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Economic Analysis of Crop Production and Dairy Farming on Marginal and Small Farms in Punjab

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Abstract

The economic analysis of crop production and dairy farming has been reported for marginal and small farmers in Punjab for the year 2003-04. It has been found that a majority of the farm households are not able to meet their requirements from their income from crops and dairy farming. Further dairy farming has emerged as a major allied enterprise for supplementing the income of marginal and small farmers in Punjab. Income from off-farm sources has been identified another important factor contributing significantly to the disposable income of these farm households. The study has suggested to further exploit the potential of off-farm sources towards meeting the domestic expenditure. Also, the technical efficiency of crops and dairy farming should be improved to provide more income to farmers.

Introduction

In Punjab, out of 11.7 lakh operational holdings in 1990-91, 2.04 lakh holdings (18.3%) were of 1-2 hectares in size and 2.96 lakh (26.5%) were of less than one hectare. The number of total holdings declined to 9.97 lakh in 2000-01. As such, the number of smallholdings declined to 1.73 lakh (17.4%) and of marginal holdings to 1.23 lakh (12.3%). Considering the average size of small farms as 1.61 hectares in Punjab, it has been computed by the Commission for Agricultural Costs and Prices that the total net returns were only Rs 12,000/- from two crops, i.e. paddy and wheat in a year, which turned out to be Rs 200/- per capita per month for a family of 5 members. If we exclude the imputed cost of family labour which is a notional cost, the total net return for such a holding would be about Rs 20,000/- per annum, i.e. Rs 333/- per capita per month, which is below the minimum wages prescribed for a living. Thus, small farms, *per se*, are not viable unless they are supported with some supplementary income (Chandra, 2001).

Adoption of dairy enterprise can raise the income levels of marginal and small farmers. The share of dairy in farm business income improved from 43.4 per cent during 1987-90 to 54.6 per cent during 2000-03 on marginal farms, and from 31.0 per cent to 37.4 per cent on small farms (Sidhu and Bhullar, 2004). The present study has investigated the costs and returns to factors of production from crop and dairy farming on marginal and small farms in Punjab.

Methodology

Four-stage-stratified-random sampling technique was adopted for the study, i.e. agro-climatic zone (first stage), development block (second stage), village (third stage), and operational

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holding (fourth stage). Three districts, namely Ropar, Ludhiana and Bathinda, representing each of the three different agro-climatic zones of Punjab and having relatively higher concentration of marginal and small farmers in the respective zones were selected. Ropar district was selected to represent the low-productivity foothills region known as Kandi region (zone-I), whereas Ludhiana and Bathinda districts represented the high-productivity central plain (zone-II) and Southwestern regions (zone-III), respectively. Forty marginal and forty small farmers were selected from each zone, thus, making a sample size of 240 respondents. The data were collected during the year 2003-04 on a pre-tested specially structured schedule through personal interview method. Tabular analysis was carried out to estimate various cost and income levels, returns to different factors of production and economic surplus of the selected respondents.

Different types of costs have been worked out in the study. In cost A_1, depreciation on fixed capital, interest on working capital and cost on different inputs have been included. Cost A_2 was obtained by adding rent paid for leased-in-land to cost A_1 and cost B_1 was obtained by adding interest on fixed capital to cost A_1. Cost B_2 was calculated by adding the rental value of owned land and rent paid for the leased-in-land to cost B_1. Two more concepts of cost of production were used in the study, viz. cost C_1, a sum total of cost B_1 and imputed value of family labour; and cost C_2 which was the sum total of cost B_2 and imputed value of family labour.

Results and Discussion

Economics of Crop Production

The average size of operational holding of marginal farmers was 1.77 acres in zone-I, 2.08 acres in zone-II and 1.83 acres in zone-III. The small farmers were operating on 3.58 acres, 3.90 acres and 3.42 acres of land in zone-I, zone-II and zone-III respectively. The major cropping pattern was found to be wheat-maize in zone-I, wheat-rice in zone-II and wheat-cotton in zone-III. Fodder emerged as the second major crop on marginal and small farms in all the zones of Punjab.

Costs Structure and Income from Crop Production

The costs structure and per-hectare income from crop production by marginal and small farmers in different zones of Punjab have been given in Table 1. In zone-I, the per-hectare cost on fixed as well as working resources on marginal as well as small farms was found to be almost same. On including the imputed value of family labour and rental value of owned land, cost C_2 was found more on small than marginal farms in all the three zones. The per-hectare gross income from crop production was estimated to be almost same on marginal (Rs 23926) and small (Rs 23714) farms.

In zone-II, cost A_1 was slightly higher on small than marginal farms. With the addition of interest on fixed capital and imputed value of family labour, the cost C_1 increased to Rs 26363 on marginal and Rs 30233 on small farms. The rental value of land was significantly higher in this zone, and this pushed up the cost C_2 on both marginal and small farms. The per-hectare gross returns from crop production in zone-II came to be higher on small (Rs 60789) than marginal (Rs 55463) farms.

In zone-III, the per-hectare cost on fixed and working capital, i.e. cost A_1 came to be lower on marginal (Rs 21086) than small (Rs 24246) farms. The total cost, including the owned and fixed resources also worked out to be lower on marginal (Rs 49264) than small (54548) farms. The gross returns were also lower on marginal (Rs. 49214) than small (Rs 54419) farms in this zone.

The inter-zonal comparison revealed that the per-hectare cost of crop production was lowest in zone-I and highest in zone-II, which was due to the low-costing maize crop in zone-I and high-costing paddy and cotton crops in zones-II and III. The input-use was quite intensive in zones-II and III due to better irrigation facilities, higher mechanization and more expenditure on plant protection chemicals. Another factor of higher cost of production in zones-II and III was the higher rental value of owned land due to its higher productivity as compared to that in zone-I. Moreover, use of hired human labour was also quite high in zones-II and III than zone-I due to some labour-intensive agronomic operations of paddy and

Table 1. Costs structure and income from crop production on marginal and small farms in different zones of Punjab: 2003-04

(Rs/ha/annum)

Particulars	Zone-I		Zone-II		Zone-III	
	Marginal	Small	Marginal	Small	Marginal	Small
Items of expenditure						
Depreciation on fixed capital	116	202	775	1839	188	1203
Seed	987	970	844	921	1692	1822
Fertilizers and FYM	1813	2164	3667	4319	3093	3352
Plant protection measures	210	308	2084	2135	6739	7288
Irrigation charges	1122	1234	2980	2806	1237	1432
Hired human labour	840	821	2889	3407	1661	2107
Tractor	2872	2283	6478	6916	5377	5787
Bullock	248	171	0	0	0	0
Combine harvester	0	0	802	1017	0	0
Miscellaneous	146	152	311	365	105	158
Interest on working capital	412	405	1003	1094	995	1097
Cost A_1	8767	8710	21833	24820	21086	24246
Rent paid for leased-in-land	0	0	388	734	0	0
Cost A_2	8767	8710	22221	25554	21086	24246
Interest on fixed capital	116	202	775	1839	188	1203
Cost B_1	8883	8912	22608	26659	21274	25449
Rental value of owned land and rent paid for leased-in-land	9750	11281	28953	29811	21500	22300
Cost B_2	18633	20192	52427	56470	42774	47749
Imputed value of family labour	5278	5404	3754	3574	6490	6799
Cost C_1 (Cost B_1 + Family labour)	14160	14315	26363	30233	27764	32248
Cost C_2 (Cost B_2 + Family labour)	23910	25596	56181	60044	49264	54548
Income						
Gross returns	23296	23714	55463	60789	49214	54419

cotton crops. The gross returns were found to be the highest in zone-II, followed by zone-III and zone-I. It may be attributed to the yield and price variations in maize, paddy and cotton crops in these zones.

Economics of Dairy Farming

Buffaloes were found to constitute a major proportion in the total milch animals in all the zones in Punjab. The average numbers of milch, draught and young animals on marginal farms were respectively found to be 2.16, 0.48 and 0.52 in zone-I; 2.88, 0.92 and 1.12 in zone-II; and 1.92, 0.52 and 0.96 in zone-III.

Similarly, the average numbers of milch, draught and young animals on small farms respectively were 2.92, 1.40 and 0.76 in zone-I; 3.24, 0.88 and 1.12 in zone-II; and 2.44, 0.76 and 1.20 in zone-III.

Costs Structure and Income from Dairy Farming

The information on costs structure and income of the marginal and small farmers from dairy farming in different zones of Punjab has been given in Table 2. The total income from dairy enterprise was calculated by including income from milk, dung and sale of animals during the period under study.

In zone-I, the per animal cost on fixed as well as working resources was found higher on marginal (Rs 7248) than small (Rs 7032) farms. On including the imputed value of family labour in the cost of dairy farming, the total cost became still higher on marginal

Table 2. Costs structure and income from dairy farming on marginal and small farms in different zones of Punjab: 2003-04

(Rs/animal/annum)

Particulars	Zone-I		Zone-II		Zone-III	
	Marginal	Small	Marginal	Small	Marginal	Small
Cost items						
Depreciation on fixed capital	853	890	1209	1303	1027	1062
Green fodder	2261	2330	3207	3252	2688	3282
Dry fodder	1384	1562	1760	1794	1597	1837
Concentrates	2036	1488	1863	1895	1894	1877
Mineral mixture	29	40	94	111	60	83
Veterinary services	102	131	96	101	95	94
Hired human labour	0	33	27	34	0	23
Interest on working capital	581	558	705	719	633	720
Cost A_1	7248	7032	8961	9208	7995	8978
Interest on fixed capital	1219	1271	1727	1861	1467	1517
Cost B_1	8466	8303	10689	11069	9462	10495
Imputed value of family labour	2518	1832	1825	1957	1911	1991
Cost C_1	10984	10135	12514	13026	11373	12486
Income						
Gross returns	9450	8884	12988	13497	11325	11782

(Rs 10984) than small (Rs 10135) farms. The per animal gross income from dairy farming was also found to be higher on marginal (Rs 9450) than small (Rs 8884) farms.

In zone-II, the cost on different purchased inputs, including depreciation of fixed capital, came to be Rs 8961 per animal and Rs 9208 per animal on marginal and small farms, respectively. Intensively used family labour in dairy farming made the total cost, i.e. cost C_1 to be lower on marginal (Rs 12514) than small (Rs 13026) farms which resulted in getting gross returns from dairying of the order of Rs 12988 and Rs 13497 per animal on the respective categories of farms in this zone.

In zone-III, the per animal cost of fixed capital and purchased inputs, i.e. cost A_1 came to be lower on marginal (Rs 7995) than small (Rs 8978) farms. The total cost including owned and fixed resources was also lower on marginal (Rs 11373) than small (Rs 12486) farms. The gross returns were Rs 11325 and Rs 11782 per animal from dairy farming on marginal and small farms, respectively.

The inter-zonal analysis revealed that on dairy farming the use of hired human labour was lowest; even no use of hired human labour was recorded on marginal farms in zone-I and zone-III. Fixed resources were found to be highest in zone-II and lowest in zone-I. All this resulted in the highest cost of dairy farming at each level, i.e. cost A_1, cost B_1 and cost C_1 in zone-II, followed by zone-III and zone-I. Although the herd size played an important role, the higher level of milk yield in zone-II fetched highest gross returns in this zone, followed by zone-III and zone-I.

Returns to Factors of Production from Crop Production and Dairy Farming

A perusal of Table 3 revealed that after deducting total cost from the gross returns, per acre net returns or total returns to management from crop production and dairy farming were negative on marginal and small farms in zone-I and zone-III, and positive in zone-II. By taking out the imputed rental value of owned land from the total cost, the per acre returns to land and management were found to be highest in

Table 3. Returns to different factors of production from crop production and dairy farming on marginal and small farms in different zones of Punjab: 2003-04

(Rs/acre)

Particulars	Category	Zone-I		Zone-II		Zone-III	
		Marginal	Small	Marginal	Small	Marginal	Small
Average size of landholding (acres)	-	1.77	3.58	2.08	3.90	1.83	3.42
Returns to management	Crops	-246	-753	-287	298	-20	-52
	Dairy	-2739	-1776	1121	632	-90	-907
	Total	-2985	-2529	834	930	-110	-958
Imputed rental value of owned-land	-	3900	4512	11660	12000	8600	8920
Returns to land and management	Crops	3654	3759	11485	11929	8580	8868
	Dairy	-2739	-1776	1121	632	-90	-907
	Total	915	1984	12606	12561	8490	7962
Imputed value of family labour	Crops	2111	2161	1502	1429	2596	2720
	Dairy	4495	2600	4317	2630	3550	2561
	Total	6607	4761	5819	4059	6146	5281
Returns to labour and management	Crops	1865	1408	1215	1727	2576	2668
	Dairy	1757	824	5438	3262	3460	1655
	Total	3622	2233	6653	4990	6036	4323
Returns to land, labour and management	Crops	5765	5921	12987	13358	11176	11588
	Dairy	1757	824	5438	3262	3460	1655
	Total	7522	6745	18425	16620	14636	13243

zone-II on both marginal (Rs 12606) and small (Rs 12561) farms and lowest in zone-I. The returns to labour and management were also found to be highest in zone-II and lowest in zone-I on both marginal and small farms. On taking together the returns to land, labour and management, the maximum reward was witnessed in zone-II, followed by zone-III, and zone-I on both categories of farms.

It was also observed from Table 3 that crop farming alone could fetch a positive return only on small farms in zone-II, while in all other zones the net returns or the returns to management were negative. The returns to land and management were observed to be highest on marginal and small farms in zone-II because of higher rental value of owned-land in that zone. But, the returns to labour and management were found to be highest in zone-III owing to a comparatively higher use of family labour by the marginal and small farmers in labour-intensive operations of cotton crop.

The returns to management from dairy enterprise were positive on the marginal and small farms of zone-II and negative in the other two zones. The returns to labour and management from dairying were estimated to be positive in all the three zones, indicating that dairy farming was being operated at the cost of family labour in the state.

Thus, it could be concluded that it was due to resources like owned land and family labour that the marginal and small farmers were able to get positive returns, otherwise if returns to management or net returns were considered, they faced negative trends in zone-I and zone-III, while in zone-II, they were able to manage positive total net returns because of higher productivity of crop and milk in this zone than the other two zones.

Disposable Income

The disposable income from crops, dairy and off-farm activities of marginal and small farmers in different zones of Punjab has been recorded in Table 4 for the year 2003-04. The total disposable income was found to be highest in zone-II, on both marginal (Rs 64525) and small (Rs 99253) farms, followed by zone-III and zone-I.

Table 4. Disposable income from crops, dairy and off-farm activities of marginal and small farmers in different zones of Punjab: 2003-04

(Rs/farm family/annum)

Sources of income	Zone-I		Zone-II		Zone-III	
	Marginal	Small	Marginal	Small	Marginal	Small
Farm business income from crops	10286	21485	27981	56112	20589	41277
	(23.49)	(37.07)	(43.36)	(56.53)	(41.29)	(64.19)
Farm business income from dairy	6960	9407	19810	22474	11320	12336
	(15.89)	(16.24)	(30.71)	(22.65)	(22.70)	(19.18)
Total farm business income	17246	30892	47791	78585	31910	53613
	(39.38)	(53.31)	(74.07)	(79.18)	(63.99)	(83.37)
Off-farm income	26552	27060	16734	20688	17956	10696
	(60.62)	(46.69)	(25.93)	(20.82)	(36.01)	(16.63)
Total disposable income	43798	57952	64525	99253	49866	64309
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)

Note: Figures within the parentheses indicate percentages to total disposable income

Table 5. Economic surplus from crops, dairying and overall after including off-farm income of marginal and small farmers in different zones of Punjab: 2003-04

(Rs/farm family/annum)

Particulars	Zone-I		Zone-II		Zone-III	
	Marginal	Small	Marginal	Small	Marginal	Small
Farm business income from crops and dairy	17246	30892	47791	78585	31910	53613
Domestic expenditure (Food and non-food items)	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

Analysis of source-wise income revealed that highest proportion of the total disposable income was provided by off-farm activities, followed by crops and dairy to small and marginal farmers in zone-I. In zone-II, the maximum contribution to disposable income on marginal and small farms was of crops, followed by dairy and off-farm sources. However, in zone-III, the maximum contribution to the total disposable income was of crops, followed by off-farm activities and dairy on marginal farms, and crops, followed by dairy and off-farm sources on small farms.

Economic Surplus

The economic surplus was calculated by deducting the domestic expenditure on food and non-food items from the disposable income of a farm household. A perusal of Table 5 indicated that the marginal farmers could not meet their household requirements on the basis of their 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 meager surplus of Rs 460/- per 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 economic surplus after meeting the domestic expenditure. The

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 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.

Conclusions

The conclusions and policy measures pertaining to the sustainable development of marginal and small farmers are indicated as under :

- Dairying has emerged as a major allied enterprise for supplementing the income of marginal and small farmers in all the zones in Punjab. Its potential should be further exploited, particularly in zone-I, to raise the level of economic surplus of marginal and small farmers in Punjab.
- Domestic expenditure has been found to exceed the disposable income, turning the economic surplus towards the negative on marginal and small farms. Therefore, to meet the domestic expenditure in a rational manner, more income-earning opportunities from off-farm activities need to be explored.
- To enhance the level of returns from crops and dairy farming, the technical efficiency of these enterprises should be improved. The expenditure enhancement on input-use and irrigation facilities needs utmost attention in addition to better animal healthcare in zone-I.

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