diversification. The study was planned to achieve the following objectives:

1. To profile the farmers growing vegetables.
2. To quantify the shift in area from other crops to vegetable cultivation and vice-versa in the last five years

II. METHODOLOGY

Locale and Sampling: Study was conducted in six agro climatic zones of Punjab to capture the variations, which exist in the vegetable farming pattern throughout the state with regard to agro-climatic conditions. One district was selected from each zone to represent variation in agro climatic conditions with an exception of third zone (Central plain zone). This zone was represented by two districts owing to its large size. Hence a total of seven districts were selected from the state. From the list of blocks in the selected districts, one block adjoining to the district headquarters and one away from it was purposively selected, so as to capture the variations in the problems faced by vegetable growers. Hence a total of fourteen blocks with one village each were selected. Four families per village from small (< 5 acres), medium (5 - 10 acres), large (> 10 acres) sized landholding were selected. The totals of one hundred sixty eight families were selected as the sample for the purpose of the study representing twelve families from each village.

Data Collection: An interview schedule was prepared, pretested and used for collection of data through personal interviews.

Analysis of Data: The data were analyzed with the help of statistical tools like frequency and percentage.

III. RESULTS

Profile of the Respondents

The profile of the vegetable growers (Table 1) reveals that 16.07 per cent belong to young age group, where as majority i.e. 58.92 per cent are middle aged. One fourth of the respondents are in the old age category. With regard to level of education of respondents the data indicate that majority (53.53%) had medium level of education, only 28.57 per cent were in the low and 17.85 per cent of the respondents belong to high level of education category. The level of education of the family, indicate that majority (51.19%) had low level of education, 38.69 per cent were in the

Table 1: Distribution of respondents according to their personal and socio-economic characteristics (n=168)

Personal socio-economic characteristics	Respondents	
	Fre-quency	Per-centage
Age		
Young (< 30 years)	27	16.07
Middle age (30 - 50 years)	99	58.93
Old (> 50 years)	42	25.00
Education Level of Respondents		
Low (0-5)	48	28.57
Medium (5-10)	90	53.57
High (10-15)	30	17.85
Education Level of Family		
Low (3-7)	86	51.19
Medium (7-11)	65	38.69
High (11-15)	17	10.11
Type of Family		
Nuclear	55	32.73
Joint	113	67.26
Size of Family		
Small (< 5)	59	35.11
Medium (5- 9)	72	42.85
Large (> 9)	37	22.02
Operational Land Holding		
Small (< 5)	21	12.50
Medium (5-10)	46	27.38
Large (>10)	101	60.11
Annual Farm Income		
Low (< 2.13 Lakh rupees)	61	36.30
Medium (2.13 Lakh rupees)	79	47.02
High (> 6.09 Lakh rupees)	28	16.66
Organizational Membership		
Low (< 2)	121	72.02
Medium (2- 6)	42	25.00
High (> 6)	5	2.97

medium and only 10.11 per cent of families belong to the category of high level of education

Joint families were found in majority (67.26%) of the households. With regard to size of the family, 35.11 per cent families were small sized, majority of the families i.e. 42.85 per cent were medium sized and 22.02 per cent were large sized. Majority of respondents i.e. 60.11 per cent were having large operational land holdings followed by 27.38 per cent having medium while 12.50 per cent were having small operational landholdings.

With regard to annual farm income, majority of the families were placed in medium category and least (16.66 %) were in low-income category. The organizational membership of the majority that is 72.02 per cent was low. Only 2.97 per cent of them were having high level of organizational membership.

Area under Vegetable Crops

The area under vegetable crops ranged from one acre to 11.00 acres (Table 2). However, the majority of the farmers were growing vegetables in area less than 3.5 acres. Nearly 20.00 per cent were in the large category that is of more than 7.00 acres.

Table 2: Distribution of respondents according to area under vegetable crops (n = 168)

Categories (acres)	Respondents	
	f	%
1- 3.5	83	49.40
3.5 - 7.0	52	30.95
7.0 - 11.0	33	19.64

Area under Different Crops during Kharif Season

The data as shown in Table 3 reveals that the area under different crops was 2943.50 acres during 2002-2004. Out of this area, on an average, maximum that is nearly 66.73 % was found to be under paddy and the remaining under other crops. The remaining area was mainly shared by vegetable crops (21.08%), pulses (3.44%), oilseeds (5.02%) and sugarcane (3.70%). The area under other crops between the years 2002-2006, on an average was approximately 33.27 per cent.

The year wise analysis shows that in the year 2002, the maximum area (68.11%) was under paddy followed by vegetable crops (21.06%), oilseeds (4.58%), pulses (3.43 %) and sugarcane (2.80%). The trend was nearly similar in 2004, whereas in the year 2003, 2005 and 2006, the least area was under pulses.

The increase or decrease of the area under each crop as given in the table indicate that the area under paddy decreased between 2002 and 2003 (-1.36%) and again in year, 2003-2004 by 1.12 per cent. However, in the two subsequent years there was an increase of 0.63 and 0.66 per cent respectively. Hence, the overall decrease of 1.19 per cent was observed in area under paddy.

With respect to other crops, the area was 31.88 per cent of the total operational area in the 2002 which subsequently rose by 1.36 per cent in the year 2003, and 1.12 per cent in the year 2004 but decreased by 0.63 per cent in the year 2004 and 0.66 per cent in the year 2006. On the whole, the area under diversification increased from 31.88 to 33.07 per cent (+1.19 %).

Table 3: Year wise distribution of area under different crops during kharif season (Total operational land holding 2943.50 acres)

Year	Other crops										Total area diversified	
	Paddy		Vegetable crops		Pulses		Oilseed		Sugarcane			
	Area (acres)	%	Area (acres)	%	Area (acres)	%	Area (acres)	%	Area (acres)	%		
2002	2005.00	68.11	620.00	21.06	101.00	3.43	135.00	4.58	82.50	2.80	938.50	31.88
2003	1965.00	66.75		20.58		3.64		5.06		3.95		33.24
		(-1.36)	606.00	(-0.48)	107.00	(+0.21)	149.00	(+0.48)	116.50	(+1.15)	978.50	(+1.36)
2004	1932.00	65.63		21.81		4.06		4.72		3.77		34.36
		(-1.12)	642.00	(+1.23)	119.50	(+0.42)	139.00	(-0.34)	111.00	(-0.18)	1011.50	(+1.12)
2005	1950.50	66.26		20.80		3.36		5.24		4.31		33.73
		(+0.63)	612.50	(-1.01)	99.00	(-0.70)	154.50	(+0.52)	127.00	(+0.54)	993.00	(-0.63)
2006	1970.00	66.92		21.14		2.73		5.52		3.66		33.07
		(+0.66)	622.50	(+0.34)	80.50	(-0.63)	162.50	(+0.28)	108.00	(0.65)	973.50	(-0.66)
Ave- rage	1964.50	66.73	620.60	21.08	101.40	3.44	148.00	5.02	109.00	3.70	979.00	33.27

* Figures in brackets indicate percentage shift in area

Share of vegetable crops in the area under diversification was substantive but after five years, the gain in area was only 0.08 per cent. The area under pulses reduced by 1.30 per cent but under oilseeds increased from 4.58 to 5.52 per cent (+0.94). The sugarcane gained 0.86 per cent area.

Area under Different Crops during *Rabi* Season

The Table 4 shows the area under various crops during the five years (2002 to 2006) under review (during the *rabi* season). The average area under the main crop that is wheat, was maximum that is 68.23 per cent during the years. The remaining 31.77 per cent was shared by vegetable crops (22.27 %) followed by oilseeds (4.75 %), sugarcane (2.70 %) and pulses (1.93 %).

The year wise analysis of this pattern reveals that the area under wheat increased by 0.42 per cent in the year 2003 as compared to the year 2002. This gain in area under oilseeds was 2.99 per cent which might be due to the reduction in area under vegetable crops (2.24 %), pulses (1.13 %) and sugarcane (0.04 %).

In the subsequent year, the area under wheat reduced by 1.44 per cent and under oilseeds by 2.04 per cent. The gain was registered in the area under vegetable crops + 2.66 %) and sugarcane + 0.16 %). The trend was similar in the year 2005. But the following year (2006) again saw a gain in area by the wheat crop + 0.49 %) and vegetable crops. However, there was a loss of 0.49 per cent area under other crops.

Diversification to Vegetable Crops during *Kharif* Season

The total area under diversification as also shown in Table 5 reveals that during the year 2002 the area under crops other than paddy was 938.50 acres which increased to 973.50 acres (+1.19). Out of the total area, share of vegetable crops was 21.06 per cent in the year 2002 which registered an increase and decrease in each subsequent year. However, an overall increase under vegetable crops within these five years was 0.08 per cent.

Out of the area under crops other than paddy,

Table 4: Year wise distribution of area under different crops during *rabi* season (Total operational land holding 2943.50 acres)

Year	Other crops										Total area diversified	
	Paddy		Vegetable crops		Pulses		Oilseed		Sugarcane		Area	
	Area (acres)	%	Area (acres)	%	Area (acres)	%	Area (acres)	%	Area (acres)	%	Area (acres)	%
2002	2031.50	69.02	650.50	22.10	71.50	2.43	111.00	3.77	79.00	2.68	912.00	30.98
2003	2044.00	69.44		19.86		1.30		6.76		2.64		30.56
		(+0.42)	584.50	(-2.24)	38.00	(-1.13)	199.00	(+2.99)	78.00	(-0.04)	899.50	(-0.42)
2004	2001.50	68.00		22.52		1.95		4.72		2.80		32.00
		(-1.44)	663.00	(+2.66)	57.50	(+0.66)	139.00	(-2.04)	82.50	(+0.16)	942.00	(+1.45)
2005	1975.50	67.11		23.20		2.16		4.28		3.24		32.89
		(-0.88)	683.00	(+0.68)	63.50	(+0.20)	126.00	(-0.44)	95.50	(+0.44)	968.00	(+0.88)
2006	1990.00	67.61		23.70		1.85		4.23		2.61		32.39
		(+0.49)	697.50	(+0.49)	54.50	(-0.30)	124.50	(-0.06)	77.00	(-0.60)	953.50	(-0.49)
Ave- rage	2008.50	68.23	655.70	22.27	57.00	1.93	139.90	4.75	82.40	2.70	935.00	31.77

*Figures in brackets indicate percentage shift in area

Table 5: Area diversified to vegetable crops during *kharif* season (Total operational land holding 2943.50 acres)

Year	Total area diversified		Percentage area diversified to vegetable crops			
			Out of total area (out of 2943.50 acres)		Out of area diversified (year wise variation)	
	Acres	%	Acres	%	Acres	%
2002	938.50	31.88	620.00	21.06	620.00	66.06
2003	978.50	33.24	606.00	20.58	606.00	61.93
2004	1011.50	34.36	642.00	21.81	642.00	63.50
2005	993.00	33.73	612.50	20.80	612.50	61.68
2006	973.50	33.07	622.50	21.14	622.50	63.97

vegetable crops share was 66.06 per cent in the year 2002 which decreased to 61.93 per cent in 2003, and again rose to 63.50 per cent in 2004 and 63.97 per cent in 2006 with a decline in the year 2005. However, an overall decrease of 2.09 per cent can be observed between the year 2002 and 2006 in area under vegetable crops (out of the total area diversified).

The year wise inconsistency in the area as seen in the table, is an indicator of interest of the farmers, in vegetable cultivation and simultaneous problems faced by them which lead them to reconsider other options. Beside, the alternative of growing paddy seems to be an attractive option in light of fixed price, easy marketing procedures, even when farmers are conscious of its ill effects on the environment in general and the water table in particular. The intensive use of resources and ill-effects on the environment do not deter farmers from paddy cultivation.

Vegetable crops can be made an attractive option through planned strategies for increasing production, training farmers in the technical skills required, providing better marketing, storage and processing facilities and above all by educating the farmers in marketing skills. A minor increase in return from vegetable crops as against paddy is not sufficient for the farmers to get attracted to their cultivation. This has been emphasized in earlier study by Joshi et al. (2006). The study concluded that production and market risk are higher in high value crops. The high cost transport facilities required for highly perishable crops also determine their adoption. The farmers tend to get attracted to crops which are less risky as far as perish ability and marketing are concerned.

Diversification to Vegetable Crops during Rabi Season

The total area as already discussed in the

Table 4 and also shown in this Table 6 reveals that area under diversification increased from 912.00 acres in 2002 to 953.50 acres in 2006 (30.92 to 32.49 %). It also increased from 650.50 acres to 697.50 acres in case of vegetable crops (22.09 to 23.69 %). Even through the increase is marginal (1.60 %), but it is significant in light of the problems faced in growing vegetable crops as compared to the main crop that is wheat.

Out of the diversified operational area that is 650.50 acres, vegetable crops alone was cultivated in 71.32 per cent in the year 2002 which increased to 73.15 per cent by the year 2006. The fall was registered only during the year 2003 with only 64.98 per cent of the diversified area under vegetable crops. It subsequently increased to 70.38 per cent in the year 2004 and to 70.53 per cent in the year 2005. It further increased to 73.15 per cent in the year 2006. Hence, there was a gain of 8.17 per cent of the diversified area by the vegetable crops between the year 2003 and 2006. The trend is not very encouraging considering the percentage increase (71.30 to 73.15 %).

IV. DISCUSSION

Profile of the Respondents

Joint families are mostly involved in vegetable farming. This can be attributed to these crops being labour intensive. Vegetable cultivation being a risky proposition and also requiring high input as compared to wheat and paddy can be the reason for the majority of the farmers having large operational land holdings. They could cultivate vegetables in few acres and wheat – paddy in the remaining. Joshi et al. (2006) also concluded that the production and market risk are higher in high value crops because most of the high value crops require more capital, quality inputs, improved technologies and better information. The small holders often lack access

Table 6: Area diversified to vegetable crops during rabi season (Total operational land holding 2943.50 acres)

Year	Total area diversified		Percentage area diversified to vegetable crops			
			Out of total area (out of 2943.50 acres)		Out of area diversified (year wise variation)	
	Acres	%	Acres	%	Acres	%
2002	912.00	30.92	650.50	22.09	650.50	71.32
2003	899.50	30.56	584.50	19.85	584.50	64.98
2004	942.00	32.00	663.00	22.52	663.00	70.38
2005	968.00	32.89	683.00	23.20	683.00	70.55
2006	953.50	32.49	697.50	23.69	697.50	73.15

to these and do not diversify into high value crops. Hence, the diversification to high value crops such as vegetables in case of present sample has been done by farmers with large operational holding and having medium and high income.

Area under Vegetable Crops

Majority of the farmers were growing vegetables in area less than 3.5 acres. Nearly 20.00 per cent were in the large category that is of more than 7.00 acres. The average land holding in Punjab being 5-10 acres and the vegetable being high risk crops the farmers do not risk bringing larger area under vegetable crops. Kumar et al. (2002) also found pure vegetable farming to be risky. Still, the data is encouraging with 30.95 per cent of the farmers growing vegetables in area between 3.50 - 7.00 acres.

However, provision of quality inputs, transportation, marketing facilities and storage\ processing avenues can further act as catalyst. Kaur (1990) reported that greater effort by the extension personnel could also positively affect the prospects of vegetable cultivation.

Area under Different Crops during Kharif Season

Maximum area was found to be under paddy and the remaining under other crops and out of these other crops, vegetable cultivation had the maximum share. The increase or decrease of the area under each crop indicate that the area under paddy decreased between 2002 and 2003 and again in year, 2003-2004. However, in the two subsequent years there was an increase of 0.63 and 0.66 per cent respectively. Hence, the overall decrease of 1.19 per cent was observed in area under paddy.

Share of vegetable crops in the area under diversification was substantive but after five years, the gain in area was only negligible. The findings indicate that although there have been a shift of area from paddy to other crops but the increase is not to the desired level. This can be attributed to lack of marketing support to other crops as compared to paddy. The farmers even though are aware of the disadvantage of growing paddy; they get attracted to it due to the ensured market and a fixed support price. Lack of marketing facilities and lack of support price of other crops make farmers opt for paddy crop. Hence there is a

need to intensify the efforts through analysis of the shortcomings in the previous policies and strategies. Both the government at the policy formation and the concerned departments at the implementation level should bring in changes that can motivate the farmers to diversify to other crops.

Area under Different Crops during Rabi Season

The average area under was maximum and as in *kharif* season out of the remaining area vegetable farming was most prominent. The overall data indicate that between the year 2002 and 2006, there has been a decrease in area under wheat meaning that the area under other crops increased during this period. But this decrease was only 1.41 per cent of the operational area.

Wheat is the main crop grown in Punjab during the *rabi* season and is also essential for the food security of the country. It does not have any adverse effect on the environment and soil productivity as in case of paddy. The easy production, management and marketing practices are also responsible for the farmers opting for wheat. The long stretch of the free time more than three months) at the disposal of the farmer by sowing wheat which is not available to them by cultivating other crops can be one of the important reason for not opting for crops requiring both intensive and extensive care. But, this is a major cause of concern with regard to the under utilization of family labour, lesser income and more free time have socio-economic implications for the rural families of Punjab.

Diversification to Vegetable Crops during Kharif Season

An overall increase under vegetable crops within five years was only 0.08 per cent. The year wise inconsistency in area under vegetable cultivation is an indicator of interest of the farmers, in vegetable cultivation and simultaneous problems faced by them which lead them to reconsider other options. Beside, the alternative of growing paddy seems to be an attractive option in light of fixed price, easy marketing procedures, even when farmers are conscious of its ill effects on the environment in general and the water table in particular. The intensive use of resources and ill-effects on the environment do not deter farmers from paddy cultivation. Kumar and Singh (2002)

stated that adoption of vegetable farming can prove to be a turning point in agriculture because of high net returns from these capital and labour intensive crops than general crop farming. Besides, adoption of vegetable crops can be of great help in creating employment opportunities.

Vegetable crops can be made an attractive option through planned strategies for increasing production, training farmers in the technical skills required, providing better marketing, storage and processing facilities and above all by educating the farmers in marketing skills. A minor increase in return from vegetable crops as against paddy is not sufficient for the farmers to get attracted to their cultivation. BIRTHAL et al. (2006) reported that up scaling of high value agriculture was constrained by a lack of infrastructure for production, marketing and processing. The farmers tend to get attracted to crops which are less risky as far as perish ability and marketing are concerned.

Diversification to Vegetable Crops during Rabi Season

The significance of marginal increase in area under vegetable cultivation cannot be denied in light of the problems faced in growing vegetable crops as compared to the main crop that is wheat. The trend is not very encouraging considering the percentage increase (71.30 to 73.15 %) and the emphasis through policy making and implementing agencies on cultivation of vegetable crops.

V. CONCLUSION

There has been marginal increase in area under vegetable cultivation during the period between 2002-2006 with fluctuations every year both during the *kharif* and *rabi* season. The increase has been followed by decrease in area during the successive years which can be attributed to the problems of marketing. Lucrative prices of vegetables can be the reason for the increase in area and lack of support price can be the cause of farmers shifting back to paddy and wheat.

VI. RECOMMENDATIONS

Increase in operational area under vegetable cultivation can be further maximized through intensive actions both at the policy formulation,

technology transfer and infrastructure provision especially in the area of processing. The extension personnel can play role in technology transfer, skill improvements and also in educating farmers regarding marketing trends and skills. It is very important to bring about attitudinal changes among the rural families with regard to dignity of labour. They should be made aware of the importance of diversification for optimum utilization of family labour which otherwise remains underutilized. The youth should be particularly motivated to go for intensive farming on small landholdings to increase farm income. The role of the scientist is equally important with regard timely, appropriate and effective recommendations and their onward dissemination to the farmers can also benefit the existing growers and motivate others to follow.

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