Journal of Agricultural Development and Policy, 2025
Volume 35, No. 1, 118-127
https://doi.org/10.63066/23220457.35.1.015

NAAS - 4.34
UGC CARE List Journal

Economics of Cost of Cultivation of Major Crops in the Cotton Belt of Rural Punjab

Mandeep Kaur

Department of Economics, Akal Degree College, Mastuana Sahib, Sangrur, Punjab

Abstract

Today every farmer in India has to face the basic economic problems of maximising the profitability and minimising the costs. To accomplish this, it is crucial to estimate the cultivation costs and profitability of different crops. The present study aimed to assess the costs of producing main crops in the cotton belt region of Punjab. The data was collected from 520 farmer households. The study observed that the new agricultural strategy adopted for increasing production and productivity followed in Punjab has become costlier in terms of rising cultivation costs. The research revealed that, during 2016-17, the cultivation expenses for wheat, paddy and cotton was Rs. 20157, Rs. 27682, and Rs. 27034 per acre, respectively. Per acre cultivation cost of wheat and paddy showed a declining trend with the larger farm sizes. The analysis highlighted that the marginal farmer households had to spent larger shares on irrigation charges due to the high dependence upon diesel irrigation. The cost of pesticides and insecticides was the highest in cotton farming which contributed to comparatively higher cultivation cost for this crop.

Keywords: Cost, Crop, Farmer, Depreciation, Leased-in land, Working capital

JEL Classification: D24, J43, Q11, Q12, Q16

Introduction

Land in the cotton belt of rural Punjab is being utilised under various crops including wheat, mustard, paddy, cotton, sugarcane, potatoes, *guara* or beans, orange orchards, etc. But wheat, paddy, and cotton are the major crops produced on a large scale. Wheat is one of the main crops cultivated in every district of the Punjab state. Wheat is a staple food and is the first important foodgrain consumed by the people in Punjab. At the same time, paddy and cotton are the cash crops produced during the *Kharif* season mainly for commercial purposes. Apart from geographical requirements, the production of any crop also depends significantly upon procurement prices, productivity level, technology available, cost of inputs utilised in production, and the returns attained from that crop. The cost and return relationship is of crucial importance in the field of agriculture. In agriculture, the cultivation cost of crops includes various input expenditure incurred by a farmer to attain final produce.

There are growing realisations that the current mono-cropping pattern of wheat and rice and the new agricultural strategy adopted for increasing production and productivity followed in Punjab has become costlier in terms of rising costs of cultivation. Various studies conducted in Punjab as well as at India levels stated that costs of cultivation had increased whereas the returns from farming had declined. Nadkarni (1988) observed that around the mid-eighties, a wheat growing farmer in Punjab was receiving lower net returns per hectare, despite spending more on modern inputs, than a wheat growing farmer in Madhya Pradesh. Sidhu and Johl (2002) found that the rate of returns per hectare declined drastically for rice and wheat because of high fixed costs, while it was due to fixed as well as variable costs in the case of cotton. According to the conclusions of the report entitled, 'District-wise cost of cultivation study of important crops in Punjab', Kaur *et al* (2018) observed human labour as an essential component of the operational cost constituting a significant proportion of 15 to 26 per cent of the cultivation cost in operations like paddy transplanting, cotton picking, and many operations in vegetable cultivation. Machine labour which comprised working expenses, maintenance costs and depreciation accounted for 8 to 16 per cent of the cultivation cost for different crops. The study brought out the startling fact that the use of capital-intensive technology in farming and overheating land-lease rates, the fixed costs contributed more than 50 per cent to the total cost of cultivating most of the crops in Punjab. The significantly increasing fixed costs have threatened the economic viability of agriculture,

Corresponding author email: mmultani1992@gmail.com

especially for the smaller-size categories. While the variable costs of wheat and paddy production declined during the 1980s and 1990s, the fixed costs gradually increased during this period (Sidhu *et al*, 2005). The result of Esar *et al* (2023) revealed that machine and human labour found to be the major components of the cultivation cost.

Data Sources and Methodology

An attempt has been made, in this research paper, to calculate the cost of cultivation of three major crops ,i.e., wheat, paddy and cotton among sampled farmer households belonging to the cotton belt region of rural Punjab. The study utilised the cost concepts given in the manual on 'Cost of Cultivation Surveys' by Directorate of Economics and Statistics, Ministry of Agriculture, Government of India. **Cost of cultivation** includes the input expenditure incurred by a farmer to attain final produce. In the present study, $CostA_1$ and $CostA_2$ (paid-out costs) are calculated for wheat, paddy, and cotton sown in the study region.

$CostA_1$ includes the value of seeds (farm produced and purchased seeds), insecticides and pesticides, manure (owned and purchased), fertilisers, casual and contractual labour charges, irrigation charges, hired machinery charges, owned machinery and implements charges, depreciation of farm machinery, implements and farm buildings, and interest on working capital. **$CostA_2$** includes $CostA_1$ and Rent paid for leased in-land.

The charges of hiring casual labour, contractual labour and charges of hired machinery were calculated considering rates prevailing within a concerned research area at that particular time with regard to operating costs. The cost of seeds, chemical fertilizers, manure, plant protection chemicals such as insecticides, pesticides and weedicides, interest on working capital and irrigation charges were calculated at prevailing price during that time. The owned seed was priced in accordance with the prevailing price of seeds. The rate of interest charged on working capital is 7 per cent per annum and a half for crop period. The cost of cultivation was calculated using following method:

$$CA1_c = \sum_{i=1}^{n} * \sum_{j=1}^{m} * \sum_{k=1}^{t} (I_{ijk} * PI_{ijk}) / \sum_{i=1}^{n} * \sum_{j=1}^{m} A_{ij}$$

$$CA2_c = CA1_c - \sum_{i=1}^{n} * \sum_{j=1}^{m} R_{ij}$$

where,

$CA1_c$ = CostA1 of c^{th} crop (Rs./acre)

I_{ijk} = k^{th} input used by the i^{th} farmer household for the j^{th} farm (Kg or litre/acre)

PI_{ijk} = Price of k^{th} input used by the i^{th} farmers household for the j^{th} farm (Rs./acre)

A_{ij} = Operational Area under c^{th} crop of j^{th} farm of i^{th} farmer household

R_{ij}= Rent of Leased-in Land by the i^{th} farmers household for the j^{th} farm (Rs./acre

k= Types of input (fertilizer, plant protection chemicals, labour, etc.)

C= Selected crops (1-Wheat, 2-Paddy and 3-Cotton)

Both the primary as well as secondary data had been used for conducting present study. Secondary data was collected from various journals, books, magazines, reports, dissertations, theses, internet websites, etc. Primary data were collected through a well-structured schedule from selected farmer households using a multi-stage stratified random sampling technique for the period 2016-17. Firstly, four districts, Mansa, Bathinda, Sri Mukatsar Sahib, and Fazilka, had been selected purposely from cotton belt region of rural Punjab. Secondly, all 23 developmental blocks of these four selected districts had been chosen. Thirdly, one village from each selected block was picked up. Fourthly, 10 per cent of the farmer households of different categories from each village were selected randomly. Thus, the sample included 520 sampled farmer households of different farm-size categories including 118, 126, 134, 115, and 27 marginal, small, semi-medium, medium, and large farmer households, respectively. Finally, descriptive statistical methods such as averages, percentages, etc., had been used to analyse the results.

Results and Discussion

This section deals with per household and per acre cost of cultivation of wheat, paddy and cotton among different categories of farmer households in the cotton belt region of rural Punjab.

Cost of Cultivation of Wheat

Wheat is the main cereal grown all over Punjab. It is a *Rabi* crop and sown during November and harvested in April. Table 1 represents the different components of per household and per acre cost of wheat cultivation among different categories of farmer households in the cotton belt region of rural Punjab. The field survey observed that most of the farmer household had sown farm produced seeds of wheat, and some of the medium and large farmer households used new varieties of purchased wheat seeds from the market. The survey revealed that generally 40 kg to 50 kg of wheat seeds were utilised in one acre of land. Generally, three or four bags of *NPK* and one bag of *DAP* were used in cultivating one acre of wheat crop. Table 1 demonstrates that the value of wheat seeds was Rs. 9252 for an average farmer household. The cost of seeds was Rs. 2065 for the marginal farmer households and Rs. 29676 for the large farmer households. The cause for such a vast range was that there were significant variations in the operational holdings among the marginal and large farmers. Furthermore, the large farmers preferred to sow new types of purchased seeds, whereas the marginal farmers frequently relied on farm-produced seeds of wheat. The average cost of fertilisers was Rs. 21935 among all the sampled farmer households. The

cost of fertilisers increased as the size of the farm increased. Usually, one or two sprays of pesticides were required for growing wheat. Cost of insecticides and pesticides varied based on the prices of different brands of these products used by the farmers. The poor marginal and small farmers used low-priced, whereas the medium and large farmers used high-priced and better-quality insecticides and pesticides. The cost of insecticides and pesticides was Rs. 10588 for an average farmer household which was 5.44 per cent of the total cost. Among the marginal farmer households, the cost of insecticides and pesticides was found to be Rs. 3229 (4.63 per cent), while it was Rs. 33908 (5.75 per cent) among the large farmer households. Per household cost of manure was Rs. 2992 in wheat crop. Hired labour is required in all crops of wheat, paddy and cotton for different functions to be performed by labour such as levelling the land, preparing the land, sowing the crop, putting *NPK* into crops, spraying pesticides and insecticides, harvesting, threshing, etc. Per household cost of contractual labour in wheat cultivation was Rs. 17851. The marginal and small farmer households spent no amount on hiring contractual labour. In contrast, the medium and large farmer households had to spend Rs. 39239 and Rs. 168148 on it, respectively. Similarly, cost of hiring casual labour had a direct relationship with the size of landholdings as it was Rs. 445 among the marginal and Rs. 22257 among the large farmers. An average farmer spent Rs. 5838 for hiring casual labour for wheat production. The use of hired labour in the fields depends upon the family-size and farm-size. Generally, the large farmers required more hired labour relative to the smaller ones. The marginal, small, and semi-medium farming households mostly utilised their family labour to irrigate the fields, spray the crop, put *NPK* and *DAP* in the crop, etc. The medium and large farmer households used both casual and contractual labour to perform the activities mentioned above.

The cost of owned machinery and implements was Rs. 19155 for an average household, whereas it was Rs. 3307 and Rs. 66175 among the marginal and large farmer households, respectively. Per household cost of hired machinery and implements was Rs. 26579 while this cost was Rs. 11669 and Rs. 68667 among the marginal and large farmer households, respectively. Because of the lack of owned farm machinery with the smaller holdings, they had to invest more on hired machinery and implements. The irrigation charges contributed 1.97 per cent to the total cost for an average farmer household. The interest on working capital was found to be Rs. 4131. Both absolute, as well as relative share of interest on working capital, increased as the farm-size increased, as it was Rs. 1074 among the marginal and Rs. 16959 among large farmer households. The expenses incurred on depreciation of farm machinery, implements and buildings were Rs. 15345.

In this way, $CostA_1$ for the wheat crop was calculated to be Rs. 137504 for an average farmer household, while the $CostA_1$ for the marginal, small, semi-medium, medium, and large farm-size categories was Rs. 34419, Rs. 66041, Rs. 103612, Rs. 262412, and Rs. 557717, respectively. The marginal farmers had to spend the highest share for paying rent of leased-in land. It decreased with the increased size of landholdings as its share was 50.68 per cent among the marginal and only 5.48 per cent among the larger farm-size category. The total paid-out cost, i.e., $CostA_2$, was found to be Rs. 194716 for an average sampled farmer household. It was Rs. 590032 among the large and Rs. 69784 among the marginal holdings. The total cost of cultivation and farm-size had a positive relationship.

Per acre cost of wheat was obtained by dividing per household cost of wheat by the respective size of operational holding on which wheat was sown during 2016-17. On average, the operational area under wheat crop was 9.66 acres for all the sampled farmer households, while it was 2.99, 5.79, 8.16, 17.79, and 29.68 for the marginal, small, semi-medium, medium, and large farmer households, respectively. The average CostA for producing wheat was Rs. 20157 per acre, while it was the largest (Rs. 23339) for the marginal farmers, followed by Rs. 20957, Rs. 19880, Rs. 19740, and Rs. 19583 per acre across the small, large, medium, and semi-medium farmers, respectively. In the total paid out cost, the share of $CostA_1$ of wheat was Rs. 14234, and the rent of leased-in land accounted for Rs. 5923 per acre. For growing wheat, the highest share in the per-acre $CostA_2$ was spent on rent of leased-in land (Rs. 5923), followed by the charges of hired machinery and implements (Rs. 2751), cost of fertilisers (Rs. 2271), cost of owned machinery and implements (Rs. 1983), contractual labour cost (Rs. 1848), depreciation of farm machinery, implements and buildings (Rs. 1589), pesticides and insecticides cost (Rs. 1096), seeds (Rs. 958), casual labour (Rs. 604), interest on working capital (Rs. 428), and the cost of manure (Rs. 310).

The data demonstrated that per acre cost of wheat for an average farmer household had a direct association with the size of farm for almost all the constituents of cost of wheat cultivation except for the value of manure, charges of hired machinery and implements, and the irrigation charges. The charges of hired machinery and implements were negatively related to the size of farm because the smaller farm-size categories lacked their owned farm machinery and implements, so they had to go for hired machinery for accomplishing most of their agricultural operations. However, the medium and large farmer households hired only combine harvesters for harvesting wheat and reapers for making wheat straw. The irrigation charges were the highest for the marginal farmer households because a significant proportion of these farmer households had not installed electric pumps, so they had to depend upon diesel engines, farm generators and tractors, which consume diesel for irrigating wheat and thereby put an extra burden of cost upon them.

Table 1: Cost of cultivation of Wheat among farmer households **(Rs./unit)**

Wheat Cost Components	Marginal	Small	Semi-medium	Medium	Large	All Sampled Farmer Households
Seeds	2065 (2.96) {691}	4980 (4.10) {860}	8159 (5.11) {1000}	17787 (5.06) {1000}	29676 (5.03) {1000}	9252 (4.75) {958}
Fertilisers	5627 (8.06) {1882}	11364 (9.37) {1963}	18629 (11.66) {2283}	41137 (11.71) {2312}	77169 (13.08) {2600}	21935 (11.27) {2271}
Pesticides & Insecticides	3229 (4.63) {1080}	5855 (4.83) {1011}	8974 (5.62) {1100}	19731 (5.62) {1109}	33908 (5.75) {1142}	10588 (5.44) {1096}
Manure	2087 (2.99) {698}	2608 (2.15) {450}	2844 (1.78) {349}	3826 (1.09) {215}	5911 (1.00) {199}	2992 (1.54) {310}
Contractual Labour	0 (0.00) {0}	0 (0.00) {0}	1716 (1.07) {210}	39239 (11.17) {2206}	168148 (28.50) {5665}	17851 (9.17) {1848}
Casual Labour	445 (0.64) {149}	2391 (1.97) {413}	4079 (2.55) {500}	13340 (3.80) {750}	22257 (3.77) {750}	5838 (3.00) {604}
Owned Machinery	3307 (4.74) {1106}	9790 (8.07) {1691}	16867 (10.56) {2067}	37303 (10.62) {2097}	66175 (11.22) {2230}	19155 (9.84) {1983}
Hired Machinery	11669 (16.72) {3903}	18590 (15.32) {3211}	23378 (14.63) {2865}	44483 (12.67) {2500}	68667 (11.64) {2314}	26579 (13.65) {2751}
Irrigation	2249 (3.22) {752}	1580 (1.30) {273}	3039 (1.90) {372}	6808 (1.94) {383}	12637 (2.14) {426}	3838 (1.97) {397}
Interest on working capital	1074 (1.54) {359}	2001 (1.65) {346}	3069 (1.92) {376}	7828 (2.23) {440}	16959 (2.87) {571}	4131 (2.12) {428}
Depreciation	2667 (3.82) {892}	6883 (5.67) {1189}	12857 (8.05) {1576}	30931 (8.81) {1739}	56210 (9.53) {1894}	15345 (7.88) {1589}
$CostA_1$	34419 (49.32) {11511}	66041 (54.43) {11406}	103612 (64.84) {12697}	262412 (74.72) {14751}	557717 (94.52) {18791}	137504 (70.62) {14234}
Rent of Leased-in Land	35364 (50.68) {11828}	55298 (45.57) {9551}	56185 (35.16) {6885}	88768 (25.28) {4990}	32315 (5.48) {1089}	57212 (29.38) {5923}
$CostA_2$	69784 (100.00) {23339}	121339 (100.00) {20957}	159796 (100.00) {19583}	351180 (100.00) {19740}	590032 (100.00) {19880}	194716 (100.00) {20157}

Source: Field Survey, 2016-17.

Notes: Figures given in ( ) represent percentages.

Figures given in { } represent cost per acre.

Cost of Cultivation of Paddy

Paddy is a *Kharif* crop. It is sown in the months of June-July and harvested in November-December. The field survey provided information that in the case of paddy, the transplantation method was commonly used by the farmer households wherein seeds were first sown in nurseries, and then the seedlings with 3-4 leaves were transplanted to the field. This transplantation technique necessitated a significant amount of labour for planting paddy. The expense of labour increased twofold for Basmati farming since it demanded labour for both planting and harvesting as well. It required 5 kg of seeds for preparing seedlings for one acre of land. Generally, 3 to 4 bags of *NPK* and one bag of *zinc* was used for one acre of paddy crop. The insecticides and pesticides were used as per the requirements to protect crop from the disease or the pest. Usually, 4 to 6 sprays of pesticides were required in the paddy. As told by the farmers, they used *Rifit* herbicide to control grasses, sedges and some broadleaf weeds in transplanted paddy. *Padan* insecticide was used against chewing, sucking and boring insects. Four to five other sprays were required in paddy to protect or fight against diseases like leaf folder (*patavalate*), stem borer (*gob sundi*), sheath blight *(ulli rog* or *mehndi color de spots*), and black plant hopper (*kala tela*).

As the paddy required heavy labour, migrant labour from UP and Bihar States was generally used for sowing sapling and harvesting paddy. Paddy crop needed lots of water to grow. The cost of irrigating paddy was much higher because large parts of the Mansa and Fazilka districts still had not equipped with submersible pumps on the farms. To irrigate paddy, these farmers usually used diesel engines, generators and tractors, which increased the cost of cultivation of paddy.

Table 2 illustrates per household cost of paddy cultivation among the sampled farmer households. The $CostA_2$ per household for paddy was calculated to be Rs. 184360 among all sampled farmer households, while, it was Rs. 44093 for the marginal andRs. 640963 for the large farmer households. Out of the total paid-out cost of paddy cultivation, $CostA_1$ accounted for Rs. 140345 (76.13 per cent), whereas the rent of leased-in land contributed Rs. 44015 (23.87 per cent) for an average farmer household. The share of $CostA_1$ was directly associated with the size of landholdings. It was the lowest (Rs. 23269) for the marginal farmer households and the highest (Rs. 608648) for the large farmer households. The proportionate share of rent of leased-in land was negatively associated with the landholdings' size as it was 47.23 per cent among the marginal and only 5.04 per cent for the large farmer households. The second-largest share was contributed by casual labour, which accounted for Rs. 29256 (15.87 per cent) among the farmer households. The irrigation charges accounted for Rs. 24193 (13.12 per cent), followed by Rs. 23926 (12.98 per cent) for pesticides and insecticides, Rs. 15728 (8.53 per cent) for hiring contractual labour, Rs. 13581 (7.37 per cent) for owned machinery and implement charges, Rs. 9957 (5.40 per cent) for depreciation of farm machinery, implements and farm buildings, Rs. 8882 (4.82 per cent) for fertilisers, Rs. 6596 (3.58 per cent) for hired machinery and implement charges, Rs. 4409 (2.39 per cent) for interest on working capital, Rs. 3237 (1.76 per cent) for the cost of manure, and Rs. 579 (0.31 per cent) for seeds. So far as the different farm-size categories were concerned, the absolute share of all the cost components of paddy per household increased with the increasing size of landholdings. But the relative shares of different constituents of cost of cultivation followed different pattern.

Among all the cost components involved in the cultivation of paddy, the larger farmer households incurred the highest cost on hired human labour, including both the casual as well as contractual labour, which was 40.82 per cent. However, for the marginal farmer households, the corresponding share was only 10.49 per cent. In addition, the marginal farming households incurred the highest cost on rent paid for leased-in land, which was 47.23 per cent. However, the share of large farmer households for this was only 5.04 per cent.

Per acre cost of paddy was obtained by dividing per household cost incurred to produce paddy by the size of operational holdings on which paddy was sown during 2016-17. The operational area under paddy was 6.66 acres for all the sampled farmer households, while it was 1.37, 2.94, 6.05, 13.18, and 22.36 acres for the marginal, small, semi-medium, medium, and large farmer households, respectively. The data showed that the total paid-out cost, i.e., $CostA_2$, of paddy was Rs. 27682 among an average farmer household, including Rs. 21073 of $CostA_1$ and Rs. 6609 of rent of leased-in land. For growing paddy, an average farmer household spent the highest amount on hiring casual labour, which was Rs. 4393 per acre, followed by Rs. 3633 for irrigation charges, Rs. 3593 for pesticides and insecticides, Rs. 2362 for contractual labour, Rs. 2039 for owned machinery and implement charges, Rs. 1495 for depreciation of farm machinery, implements and farm buildings, Rs. 1334 on fertilisers, Rs. 990 on charges of hired machinery and implements, Rs. 662 for interest on working capital, Rs. 486 on manure, and only Rs. 87 on seeds.

The data clarified that almost all the components of the cost of paddy cultivation had observed a direct relationship with the farm holdings except for the expenses on manure, charges of higher machinery and implements, irrigation charges, depreciation charges, and rent of leased-in land. The marginal and small farming households incurred no cost on contractual labour because they had very small landholdings for which they did not require contractual labour, and these households utilised their family labour. Charges of hired machinery and implements decreased as size of farm increased.

The data pinpointed that per household cost of paddy

Table 2: Cost of cultivation of Paddy among farmer households **(Rs./unit)**

Paddy Cost Components	Marginal	Small	Semi-medium	Medium	Large	All Sampled Farmer Households
Seeds	103 (0.23) {75}	226 (0.27) {77}	485 (0.30) {80}	1182 (0.33) {90}	2208 (0.34) {99}	579 (0.31) {87}
Fertilisers	1716 (3.89) {1253}	3832 (4.53) {1303}	7926 (4.88) {1310}	17857 (5.02) {1355}	30293 (4.73) {1355}	8882 (4.82) {1334}
Pesticides & Insecticides	4315 (9.79) {3150}	9564 (11.30) {3253}	21545 (13.27) {3561}	48753 (13.70) {3699}	82736 (12.91) {3700}	23926 (12.98) {3593}
Manure	955 (2.17) {697}	1710 (2.02) {582}	2602 (1.60) {430}	5919 (1.66) {449}	12072 (1.88) {540}	3237 (1.76) {486}
Contractual Labour	0 (0.00) {0}	0 (0.00) {0}	3582 (2.21) {592}	32465 (9.12) {2463}	146852 (22.91) {6568}	15728 (8.53) {2362}
Casual Labour	4626 (10.49) {3376}	10791 (12.74) {3671}	25085 (15.45) {4146}	59534 (16.72) {4517}	114794 (17.91) {5134}	29256 (15.87) {4393}
Owned Machinery	1702 (3.86) {1243}	5819 (6.87) {1979}	12166 (7.49) {2011}	27355 (7.68) {2075}	50065 (7.81) {2239}	13581 (7.37) {2039}
Hired Machinery	2694 (6.11) {1966}	4631 (5.47) {1575}	6635 (4.09) {1097}	10667 (3.00) {809}	15287 (2.39) {684}	6596 (3.58) {990}
Irrigation	5127 (11.63) {3742}	6661 (7.87) {2266}	19658 (12.11) {3249}	50689 (14.24) {3846}	98985 (15.44) {4427}	24193 (13.12) {3633}
Interest on working capital	743 (1.69) {543}	1513 (1.79) {515}	3489 (2.15) {577}	8905 (2.5) {676}	19365 (3.02) {866}	4409 (2.39) {662}
Depreciation	1287 (2.92) {940}	3674 (4.34) {1250}	9505 (5.86) {1571}	20152 (5.66) {1529}	35990 (5.62) {1610}	9957 (5.40) {1495}
$CostA_1$	23269 (52.77) {16985}	48422 (57.19) {16470}	112678 (69.41) {18624}	283479 (79.63) {21508}	608648 (94.96) {27220}	140345 (76.13) {21073}
Rent of Leased-in Land	20823 (47.23) {15199}	36251 (42.81) {12330}	49654 (30.59) {8207}	72495 (20.37) {5500}	32315 (5.04) {1445}	44015 (23.87) {6609}
$CostA_2$	44093 (100.00) {32184}	84673 (100.00) {28800}	162332 (100.00) {26832}	355973 (100.00) {27009}	640963 (100.00) {28666}	184360 `(100.00) {27682}

Source: Field Survey, 2016-17.

Notes: Figures given in ( ) represent percentages.

Figures given in { } represent cost per acre.

cultivation increased along with the farm-size; however, the per-acre cost of paddy (CostA2) was the highest for the marginal and small farmer households. For almost all the constituents, per acre cost of cultivating paddy for an average farmer household had a direct association with the size of the farm except for manure, charges of hired machinery & implements, and the irrigation charges. The marginal farmers had to spend heavily on diesel irrigation because they lacked funds to install electric tubewell on their farms. However, the large farmer households spent the highest share on hiring labour.

Cost of Cultivation of Cotton

Cotton is another *Kharif* crop that is planted in May-June and gathered in October-November. It is among the key fibers and cash crops in the nation. It has been playing a dominant role not only in the agricultural economy but also in the industrial economy as it provides raw cotton fibre to the cotton textile industry. However, cotton is a pest-attracting plant, which requires many sprays of insecticides and pesticides. The field survey revealed that the cotton crop required three packets of seeds (450 gm per packet), one bag of *DAP* (50 kg), one bag of *super* (50 kg), and two bags of *NPK* (100 kg). It required 7-10 sprays for protecting or fighting against major pests such as American bollworm, pink bollworm, tobacco caterpillar, jassids, spotted bollworm, mealy bugs, whitefly, thrips, etc., as per the requirements of the crop. Cotton cultivation also required huge labour for weeding and harvesting activities such as picking and separating cotton and removing cotton sticks from the field.

Table 3 represents the per-household cost of cotton cultivation among the sampled farmer households. The data showed that $CostA_2$ for cotton was Rs. 79480 for an average farmer household. The cost of cultivation assisted a favorable association with the landholdings excluding small farmer households who interchanged their position with the semi-medium farm-size category. It stood at Rs. 43720 for marginal farming households and rose up to Rs. 47851, Rs. 69450, Rs. 133596, and Rs. 209054 for semi-medium, small, medium and large farmer households, respectively. Out of the total paid out cost, $CostA_1$ showed a direct correlation with farm-size except for semi-medium farmer households; as it was Rs. 28845 among the marginal and Rs. 209054 among the large farmer households. The rent of leased-in land included Rs. 14875 for marginal farmer households, while it was Rs. 19012, Rs. 6531, and Rs. 16274 for small, semi-medium and medium farmer households, respectively.

Within the various components of cotton farming expenses, pesticides and insecticides represented the largest portion, totaling Rs. 18869 (23.74 per cent) for an average farming household, followed by Rs. 13974 (17.58 per cent) for casual labour, Rs. 7059 (8.88 per cent) for seeds, Rs. 6598 (8.30 per cent) for owned machinery and implement charges, Rs. 5421 (6.82 per cent) for fertilisers, Rs. 4411 (5.55 per cent) for contractual labour, Rs. 4099 (5.16 per cent) for depreciation of farm machinery, implements and farm buildings, Rs. 2101 (2.64 per cent) for interest charged upon working capital, Rs. 1555 (1.96 per cent) on irrigation charges, Rs. 1089 (1.37 per cent) on charges of hired machinery and implements and Rs. 1042 (1.31 per cent) for the value of manure.

The per-household cost of cotton cultivation varied across different farm-size categories based on the size of operational holdings, use of pesticides and insecticides, etc. The expenses of rented machinery and tools showed an inverse correlation with the farm-size, being Rs. 2054 (4.70 per cent) for marginal, Rs. 1978 (2.85 per cent) for small and Rs. 556 (1.16 per cent) for semi-medium farmer households. The large farmers No expenses were incurred on hired machinery and implements by the medium and large farming households. The survey observed that the intensive cultivation of rice had resulted in severe depletion of groundwater resources. It had also raised the production costs as shallow tubewells were substituted with deep tubewells equipped with submersible pumps (Sarkar & Das, 2014).

Per acre cost of the cotton crop was obtained by dividing per household cost incurred to produce cotton by the size of the operational area under cotton during 2016-17. The operational area under cotton was 2.94 acres for an average sampled farmer household, while it was 1.62, 2.81, 2.03, 4.51, and 7.20 acres for marginal, small, semi-medium, medium, and large farmer households, respectively. Table 3 describes the cotton cultivation cost on a per-acre basis among the farmers in the cotton belt region. The data depicted that cost of cotton cultivation was Rs. 27034 per acre, which included Rs. 22522 of $CostA_1$ and Rs. 4512 for rent of leased-in land. Across the different farm-size groups, the $CostA_1$ of cotton was Rs. 17806, Rs. 17949, Rs. 20355, Rs. 26014, and Rs. 29035 for marginal, small, semi-medium, medium and large farm holders, respectively. This upward trend was dominated by the increasing cost of contractual and casual labour with increased farm size. The rent of leased-in land was the largest amounting to Rs. 9182 among the marginal farmer households, followed by Rs. 6766, Rs. 3608 and Rs. 3217 for small, medium and semi-medium farmer households, respectively. No land was taken on rent for cotton cultivation by the large farmers.

An average farming household spent the highest portion of Rs. 6418 on pesticides and insecticides, followed by Rs. 4753 on casual labour, Rs. 2401 on seeds, Rs. 1844 on fertilisers, Rs. 1500 on contractual labour, Rs. 1394 on depreciation of farm machinery, implements and farm buildings, Rs. 714 on interest on working capital, Rs. 370 on charges of hired machinery and implements, and Rs. 354 on manure. The per-acre cost of seeds, fertilisers, pesticides and insecticides, casual labour, contractual labour, owned machinery and implements, and depreciation increased with

Table 3: Cost of cultivation of Cotton among farmer households **(Rs./unit)**

Cotton Cost Components	Marginal	Small	Semi-medium	Medium	Large	All Sampled Farmer Households
Seeds	3876 (8.87) {2393}	6743 (9.71) {2400}	4874 (10.19) {2401}	10816 (8.10) {2398}	17289 (8.27) {2401}	7059 (8.88) {2401}
Fertilisers	2931 (6.70) {1809}	5099 (7.34) {1815}	3686 (7.70) {1816}	8450 (6.32) {1874}	13507 (6.46) {1876}	5421 (6.82) {1844}
Pesticides & Insecticides	9690 (22.16) {5982}	16857 (24.27) {5999}	13200 (27.59) {6503}	30194 (22.60) {6695}	48265 (23.09) {6703}	18869 (23.74) {6418}
Manure	1131 (2.59) {698}	1297 (1.87) {461}	747 (1.56) {368}	955 (0.71) {212}	1303 (0.62) {181}	1042 (1.31) {354}
Contractual Labour	0 (0.00) {0}	0 (0.00) {0}	149 (0.31) {74}	11839 (8.86) {2625}	33778 (16.16) {4691}	4411 (5.55) {1500}
Casual Labour	2702 (6.18) {1668}	6732 (9.69) {2396}	8013 (16.75) {3947}	31166 (23.33) {6911}	53394 (25.54) {7416}	13974 (17.58) {4753}
Owned Machinery	3221 (7.37) {1988}	6064 (8.73) {2158}	4637 (9.69) {2284}	10401 (7.79) {2306}	17376 (8.31) {2413}	6598 (8.30) {2244}
Hired Machinery	2054 (4.70) {1268}	1978 (2.85) {704}	556 (1.16) {274}	0 (0.00) {0}	0 (0.00) {0}	1089 (1.37) {370}
Irrigation	966 (2.21) {596}	932 (1.34) {332}	1152 (2.41) {567}	2663 (1.99) {590}	4319 (2.07) {600}	1555 (1.96) {529}
Interest on working capital	930 (2.13) {574}	1600 (2.30) {569}	1295 (2.71) {638}	3727 (2.79) {826}	6623 (3.17) {920}	2101 (2.64) {714}
Depreciation	1345 (3.08) {830}	3136 (4.52) {1116}	3011 (6.29) {1483}	7112 (5.32) {1577}	13201 (6.31) {1833}	4099 (5.16) {1394}
$CostA_1$	28845 (65.98) {17806}	50438 (72.63) {17949}	41320 (86.35) {20355}	117322 (87.82) {26014}	209054 (100.00) {29035}	66216 (83.31) {22522}
Rent of Leased-in Land	14875 (34.02) {9182}	19012 (27.37) {6766}	6531 (13.65) {3217}	16274 (12.18) {3608}	0 (0.00) {0}	13264 (16.69) {4512}
$CostA_2$	43720 (100.00) {26988}	69450 (100.00) {24715}	47851 (100.00) {23572}	133596 (100.00) {29622}	209054 (100.00) {29035}	79480 (100.00) {27034}

Source: Field Survey, 2016-17.

Notes: Figures given in ( ) represent percentages.

Figures given in { } represent cost per acre.

the increased landholdings. In comparison, the cost of manure and charges for hired machinery and implements decreased as the land size increased.

The medium and large farming households had not used hired machinery and implements. The irrigation charges also exhibited a favorable association with the farm holdings excluding marginal farmer households. Due to the lack of electric pumps, they had to spend more on irrigating fields. The CostA2 was the lowest, i.e., Rs. 23572 for semi-medium farmer households, rose up to Rs. 24715, Rs. 26988, Rs. 29035, and Rs. 29622 among the small, marginal, large, and medium farmer households, respectively. The higher cost among the medium and large farmer households was due to using more casual labour, costly and high-quality pesticides& insecticides, fertilizers, etc.

From the above analysis, it can be concluded that cultivation cost per acre was the largest for cotton crop and for producing wheat, paddy and cotton crops, the CostA1 per acre was higher among the large farmer households. Esar and Sachdeva (2023) found the similar results that total cost per hectare for cotton cultivation was the highest at Rs. 59269 in Punjab during the agricultural year 2018-19.The results are similar to the study conducted by Bhattacharya and Majid (1976). They discovered that overall input expenses per farm were significantly greater on large farms compared to smaller ones. Average costs per acre were higher on large farms due to their access to more resources for purchasing inputs. Still, small farms economised on purchased inputs and used family resources more intensively. Government of India (2008) noted that use of inputs to boost productivity had significantly risen since the Green Revolution, contributed to higher costs of cultivation. In addition, because of the application of high amounts of chemical fertilisers, farmers have to spend significantly on insecticides, weedicides, and herbicides, which increased the cultivation expense several times (Raghavan, 2008).

Many other studies also supported the results of the study. Sharp rise in prices of inputs, removal of subsidies on inputs, privatisation, and the breakdown of the infrastructure (Wilson, 2002) were the main factors leading to these high cultivation costs. The failure of the cotton crop and the frozen Minimum Support Price of wheat and paddy placed the entire cotton belt under stress (Bhullar *et al*, 2011). According to Narayanamoorthy (2007), the costs associated with crop cultivation have risen over time due to higher wage rates for labour, increased input prices, and other managerial expenses. Sidhu and Johl (2002) showed that the rate of returns per hectare declined drastically for rice and wheat because of high fixed costs, while it was due to both fixed and variable costs in the case of cotton. Shergill (1998) studied rural indebtedness and the escalating costs of inputs in Punjab and argued that minimal surplus was left with farmers to spend or repay outstanding loans.

Gandhi (1997) found that over-mechanisation, increased labour costs and irrigation costs were the driving factors behind the increasing cost of cultivation. Pattanaik *et al* (2008) found that not only input costs but also land lease rates had gone up substantially. They observed that the land lease rate went up to as much as Rs. 50000 per acre per year in 2015, increasing the cost of cultivation manifold. Jodhka (2006), Johl (1986), Government of Punjab (2013), Singh (2016), and Dandekar and Bhattacharya (2017) concluded that the higher cost of farm inputs such as seeds, fertilisers, insecticides, and pesticides, rising wages, improper cropping pattern and related technologies, etc., were the main causes behind increasing cost of production, declining returns and growing distress among farmers. Kaur *et al* (2018) also found the high land lease rates in Punjab agriculture. They stated that due to scarcity of other employment opportunities beyond the farming sector, a large number of farming households relied on their own resources, particularly labour and capital, to lease the limited land available, which pushed the rental rates above its economic rational.

Conclusions and Policy Implications

The research emphasised that cost per acre of growing wheat, paddy, and cotton crops for an average farmer household had a direct association with the farm-size for nearly all components of cost of cultivation, with the exception of the value of manure, charges of hired machinery and implements, and the irrigation charges. The cultivation expenses per acre were the highest for cotton crop (Rs. 22522) in comparison to paddy (Rs. 21073) and wheat (Rs. 14234). For wheat cultivation, the largest portion of CostA1 totaling Rs. 2271 per acre, was allocated to fertilisers. Conversely, for paddy farming, the predominant share of CostA1 was attributed to employ casual labour (Rs. 4393 per acre), while in cotton farming, the greatest share was spent on pesticides and insecticides (Rs. 6418 per acre). It was found that the farmers with larger landholdings could invest in costly inputs and farm machinery and equipment for raising returns from farming. However, the resource-poor marginal and small farmers had to depend upon hired machinery to perform various agricultural operations from sowing to harvesting. Also, the marginal farmer households had to spend larger shares on irrigation charges because most of them had not installed electric tubewells on their farms in the study area, and they either had to depend upon diesel irrigation or other's electric tubewell on payment basis.

As the costs of cultivation of crops were very high, it affected the profitability in the study area. Thus, special measures such as subsidised farm inputs including seeds, fertilizers and pesticides, diesel, provision of agricultural machinery on a custom hiring basis, and credit at a low interest rate should be adopted to help the poor marginal, and small farmers in reducing the cultivation expenses and

enhance profitability of farmers. Rationalising rental rates of agricultural land in the Punjab state would also be helpful in enhancing the earnings of tenant farmers. The government must spend on research and development activities and ensure the proper checks on the quality of seeds, fertilisers and pesticides to save the cotton crop. Also, the farmers must use the government recommended farm inputs and techniques to reduce the chances of crop failure. The returns from farming could also be raised through assured marketing and by paying remunerative prices for their crops. For this, minimum support prices should be fixed to guarantee income that is at least 50 per cent higher than the weighted average cost of production, as proposed by M. S. Swaminathan. The government should guarantee profitable minimum support prices for agricultural products by taking into account production costs and consumer price indices.

Also, it was seen in the field survey that farmers, generally, did not record the costs and returns from cultivation of crops. Farmers must keep details of the types of seeds, quantity of fertilisers and pesticides used, expenses incurred and returns obtained from each crop. It would help farmers to compare and detect the unnecessary costs and make efforts to reduce that costs for the next farming seasons in general and the government to collect exact data regarding cost of cultivation in particular.

References

Bhattacharya P and Majid J A 1976. Impact of green revolution on output cost and income of small and big farmers. *Economic and Political Weekly* **1152**:A147-A150. https://www.jstor.org/stable/ 4365209

Bhullar A S, Sidhu R S and Singh S 2011. Farmers' suicides in Punjab: A census survey of the two most affected districts. *Economic and Political Weekly* **462:**131–137. https://www.jstor.org/stable/ 23018817

Dandekar A and Bhattacharya S 2017. Lives in debt: Narratives of agrarian distress and farmer suicides. *Economic and Political Weekly* **LII2:**77-84. https://www.jstor.org/stable/26696131

Esar B A and Sachdeva J 2023. Costs and returns from cultivation of major crops in Punjab. *Agricultural Situation in India* **LXXIX3**: 6-17. https://www.researchgate.net/publication/380637271

Esar B A, Sachdeva J and Mouzam S M 2023. Cost of cultivation and production of various crops in Punjab. *Journal of Agricultural Development and Policy* **332**: 253-259. https://www.research gate.net/publication/378156339_Cost_of_Cultivation_and_Production_of_Various_Crops_in_Punjab

Gandhi V P 1997. Technology cost reduction and returns in agriculture: A study of wheat and rice in Punjab. *Vikalpa* **222**: 35-48. https://journals.sagepub.com/doi/pdf/10.1177/0256090919970207

Government of India 2008. Key issues and problems of marginal and small farmers: A Report on a special programme for marginal and small farmers. Government of India, National Commission for Enterprises in the Unorganised Sector, New Delhi. https://dcmsme.gov.in/Special_Programme_for_Marginal_and_Small_Farmers.pdf

Government of Punjab 2013. Draft: Agriculture policy for Punjab. https://punjab.gov.in/wpcontent/ uploads/2019/04/Agriculture-policy-of-punjab.pdf

Jodhka S S 2006. Beyond crisis- Rethinking contemporary Punjab agriculture. *Economic and Political Weekly* **41**:1530-1537. https://www.jstor.org/stable/4418111

Johl S S 1986. Report of the expert committee for agricultural diversification in Punjab. Government of Punjab. https://peri.punjab.gov.pk/system/files/461

Kaur M, Singh S, Singh J, Singh J M, Kingra H S and Sachdeva J 2018. *District-wise cost of cultivation of important crops in Punjab*. Punjab Agricultural University, Department of Economics and Sociology, Ludhiana.

MOSPI 2008. Mannual on cost of cultivation surveys. CSO-M-AG-02. https://mospi.nic.in

Nadkarni M V 1988. Crisis of increasing costs in agriculture: Is there a way out? *Economic and Political Weekly* **2339:** A114-A119. https://www.jstor.org /stable /4379085

Narayanamoorthy A 2007. Deceleration in agricultural growth: Technology fatigue or policy fatigue? *Economic and Political Weekly* **23**: 2375-79.https://www.jstor.org/stable/4419724

Pattanaik B K, Singh K, Singh S and Singh M M 2008. *Contract farming system in Punjab: An appraisal*. Centre for Research in Rural and Industrial Development, Chandigarh.

Raghavan M 2008. Changing pattern of input use and cost of cultivation. *Economic and Political Weekly* **43**:123-129. https://www.jstor.org/stable/40278909

Sarkar A and Das A 2014. Groundwater irrigation electricity-Crop diversification nexus in Punjab: Trends turning points and policy initiatives. *Economic and Political Weekly* **XLIX52**: 64-73. https://www.jstor.org/stable/24481208

Shergill H S 1998. *Rural credit and indebtedness in Punjab*. Monograph Series IV. Institute of Development and Communication, Chandigarh.

Sidhu R A, Bhullar A S and Joshi A S 2005. Income employment and productivity growth in the farming sector of Punjab: Some issues. *Journal of Indian School of Political Economy* **17**: 59-72. https://i-scholar.in/index.php/JISPE/article/view/172542

Sidhu R S and Johl S S 2002. Three decades of intensive agriculture with special reference to Punjab, In: *Future of Punjab agriculture*, Ed: S S Johl and S K Ray. Centre for Research in Rural and Industrial Development (CRRID), Chandigarh, pp.16-39.

Singh N 2016. Farmer suicides in India's breadbasket. *Economic and Political Weekly* **51**:29-30. https://www.epw.in/journal/2016/37/book-reviews

Wilson K 2002. Small cultivators in Bihar and 'new' technology: Choice or compulsion? *Economic and Political Weekly* **37**: 1229–1238. https://www.jstor.org/stable/4411926

Received: February 25, 2025 Accepted: April 10, 2025