Developing Country Studies
ISSN 2224-607X (Paper) ISSN 2225-0565 (Online)
Vol.7, No.2, 2017

Study of the Farmers Knowledge Regarding Pesticide Usage on Cotton Crop at District Nushki, Balochistan Province

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Abstract
In order to identify the farmers' knowledge regarding pesticide usage on cotton crop in district Nushki of Balochistan province, the study was carried out during the year 2014. The impacts of pesticide application on environmental degradation and human health were also investigated. Cotton growers were enquired for their knowledge regarding the pesticides and their use on cotton crop as well as perceive on the impact of pesticides on cotton production, adverse effects on human health and environment as well. The study showed that majority (93.02%) were not satisfied on extension services and the usefulness of the extension agents for use of pesticides on cotton and the help from extension agents (91.25%). In case of cotton growers' knowledge regarding proper pesticide products, majority (51.16%) were not satisfied; 45.35 percent were satisfied to some extent; 45.35% were positive for the assumption that unsafe pesticide application is a health risk for the applicators, while 38.37% showed adverse attitude 16.28% were highly satisfied over this assumption. 70.93% growers were satisfied to some extent and 10.47 percent highly satisfied for followup of instructions on the label. Regarding adverse effects of indiscriminate use of pesticides on animals and other ecosystem, majority (63.95%) was satisfied to some extent, 30.23 percent were highly satisfied and 5.81 percent were not satisfied. Majority (53.49%) was satisfied to some extent on adoption and effectiveness of traditional methods of pesticide application; 31.40 percent were not satisfied and 15.12 percent were highly satisfied. Most of the cotton growers (40.70%) agreed to some extent, 32.56 percent strongly agreed and 26.74 percent disagreed that use of pesticide creates environmental problems; while 89.53% strongly agreed that the use of pesticide increases the yield of cotton. 39.53% agreed, 34.88 percent strongly agreed and 25.58 percent disagreed that underground water is contaminated by the use of pesticides. 36.05% agreed to some extent, 32.56 percent disagreed and 31.40 percent strongly agreed that use of pesticides spray on cotton crop is harmful for biological life. 43.02% growers strongly agreed, 38.37 percent agreed to some extent and 18.60 percent disagreed that abundant use of pesticides pollutes the atmosphere. 65.12% growers strongly agreed, 22.09 percent disagreed and 12.79 percent agreed to some extent that natural taste of food due to pesticidal sprays is changed. For motivation of cotton growers for proper application of pesticides, growers were optimistic for training programs (94.19%); motivational campaigns (65.12); through education (89.53), extension activities (95.35%); and mass media (56.98%). Neighboring farmer was the chief source of information for cotton growers, followed by TV, Radio, Dem. Plots, newspaper, contact farmer, research worker, Magazines and extension worker ranked. In cotton growers' problems, financial constraints ranked 1st, adult rated pesticides ranked 2nd, afraid of loss ranked 3rd, lack of knowledge ranked 4th and non-availability of pesticides and other inputs remained the least ranked 5th.
Keywords: Farmer Knowledge, Pesticides, Cotton

Introduction.

Agriculture in Pakistan ensures satisfactory production and accessibility of food for the inhabitants and provides employment to people in a straight line. Pakistan agriculture desires a foremost alteration if it has to drastically supply towards the upgrading of trade of the populace as well as macroeconomic wellbeing and richness. Pakistan agriculture and food safety apprehension stay far above the ground on the policy schema at national level. Owing to intensive events, the presentation of agriculture has been hopeful with 2.1% growth rate during the year 2013-14 (GOP, 2014). According to the latest Economic Survey of Pakistan (2014), Pakistan's agriculture division engages 43.7% labour force with the intention of their own food requirements and makes sure accessibility of food for the rest of state and value-added actions. The possible responsibility for agriculture is to diminish scarcity and force intensification for countries whose financial system is agriculture-based. The changeover of agriculture from traditional to modern farming practice is pedestal on sufficient accessibility of contribution like certified seeds, fair use of fertilizers, mechanization, agricultural credit and chance of investment in agricultural research.

Cotton is a cash crop, leading world in natural fibre fabrication. The global textile industry largely is stand on cotton fibre and this crop is also a main resource of edible oil production (Abid et al., 2011). The role of

cotton in national economy is of prime thought create income for the wealth (Khan et al., 2009) and records for 7.0% value added in agriculture and donate 1.5% to GDP (GOP, 2014). As well make enormous quantity of foreign exchange via its sell abroad, cotton in addition give fiber for domestic textile industry. Apart from the immense economic significance of cotton as a fibre crop, its contribution in edible oil is understandable from the reality that it supply 65-70% to the local edible oil industry and feed (seed cake) for animals utilization (Khan, 2010). During 2013-14, the cotton was sophisticated on 2806,000 hectares of land with production of 12.769 million bales. The pest harass in the early kharif season is chiefly liable for inferior cotton production (GOP, 2014).

Agro-chemicals have turn out to be an essential fraction of cotton creation and information on use of agro-chemicals is painstaking to be a crucial aspect in gaining most favorable yield under varied climatic conditions and agronomic practice. For finest exploitation of production knowledge and inputs, it is compulsory to keep away from over-use of agro-chemicals. Pesticide cruelty is rising in many Asian countries with untowards property in all aspects of crop production. Pesticides caused harmful effects on human health and destroying 40 thousand individuals annually (WHO, 2005), equal to 10% of all fatalities in the agricultural sector (Sharma, 2007).

A broad range of pesticides is used for pest and vector control in agricultural areas, but many farming communities are not truthly telling about the hazards related with the use of chemicals (Ajayi, 2000). The consequent health issues and numerous climatic problems by the use of pesticides in agriculture and public health are generally externalized in estimations of the economic burdens and benefits of pesticides (Ajayi, 2000).

It has been documented that continuous indiscriminative use of pesticides have caused irreversible damage to the environment and developed resistance in insect pest species against these chemicals. The farming communities are less aware of the recommended dosage and methods of insecticidal application; and in result natural fertility of the soil is reduced, soil structure is disturbed and a reduction in the water holding capacity of the soil along with increased susceptibility to soil erosion that has adversely affected the soil productivity. Besides, contamination and deterioration in the quality of groundwater sources are also being reported to be the casualties caused by excessive use of pesticides in cotton in particular, which also indiscriminately kill insects and micro-organisms (Shetty, 2004; Barik and Gautam, 2009).

The awareness of pest management and knowledge regarding the recommended dosage and methods of pesticides application of farmers is the key factor for successful cotton production strategies. Although, the farmers field schools and other non-governmental organizations are apparently looking busy to develop awareness among the farmers regarding the recommended pesticide application for cotton, but unluckily the farmers of the country and particularly of Sindh province do not possess adequate knowledge in relation to proper dosage and method of pesticide application in cotton (Hoque et al. 2008). Moreover, the farmers do not have sufficient knowledge regarding the economic implications associated with indiscriminate use of synthetic pesticides in cotton (WHO, 2005; Lalitha and Ramaswami, 2007; USDA, 2011).

There is shortage of studies correlated to these issues in Balochistan province of Pakistan. A study which looks into the health effects of acute pesticides among the cotton farmers of Balochistan province is a positive step to fill this research gap. Specific studies dealing with the farming practices of the farmers regarding pesticide use and its impact on the health of workers in the field and over bioecology of the area need to be investigated with particular reference to Balochistan province in an effort to develop a policy for its appropriate management minimizing all the hazards associated. Therefore, study was carried out to identify the Farmers knowledge regarding pesticide usage on cotton crop of district Nushki, Balochistan province and to look into the various aspects of pesticide use in growing cotton crop and its impact on environmental degradation and human health.

MATERIALS AND METHODS

The research planning is entirely based on the nature of project and accordingly the objectives are developed; and the project objectives are followed by the plan of work. So, a meaningful research work involves appropriate planning before producing further. Research planning envelopes the purpose for which it is being carried out. Therefore, workable research plan is essentially chalked out for all research studies particularly in social sciences. Therefore, the present study was carried out to identify the cotton growers' knowledge regarding pesticide usage in district Nushki, Balochistan province and to look into the aspects of pesticide use on cotton and its impact on environmental degradation and human health.

Descriptive survey method of research was employed in this study. A descriptive survey design is appropriate for obtaining people's perceptions on social issues and social facts concerning the current status of phenomena and/or for describing the nature of existing conditions in a situation (Cohen and Manion, 1980; Trochim, 2000). The descriptive survey design was selected because the primary purpose of the present study was carried out to assess farmers' perceptions on the use of pesticides on cotton using the farmers of district Nushki of Balochistan province.

Target Area

The cotton growers of Nushki district of Balochistan province were mainly focused for knowing their opinions and perceptions regarding their knowledge regarding the pesticide use on their cotton crop. However, in Nushki district other field crops are also extensively cultivated; but in the present study only the cotton growers were examined.

Target Population and Representative Sample

Initially, it was planned to include 100 cotton growers in this survey study from Nushki district. However, administration of the questionnaire, the final sample size could reach to 86 cotton growers according the Central Limit Theorem this sample size was approximately normal (Anderson et al., 1993). Therefore, in most of the cases a minimum sample recommended for the studies is not more than 60 samples. However, a sample size of 86 growers was finalized. Thus, 86 cotton growers were interviewed considering the study objectives and hypothesis in mind by administration of the questionnaire.

Considering time limit and resource constraints as well as the availability of cotton growers, the 86 respondents were enough to represent the entire population. In all 15 villages were selected from Nushki district and from each of the selected villages, 5 cotton growers were selected. However, in one village more active cotton growers were available and hence six respondents were interviewed from this village. Stratified random sampling technique was used for the selection of cotton producers. Arithmetic means and weighted averages were used for analysis of data.

Designing questionnaire and data analysis

Closed ended questions were preferably included in the questionnaire and a semi structured type questionnaire was developed. Cotton growers' perceptions were recorded using 5 point Likert scale and questionnaire was developed to facilitate the easy understanding and facilitate the questionnaire contents to computer package Statistical Package for Social Sciences (SPSS) for analysis purpose. Descriptive statistical methods i.e. mean, standard error, frequencies, and percentage were in mind to be calculated and contents of the questionnaire were repeatedly discussed with the research supervisor to achieve meaningful outcome after analysis and feasible to interpret.

The questionnaire was finalized with the consolation of the senior faculty members of the department. The data were collected through personal interview on the questionnaire by the researcher himself to get the accurate information from the respondent farmers. The structured interview schedule contained items concerning personal characteristics of the farmers included age, qualification (education), land holding, type of tenure, farming experience, area brought by the farmers under cotton cultivation, type of irrigation, knowledge and perceptions of farmers regarding pesticide application, perceptions on impact of pesticides on cotton production, effectiveness of pesticide application and effects of pesticide application on human health and environment as well.

Administrating the questionnaire

The questionnaire was administered by interviewing the respondents personally by the researcher in order to get accurate and valid information from the respondent cotton growers. Due to suspicious nature and illiteracy of the farmers, a great deal of time had to be spent in explaining the purpose of the study to the cotton growers and assuring them that the information being collected from them would be kept secret and only conclusion would be published for educational purpose. The researcher faced many difficulties in approaching the farmers because he had to travel down in the interiors and no easy access he found to approach the villagers during the data collection process.

Analysis of data

The information on the basis of cotton growers perceptions on various related aspects in the questionnaires during personal visits, were subjected were input to the computer using SPSS package and derived means, percentage and Grand point averages for individual importance. Ranking of the importance were assigned by the researcher based on mean score using likert scale.

RESULTS

Cotton growers by their age

In decision making process on agriculture, age of the farmer plays major role as well as develop positive attitude towards the adoption behavior that helps in decision making and technological diffusion with appropriate thinking. The cotton growers in the study area were divided into various age groups such as 20-30 years, 31-40 years, 51-60 years, and >60 years. The information gathered in relation to age of cotton growers of Nushki district of Balochistan during the survey is given in Fig 1**.** The age of more than 60 years.

The results showed that there were the farming communities either working personally at their cotton fields or operating their farms as managers belonged to varied age groups. However, the cotton growers of 30 to 50 years age dominated the study area in sense of their age.

Level of education among growers

Traditional farming can only be replaced with the advanced profitable agriculture farming, if the educated farmers take interest in this field of business. Positive association of adoption with the education level of the growers has been found and an educated grower will easily adopt the innovations and developments in agriculture and accept the ideas as compared to uneducated farmer. The data collected in regards to the educational level of the respondents are presented in the following Table. It can be seen from the data (Fig-2) that majority (38.07%) of the cotton growers in the study area only obtained primary school education, 29.07 percent were uneducated, 24.42 percent could only reach middle school education and only 4.65 percent of the respondents reported to have completed matriculation. Only 2.33 percent could enter college level studies; while 1.16 percent graduates were also growing cotton in the study area. None of the farm operators growing cotton reached to have Masters degree. The situation was not so promising among the cotton growers in the Nushki district of Balochistan in regards to their education level. Nearly 70 percent of the cotton growers in the study area either were uneducated or had only primary school education.

Land holding

Size of land holding also has significant influence on the decision making in relation to technological adoptions in agriculture. The decisions made by the landlords have been found to vary and small holding never respond to technological advancement as accepted by the big landlords. Generally, the lack of interest on part of government led research and extension agencies is behind the backwardness of small land holding farmers; because government led research and extension agencies only support to progressive growers and big landlords and in this way the major beneficiaries of the government efforts for development agriculture are the big landlords and average farmers is deprived of such facilities provided by the government for average grower. The information in relation to land holding is presented in the following Table. The table-3 exhibited that majority of the cotton growers in the study area (48.84%) possessed land only upto 10 acres; 24.42 percent of the cotton growers possessed land in the range of 11-20 acres, 22.09 percent possessed 21-30 acres of agricultural land, and only 2.33 and 2.33 percent respondents had 31-40 and more than 40 acres of agricultural land. This indicates that in Nushki district small holding cotton growers were in majority and big landlords were relatively in smaller number.

Type of tenure

In technology adoption process in agriculture, the land tenure is also considered as an important factor to influence the decision making and adoption process. The owner farmers who are independent in decision making may adopt improved practices more easily as compared to tenants who are not sure to adopt improved farm operations because of risk factor. Table-4 shows the information regarding the type of tenure such as landlord, land on share (tenant), land on rent (annual contract) or tenant cum landlord. It is evident from the data (Fig-4) that majority (36.05%) of the respondents were landlords, while 25.58 percent obtained the land on share (tenant) and did not own any land; while 20.93 percent of the respondents were tenant cum landlords. The tenant cum landlords possessed own land in smaller area and in addition to their own land, they also cultivate land of other landlords on share. However, 17.44 percent respondents obtained land from other landlords on rent.

Farming experience of cotton growers

Farming experience plays vital role in decision making in relation to adoption of innovated farming methods. The experienced and educated farmers never hesitate to adopt modern crop production technologies. The table-5 indicates the responses of cotton growers regarding their farming experience. The data in table 5 indicated that majority of the cotton growers (45.35%) had more than 20 years farming experience; while 38.37 percent of the respondents possessed farming experience of 10-20 years; while 16.28 percent of the cotton growers having farming experience of 5-10 years. This indicates that most of the cotton growers in the study were of the middle age groups having plenty of farming experience.

Area under cotton cultivation

Cotton in this area is cultivated in Nushki district of Balochistan since long cultivation of this crop is considered as a profitable agriculture farming. The landlords having greater land holding are more responsive to latest cotton production technologies as compared to those having relatively smaller piece of land. In Fig-5 b the data regarding area under cotton cultivation brought by the respondent cotton growers is furnished. It is observed that majority of the cotton growers (59.30%) in the study area cultivated cotton on an area upto 10 acres, 18.60

percent growers cultivated cotton on an area of 11-20 acres, 12.79 percent cotton growers brought 21-30 acres under cotton cultivation, while 5.81 percent of the cotton growers brought more than 40 acres of land on average under cotton cultivation. However, 3.49 percent of the respondents cultivated cotton on 31-40 acres of their land. It was observed that almost all the small holdings cultivate cotton; and big landlords also have keen interest to grow cotton being a profitable crop

Knowledge on pesticide application as perceived by cotton growers

The cotton growers belonged to Nushki district of Balochistan were asked to perceive on their knowledge regarding pesticide application and their satisfaction was assessed using likert scale (1=Not satisfied, 3=satisfied to some extent, 5=highly satisfied).

Cotton growers' perceptions regarding pesticide application

The degree of satisfaction of the cotton growers in regards to their knowledge of pesticide application in Nushki district was assumed and accordingly the cotton growers were invited to perceive. A high majority (93.02%) of the growers were 'not satisfied' about the usefulness of the help from extension agents regarding proper use of pesticides on cotton; 6.98% were 'satisfied to some extent' and none of the respondents were 'highly satisfied'.

Majority (67.50%) of growers were 'satisfied to some extent' on their awareness regarding techniques of pesticide application; and 20.00 percent were 'highly satisfied' and 12.50 were not satisfied. In case of help from extension agents for proper method and knowledge of pesticide application, a high majority (91.25%) of growers was not satisfied and only 6.25 percent were satisfied to some extent and 2.50 percent were 'highly satisfied'. While enquired about the cotton growers' awareness regarding techniques of pesticide application, 75.88% were satisfied to some extent, 20.93 percent were not satisfied; while only 3.49 percent were highly satisfied. The cotton growers were asked to perceive about their knowledge regarding proper pesticide products; majority (51.16%) were not satisfied; 45.35 percent were satisfied to some extent and only 3.49 percent were highly satisfied over this assumption. In case of help of farmer from extension agent for proper method and knowledge of pesticide application, 93.02 percent of cotton growers were not satisfied, 6.98 percent were satisfied to some extent and none of the cotton growers were highly satisfied on this assumption. Over the assumption that that unsafe pesticide application is a health risk for the applicators, majority (45.35%) stated that they are satisfied to some extent, 38.37% were not satisfied and onyl 16.28% were highly satisfied over this assumption. Over the follow-up of instructions on the label of pesticide packaging, majority (70.93%) perceived satisfied to some extent, 18.60 percent growers were not satisfied; while only 10.47 percent growers were highly satisfied regarding followup of instructions on the label of pesticide backaging.

Cotton growers were asked to perceive about their awareness regarding safe use of pesticides, and majority of the cotton growers (58.14%) were satisfied to some extent over their awareness, 31.40 percent were not satisfied and 10.47 percent were highly satisfied over their awareness regarding safe use of pesticides. Similarly, the assumption indicating whether the growers possess necessary knowledge regarding precautions for pesticide application, 51.16 percent were satisfied to some extent, 26.74 percent were highly satisfied and 22.09 percent growers were not satisfied for their knowledge regarding precautions for pesticide application on cotton. The cotton growers were invited to offer their perceptions on their awareness that unsafe pesticide application is a health risk, the majority (65.12%) of the growers was satisfied to some extent, 24.42 percent were highly satisfied; while 10.47 percent of the growers were not satisfied on their awareness on this assumption. The cotton growers were asked to perceive on their awareness about adverse effects of indiscriminate use of pesticides on animals and other ecosystem due to and majority (63.95%) of the cotton growers were satisfied to some extent, 30.23 percent were highly satisfied and 5.81 percent were not satisfied for their awareness about adverse effects of indiscriminate use of pesticides on animals.

The cotton growers in Nushki district of Balochistan were also asked to perceive on adoption of traditional methods and whether these methods of pesticide application are effective; the majority (53.49%) of the respondents were satisfied to some extent; while 31.40 percent were not satisfied and 15.12 percent were highly satisfied.

Cotton growers' perceptions regarding the impacts of pesticides on cotton

The cotton growers' perceptions were invited on assumptions regarding the impact of pesticides to assess the degree of their agreement with the statements through likert scale (1= Disagreed, 3= Agreed to some extent, 5= Strongly agreed).

The data in Table 8 indicated that the cotton growers in majority (40.70%) agreed to some extent on the assumption that use of pesticide creates environmental problems, while 32.56 percent were strongly agreed and 26.74 percent disagreed over this statement. A high majority (89.53%) of farmers strongly agreed with the assumption that the use of pesticide increases the yield of cotton, 6.98 percent were agreed to some extent and only 3.49 percent of the cotton growers disagreed over this assumption.

While assumed that underground water is contaminated by the use of pesticides; this assumption was agreed to some extent by a majority of the cotton growers (39.53%), 34.88 percent strongly agreed and 25.58 percent of the respondents were disagreed over this statement. The farmers were also invited to perceive on the statement that use of pesticides spray on cotton crop is harmful for biological life; majority of the farmers (36.05%) were agreed to some extent over this assumption, 32.56 percent were disagreed; while 31.40 percent were strongly agreed over this statement.

While assuming that abundant use of pesticides pollutes the atmosphere; majority of the cotton growers (43.02%) strongly agreed, 38.37 percent were agreed to some extent and 18.60 percent of the respondents were disagreed. Similarly, the changed natural taste of food due to pesticidal sprays on cotton was 'strongly agreed' by majority (65.12%) of cotton growers, 22.09 percent disagreed over this assumption and 12.79 percent of the cotton growers were agreed to some extent with this assumption.

The cotton growers were asked to perceive on the statement that the birds are affected by the indiscriminate use of pesticides on cotton; and majority (56.98%) of the respondents were strongly agreed with this assumption, 39.53 percent were agreed to some extent and 3.49 percent disagreed over this statement. Likewise, another very important assumption was put forward to farmers for their opinion that indiscriminate use of pesticides on cotton has toxic effects on human health due to residual effects; and majority of them (51.16%) agreed this assumption to some extent, while 38.37 percent strongly agreed over this statement and 10.47 percent were disagreed over this assumption.

Opinion survey

The opinion survey was conducted to assess the involvement of cotton growers in relation to measures for improvement in the situation regarding proper application of pesticides on cotton. After harvesting of the crop, the seed cotton is separated from lint after ginning and edible oil is mainly produced from seed cotton. Hence, the residual effects of pesticides on cotton bolls may affect the seed cotton for toxicity. However, the farmer respondents were asked to give their opinion whether the cotton growers needs to be motivated through training programs so that indiscriminate use of pesticides on cotton is avoided. The data in Table 8 indicated that a high majority of the cotton growers (94.19%) were positive and optimistic for the need of training programs to motivate the growers for proper application of pesticides on cotton crop; while only 5.81 percent opined that there was no need of training programs for this purpose. In case of cotton growers' motivation through motivational campaigns, 65.12 percent of the respondents were in favour of motivational campaigns and 34.88 percent were against this method of farmer education for proper pesticide application in cotton. A majority of 89.53 percent respondents favoured the motivation of farmers through education, but 10.47 percent opined that may be this method is not more useful. A high majority (95.35%) of the farmers were positive that the proper pesticide application may be communicated to the farmers through extension activities; while majority of farmers (56.98%) advocated positively that the farmers may be communicated for the proper application of pesticides on cotton through mass media. These results showed that majority of the farmers were positive and serious concern about the harmful effects of pesticides particularly when applied on cotton. So, there should be effective training of the growers for using proper method and timing of pesticide application.

Role of government agencies for training the farmers for proper pesticide application

In agriculture, the role of public sectors research and extension institutions is of great importance; and the development in farming communities and agriculture as well is linearly associated with the effectiveness of these institutions. The performance of government agencies towards motivation of the farmers and farmers' training is not strong enough; and there is dire need to strengthen the activities of the public sector departments related to agriculture for proper training of the farmers towards safe use of pesticides on cotton. The data so obtained in regards to role of government in motivating the farmers is given in the following Table. The data in table-10 indicated that majority of farmers (54.65%) were not in favour of demonstration plots at farmers' field, and 45.35 percent of the cotton growers were in favour of demonstration plots at farmers' field where all the recommended methods of pesticide application on cotton are demonstrated before the farmers of the area. A high majority of the cotton growers (91.86%) was positive and optimistic for training of farmers by the Environment Protection Agency; while training of farmers on awareness on residual effects of toxic chemicals sprayed for control of insect pests is favoured by 98.84 percent of the respondent cotton growers. Similarly, majority of the cotton growers were positive and optimistic (77.91%) and suggested the adoption of IPM strategies to control insect pests on cotton.

Cotton growers' perceptions on the effectiveness information sources

Ranking of the information sources for the farmers' training on various agricultural aspects was developed on the basis of cotton growers' perceptions. The situation regarding the farmers' awareness on cotton production and protection technology could not be improved upto the desired level. In this study the farmers were asked to

judge the effectiveness of information sources regarding diffusion of recommended practices on a Likert type scale (1=Not effective, 2=Effective to some extent, 3=Effective, 4=Very effective and 5= extremely effective). Table-5 presents all the information regarding the effectiveness of sources of information about recommended practices for pesticide application on cotton. It can be seen from the data in Table-5that neighbouring farmers were the most effective source of information with mean±SD of 3.38±0.23 and by likert scale it ranked 1st; while according to the farmers' perceptions, T.V. ranked 2nd with mean±Std of 2.86±0.13 and according to the mean derived from likert scale, these two sources are read as 'very effective' on average. Similarly, Radio ranked 3rd with mean±Std of 2.78±0.09 and Demonstration plots ranked 4th with mean±Std of 1.98±0.15 later two sources of information are considered 'effective' on average. However, newspaper ranked 5th, contact farmer 6th, research worker7th, Magazines 8th and extension worker ranked 9th on the basis of effective sources of information as ranked by the cotton growers in nushki district of Balochistan.

Problems faced by farmers in adoption of recommended production practices of cotton

The cotton growers are always confronted by the problems in adoption of recommended crop production practices; because with the development of new crop varieties, the variety specific technologies are developed, but these technologies do not reach at the farmer door step for timely adoption. However, the farmers always remain confused about the new varieties and adoption of crop production technologies due to poor extension services. In the present study the farmers were asked to disclose about their problems that they faced in adoption of recommended practices for cotton production through a Likert type scale (1=Not at all, 3=To some extent, 5=To a greater extent). Table-12 indicates the information regarding the problems of cotton growers in the study area regarding adoption of recommended practices for cotton crop. It is evident from the data (Table-12) that financial constraints have been the major problem of farming communities in Nushki district of Balochistan ranking 1st with mean±Std of 4.04±0.17 and accordingly this problem happened 'to a greater extent'; while according to the farmers' perceptions, adultrated pesticides and other inputs was the also one of the most important problem at rank 2nd, with mean±Std of 3.32±0.21 and afraid of loss ranked 3rd with mean±Std of 2.96±0.15 and lack of knowledge ranked 4th with mean±Std of 2.4±0.13 and these two problems are categorized as 'to some extent' on average. However non-availability of pesticides and other inputs remained the least ranked 5th problem as ranked by the farmers in the study area.

DISCUSSION

The study showed that majority (93.02%) were not satisfied on extension services and the usefulness of the extension agents for use of pesticides on cotton and the help from extension agents (91.25%). In case of cotton growers' knowledge regarding proper pesticide products, majority (51.16%) were not satisfied; 45.35 percent were satisfied to some extent; 45.35% were positive for the assumption that unsafe pesticide application is a health risk for the applicators, while 38.37% showed adverse attitude 16.28% were highly satisfied over this assumption. 70.93% growers were satisfied to some extent and 10.47 percent highly satisfied for followup of instructions on the label. Adeola (2012) concluded that a high level of awareness on the risks associated with the use of pesticides was found among the respondents. However, majority of the farmers did not use protective clothes when applying pesticides. Farmers showed favorable attitudes about the risk of pesticide usage. Farmers' age, education and contacts with extension agent had positive and significant associations with perceived effects of pesticides use on the environment. The intensification of extension services to educate farmers on safe use of pesticides in cotton production is recommended. Sanzidur Rahman (2012) land ownership and agricultural credit are positively related to pesticide usage. Pesticide use is higher in underdeveloped regions. Sharp regional variations also exist in pesticide usage. Sial (2014) also showed agreement with the present study results for these aspects when carried out studies in Taluka Usta Muhammad, district Jafferabad, Balochistan. Major policy thrusts for devising pesticide regulation and effective implementation, increasing farmers' awareness of the effects of pesticide use, and expansion of IPM practices are suggested to safeguard poor farmers in their pursuit of agricultural livelihoods.

The study further showed that regarding adverse effects of indiscriminate use of pesticides on animals and other ecosystem, majority (63.95%) was satisfied to some extent, 30.23 percent were highly satisfied and 5.81 percent were not satisfied. Majority (53.49%) was satisfied to some extent on adoption and effectiveness of traditional methods of pesticide application; 31.40 percent were not satisfied and 15.12 percent were highly satisfied. Most of the cotton growers (40.70%) agreed to some extent, 32.56 percent strongly agreed and 26.74 percent disagreed that use of pesticide creates environmental problems; while 89.53% strongly agreed that the use of pesticide increases the yield of cotton. 39.53% agreed, 34.88 percent strongly agreed and 25.58 percent disagreed that underground water is contaminated by the use of pesticides. 36.05% agreed to some extent, 32.56 percent disagreed and 31.40 percent strongly agreed that use of pesticides spray on cotton crop is harmful for biological life. 43.02% growers strongly agreed, 38.37 percent agreed to some extent and 18.60 percent disagreed that abundant use of pesticides pollutes the atmosphere. 65.12% growers strongly agreed, 22.09

percent disagreed and 12.79 percent agreed to some extent that natural taste of food due to pesticidal sprays is changed. Bond et al. (2012) reported that indiscriminate pesticide use. Farmers had a strong behavioral intention and favorable attitudes, subjective norm and perceived behavioral control to apply pesticide in the coming season. The extension program is likely to be more successful if it dispels myths of pesticide function and includes women and marginal farmers in activities. The key learning's from the study are that farmers have a favorable intention towards pesticide use; attitude was the most important factor influencing behavioral intention. The trend of pesticides use by farmers over years is probably based on farmers' knowledge on pesticide application in relation to effectiveness of pesticides, pests, farm size, and price and weather condition. The pesticides can be fatal if inhaled, swallowed, or absorbed through the skin, even though the effects of contacts and/or inhalation may be delayed due to its formulation (Santo et al., 2002). The effects of exposure even of a short duration can be delayed but there is a possibility of cumulative effects (Gupta, 1994). Health and environmental problems cannot be isolated from economic concerns due to the fact that incorrect pesticide use results not merely in actual yield loss but also in health and possible effects of air and water pollution. The problem of farmers' health should be an important concern for policymakers when looking at the economic efficiency of horticultural production. Sial (2014) also supported all the parameters examined in this study in Taluka Usta Muhammad, district Jafferabad, Balochistan.

For motivation of cotton growers for proper application of pesticides, growers were optimistic for training programs (94.19%); motivational campaigns (65.12); through education (89.53), extension activities (95.35%); and mass media (56.98%). Neighbouring farmer was the chief source of information for cotton growers, follwoed by TV, Radio, Dem. Plots, newspaper, contact farmer, research worker, Magazines and extension worker ranked. In cotton growers' problems, financial constraints ranked 1st, adultrated pesticides ranked 2nd, afraid of loss ranked 3rd, lack of knowledge ranked 4th and non-availability of pesticides and other inputs remained the least ranked 5th. Erbaugh et al. (2001) demonstrate that more active participation of growers increases knowledge of pest management knowledge, providing preliminary support for participatory research and extension approach. However, recommendations for increasing the number of farmer participants and improving the evaluation process are of paramount importance. The use of pesticide was observed to be high, with over 40 different formulations, probably because farmers assume that the only solution to pest problems is to spray more frequently and using different types of pesticides (Dinham, 2003).

The studies (Ngowi, 2003) revealed that farmers were not receiving agricultural extension service hence have attempted various means especially in pesticides use when dealing with pest problems but were constrained by the lack of appropriate knowledge. However, pesticide usage in the study area seems to be highly influenced by pesticide dealers and neighbouring farmers who were carrying out their business right in the farming communities and very interested in achieving large sales of their pesticides. This is a typical situation, the choice of pesticides to be used by farmers is influenced by the pesticide dealers. Insecticides were the most used because insect pests were the most serious problem in cotton production in the study area. Although in this study it was observed that insecticides were the most commonly used pesticides, usually amounts and types of pesticides used have been reported to show important differences among farmers, type of agricultural production and level of economic development. The tank mixture of pesticides observed

Conclusion

In this study indicates that farmers lack basic knowledge of pesticides. In general, the frequencies of pesticides application by farmers were high. Such heavy use of pesticides may result in frequent contact with pesticides, which can lead to significant health problems.

- A high majority (93.02%) of the growers were not satisfied about extension services and the usefulness of the extension agents for them regarding proper use of pesticides on cotton.
- Majority (67.50%) of growers were satisfied to some extent on their awareness regarding techniques of pesticide application.
- 91.25% of growers were not satisfied over the help from extension agents for proper method and knowledge of pesticide application.
- Some 75.88% showed their satisfaction to some extent on their awareness regarding techniques of pesticide application.
- In case of cotton growers' knowledge regarding proper pesticide products, majority (51.16%) were not satisfied; 45.35 percent were satisfied to some extent.
- Some 93.02 percent of cotton growers were not satisfied from the help of farmer from extension agent for proper method and knowledge of pesticide application.
- Some 45.35% were positive for the assumption that unsafe pesticide application is a health risk for the applicators, while 38.37% were showed adverse attitude 16.28% were highly satisfied over this assumption.
- Some 70.93% cotton growers were satisfied to some extent and 10.47 percent growers were highly

satisfied regarding followup of instructions on the label.

- Majority (58.14%) was satisfied to some extent, 31.40 percent were not satisfied and 10.47 percent were highly satisfied over their awareness regarding safe use of pesticides.
- About cotton growers' knowledge on precautions for pesticide application, 51.16 percent were satisfied to some extent, 26.74 percent were highly satisfied and 22.09 percent growers were not satisfied.
- Majority (65.12%) of the cotton growers was satisfied to some extent, 24.42 percent were highly satisfied; and 10.47 percent were not satisfied on assumption that unsafe pesticide application is a health risk.
- Regarding adverse effects of indiscriminate use of pesticides on animals and other ecosystem, majority (63.95%) was satisfied to some extent, 30.23 percent were highly satisfied and 5.81 percent were not satisfied.
- Majority (53.49%) was satisfied to some extent on adoption and effectiveness of traditional methods of pesticide application; 31.40 percent were not satisfied and 15.12 percent were highly satisfied.
- Most of the cotton growers (40.70%) agreed to some extent, 32.56 percent strongly agreed and 26.74 percent disagreed that use of pesticide creates environmental problems.
- A high majority (89.53%) strongly agreed that the use of pesticide increases the yield of cotton.
- Some 39.53% agreed, 34.88 percent strongly agreed and 25.58 percent disagreed that underground water is contaminated by the use of pesticides.
- Some 36.05% agreed to some extent, 32.56 percent disagreed and 31.40 percent strongly agreed that use of pesticides spray on cotton crop is harmful for biological life.
- 43.02% growers strongly agreed, 38.37 percent agreed to some extent and 18.60 percent disagreed that abundant use of pesticides pollutes the atmosphere.
- 65.12% cotton growers strongly agreed, 22.09 percent disagreed and 12.79 percent agreed to some extent that natural taste of food due to pesticidal sprays is changed.
- Majority (56.98%) strongly agreed, 39.53 percent agreed to some extent and 3.49 percent disagreed that the birds are affected by the indiscriminate use of pesticides on cotton.
- Majority (51.16%) agreed to some extent, 38.37 percent strongly agreed and 10.47 percent disagreed that indiscriminate use of pesticides on cotton has toxic effects on human health due to residual effects.
- Most of the cotton growers (94.19%) were optimistic for need of training programs to motivate the growers for proper application of pesticides on cotton crop; 65.12 percent were in favour of motivational campaigns; 89.53 percent favoured the motivation of farmers through education; 95.35% were optimistic that extension activities may be effective to guide them for proper pesticide application; 56.98% also advocated the role of mass media for the proper application of pesticides on cotton.
- The role of government agencies for proper guidance of cotton growers in pesticide application and 54.65% were against the demonstration plots at farmers' field, and 45.35 percent favoured this activity; 91.86% were optimistic for farmers' training by the Environment Protection Agency; 98.94% demanded training on awareness on residual effects of toxic chemicals sprayed for control of insect pests; while 77.91% also suggested the adoption of IPM strategies to control insect pests on cotton.
- While ranking the source of cotton growers' information on pesticide application, neighbouring farmers ranked 1st as most effective source of information (3.38±0.23), T.V. ranked 2nd (2.86±0.13), Radio ranked 3rd (2.78±0.09), Dem. plots ranked 4th (1.98±0.15), newspaper, contact farmer, research worker, Magazines and extension worker ranked 5, 6, 7, 8 and 9th on the basis of effectiveness of sources of information.
- In case of farmers major problems, financial constraints ranked 1st (4.04±0.17), adultrated pesticides in the market ranked 2nd (3.32±0.21), afraid of loss ranked 3rd (2.96±0.15), lack of knowledge ranked 4th (2.4±0.13) and non-availability of pesticides and other inputs remained the least ranked 5th problem as ranked by the farmers in the study area.

Suggestions

- ❖ Village level farmers committees may be established, headed by the extension EDOs and fortnightly meetings with the farmers may be ensured to discuss issues related to cotton growing and application of pesticides.
- ❖ The training of farmers is an essential requirement of the time; the government should now be very serious to look into the matter launching result oriented projects to educate the average grower for IPM strategies.
- ❖ Extension services are the backbone of agriculture, but no extension activity is upto the desired level. There is need to strengthen the extension services in the study area.
- ❖ Agriculture credit may be facilitated for the farmers of the area, because financial constraint has been

the top ranking problem of the cotton growers of Nushki district.

- Introduction of trichogramma or chrysoperla cards for cotton fields may be ensured in this area.

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Notes

Fig 1.Age of cotton growers used as respondents in district Nushki of Balochistan province

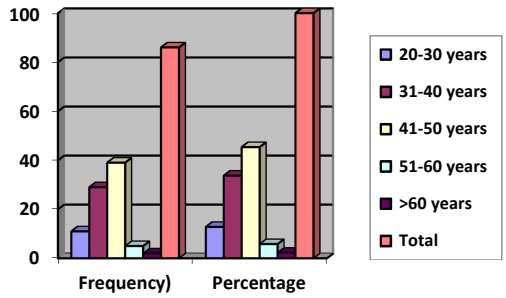
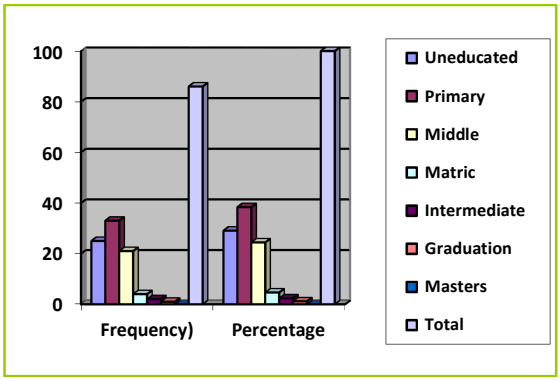
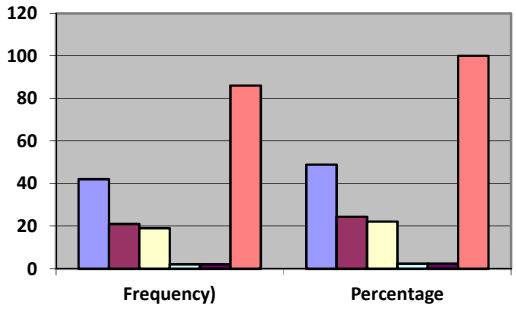


Fig 2. Education level of cotton growers used as respondents in district Nushki of Balochistan province



Land ownership status of cotton growers used as respondents in district Nushki of Balochistan province



Tenure status of cotton growers used as respondents in district Nushki of Balochistan province

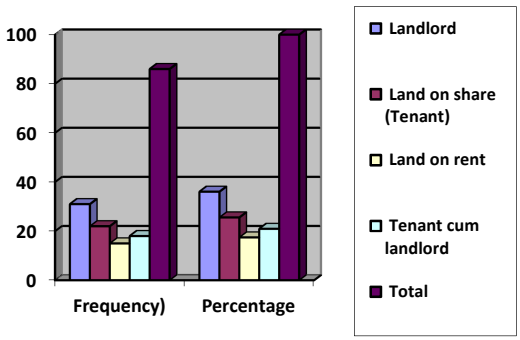


Fig 5 (a)Farming experience of cotton growers used as respondents in district Nushki of Balochistanprovince (b)Area under cotton cultivation brought by the respondent growers in district Nushki of Balochistan province

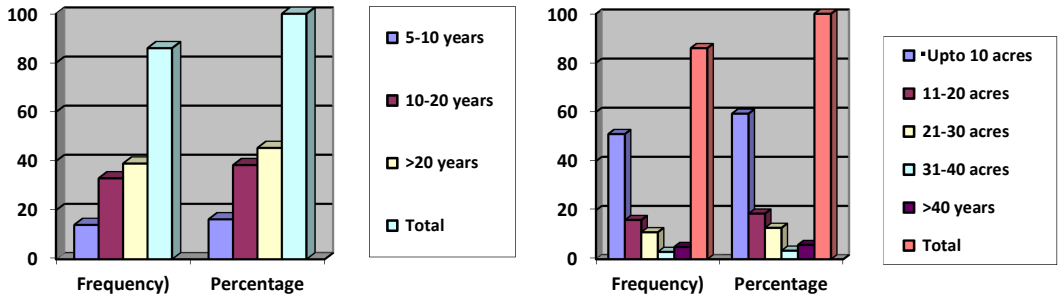


Table-1 Perceptions of cotton growers regarding pesticide application on their cotton crop in district Nushki of Balochistan province

Assumptions	Not satisfied		Satisfied to some extent		Highly satisfied		Total	
	Freq.	%	Freq.		%	Freq.	Freq.	%
Help from extension agent regarding proper use of pesticides is useful	80	93.02	6	6.98	0	0.00	86	100
Awareness of farmer regarding techniques of pesticide application	18	20.93	65	75.58	3	3.49	86	100
Knowledge of farmer regarding proper pesticide products	44	51.16	39	45.35	3	3.49	86	100
Help of farmer from extension agent for proper method and knowledge of pesticide application	80	93.02	6	6.98	0	0.00	86	100
Pesticide application is of health risk (farmers' knowledge and perception)	33	38.37	39	45.35	14	16.28	86	100
Following of instructions on label and understand these instructions on pesticide pack	16	18.60	61	70.93	9	10.47	86	100
Awareness of farmer regarding safe use of pesticides	27	31.40	50	58.14	9	10.47	86	100
Awareness of farmer regarding precautions for pesticide application	19	22.09	44	51.16	23	26.74	86	100
Awareness of grower regarding human health risk by pesticidal spray	9	10.47	56	65.12	21	24.42	86	100
Awareness about adverse effects of indiscriminate use of pesticides on animals and other ecosystem, particularly due to adoption of traditional pesticide application methods	5	5.81	55	63.95	26	30.23	86	100
Adoption of traditional methods and whether these methods of pesticide application are effective	27	31.40	46	53.49	13	15.12	86	100

Table-2 Perceptions of cotton growers regarding the impact of indiscriminate use of pesticides on their cotton crop in district Nushki of Balochistan province

Assumptions	Disagreed		Agreed to some extent		Strongly agreed		Total	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Use of pesticides creates environmental problems	23	26.74	35	40.70	28	32.56	86	100
Use of pesticides increases the cotton yields	3	3.49	6	6.98	77	89.53	86	100
Use of pesticides creates underground water contamination	22	25.58	34	39.53	30	34.88	86	100
Use of pesticides is harmful for biological life	28	32.56	31	36.05	27	31.40	86	100
Abundant use of pesticides creates pollution in the atmosphere	16	18.60	33	38.37	37	43.02	86	100
Use of pesticides on cotton may cause toxic residual effect on food items from cotton seed (edible oil/cake)	19	22.09	11	12.79	56	65.12	86	100
Awareness of the farmers for bad effects of pesticide application on birds	3	3.49	34	39.53	49	56.98	86	100
Use of pesticides on cotton has toxic effects on human health due to residues in edible oil/cake	9	10.47	44	51.16	33	38.37	86	100

Table-3 Opinions of respondent cotton growers on farmers' development through training programs for proper pesticide application on cotton crop cotton in district Nushki of Balochistan province

Programs	Yes		No		Total	
	Frequency	%	Frequency	%	Frequency	%
Through training	81	94.19	5	5.81	86	100.00
Through motivation campaign	56	65.12	30	34.88	86	100.00
Through education	77	89.53	9	10.47	86	100.00
Through extension activities	82	95.35	4	4.65	86	100.00
Through mass media	49	56.98	37	43.02	86	100.00

Table-4 Role of government agencies related to agriculture for motivation of the farmers for using proper method of pesticide application on cotton

Programs	Yes		No		Total	
	Freq.	%	Freq.	%	Freq.	%
Demonstration plots	39	45.35	47	54.65	86	100.00
Trainings by Environment Protection Agencies	79	91.86	7	8.14	86	100.00
Training of farmers for residual effects of toxic pesticides	80	93.02	6	6.98	86	100.00
Training of farmers for harmful effects on human health due to residual toxic effects of pesticides	85	98.84	1	1.16	86	100.00
IPM practices for control insect pests particularly on cotton	67	77.91	19	22.09	86	100.00

Table-5 Farmers' perceptions regarding the effectiveness of information sources on pesticides application on cotton

Source of information	Not effective		Some-what extent		Effective		Very effective		Extremely effective		Total	Mean	S.D.	Rank
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%				
Radio	12	13.95	24	27.91	30	34.88	11	12.79	9	10.47	86	2.78	±0.09	3rd
T.V.	14	16.28	16	18.60	31	36.05	18	20.93	7	8.14	86	2.86	±0.13	2nd
Extension worker	82	95.35	1	1.16	3	3.49	0	0.00	0	0.00	86	1.08	±0.11	9th
Research worker	59	68.60	23	26.74	4	4.65	0	0.00	0	0.00	86	1.36	±0.04	7th
Newspaper	22	25.58	61	70.93	3	3.49	0	0.00	0	0.00	86	1.78	±0.17	5th
Magazine	79	91.86	6	6.98	0	0.00	1	1.16	0	0.00	86	1.1	±0.01	8th
Neighbouring farmer	2	2.33	6	6.98	50	58.14	13	15.12	15	17.44	86	3.38	±0.23	1st
Dem. Plots	43	50.00	23	26.74	3	3.49	13	15.12	4	4.65	86	1.98	±0.15	4th
Contact farmer	35	40.70	36	41.86	15	17.44	0	0.00	0	0.00	86	1.77	±0.08	6th

Table-6 Farmers' problems they faced in adoption of recommended production practices for cotton

Source of information	Not at all		To some extent		To a greater extent		Total	Mean	S.D.	Rank
	Freq.	%	Freq.	%	Freq.	%				
Lack of knowledge	44	51.16	24	27.91	18	20.93	86	2.4	±0.13	4th
Financial constraints	9	10.47	23	26.74	54	62.79	86	4.04	±0.17	1st
Afraid of loss	27	31.40	34	39.53	25	29.07	86	2.96	±0.15	3rd
Non-availability of inputs including pesticides	81	94.19	5	5.81	0	0.00	86	1.12	±0.14	5th
Adulterated pesticides	8	9.30	56	65.12	22	25.58	86	3.32	±0.21	2nd

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