Economics of Production of Green Peas (*Pisum sativum* L.) in Punjab

Rohit Singla, S.S. Chahal and P. Kataria*

Abstract

The economics of production and factors influencing the productivity of green peas in Punjab have been studied using the primary data from pea growers. The data have been analysed using simple tabular and functional analyses. The results have revealed that the green peas and wheat are the main crops in *rabi* season. It has been noticed that 75.85 per cent of the farmers purchase pea seeds from dealers. The yield of green peas has been found the highest on small farms among all the farm-size categories. The total cost incurred has been higher in large than small and medium farmers due to more use of inputs by the former. The gross and net returns have been found higher in large than small and medium farmers due to realization of higher prices by them and exploring of other markets due to their higher marketable surpluses. The functional analysis has revealed that the fertilizers, irrigation and machinery are the impact variables, influencing the productivity of green peas positively. The returns over variable costs in the case of peas have been higher by 129 per cent than those in wheat (main competing crop). It has been argued that the farmers be advised by the agricultural extension experts to adopt green pea cultivation for improving the efficiency of the farms through increased income per unit of land. Moreover, it will provide impetus to the diversification program of the state government and improve the soil health.

Introduction

The potential of vegetables in contributing to the national economy has been well recognized in recent years. India is the second largest producer of vegetables, next only to China, in the world with a production of 40 million tonnes from four million hectares of land area. In spite of that, this seemingly high level of production can provide only 208 grams of vegetables

per capita (Sharma, 2003), as against the suggested dietary intake of 275g and 250 g per capita per day for adult male and female, respectively for undertaking moderate work (Swaminathan, 2002).

In India, the area under green peas rose continuously from 177.7 thousand hectares in 1991-92 to 272.6 thousand hectares in 1999-2000. The percentage of area under peas in India to global area under peas has also risen from 3.2 per cent in 1991-92 to 4.5 per cent in 1999-2000. The production of green peas has increased from 1.30 million tonnes in 1991-92 to 3.20 million tonnes in 2003-04 (*www.fao.org*). However, the productivity of green peas has shown an irregular trend, it declined from 14,326 kg /ha in 1991-92 to 10,000 kg per ha in 1997-98 and further to 9143 kg/ha in 1999-00 (*www.fao.org*).

The area under green peas in Punjab was 13.2 thousand hectares in 1995-96 which, increased to 13.5 thousand hectares in 2001-02. The production and productivity of green peas were 79.7 thousand tonnes and 6040 kg / ha in 1995-96, respectively, while the corresponding figures for 2001-02 were 86.3 thousand tonnes and 6000 kg/ha, respectively (Anonymous, 2002).

Green peas cultivation is highly labour-intensive like all other vegetable crops (Rao and Tripathi, 1979 and Khunt and Desai, 1996) and requires high dosages of manures and fertilizers. The main constituent of the cost of cultivation of peas is manures and fertilizers, followed by cost on bullock/ human labour/tractor and pesticides/chemicals. At the same time, the income per hectare from vegetable crops has been almost four-times, as compared to that from food crops (Thakur *et al.,* 1994). Thus, the farmers should have to be motivated to diversify to more remunerative cropping patterns like vegetable cultivation instead of the traditional, less profitable ones (Singh, 1995). Similar types of results were reported by Maurya *et al.* (2001) and Sharma *et al.* (2000). However, none of the studies so far has provided an in-depth analysis of the economics of green peas cultivation in Punjab. Therefore, the present study was undertaken to (i) estimate the economics of production of green peas in Punjab, and (ii) study the relative importance of different factors influencing the productivity of green peas.

Methodology

The primary data used in the study were collected from pea growers in Punjab.

Selection of Pea Growers

Multistage stratified random sampling technique was used for the selection of pea growers. In the first stage, the pea-growing districts were selected. The district-wise data on area under peas were obtained from the

Office of the Director of Horticulture, Punjab, for the year 1997-98. All the districts were then arranged in the descending order of area under peas and the average area per district was computed. All the districts were then divided into two strata, one having area above and other below the average area per district in the state, so as to divide the state as per the concentration of pea acreage. Consequently, one district from each stratum was chosen randomly. Finally, Ludhiana was selected as the district with lower concentration while, the Hoshiarpur district was selected with higher concentration of area under green peas. At the next stage, four blocks, i.e. two blocks from each district, where the density of pea growers was higher, were purposively selected. The blocks thus selected were: Hoshiarpur-I and Mahilpur from Hoshiarpur district and Ludhiana-I and Jagraon from the Ludhiana district. At the third stage, a cluster of 3 villages was selected from each block, where the concentration of pea growers was highest. At the last stage, the lists of pea growers were prepared for each cluster of villages. The pea growers were categorized into three categories on the basis of area under green peas, viz. Small (<1.2 ha), Medium (1.2-2.4 ha), and Large (>2.4 ha). From each cluster 30 farmers having proportional allocation with respect to different categories of farms were selected randomly, making a total sample of 120 pea-growing farmers for this study as per the details given below:

Districts	Name of blocks	Sample villages	Farmers under different categories			Total farmers
			Small	Medium	Large	
Hoshiarpur	Hoshiarpur-I	Chhabewal Jian Lehli Khurd	12	9	9	30
	Mahilpur	Dhakon Sherpur Nangal Khidari	14	11	5	30
Ludhiana	Ludhiana-I	Detwal Bains Gahaur	13	9	8	30
	Jagraon	Sivian Leelan Sherpur Kalan	17	10	3	30
Total			56	39	25	120

Concepts Used in the Study

Variable Costs

The sum total of the costs incurred on seeds, fertilizers, FYM, plant protection chemicals, electricity/diesel charges for irrigation, human labour,

animal labour, machinery/tractor hours, and interest on working capital @ 12 per cent per annum for half of the period covered under green peas, constituted the total variable costs.

Fixed Costs

The fixed costs were:

Interest on fixed capital: It was assumed as 12 per cent per annum on the investment incurred on machinery, equipment, etc.

Depreciation: It was calculated by straight line method by deducting junk value from the original value and dividing the remainder by number of useful years of assets under study.

Land rent: It was taken as Rs 30,000 per hectare, which was the usual rate in the sample villages during the study period (2001-02).

Repair charges: Only minor repair charges for machinery and equipment were considered.

Gross and Net Returns

The gross returns were worked out by multiplying the total output with price received by farmers and the net returns were calculated by deducting the total costs from gross returns.

Functional Analysis

To identify the factors affecting the productivity of green peas, a number of equations were exercised with different combinations of explanatory variables. The best fit was chosen on the basis of *a-priori* logical signs, significance of coefficients and goodness of fit. The equation chosen for yield response was:

$$\ln y = \ln a + b_1 \ln x_1 + b_2 \ln x_2 + b_3 \ln x_3 + b_4 \ln x_4 + b_5 \ln x_5 + b_6 \ln x_6 + u$$

where,

Y = Yield of green peas (q/ha)

a = Constant

b_1 to b_6 = Regression coefficients corresponding to x_1 through x_6

u = Random error-term

x_1 = Net sown area (ha)

x_2 = Irrigations (No.)

x_3 = Human labour (h/ha)

x_4 = Machinery used (h/ha)

x_5 = NPK (kg/ha)

x_6 = Plant protection chemicals (litres/ha)

The explanatory variables were tested for their stochastic independence, and the results have been discussed using simple tabular technique.

Results and Discussion

General Characteristics of the Sample

The general characteristics of the sample farmers in Punjab in the year 2002-03, presented in Table 1, reveal that the size of average operational holding was 2.08 ha, 3.11 ha and 6.13 ha per farm in the case of small, medium and large pea-growing farmers. The average family worker per household was the highest in the case of small farmers (1.78), followed by medium (1.62) and large (1.64) farmers. In the large category, the female farm workers were almost negligible. Similarly, the children as farm workers were more in small and medium categories than large category. It was noticed that 38.34 per cent of respondent farmers were illiterate and 41.66 per cent had only primary education. The incidence of illiteracy was higher in small and medium farmers than large farmers.

Table 1. General characteristics of sample farmers in Punjab: 2002-03

Particulars	Farms			
	Small	Medium	Large	Overall
Number of farms	56	39	25	120
Operational holding (ha)	2.08	3.11	6.13	3.26
(i) Owned	1.00	2.21	5.29	2.29
(ii) Leased -in	1.08	0.97	0.84	0.99
(iii) Leased- out	0.00	0.07	0.00	0.02
Average family size (per household)	5.56	6.46	8.00	6.35
Average family farm workers (per household), No.				
(i) Male	1.78	1.62	1.64	1.70
(ii) Female	1.60	0.68	0.03	0.97
(iii) Children	0.95	0.85	0.21	0.83
Educational status (per cent)				
(i) Illiterate	53.57	20.51	32.03	38.34
(ii) Primary	37.50	51.28	36.01	41.66
(iii) Secondary	8.93	23.07	15.98	15.00
(iv) Higher	0.00	5.14	15.98	5.00

Area Allocation to Pea Crop

The green peas occupied 22.23 per cent, 26.56 per cent and 26.73 per cent of the total cropped area for small, medium and large farms, respectively with the overall figure as 25.35 per cent. It was found that the farmers allocated more area to peas as they reported that the pea cultivation was more profitable as compared to wheat crop, to which the overall cropped area was 12.66 per cent of the total cropped area.

Area Allocated to Different Varieties of Peas

It was observed (Table 2) that 'Arkal' and 'PPL-87' were the most popular varieties among the pea growers, the former being the early maturing and the latter being the high-yielding variety. These varieties occupied 40.83 and 45.83 per cent area, respectively. The area allocated to 'Arkal' and 'PPL-87' varieties was somewhat lower by small (80.35%), as compared to medium (92.21%) and large (92.00%) farmers. The farmers preferred 'Arkal' and 'E-6' to other varieties due to their early maturity, which ensured higher prices during pre-harvest season, besides good eating quality. Some farmers preferred 'PPL-87' and 'PPL-88' due to their higher productivity.

Source of Seed Material

The dealer was found the first choice of the pea growers as compared to other sources for the procurement of seed (Table 3). Nearly 75.80 per cent of seed was procured from the dealers. Small (79.81%) and medium (79.80%) farmers were more interested in purchasing the seed from dealers as compared to large farmers (69.02%).The second preference was of own seed because of its high price in the local markets. Nearly 24.20 per cent of seeds were those that were retained by the farmers for the subsequent crop. It was noticed that none of the farmers procured seed supplies from

Table 2. Distribution of area to different varieties of green peas on sample farms: 2002-03

(In per cent)

Particulars	Small farms	Medium farms	Large farms	All farms
Arkal	32.14	43.59	56.00	40.83
E-6	14.29	7.69	0.00	9.17
PPL-87	48.21	48.72	36.00	45.83
PPL-88	5.36	0.00	8.00	4.17
Total	100.00	100.00	100.00	100.00
	(58.24)	(73.32)	(89.02)	(220.58)

Note: Figures within the parentheses show area under peas in ha

Table 3. Source of seeds used by pea growers: 2002-03

(kg/ha)

Particulars	Small farm	Medium farm	Large farm	All farms
Owned	20.12	22.36	38.42	26.97
	(20.19)	(20.20)	(30.98)	(24.20)
Dealers	79.54	88.31	85.61	84.48
	(79.81)	(79.80)	(69.02)	(75.80)
Total	99.66	110.67	124.03	111.45
	(100.00)	(100.00)	(100.00)	(100.00)

Note: Figures within the parentheses are percentages of total

the government agency or other farmers. It is pertinent to mention that Punjab Agricultural University, Ludhiana, has recommended 111.15 kg/ha and 74.10 kg/ha of seed for early and main season varieties of peas, respectively in Punjab (Anonymous, 2005).

Production Practices for Green Peas

Different production practices in pea cultivation followed on the sample farms have been recorded in Table 4. The area under pea/farm turned out to be 1.84 ha. The human labour used by the small, medium and large farms was 165.03, 153.63 and 171.93 human-days per hectare, respectively with the overall figure of 162.76 human-days per hectare. Small farmers employed more of family labour as their resource, while medium and large farmers used more of hired labour because of their higher purchasing power and less of availability.

The recommended doses of FYM, urea (N), super phosphate (P) are 20 tonnes, 111.15 kg (49.4 kg) and 382.85 kg (61.75 kg) per ha, respectively (Anonymous, 2005). The use of urea was found as 196.18 kg/ha on small, 171.04 kg/ha on medium and 161.83 kg/ha on large farms. The application of single super phosphate (SSP) was estimated to be 14.00 kg/ha at the overall level. The results clearly showed that the farmers used less of SSP, and more of di-ammonium phosphate (DAP), may be because DAP is a good source of both nitrogen and phosphorus. The quantity of plant protection materials used was 1.16 litres/ha at the overall level, which revealed that the farmers used very small quantity of pesticides, as there was less incidence of insect pest on the crop. The data on yield showed that the productivity of green peas was more in small than medium and large farms, maybe due to better management of the small farms.

Table 4. Peas production practices in Punjab: 2002-03

Particulars	Farms			
	Small	Medium	Large	Overall
Pea area per farm, ha	1.04	1.88	3.56	1.84
Number of ploughings	3.25	3.16	3.85	3.35
Number of irrigations	4.11	4.82	4.88	4.50
Total human labour, human-days/ha	165.03	153.63	171.93	162.76
	(100.00)	(100.00)	(100.00)	(100.0)
(a) Family	40.35	24.75	13.86	29.76
	(24.45)	(16.11)	(8.06)	(15.73)
(b) Hired	124.68	128.88	158.07	133.00
	(75.55)	(83.89)	(91.94)	(84.27)
Tractor/machinery, h/ha	13.86	16.80	19.27	15.94
Animal labour, h/ha	9.76	5.84	0.88	6.64
Seed, kg/ha	99.66	110.67	124.03	108.32
Urea, kg/ha	196.18	171.04	161.83	180.85
SSP, kg/ha	21.64	7.81	6.56	14.00
DAP, kg/ha	126.65	131.72	127.36	128.45
Zinc, kg/ha	0.75	4.68	6.56	3.24
Other micronutrients, kg/ha	1.69	4.62	3.29	2.98
FYM, t/ha	4.54	5.59	7.88	5.58
Plant protection chemicals, L or kg/ha	1.24	1.02	1.19	1.16
Green pea yield, kg/ha	7627	7180	7084	7369

Note: Figures within the parentheses indicate the percentages of total human labour

Cost of Production of Green Peas

The cost of pea cultivation, presented in Table 5, revealed that the total variable cost was higher for small (63.24 %) than medium (57.62%) and large (57.09%) farms. Thus, a major share of the total cost was constituted by variable cost. The perusal of Table 5 reveals that small farmers incurred more expenditure on urea than medium and large farmers, since the small farmers undertook intensive cultivation due to shortage of land.

Human labour, especially the hired labour, accounted for a major chunk of the total expenditure, affirming the claim made by Khunt and Desai (1996) and Rao and Tripathi (1979) that vegetable cultivation is highly labour-intensive. The cost of human labour was more on the small farms (30.20%) than medium (26.46%) and large (27.81%) farms because of involvement of more family labour in the case of small farms. The expenditure on hired labour was higher on large (24.61%) than medium (20.75%) and small (20.95%) farms. Human labour cost constituted a major portion of total cost because the harvesting/picking of peas was done manually. The use of

Table 5. Cost of cultivation of green peas in Punjab: 2002-03

(Rs /ha)

Particulars	Farm categories			
	Small	Medium	Large	Overall
Variable costs				
(i) Seeds	3478.43	3646.12	3505.10	3538.49
	(12.27)	(12.35)	(11.59)	(12.15)
(ii) Fertilizers				
(a) Urea	909.16	791.16	732.41	833.99
	(3.21)	(2.68)	(2.42)	(2.86)
(b) SSP	56.74	21.08	17.73	37.02
	(0.20)	(0.07)	(0.06)	(0.13)
(c) DAP	1215.06	1256.33	1208.85	1227.18
	(4.29)	(4.26)	(4.00)	(4.21)
(d) Zinc	11.48	66.29	100.11	47.76
	(0.04)	(0.22)	(0.33)	(0.16)
(e) Other micronutrients	60.69	70.12	84.24	68.66
	(0.21)	(0.24)	(0.28)	(0.24)
(iii)FYM	138.97	171.25	241.12	170.74
	(0.49)	(0.58)	(0.80)	(0.59)
(iv) Plant protection chemicals	501.79	375.23	467.18	453.45
	(1.77)	(1.27)	(1.54)	(1.56)
(v) Electricity/diesel	735.21	597.39	449.93	630.99
	(2.59)	(2.02)	(1.49)	(2.17)
(vi) Human labour	8558.83	7809.28	8413.41	8284.93
	(30.20)	(26.46)	(27.81)	(28.45)
(a) Hired	5936.73	6126.28	7443.91	6312.33
	(20.95)	(20.75)	(24.61)	(21.68)
(b) Family	2622.10	1683.00	969.50	1972.60
	(9.25)	(5.71)	(3.20)	(6.77)
(vii) Animal labour	280.60	167.90	25.36	190.80
	(0.99)	(0.57)	(0.08)	(0.66)
(viii) Machinery/tractor	1871.10	1932.40	1927.62	1902.80
	(6.60)	(6.55)	(6.37)	(6.53)
(ix) Interest on working capital @12%	104.79	102.26	98.23	102.60
for half of the period	(0.37)	(0.35)	(0.32)	(0.35)
Total Variable Costs	17922.85	17006.81	17271.22	17489.38
	(63.24)	(57.62)	(57.09)	(60.06)
Fixed Costs				
(i) Interest on fixed capital @ 12%	659	2117	2696	1557
per annum	(2.33)	(7.17)	(8.91)	(5.35)
(ii) Depreciation (straight line method)	630	1266	1442	1006
	(2.22)	(4.29)	(4.77)	(3.46)
				Contd

Table 5. Cost of cultivation of green peas in Punjab: 2002-03 — *Contd*

(Rs /ha)

Particulars	Farm categories			
	Small	Medium	Large	Overall
(iii) Land rent @ Rs 30,000/ ha /year	8694	8403	8157	8487
	(30.68)	(28.47)	(26.96)	(29.15)
(iv) Repair charges	433	724	686	581
	(1.53)	(2.45)	(2.27)	(1.99)
Total fixed costs	10418	12511	12982	11632
	(36.76)	(42.38)	(42.91)	(39.94)
Total costs	28341	29518	30253	29121
	(100.00)	(100.00)	(100.00)	(100.00)

Note: Figures within the parentheses are the percentages of total cost

animal labour was less; the cost per hectare was Rs 280.60 for the small farms, and it declined as the size of farm increased. The cost on tractor-use was 6.53 per cent of the total cost.

The fixed cost accounted for 39.94 per cent of the total costs. The total fixed costs were higher in medium (42.38%) and large (42.91%) than small (36.76%) farms. The fixed costs included the interest on fixed capital, depreciation, land rent and minor repair charges. The total cost incurred was maximum by the large farmers (Rs 30253/ha), followed by medium (Rs 29517/ha) and small (Rs 28341/ha) farms.

Economics of Peas Cultivation

The price received by small, medium and large farmers was Rs 743/q, Rs 795/q and Rs 853/q, respectively (Table 6). The large farmers could get better price for their produce than that by medium and small farmers because

Table 6. Economics of pea cultivation in Punjab: 2002-03

Particulars	Farms			
	Small	Medium	Large	Overall
Yield, q/ha	76.27	71.80	70.84	73.69
Cost of production, Rs/q	372	411	427	395
Price/rate, Rs/q	743	795	853	783
Gross returns, Rs/q	56658	57069	60400	57671
Total costs, Rs/q	28341	29518	30253	29122
Net returns, Rs/q	28317	27551	30146	28549
Returns over variable costs, Rs/q	38735	40062	43128	40182
Marketed surplus, q/farm	69.35	124.21	169.04	108.10

the former had cultivated early-maturing varieties and were able to realize higher prices. It was also noticed that some farmers sold their produce in the distant consuming markets at better prices.

The returns over variable cost in peas were Rs 40182/ha, which were 129 per cent more than those in the case of wheat (Rs 17547/ha) (Annexure I). It clearly shows that the cultivation of green peas was more profitable than its main competing crop, wheat.

Factors Contributing to Productivity of Green Peas

The relative roles of different factors influencing the yield of green peas were studied using the regression analysis and the results are presented in Table 7. The value of adjusted $\bar{R}^2$ was found to be 0.95 in small, 0.81 in medium and 0.91 in large pea-growers. The coefficients corresponding to irrigation and human labour were positive and highly significant in small farms. In medium farms, the coefficients of machinery and fertilizers were highly significant and positively affected the yield. In the case of large farms, the coefficients of irrigation and pesticides were significant.

The non-significance of the regression coefficient corresponding to NSA, which connotes the farm-size, indicates that the farmers with larger holdings

Table 7. Estimated coefficients for yield response functions of green peas in Punjab: 2002-03

Category/Variety	Farms			
	Small	Medium	Large	Overall
Constant	0.1849	-0.1424	0.7105	0.4620
NSA (ha)	0.0887[NS]	-0.0559[NS]	0.0085 [NS]	0.0570[NS]
	(0.0583)	(0.1019)	(0.0844)	(0.0451)
Irrigation (No.)	0.2897***	0.2036[NS]	0.5613**	0.6003***
	(0.0884)	(0.1373)	(0.2234)	(0.0833)
Labour (human-days/ha)	0.3786***	0.1911[NS]	0.1332 [NS]	0.0948 [NS]
	(0.1081)	(0.1219)	(0.1673)	(0.0761)
Machinery (h/ha)	0.0572[NS]	0.2915***	0.1465 [NS]	0.1960***
	(0.0562)	(0.0785)	(0.1321)	(0.0447)
NPK (kg/ha)	0.1471[NS]	0.7926***	0.0892 [NS]	0.3490***
	(0.0929)	(0.1624)	(0.1728)	(0.0859)
Pesticides (L/ha)	0.0035[NS]	0.0326[NS]	0.0592*	0.0290**
	(0.0135)	(0.0208)	(0.0335)	(0.0143)
R^2	0.96	0.84	0.93	0.87
$\bar{R}^2$	0.95	0.81	0.91	0.86

Note: Figures within the parentheses indicate the standard errors.
      ***, ** and *indicate significance at 1, 5 and 10 per cent levels, respectively.
      NS = Non-significant

do not stand at a better position as far as productivity is concerned. At the overall level, irrigation, machinery and fertilizer had significant effect on yield. The results reveal that, the yield would be increased by 0.60, 0.35 and 0.20 per cent with one per cent increase in irrigation, fertilizer and machinery used, respectively.

Conclusions

Green peas and wheat are the main crops grown by farmers in Punjab during the *rabi* season, but they allocate more area to peas because they have found it more profitable to even wheat. The pea seeds are purchased mostly from dealers and not from other farmers or government agencies. The yield of green peas has been higher on small than medium and large farms because of better management in small farms. The costs incurred on seeds, FYM, zinc, hired labour and machinery are more in large farms, but the expenditure on urea, DAP, electricity/diesel, family labour and animal labour are higher on the small farms. The gross and net returns have been found higher in large farms due to realization of higher prices because of cultivating early-maturing varieties and exploring other markets due to higher marketable surpluses. Fertilizers, irrigation and machinery have been the impact variables, influencing the productivity of green peas positively. The returns over variable costs in peas have been found 129 per cent higher than those accruing from wheat (main competing crop), which encourages the farmers to adopt peas cultivation. This crop, being highly labour-intensive, will help provide employment to the family members on the farm itself, particularly in the case of small and marginal farmers. It will provide impetus to the diversification programme of the state government, besides improving the soil health, being a leguminous crop.

References

Anonymous, (2002) *District-wise Estimated Production of Peas in Punjab*. Punjab Horticulture Department (culled from *www.punjabstat.com*).

Anonymous, (2005) Peas. In: *Package of Practices for Vegetables of Punjab (Punjabi version)*, Eds: K.Mahindra and S.S.Gill. Ludhiana: Punjab Agricultural University. pp.53-58

Khunt, K. A. and D. B. Desai, (1996) Economic feasibility and marketing of perennial vegetables in South Gujarat. *Financing Agriculture,* **28**: 9-14.

Maurya, O. P., G. N. Singh and R. K. S. Kushwaha, (2001) An economic analysis of production and marketing of potato in district Varanasi (UP). In: *Encyclopaedia of Agricultural Marketing,* Vol. 8**,** Ed : J. Prasad. New Delhi: Mittal Publications. pp. 229-38.

Rao, N. S. and B. N. Tripathi, (1979) A study of economics of production and marketing of some vegetable crops in Kankipadu block of Krishna District, AP. *Allahabad Farmer,* **50**: 341.

Sharma, B. K., (2003) Per capita availability of vegetables, *The Indian Express* (Chandigarh), August 20, **27**: 11

Sharma, V. K., Inder Sain and G. Singh, (2000) Income and employment from summer vegetables vis-à-vis paddy in Punjab. *Journal of Agriculture, Development & Policy,* **12**: 38-43.

Singh, D. V., (1995) Potential options for betterment of peasants in new economic environment: A case of Himachal Pradesh. *The Bihar Journal of Agricultural Marketing,* **3**: 346-54.

Swaminathan, M.S., (2002) Food groups and balance diet: Recommended dietary allowances. In: *Essentials of Food and Nutrition — An Advanced Textbook,* Vol. 2. pp. 1-23. Bangalore: The Bangalore Printing and Publishing Co. Ltd.

Thakur, D.S., Sanjay, D.R. Thakur and K.D. Sharma, (1994) Economics of off-season vegetable production and marketing in hills. *Indian Journal of Agricultural Marketing,* **8**: 72-82.

Annexure I

Economics of pea vis-à-vis wheat cultivation in Punjab: 2002-03

Particulars	Green peas	Wheat*
Yield, q/ha	73.69	40.66
Cost of production, Rs/q	395	574
Price/rate, Rs/q	783	627
Gross returns, Rs/ha	57671	29200
Total costs, Rs/ha	29122	23330
Net returns, Rs/ha	28549	5869
Returns over variable costs, Rs/ha	40182	17547

* The Agricultural Costs and Prices Commission, Ministry of Agriculture, Government of India, New Delhi.