

## The Usefulness and Use of Agricultural Extension Services in Balochistan, Pakistan

Social Work

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### Abstract

*Farmers' adoption of technology or technical knowledge recommended by extension officials is considerably influenced by their perception of the usefulness of that technology or knowledge. Cognizant of this, we conducted a study of 200 farm households in Balochistan, Pakistan to analyze how useful date farmers found the available agricultural extension services. Primary data were collected by questionnaire, and statistical tools including cross tabulation, a binary correlation matrix and logistic regression were used. In most cases, the same factors influencing varying perceptions of the usefulness of the services were significantly positively correlated with perceptions of the usefulness of both land preparation methods and pest control-related extension services. Variables included head of household's age, head of household's literacy, adequacy of irrigation water, field assistant's visits to the farmer, farmer's visits to the District Agriculture Extension Department (DAED) and percentage of dead trees. Although most farmers were visited once a year, fewer than half used the services, which were mostly for land preparation and pest control. Conclusions are drawn and broad policy recommendations made for enhancing the production of crops in general and date palm in particular.*

**Key words:** Agricultural extension; Date palm farmers, Productivity; Balochistan

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## **1. Introduction**

The agriculture sector in many developing countries employs the major proportion of the rural population and contributes significantly to both local and national economies (Sachs, 2006; World Bank, 2010). Despite its declining share, agriculture's contribution to GDP ranges from 20% to 40% in many developing countries. In Pakistan, for example, agriculture accounts for 30% of the total value of the country's exports, directly involves 75% of the population, and is the "backbone" for economic development in the country (GoP, 2000; Siddiqui and Mirani, 2012). In view of such contributions, developing countries, including Pakistan, have adopted policies emphasizing, besides other things, the provision of extension services to enable farmers to access and use essential improved technologies for enhancing agricultural production. Accordingly, governments have allocated substantial funds and deployed a large number of extension staff to ensure the effective delivery of agricultural extension services (Shah et al., 2010; World Bank, 2010; Umata et al., 2011). These agricultural extension services are intended to address agriculture's 'environmental', 'economic' and 'social' problems through effective linkages among the extension centers and researchers; by involving smallholder farmers, in particular, in the problem-solving and decision-making process; and by disseminating useful knowledge, skills and information (Chambers, 1995; Bernet et al., 2000; Qamar, 2005; Hu et al., 2009; World Bank, 2010; Mofakkarul-Islam et al., 2011; Lukuyu et al., 2012). However, in developing countries, including Pakistan, the extension programs still employ a conventional, top-down type philosophy that does not take into account diversified ground situations and farmers' needs in an era of rapid marketization (FAO, 2010; World Bank, 2010; Hu et al., 2010; Al Sharafat, 2012; Siddiqui and Mirani, 2012; Baloch and Thapa, 2014 ).

The concerns of the majority of small- and medium-scale farmers seem to have been overlooked by the public extension officials in developing countries in general (Poulton, 2010; World Bank, 2010; Al-Sharafat, et al., 2012; Benjamin, 2013) Pakistan in particular (Riaz, 2010). Small-scale farmers are the most disadvantaged and vulnerable in developing countries, as they tend to be poor, illiterate, lacking in basic farm implements, and heavily dependent on purchased extension services and inputs (Sachs, 2006; World Bank, 2008, Riaz, 2010; Baloch and Thapa, 2014).

The evidence available from the implementation of agricultural extension programs and projects in developing countries clearly indicates that the provision of funds and extension staff alone cannot ensure effective delivery of services to farmers insofar as the effectiveness of any agricultural

extension service depends on both the farmers' access to and the suitability of those services (FAO, 2005; World Bank, 2010; Umata et al., 2011; Gosh, 2012; Al-Sharafat et al., 2012). Accounting for the major proportion of the rural population, small-scale farmers in developing countries are unfamiliar with modern technology and have poor access to agricultural information systems, mostly due to the inadequate services delivered by both the government and non-government institutions (Chambers, 1995; Rogers, 2003; Qamar, 2005; World Bank, 2010; Benjamin, 2013). In some instances, even though extension services are made available, farmers find them not to be of much use as the services have been devised without due consideration for their specific conditions. Therefore, these farmers do not bother to seek extension services (World Bank, 2010; Siddiqui and Mirani, 2012). Similarly, the low use of technologies and extension services is not always due to the farmers' unwillingness but mostly due to other factors that include poor service delivery mechanisms, a lack of adequate personnel and a shortage of the required equipment (Benjamin, 2013). The lack of transportation facilities and the inadequacies of untrained extension workers are other causes of extension services not being used by farmers (Chambers, 1995; Qamar, 2005; World Bank, 2010; Gosh, 2012).

Like other developing countries, Pakistan has pursued agricultural extension policies (GoP, 2004, 2005) as the agriculture sector contributes substantially to the national and local economies. Accordingly, the government has implemented ambitious extension programs with the provision of a substantial budget for the required extension staff, infrastructure and trainings for both extension officials and farmers. Of the limited number of studies carried out on agricultural extension in Pakistan, the main concern has been the academic structure of the extension education, (Shah et al., 2010) and the organizational structure of the extension agencies (Siddique, 2006). Some of the studies have also covered private extension services (Riaz, 2010; Mengal et al., 2012; Siddiqui and Mirani, 2012). However, no serious effort has yet been made to ascertain whether or to what extent farmers have access to extension services, or whether farmers find the extension services useful. While the actual effect of extension services depends on the extent of the use of the knowledge and technology emanating from the farmers' perception of the usefulness of the services, no study has yet been undertaken to determine the use of such knowledge and its determinants. This study makes an important contribution to bridge this research gap by taking into account the situation in a date palm growing area of Pakistan's Balochistan Province. Besides making a contribution to the studies on agricultural extension, the findings of this study

bear important policy relevance for Pakistan and anywhere else with a similar situation.

## **2. Study area and methods of data collection**

We selected the Panjgur District as our study site because it is amongst the leading date producing districts in Balochistan (PHDEB, 2008; GoB, 2008; Baloch and Thapa, 2014). Covering an area of 16,891 km<sup>2</sup>, with elevations ranging from 465-1776 meters above the mean sea level (GoB, 2011), the district features dry climatic conditions, which are suitable for date cultivation. Although agricultural land accounts for only 4.6% of the district's land area, the economic mainstay for the majority of the population is livestock production and land cultivation, of which date palm is the major crop (Ghicki, 2011; GoB, 2011).

Historically, date palm was already grown in the area when Alexander the Great traveled through the Ketch Valley of Balochistan in the 4<sup>th</sup> century BC (IHS, 2011). Date palm is known as one of the most resilient species of trees and can survive for several months with very little water as well as in severe climatic conditions (Saleem et al., 2005; Baloch et al., 2006). This hardiness combined with the market demand for dates might be the main reason why the ancestors of the present-day farmers first started cultivating date palm in Balochistan. The climate of the area is also suitable for growing date palm. Starting in May and continuing for only 5 months until September, the Balochistan summer is relatively shorter than the winter, which starts in October and lasts for 7 months until April. June and July are the hottest months; November, December and January are the coldest. The average temperature in summer is usually below 32C, although the hottest months can sometimes peak at 38C. In the coldest months, the mean temperature drops below freezing point (GoB, 2005; GoB, 2011).

Panjgur district comprises 16 union councils, which are the lowest administrative units of Pakistan. From the union councils, Gramkan was randomly selected for the survey. Gramkan is home to almost 300 households (Information provided by District Agriculture Office) which grow date palm as their main source of income to meet their basic needs including food. Therefore, this union council was selected for the survey. Following a reconnaissance conducted in March 2012, 200 date palm farm households, accounting for two-thirds of all date palm farmers in the union council, were surveyed. As no secondary information existed on individual date palm farmers, the farm households to be surveyed were selected by using the random

sampling method. Accordingly, two university-educated field assistants were chosen to go into the villages at certain intervals and select farm households to participate in the questionnaire survey. Prior to conducting the survey, the assistants were trained and prepared by the first author. As the majority of farmers are not able to read and write even in the local language, the assistants as well as the first author read every question in *Balochi*, the language commonly spoken in the study area. Even the literate farmers requested that the questions be read to them as they found it easier to respond in this way. The questionnaire was pretested and revised as needed before the main survey was conducted. Additional information was also collected from date farmers and 33 additional key informants, consisting of the Agriculture Minister; the Director General of Agriculture Extension, Balochistan; the Deputy Director of Agriculture Extension, Panjgur District; 8 agriculture officers; 10 extension workers; and 12 community leaders. These key informants provided information on various aspects of agricultural extension, including the access to, usefulness of and application of those services as well as the actual problems faced by the date palm farmers due to poor extension services and lack of organizational support.

The traditional land tenure is very a complex system in the study area. Surprisingly, out of the 200 farm households we sampled, no farmer knew the size of their landholding. The key informants and agricultural extension officials informed us that a similar situation exists across the entire district. Therefore, this is a great concern for the District Agricultural Department. However, it was confirmed that most date palm farms are inherited and owned by extended family members, with the specific trees owned by individual households. The farmers know very well which date palm tree belongs to whom. Therefore, the grouping of farm households based on landholding size has not been considered sensible for the purpose of analysis. As an alternative, farmers were categorized based on the numerical ownership of date palm trees. Farmers with  $\leq 100$  trees are categorized as small-scale farmers, those with 101-200 trees as medium-scale farmers, and those with  $>200$  trees as large-scale farmers. Of the total 200 farm households we sampled, 111 belonged to the first group, 49 to the second group, and 40 to the third group.

## **2.1 Public agriculture extension: organizational structure and delivery mechanism**

The Provincial Agriculture Department under the Ministry of Agriculture of Pakistan administrates the agricultural extension provisioned in all 30 districts of Balochistan, while the central government provides the

annual budget. The District Agriculture Extension Department (DAED) is responsible for implementing all centrally-planned extension programs at the union council level. The programs include: (i) dissemination of information/technology (e.g. fertilizer, seeds, farm machinery and equipment, and pest control); (ii) dissemination of research findings; and (iii) technical skill development through farmer field schools, training and farm visits, awareness campaigns, and community mobilization (GoB, 2010). Organizationally, agricultural extension in Balochistan is divided into a three-tier structure at the provincial, district and union council levels. In each union council with an average of 2,000-2,400 households, the services are normally provided by just two field assistants accompanied by two local helpers called “*Beldar*”. As a result, the number of farm households that each assistant has to serve is very high, which has for a long time been a typical problem in many developing countries (Qamar, 2005; World Bank, 2010; Ghosh, 2012; Al-Sharafat et al., 2012). Most extension assistants have a high school degree and have completed a two-year training course on general extension with a focus typically on staple crops and cash crops being grown in Pakistan. According to the district agriculture extension officers, the assistants are not trained to scientifically understand and help farmers to mitigate date palm-related problems. The land preparation and control services include land plotting, growing better varieties of date palm at the required distance (20-25 feet), bi-annual application of organic fertilizer, hoeing, and the pest control measures, such as the necessary pruning of crops and the application of both organic and inorganic pesticides.

## **2.2 Data Analysis**

The data were analyzed using descriptive statistics, such as frequency distribution and cross tabulation, and analytical statistics, such as correlation coefficients and binary logistic regression. The aim of the research was to determine which factors influence small farmers’ perceptions of the usefulness of available agricultural extension services on land preparation, irrigation methods and pest control. This was to be achieved through correlation analysis. Applying binary logistic regression, the factors influencing the use of extension services on land preparation and pest control were analyzed. However, such analysis was deemed not appropriate for the use of knowledge on irrigation methods as nearly 90% of the farmers found the knowledge gained to be of no use due to scarcity of water available for the irrigation of date palm.

The factors influencing farmers’ perceptions of the usefulness of gained knowledge on land preparation and pest control were analyzed using

correlation analysis. The analyses included nine variables: head of household's age ( $X_1$ ), head of household's literacy ( $X_2$ ), adequacy of irrigation water ( $X_3$ ), field assistant's visits to the farmer ( $X_4$ ), farmer's visits to the District Agricultural Extension Department (DAED) ( $X_5$ ), source of learning about date palm farming ( $X_6$ ), percentage of dead trees ( $X_7$ ), farmer's satisfaction with public extension services ( $X_8$ ), and total number of trees owned by the farmer ( $X_9$ ).

Logistic regression was employed to analyze the factors influencing the use of gained knowledge on land preparation and pest control as both of these dependent variables were binary. The model included only 157 farm households who had gained knowledge from field assistants/extension workers.

### ***Model specification***

The logistic regression model hypothesized that the dichotomous dependent variable is associated with independent variables; such as,  $X_1, X_2, \dots, X_K$ . The model is specified as follows:

$$\text{logit}(E[Y_{i|x_1, x_2, \dots, x_7}]) = \text{logit}(P_i) = \ln \left[ \frac{P_i}{1 - P_i} \right] = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \dots + \beta_k X_{ki}$$

Where;

$P_i$  is the predicted probability that determines the chances of use of extension services in response to the explanatory variables.

In logistic regression, the regression coefficients (B) represent the change in the logit for each unit change in the predictor. Given that the logit is not intuitive, emphasis is given to a predictors' effect on the exponential function  $\text{Exp}(B)$  of the regression coefficient – the odds ratio. The exponential value can be interpreted as the size of change in response to a unit change in an independent variable, considering the other variables constant (Field, 2009).

Two separate logistic regression models were applied to investigate the use of extension services for 'land preparation' and 'pest control'. It was given a value of 1 if the respondent used the services; 0 if otherwise. The influence of a total of seven independent variables on the usefulness of the extension services for land preparation was considered. Those variables were: head of household's age ( $X_1$ ), head of household's literacy ( $X_2$ ), total number of date palm trees ( $X_3$ ), whether the date palms were inherited ( $X_4$ ), field assistant's

visits to the farmer ( $X_5$ ), farmer's visits to District Agricultural Extension Department (DAED) ( $X_6$ ), and percentage of dead trees ( $X_7$ ).

### **3. Results**

Date palm farmers in the study area were being provided with needed technical assistance by fellow farmers, public extension officials and businessmen-cum-extension workers selling agricultural products including fertilizers and pesticides. According to the farmers, when they had any problems with their date palm trees, such as pest infestations, they mainly sought assistance from fellow farmers who had experience of the problem. This was because public extension officials either rarely bothered to visit them or had little knowledge of how to solve date palm-specific problems. In group as well as one-to-one discussions, the farmers opined that many fellow farmers had gained a comprehensive knowledge of date palm growing and pest control through the trial and error method practiced over a long period. Although not frequently, many date farmers in the study area also sought advice from public agricultural extension workers on land preparation, application of fertilizer, and crop management, including date palm sucker growing, pruning of trees, irrigation methods, and application of pesticides. Some farmers also sought extension services from a few private businessmen who were selling agricultural products. Any advice from such businessmen was, however, limited to the use of the products they were selling. The farmers mentioned that pesticides bought from local shops were not very effective. Sometimes, the businessmen even sold date-expired pesticides to farmers by taking advantage of their illiteracy.

#### **3.1 Farmers' perceptions of the usefulness of extension services**

Of the 200 sample farmers, 157, or 78%, were visited by field assistants at least once a year, although this proportion also varied by size/type of farmer (Table 1). As mentioned above, the farmers received advice on land preparation, irrigation methods and pest control. Notably, the overwhelming majority of all types of farmers found the advice on land preparation and irrigation methods useful. With regard to pest control, which was one of the main constraints of date palm production, less than half of the small- and large-scale farmers found it useful. However, approximately two thirds of the medium-scale farmers found the advice helpful. The factors explaining such variation in the usefulness of extension services are discussed in the following section.



**Table 1**

Proportion of farm households perceiving extension services useful

Extension service	Small-scale Farmers (f =90*)	Medium-scale Farmers (f =34*)	Large-scale Farmers (f=33*)
Land preparation <sup>1</sup>	63.1	81.6	67.5
Irrigation methods	75.7	83.7	80.0
Pest control	39.6	63.3	45.0

Source: Field survey, 2012

*Note.*

\*f = Frequency of farm households being visited by extension agents at least once a year.

<sup>1</sup>Including hoeing, plowing, fertilizer application and crop growing

### **3.2 Factors influencing perceptions of the usefulness of land preparation-related services**

Correlation analysis revealed five out of eight significant variables positively correlated with the usefulness of the land preparation related services provided by the public extension agencies (Table 2). Those variables were: ‘head of household’s age’ (X<sub>1</sub>), ‘head of household’s literacy’ (X<sub>2</sub>) ‘adequacy of irrigation water’ (X<sub>4</sub>) ‘extension worker’s visits to the farmer’ (X<sub>5</sub>), ‘farmer’s visits to DAED’ (X<sub>6</sub>), and ‘percentage of dead trees’ (X<sub>8</sub>). Nevertheless, two variables—‘total number of trees’ (X<sub>3</sub>) and ‘satisfaction with the public extension services’ (X<sub>7</sub>)—were not significantly associated with perceptions of usefulness regarding the land preparation-related extension services. These results imply that farmers who were visited by extension workers or who had visited DAED by themselves considered the extension services related to land preparation useful. Likewise, household heads who were within the age group of 18-60 years old and who were literate found extension services useful. Finally, the farmers who suffered more loss in terms of the proportion of their date palm trees which had died also found extension services useful. Notably, two extension related variables, namely, extension worker’s visits to the farmer (X<sub>5</sub>) and farmer’s visits to DAED (X<sub>6</sub>), were found to be relatively more strongly correlated to farmers’ perceptions of the usefulness of extension services than other variables (Table 2).

**Table 2**

Factors influencing date farmers' perceptions of the usefulness of the knowledge on land preparation

Variable	Description	Pearson Correlation	p-value
X <sub>1</sub> . Head of household's age (Dummy)	1 if 18-60 years; 0 if otherwise	.267**	.000
X <sub>2</sub> . Head of household's literacy (Dummy)	1 if literate; 0 if otherwise	.181*	.010
X <sub>3</sub> . Number of date palm trees	Total number	-.035	.619
X <sub>4</sub> . Adequacy of irrigation water (Dummy)	1 adequate; 0 if otherwise	.034	.034
X <sub>5</sub> . Field assistant's visits to the farmer (Dummy)	1 if yes; 0 if otherwise	.399**	.000
X <sub>6</sub> . Farmer's visits to DAED <sup>1</sup> (Dummy)	1 if yes; 0 if otherwise	.217**	.002
X <sub>7</sub> . Satisfaction with public extension services (Dummy)	1 if satisfied; 0 if otherwise	.114	.114
X <sub>8</sub> Dead date palm trees due to pests	Percentage of date palm trees (per year)	.146*	.044

Source: Field survey, 2012

<sup>1</sup>DAED = District Agriculture Department

\*\*Correlation is significant at the 0.01 level

\* Correlation is significant at the 0.05 level

Coincidentally, the same five variables significant positively correlated to the perception of the usefulness of land preparation-related extension services were also found to be significant positively correlated with the perception of the usefulness of extension services related to pest control, although the degree of correlation varied from one variable to another (Table 3). These results indicate that farmers who were visited by extension workers or who had visited DAED by themselves perceived that the extension services related to pest control were useful. Likewise, household heads who were within the age group of 18-60 years and who were literate found the services useful. Finally, the farmers who had suffered greater loss in terms of the proportion of

their date palm trees which had died also found the extension services useful. Notably, with a correlation coefficient of 0.7, the matter of whether an extension worker had visited a farmer was the variable most strongly correlated to the perception of usefulness of the extension services related to pest control (Table 3), indicating the significant role of agricultural extension in influencing farmers' perceptions.

**Table 3**

Factors influencing date farmers' perceptions of the usefulness of the knowledge on pest control

Variable	Description	Pearson Correlation	p-value
X <sub>1</sub> . Head of household's age (Dummy)	1 if 18-60 years; 0 if otherwise	.304**	.000
X <sub>2</sub> . Head of household's literacy (Dummy)	1 if literate; 0 if otherwise	.155*	.029
X <sub>3</sub> . Number of date palm trees	Total number	.010	.890
X <sub>4</sub> . Adequacy of irrigation water (Dummy)	1 if adequate; 0 if otherwise	.137	.053
X <sub>5</sub> . Field assistant's visits to the farmer (Dummy)	1 if yes; 0 if otherwise	.669**	.000
X <sub>6</sub> . Farmer's visits to DAED (Dummy)	1 if yes; 0 if otherwise	.396**	.000
X <sub>7</sub> . Satisfaction with extension services (Dummy)	1 if satisfied; 0 if otherwise	-.095	.183
X <sub>8</sub> . Dead date palm trees due to pests	Percentage of date palm trees	.299**	.000

Source: Field survey, 2012

\*\* Correlation is significant at the 0.01 level

\* Correlation is significant at the 0.05 level

#### 4. Application of knowledge acquired

Application of the knowledge gained from extension agents varied between farmer groups. The majority of medium-scale farmers took advantage of knowledge on land preparation and pest control (Table 4). Approximately 40% each of small- and large-scale farmers applied knowledge on land preparation; knowledge on pest control was applied by roughly 30% of both groups of farmers. Notably, less than 10% of small- and medium-scale farmers

and about 20% of large-scale farmers used the knowledge on irrigation methods (Table 4).

**Table 4**

Date palm households who used the knowledge gained

Extension service	Small-scale farmers (f=90 <sup>1</sup> )	Medium-scale farmers (f=34 <sup>1</sup> )	Large-scale farmers (f=33 <sup>1</sup> )
Land preparation	37.8	61.2	40.0
Irrigation methods	6.3	4.1	17.5
Pest control	28.8	53.1	27.5

Source: Field survey, 2012

<sup>1</sup>Frequency of farmers who had acquired advice from field assistants

#### **4.1 Factors influencing the application of knowledge on land preparation**

The results of logistic regression revealed that four variables—‘household head’s age’, ‘number of dead trees’, ‘total number of date palm trees’, and ‘inheritance of date palm trees’—were significantly associated with the application of gained knowledge (Table 5). With a unit increment in household head of economically active age group, there was an eight times greater chance of using the extension services related to land preparation (Table 5). Likewise, a unit increment in the number of date palm trees increased the likelihood of the gained knowledge on land preparation being applied by a factor of just over 1. In contrast, the use of acquired knowledge reduced in line with incremental increases in the number of households who had inherited their date palm trees. This implies that farmers who had grown their date palm trees by themselves were more likely to use the knowledge on land preparation. The application of the knowledge increased by slightly more than one time with a unit increment in the number of dead date palm trees (Table 5).

**Table 5**

Variables influencing farmers' use of acquired knowledge on land preparation

Variable	Description	B	S.E.	Wald	Sig.P	Exp(B)
X <sub>1</sub> . Head of household's age (Dummy variable)	1if 18-60 years; 0 if otherwise	2.079	.544	14.597	.000	8.000
X <sub>2</sub> .Total number of date palm trees (HH)	Total number	.003	.001	5.388	.020	1.003
X <sub>3</sub> . Whether the date palm trees were mostly inherited (Dummy variable) (Dummy variable)	1 if inherited; 0 if otherwise	-2.737	.664	17.014	.000	.065
X <sub>4</sub> .Dead date palm trees due to pests	Percentage of total date palm trees	.139	.039	12.722	.000	1.149
Constant		-1.249	.875	2.040	.153	.287

Source: Field survey, 2012

Note:The -2 log likelihood ratio (-2LL) for Nagelkerke R Square showed variances of 32% and 43%, respectively, confirming a moderate relationship between the predictors and the prediction.

#### 4.2 Factors influencing the application of knowledge on pest control

Five variables significantly influenced the application of knowledge on pest control provided by public extension (Table 6). Among these, 'extension agent's visits to the farmer', 'farmer's visits to DAED', and 'household head's age' had positive influences, while 'inheritance of date palm trees' and 'source of learning date farming' had negative influences on the application of acquired knowledge on pest control.

The results indicate that those farm households whose heads were within the economically active age range (18-60) had an almost 8 times greater chance of using the knowledge on pest control compared to other households (Table 6). Furthermore, an increase of one date palm tree in the farm was likely to increase the chance of using the knowledge by slightly more than one unit. In contrast, with a unit increment in the number of households who had learnt about date palm growing from their ancestors, the use of acquired knowledge decreased as in the case of the use of knowledge on land preparation (Table 6).

Notably, a one unit increment in the number of farm households visited by field assistants led to an increase in the use of knowledge on pest control by nearly 157 times. Likewise, an increase of one in the number of a farmer's visits to DAED resulted in a rise in the use of knowledge on pesticides by a factor of almost 11.

However, as in the case of the use of knowledge on land preparation, the use of knowledge on pest control decreased as the number of households who had inherited their date palm trees increased (Table 6). Contrasting to the previous model, the number of dead date palm trees did not have a statistically significant association with the use of knowledge on pest control.

**Table 6**  
Variables influencing farmers' use of the acquired knowledge on pest control

Variable	Description	B	S.E.	Wald	Sig.P	Exp(B)
X <sub>1</sub> . Head of household's age (Dummy variable)	1if 18-60 years; 0 if otherwise	2.079	.534	15.157	.000	7.997
X <sub>2</sub> . Total number of date palm trees (HH)	Number	.004	.002	2.935	.087	1.004
X <sub>3</sub> . Source of learning (Dummy variable)	1 if Inherited; 0 if otherwise	-2.737	1.302	4.420	.036	.065
X <sub>4</sub> . Field assistant's visits to the farmer	1 if yes; 0 if otherwise	5.055	.859	34.611	.000	156.782
X <sub>5</sub> . Farmers' visits to DAED	1 if yes; 0 if otherwise	2.397	.949	6.381	.012	10.993
X <sub>6</sub> . Whether the date palm trees were mostly inherited (Dummy variable)	1 if Inherited; 0 if otherwise	-1.910	.970	3.878	.049	.148
X <sub>7</sub> . Dead date palm trees	Percentage of date palm trees	.032	.061	.283	.595	1.033
Constant		.436	1.417	.095	.758	1.546

Source: Field survey, 2012

The -2 log likelihood ratio (-2LL) for Nagelkerke R Square showed variances of 54% and 75% confirming the goodness of fit.

## **5. Discussion**

In line with the national agricultural extension policy, the Government of Balochistan provides agricultural extension services in all districts of the province. The primary objective of the extension is to enhance agricultural production through the development of farmers' knowledge and skills. However, any extension will be able to achieve the intended objectives only when the farmers find it useful for their specific circumstances and needs. The findings of this study revealed that slightly more than half of the surveyed date palm farmers perceived extension services related to land preparation and irrigation methods to be useful. During the field survey, farmers frequently mentioned that the infestation of their date palm trees with the *shera*g/Dubas bug (*Ommatissus lybicus*) was a serious problem. However, irrespective of type, the majority of all date farmers found the services aimed at controlling such pests not useful. While only a few farmers had used the irrigation method advised by the extension workers, the proportions of farmers using the knowledge on land preparation and pest control were substantially lower than the proportions of farmers who perceived these extensions to be useful. Several institutional and socioeconomic factors explained the variations in farmers' perceptions on the usefulness of extension services and use of knowledge.

### **5.1 Institutional factors influencing the usefulness and use of extension services**

As mentioned above, the Government of Balochistan has made extension services available specifically for the provision of knowledge on land preparation, irrigation methods and pest control. The results of the analysis revealed that most date farmers could not use the recommended irrigation methods (i.e., irrigating the farm more than one time) due to insufficient water being available because of poor maintenance of *Kariz* (indigenous underground sources of irrigation water) in particular as well as drought. However, the results of the analysis revealed that, despite the difficulty of access to the extension services as reflected in the extension workers' once-a-year visits to farmers in the majority of instances, the services provided had a significant positive influence on farmers' perceptions of both the usefulness and use of the services related to land preparation methods and pest control. Likewise, farmers' visits to DAED also had a significant influence on their perceptions of the usefulness and use of services related to land preparation and pest control. These are both theoretically and practically logical findings. According to the theoretical model of human attitude and behavior developed by Ajzen (2007), any human's behavior/action largely depends on their attitude, which is invariably influenced and shaped by their perception of the possible outcome of that behavior. The findings of our

analysis indicate that through direct interaction with farmers, the extension officials could help the farmers to understand the usefulness of their services related to land preparation or pest control in terms of increasing crop production. Besides receiving basic information on methods of land preparation and pest control, farmers could also discuss other matters pertinent to those methods with the extension officials. However, in the case of date farmers who could not meet the extension officials, it was obvious that the farmers could not know directly from the extension officials about the usefulness of those methods for increasing the production of their date palm. Therefore, the findings of the study show a tendency toward not considering extension services useful on the part of farmers who were neither visited by extension workers nor able to meet extension officers at DAED.

One very important and well known factor not included in the correlation analysis seeking to determine the variables which influence the perception of usefulness was the qualifications of, in particular, the field based extension workers, each of whom has to serve 1,000–2,000 farm households. The basic qualifications of almost all extension workers are the same—all of them have attended a basic three-year vocational program after passing a grade 10 exam. The extension workers as well as the officers at DAED confirmed that the program provided them with general knowledge on issues and possible solutions to problems related to the typical staple crops of Pakistan, such as wheat, paddy and cotton. They did not have any academic or practical exposure to special location specific crops such as date palm. Therefore, the extension workers could not provide much help to farmers in terms of solving their date palm production problems. Aware of this, many farmers mentioned during the field survey that the services provided by the extension workers were not useful. Some of the farmers even claimed that they were more knowledgeable than the extension workers and, therefore, they did not seek any advice from them.

What is interesting about the findings of this study is that while the majority of farmers found the knowledge on land preparation and pest control provided by the field level extension workers and officers at DAED useful, the proportion of farmers who actually used the knowledge acquired was lower in the case of both land preparation methods and pest control. This is a normal phenomenon because in heterogeneous socioeconomic situations, not everybody who considers any technology or method useful will necessarily apply that method. However, what became clear from the findings of the logistic regression analysis is that access to extension services, whether provided by field based extension workers or DAED based extension officers,



was instrumental in the application of the knowledge acquired by the farmers. This, as in the case of perceptions of the usefulness of extension services, was explained by the fact that farmers' direct contact with extension officials helped them to gain a detailed understanding of land preparation methods and pest control, which in turn motivated them to make use of that knowledge. In contrast, those who did not have such contact were not motivated to apply the recommended methods.

## **5.2 Socio-economic factors influencing the usefulness and use of extension services**

Besides the institutional factors discussed above, the findings of correlation and logistic regression analysis revealed that several socioeconomic factors had influenced farmers' perceptions of the usefulness and the use of knowledge transferred by extension officials. The typical socio-cultural settings of rural areas in Balochistan are dominated by males in general and, with regard to household matters including farming decisions, by household heads in particular. The perception and decision of any household's head was strongly representative of the entire household. Therefore, household head's characteristics, including age and education, were significant. With regard to perceptions of the usefulness of knowledge on land preparation and pest control acquired from extension officials, the 18-60 age group and households with literate heads perceived the knowledge to be useful. Thus, households with such heads also used the acquired knowledge on land preparation and pest control. As none of the household heads were below 18 years of age, those aged above 60, most of whom were illiterate as well, generally perceived that the knowledge gained from extension officials was not useful. Having been engaged in date palm farming for several decades and being aware that the extension workers did not have proper knowledge on date palm farming, household heads of this age group mentioned during the field survey that they were more knowledgeable than the extension workers. Therefore, they did not perceive the knowledge transferred by the extension workers to be useful, as reflected in the significant positive correlation between household heads in the 18–60 age group and perceptions of extension services related to both land preparation methods and pest control. Another possible reason might be that farmers aged above 60 years could not understand the methods and techniques well enough to be able to use those recommended practices and technology.

The education level of household heads also influenced perceptions of the usefulness of both land preparation methods and pest control-related extension services. The results of correlation analysis, which revealed a

significant positive correlation between household heads' levels of education and their perceptions of the usefulness of the services related to land preparation and pest control, indicate that the usefulness of the services was more appreciated by literate household heads, while illiterate household heads considered the services not useful. This might be partly attributed to the fact that the literate household heads by virtue of their basic education could gain a better comprehension of the methods and techniques explained by the extension officials. In contrast, the illiterate household heads found it difficult to understand those methods and techniques sufficiently well. Therefore, the extension services were not useful for them (World Bank, 2010; Umeta et al., 2011; Siddiqui and Mirani, 2012).

Regarding the use of knowledge on land preparation and pest control, once again the households whose head was in the age group of 18-60 years had a greater tendency to utilize the knowledge primarily for the reason that this group of household heads perceived related extension services useful (Table 5, 6). This tendency might have partly emanated from their positive perception of the usefulness of the knowledge and methods extended to them by extension officials as reflected in the significant positive correlation between this age group of household heads and their perceptions of the usefulness of the extension services (Table 3, 4). As explained above, such positive perceptions may have emanated from those household heads' ability to analyze and comprehend the explained methods and knowledge sufficiently well as, overall, they belonged to a relatively young age group. When the household heads considered the knowledge or methods pertinent to land preparation and pest control useful, this was a green light for other household members to apply the knowledge and methods.

Each farmer's percentage of dead palm trees was another factor significantly positively influencing their use of knowledge and methods on both land preparation and pest control. Reportedly, an average of 12% of the date palm trees in the study area were dying every year. As a result, the production of dates had declined by 65% over the last decade. According to the farmers, the trees were dying mainly due to *sherago* and mice infestations. The lack of proper management of land and trees were other causes of the death of trees. Being wary of such losses, there was a tendency among farmers who had incurred relatively heavy losses in terms of dead date palm trees to apply the land preparation and pest control methods recommended by extension officials so as to minimize further loss. However, group discussions held with farmers revealed that the methods and techniques recommended by the extension officials were not very effective as reflected in the continuingly high death rate of date palm trees. Date palm farmers mentioned that, in particular,

the field level extension workers did not have enough knowledge on how to control pests like *sherago* and mice, which, as mentioned above, was mainly attributed to the fact that the extension workers were not trained to deal with the date palm-specific problems such as pests and diseases (Siddique, 2006; PHDEB, 2008; Shah et al., 2011; El-Juhany L. I., 2011; Al-Sharafat et al., 2012).

While farmers inheriting the majority of their date palm trees did not significantly influence the use of the land preparation-related methods and techniques recommended by the extension officials, it did significantly negatively influence the use of methods and techniques related to pest control. This was explained by the fact that farmers who had inherited most trees from their fathers and forefathers were also knowledgeable about methods of pest control. In several instances, such farmers considered themselves more knowledgeable than the field based extension workers and their claims were reinforced by the fact that the spraying of the inorganic pesticides recommended by the extension workers provided little effective help in controlling the death of their date palm trees. The farmers as well as the extension officials mentioned that those pesticides had instead had a devastating effect on the pests' natural predators, such as birds, thereby accelerating the death rate of the trees. Therefore, there was a tendency among farmers who had inherited most of their date palm trees not to apply the pesticides or other methods recommended by the extension workers. Rather, they had a tendency to use their traditional methods to control the pests, although those methods were also not particularly effective. This finding is consistent with the findings of studies undertaken elsewhere (Riaz, 2010; Al-Sharafat, 2012; Benjamin, 2013).

## **6. Conclusion**

Small farmers in developing countries are confronted by several technical production constraints as in the case of date farmers in Balochistan. Therefore, the provision of an effective agricultural extension that can provide appropriate knowledge and technology is indispensable for enabling small-scale farmers to overcome particularly technical constraints of production. However, it should be noted that the use of any knowledge or technology is not merely "give and take". The use of any new knowledge or technology follows a gradual, incremental process (Rogers, 2003). First of all, farmers should have easy and frequent access to extension services that would provide them with opportunities to first listen to the concerned officials about what they have to do to solve their production related problems in an effective way. Only then would they be able to assess the usefulness of the services and after that,

if perceived useful, would they use that knowledge and technology. The results of our study indicate that access to extension services as reflected in extension officials' visits to date farmers and the farmers' visits to DAED can help the farmers a great deal in terms of assessing the usefulness and use of recommended knowledge and technology. Of course, the suitability of the services extended and the qualifications of concerned extension officials are also important. Our findings revealed that the highest proportion farmers availed extension services once a year. However, less than half of the farmers could make use of the acquired services related to land preparation and pest control. This is a great concern for the relevant organization/s. In the case of date palm production in Balochistan, the traditional blueprint for extension training focuses on staple crops of the country and, therefore, cannot help to address the inherent problems of date palm farming and enhance crop production as reflected in the high death rate of date palm trees and sharply declining crop production.

Learning lesson from these findings, the Department of Agriculture of Balochistan should first design several extension course packages suitable for location-specific special cash crops such as date palm, which is the economic mainstay of a substantial proportion of the province's rural population. This would require an adequate number of well qualified subject matter specialists particularly at the District Agricultural Extension Department. Of course, as highlighted in this study, the provision of an inadequate number of field based extension workers each of whom has to serve 1,000–1,200 households is not going to serve the purpose, even if the workers are well equipped with the required knowledge. Farmers' confidence in the recommended knowledge and technology can be improved by increasing the extension service officials' interaction with the farmers. This would first require the provision of an adequate number of extension workers. In view of the budgetary constraints, DAED might consider recruiting educated and intelligent date farmers as extension workers, thereby reducing the financial burden and enhancing the chance of the knowledge and technology being used by the farmers. The studies on agricultural extension conducted elsewhere have proven that farmer-to-farmer consultation can be very effective (GoP, 2005; World Bank, 2010; Umata et al., 2011; Mofakkarul-Islam et al., 2011; Lukuyu et al., 2012). Likewise, the Provincial Agricultural Extension Department needs to give up the age-old practice of requiring farmers to visit extension workers or DAED to secure extension services. Rather, in the pursuit of improving interaction between farmers and extension officials, the process should be reversed with the officials required to visit the farmers.

Since a considerable percentage of farm household heads are either illiterate or more than 60 years old, extension services will not be able to address production problems in an effective way as long as the needs of such farmers are ignored. Therefore, in view of the findings of this study, there should be more interaction between such group of farmers and extension officials as their old age and illiteracy mean that it takes time to convince them to apply new knowledge and technology even if they have proven benefits. However, learning lessons from the past, it should be ensured that any new knowledge or technology passed on to farmers is suitable for their specific crops and situations.

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