CONSTRAINTS IN ADOPTION OF IMPROVED TECHNOLOGY IN COTTON PRODUCTION

Khurshid Ali Qureshi, Muhammad Aslam Chaudhry, Buland Akhtar, Ishtiaq Hassan and Altaf Hussain Saqib
University of Agriculture, Faisalabad

Adoption of improved technologies has been partial even on the high productivity farms. As a consequence, less than half of the yield potential could hardly be realized. This leaves ample scope to intensify efforts to speed up adoption as a means to realize full yield potential. Analysis of the data showed that it was the package of technology that mattered and not the individual inputs taken up in isolation. This must, therefore, be brought home to the farmers that they need to adopt a complete set of inputs together in a package, otherwise full benefit of the investment in a few isolated inputs would not be realized.

INTRODUCTION

The present cotton scenario is exciting and holds even better prospects for future, both in terms of employment and exports. Production level increased from an average 3.0 million bales in the late sixties to an unprecedented 12.5 million bales during 1991-92. The area under cotton increased from 1.7 to 2.89 million hectares over the same period (Anonymous 1991-92).

Cotton crop has achieved a remarkable break-through in terms of yield per unit area. This is evident from a comparison with countries like India, Sri Lanka, Thailand and Egypt. The yield of cotton in Pakistan was 22% below the world average in 1982-83, but it exceeded that average in 1987-88. It is, however, still half way that in Australia, being the highest in the world. This shows the potential for further improvement. Comparative figures for the selected countries and the world are given in Table 1.

Pakistan has been facing huge deficit in production of edible oils since 1970-71. This deficit increased tremendously, resulting in heavy drain on our foreign exchange resources. At present cotton is a major source whereby about 55% of domestic oil production, estimated at 481 thousand tonnes, was produced in 1989-90. Pakistan had to import 908 thousand tonnes of edible oil worth Rs. 6831 million in 1989-90.

The progressive farmers obtain cotton yields ranging 2 to 3 times the national average, which is 571 kg/ha. No doubt there was significant increase in cotton productivity, but two-thirds of the potential yet remains to be exploited. This means that existing technologies and the available high yielding varieties possess the required capability to increase the cotton yield.

The gap between progressive farmers and the national average cotton yield represents the untapped yield resource existing at the current level of technology. Highest priority should, therefore be given to bridge the gap in order to produce enough to meet our future demand for fibre and edible oil production.

Higher yield at the experimental stations or the progressive farms amply prove that appropriate technologies best suited to our conditions are available. Adoption of such technologies by progressive farmers further reveals that such technologies are

economical too, but are not finding their way to the common farms. The present study was, therefore, designed to explore the possible constraints which hindered adoption of improved cotton technologies by the common farmers and were responsible for low productivity.

Table 1. Cotton yield of selected countries, 1982-83 to 1987-88

Countries	1982-83	1986-87	1987-88
		(kg/ha)	
Pakistan	365	528	571
India	179	222	198
Sri Lanka	539	539	539
Thailand	575	689	423
Egypt	1022	914	863
Australia	1047	1413	1209
World Average	469	502	536

Source: Anonymous, 1991-92.

MATERIALS AND METHODS

An attempt was made to map the extent and pattern of adoption alongwith delineation of factors impeding adoption of improved cotton technology in the Sargodha Zone. This study is based on cross sectional primary data for the year 1989-90, recorded by interviewing 75 respondents representing various productivity levels. Productivity levels in the available data varied from the lowest 10 kg/acre to the highest yield of 1296 kg/acre. These levels were classified into 3 yield levels namely less than 400 kg, 400 to less than 600 kg and above 600 kg/acre as low, medium and high productivity levels respectively.

RESULTS AND DISCUSSION

The study yielded the following results:

Education: Education appeared to facilitate adoption resulting in higher productivity. In the low productivity group 47% were illiterate, 26.5% upto primary level, 14.7% matric and only 11.8% were above matric. In the medium productivity level, 25% were illiterate, 20% each were upto primary and matric and 35% were above matric. In case of higher productivity group, only 4.8% were illiterate, 19% upto primary, 28.6% were matric, while 48.6% were above matric. Pratt (1986) reported a positive correlation between education and higher productivity.

Mode of irrigation and farm power: Canal-cum-tubewell was the predominant source of irrigation (66.7%) in all the three productivity groups. Canal alone served 29.3% , while tubewell as a single source of irrigation was of minor significance (4%). The higher productivity group had a greater access to tractor (60%), while bullocks alone were rather a smaller source (18.2%). With the medium productivity farms, tractor and bullocks appeared roughly to be equally distributed, while on the low productivity farms bullock power tended to dominate (47.1%). Athar (1982) found that lack of irrigation water, farm power, repair and

maintenance facilities hindered adoption of improved inputs.

Cropping patterns: The higher productivity groups specialized in cotton production (25.2% of the total cropped area was devoted to cotton). On the medium and low productivity farms 21.37% and 10.3% of their cropped area was under cotton respectively. Hayat (1982) proved that specialization was positively correlated with higher productivity level.

Sowing methods: Tractor drill, by covering 95.4% of acreage, turned out to be the predominant method of cotton sowing on the high productivity farms. The share of tractor drill on medium productivity farms was 81.87%, while about 34% of the cotton area was sown by tractor drill on low productivity farms. This group used other methods of sowing i.e. "kera" 1.9% "pora" 25.8%, bullock drill 25% and broadcasting 13.4%. The main constraint to adopt the improved methods was non-availability of proper implements.

Cotton varieties: In the study area, NIAB-78 by claiming 79 to 87% of the cotton acreage, predominated on all the farms irrespective of the productivity levels. This showed that selection of varieties did not matter much in higher productivity, as did its proper care. It was reported that farmers having small holdings were unable to adopt new improved high yielding varieties due to involvement of high risk (PARC, 1983).

Gap filling: The proportion of non-adopters was very high on the low productivity farms (91%) as compared to that on the medium (85%) and high productivity farms (71%). The chief cause (62-74%) was lack of knowledge. The proportion of non-adopters of the practice of thinning was high on the low productivity farms (62%) than on the medium (40%) and had productivity farms (38%). The causes for not doing thinning were lack of knowledge (14-50%), shortage of labour (9-10%) and non-availability of implements (3-4%) on the farms under study. These findings were in line with those of Ali (1983).

Weeding: The proportion of non-adopters was very high in the low productivity group (91%) than on the medium (85%) and high productivity farms (62%). The chief causes were lack of knowledge (33 to 74%) and lack of labour (10 to 24%).

Use of chemical fertilizer: Actual fertilizer use in the study area was only 50 nutrient kg/ha or 38% of the recommended level. The low productivity farms used 23.5 kg N and 14.6 kg P per acre. The medium productivity farms applied 32.1 kg N, 13.8 kg P and 0.7 kg K per acre. The higher productivity farms applied 47.4 kg N, 23.4 kg P and 3.5 kg K/acre. Productivity was positively related with fertilizer use. Main constraints to the optimal level of fertilizer use turned out to be lack of knowledge (36.4%), lack of funds (7.6%) and non-availability of fertilizer in the market at the time of need (12.9%). The regression analysis showed that P was positive but non-significant and N had negative role in productivity. Khan (1987) stated the main constraints for non-adoption of chemical fertilizers as lack of knowledge, high cost of chemical fertilizer and lack of credit facilities.

Pesticide spraying: NIAB-78 was the predominant cotton variety of the study area. It required 5 to 6 sprays as and when warranted by the pest population. The high productivity farms were able to apply 5.3 sprays per acre and realized better yield than the low and the medium productivity farms. Medium productivity farms attempted 4.0 sprays per acre, while the low productivity farms applied in all only 2 sprays per acre. Lack of requisite knowledge (67.7%) and high prices (11.8%) were the main constraints for not adopting spraying at the recommended levels. The regression analysis

showed that spraying was highly significant. Aslam (1987) reported that main difficulties in the adoption of recommended plant protection measures were lack of knowledge, lack of finance, high prices of chemicals and machinery.

Profitability with respect to total cost: On the low productivity farms, total cost averaged Rs. 3529.81/acre, whereas gross income was Rs. 1384.70 only, resulting in a net loss of Rs. 2144.81/acre. Total cost on the medium productivity farms was Rs. 4129.13/acre, while gross income was Rs. 3371.25/acre, which resulted in a net loss of Rs. 757.88/acre. The high productivity farms incurred a total cost of Rs. 5395.30 and earned a gross income of Rs. 7366.00, realizing a net profit of Rs. 2281.00/acre. Benefit cost ratio with respect to total cost was 0.39 on low productivity farms, 1.11 on medium and 1.45 on high productivity farms. The ratio between fixed and variable costs averaged 0.87 on the low productivity farms, 1.11 on the medium and 1.46 on the high productivity farms. This points out that an increase in variable cost could lead to higher productivity and greater profitability.

Profitability with respect to variable cost: On an average, variable costs averaged Rs. 1646.57 per acre on the low productivity farms, yielding a negative gross margin of Rs. 267.87 per acre. The medium farms incurred Rs. 2157.41 as variable cost and earned a gross margin of Rs. 1195.84 per acre. The high productivity farms invested Rs. 3017.00 in variable cost and earned a gross margin of Rs. 4349.00.

Profitability with respect to marginal cost: Marginal rates of returns averaged 389% on the medium productivity farms and 474% on the high productivity farms. This suggests that the low productivity farms were investing very little in variable inputs. They are well advised to follow input use pattern of the higher productivity farms to turn losses into profit, as by investing another sum of Rs. 528.00 in variable inputs, they could get an income of Rs. 1986.00/acre as did the medium productivity group. Similarly, by investing another Rs. 841.00 in variable inputs, the medium productivity farms could raise their income by Rs. 3994.75/acre as was the case with the high productivity farms. They should also step up investment to attain the point of maximum profit. Currently, the ratio between their added-costs and added-returns was found to be 1:4.75. Thus, they did not seem to have reached the stage in production process where added-costs are equal to the added-returns. So with minor investments in some critical inputs, potential yield of 1600 kg and above, could be equal to added income.

Extent of adoption: In the face of the technology recommended by the Department of Agriculture, adoption averaged 48% on the low, 65.6% on the medium and 89% on the high productivity farms. But in view of specifically the technology for NIAB-78 as recommended by the Nuclear Institute for Agriculture and Biology, the adoption rate worked out to be 38% on the low, 53% on the medium and 71% on the high productivity farms, while the realized yield was 11%, 27% and 44% respectively of the potential yield on the low, medium and high productivity farms.

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