SKILL GAPS IN COTTON MANAGEMENT PRACTICES IN PAKISTANI FARMERS, AND HOW TO IMPROVE IT

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ABSTRACT

Cotton is an important source of fiber and used as main input in the textile industries throughout the world. Pakistan is 4th in terms of cotton production and 10th in terms of yield. There is a serious decline in production of cotton since last few years in Pakistan due to untrained farmers. The aims of this study were to address the skill gap of the farmers and how to bridge those gaps. Random sampling technique was used to determine sample size. The total sample size of the study was 300 respondents. The collected data were analyzed by using Statistical Package for Social Sciences (SPSS). Results showed that most of the cotton growers had skill gap in production practices and control of factors involved in low production and poor quality. Majority of the production practices have a significant relationship with the educational level of the respondents. Highest significance relationship was found between the biological control of pests and educational level of the respondents. It appeared that there is no relationship between knowledge regarding production practices of cotton and age of the respondents. Yield per acre of the respondents is directly proportional to the educational level of the respondents.

Keywords: Cotton, farmers, production practices, knowledge gap.

INTRODUCTION

Cotton is an important commodity in Pakistan. It is an essential source of raw material needed for the survival and expansion of the textile industry. Cotton has a share of 5.2% in agricultural value addition and 1.0% in GDP contributions in Pakistan (GOP, 2016). It contributes 43.0% in manufacturing, 60.0% of the total export earnings, and 39.0% of employment (GOP, 2016). Cotton production experienced a decline over the past few years. In 2015 and 2016 the subtle decline became massive leading to increase in cotton imports from other countries (GOP, 2016).

In Pakistan, one of the reason for loss in cotton production in recent years is poor linkages among the research institutions, agricultural universities, extension service providers, and the farmers to facilitate the farming community on up-to-date cotton management knowledge and information. Due to weak linkages, the productivity of cotton is not improving significantly. In developed countries like Australia, farmers have strong linkages with universities, cooperative research centers, government departments and cotton industry. Thus, there is need to establish a backup support information system on quality seed, issues of soil health management, insect pests, and diseases management, harvest and post-harvest management and marketing information etc. (Ali, 2008).

Despite the fact that cotton value chain has strategic importance in Pakistan in terms of its contributions towards GDP, employment, export earnings, poverty alleviation, and empowerment of women, its real value has not yet been realized. The entire cotton value chain needs to be advanced in terms of production practices, marketing practices, better technology and research & innovation. The Medium Term Development Framework (MTDF) 2005-10 of the Government of Pakistan also recommends that it is compulsory to get out of the low skills equilibrium in which both individuals and employers are trapped in a low expectations and low production environment.

Though, Pakistan ranks 4th in the world in terms of overall cotton production, per acre yield is still significantly lower in contrast with other cotton producing countries like Israel, Australia, Syria, China, and Mexico etc. (GOP, 2017). Also, the lower level of knowledge, skills, and attitude (KSA) is resulting farmers to get small returns, which then lacks competence and incentive to spend in technological upgradation of the cotton farming. This requires studies to analyze and enhance (KSA) of cotton growers in the country in order to increase the yield, quality and income of the farmers. This will help to define and establish important measures to bridge the skills/knowledge gap of the farmers and enable the stakeholders to manage cotton production.

Efforts from both government and private sectors are so far unable to bridge skills gap and analyze constraints related to production and marketing of cotton in district Bahawalnagar of Punjab, Pakistan. This study contributes towards body of knowledge by identifying the skills/knowledge gaps which are persisting in the study area regarding cotton crop management. It generates information to frame cotton production and marketing development programs and suggesting guidelines for

cotton growers. The objectives of the study were to investigate factors affecting crop management and quality assurance and to examine skills level of cotton growers regarding crop management and its marketing.

MATERIALS AND METHODS

Cotton growers living in district Bahawalnagar served as the population of study. Bahawalnagar district comprises five tehsils named as Bahawalnagar, Chishtian, Haroonabad, Fort Abbas and Minchinabad. Multi-stage-random sampling technique was used to determine respondents. For the selection of study sample, two rural union councils were selected from each tehsil randomly. From each selected union council, two villages were selected randomly. From each of the selected village, fifteen cotton farmers were selected randomly, thus making a total of three hundred respondents. This study used a descriptive research design employing interview schedule to collect data from farmers. Likert scale was used to assess the level of awareness, knowledge, and skills.

An interview schedule was developed to collect data which contained two main sections indicating the objectives of the study. To check the validity of the instrument, a panel of experts which included one Professor and two Assistant Professors from the Institute of Agri. Extension and Rural Development and one Associate Professor from the Department of Agricultural Marketing and Business, University of Agriculture Faisalabad who were asked to critically review the instruments. Upon completion of the review, the panel concluded that the interview schedule had both face and content validity. The researcher had incorporated the mutually agreed points in the instrument. The researcher had calculated the reliability of the instrument using Cronbach's alpha with the help of computer software namely Statistical Package for Social Sciences (SPSS), the average value of Cronbach's alpha for instrument was 0.82. The collected data were analyzed by using SPSS software.

The scale was used to determine the levels, defined as:
1=Very low, 2=Low, 3=Medium, 4=High, 5=Very high.
F×S= Weighted score, where F=frequency and S=Scale.
Possessed Knowledge= Means, Required knowledge= 5-Possessed Knowledge

RESULTS

Socio-economic attributes of the cotton farmers: Farmers with the age become more productive with improved managerial skills, but, the age distribution of the growers may impacts the adaption of the new technologies and productivity of the cotton field. In order

to evaluate the per acre yield and production practices, we first determined the percent distribution of the cotton growers in terms of age. The highest (32.33%) age category of cotton farmers was 36-45 years (Table1). The smallest age categories were "up to 25 years" (10.33%) and "above 55 years" (10.33%). It appeared that more than half of the respondents associated with the study were in the middle age category. As the age of the respondents' increased, they got farming experience, but at the same time behaved like stereotypes to adopt new technologies regarding cotton production and its marketing. About one-fourth (24.33%) of the respondents had schooling till matriculation followed by middle-level education (21.66%). The smallest educational category was "above masters" (2.00%). About one-tenth (9.33%) of the respondents were illiterate which were not able to read and write.

Less than one-third (31.00%) of the respondents belonged to "5-10 years" category of farming experience. The smallest farming experience category was "above 20 years" (9.00%). As the farming experience of the respondents' increased, there was an increase in skills level regarding the production practices of cotton and its marketing. Less than one-third (30.33%) of the respondents belonged to "1-5 acres" category of farm area (land holding). The smallest size of farm area was "above 20 acres" (6.67%). Highest (34.33%) quantity of the respondents was in "less than 500 kgs" category of cotton yield per acre. The smallest category was the "above 1500 kgs per acre" (1.33%).

Production Practices of Cotton: Cotton crop management is a complex farming system and is influenced by clashes in the time of harvesting of earlier crops and the time of sowing of cotton and interactions due to effects of residues on succeeding crops (Byerlee *et al.*, 1986). Iqbal and Khan (2001) found that well-timed accessibility of inputs such as seeds, fertilizers, pesticides, and weedicides could increase crop productivity. There are different factors that influence the productivity of cotton as physical factors like land preparation, seed quality, irrigation, plant protection practices and qualitative variables like age, education, farming experience, etc. (CABI South Asia, 2008). To investigate the relationship between farm productivity and skill gap, we analyzed the skills level of the respondents regarding production practices of cotton. Our results demonstrate decrease in per acre yield with increase in skill gap of the farmers regarding production practices of cotton.

Most of the respondents had a knowledge gap in production practices of cotton with highest gap in "biological control of insect pests" and "physical control of insect pests". Most of the farmers were having low knowledge level regarding selection of quality seed and variety, maintaining proper plant population, proper

irrigation and clean picking of cotton. The lowest knowledge gap was found in "land preparation" and "delinting". It appeared that the knowledge gap was existed among the respondents regarding right application of pesticides.

Factors Involved in Low Production and Poor Quality: Among the significant factors contributing towards low productivity of cotton are the poor quality of seed, lack of price assurance mechanism and the failure of an operational credit input system. Extension services provided to farmers are also extremely weak to overcome this situation. Cotton production in Pakistan is facing lot of issues and challenges like lower yield, poor institutional linkages, research and development, extension network, untimely availability and adulteration in pesticides and fertilizers, increased cost of production, poor quality of cotton, lack of standards, enforcement of cotton standards, fiber length, low prices and lack of modern technologies and agronomic practices (Ali, 2008). Lack of standards and their proper enforcement is a big issue in Pakistan as it plays a significant role in the maintenance of quality and productivity of cotton. Extension department is unable to enhance the skills level of the cotton growers to control factors affecting production and quality of cotton. Table 3 shows the data related to the knowledge gap of the respondents regarding factors responsible for low production and poor quality of cotton.

Table 3 displays that most of the respondents had knowledge gap in controlling of "Causes of diseases", "Cultivation of unapproved varieties" and "Absence of an established maturity index" as factors involved in low production and low quality. The smallest knowledge gap was found in controlling "Lower returns to farmers" and "Proper way of picking" as factors involved in low production and low quality of cotton. By controlling all these factors, production and quality of cotton can be enhanced. Increased knowledge level of the respondents regarding control of these factors results in higher yields and high quality of cotton.

Relationship between Age, Educational Level, Yield and Skills Gap Regarding Production Practices of Cotton: Majority of farmers in Pakistan was illiterate and used imprudent insecticides and pesticides and conventional/traditional production technology of cotton. Additionally, farmers did not had knowledge and skills about latest technologies especially related to cotton production. Because of this reason, farmers are not competent enough to get good yield as compared to the potential yield of cotton (Zahid *et al.,* 2013). Educational level plays a key role in the awareness and adoption of upgraded technology and achieving higher yields. Bakhsh *et al.* (2005) found that increase in year of schooling as 1.0% can increase cotton productivity by 0.15%. The educated cotton growers cope with different farming practices in an improved manner with no trouble as compared to uneducated cotton growers and learn innovations and developments concerning production technologies of crops. Improved productivity would be the outcome of adoption of latest technologies and better management practices in cotton production. So increased yield is a result of the high skill level of respondents regarding production practices of cotton. The data related to the relationships between age, educational level, yield and knowledge gap regarding production practices of cotton are presented in Table 4.

Table 4 showed that age had positive correlation with skills gap regarding land preparation and seed wastage. It had appeared that age had non-significant positive correlation relationship with seed quality, delinting, seed rate and picking of cotton. Age had negative correlation with use of pesticides, variety selection, biological control of insects and proper fertilization of crop. Educational level had positive correlation with knowledge level of cotton growers regarding production practices of cotton. Highest significant correlation relationship of educational level was found with knowledge level in biological control of pests. It appeared that educational level had positive correlation with knowledge level in use of pesticides, proper sowing methods, maintaining plant population and proper weeding of crop. Yield had positive correlation relationship with knowledge level of cotton growers regarding production practices of cotton. Relationships between yield and knowledge level regarding sowing methods, maintaining plant population, seed quality and weeding were highly significant. It appeared that yield had relationship with knowledge level regarding seed rate, proper irrigation, sowing time and delinting.

Table 1. Socio-economic attributes of the cotton farmers.

Age	Categories	Frequency	Percentage
	Up to 25	31	10.33
	25-35	72	24.00
	36-45	97	32.33
	46-55	69	23.00
	Above 55	31	10.33
	Total	300	100
Education	Illiterate	28	9.33

	Primary	45	15.00
	Middle	65	21.66
	Matriculation	73	24.33
	Intermediate	50	16.67
	Bachelors	22	7.33
	Masters	11	3.67
	Above masters	6	2.00
	Total	300	100.00
Farming experience	Less than 5	62	20.67
	5-10	93	31.00
	11-15	78	26.00
	16-20	40	13.33
	Above 20	27	9.00
Farm area (acres)	1-5	91	30.33
	6-10	75	25.00
	11-15	59	19.67
	16-20	46	15.33
	Above 20	20	6.67
	Total	300	100%
Cotton yield (kg per acre)	Less than 500	103	34.33
	501-700	86	28.67
	701-900	52	17.33
	901-1100	32	10.67
	1101-1300	13	4.33
	1301-1500	10	3.33
	Above 1500	4	1.33
	Total	300	100

Table 2. Knowledge gap of the respondents regarding production practices of cotton.

Production practices	Weighted score	Possessed level	Required level	Standard deviation
Land preparation	633	2.11	2.99	1.19
Evaluation of seed quality	534	1.78	3.22	1.15
Selection of variety	444	1.48	3.52	1.18
Seed treatment before sowing	495	1.65	3.35	1.20
Delinting	549	1.83	3.17	1.21
Avoiding seed wastage	501	1.67	3.33	1.18
Sowing methods	510	1.71	3.29	1.18
Maintaining plant population	411	1.37	3.63	1.30
Proper Seed rate	483	1.61	3.39	1.18
Timely sowing	498	1.66	3.34	1.19
Identifying irrigation time	447	1.49	3.41	1.21
Application of recommended fertilizers	501	1.67	3.33	1.18
Intercultural practices (i.e. weeding)	477	1.59	3.41	1.17
Right application of pesticides	414	1.38	3.62	1.19
Use of biological control of pests	339	1.13	3.87	1.49
Use of physical control of pests	366	1.22	3.78	1.21
Assuring clean picking of cotton	561	1.87	3.13	1.18
Destruction of cotton stalks	507	1.69	3.38	1.22
Storage of cotton	537	1.79	3.21	1.14

1=Very Low, 2=Low, 3=Moderate, 4=High, 5=Very High

Table 3. Knowledge gap of the respondents in controlling factors involved in low production and quality.

Factors involved in low production and quality	Weighted score	Possessed level	Required level	Standard deviation
Improper way of picking	808	2.69	2.31	1.11
Improper time of picking	713	2.38	2.62	1.37
Improper handling after picking	795	2.65	2.35	1.21
Improper storage	801	2.67	2.33	1.14
Mixing in varieties	712	2.37	2.63	1.06
Poor quality seed	800	2.66	2.34	1.13
Lack of availability of capital	790	2.63	2.37	1.15
Adulteration of seed, pesticides, and fertilizers	778	2.59	2.41	1.07
Cultivation of unapproved varieties	563	1.87	3.13	1.36
Lack of training of farmers	735	2.45	2.55	1.14
Low return to farmers	888	2.96	2.04	1.12
Poor marketing practices	801	2.67	2.33	1.14
Non availability of labor	764	2.54	2.46	1.20
Absence of an established maturity index	657	2.19	2.81	1.32
Poor weather at harvesting time	756	2.52	2.48	1.20
Untimely harvesting	782	2.60	2.40	1.26
Lack of appropriate harvesting tools	564	1.89	3.11	1.06
Lack of appropriate transport system	786	2.62	2.38	1.15
Causes of diseases	512	1.79	3.21	1.29

1=V. Low, 2=Low, 3=Moderate, 4=High, 5=V. High

Table 4. Pearson Correlation between Age, Educational Level, Yield and Knowledge Gap regarding Production Practices of Cotton.

Production Practices	Age	Educational level	Yield
Land preparation	0.36	0.04	0.41
Evaluation of seed quality	0.38	0.12	0.58
Selection of variety	-0.07	0.10	0.51
Seed treatment before sowing	-0.03	0.41	0.50
Delinting	0.15	0.12	0.45
Avoiding seed wastage	0.40	0.53	0.47
Sowing methods	-0.04	0.58	0.60
Maintaining plant population	-0.03	0.28	0.59
Proper Seed rate	0.10	0.11	0.46
Timely sowing	-0.08	0.10	0.41
Identifying irrigation time	-0.17	0.37	0.49
Application of recommended fertilizers	-0.02	0.19	0.37
Intercultural practices (i.e. weeding)	-0.09	0.11	0.40
Right application of pesticides	-0.07	0.49	0.57
Use of biological control of pests	-0.08	0.69	0.29
Use of physical control of pests	-0.05	0.59	0.35
Assuring clean picking of cotton	-0.10	0.43	0.52
Destruction of cotton stalks	0.15	0.15	0.18
Storage of cotton	-0.01	0.46	0.56

DISCUSSION

The study showed that most of the respondents belonged to middle age category and are not in line with those of Zahid *et al.* (2013) who found that most of the respondents belonged to old age category. About one-fourth of the respondents (24.33%) had schooling till matriculation and it was highest found educational category. The results of the present study are inconsistent with those of Zahid *et al.* (2013) who found that more than one-third (33.33%) of the respondents belonged to matriculation category of educational level. It appeared that less than one-third (31.00%) of the respondents

belonged to "5-10 years" category of farming experience. The results of the study are inconsistent with those of Zahid *et al.* (2013) who found that most of cotton growers belonged to 11-20 years of farming experience category. The results of the study showed that majority of the cotton growers had a small size of farm area and similar to those of Zahid *et al.* (2013) who found that a majority of the respondents were belonging to small farmer category and were possessing up to 12.5 acres of farm area. Highest (34.33%) number of the respondents were in "Less than 500 Kgs" category of cotton yield per acre. It is assumed that one of the important reasons of yield gap is a lack of skills of the cotton growers (Irfan, 2013). In economic year 2014-15, the average yield of cotton in Pakistan was 802 Kgha^{-1} and in 2015-16, there was decrease of 26.8% in average yield of cotton than last year (GOP, 2017).

It appeared that cotton growers were having highest knowledge gap in biological and physical control of insects and assessment and right application of pesticides. The results of the study are similar to those of Chaudary et al. (2016) who found that most of the farmers lack knowledge of production practices of cotton. Silvertooth (2016) explained that farmers need training regarding production and management practices of cotton.

Most of the respondents had knowledge gap in causes of diseases, cultivation of approved varieties and established maturity index as factors involved in low production and poor quality. The results of the study are inconsistent with those of UNCTAD (2018) who explained that farmers need training to control factors affecting production and quality of cotton. United Nations is working on a project for capacity building and skills development of cotton farmers in Asia and Africa (UNCTAD, 2018). It appeared that age had no significant relation with production practices of cotton. Educational level had positive correlation with knowledge level of cotton growers regarding production practices of cotton. Yield had positive correlation relationship with knowledge level of cotton growers regarding production practices of cotton. The results of the study were similar to those of Zahid *et al*. (2013) who found that educational level and yield had significant relationship with different production practices of cotton.

In conclusion, among the cotton farmers in Pakistan, the highest age category is 36-45 years. Since one-fourth of the respondents in this study had schooling till matriculation, education is likely the main problem regarding adaptation of cotton management practices. Majority of the respondents were having knowledge gap in production practices with highest knowledge gap in "biological control of insect pests" and "physical control of insect pests". Moreover, with an increase in knowledge/skills gap of the farmers, the yield per acre

decreases. Main reason of the skills gap is the absence of an established maturity index as factors involved in low production and low quality.

Recommendations: Overall, yield per acre of the respondents was directly proportional to the educational level of the respondents. It highlighted that cotton farmers should be trained to decrease their knowledge/skills gap regarding production practices of cotton. Awareness regarding causes of cotton diseases should be diffused among cotton farming community. Maturity index should be established by extension department and cotton marketing system should be improved by the government.

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