INFLUENCE OF PARTICIPATION IN AGRICULTURAL SUPPORT SERVICES ON INCOME FROM AGRICULTURE: RESULTS FROM THE MULTIPLE REGRESSION MODEL (A CASE FROM RURAL NORTHWEST PAKISTAN)

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ABSTRACT
The government of Pakistan, like those of other developing countries, is making efforts to provide different support services to the farmers. To increase production per unit area is important element of policy for agricultural development. To contribute to the sectoral goal of production maximization, the farmers must participate in different support services. This study exemplify rural northwest Pakistan, however the findings can principally be transferred to any agrarian economy in the developing countries. The effects of farmers participation in different support services on net income from agriculture was determined by using linear regression model. The results of the model show that participation in agricultural support services has significant influence on income from agriculture. The study concludes that for development of agriculture at the macro level, it is essential that provision of support services to the farmers should be given due importance in policy formulation so that they could properly benefit from them to increase their farm production and income level.

INTRODUCTION
Agriculture plays an important role in the economy of Pakistan as it remains the most important sector for employment and income generation. Pakistan’s rural sector accounts for almost 70% of employment, about two third of which is in agriculture, which provides over 60% of the export earning and 26% of the GDP (Federal Finance Minister, Govt of Pakistan 2002). Still production per unit area is low. The reasons for this low productivity, among others, are insufficient information available to the farmers about the outcomes of modern research, lack of knowledge about the use of new technology, capital shortage, and exposure to risks, etc. The low productivity on one hand and the expansion of off-farm sector on the other has reduced the relative importance of agriculture in Pakistan in general and in the North West Frontier Province (NWFP) in particular. People are moving from agriculture into non-farm employment sector. To compete with the rapidly dominating off-farm economy, measures are required on priority basis to develop agriculture sector so that farmers could get maximum output from their land

A smooth agricultural and rural development process demands for adequate participation of farmers in different agricultural support services. Support services to the farmers include agricultural credit, agricultural marketing, and agricultural extension. The government is keen to provide these services to the farmers. Besides, private sector organizations also play their role in providing support services to the farmers. The goal, thereby is to increase productivity and improve the living conditions of the farmers through increased income from agriculture.

Agricultural development implies shift from traditional to new science based methods of production. This includes adopting of new technology, developing new cropping patterns and developing new farming systems. For farmers to adopt new production technologies successfully, they need capital to finance the technology to provide it at farm and must learn how to use it correctly in their farming system (Manig, 1991:177). To finance the modern technology, the farmers, especially in the developing countries occasionally need credit. The credit sources available to the farmers are formal and informal credit institutions. Similarly, to employ the modern technology properly at farm, the farmers need to be properly trained in a way so that they could improve their land, prepare a suitable cropping pattern and to adopt the practices evolved through the latest scientific research in agriculture throughout the world. Thus, the farmers can improve their farm production.

Agriculture is the mainstay of living for farmers in rural areas. To earn cash income from their production, they need to provide their surplus produce to the market. The availability of the proper marketing infrastructure to the farmers is essential for deriving more income from the marketed products. To increase productivity through educating farmers to adopt new technology, to provide them resources to finance this new technology, and to provide them infrastructure to conveniently and properly market their farm products is essential for improving the economic conditions of the farmers.

Agricultural support services available to the farmers

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in the research area are agricultural credit, marketing, and extension services. The structure of credit, marketing, and extension organizations is discussed herewith.

**Structure of Extension Organization in NWFP**

In NWFP, like other provinces of Pakistan, extension services are the domain of the public sector. Besides, some NGOs, commercial companies, mass media organizations and farmers group are also providing these services. In NWFP, agricultural extension wing of the provincial agriculture department is the major extension services body. The Director General extension is responsible for managing and supervising extension activities in the whole province. At the lower end of the hierarchy are Field Assistants and Field Workers at the union council/village level. A Field Assistant / Field Worker are mostly responsible for making direct contacts with the farmers (Inayat, 2007:31).

The extension department is providing extension services to the farmers through a network of the trained extension field workers. The extension workers go to the farmers to disseminate outcomes of the modern agricultural research. In past, traditional extension system was functional in NWFP. In early 80s, Training & Visit system was launched in many areas of NWFP. However, after the demise of Training and Visit (T&V) system and less output of the traditional system, new extension approaches were introduced in the area. The farmers are now educated and trained through modern approaches such as Farmers Field School (FFS), Integrated Pest Management (IPM), Integrated Seed and Crop Management (ISCM) and different other participatory approaches.

**Structure of Financial Institutions in NWFP**

There are two types of financial institutions in the NWFP; formal and informal. Formal financial institutions defined as state and Agricultural Development Banks and other banking institutions, as well as member based MFI (Micro-finance Institutions). This group includes credit unions and cooperatives, group-based programme supported by government agencies or non-governmental organizations, village banks, and financial service associations. All other household financial transactions are within the informal sector (Zeller/Sharma 1998:26). The informal institutions include friends, relatives, neighbours, landlords, commission agents, and professional money lenders etc. (Chishti, 1988:137). The informal supply of credit is socially and functionally tied to the social and economic relations of both parties. No doubt that informal credit played an important role in the past but major part of this credit was utilized for non-productive purposes.

With time, the sources of institutional credit have expanded. The formal sources of institutional credit in Pakistan are Zarai Traqiati Bank Limited (ZTBL), other commercial banks and credit cooperatives. In the past few years, it has been observed that supply of agricultural loans by formal creditors has expanded. National Bank of Pakistan, for the first time, started a selective credit policy in 1972 and presently, almost 3000 branches of all commercial banks grant credit (Fiege in Manig 1988:55). The ZTBL generally grants medium-term loans (development loans) for procurement of the capacity effective inputs whereas commercial banks grant short-term loans (seasonal loans and production loans) in order to finance variable inputs. The credit programmes of the cooperative banks differ very little from those of the commercial banks and the ZTBL. In the supply of credit from the organized creditors, there are only minor differences with respect to the upper credit limits and the security demanded.

However, despite the fact that formal credit institutions have expanded the grant of credit to the farmers, still less than 10% farmers have access to adequate and affordable financial services (Manig 1990). Since formal credit is backed up by collateral in the form of landed property; majority of the small farmers who are credit worthy cannot benefit from institutional credit sources. Therefore, majority of the small farmers who wish to finance inputs and technology to derive more income from their land turn to the informal credit markets.

**Structure of Agriculture Markets in NWFP**

For the most important farm products in the area – gur, vegetables and fruits – five large wholesale markets exists in the main city of Peshawar (For average prices of different farm products in the area, please see annexure 1). All these markets are privately enterprises (Muessen in Manig 1988:80). The role of the government-marketing department is limited to collecting data on prices, its statistical evaluation and broadcast on media (radio). All other products such as milk, milk products, fodder etc., are sold directly to the consumers in the village or at Peshawar. There exists no formal market for marketing of cereals, which are supplied to the consumer either in the village or are directly sold to the dealers in Peshawar.

Before 90s, there was only one vegetable market in Peshawar. But due to the increasing volume of the
turnover, and the unhygienic situation prevailed in the relatively small vegetable market; the government established a new market outside the main city on the road to Yousaf Khel. This market spreads on a large area, which provides open spacious marketing environment to the producers. In both of these markets, there is a hold of several commission agents through whom the marketing contracts are made for vegetables (Inayat, 2007).

A number of commission agents also dominate Gur market. The difference between marketing relations of commission agents with producers at gur and vegetable markets is based on economic and social ties. The gur commission agents place more emphasis on personal and social relations whereas the commission agent’s relation with producers at vegetable markets is mostly based on financial terms.

There are two fruits markets in Peshawar called the ‘old fruitmandi’ and ‘new fruitmandi’. These two mandis (markets) are under the control of few commission agents who mediate large volume of fruits from/to other parts of the province. However, no local producers can be found in these markets. The conditions at both of these markets, especially the old one, are quite unhygienic and the space for a large number of small retailers at the auctions time is too small. Therefore, the over-crowding sometimes makes the business too difficult for the retailers (Bokeloh in Manig 1992:65-66).

The afore-mentioned services are available to the farmers in the research area who can benefit from them through their active participation. This study is based on the participation of farmers in these services and the influence of their participation on net income from agriculture.

**Tools for Data Collection**

Interview schedule was used for data collection. Both qualitative and quantitative data and information were collected by applying semi-structured interviews in addition with the field observations, group discussions, as well as other participatory methods. A standardized questionnaire was used to collect information from the farmers.

**Data Source and Sample Selection**

The primary data for research was collected during the actual field survey in these villages which was conducted from February 2005 to February 2006. A standardized questionnaire was used and information about the general characteristics of the households in six villages was collected. Information on credit and marketing products and extension services were of specific interest for this study. The total sample size across six villages was 120 households. From each village, 20 households were proportionately and randomly selected from different categories of the farm households. The randomized selection was executed by using SPSS.

**Analytical Techniques**

The data obtained was analyzed by using SPSS. To find results of the main question, regression analysis technique was used.

**RESULTS AND DISCUSSIONS**

The main author collected field data for his PhD dissertation at Georg-August University Goettingen, Germany. The same study was conducted in 1967-68 and then 1986-87 in the same villages by other research teams of PhD scholars and faculty members from the same university. The study was taken as follow-up of the previous studies; therefore, some fixed parameters were used including controlled selection of the sample size.

Farmers in the research area were asked about their participation in agricultural support services. Different farmers participated in different services at different levels. The cross-tabulation outcomes showing the frequency of farmers who participated in different support services are shown in table I. The table shows almost uniform distribution of farmers in all villages who participated in agricultural credit and agricultural marketing services. A total of 75 households (62.5%) were involved in procurement of credit whereas 83 households (69.2%) were involved in supplying one or more products to the market. Participation in the extension services was, however, too low and unsatisfactorily. Only 3 households (2.5%) reported that they benefit from visits paid by extension workers to them.

**MATERIAL AND METHODS**

The research was conducted in six selected villages of district Peshawar in North West Frontier Province (NWFP). The villages include, Dalazak, Kukar, Gulbela, Kochian, Mushtarzai and Yousaf Khel. All these villages lie in close vicinity of Peshawar and represent different socio-economic characteristics. Variations exist Considerable variations exist in the cropping pattern in all these villages. For instance, the main crop in Gulbela and Kochian is sugarcane, in Dalazak and Yousaf Khel are cereals and in Mushtarzai are vegetables. In Kukar, fodder is mostly produced as large number of livestock farmers inhabit in this village.
The participation of farmers in different agricultural support services was regressed against income of these households from agriculture to determine the influence of these services on their income from agriculture. The underlying hypothesis for the research was “more income from agriculture is a function of greater participation in agricultural support services”. It is hypothesized that a household having more participation in agricultural support services is more likely to use better resources at farm and will derive more income from agriculture than the households not participating. For the purpose of econometric analysis, the income from agriculture derived only in cash has been considered here. The farm products used for consumption, which are not easy to quantify in terms of money have been excluded from the net income.

However, it is important to mention here that most of the small farmers in the area produce for subsistence only. For them increase in production per unit area is important as their major consumption items are bread, vegetables and milk. Producing cereal, vegetables and milk on their own farm can provide them opportunity to save part of their food expenditure. Subsistence production can also have an influence on household income (as consumption expenditures are reduced to minimum or zero and the amount can be utilized for other purposes). However, due to a difficult and lengthy procedure of quantifying the household own consumption in monetary terms, subsistence production of a household has been excluded from the analysis.

**Multiple Regression Model**

Multiple regression analysis allows many observed factors to affect the dependent variable. The multiple linear regression model is used to study the relationship between a dependent variable and one or more independent variables.

The effect of participation in credit, marketing and extension services (independent variables) on a household’s net income from agriculture (dependent variable) were determined through regression model. Since we had more than one independent variables, therefore multiple linear regression model was used and a precise, deterministic relationship among variables on both side of the equation was expected.

The non-linear results through linear regression models can be obtained by applying the logarithm function as well. However, various logarithm forms of linear regression models have not been used here.

We know that the usual regression model is

\[ Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_p X_p + \mu \]

Where the estimated model is

\[ E(Y|X) = \hat{\beta}_0 + \hat{\beta}_1 X_1 + \hat{\beta}_2 X_2 + \ldots + \hat{\beta}_p X_p \]

Or the prediction

\[ \hat{Y} = \hat{E}(Y|X) = \hat{\beta}_0 + \hat{\beta}_1 X_1 + \hat{\beta}_2 X_2 + \ldots + \hat{\beta}_p X_p \]

**The Model Specification**

Variables used in the model include income from agriculture (dependant variable) and household participation in the credit, marketing and extension services (independent variables). A household having participation in all or at least one of these services is likely to have more income from agriculture than others. Participation in credit is hypothesized to have positive effect on income from agriculture because a household having more monetary capital can easily finance farm machinery and other inputs compared to a household with less or no capital. Similarly, farmers having participation in extension services can derive more income from land compared to others. They can use high yielding varieties and modern agricultural techniques at farm. Having knowledge of proper application of fertilizers and pesticides, they can obtain more production than those not participating. Similarly, participation in farm marketing is also hypothesized to have a significant influence on a household income from agriculture. Descriptive statistics of the variables used in the analysis are presented in table II.

**Results of Multiple Regression Model**

The influence of agricultural support services on a household’s income from agriculture were derived by using the following regression model.

\[ \hat{E}[Y|X] = \hat{\beta}_0 + \hat{\beta}_1 X_1 + \hat{\beta}_2 X_2 + \hat{\beta}_3 X_3 \] (2)

Where

\[ Y = \text{Net Income from Agriculture} \]
\[ X_1 = \text{Participation in Credit programme} \]
\[ X_2 = \text{Involved in Farm Marketing} \]
\[ X_3 = \text{Participation in Extension activities} \]

The results of the model used for determining income from agriculture are presented in table III. The table shows that participation in all types of support
services has positive effect on income from agriculture. The outcomes of participation in the credit services are significant at 10%. It has been observed that credit, especially those from the formal institutions is mostly used for agricultural purposes, such as financing machinery and inputs. Thereby, credit shows positive effect on a household income from agriculture.

Participation in extension services has highly significant influence on income from agriculture. However, it is important to mention here that the results of extension model could be misleading to some extent as the field data confirms that the positive response size was too low. Furthermore, the extension workers visited only well-off farmers who have more land and resultantly more income than others. Most effective result in this model is the influence of agricultural marketing on a household income from agriculture. The farmers frequently involved in marketing farm products are likely to have more income from agriculture and vice versa. As we used only cash income as dependent variable (and not the total income), therefore, the income of household is directly connected with the cash income via marketing.

Based on the results of the overall model, it is deduced that income from agriculture increases with more participation in the aforesaid services. This shows that more income from agriculture is a function of efficient utilization of resources at farm which is further a function of participating in different support services. Thus, the hypothesis that more income from agriculture is a function of participation in different farmers support services is hereby accepted. The results of the F- test confirms that the overall regression comes out to be highly significant.

**CONCLUSIONS AND RECOMMENDATIONS**

The purpose of the provision of support services to the farmers is to provide them physical environment for efficient utilization of their farm to increase production and to properly supply their products to the market to grasp maximum output. The ultimate purpose, thereby, is to increase their income from agriculture to improve their economic and social conditions. However, extended participation in support services improve the income and social conditions of the farmers on one hand, and on the other, increases their dependencies on other socio-economic systems and therefore their vulnerability.

Based on the findings of this study, it is concluded that agricultural support services have positive effects on income from agriculture. Participation in different support services, especially marketing and credit services, has shown increasing effect on income of the household. Credit, especially formal credit, is mostly utilized for farm purposes which in turn increase income from agricultural land. Similarly, households adopting modern agricultural practices and involved in marketing farm products derive more income from agriculture than others.

However, it has been observed that participation in support services is not possible to small farmers due to a variety of limitations. For examples, many potential farmers who need to finance agricultural implements and inputs through credit cannot do it simply because of the difficult pre-conditions of the formal credit institutions. Similarly, the extension workers do not normally visit the small farmers and majority of the farmers are left deprived from their services. The markets for farm produces are occupied by some permanent commission agents who control pricing and marketing mechanism throughout the marketing process.

Hence, it is recommended that the government should provide formal credit schemes to the farmers which are based on easy and flexible pre-requisite system. Alternate collateral system should be introduced instead of land so that small farmers could easily comply with the restriction of the credit institutions. The extension department needs to improve efficiency of the extension workers by providing them more trainings and developing a system of monitoring all activities of the field workers so that they feel forced to go to all farmers. Similarly, farmers can have more income from their produce if the number of markets for farm products increases.

If the opportunities to farmers increase to adequately participate in the farming support service, no doubt that agricultural production can increase to an optimal level in the area, which in turn can provide more income to the farmers from their farming efforts. As human nature, if the output from farming practices increases, the interest of the farmers in farming will certainly increase. This can have very significant result on the overall development of agriculture and socio-economic development of the farmers.
Table I  Frequency Distribution of Farmers Participating in Different Support Services

<table>
<thead>
<tr>
<th>Villages</th>
<th>Participated in Credit</th>
<th>Participated in Marketing</th>
<th>Participated in Extension</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes  No</td>
<td>Yes  No</td>
<td>Yes  No</td>
<td></td>
</tr>
<tr>
<td>Dalazak</td>
<td>11  9</td>
<td>14  6</td>
<td>0  20</td>
<td>20</td>
</tr>
<tr>
<td>Gulbela</td>
<td>9  11</td>
<td>17  3</td>
<td>2  18</td>
<td>20</td>
</tr>
<tr>
<td>Kochian</td>
<td>13  7</td>
<td>15  5</td>
<td>0  20</td>
<td>20</td>
</tr>
<tr>
<td>Kukar</td>
<td>13  7</td>
<td>11  9</td>
<td>1  19</td>
<td>20</td>
</tr>
<tr>
<td>Mushtarzai</td>
<td>15  5</td>
<td>16  4</td>
<td>0  20</td>
<td>20</td>
</tr>
<tr>
<td>Yousaf Khel</td>
<td>14  6</td>
<td>10  10</td>
<td>0  20</td>
<td>20</td>
</tr>
<tr>
<td>Total</td>
<td>75  45</td>
<td>83  37</td>
<td>3  117</td>
<td>120</td>
</tr>
</tbody>
</table>

Source: Field Data

Table II  Summary Statistic for the Variables used in Multiple Regression Model

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Mean</th>
<th>Std. Deviation.</th>
</tr>
</thead>
<tbody>
<tr>
<td>FCPLA</td>
<td>Participated in Credit Schemes</td>
<td>.13</td>
<td>.341</td>
</tr>
<tr>
<td>EXFVW</td>
<td>Received Extension Services</td>
<td>.10</td>
<td>.301</td>
</tr>
<tr>
<td>HACTM</td>
<td>Involved in Farm Marketing</td>
<td>.69</td>
<td>.464</td>
</tr>
<tr>
<td>NIFPAS</td>
<td>Income from Agriculture (in 1000s)</td>
<td>97.33</td>
<td>302.19</td>
</tr>
<tr>
<td>N</td>
<td>120</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Derived from Field Data

Table III  Influence of Agricultural Support Services on Income from Agriculture

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficients</th>
<th>Standard Errors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participated in Credit Schemes during the Last Year</td>
<td>926.67 *</td>
<td>557.85</td>
</tr>
<tr>
<td>Received Extension Services during the Last Year</td>
<td>467.59 ***</td>
<td>170.08</td>
</tr>
<tr>
<td>Involved in Farm Marketing during the Last Year</td>
<td>138.74 **</td>
<td>58.53</td>
</tr>
<tr>
<td>Constant</td>
<td>-676.19</td>
<td>643.17</td>
</tr>
<tr>
<td>F- Value</td>
<td>5.074</td>
<td></td>
</tr>
<tr>
<td>P- Value</td>
<td>0.002 ***</td>
<td></td>
</tr>
</tbody>
</table>

**[**][**] Significant at p=0.10 (0.05) [0.01]
Annexure 1  Average Price of Different Marketing Products in the Area

<table>
<thead>
<tr>
<th>No</th>
<th>Product</th>
<th>Price</th>
<th>No</th>
<th>Product</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(Mounds)</td>
<td>(Pak. Rs)</td>
<td></td>
<td>(Mounds)</td>
<td>(Pak. Rs)</td>
</tr>
<tr>
<td>1</td>
<td>Sugarcane</td>
<td>45</td>
<td>9</td>
<td>Tomato</td>
<td>500</td>
</tr>
<tr>
<td>2</td>
<td>Gur</td>
<td>1000</td>
<td>10</td>
<td>Okra</td>
<td>400</td>
</tr>
<tr>
<td>3</td>
<td>Milk (Seer)</td>
<td>25</td>
<td>11</td>
<td>Pea</td>
<td>800</td>
</tr>
<tr>
<td>4</td>
<td>Wheat</td>
<td>500</td>
<td>12</td>
<td>Pumpkin</td>
<td>500</td>
</tr>
<tr>
<td>5</td>
<td>Maize</td>
<td>400</td>
<td>13</td>
<td>Egg plant</td>
<td>500</td>
</tr>
<tr>
<td>6</td>
<td>Berseem (per Jareb)</td>
<td>6000</td>
<td>14</td>
<td>Cucumber</td>
<td>200</td>
</tr>
<tr>
<td>7</td>
<td>Maize /Jareb (Fodder)</td>
<td>4000</td>
<td>15</td>
<td>Fennel</td>
<td>1200</td>
</tr>
<tr>
<td>8</td>
<td>Reed (100 bundles)</td>
<td>450</td>
<td>16</td>
<td>French Bean</td>
<td>500</td>
</tr>
</tbody>
</table>

1 Jareb = 0.5 Acres  
Source: Field Data

REFERENCES


