



Cost and Returns of Cotton Cultivation with Special Reference to Pesticide Usage in Dharwad District of Karnataka

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ABSTRACT

Large scale and indiscriminate use of pesticides increase the cost of production. Cotton is one among such crops where farmers try to gain more returns by excess use of pesticides. This paper is focused on cost and returns of cotton with special reference to pesticide use under different farm size groups in Dharwad district of Karnataka. Multistage sampling technique was used for collecting the primary data from a sample of 120 cotton growing farmers. The total cost incurred by large farmers was high (Rs. 52,865.37/ha) as compared to medium and small farmers (Rs. 51,574.65/ha and Rs. 50,766.27/ha). The net returns per hectare obtained by large farmers was high (Rs. 42,825.52/ha) as compared to medium and small farmers (Rs. 40,299.60/ha and Rs. 39,384.04/ha respectively). The pesticide shared 9.76 per cent of the total cost of cultivation of cotton. It was noticed that the expenditure on pesticide was highest for small farmers (Rs. 5192.61/ha) as compared to large (Rs. 5019.49/ha) and medium farmers (Rs. 4,947.93/ha). The cotton yield was highest in case of large farmers being 17.90 q per ha as compared to medium (17.55 q/ha) and small farmers (17.37 q/ha). Returns per rupee investment was highest for large farmers i.e. 1.81 as compared to medium and small farmers i.e. 1.78 and 1.77 respectively. The cost of pesticides was around Rs. 4500- Rs. 5000 for about 45 per cent of the sample farmers.

Keywords- Cost, Pesticide, Returns, Returns to investment ratio.

Cotton crop accounts for about 16 per cent of global insecticide usage. Almost one kilogram of hazardous pesticide is applied for every hectare under cotton. A total of one to three per cent of agricultural workers worldwide suffer from acute pesticide poisoning with at least one million requiring hospitalization each year (EJF, 2007). *Bt* cotton replaced more and more conventional cotton area in India, since its release in 2002, by Genetic Engineering Approval Committee (GEAC). Various studies have shown that *Bt* cotton has a higher yield than non-*Bt* types and required fewer insecticides and labor for application and there was a check to bollworm complex but the sucking pest population increased, gradually reaching injury level in many parts of India. Resistance in leafhopper population against organophosphates has been reported by Sagaret *al.* (2013). Mirid bug has become a major pest in the recent past in cotton growing areas of Karnataka (Patilet *al.* 2006) and themealy bug has been reported as one of these severe pests on *Bt* cotton from different parts of the country. India is the largest producer of cotton in the world producing 26.8 million bales and accounting for about 26.5 per

cent of the world cotton production (NASS USDA, 2015). It has the distinction of having the largest area (11.7 million hectares) under cotton cultivation in the world. Global pesticide use has grown to 3.5 billion kg active ingredients per year for over the past 20 years, which amounts to \$45 billion (Pretty and Bharucha, 2015). Out of this, 45 per cent is used by Europe alone, 25 per cent is consumed in USA, and 25 per cent in rest of the world. India's share is just 3.75 per cent. The use of pesticides in Korea and Japan is 6.6 kg per ha and 12.0 kg per ha respectively, whereas in India, it is only 0.5 kg per ha (De *et al.* 2014). Therefore, an attempt was made in the present paper to assess the cultivation of cotton among different farm size groups. More specifically, the objective of the study is to work out the cost and returns in cotton cultivation with special reference to pesticide usage among different farm size holders.

MATERIAL AND METHODS

In Karnataka, cotton is grown in 8.75 lakh hectares with 23.12 lakh bales of production and 1793 metric tonne of pesticide consumption during 2014-

15. Dharwad district of Karnataka occupying an area of 90,497 ha under cotton was purposively selected for the present study. Three taluks i.e., Navalgund, Kundagol and Hubli were selected based on maximum area under cotton cultivation. Two villages from each taluk were selected based on the highest number of cotton farmers and maximum area under cotton. Twenty cotton farmers from each village were post stratified into small, medium and large farmers proportionately making a total sample of 120. Primary data on various aspects of sample farmers for 2016-17 agricultural year was collected through field survey by the interview and recall memory method with the help of a pre-tested and well-structured schedule in the months of November and December 2016. Simple averages and percentages were calculated for tabulation of the collected data and estimating costs and returns structure with reference to pesticide use. The sample farmers having land holdings of two and less than two hectares were grouped as small farmers while farmers having land holdings more than two and less than four hectares were grouped as medium farmers and land holdings of more than four hectares were grouped as large farmers.

RESULTS AND DISCUSSION

Input utilization in cotton cultivation

The inputs used per hectare in cotton cultivation are presented in table 1. It can be observed from the table that the average per hectare utilization of seed was highest in case of large farmers (2.72 kg) followed by medium farmers (2.69 kg) and small farmers (2.67 kg). The average usage of seed per hectare for 120 farmers was 2.69 kg. The average per hectare utilization of fertilizer was highest in case of large farmers (314.25 kg) followed by medium farmers (312.50 kg) and small farmers (309.25 kg). The utilization of human labour was high in large farmers (59.77 man days) followed by medium farmers (57.12 man days) and small farmers (55.93 man days). The average human labour used per ha was 57.60 man days. The human labour utilization in cotton was higher when compared to bullock and tractor labour. The entire crop cannot be harvested at one stretch so it has to be carried out at suitable intervals (mostly three times). Weeding was the next major operation, which consumed substantial amount of human labour. The weeding operation was carried out two to three times when there was increased weed incidence during the crop growth period. Most of the operations are human labour intensive. Bullock

labour utilization was more in small farmers (3.21 hours) as compared to medium farmers (2.96 hours) and large farmers (2.57 hours). Most of the farmers used tractor labour against bullock labour because of machine use efficiency. FYM used was 2 tonne per hectare. Plant protection chemicals (PPC) were used more by small farmers (1.02 kg) followed by medium (0.98 kg) and large farmers (0.92 kg).

Cost and returns of sample farmers in cotton cultivation

The cost and returns from cotton cultivation were calculated and presented in table 2. Among the different farm size groups, the total cost incurred by large farmers was highest (Rs. 52,865/ha) as compared to medium and small farmers (Rs. 51,575/ha and Rs. 50,766/ha). The cost of human labour, seed, fertilizer and tractor labour accounted for major share in the variable costs in case of large farmers, because these are major inputs and most of the operations like harvesting or picking, spraying and weeding are labour intensive.

This may be attributable to the fact that large farmers have more variable and fixed costs than their counterparts. The average cost of cultivation in cotton was Rs. 51,735 per hectare. The gross returns per hectare obtained by large farmers were high (Rs. 95,691/ha) as compared to small and medium farmers (Rs. 91,874/ha and Rs. 90,150/ha respectively). The average gross returns in cotton was Rs. 92,572 per hectare. The net returns per hectare obtained by large farmers was high (Rs. 42,826/ha) as compared to medium farmers and small farmers (Rs. 40,300/ha and Rs. 39,384/ha respectively). The average net returns was Rs. 40,836 per hectare. The cost of production was high in case of large farmers (Rs. 2953/q) as compared to medium and small farmers (Rs. 2939/q and Rs. 2923/q respectively). The net returns per quintal was high in case of large farmers (Rs. 2393/q) as compared to medium and small farmers (Rs. 2296/q and Rs. 2267/q respectively). It was noticed that large farmers had highest variable and fixed costs i.e. Rs. 41,623.62 per ha and Rs. 11241.95 per ha respectively than other farm size groups. Labour expense was the major component of variable cost while the rental value of land was the major fixed cost. The other items like land revenue and taxes, depreciation on farm implements and farm building charges and interest on fixed capital in fixed costs were of minor importance.

Similar results were found with Murthy (2015). The distribution pattern of operational cost under various inputs revealed that labour shared the highest proportion of the total cost. The share of human labour, bullock labour and machine labour were 24.49 per cent, 5.92 per cent and 7.64 per cent respectively. The share of seeds, fertilizers and FYM were 9.89 per cent, 8.60 per cent and 9.66 per cent respectively to the total cost of cultivation. The availability of FYM was the main problem of study area. The pesticide shared 9.76 per cent of the total cost of cultivation of cotton. It was noticed that the expenditure on pesticide was highest for small farmers (Rs. 5192.61/ha) as compared to large (Rs. 5019.49/ha) and medium farmers (Rs. 4,947.93/ha). Small farmer's feared more of crop loss, so spent more on pesticides.

The average yield of cotton was 17.60 quintal per hectare. The yield of cotton was highest in case of large farmers being 17.90 q/ha as compared to medium (17.55 q/ha) and small farmers (17.37 q/ha). This might be due to better output price realized by them than by their other counterparts. Returns per Rupee Investment was highest for large farmers i.e., 1.81 as compared to medium and small farmers i.e. 1.78 and 1.77 respectively. Similar results were found in Gamanagati (2012).

In Table 3, the cost of plant protection chemicals in case of small farmers is more compared to large and medium farmers i.e. 5192.61 Rs./ha which has 10.23 percent share in the total cost. In case of medium and large farmers it is 9.59 and 9.49 per cent share to the total costs. The average pesticide use per cent share to the total costs is 9.76 for an overall sample of 120 farmers.

Cost of per hectare pesticide application among different farm sizes is presented in table 4. Cost of pesticide was in the range of Rs.2500 to more than Rs.6500 in the study area. The range of pesticide cost from Rs.4500- Rs.5500 was highest among 54 farmers (i.e. 45.00 %) mostly small farmers, followed by medium and large farmers. Farmers in the group of more than Rs. 6500 were less in number i.e. 4.16 per cent to the total. Santkumar and Dhandapani (2000) indicated that cotton crop in Nanded district of Maharashtra was treated with PPCs eight times during its production cycle.

Conclusion

Among the different farm size groups, the total variable cost incurred per hectare by large

farmers was highest followed by medium farmers and small farmers. The cost of human labour, bullock labour, machine labour, pesticides, fertilizer, seeds and FYM were the cost items with major share in variable costs, because these are major inputs and most of the operations like harvesting or picking, spraying and weeding are human labour intensive. The distribution pattern of operational cost under various inputs revealed that cost of human labour was highest in large farmers compared to medium farmers and small farmers. Whereas bullock labour cost was highest in case of small farmers as compared to medium and large farmers. The pesticide shared 9.76 per cent of the total cost of cultivation. Human labour, pesticides, machine labour and fertilizers were the major inputs in cotton production. Therefore, timely supply of these quality inputs to the farmers may be ensured. Small farmers are not having much of machine labour so the agricultural engineering department should fabricate different models of power operated machines suitable to different kinds of utilities for small farm at low cost. Cotton production in the study area was found to be profitable as also supported by a high magnitude of returns per rupee investment of 1.81, 1.78 and 1.77 among different farm size farmers. The range of pesticide cost was from Rs.4500-Rs.5500 among 54 farmers i.e. 45.00 per cent, mostly small farmers followed by medium and large farmers. PPC use decreased with the size of land holding in study area. The farmers need to be educated and trainings should be given with respect to various issues related to pesticide usage.

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Table 1 Input utilization in cotton cultivation of sample farmers

S.No.	Particulars	Unit	Small farmers n=40	Medium farmers n=40	Large farmers n=40	Total farmers n=120
1	Seeds	Kgs	2.67	2.69	2.72	2.69
2	Fertilizer	Kgs	309.75	312.50	314.25	312.16
3	Human labour	Man days	55.93	57.12	59.77	57.60
4	Bullock labour	Pair days	3.21	2.96	2.57	2.91
5	Machine labour	Hour	3.93	4.82	5.97	4.90
6	FYM	Tonne	2.00	2.00	2.00	2.00
7	Plant protection chemicals	a.i.kg	1.02	0.98	0.92	0.97

Table 2 Cost of cultivation of cotton of sample farmers (Rs./ha)

S.No	Particulars	Small farmers n=40	Medium farmers n=40	Large farmers n=40	Total farmers n=120	Per cent to the total
1	Human labour	12,304.60	12,566.40	13,149.40	12,673.47	24.49
2	Bullock labour	3379.55	3116.34	2705.74	3067.21	5.92
3	Machine labour	3304.69	4223.13	4331.87	3953.23	7.64
4	Seeds	5081.78	5096.02	5176.68	5118.16	9.89
5	Fertilizer	4418.73	4457.96	4482.92	4453.20	8.60
6	FYM	5000.00	5000.00	5000.00	5000.00	9.66
7	Plant protection chemicals	5192.61	4,947.93	5019.49	5053.34	9.76
8	Interest on working capital @7%	1992.17	1910.13	1757.32	1886.54	3.64
	Total variable costs	40,674.12	41,317.91	41,623.62	41,205.15	79.65
9	Depreciation on Implements & Farm Building	962.73	1003.29	1943.86	1303.29	2.51
10	Land revenue and taxes	60.45	60.45	60.45	60.45	0.11
11	Rental value of land	8333.33	8333.33	8333.33	8333.33	16.10
12	Interest on fixed capital @12%	735.63	859.67	904.31	833.20	1.61
	Total fixed costs	10,092.14	10,256.74	11,241.95	10,530.28	20.35
	Total costs	50,766.00	51,575.00	52,865.00	51,735.00	100.00
	Yield(q)	17.37	17.55	17.90	17.60	
	Cost of production (Rs./q)	2923.00	2939.00	2953.00	2938.00	
	Total output/Gross returns	90,150.00	91,874.00	95691.00	92,572.00	
	Net returns	39,384.00	40,300.00	42,826.00	40,836.00	
	Net returns (Rs./q)	2267.00	2296.00	2392.00	2319.00	
	Returns per Rupee Investment	1.77	1.78	1.81	1.79.00	

Source: Field survey data

Table 3 Total pesticide use as percent of total cost in cotton (Rs./ha)

Item	Small farmers		Medium farmers		Large farmers		Total farmers	
	n=40		n=40		n=40		n=120	
	Cost	Per cent	Cost	Per cent	Cost	Per cent	Cost	Per cent
Cost of plant protection chemicals	5192.61	10.23	4,947.93	9.59	5019.49	9.49	5053.34	9.76
Total costs	50.76	100.00	51,575.00	100.00	52,865.00	100.00	51,735.00	100.00

Table 4 Cost of pesticide application among different size group of farmers

S.No.	Cost of PPC (Rs/ha)	Small farmers n=40	Medium farmers n=40	Large farmers n=40	Total farmers n=40	Per cent to the total
1	2500-3500	3	7	7	17	14.16
2	3500-4500	7	10	13	30	25.00
3	4500-5500	23	17	14	54	45.00
4	5500-6500	5	5	4	14	11.66
5	>6500	2	1	2	5	4.16

Source: Field survey data

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