

Economics of crop and livestock production in Uttar Pradesh

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Received: 24 November 2009; Accepted: 26 May 2010

ABSTRACT

A survey of 216 farm households was conducted across 3 districts each from south west semi arid plain and mid plain zone of Uttar Pradesh, India during 2006–07. The economic analysis indicated that all the farmers are diversifying their crop activities. It was found in both the zones that as farm size increases the herd size also increases. The per hectare cost of production was the lowest in mid plain and the highest in south-west semi arid plains. In general, per hectare cost on livestock management indicated inverse relationship between farmers' dependency on livestock and farm size. The study revealed that after deducting total cost from the gross income, per hectare net return or total return to management from crop production and livestock production were negative (Rs 3542) on small farms in mid plain and positive on marginal and large farms (Rs 3479 and Rs 4609). The livestock productivity was higher in south-west semi arid zone and therefore, farmers were able to manage higher return. The source-wise income revealed that highest proportion (85%) of the total net income was provided by crop production in mid plain and from livestock (65.8%) in south-west semi arid plain. The income was not sufficient for maintenance of balanced food, health and education of their family. There is a large scope to expand farm activities i.e. dairying, goatery, poultry, bee keeping etc. for increasing farm income besides providing low cost technology for farm production and reliable prices of their farm produce.

Key words: Crop and livestock production system, Cost structure, Diversification, Returns, Production system

There is an increasing consensus that in the developing countries, growth in agriculture is more poverty-reducing than the growth in other economic sectors. In India, agriculture and allied activities, despite their falling shares in the gross domestic product, are central to livelihood of millions of rural people. Nearly 72% of India's population lives in rural areas, and 75% of it depends on agriculture and allied activities for livelihood (Birthal and Taneja 2006). Indian agriculture achieved a spectacular growth during post-green revolution period due to the development of the improved production and protection technologies, but unabated growth in population and its excessive dependence on agriculture continue to pose serious challenges to policy makers and agricultural scientists. Besides this, industrialization, leading to shrinkage of agricultural land as well as operational holdings, globalization of market and change in agriculture trade and tariff policies have a bearing on existing farming systems calling for drastic and innovative changes. In 2002–03, the small farm households (<2 ha) comprised 60% of the rural households, controlled 76% cattle, 72% buffaloes, 80% small ruminants, 83% poultry and 90% pigs.

Thus, faster growth in livestock sector has considerable potential to contribute to agricultural growth and thereby poverty reduction (Birthal and Taneja 2006). The National Agricultural Policy targets 4% growth in agriculture sector over the next two decades and envisages an important role for the livestock sector in achieving it.

Uttar Pradesh is far behind in farm business income than its counterpart in Punjab (Singh *et al.* 2009) in spite of having huge potential for it. The livestock was the main source of employment for small farmers and have a very good scope for increasing the farm income through livestock enterprises in Uttar Pradesh (Singh *et al.* 2009). Under the gradual shrinking of land holding it is necessary to integrate land based enterprises like livestock, dairy fishery, poultry, duckery, apiary, field and horticultural crops etc. within the bio-physical and socio-economic environment of the farmers to make farming more profitable and dependable. Keeping this in view, the present study was conducted with the specific objective to study the cost and returns to factors of production from crop and livestock farming on different categories of farmers.

MATERIALS AND METHODS

Five stage stratified random sampling was adopted for the study, i.e. agro-climatic zone (first stage), district (second

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stage), development block (third stage), village (fourth stage) and operational holding (fifth stage). Three districts namely Agra, Aligarh and Badaun representing south-west semi-arid plain and Sitapur, Unnao and Jhansi representing mid plain were selected. The sample size consists of 108 farm households from each zone during 2006–07. Data were obtained through personal interview with the help of pre-tested structured schedules. Crop diversification index was calculated by using Simpson Index of diversity as used (Joshi 2002).

Simpson index of diversity: $I_i = 1 - (\sum_i S_i^2) / (\sum_i S_i)^2$

where S_i is the share of crop 'i' in gross crop area. A high Simpson index indicates greater crop diversity, while a low index reflects more specialization.

Tabular analysis was carried out to estimate various incomes, cost and returns to different factors of production and economic surplus of the selected households. Different types of costs have been worked out in the study. Depreciation on fixed capital, interest on working capital and cost on different inputs has been included in cost A_1 . 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 to cost B_1 . Cost C_1 is the total of cost B_1 and imputed value of family labour. And cost C_2 was the sum total of cost B_2 and imputed value of family labour.

Return to factors of production from crop production and livestock farming were computed after deducting total cost from the gross income per hectare, net return or total return to management from crop production and livestock production. Returns to land and management was calculated by taking out the imputed value of owned land from the total cost per hectare.

RESULTS AND DISCUSSION

In mid plain the average size of operational holding varied from 0.66 ha for marginal farmers to 7.44 ha for large farmers. The range of land ownership was not varying much for marginal and large farmers in South-west semi arid plain (0.71) as compared to mid plain (7.78).

However, proportion of area under cereals decreased as farm size increased across the groups (Table 1). Pulses were the second most important crops and share in gross cropped area increased as farm size increased. In all cereal, pulses and oilseeds comprises about 78 per cent of gross cropped area. The cropping intensity was lowest (114%) for large farmers due to cultivation of oil seeds and pulses. It was found that farmers were more dependent on food crops and share of high value crops like, fruits vegetables etc. in cropping pattern was to negligible due to their food security. In mid plain rice-wheat was the major cropping system of the area and cereals, pulses and oilseeds command about 81% of the total gross cropped area. Fodder crops accounted only about 4% area in the region. In south west semi arid plain *bajara* and wheat was the major cropping system. Cereal crops occupied about 63% area

Table 1. Cropping pattern of sample households in different zone of Uttar Pradesh

Crops	(area in ha)				
	Marginal	Small	Medium	Large	Total
<i>Mid plain</i>					
Cereals	58.69	56.86	53.90	40.85	52.16
Pulses	16.60	16.66	14.63	25.03	18.36
Oilseeds	6.44	5.31	7.80	19.84	10.02
Sugarcane	7.78	9.01	2.68	1.42	5.13
Vegetable	1.19	0.81	2.2	2.36	1.65
Fodder	5.64	4.38	4.15	0.94	3.63
Others	2.15	4.28	19.02	10.18	9.28
Gross cropped area	1.21	2.61	5.47	8.47	2.94
Cropping intensity	185.32	166.88	164.66	113.87	150.39
<i>South-west semi-arid plain</i>					
Cereals	69.69	62.18	59.2	65.92	63.07
Pulses	1.65	4.99	5.78	4.27	4.71
Oilseeds	4.52	9.91	3.44	9.51	6.78
Sugarcane	-	1.43	5.26	1.90	2.92
Vegetable	5.18	1.72	8.8	6.9	6.56
Fodder	10.71	11.35	12.85	7.45	10.51
Others	8.25	8.45	4.68	4.05	5.47
Gross cropped area	1.45	2.89	5.75	11.21	4.47
Cropping intensity	217.01	189.72	194.47	150.89	177.60
<i>Overall</i>					
Cereals	64.19	59.52	56.55	53.39	57.62
Pulses	9.13	10.83	10.21	14.65	11.54
Oilseeds	5.48	7.61	5.62	14.68	8.40
Sugarcane	3.89	5.22	3.97	1.66	4.03
Vegetable	3.19	1.27	5.50	4.63	4.11
Fodder	8.18	7.87	8.50	4.20	7.07
Others	5.20	6.37	11.85	7.12	7.38
Gross cropped area	1.33	2.75	5.61	9.84	3.71
Cropping intensity	201.17	178.30	179.57	132.38	164.00

followed by fodder crops (10.51%). Farm size wise analysis indicated that area under fodder crop decreased as farm size increased except large farmers in mid plain while increased in southwest semi arid plain.

Marginal farmers were less diversified in comparison to other farmers in all the zones except few cases (Table 2). The average diversification index for marginal farmers was 0.6313 as compared to 0.7497 for large farmers in mid plain. Similarly it was 0.6623 for marginal farmers as against 0.7168 for large farmers of south-west semi-arid plain. In all, the sample household's followed medium to high degree crop diversification for fulfillment of family requirement and risk minimization. However, there is a large scope for diversification towards high value crops.

It was observed that buffalo was the important milch animal kept on the different farming systems. On the whole a farmer possessed 0.19 crossbred cow in comparison to 1.34 buffaloes (Table 3). The livestock pattern in mid plain contains about 16% draught animals in comparison to 7% in

Table 2. Crop diversification of different size of farms in different zone of Uttar Pradesh

Level of diversification	Marginal		Small		Medium		Large		Total	
	No of HH	Diver. Index	No of HH	Diver. Index	No of HH	Diver. Index	No of HH	Diver. Index	No of HH	Diver. Index
<i>Mid plain</i>										
High	14	0.7603	21	0.7380	10	0.7394	9	0.7612	53	0.7473
Medium	33	0.5825	14	0.6386	5	0.6611	1	0.6466	54	0.6056
Low	0	0.0000	1	0.0000	0	0.0000	0	0.0000	1	0.0000
Average	47	0.6313	36	0.6788	15	0.7133	10	0.7497	108	0.6695
<i>South-west semi-arid plain</i>										
High	17	0.7584	15	0.7534	21	0.7797	10	0.7824	63	0.7681
Medium	15	0.5534	13	0.6006	11	0.6091	4	0.6395	43	0.5899
Low	0	0.0000	1	0.4444	0	0.0000	1	0.3704	2	0.4074
Average	32	0.6623	29	0.6742	32	0.7211	15	0.7168	108	0.6905
<i>Overall</i>										
High	30	0.7585	36	0.7444	31	0.7667	19	0.7724	116	0.7586
Medium	49	0.5737	27	0.6203	16	0.6253	5	0.6409	97	0.5986
Low	0	0.0000	2	0.2222	0	0.0000	1	0.3704	3	0.2716
Average	79	0.6439	65	0.6768	47	0.7186	25	0.7300	216	0.6800

south-west semi-arid plain. This indicates that the farmers were less interested in keeping the crossbred cows because the price of the milk is not attractive in comparison to buffalo milk. It shows that the cross breeding programme and milk cooperatives needs to be strengthened. Livestock pattern revealed that as farm size increases the herd size also increases in both the zones except large farmers in south west semi arid plain. A marginal and small farmer of south

west semi arid plain reared at least one goat or sheep for supplementing his income. Calves were the second largest flock of bovine population on all size groups. The livestock pattern indicates greater scope for expansion towards dairy and meat animals.

Cost structure and income from crop production

Cost structure per hectare and income from crop

Table 3. Farm size wise livestock pattern of households in different study zones

								(%)
Farm Size	Milch cow (local)	Milch Cow (Crossbred)	Dairy Buffaloes	Bullocks/he buffaloes	Calves	Goat	Sheep	Total
Mid plain								
Marginal	7.88	1.21	27.88	18.79	27.88	16.36	0	100
Small	11.97	0	28.87	18.31	26.76	14.08	0	100
Medium	12.05	0	26.51	13.25	22.89	25.30	0	100
Large	19.72	0	33.80	11.27	33.80	1.41	0	100
Total	11.71	0.43	28.85	16.49	27.55	14.97	0	100
Total animals (No.)	0.5	0.02	1.23	0.7	1.18	0.64	0	4.27
South-west semi arid plain								
Marginal	3.48	0.87	30.43	7.83	24.35	30.43	2.61	100
Small	8.73	5.56	29.37	3.97	32.54	1.59	18.25	100
Medium	6.2	10.53	41.52	7.68	27.26	6.82	0	100
Large	12.68	19.72	22.54	8.45	26.76	9.86	0	100
Total	7.18	8.24	32.75	6.82	27.89	11.62	5.49	100
No. of animals	0.31	0.36	1.44	0.3	1.22	0.51	0.24	4.38
Overall								
Marginal	5.68	1.04	29.16	13.31	26.12	23.40	1.31	100
Small	10.35	2.78	29.12	11.14	29.65	7.84	9.13	100
Medium	9.13	5.27	34.02	10.47	25.08	16.06	0.00	100
Large	16.20	9.86	28.17	9.86	30.28	5.64	0.00	100
Total	9.45	4.34	30.80	11.66	27.72	13.30	2.75	100
No. of animals	0.41	0.19	1.34	0.50	1.20	0.58	0.12	4.33

production of different categories of farmers of the 2 selected zones of Uttar Pradesh are given in Table 4. In mid plain, the per hectare cost A_1 decreased with increasing farm size except in case of small farmers. The cost A_1 varies from about Rs 11 624 for marginal farmers to Rs 13 303 for large farmers. As regards to cost C_2 which includes rental value of owned land and imputed value of family labour varies from Rs 36 596 for marginal farmers to Rs 39 591 for small farmers. Per hectare estimated gross return from crop production varied from about Rs 32 801 for medium farmers to Rs 41 577 large farmers of mid plain.

In south west semi arid plain, cost A_1 was considerably higher on small farms (Rs 15 005) and lower on marginal farms (Rs 11 110). With addition of rent paid for leased in land and interest on fixed capital, rental value of owned land and imputed value of family labour the cost C_2 ranged from Rs 37 134 on marginal farms to Rs 43 903 on medium farms indicating that cost B_1 was increasing as farm size increasing except in case of medium farms. The inter-zonal comparison revealed that the per hectare cost of production was lowest in mid plain Rs 38 079 and highest in south west semi arid plain of Rs 40 603, which was due to the low cost of

Table 4. Cost structure and income from crop production in different zone of Uttar Pradesh

Particulars	(Rs/ha/annum)				
	Marginal	Small	Medium	Large	Total
<i>Mid plain</i>					
Total variable cost	11070.1	13180.0	12206.4	12669.3	12281.4
Interest on working capital	553.5	659.0	610.3	633.5	614.1
Cost A_1	11623.6	13839.0	12816.7	13302.7	12895.5
Rent paid for leased in land	500.0	0.0	0.0	0.0	125.0
Cost A_2	12123.6	13839.0	12816.7	13302.7	13020.5
Interest on fixed capital	2428.8	3422.9	3692.3	2301.6	2961.4
cost B_1	14552.4	17261.9	16509.0	15604.4	15981.9
Rental value of owned land	17500.0	18000.0	18000.0	18000.0	17875.0
Cost B_2	32052.4	35261.9	34509.0	33604.4	33856.9
Imputed value of family labour	4543.1	4329.3	4046.7	3968.7	4222.0
Cost C_1 (B_1 +family labour)	19095.6	21591.2	20555.8	19573.1	20203.9
Cost C_2 (B_2 +family labour)	36595.6	39591.2	38555.8	37573.1	38078.9
Gross return	39934.3	39286.9	32801.3	41576.6	38399.8
<i>South-west semi-arid</i>					
Total variable cost	10581.3	14290.4	12618.3	13626.1	12779.0
Interest on working capital	529.1	714.5	630.9	681.3	639.0
Cost A_1	11110.3	15004.9	13249.2	14307.4	13418.0
Rent paid for leased in land	1250.0	1250.0	1500.0	8750.0	3187.5
Cost A_2	12360.3	16254.9	14749.2	23057.4	16605.5
Interest on fixed capital	1601.3	3371.2	3470.9	2872.2	2828.9
cost B_1	13961.6	19626.1	18220.1	25929.7	19434.4
Rental value of owned land	18750.0	18750.0	18500.0	11250.0	16812.5
Cost B_2	32711.6	38376.1	36720.1	37179.7	36246.9
Imputed value of family labour	4422.7	5527.7	3775.3	3700.3	4356.5
Cost C_1 (B_1 +Family labour)	18384.3	25153.8	21995.4	29630.0	23790.9
Cost C_2 (B_2 +Family labour)	37134.3	43903.8	40495.4	40880.0	40603.4
Gross return	34388.3	47540.3	34806.5	38046.4	38695.4
<i>Overall</i>					
Total variable cost	10825.7	13735.2	12412.4	13147.7	12530.2
Interest on working capital	541.3	686.8	620.6	657.4	626.5
Cost A_1	11366.9	14422.0	13033.0	13805.1	13156.7
Rent paid for leased in land	875.0	625.0	750.0	4375.0	1656.3
Cost A_2	12241.9	15047.0	13783.0	18180.1	14813.0
Interest on fixed capital	2015.1	3397.1	3581.6	2586.9	2895.2
cost B_1	14257.0	18444.0	17364.6	20767.0	17708.2
Rental value of owned land	18125.0	18375.0	18250.0	14625.0	17343.8
Cost B_2	32382.0	36819.0	35614.6	35392.0	35051.9
Imputed value of family labour	4482.9	4928.5	3911.0	3834.5	4289.2
Cost C_1 (B_1 +family labour)	18739.9	23372.5	21275.6	24601.6	21997.4
Cost C_2 (B_2 +family labour)	36864.9	41747.5	39525.6	39226.6	39341.1
Gross return	37161.3	43413.6	33803.9	39811.5	38547.6

production of sugarcane and maize crop in mid plain.

Economics of livestock farming

Dairy buffaloes (31%), calves (28%) and goats (13%) constitute a major portion in the total livestock in all the zones. The average numbers of different animal have been given in Table 2 and the information on costs structure and income in Table 5.

The gross income from livestock was calculated by including income from milk, dung, meat and sale of livestock during the period under study. In mid plain per hectare per annum burden of fixed as well as working resources (cost A_1) was considerably higher on marginal farms (Rs 48 711) than average farmer (Rs 24 895). On including the interest on fixed capital and imputed value of family labour in the cost of livestock farming the total cost becomes still higher on marginal farms (Rs 62 679) than average farmer (Rs 31 608). Average income per hectare from livestock farming was also higher (Rs 62 819) than average farmer (Rs 27 238). However, net income was higher in medium farmers.

In south-west semi-arid plain, the cost on different

purchased inputs including depreciation on fixed capital, came to be Rs 46 026/ha on marginal farms followed by Rs 30 096 on small farms. The trend remained the same after inclusion of interest on fixed capital and imputed value of family labour. In general per hectare cost on livestock management varies from Rs 11 636 for large farmers to Rs 61 438 for marginal farmers indicating inverse relationship between farmers dependency on livestock and farm size.

Return to factors of production from crop production and livestock farming

After deducting total cost from the gross income, per hectare net return or total return to management from crop production and livestock production were negative in small farms in mid plain and positive on marginal and large farms (Table 6). By taking out the imputed value of owned land from the total cost, the per hectare return to land and management were found to be highest on all farms ranging from Rs 16 466 on large farms to Rs 108 196 on medium farms in southwest semi arid plain and lowest in mid plain varying from Rs 14 458 on small farms to Rs 22 609 on

Table 5. Cost structure and income from livestock in different zone of Uttar Pradesh

(Rs/ha/annum)

Particulars	Marginal	Small	Medium	Large	Total
<i>Mid plain</i>					
Depreciation on fixed capital	6534.1	4360.9	2208.7	1379.0	3425.3
Variable cost	39963.4	20487.7	12008.3	8050.3	20127.3
Interest on working capital	2213.8	1366.7	967.1	915.5	1342.0
Cost A_1	48711.3	26215.3	15184.0	10344.7	24894.7
Interest on fixed capital	6534.1	4360.9	2208.7	1379.0	3425.3
Cost B_1	55245.4	30576.2	17392.7	11723.7	28320.0
Imputed value on family labour	7433.9	3012.1	2018.4	688.2	3288.1
Cost C_1	62679.3	33588.2	19411.0	12411.9	31608.2
Gross income	62819.3	30350.6	22952.2	13017.3	27238.0
<i>South-west semi-arid zone</i>					
Depreciation on fixed capital	3816.8	2793.7	1937.9	791.5	1539.4
Variable cost	40069.9	25799.1	17203.3	8372.9	22861.3
Interest on working capital	2139.0	1503.7	1152.8	726.5	1342.4
Cost A_1	46025.6	30096.4	20293.9	9891.0	25743.1
Interest on fixed capital	3816.8	2793.7	1937.9	791.5	1539.4
Cost B_1	49842.4	32890.1	22231.7	10682.5	27282.5
Imputed value on family labour	11015.2	4658.9	1670.6	204.7	4387.3
Cost C_1	60857.5	37548.9	23902.4	10887.2	31669.9
Gross income	111378.0	84044.4	119287.6	18936.5	90111.8
<i>Overall</i>					
Depreciation on fixed capital	5175.4	3577.3	2073.3	1085.3	2482.4
Variable cost	40007.2	22820.9	15226.2	8253.7	21576.9
Interest on working capital	2175.9	1419.1	1090.9	823.1	1346.4
Cost A_1	47358.4	27817.2	18390.4	10162.1	25405.7
Interest on fixed capital	5175.4	3577.3	2073.3	1085.3	2482.4
Cost B_1	52533.9	31394.5	20463.7	11247.4	27888.1
Imputed value on family labour	8903.7	3735.5	1976.9	388.3	3751.1
Cost C_1	61437.6	35129.9	22440.6	11635.6	31639.1
Gross income	123789.8	53936.9	105741.8	16567.3	62603.6

Table 6. Returns to different factors of production from crop and livestock in different zone of Uttar Pradesh

(Rs/ha/annum)

Particulars		Marginal	Small	Medium	Large	Total
<i>Mid plain</i>						
Return to management	Crops	3338.8	-304.2	-5754.5	4003.5	320.9
	Livestock	139.9	-3237.7	3541.2	605.4	-4370.2
	Total	3478.7	-3541.9	-2213.3	4608.9	-4049.3
Imputed rental value of owned land		17500	17500.0	18000.0	18000.0	18000.0
Return to land and management	Crops	20838.8	17695.8	12245.5	22003.5	18195.9
	Livestock	139.9	-3237.7	3541.2	605.4	-4370.2
	Total	20978.7	14458.1	15786.7	22608.9	13825.7
Imputed value of family labour	Crops	4543.2	4329.3	4046.7	3968.7	4505.2
	Livestock	7433.9	3012.1	2018.4	688.2	3288.1
	Total	11977.1	7341.3	6065.1	4656.9	7793.3
Returns to labour and management	Crops	7881.9	4025.1	-1707.7	7972.3	4542.9
	Livestock	7573.9	-225.6	5559.5	1293.6	-1082.1
	Total	15455.8	3799.4	3851.8	9265.8	3460.8
Returns to land labour and management	Crops	25381.9	22025.0	16292.3	25972.2	22701.1
	Livestock	7573.9	-225.6	5559.5	1293.6	-1082.1
	Total	32955.8	21799.4	21851.8	27265.8	21619.0
<i>South-west semi-arid zone</i>						
Return to management	Crops	-2746.1	3636.5	-5688.8	-2833.6	-1908.0
	Livestock	50520.5	46495.5	95385.2	8049.3	58442.0
	Total	47774.4	50132.0	89696.4	5215.7	56534.0
Imputed rental value of owned land		18750	18750.0	18750.0	18500.0	11250.0
Return to land and management	Crops	16003.9	22386.5	12811.2	8416.4	14904.5
	Livestock	50520.5	46495.5	95385.2	8049.3	58442.0
	Total	66524.4	68882.0	108196.4	16465.7	73346.5
Imputed value of family labour	Crops	4422.7	5527.7	3775.3	3700.3	4371.4
	Livestock	11015.2	4658.9	1670.6	204.7	4387.3
	Total	15437.9	10186.6	5445.9	3905.1	8758.7
Returns to labour and management	Crops	1676.7	9164.2	-1913.6	866.8	2448.5
	Livestock	61535.6	51154.4	97055.8	8254.0	62829.3
	Total	63212.3	60318.6	95142.3	9120.8	65277.8
Returns to land labour and management	Crops	20426.6	27914.2	16586.4	12116.8	19275.9
	Livestock	61535.6	51154.4	97055.8	8254.0	62829.3
	Total	81962.3	79068.6	113642.3	20370.8	82105.2
<i>Overall</i>						
Return to management	Crops	296.4	1666.1	-5721.7	585.0	-793.5
	Livestock	25330.2	21628.9	49463.2	4327.4	27035.9
	Total	25626.6	23295.0	43741.5	4912.3	26242.3
Imputed rental value of owned land		18125	18125.0	18375.0	18250.0	14625.0
Return to land and management	Crops	18421.4	20041.1	12528.4	15210.0	16550.2
	Livestock	25330.2	21628.9	49463.2	4327.4	27035.9
	Total	43751.6	41670.0	61991.5	19537.3	43586.1
Imputed value of family labour	Crops	4482.9	4928.5	3911.0	3834.5	4438.3
	Livestock	9224.6	3835.5	1844.5	446.4	3837.7
	Total	13707.5	8764.0	5755.5	4281.0	8276.0
Returns to labour and management	Crops	4779.3	6594.6	-1810.6	4419.5	3495.7
	Livestock	34554.8	25464.4	51307.7	4773.8	30873.6
	Total	39334.0	32059.0	49497.1	9193.3	34369.3
Returns to land labour and management	Crops	22904.3	24969.6	16439.4	19044.5	20988.5
	Livestock	34554.8	25464.4	51307.7	4773.8	30873.6
	Total	57459.0	50434.0	67747.1	23818.3	51862.1

large farms. When clubbed together, the return to land, labour and management, the maximum reward was witnessed in south-west semi-arid plain.

It was also observed (Table 6) that crop farming alone could fetch a positive return only on marginal and large farms in mid plain and on small farms in south-west semi arid plain while in all other farm categories of respective zone the net return or the return to management were negative because of higher rental value of owned land and inefficient management.

But, the return to labour and management were highest in south-west semi arid plain because of higher percentage of cross breed cows, dairy buffalo's, goat and sheep in comparison to mid plain. The returns to management from livestock enterprises were positive on all farms in both the zones except on small farms in mid plain, indicating livestock farming was a good source of income to all farmers especially in south-west semi-arid plain.

Net farm income

The net income from crop, livestock and off farm activities of different farmers in different zone of Uttar Pradesh has been given in Table 7 for the year 2006–07. Total net income was about two-and-half time more for all farmers except large farmers in south west semi arid plain in comparison to mid plain. The marginal, small and medium farmers of mid plain had a disposable income Rs 28 262, Rs 56 170 and Rs 90 281 respectively, while the same was Rs 67 803, Rs 164 826 and Rs 395 069 in south west semi arid plain. The large farmers of mid plain had higher disposable income because of considerably higher income from crop production. The source-wise income revealed that highest proportion of the income was provided by crop production in mid plain and from livestock in south-west semi-arid plain.

Net savings

Net savings were calculated by deducting the domestic

Table 7. Net income from crop, livestock and off farm activities in different zone of Uttar Pradesh

(Rs/farm family/annum)

Particulars	Marginal	Small	Medium	Large	Total
<i>Mid plain</i>					
Crop income	16752.1	34579.3	54090.4	193233.5	74663.8
	59.3	61.6	59.9	82.2	84.7
Livestock income	4998.7	-354.2	18457.7	9624.0	-2120.9
	17.7	-0.6	20.4	4.1	-2.4
Off farm income	6510.6	21944.5	17733.3	32240.0	15596.3
	23.0	39.1	19.6	13.7	17.7
Total	28261.5	56169.5	90281.4	235097.5	88139.3
	100.0	100.0	100.0	100.0	100.0
Average size of holding (ha)	0.66	1.57	3.32	7.44	1.96
<i>South-west semi-arid zone</i>					
Crop income	14502.9	42708.7	50091.1	94268.3	50392.8
	21.4	25.9	12.7	49.9	20.4
Livestock income	43690.3	78266.2	293108.6	64216.4	162727.9
	64.4	47.5	74.2	34.0	65.8
Off farm income	9609.4	43850.9	51868.8	30600.0	34111.0
	14.2	26.6	13.1	16.2	13.8
Total	67802.6	164825.8	395068.5	189084.7	247231.7
	100.0	100.0	100.0	100.0	100.0
Average size of holding (ha)	0.71	1.53	3.02	7.78	2.59
<i>Overall</i>					
Crop income	15627.5	38644.0	52090.7	143750.9	62528.3
	25.9	35.0	22.3	67.0	36.5
Livestock income	24344.5	38956.0	155783.2	36920.2	80303.5
	40.3	35.3	66.6	17.2	46.9
Off farm income	20442.3	32911.6	26142.9	34016.7	28378.3
	33.8	29.8	11.2	15.8	16.6
Total	60414.3	110511.6	234016.8	214687.8	171210.2
	100.0	100.0	0100.0	100.0	100.0
Average size of holding (ha)	0.69	1.55	3.17	7.61	2.28

Table 8. Net saving from crop and livestock after including off farm income in different zone of Uttar Pradesh

(Rs/farm family/annum)

Farming systems	Family size	Income from crop and livestock	Domestic expenditure	Savings	Off farm income	Overall saving
<i>Mid plain</i>						
Marginal	6.81	21750.8	62515.8	-40765.0	6510.6	-34254.3
Small	9.25	34225.1	84915.0	-50689.9	21944.5	-28745.5
Medium	8.53	72548.1	78305.4	-5757.3	17733.3	11976.0
Large	13.90	202857.5	127602.0	75255.5	32240.0	107495.5
Total	8.52	72543.0	78213.6	-5670.6	15596.3	9925.7
<i>South-west semi-arid plain</i>						
Marginal	9.59	58193.2	88036.2	-29843.0	9609.4	-20233.6
Small	9.45	120974.9	86751.0	34223.9	43850.9	78074.8
Medium	10.47	343199.7	96114.6	247085.1	51868.8	298953.9
Large	11.27	158484.7	103458.6	55026.1	30600.0	85626.1
Total	10.05	213120.7	92259.0	120861.7	34111.0	154972.7
<i>Overall</i>						
Marginal	9.42	39972.0	86475.6	-46503.6	20442.3	-26061.3
Small	8.99	77600.0	82528.2	-4928.2	32911.6	27983.4
Medium	12.19	207873.9	111904.2	95969.7	26142.9	122112.6
Large	9.9	180671.1	90882.0	89789.1	34016.7	123805.8
Total	9.22	142831.8	84639.6	58192.2	28378.3	86570.6

expenditure based on the NSS 59th Round Survey (Anonymous 2003) with 20% increase in domestic expenditure due to price rise during period 2003 to 2007. In general the marginal farmers could not meet their household requirement (Table 8) on the basis of their income from all sources like crop, livestock and off farm income. They were in deficit of Rs 26 061. Zone wise analysis indicated that the marginal and small farmers in mid plain and marginal farmers in south west semi arid zone were in deficit of Rs 34 254, Rs 28 745 and Rs 20 233 respectively.

Thus it could be concluded that farmers in general and marginal and small farmers in particular were able to get positive returns due to engagement of family labour, otherwise if return to management or net return were considered, they realize negative return in both the zones particularly in crop production. The similar observations were reported by Singh and Joshi (2009). The livestock productivity was higher in south west semi arid zone and therefore, farmers were able to manage higher return in comparison to mid plain. The study indicated that farmers were surviving without proper maintenance of balanced food, health and education of their family. Their income can be increased by expansion of farm activities i.e. dairying, goatery, poultry, bee keeping etc. besides providing low cost technology for farm production and reliable prices of their farm produce. This will enable them to bear the cost of health and education which became very dearer in the era of

commercialization.

ACKNOWLEDGEMENTS

The authors are thankful to Dr Mruthyunjaya, Ex National Director, National Agriculture Innovative Project (ICAR), New Delhi, for his valuable suggestions in preparation of this article. This work was undertaken in Ad-hoc project entitled "Economics of Farming Systems Diversification through high value enterprises in Uttar Pradesh", financed by Indian Council of Agricultural Research New Delhi. Authors are thankful to Indian Council of Agricultural Research New Delhi for financing the project.

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