

Cost, Returns And Profitability: A Case Study Of Bt Cotton Cultivation In Southwest Punjab, India

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Abstract: This study analyzed and compared the cost and return of Bt cotton cultivation in three districts of southwest Punjab e.g Faridkot, Bathinda, and Fazilka. The primary data collected through the administration of 120 copies of questionnaires to randomly selected farmers. From Faridkot, Bathinda and Fazilka districts, 34, 47 and 39 farmers are selected respectively. The Bt cotton growing farmers were divided into three size groups on the basis of the size of their operational land holdings. These size groups are small (0-4.99 acres), medium (5-9.99 acres) and large (10 and above acres). The data pertained to 2012-13 agricultural year. Cost concepts of Commission for Agriculture Costs and Prices are used in the study. The study shows that on an average net income is negative (Rs. - 959) for all farmers of Southwest Punjab, so most of the farmers are not in a position to cope up their family labour, rent of their owned land and value of their management functions.

I. INTRODUCTION

Cotton is one of the cash crops of southwest Punjab. It occupies a noteworthy place in the farming and industrial (viz. textile) economy of the state as well as in India. It has been observed that with the increase in water logging, the area under cotton crop has been shrinking. For example, the area under cotton crop was 7 lakh hectares in 1990-91 which decreased to 4.81 lakh hectares in 2011-12. There have been wide fluctuations in the cotton yield. The cotton crop is prone to pest attacks which increase the cost of production of cotton crop because of the increase in the expenditure on insecticides and pesticides. As a result, Bt cotton has been introduced which is said to be pest resistant. It is therefore, significant to examine whether the farmers involved in the cultivation of Bt cotton are earning adequate returns or not. It is also interesting to see the cost pattern and profitability of this crop on different farm sizes and in different districts of Punjab.

The present study has been concentrated on the analysis of the cost of cultivation of the Bt Cotton in some south-western districts of Punjab. Nevertheless, not much credible research pertaining to the cost of this crop is available. The specific objectives of this paper are as following.

- ✓ To review studies showing cost and profitability of Bt cotton crop.
- ✓ To discuss the cost pattern of Bt cotton on different farm sizes.
- ✓ To explore the profitability of Bt cotton in different farm sizes.

II. REVIEW OF LITERATURE

Following studies have been reviewed to adjudge the impact of Bt cotton on costs and profitability.

Qaim M. and Alain De Janvry (2003) shown that the GM technology significantly reduced insecticide applications and increases yields. However, these advantages are curbed by the high price charged for GM seeds. A lower price would not only increase benefits for growers, but could also multiply company profits because of increased demand for seeds. Lence S.H. and Dermot J. Hayes (2005) concluded that the long-run results show that under reasonable circumstances, consumer and producer welfare is larger after the introduction of GM technology.

Debyani and Neeta (2012) measured the economic impact of Bt cotton as compared to Non Bt cotton. The results

revealed that 85 percent of the farmers felt that productivity had gone up considerably after the usage of Bt cotton seeds as Bt cotton gives higher yield than conventional varieties of cotton. They found that Bt cotton does have an adverse effect on health, environment and soil as some farmers do suffer from allergy while working on Bt cotton fields and it also leads to reduced fertility of soil. Another negative aspect of Bt cotton is that farmers have to incur high costs on irrigation, fertilizers and pesticides.

Finger et al (2011) found that compared to conventional crops, GM crops can lead to yield increases and can lead to reductions in the costs of pesticide application, whereas seed costs of GM crops are usually substantially higher. Kiresur and Ichangi (2011) show that Bt cotton has offered increasing returns to scale. The impact of Bt cotton, as perceived by the farmers, has been in terms of enhanced yield; reduced pest and disease incidence; increased income, employment, education and standard of living; and reduced health risk. Lastly they suggested development agencies should take greater attention towards quality and quantity supply of Bt cotton seeds to farmers and need of more research for incorporating resistance/ tolerance to Spodoptera and pink bollworms.

Morse, Bennett, and Ismael (2007) found that GM technology adopting households have a significantly higher income from cotton (44% greater) than do non-adopters. Megha and Sangha (2012) stressed the need of research for analyzing the short and long term effects of transgenic crops on the environment. Evidence indicates that such genetic exchanges among wild, weed and crop plants already occur. A major environmental consequence resulting from the massive use of Bt toxin in cotton or other crops occupying a larger area of the agricultural landscape, is that neighboring farmers who grow crops other than cotton, but sharing similar pest complexes, may end up with resistant insect populations colonizing their fields.

III. DATA SOURCES AND METHODOLOGY

The present study is based on the primary data. The cotton crop is grown mainly in the six districts of southwest Punjab e.g. Mansa, Bathinda, Muktsar, Faridkot, Ferojpur and Fazilka. For the purpose of study three districts are selected because Bt cotton cultivation is concentrated in these districts. The primary data collected from 120 Bt cotton growing farmers of these three districts. The selection of farmers was random. From Faridkot, Bathinda and Fazilka districts, 34, 47 and 39 farmers are selected respectively. To collect data a detailed questionnaire was prepared and 120 Bt cotton growing farmers were personally met and data was collected from them in order to fulfill the objectives of study. The Bt cotton growing farmers were divided into three size groups on the basis of the size of their operational land holdings. These size groups are small (0-4.99 acres), medium (5-9.99 acres) and large (10 and above acres). The data pertained to 2012-13 agricultural year.

Cost concepts of Commission for Agriculture Costs and Prices are used in the study. These concepts are defined as following.

COST CONCEPTS

Cost A_1 : All variables costs excluding family labour cost and including land revenue, depreciation and interest on working capital.

Cost A_2 : Cost A_1 + Rent paid for leased-in land.

Cost B_1 : Cost A_1 + Interest on the value of owned fixed capital assets (excluding land).

Cost B_2 : Cost B_1 + Rental value of owned land.

Cost C_1 : Cost B_1 + Imputed value of family labour.

Cost C_2 : Cost B_2 + Imputed value of family labour.

Cost C_3 : Cost C_2 + 10 percent of cost C_2 on account of managerial functions performed by farmers.

INCOME MEASURES

✓ Gross value of Output (GVO)

It is the total value of main and byproduct multiplied by their prevailing prices.

✓ Return over variable cost (RVC)

$RVC = GVO - \text{Cost } A_1$

✓ Farm business income (FBI)

$FBI = GVO - \text{Cost } A_2$

✓ Family labour income (FLI)

$FLI = GVO - \text{Cost } B_2$

✓ Net income (NI) = $GVO - \text{Cost } C_2$

✓ Returns to Management (RM) = $GVO - \text{Cost } C_3$

✓ Returns per rupee (RPR) = $GVO / \text{Cost } C_2$

IV. DATA ANALYSIS

COST OF BT.COTTON CULTIVATION

FARIDKOT DISTRICT

Table 1 shows that cost A_1 per acre is the highest (Rs.17113) for medium farmers and the lowest (Rs.15049) for small farmers. It is Rs.15639 and Rs.15926 for large and all farmers respectively. Relatively more consumption of seeds, fertilizers, insecticides & pesticides, harvesting costs besides the higher human labour have increased the cost A_1 in case of the medium farmers vis-à-vis large and small farmers. The seed cost is higher for large farmers (Rs.2047 or 13.09 percent of cost A_1) in comparison to medium (Rs.2002 or 11.70 percent of cost A_1) and small farmers (Rs.1909 or 12.69 percent of cost A_1). On an average seed cost of Rs.2018 confirms the earlier studies which show that average expenditure on seeds is higher for Bt cotton than non Bt cotton largely due to higher cost of Bt cotton seeds. Thus, in this context, it may be mentioned that Bt cotton (hybrid) seeds were initially sold at a price which was five-times that of the local hybrid variety (Acharya, 2006).

The harvesting cost is the highest for the medium farmers (Rs.4424), followed by the large (Rs.3691) and small farmers (Rs.3376). Expenditure on insecticides & pesticides is highest for large farmers (Rs.4226) in comparison to medium (Rs.3694) and small farmers (Rs.3528). This contradicts and belies the claim of the seed companies that Bt cotton lessens

pest attacks and consequently, it diminishes the use of pesticides and insecticides significantly.

Cost A_2 is the highest (Rs.20348) for medium farmers (because they cultivate more rented land) followed by large farmers (Rs.16966) and small farmers (Rs.16351). On an average it is Rs.17719 in the district. The cost B_1 is the highest for medium farmers (Rs.17476) and the lowest for small farmers (Rs.15596). It is Rs.15903 and Rs.16250 for large and all farmers. As proportion to cost C_3 it is highest for medium farmers (50.45%) followed by large farmers (43.56%) and small farmers (43.45%). Because medium farmers cost A_1 is more than large and small farmers.

The cost B_2 is highest for large farmers (Rs 32628) followed by small farmers (Rs 31803) and medium farmers (Rs 30741). On an average it is Rs 32059 for all farmers of Faridkot district. The cost C_2 is the highest for large farmers (Rs.33183) in comparison to small farmers (Rs.32630) and medium farmers (Rs.31488) in Faridkot district in the production of Bt cotton. It (Continue-)

| COSTS | Faridkot | | | | Bathinda | | | |
|--|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| | Small | Medium | Large | Overall | Small | Medium | Large | Overall |
| 1 Land Preparation | 1138 (7.56) | 1055 (6.16) | 1007 (6.44) | 1035 (6.50) | 1467 (9.32) | 909 (5.52) | 739 (4.98) | 791 (5.24) |
| 2 Seeds | 1909 (12.69) | 2002 (11.70) | 2047 (13.09) | 2018 (12.67) | 2133 (13.56) | 1898 (11.53) | 1784 (12.02) | 1813 (12.01) |
| 3 Bunding | 1257 (8.35) | 2072 (12.12) | 1214 (7.76) | 1431 (8.98) | 1433 (9.11) | 1144 (6.94) | 1743 (11.75) | 1649 (10.92) |
| 4 Fertilizers | 1743 (11.58) | 1724 (10.07) | 1698 (10.86) | 1710 (10.74) | 1992 (12.66) | 1533 (9.31) | 1496 (10.08) | 1520 (10.07) |
| 5 Manure | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 2 (0.01) | 2 (0.01) |
| 6 Insecticides and Pesticides | 3528 (23.45) | 3694 (21.59) | 4226 (27.02) | 4006 (25.15) | 4167 (26.48) | 5222 (31.70) | 2790 (18.80) | 3177 (21.05) |
| 7 Irrigation | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 299 (2.02) | 247 (1.63) |
| 8 Harvesting | 3376 (22.43) | 4424 (25.85) | 3691 (23.60) | 3831 (24.05) | 3280 (20.84) | 3486 (21.17) | 3493 (23.54) | 3483 (23.08) |
| 9 Hired Permanent Labour | 0 (0) | 245 (1.43) | 139 (0.89) | 147 (0.92) | 0 (0) | 15 (0.09) | 575 (3.88) | 476 (3.15) |
| 10 Hired Casual Labour | 272 (1.81) | 543 (3.17) | 573 (3.66) | 527 (3.31) | 811 (5.15) | 1388 (8.42) | 1073 (7.23) | 1106 (7.33) |
| 11 Interest on Working Capital | 264 (1.76) | 315 (1.84) | 292 (1.87) | 294 (1.85) | 306 (1.94) | 312 (1.89) | 280 (1.89) | 285 (1.89) |
| 12 Depreciation | 1562 (10.38) | 1038 (6.07) | 753 (4.82) | 927 (5.82) | 150 (0.95) | 564 (3.42) | 562 (3.79) | 546 (3.62) |
| 13 A_1 | 15049 (100) | 17113 (100) | 15639 (100) | 15926 (100) | 15738 (100) | 16471 (100) | 14836 (100) | 15095 (100) |
| 14 A_1 | 15049 (41.92) | 17113 (49.40) | 15639 (42.84) | 15926 (44.28) | 15738 (42.25) | 16471 (43.09) | 14836 (43.04) | 15095 (43.02) |
| 15 $A_2 = \text{Cost } A_1 + \text{Rent Paid for leased in Land}$ | 16351 (45.55) | 20348 (58.74) | 16966 (46.47) | 17719 (49.26) | 15738 (42.25) | 16471 (43.09) | 16619 (48.22) | 16565 (47.20) |
| 16 $B_1 = \text{Cost } A_1 + \text{Interest on Fixed capital (Ex Land)}$ | 15596 (43.45) | 17476 (50.45) | 15903 (43.56) | 16250 (45.18) | 15791 (42.39) | 16668 (43.60) | 15032 (43.61) | 15286 (43.56) |
| 17 $B_2 = \text{Cost } B_1 + \text{Rent on Owned Land}$ | 31803 (88.60) | 30741 (88.75) | 32628 (89.38) | 32059 (89.13) | 33791 (90.73) | 34668 (90.69) | 31249 (90.67) | 31817 (90.67) |
| 18 $C_1 = \text{Cost } B_1 + \text{Imputed value of Family Labour}$ | 16422 (45.75) | 18223 (52.61) | 16458 (45.08) | 16888 (46.95) | 15858 (42.57) | 16749 (43.81) | 15114 (43.85) | 15368 (43.79) |
| 19 $C_2 = \text{Cost } B_2 + \text{Imputed value of Family Labour}$ | 32630 (90.90) | 31488 (90.90) | 33183 (90.90) | 32696 (90.90) | 33858 (90.91) | 34749 (90.90) | 31331 (90.90) | 31898 (90.90) |
| 20 $C_3 = \text{Cost } C_2 + \text{Management Cost (10% of Cost } C_2)$ | 35893 (100) | 34637 (100) | 36502 (100) | 35966 (100) | 37243 (100) | 38224 (100) | 34464 (100) | 35088 (100) |

Table 1: Cost Pattern of Bt-Cotton in Southwest Punjab (Rs. Per Acre)

Figures in parenthesis from serial no 1 to 12 are shown as percentage to cost A_1 and from 14 to 19 are shown as

percentage to Cost C_3 is Rs.32696 on an average in the district. The cost C_3 is highest for large farmers (Rs.36502) in contrast to small (Rs.35893) and medium farmers (Rs.34637). On an average it is Rs.35966 for all farmers.

BATHINDA DISTRICT

The table 1 reveals that cost A_1 is Rs.15095 for all farmers in Bathinda district. It shows that medium farmers spend more on insecticides and pesticides, harvesting, hired casual labour and depreciation that is why cost A_1 is the highest (Rs.16471) for them in comparison to large (Rs.14836) and small farmers (Rs.15738). The maximum expenditure is on harvesting of the crop (Rs.3483 or 23.08 percent of cost A_1) followed by insecticides and pesticides (Rs.3177 or 21.05%). Expenditure on insecticides and pesticides as proportion to cost A_1 is highest (31.70%) for medium farmers in comparison to small (26.48%) and large farmers (18.80%). The indiscriminate use of pesticides not only increases the financial burden of the farmers and reduces the profit margins by increasing the cost of cultivation but also creates health hazards and environmental risks (Narayanamoorthy and Kalamkar, 2006).

Table 1 also indicates that cost A_2 is the highest for large farmers (Rs.16619) followed by medium farmers (Rs.16471) and small farmers (Rs.15738). On an average it is Rs.16565 for all Bt-cotton growing farmers. The cost B_1 is highest for medium farmers (Rs.16668) in contrast to small farmers (Rs.15791) and large farmers (Rs.15032). This is Rs.15286 for all Bt cotton growing farmers. The cost B_2 is highest for medium farmers (Rs.34668) in comparison to small farmers (Rs.33791) and large farmers (Rs.31249). This cost is Rs.15368 for all Bt cotton growing farmers of Bathinda district. Cost C_1 is highest for medium farmers (Rs.16749) followed by small farmers (Rs.15858) and large farmers (Rs.15114) of Bathinda district. This cost is Rs.15368 for all farmers of Bathinda district.

The cost C_2 is highest for medium farmers (Rs.34749) followed by small farmers (Rs.33858) and large farmers (Rs.31331) in Bathinda district. The average C_2 cost is Rs.31898 for all farmers. Cost C_3 is highest for medium farmers (Rs.38224) followed by small farmers (Rs.37243) and large farmers (Rs.34464). This is Rs.35088 for all Bt cotton producing farmers in the district.

FAZILKA DISTRICT

Table 1 depicts the cost A_1 per acre is the highest (Rs.16268) for small farmers and the lowest (Rs.14466) for the large farmers in Fazilka district and for the medium farmers it is Rs.14666. Cost incurred on insecticides and pesticides is Rs.3581 for all farmers, which is almost one fourth of the cost A_1 . It belies the claim of proponents of Bt cotton that it uses less insecticides and pesticides due to pest resistant. The seed cost (Rs.2189) is 15.04 percent of cost A_1 . The seed cost is the highest (Rs.2286) for small and the lowest for the medium farmers (Rs.1995). Higher cost on seeds confirms the prevailing view that the Bt cotton seeds are dearer in comparison to non Bt cotton seeds.

From table 1, it is found that cost A_2 is higher for medium farmers (Rs.19166) in comparison to small farmers (Rs.16268) and large farmers (Rs.16087). On an average it is Rs.16412 for all Bt cotton growing farmers of Fazilka district. Cost B_1 is highest for small farmers (Rs.16409) and lowest for large farmers (Rs.14605). This is Rs.14706 and Rs.14683 for medium farmers and all farmers respectively. Cost B_2 is higher for small farmers (Rs.31409) in comparison to large (Rs.27983) and medium (Rs.25206) farmers. On an average it is Rs.27825 for all farmers of Fazilka district. (Concluded)

(Rs.31940) in comparison to large farmers (Rs.28155) and medium farmers (Rs.25541). On an average it is Rs.28026 for all farmers of Fazilka district. Cost C_3 is highest for small farmers (Rs.35134) and lowest for medium farmers (Rs.28095). This is Rs.30970 and Rs.30829 for large and all Bt cotton growing farmers of Fazilka district.

SOUTHWEST PUNJAB

Table 1 shows that cost A_1 per acre is the highest (Rs.16083) for the medium farmers and lowest (Rs.14980) for the large farmers and for the all farmers it is Rs.15192 in southwest Punjab. The expenditure incurred on insecticides and pesticides maximum is highest (Rs.3588 or 23.62 percent of cost A_1) followed by harvesting (Rs.3393 or 22.33%), seed cost (Rs.2007 or 13.21%) and expenditure on fertilizers (Rs.1580 or 10.40%). The expenditure incurred on insecticides and pesticides is the highest for the medium farmers (Rs.4231) followed by small (Rs.4040) and large farmers (Rs.3512). On seeds expenditure is higher for small farmers followed by large and medium farmers.

Cost A_2 is the highest for the medium farmers (Rs.18662) followed by large farmers (Rs.16558) and small farmers (Rs.16119). On an average it is Rs.16899 for all farmers. Cost B_1 is the highest for the medium farmers (Rs.16283) and the lowest for large farmers (Rs.15180). It is Rs.15932 and Rs.15407 for small and all farmers respectively. The cost B_2 is higher for small farmers (Rs.32334) than large (Rs.30620) and medium farmers (Rs.30205). On an average it is Rs.30567 for all farm sizes.

The cost C_1 is the highest (Rs.16671) for medium farmers in comparison to small (Rs.16406) and large farmers (Rs.15450). On an average it is Rs.15713 for all farmers. The cost C_2 is the highest for small farmers (Rs.32809) and the lowest for medium farmers (Rs.30593). It is Rs.30890 and Rs.30874 for large and all farmers respectively. The cost C_3 is highest for small farmers (Rs.36090) and almost same for medium (Rs.33652) and large farmers (Rs.33978). It is Rs.33961 on an average for all Bt cotton growing farmers of southwest Punjab.

V. GROSS INCOME AND PROFITABILITY OF BT COTTON

Deshpande (2002) has pointed out that by reason of drastic drop in yield and upsurge in cost of cultivation, the cotton cultivation is more and more becoming uneconomical in India per se, which may have in some occurrences lead to farmers' suicides. It, in this context, becomes important to analyze which districts and which farmer categories are producing more output and which less output per acre of land. The present study provides information relating to the output of Bt cotton in rupees on per acre basis in all the selected three districts of Punjab across all the three categories of the farmers. Gross value of output (GVO) is the highest in Bathinda district (Rs.32685) and the lowest in Fazilka district (Rs.24938) which shows that there is a lot of variation across these two districts. The Amount realized in Faridkot district is Rs.32122. GVO is the highest for small farmers (Rs.31807)

| | COSTS | Fazilka | | | | Southwest Punjab | | | |
|----|---|---------------|---------------|---------------|---------------|------------------|---------------|---------------|---------------|
| | | Small | Medium | Large | Overall | Small | Medium | Large | Overall |
| 1 | Land Preparation | 1469 (9.03) | 1445 (9.85) | 907 (6.80) | 983 (6.76) | 1358 (8.66) | 1136 (7.07) | 884 (5.90) | 936 (6.16) |
| 2 | Seeds | 2286 (14.05) | 1995 (13.60) | 2208 (15.13) | 2189 (15.04) | 2110 (13.45) | 1965 (12.22) | 2013 (13.44) | 2007 (13.21) |
| 3 | Bunding | 1525 (9.37) | 1340 (9.14) | 1122 (8.01) | 1160 (7.97) | 1404 (8.96) | 1518 (9.44) | 1360 (9.08) | 1413 (9.3) |
| 4 | Fertilizers | 1654 (10.17) | 1601 (10.91) | 1492 (10.43) | 1509 (10.37) | 1797 (11.45) | 1619 (10.07) | 1562 (10.43) | 1580 (10.40) |
| 5 | Manure | 0 (0) | 110 (0.75) | 43 (0.34) | 49 (0.33) | 0 (0) | 37 (0.23) | 15 (0.10) | 17 (0.11) |
| 6 | Insecticides and Pesticides | 4424 (27.20) | 3778 (25.76) | 3521 (24.75) | 3581 (24.61) | 4040 (25.76) | 4231 (26.31) | 3512 (23.45) | 3588 (23.62) |
| 7 | Irrigation | 397 (2.44) | 0 (0) | 530 (3.25) | 471 (3.23) | 132 (0.84) | 0 (0) | 277 (1.85) | 239 (1.57) |
| 8 | Harvesting | 2897 (17.81) | 2883 (19.65) | 2860 (19.80) | 2864 (19.68) | 3184 (20.30) | 3597 (22.37) | 3348 (22.35) | 3393 (22.33) |
| 9 | Hired Permanent Labour | 0 (0) | 0 (0) | 739 (4.39) | 635 (4.36) | 0 (0) | 87 (0.54) | 484 (3.23) | 419 (2.76) |
| 10 | Hired Casual Labour | 903 (5.55) | 1115 (7.60) | 371 (3.24) | 468 (3.22) | 662 (4.22) | 1015 (6.31) | 673 (4.49) | 701 (4.61) |
| 11 | Interest on Working Capital | 311 (1.91) | 285 (1.95) | 276 (1.92) | 278 (1.91) | 294 (1.87) | 304 (1.89) | 283 (1.89) | 286 (1.88) |
| 12 | Depreciation | 402 (2.47) | 115 (0.78) | 397 (2.54) | 368 (2.53) | 705 (4.49) | 572 (3.56) | 571 (3.81) | 614 (4.04) |
| 13 | A_1 | 16268 (100) | 14666 (100) | 14466 (100) | 14554 (100) | 15685 (100) | 16083 (100) | 14980 (100) | 15192 (100) |
| 14 | A_1 | 16268 (46.30) | 14666 (52.20) | 14466 (46.70) | 14554 (47.20) | 15685 (43.46) | 16083 (47.79) | 14980 (44.08) | 15192 (44.73) |
| 15 | $A_2 = \text{Cost } A_1 + \text{Rent Paid for leased in Land}$ | 16268 (46.30) | 19166 (68.21) | 16087 (51.94) | 16412 (53.23) | 16119 (44.66) | 18662 (55.45) | 16558 (48.73) | 16899 (49.76) |
| 16 | $B_1 = \text{Cost } A_1 + \text{Interest on Fixed capital (Ex Land)}$ | 16409 (46.70) | 14706 (52.34) | 14605 (47.15) | 14683 (47.62) | 15932 (44.14) | 16283 (48.38) | 15180 (44.67) | 15407 (45.36) |
| 17 | $B_2 = \text{Cost } B_1 + \text{Rent on Owned Land}$ | 31409 (89.39) | 25206 (89.71) | 27983 (90.35) | 27825 (90.25) | 32334 (89.59) | 30205 (89.75) | 30620 (90.11) | 30567 (90.00) |
| 18 | $C_1 = \text{Cost } B_1 + \text{Imputed value of Family Labour}$ | 16940 (48.21) | 15041 (53.53) | 14776 (47.71) | 14884 (48.27) | 16406 (45.45) | 16671 (49.53) | 15450 (45.47) | 15713 (46.26) |
| 19 | $C_2 = \text{Cost } B_2 + \text{Imputed value of Family Labour}$ | 31940 (90.90) | 25541 (90.90) | 28155 (90.91) | 28026 (90.90) | 32809 (90.90) | 30593 (90.90) | 30890 (90.91) | 30874 (90.91) |
| 20 | $C_3 = \text{Cost } C_2 + \text{Management Cost (10% of Cost } C_2)$ | 35134 (100) | 28095 (100) | 30970 (100) | 30829 (100) | 36090 (100) | 33652 (100) | 33978 (100) | 33961 (100) |

Table 2: Cost Pattern of Bt-Cotton in Southwest Punjab (Rs. Per Acre)

Figures in parenthesis from serial no 1 to 12 are shown as percentage to cost A_1 and from 14 to 19 are shown as percentage to Cost C_3

The cost C_1 is highest (Rs.16940) for small farmers and lowest for large farmers (Rs.14776). This is Rs.15041 and Rs.14884 for medium and all Bt cotton growing farmers of Fazilka district. Cost C_2 is highest for small farmers

and the lowest for large farmers (Rs.29839). It shows that there is a lot of variation across these two farm categories. This is Rs.30032 and Rs.29915 for medium size and all farmers respectively.

| District | Farmsize | GVO | RVC | FBI | FLI | NI | RM | RPR | |
|------------------|------------------|----------------|------------------|------------------|------------------|------------------|------------------|------------------|-----|
| Faridkot | Small | 31135 (100) | 16086 (51.66) | 14784 (47.48) | -668 (-2.14) | -1494 (-4.79) | -4757 (15.27) | 95 | |
| | Medium | 32653 (100) | 15540 (47.59) | 12305 (37.68) | 1912 (5.85) | 1165 (3.56) | -1984 (-6.07) | 104 | |
| | Large | 32114 (100) | 16475 (51.30) | 15148 (47.16) | -514 (1.60) | -1069 (3.32) | -4387 (13.66) | 97 | |
| | Overall | 32122 (100) | 16196 (50.42) | 14403 (44.83) | 63 (0.19) | -574 (1.78) | -3844 (11.96) | 98 | |
| | Bathinda | Small | 29640 (100) | 13902 (46.90) | 13902 (46.90) | -4151 (14.00) | -4218 (14.23) | -7603 (25.65) | 88 |
| Bathinda | Medium | 31880 (100) | 15410 (48.33) | 15410 (48.33) | -2788 (8.74) | -2869 (8.99) | -6344 (19.89) | 92 | |
| | Large | 32962 (100) | 18126 (54.99) | 16343 (49.58) | 1713 (5.19) | 1632 (4.95) | -1502 (-4.55) | 105 | |
| | Overall | 32685 (100) | 17590 (53.81) | 16120 (49.31) | 868 (2.65) | 787 (2.40) | -2403 (-7.35) | 102 | |
| | Fazilka | Small | 34645 (100) | 18377 (53.04) | 18377 (53.04) | 3236 (9.34) | 2705 (7.80) | -489 (-1.41) | 108 |
| | Medium | 25562 (100) | 10897 (42.62) | 6397 (25.02) | 356 (1.39) | 21 (0.08) | -2533 (-9.90) | 100 | |
| Fazilka | Large | 24440 (100) | 9974 (40.81) | 8352 (34.17) | -3543 (14.49) | -3715 (15.20) | -6530 (26.71) | 87 | |
| | Overall | 24938 (100) | 10384 (41.63) | 8526 (34.18) | -2887 (11.57) | -3089 (12.38) | -5891 (23.62) | 89 | |
| | Southwest Punjab | Small | 31807 (100) | 16122 (50.68) | 15688 (49.32) | -528 (1.66) | -1002 (3.15) | -4283 (13.46) | 97 |
| | Medium | 30032 (100) | 13949 (46.44) | 11370 (37.85) | -173 (0.57) | -561 (1.86) | -3620 (12.05) | 99 | |
| | Large | 29839 (100) | 14859 (49.79) | 1328 (44.50) | -781 (2.81) | -1051 (3.52) | -4140 (13.87) | 96 | |
| Southwest Punjab | Overall | 29915 (100) | 14723 (49.21) | 13016 (43.50) | -652 (2.17) | -959 (3.20) | -4046 (13.52) | 97 | |

Table 3: Different Concepts of Profitability of Bt Cotton (Rs. Per Acre)

Figures in the parenthesis are shown as percentage to GVO

Legends: GVO-Gross Value of Output, RVC- Returns over Variable Cost, FBI- Family Business Income, FLI-Family Labour Income, NI- Net Income, RM- Returns to Management, RPR- Returns per Rupee

The district-wise and farm size wise distribution of the selected households according returns on per acre basis on the cultivation of the Bt. Cotton have been given in the Table 2. The Table reveals the returns over variable cost (RVC) across the three districts is highest (Rs.17590) in case of Bathinda district, followed by Faridkot (Rs.16196) and Fazilka is found to be earning the lowest level (Rs.10384) of RVC across the three districts. As far as the farm size wise RVC values are concerned in the Faridkot district, the large farmers earned the highest (Rs.16475) RVC and it is followed by small farmers (Rs.16086) and the medium farmers came at the bottom (Rs.15540). However, in Bathinda district, notwithstanding the large farmers earned the highest value (Rs.18126) of RVC, the medium farmers followed with RVC of Rs.15410 leaving the small farmers behind at Rs.13902. Finally in case of Fazilka, the small farmers earned the highest value of RVC with Rs.18377, followed by Rs.10897 in case of the medium farmers and Rs.9974 in case of the small farmers. The RVC in southwest Punjab is highest for small farmers (Rs.16122) of southwest Punjab, followed by large (Rs.14859) and medium farmers (Rs.13949). As proportion to GVO it is highest for

(54.99%) for large farmers of Bathinda and lowest (40.81%) for large farmers of Fazilka district. The table shows that the farmers in Bathinda district have earned the highest (Rs.16120) family business income (FBI), followed by Faridkot (Rs.14403) and Fazilka districts (Rs.8526). The pattern of smaller and higher values of FBI for the small, medium and large farmers across the three districts is same as in case of RVC. On average it is Rs.14723 for all farmers of southwest Punjab. The table shows that the small farmers in southwest Punjab have earned the highest (Rs.15688) FBI, followed by large farmers (Rs.13281) and medium farmers (Rs.11370). As proportion to GVO it is highest (49.32%) for small farmers and lowest (37.85%) for medium farmers of southwest Punjab. The table 2 also shows that all the farmers across all the three districts (except medium farmers in Faridkot district, large farmers in Bathinda district and small & medium farmers in Fazilka district) have suffered losses in terms of Family Labour Income (FLI) from Bt cotton cultivation. On average FLI in southwest Punjab is negative (Rs.652).

Further, it has been pointed out by Bhatia (2006) that the MSP fixed by the government on the recommendations of the commission for agriculture costs and prices (CACPC), covered the economic cost, viz. cost C_2 of production in the major producing states in the case of paddy and wheat but in the case of cotton, the MSP covered only 75-85 per cent of cost C_2 in Maharashtra and 60-85 per cent in Punjab in different years during the period 1996-97 to 2002-03. The said study further pointed out that even the paid out cost of production of cotton in these two states was not covered by the MSP in most of these years. This undoubtedly shows the poor state of economy of cotton crop. In case of Net Income (NI) also, the farmers have been suffering losses to the extent of Rs.(-)3089 per acre in case of Fazilka district (highest loss amount), followed by Faridkot (Rs. -574) and in Bathinda they earn only Rs.787 per acre. In southwest Punjab the large farmers have been suffering losses to the extent of Rs.(-)1051 (highest loss amount), followed by small (Rs. -1002) and medium (Rs. -561). On average farmers suffer loss of Rs.(-) 959 in southwest Punjab. As proportion to GVO, the losses are (-) 3.20%.

Narayanamoorthy (2013) has previously noted that the quantum of loss incurred by the farmers in crops like cotton, groundnut and sugarcane was also large in India in recent years as compared to the pre-1990s situation. The above crisis in the cultivation of Bt. cotton is further reflected in one more noticeable indicator, viz. returns to management (RM). The information pertaining to returns to management across the three districts given in the Table 2 show that all of the farmers across all the three districts have been suffering losses in terms of negative returns. The highest negative returns are being faced by the farmers in Fazilka district (Rs.-5891), followed by Faridkot district (Rs. -3844) and Bathinda district (Rs. -2403). Moreover, there is not uniform pattern of RM across the various farm categorizations. On average return to management is negative for all farmers of southwest Punjab and is Rs.(-) 4046 or 13.52 percent of GVO.

Thus, in general it could be said that the most serious challenges faced by the cotton cultivators across the districts have been the high input costs coupled with low income from

the sale proceeds resulting in the low returns. And, this problem is there despite considerable improvement in agricultural technology. As the returns generated through Bt cotton crop cultivation is poor and even known to be not sure always, the farmers are many times unable to pay back the loan in time and the burden of debt keeps on aggregating which in turn results in several further issues like farmers suicides.

Farmers have suffered considerable losses by cultivating the Bt Cotton crop across the three districts and this generalization emerges from the Table 2 which shows the returns per rupee (RPR) for farmers, in case of all the districts under the study except Bathinda district, are suffering from the issue of less than 100 percent RPR. Even in case of Bathinda district where the RPR is found to be above 100 percent, it is not that the excessive amount is extremely above the 100 benchmark. In fact, it is merely 102 percent which is very slightly above 100 point of reference. Looking at the calculated values of RPRs according to farmer sizes, it has been found that the small farmers in the Bathinda district and large farmers in the Fazilka district are making very poor levels (below 90%) of RPR. On average return per rupee is less than 100 percent in southwest Punjab.

Swaminathan (2008) had already observed that the persistent suffering of losses or making only a little margin of surplus from crop farming would certainly discourage agriculturalists from engaging in farming. Thus, the issue of low returns in the cotton crop needs to be sorted out at the earliest. Narayanamoorthy (2013) has rightly emphasized that the agrarian crisis, which the Indian economy has been confronting with for more than a decade now, cannot be solved without providing incentives to the farmers in the form of higher profitability for crops. Due to the poor levels of profitability of the Bt cotton as well as other crops, the economic condition of agriculturalists has worsened. On inverse side, non-agricultural sector has recorded comparatively good growth rate which in turn leads to increase in disparity in between the per capita incomes among the agricultural and non-agricultural sectors.

VI. SUMMARY AND CONCLUSIONS

The average cost of production of Bt cotton is Rs.15192 per acre in southwest Punjab. It is highest for medium farms (Rs.16083) and is lowest for large farms (Rs.14980). While it is Rs.15685 for small farm. On an average net income is negative (Rs. - 959) for all farmers of Southwest Punjab. Proponents of Bt cotton argue that gene manipulation can create stronger biological defense against pests and diseases thus reducing the need for expensive treatments for small scale farmers such as chemical fertilizers and pesticides (Azadi H., Ho P. 2010). But present study shows that Expenditure on insecticides and pesticides is highest (Rs.3588) among the all inputs used. It stands against the argument of less use of these inputs in the production of Bt-cotton. The study shows that most of the farmers are not in a position to cope up their family labour, rent of their owned land and value of their management functions.

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