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Factors Influencing Economic Viability of Marginal and Small Farmers in Punjab¹

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Abstract

It has been noticed in Punjab that living in nearly the same socio-economic environment, some of the marginal and small farmers are financially viable, which means that they are able to earn enough income to meet their farm as well as household expenditure, while others fail to do so. There are multiple factors responsible for this viability. Broadly these factors are: farm size, off-farm income, income from dairy, rational domestic expenditure, and productivity of crops. This paper has examined the contribution of these factors towards the viability of marginal and small farmers by collecting data from three districts (Ropar, Ludhiana and Bathinda) of the state. The rationalizations of household expenditure and farm investment are also a source of enhancing the possibilities of financial viability of both the categories of farming families. Therefore, on the policy front, all efforts should be made to create off-farm employment opportunities for these farmers. The public investments should be made to remove the regional productivity gaps, as it will enhance income of these farmers. Assuring remunerative prices and up-scaling of the marketing and input supply facilities are the need of the hour to promote dairying and other allied activities among these farmers. All these measures will go a long way in easing the financial stress on marginal and small farmers of the area. In the prevailing economic scenario, it is difficult to pull out or push out these farmers out of agriculture in a short-run and hence the solution lies in making them part-time farmers having access to diversified sources of income as has happened in some of the South-East Asian countries.

Introduction

The marginal and small farmers account for nearly 80 per cent of the total operational holdings in the country, cultivating about 36 per cent of the total area. Punjab is one of the most progressive states of India and has a similar type of land distribution, though slightly better than the national average. Out of 9.97 lakh total holdings in the state, as per the agricultural census of 2000-01, the number of marginal and small holdings was 1.23 lakh (12.3 per cent) and 1.73 lakh (17.4 per cent), respectively. It is often ascertained that small farms are non-viable on their own. Even if farmers cultivate the best possible crops or combination of crops, the returns will remain meagre. Thus, small

farms, *per se*, are not viable unless they are supported with some supplementary income (Chandra, 2001). The deepening of economic and ecological crises and globalization of economy are likely to have large adverse impact on these farm-categories. The agricultural productivity in the state has nearly stagnated and the consistent rise in cost of production is resulting into squeezing of profit margins (Singh and Kolar, 2001). The soil and water, the two most crucial resources, have sharply deteriorated because of excessive use of chemicals and irrigation water for growing the same crops over and over again. The underground watertable is receding at an alarming rate of 30 cm per annum (Chibba *et al.*, 2005). The falling watertable is not only seriously threatening the ecological balance but also is effectively excluding marginal and small farmers from utilizing this common natural resource, leading to tension and social strife (Sidhu, 2002). The declining soil fertility and the

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watertable will further push up cost of production and increase the already prevailing indebtedness of these farmers.

To ameliorate the problems of these farmers, the various suggested options include corporatization of farming, diversification of agriculture, introduction of new generation cooperatives, contract farming, etc. (Singh, 2000). An effort is going on in this direction since 1986, when the first expert committee for diversification of agriculture was instituted, but significant results have not been achieved so far. Moreover, within the existing social rigidities such as love for land and the land laws in favour of leased land takers, the possibilities of corporatization of agriculture seems limited. In the absence of alternative employment opportunities, the pushing of marginal and small farmers out of agriculture will result in social chaos.

It has been noticed in Punjab that even with the same socio-economic environment, some of the marginal and small farmers are thriving well and are able to earn enough income to meet their actual expenditure (farm expenditure + cost of living determined by their prevailing consumption pattern and life-styles and not calculated at the normative requirement basis necessary for a dignified standard of living). There are multiple factors responsible for this viability. Broadly, the likely factors are: education level of farmers, family size, farm size, fixed investment, off-farm income, domestic expenditure and productivity of crops. This paper has examined the contribution of these factors towards the viability of marginal and small farmers for three broad agro-climatic regions of the state.

Database and Methodology

The paper is based on the primary data collected from three districts of Punjab state, viz. Ropar, Ludhiana and Bathinda, each representing a different agro-climatic zone. The Ropar district represented the low productivity foothills region known as 'Kandi' area (wheat-maize zone or zone-I), Ludhiana district represented high productivity central plain region (wheat-rice zone or zone-II) and Bathinda district represented Southwestern region (wheat-cotton zone or zone-III). Three-stage-stratified-random sampling technique was adopted for the selection of respondents. The three stages of selection comprised development

block as the first stage-sampling unit, village as the second-stage unit and operational holding as the third-stage unit. Two blocks from each district and two villages from each block were selected randomly. From each village, 10 marginal farmers (< 2.5 acre) and 10 small farmers (2.5-5.0 acre) were randomly selected. Thus, in all 240 respondents were covered in the present study.

Discriminant function analysis, which is a statistical technique used to differentiate between two or more classes, based on the common variables, was used for analysis of data. The discriminant function helps in measuring the net effect of a variable by holding the other variables constant. The sample farmers were categorized into two groups on the basis of economic surplus left with a farm household after deducting the farm and domestic expenditure from the sum of gross returns from agriculture plus off-farm income of the respective farm household. The farmers having positive economic surplus were grouped as viable farmers and the farmers with negative economic surplus were categorized as non-viable farmers. The linear discriminant function of the form of Equation (1) was applied to find the relative importance of different variables in discriminating between these two groups of farms, viz. viable farms and non-viable farms.

$$Z = \sum_{i=1}^n L_i X_i \quad \dots(1)$$

where,

Z = Total discriminant score for viable and non-viable farms of marginal and small farmers, respectively,

X_i = Variables selected to discriminate the two groups (i = 1, 2, ..., 8), like

X₁ = Education in years

X₂ = Family size in numbers

X₃ = Farm size in acres

X₄ = Total fixed investment in Rs

X₅ = Off-farm income in Rs

X₆ = Domestic expenditure in Rs

X₇ = Value productivity from crops in Rs/acre

X₈ = Net income from dairy in Rs

L_i = Linear discriminant coefficients of the variables estimated from the data, (i=1, 2, ..., 8)

The method seeks to obtain coefficients (L_i's) such that squared differences between the mean Z score for

one group and mean Z score for other group is as large as possible in relation to the variation of the Z scores within the groups.

Mahalanobis D^2 (Radha and Chowdhry, 2005) statistics was used to measure the discriminating distance between the two groups,

$$D^2 = \sum_{i=1}^n L_i d_i \quad \dots(2)$$

where, L_i is the linear discriminant coefficient and d_i is the mean difference of the two categories for the i th variable (x_i).

The significance of D^2 was tested by applying the following variance ratio (F) test:

$$\frac{(n-1-p)(n_1 n_2)}{p(n-2)(n)} D^2 \sim F(p, n-p-1) \quad \dots(3)$$

where,

n_1 = Number of farms in the viable farm group,

n_2 = Number of farms in the non-viable farm group,

n = $n_1 + n_2$, and

p = Number of variables considered in the function.

The critical mean discriminant score was obtained for each group by Equation (4):

$$Z = [\bar{Z}_1 + \bar{Z}_2] / 2 \quad \dots(4)$$

where,

$$\bar{Z}_1 = \sum_{i=1}^p L_i X_{1i} \quad \text{for viable farms}$$

$$\bar{Z}_2 = \sum_{i=1}^p L_i X_{2i} \quad \text{for non-viable farms}$$

For each individual, Z_i value was calculated by Equation (5):

$$Z_i = \sum_{i=1}^p L_i X_i \quad \dots(5)$$

If the individual Z_i value was more than Z , the individual belonged to the viable farm of the marginal and small farmers, otherwise to the non-viable category.

Economic Surplus Generated on Different Categories of Farms

The economic surplus was calculated by deducting the domestic expenditure from the total farm business

income from crops and dairy of a selected farm household. A perusal of Table 1 indicated that the marginal farmers could not meet their household requirements on the basis of their total disposable income from crops and dairy farming. They experienced a deficit of Rs 24771 in zone-I and of Rs 12560 in zone-III, while they were on the bank of survival in zone-II with a meagre surplus of Rs 460/annum. It is the adversity of the situation that even the small farmers in zone-I were living under a deficit economic surplus from agriculture to the tune of Rs 22042. However, small farmers in zone-II and zone-III seemed to be enjoying an economic surplus of Rs 19920 and Rs 6313, respectively.

After counting the off-farm income, a marginal farmer in zone-I and zone-III became viable, with Rs 1781 and Rs 5396, respectively as the overall economic surplus after meeting the domestic expenditure. The overall economic surplus of an average marginal farmer in zone-II increased to Rs 17194. Similarly, off-farm earnings helped the small farmers in zone-I to sustain with an overall economic surplus of Rs 5018.

Thus, it could be concluded that marginal farmers in all the zones and even the small farmers in zone-I are not economically viable by depending only upon crops and dairying. Income from off-farm activities is the only factor, which helps them to become viable farmers.

Viability of Farms

The distribution of marginal and small farmers into viable and non-viable classes has been presented in Table 2. Out of the total 240 sample farmers, the number of viable farmers was 165 (68.75 per cent) and of non-viable farmers was 75 (31.25 per cent). Out of 120 marginal farmers, 53.33 per cent were viable farmers, while 46.67 per cent were non-viable. In the case of small farmers, only 15.83 per cent were non-viable farmers. The zone-wise comparison of this aspect depicted that the marginal farmers were viable only to the tune of 32.50 per cent in zone-I, 75.00 per cent in zone-II and 52.50 per cent in zone-III. This kind of divergence exists because of difference in the farm size as well as crop and milk productivity on marginal farms across different regions. The position of small farmers was better as 80.00 per cent, 87.50 per cent and 85.00 per cent of the small farmers in zone-I, zone-II and zone-III, respectively were found to be viable.

Table 1. Economic surplus from crops, dairy and overall after including off-farm income of marginal and small farmers across different zones of Punjab: 2003-04

Particulars	(Rs/farm/annum)					
	Zone-I		Zone-II		Zone-III	
	Marginal	Small	Marginal	Small	Marginal	Small
Farm business income from crops	10286	21485	27981	56112	20589	41277
Farm business income from dairy	6960	9407	19810	22474	11320	12336
Total farm business income from crops and dairy	17246	30892	47791	78585	31910	53613
Domestic expenditure	42017	52935	47331	58665	44470	47300
Economic surplus from crops and dairy	-24771	-22042	460	19920	-12560	6313
Off-farm income	26552	27060	16734	20688	17956	10696
Overall economic surplus	1781	5018	17194	40608	5396	17009

Table 2. Distribution of marginal and small farmers into viable and non-viable classes on the basis of overall economic surplus across different zones of Punjab: 2003-04

Farm-size categories	(Numbers)							
	Zone-I		Zone-II		Zone-III		State	
	Viable	Non-viable	Viable	Non-viable	Viable	Non-viable	Viable	Non-viable
Marginal	13 (32.50)	27 (67.50)	30 (75.00)	10 (25.00)	21 (52.50)	19 (47.50)	64 (53.33)	56 (46.67)
Small	32 (80.00)	8 (20.00)	35 (87.50)	5 (12.50)	34 (85.00)	6 (15.00)	101 (84.17)	19 (15.83)
Overall	45 (56.25)	35 (43.75)	65 (81.75)	15 (18.75)	55 (68.75)	25 (31.25)	165 (68.75)	75 (31.25)

Note: Figures within the parentheses indicate percentages to total number of farmers in the respective category

On the overall basis, the percentage of viable farmers was observed highest in wheat-rice zone (81.75 per cent), followed by wheat-cotton zone (68.75 per cent) and wheat-maize zone (56.25 per cent). Thus, it can be concluded that the proportion of viable farmers was highest in the high productivity region, followed by moderate and low productive regions. The specific soil texture, cropping pattern along with higher level of irrigation facilities and mechanization were found to be the major factors for higher crop as well as milk productivity in wheat-rice zone as compared to other two zones.

Contribution of Selected Factors in Discrimination

The findings of discriminant function analysis on marginal and small farms in wheat-maize region have been presented in Table 3. It can be seen from the table that off-farm income and domestic expenditure were the factors, which differed significantly on viable

and non-viable marginal farms in this region. Off-farm income was significantly higher on viable marginal (Rs 39207) than non-viable marginal (Rs 20270) farms. On the contrary, domestic expenditure was found to be significantly higher on non-viable marginal farms (Rs 42314) than viable ones (Rs 33420). Both these factors contributed 67.50 per cent and 28.09 per cent, respectively towards the total distance between the two populations, i.e. viable and non-viable.

The discrimination between viable and non-viable small farms was mainly due to the fixed farm investment on crops and dairying and off-farm income. The fixed farm investment was significantly higher on non-viable farms (Rs 99739) than viable ones (Rs 58293), which led to negative economic surplus by adding up its contribution towards farm expenditure in the form of depreciation and interest. On the other hand, off-farm income again was significantly higher on viable small farms (Rs 35471) as compared to the non-viable small farms (Rs 4225). The contribution of fixed farm

Table 3. Particulars of discriminant function on marginal and small farms in wheat-maize region (Zone-I) of Punjab: 2003-04

Items	Mean		Mean difference (d _i)	Discriminant coefficient (L _i)	Discriminating distance (L _i)(d _i)	Per cent contribution to the total distance
	Viable	Non-viable				
Marginal farms						
X ₁ - Education (years)	4.31	3.78	-0.53	0.0476	-0.0252	-0.87
X ₂ - Family size (No.)	5.54	5.81	0.2763	0.1632	0.0451	1.56
X ₃ - Farm size (acres)	1.75	1.80	0.0555	0.0409	0.0023	0.08
X ₄ - Total fixed investment (Rs)	36556	34891	-1665.8	-0.00001	0.0182	0.63
X ₅ - Off-farm income (Rs)	39207	20270	-18937.2***	-0.0001	1.9467	67.50
X ₆ - Domestic expenditure (Rs)	33420	42314	8894.1***	0.00009	0.8103	28.09
X ₇ - Value productivity from crops (Rs/acre)	3957	5282	1324.2	0.00005	0.0743	2.58
X ₈ - Net income from dairy (Rs)	21240	22250	1009.8	0.00001	0.0124	0.43
D-square					2.8841** (2.58)	100.00
Small farms						
X ₁ - Education (years)	4.13	5.50	1.38	0.0160	0.0221	0.43
X ₂ - Family size (No.)	6.38	6.00	-0.3750	-0.2265	0.0850	1.66
X ₃ - Farm size (acres)	3.73	3.44	-0.2969	-1.9478	0.5783	11.28
X ₄ - Total fixed investment (Rs)	58293	99739	41446.1***	0.00005	2.0309	39.63
X ₅ - Off-farm income (Rs)	35471	4225	-31246.8***	-0.00005	1.8904	36.89
X ₆ - Domestic expenditure (Rs)	49779	47317	-2462.6	-0.00002	0.0554	1.08
X ₇ - Value productivity from crops (Rs/acre)	6442	7378	935.4	0.00020	0.1896	3.70
X ₈ - Net income from dairy (Rs)	31902	19544	-12357.6	-0.00002	0.2731	5.33
D-square					5.1248*** (3.34)	100.00
Marginal + Small farms						
X ₁ - Education (years)	4.18	4.17	-0.006	0.0690	-0.0004	-0.01
X ₂ - Family size (No.)	6.13	5.86	-0.2762	0.1382	-0.0382	-1.43
X ₃ - Farm size (acres)	3.16	2.18	-0.9825***	-1.3744	1.3504	50.61
X ₄ - Total fixed investment (Rs)	52011	49713	-2298.1	-0.00001	0.0009	0.03
X ₅ - Off-farm income (Rs)	36548	16602	-19945.9***	-0.00006	1.2027	45.08
X ₆ - Domestic expenditure (Rs)	45040	43458	-1582.2	-0.00001	-0.0063	-0.24
X ₇ - Value productivity from crops (Rs/acre)	5727	5761	33.315	0.00002	0.0008	0.03
X ₈ - Net income from dairy (Rs)	28820	21632	-7188.5*	-0.00002	0.1581	5.93
D-square					2.6680*** (5.98)	100.00

Notes: Figures within the parentheses indicate the F-ratio

***, **, * indicate significance at 1 per cent, 5 per cent and 10 per cent levels, respectively

investment and off-farm income towards the total distance between viable and non-viable small farms was calculated to be 39.6 per cent and 36.9 per cent, respectively.

While identifying the discriminating factors on marginal and small farms taken together, farm size came to be the most significant factor. The smaller landholdings, with average farm-size of 2.18 acre, were found to be non-viable as against 3.16 acre with viable farmers in the wheat-maize region. Its contribution towards total distance was 50.61 per cent. The second major discriminating factor was found to be off-farm income, which was significantly lower on non-viable farms (Rs16602) than viable farms (Rs 36548). Its contribution towards total distance was 45.08 per cent. Thus, the marginal farmers can sustain their livelihood only if they get adequate income from non-farm sector. Another factor, which came to be a significant discriminating variable, was the net income from dairy enterprise with a contribution of 5.93 per cent towards the total distance. It was significantly less on non-viable farms (Rs 21632) than viable farms (Rs 28220).

The situation in the Central Punjab was found better than in the other two regions, as the proportion of viable marginal as well as small farms was highest in this region. This region, though known for rice-wheat crop rotation, is also suitable for fodder production due to which dairy farming has gained the ground in this region. The per farm milk production on marginal farms was 5563 litres per annum in this region against 2520 litres in wheat-maize region and 3324 litres in wheat-cotton region. On small farms, the milk production per annum was 6043 litres, which was about 50 per cent higher than that of their counterparts in the other two regions. Therefore, the income from dairy has emerged as a significant factor behind the viability and non-viability of marginal and small farmers in this zone. On marginal viable farms, the average net income from dairy was Rs 51476, while on unviable farms, it was Rs 30653. Similarly, on viable small farms, the mean net income from dairy was Rs 42650, while on unviable farms, it was Rs 24724 per annum. The relative contribution of dairy to the total distance was 56.86 per cent and 14.93 per cent on marginal and small farms, respectively. Another major contributor to the total distance, on marginal farms, was the off-farm income accounting for 23.64 per cent of the total distance. On small farms, the size of

holdings contributed nearly 60 per cent to the total distance. The farm-size was 1.61 ha on viable farms and 1.20 ha on unviable small farms. For marginal and small farms taken together in this region, the net income from dairy, off-farm income, and size of holding emerged as the major determinants of viability and non-viability of these farms. Their contribution to the total distance was 32.40 per cent, 26.58 per cent and 19.83 per cent, respectively. In the case of marginal and small farms taken together, the value productivity of crops also contributed about 10 per cent to the total distance. It was due to the fact that value productivity per acre was higher on both viable and non-viable small farms than marginal farms, as is evident from Table 4.

The marginal farmers of the wheat-rice region were significantly demarcated between viable and non-viable farmers by off-farm income and net income from dairy, as their relative contributions towards total distance came to be 23.64 per cent and 56.86 per cent, respectively. On small farms in this region, farm size and net returns from dairy emerged as the significant discriminating factors between viable and non-viable small farmers, contributing 60.01 per cent and 14.93 per cent, respectively. The net returns from dairy were significantly lower by 42.03 per cent on non-viable small farms than on viable ones.

By differentiating the total of marginal and small farmers of wheat-rice region into viable and non-viable groups, it was found that farm size, off-farm income, value productivity of crops and net returns from dairy contributed significantly (19.83 per cent, 26.58 per cent, 10.55 per cent and 32.40 per cent, respectively) towards the total distance between viable and non-viable farmers. Out of this, net income from dairy turned out to be the major contributing factor followed by off-farm income.

A perusal of Table 5 reveals that family size, off-farm income and net returns from dairy emerged as the significant discriminating factors between viable and non-viable marginal farmers in wheat-cotton region, with relative contribution of -2.70 per cent, 97.42 per cent and 7.57 per cent, respectively. The negative significant contribution of family size indicated that smaller family size helped the non-viable marginal farmers to some extent. The most significant factor of discrimination turned out to be 'off-farm income'. The per farm mean off-farm income on viable

Table 4. Particulars of discriminant function on marginal and small farms in wheat-rice region (Zone-II) of Punjab: 2003-04

Items	Mean		Mean difference (d _i)	Discriminant coefficient (L _i)	Discriminating distance (L _i)(d _i)	Per cent contribution to the total distance
	Viable	Non-viable				
Marginal farms						
X ₁ - Education (years)	5.73	6.20	0.46	0.0477	0.0223	0.96
X ₂ - Family size (No.)	4.93	4.30	-0.6333	0.0039	-0.0025	-0.10
X ₃ - Farm size (acres)	2.10	2.07	-0.0250	-0.1516	0.0038	0.16
X ₄ - Total fixed investment (Rs)	98840	89717	-9122.6	0.00001	-0.0712	-3.06
X ₅ - Off-farm income (Rs)	25794	4100	-21694.1**	-0.00002	0.5489	23.64
X ₆ - Domestic expenditure (Rs)	43449	48458	5008.4	0.00009	0.4628	19.93
X ₇ - Value productivity from crops (Rs/acre)	15086	14399	-686.7	-0.00005	0.0374	1.61
X ₈ - Net income from dairy (Rs)	51476	30653	-20823.5***	-0.00006	1.3202	56.86
D-square					2.3217** (2.27)	100.00
Small farms						
X ₁ - Education (years)	4.91	6.60	1.69	-0.0106	-0.0180	-0.34
X ₂ - Family size (No.)	5.57	5.00	-0.5714	0.0991	-0.0566	-1.07
X ₃ - Farm size (acres)	4.02	3.00	-1.0214***	-3.1025	3.1689	60.01
X ₄ - Total fixed investment (Rs)	134962	133813	-1148.8	0.00001	-0.0040	-0.07
X ₅ - Off-farm income (Rs)	26560	5000	-21559.9	-0.00003	0.7136	13.51
X ₆ - Domestic expenditure (Rs)	54930	64987	10356.4	0.00005	0.5313	10.06
X ₇ - Value productivity from crops (Rs/acre)	20848	19660	-1187.8	-0.00013	0.1568	2.97
X ₈ - Net income from dairy (Rs)	42650	24724	-17925.8*	-0.00004	0.7887	14.93
D-square					5.2807** (2.36)	100.00
Marginal + Small farms						
X ₁ - Education (years)	5.29	6.33	1.04	0.0787	0.0820	3.07
X ₂ - Family size (No.)	5.28	4.53	-0.7436	0.0679	-0.0506	-1.89
X ₃ - Farm size (acres)	3.13	2.38	-0.7513**	-0.7058	0.5303	19.83
X ₄ - Total fixed investment (Rs)	118290	104416	-13874.3	-0.00001	0.0749	2.80
X ₅ - Off-farm income (Rs)	26206	4400	-21806.5**	-0.00003	0.7109	26.58
X ₆ - Domestic expenditure (Rs)	49470	53967	4497.6	0.00004	0.1781	6.66
X ₇ - Value productivity from crops (Rs/acre)	18189	16153	-2035.7*	-0.00014	0.2822	10.55
X ₈ - Net income from dairy (Rs)	46724	28676	-18047.0***	-0.00005	0.8663	32.40
D-square					2.6741*** (3.71)	100.00

Notes: Figures within the parentheses indicate the F-ratio

***, **, * indicate significance at 1 per cent, 5 per cent and 10 per cent levels, respectively

Table 5. Particulars of discriminant function on marginal and small farms in wheat-cotton region (Zone-III) of Punjab: 2003-04

Items	Mean		Mean difference (d _i)	Discriminant coefficient (L _i)	Discriminating distance (L _i)(d _i)	Per cent contribution to the total distance
	Viable	Non-viable				
Marginal farms						
X ₁ - Education (years)	4.21	3.53	-0.68	-0.1911	0.1315	3.72
X ₂ - Family size (No.)	6.00	4.53	-1.4737***	0.0647	-0.0954	-2.70
X ₃ - Farm size (acres)	1.68	1.92	0.2377	-1.3402	-0.3186	-8.99
X ₄ - Total fixed investment (Rs)	51441	54168	2726.2	-0.00003	-0.0913	-2.58
X ₅ - Off-farm income (Rs)	28519	6710	-21808.5***	-0.00015	3.4523	97.42
X ₆ - Domestic expenditure (Rs)	41364	42540	1175.6	0.00001	0.0014	0.04
X ₇ - Value productivity from crops (Rs/acre)	9966	11355	1388.7	0.00014	0.1955	5.52
X ₈ - Net income from dairy (Rs)	27066	23730	-3335.5*	-0.00008	0.2682	7.57
D-square					3.5436*** (3.61)	100.00
Small farms						
X ₁ - Education (years)	5.00	7.50	2.50	0.3382	0.8457	13.21
X ₂ - Family size (No.)	5.41	5.17	-0.2451	-0.0365	0.0090	0.14
X ₃ - Farm size (acres)	3.49	3.00	-0.4853**	-0.4598	0.2232	3.49
X ₄ - Total fixed investment (Rs)	85482	73682	-11799.6	0.00001	-0.1086	-1.70
X ₅ - Off-farm income (Rs)	12841	0	-12841.1	-0.00003	0.4828	7.54
X ₆ - Domestic expenditure (Rs)	44015	50437	6421.4	0.00005	0.3179	4.96
X ₇ - Value productivity from crops (Rs/acre)	17818	14137	-3680.2***	-0.00087	3.2177	50.25
X ₈ - Net income from dairy (Rs)	37349	21946	-15403.8***	-0.00009	1.4156	22.11
D-square					6.4033*** (3.33)	100.00
Marginal + Small farms						
X ₁ - Education (years)	4.69	4.48	-0.21	-0.0470	0.0099	0.35
X ₂ - Family size (No.)	5.65	4.68	-0.9745***	0.3770	-0.3674	-13.04
X ₃ - Farm size (acres)	2.79	2.18	-0.6145***	-0.8413	0.5170	18.35
X ₄ - Total fixed investment (Rs)	72477	58851	-13625.6	-0.00001	0.0041	0.15
X ₅ - Off-farm income (Rs)	18818	5100	-13718.1***	-0.00007	1.0521	37.33
X ₆ - Domestic expenditure (Rs)	42990	44435	1444.6	0.00003	0.0428	1.52
X ₇ - Value productivity from crops (Rs/acre)	14832	12022	-2809.4***	-0.00018	0.5214	18.50
X ₈ - Net income from dairy (Rs)	33417	23302	-10115.6***	-0.00010	1.0385	36.84
D-square					2.8184*** (5.51)	100.00

Notes: Figures within the parentheses indicate the F-ratio

***, **, * indicate significance at 1 per cent, 5 per cent and 10 per cent levels, respectively

Table 6. Particulars of discriminant function on marginal and small farms in Punjab: 2003-04

Items	Mean		Mean difference (d _i)	Discriminant coefficient (L _i)	Discriminating distance (L _i)(d _i)	Per cent contribution to the total distance
	Viable	Non-viable				
Marginal farms						
X ₁ - Education (years)	4.95	4.13	-0.8	0.0303	-0.0249	-1.28
X ₂ - Family size (No.)	5.41	5.11	-0.2991	-0.1233	0.0369	1.90
X ₃ - Farm size (acres)	1.89	1.89	0.0007	0.0477	0.0000	0.00
X ₄ - Total fixed investment (Rs)	70636	51221	-19417.4***	-0.00001	0.2660	13.72
X ₅ - Off-farm income (Rs)	29412	12782	-16630.7***	-0.00004	0.7700	39.71
X ₆ - Domestic expenditure (Rs)	40728	43488	2759.8	0.00006	0.1783	9.19
X ₇ - Value productivity from crops (Rs/acre)	11145	8970	-2175.1**	-0.00001	0.0241	1.27
X ₈ - Net income from dairy (Rs)	37325	24253	-13072.0***	-0.00005	0.6889	35.52
D-square					1.9393*** (6.81)	100.00
Small farms						
X ₁ - Education (years)	4.69	6.42	1.7	0.1301	0.2249	7.48
X ₂ - Family size (No.)	5.77	5.47	-0.2986	0.2167	-0.0647	-2.15
X ₃ - Farm size (acres)	3.75	3.18	-0.5658***	-1.9443	1.1001	36.60
X ₄ - Total fixed investment (Rs)	94014	100477	6463.3	0.00001	0.0620	2.06
X ₅ - Off-farm income (Rs)	24765	3094	-21670.6***	-0.00003	0.8365	27.83
X ₆ - Domestic expenditure (Rs)	49520	52952	3431.9	0.00003	0.1205	4.01
X ₇ - Value productivity from crops (Rs/acre)	15264	12745	-2519.1	-0.00003	0.0743	2.47
X ₈ - Net income from dairy (Rs)	37460	21666	-15794.5***	-0.00004	0.6523	21.70
D-square					3.0059*** (5.65)	100.00
Marginal + Small farms						
X ₁ - Education (years)	4.79	4.71	-0.1	0.0574	-0.0047	-0.21
X ₂ - Family size (No.)	5.64	5.20	-0.4364	-0.0080	0.0035	0.16
X ₃ - Farm size (acres)	3.03	2.22	-0.8085***	-0.9018	0.7292	32.42
X ₄ - Total fixed investment (Rs)	84943	63700	-21243.3***	-0.00001	0.0765	3.40
X ₅ - Off-farm income (Rs)	26564	10328	-16236.3***	-0.00003	0.6219	27.64
X ₆ - Domestic expenditure (Rs)	46102	45885	-216.4	0.00002	-0.0053	-0.24
X ₇ - Value productivity from crops (Rs/acre)	13671	9926	-3744.8***	-0.00006	0.2198	9.77
X ₈ - Net income from dairy (Rs)	37405	23597	-13808.1***	-0.00004	0.6089	27.06
D-square					2.2498*** (14.09)	100.00

Notes: Figures within the parentheses indicate the F-ratio

***, ** indicate significance at 1 per cent and 5 per cent levels, respectively

marginal farms was Rs 28519 against Rs 6710 on unviable marginal farms. In this way, the off-farm income of an unviable farmer was just 23.53 per cent of the income of a viable farmer. The net income from dairy was the other significant discriminating factor, which contributed 7.57 per cent to the total distance.

On small farms, farm size, value productivity from crops, and net income from dairy contributed significantly in favour of viability of the farms. The maximum contribution towards total distance between the viable and non-viable small farms was made by the value productivity from crops with 50.25 per cent share, followed by net income from dairy (22.11 per cent) and farm size (3.49 per cent). Both, value productivity from crops and net income from dairy were significantly lower by 20.65 per cent and 41.24 per cent, respectively on non-viable small farms than viable ones.

Considering marginal and small farms together, it was found that family size, farm size, off-farm income, value productivity of crops and net returns from dairy were the significant discriminating factors between viable and non-viable farms in the wheat-cotton region. The coefficient of family size was found negative, indicating favourable situation for non-viable farmers with smaller family size. Its contribution towards mitigating the distance between viable and non-viable farmers was -13.04 per cent. The difference in farm sizes between viable and non-viable farms, contributed significantly to the total distance. The levels of all the three sources of income, viz. off-farm income, value productivity of crops and net income from dairy, were significantly lower by 72.90 per cent, 18.94 per cent and 30.27 per cent, respectively on non-viable than viable farms. The highest contribution towards total distance between the viable and non-viable farms was of off-farm income, i.e. 37.33 per cent, followed by 36.84 per cent of net income from dairy.

Table 6 presents the results of the discriminant function analysis on marginal and small farms in the Punjab state as a whole. In the case of marginal farms, total fixed investment on crops and dairy, off-farm income, value productivity of crops and net income from dairy were calculated to be the significant discriminating factors, accounting for 13.72 per cent, 39.71 per cent, 1.27 per cent and 35.52 per cent contributions, respectively towards total distance between viable and non-viable farms. The total fixed investment was 37.90 per cent higher on viable marginal farms than non-viable

ones in the state. In the case of small farmers, farm size, off-farm income and net income from dairy were the significant discriminating factors with 36.60 per cent, 27.83 per cent and 21.70 per cent contributions, respectively towards the discriminating distance between viable and non-viable small farmers in the state. The off-farm income was 8-times higher and net returns from dairy were 1.73-times higher on viable small farms than non-viable ones.

The study revealed that the role of farm size in discriminating farmers into viable and non-viable groups was significant, with 32.42 per cent contribution to the total distance. Other important variables were: off-farm income, net income from dairy, and value productivity of crops with contribution of 27.64 per cent, 27.06 per cent and 9.77 per cent shares, respectively, while fixed investment on crops and dairy played the least role by 3.40 per cent in discriminating between the viable and non-viable marginal and small farms. The analysis further brought out that the crop value productivity per unit of area was less by 27.39 per cent and net income from dairy by 37.00 per cent on non-viable than viable farms.

Conclusions and Policy Implications

It can be concluded from the study that the intensity of various factors in demarcating the farmers into viable and non-viable ones differ across regions and farming categories. In low productivity region, off-farm income and rationality in domestic expenditure are the two main determinants of viability of marginal farmers. However, for small farmers, differences in the farm investment and off-farm income are the main contributors to the total distance. Therefore, the farm investment, in particular on irrigation, has emerged as a constraint. The size of farm has also contributed in a significant way in case of pooled data.

In the high productivity wheat-rice region, the net income from dairy is the main contributing factor towards viability as this region has abundant fodder as well as adequate milk processing facilities. Since this region is known for its high productivity, even the difference in farm size within the small farm category contributed significantly to viability along with net income from dairy and value productivity of crops.

In the wheat-cotton region, which has witnessed the failure of cotton crop almost for a decade, it has

been only the difference in off-farm income, which could explain the viability of a marginal farmer. Some small farmers who have shifted to Bt-cotton are able to join the viable group, as the value productivity of crops is the major contributor to the viability. These farmers have also diversified toward dairying to enhance their income. Ultimately for pooled data, net income from dairy, off-farm income, value productivity of crops and farm size have been found the factors discriminating between the two populations.

Some of the important causes of viability of the marginal and small farmers are obvious from the study. Most of the marginal farmers are likely to remain unviable if they do not get access to off-farm income. In the areas where the input availability and marketing with remunerative price are assured, dairy can play a positive role to the financial viability of these farming families.

The rationalizations of household expenditure and farm investment are also a source of enhancing the possibilities of financial viability of both the categories of farming families. Therefore, on the policy front, all efforts should be made to create off-farm employment opportunities for these farmers. The public investments should be made to remove the regional productivity gaps, as it will enhance income of these farmers. Assuring remunerative prices and up-scaling of the marketing and input supply facilities are the need of the hour to promote dairying and other allied activities among these farmers. All these measures will go a long way in easing the financial stress on marginal and small farmers of the area. In the prevailing economic

scenario, it is difficult to pull out or push out these farmers out of agriculture in a short-run and hence the solution lies in making them part-time farmers having access to diversified sources of income as has happened in some of the South-East Asian countries.

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