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Farmer's Literacy Rate as Key Driver in Food Production and Food Security: An Empirical Appraisal from Punjab, Pakistan

Sana Iftikhar[1], Hina Amir[2], Zunaira Khadim[3], Kanwal Bilal[4]
[1]Department of Economics, National College of Business Administration & Economics (NCBA&E), Lahore; [2]Department of Management Sciences, COMSATS Institute of Information Technology Lahore, Pakistan; [3]Department of Management Sciences, COMSATS Institute of Information Technology Sahiwal, Pakistan; [4]Department of Energy Research Center, COMSATS Institute of Information Technology Lahore, Pakistan
*E-mail: hinaamir@ciitlahore.edu.pk

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Abstract

Farmer's education in rural areas is an essential element to get better agricultural productivity (Mellor, 1976). The main purpose of the study is to examine that the literacy rate is key determinant in every aspect of agricultural production (food production). Either it is land, irrigation, livestock, agricultural credit or agricultural labor; literacy rate is serving as key driver in agricultural production as well as in food security. For this purpose cross-sectional data of Punjab province of Pakistan is used. Desired data were collected from Food Insecurity Report 2009 (SDPI, SDC and World Food Program 2009), Punjab Development Statistics (Government of Punjab 2009) and Punjab Agricultural Census Report 2010 (Government of Pakistan, 2012). OLS model was used to find out the results and the results show that the farmer's literacy rate has positive and significance relationship with food security in both separate cases and overall contribution of all possible variables. Government should intervene in enhancing the educational programs for Farmers and play vital role in enhancing the farmer's literacy rate.

Keywords: farmer's literacy rate, food security, food production, rural resources, Punjab.

Introduction

The agriculture sector continues to play a dominant role in Pakistan economy. It is the second largest sector, accounting for over 21% of GDP, and remains by the largest employer, absorbing 45 % of the country's total labor force. Near the 62% of the country's total population resides in the rural areas, directly or indirectly linked with the agriculture for their live hood.

Food and Agriculture Organization (FAO), food security obtains when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life (FAO, 1996).

Education may boost farm productivity through refining the quality of labor; Education is thought to be most central to agricultural production in a rapidly changing economic environment and technology. Farmer's education in rural areas is an essential element to get better agricultural productivity (Mellor, 1976).

Agricultural production by size is very important for any agricultural economy, so to enhance the productivity it is important to adopt the new technology for production that more productivity will be yield with less time and farm area. This is only possible with the availability of the educated farmers. It is also believe that agricultural development is also very important with the development of industry both are important for any economy to survive in the fast growing

technology and improvement throughout the world. There is need to emphasis on high-yielding varieties of seeds, new inputs such as chemical fertilizers and pesticides, and irrigated water.

In advance agricultural technology farmer's education plays a very important role in enhancing agricultural productivity as compared to the traditional agriculture. As education has significant role in agriculture production which helps policy makers to forms such kind of strategies/policies which enhance farmer's education. (Schultz, 1964; 1975) also assumed that farmer's education is more effective in a modernizing environment.

There are several possibilities by which schooling may create economic benefits in rural areas. Households receive income in cash and in kind from farming and off-farm activities, wage employment, and remittances from migrants. Education may increase the probability of success in each of these endeavors and, in so doing, diversify household income sources to reduce risk and improve economic security.

As farmers in rural areas do not have the information about modern technology on how to produce food efficiently and economically. With the improving knowledge of new techniques and technologies dramatically increase the farmers' level of productivity (Rosegrant and Cline, 2003).

Increasing the sustainability of agricultural practices will ensure food security in years to come by preserving and rehabilitating the resources used to produce food, including soil and water.

With the increase in farmer's education, more productivity leads to alleviate poverty by increasing in the supply of food, also improve the situation of food security (Asfaw, 2010). Research in agricultural provide insight about the production according to area and technology, which technology is in the favor of which production (Lipton and Longhurst, 1989).

Objectives of the Study

The purpose of this study is to find out the impact of educated farmer on food security and productivity via different models.

- To see the impact of educated farmers on food security in the context of land utilization.
- To evaluate the impact of educated farmers on food security in water usage (irrigation).
- To find out the relationship of educated farmers with food security while examining the institutional agricultural credit.
- To analyze the effect of food security and farmers education while examining the role of livestock in enhancing food security and agricultural production.
- Also to observe the farmers education and food security with Agricultural labor.

This will provide an economic rationale for policy interventions to improve admission to schooling in rural areas.

Methodology

Methodology plays an extremely significant role in achieving the objectives of the study by illuminating various tools and techniques to be employed.

Study Area

Pakistan is mainly comprised of four different provinces including Punjab, Sindh, Baluchistan and Khyber Pakhtun Khaw, and Azad Jammu and Kashmir and Gilgit Balttatan Territories. However, Punjab is the biggest province; the territorial segregation of this province contains 36 districts along with 6 different agro-climatic regions/cropping zones in it. It is also comprised of about 80 % of Indus Basin area (Starkloff and Zaman, 1999) which is the most fertile

irrigated land in the country. Keeping in view these attribute of the Punjab is selected in this important study to achieve the objectives.

Data and Variables

Secondary data (Cross-sectional data) were collected from Food Insecurity Report 2009 (SDPI, SDC and World Food Program 2009), Punjab Development Statistics (Government of Punjab 2009) and Punjab Agricultural Census Report 2010 (Government of Pakistan, 2012). A number of variables were utilized to find out the desired outcomes. As per title of this work, data of many rural resources like Rural Population, Operational farm holdings (OPFH), Irrigated area (IA), Institutional agricultural credit (IAC), Tractors (TRAC), livestock population (LP), farmers' literacy rate (FLR), % food insecure population (FIP) etc.

Econometric Models

Multiple Linear Regression models were used to observe the changes in dependent variables in response to the fluctuations in independent variables under study. Moreover, Food Insecure Population (%) in all of the districts of the Punjab province was taken as dependent variable in multiple models in this study. In case of econometric models, we developed land, irrigation, livestock, agricultural credit and agricultural labor models separately, to check the impact of farmer's literacy rate on food security.

$$\text{Food Security} = \alpha + \beta_1\, OPFH + \beta_2\, LUI + \beta_3\, FF + \beta_4\, FLR + \beta_5\, CHEM \quad (1)$$
$$\text{Food Security} = \alpha + \beta_1\, IA + \beta_2\, OPFH + \beta_3\, MW + \beta_4\, FLR \quad (2)$$
$$\text{Food Security} = \alpha + \beta_1\, IAC + \beta_2\, OPFH + \beta_3\, CTI + \beta_4\, TRAC + \beta_5\, MW + \beta_6\, FLR \quad (3)$$
$$\text{Food Security} = \alpha + \beta_1 AL + \beta_2\, OPFH + \beta_3 FLR \quad (4)$$
$$\text{Food Security} = \alpha + \beta_1\, LP + \beta_2\, FWA + \beta_3\, OPFH + \beta_4\, FLR \quad (5)$$

Results and discussion

In order to determine the indicators which are significant to control the Food insecure population, regression analysis is applied in the following section which will minimize their sum square deviations. Through this, it can be identified how the increase in one unit of independent variables will affect the dependent variable of FIP. The auxiliary statistics provided with this regression are coefficient of determination R^2 which will tell the total contribution of independent variables, F test which will tell the joint significant of all the independent variables.

MODEL-1:

Table-1: Land and Food Security.

Dependent Variable = Food Insecure Population (%)		
Independent Variable	**Coefficient**	**P-Value**
(Constant)	108.656	0.047*
Operational Farm Holding	-74.652	0.053*
Land Use Intensity	0.139	0.731
Fragmented Farms	-0.540	0.177
Farmer's Literacy Rate	**-0.256**	**0.017***
Chemicals (Pesticides, Herbicides & Fertilizers)	-0.047	0.088*
R^2 = 0.368	**F = 3.26**	**Sig = 0.019**
*****10%significant level, **5% significant level, *1% significant level**		

The result shows that at 10 percent OPFH, FLR and CHEM have significant negative effect on the FIP. Out of these three OPFH has stronger impact, increase in 1 unit of operational farm holding decreases the Food insecure population by 74 units as it is the direct source of increase in the production. Also 1 unit increase in the farmer's literacy rate decreases the food insecure population by 0.256 percent. Whereas increase in one unit of chemicals applied to the farm will reduce the food insecure population by 0.04 units. Significant F test shows that these independent variables collectively are significantly affect the dependent variable. Our finding is similar to the (Kiani, 2008) which concluded negative but insignificant correlation between output per cultivated acre and farm size. There is not enough good relationship between corporate farming and food security (Abbasi, 2012).

MODEL-II:

Table-2: Irrigation and Food Security.

Dependent Variable = Food Insecure Population (%)		
Independent Variable	**Coefficient**	**P=Value**
(Constant)	91.096	0.001*
Irrigated Area (Gini-Coefficient)	44.787	0.141
Operational Farm Holding	-64.287	0.073*
Male Workers (%)	-0.356	0.047*
Farmer's Literacy Rate	-0.220	0.009*
R^2 = 0.429 F = 5.45 Sig = 0.0021		
***10%significant level, **5% significant level, *1% significant level**		

In this model OPFH, MW and FLR are negatively significant to affect FIP. Increase in 1 unit of OPFH is reducing FIP by 64 units, and increase in the male workers reduces the FIP by 0.356 units this is because male workers are primarily used in the farms for food production and increase in FLR by one unit will reduce the FIP by 0.22 units this is because literate farmer is more adoptable to latest production procedures. As compared to previous model R-square is higher showing that these set of variables are more capable to describe the deviations in the food insecure population. There is a significant level of increase in cultivated area irrigated by canal except in the NWFP whereas inequality in irrigated area by tubewell has increased in all provinces in 2000 (Haq, 2007).

MODEL-III:

Table-3: Agricultural Credit and Food Security.

Dependent Variable = Food Insecure Population (%)		
Independent Variable	**Coefficient**	**P-Value**
(Constant)	77.316	0.009
Institutional Agricultural Credit	-0.084	0.686
Operational Farm Holding	-29.197	0.349
Canal and Tubewell Irrigation	-0.067	0.119
Use of Tractors (%)	0.288	0.089***
Male Workers	-0.235	0.279
Farmer's Literacy Rate	-0.327	0.004*
R = 0.482 F = 4.20 Sig = 0.0041		
***10%significant level, **5% significant level, *1% significant level		

Institutional Agricultural credit consists on the Z.T.B.P, Commercial Banks, Financial Institutes and N.G.Os. Institutional agricultural credit has negative impact or food insecurity while positive impact on food security. The availability of institutional credit can also help us in facilitating the farm productivity enhancement which will lead to higher income and better living. (Jan and Khan, 2012) emphasized the need to involve the small common farmers in the comfortable credit distribution circle and in Pakistan Zarai Taraqiati Bank Limited (ZTBL) Banks is the biggest contributor in providing credit to farmers (Ahmed and Gill, 2007). Zuberi (1989), Qureshi and Shah (1992) also find out that Institutional agricultural credit has significant effect on food security.

MODEL-IV:

Table-4: Livestock and Food Security.

Dependent Variable = Food Insecure Population (%)		
Independent Variable	**Coefficient**	**P-Value**
(Constant)	82.645	0.006
Livestock Population	10.502	0.131
Farm Work Animals	-0.063	0.783
Operational Farm Holding	-45.612	0.169
Farmer's Literacy Rate	-0.221	0.016***
R = 0.348	**F = 3.89**	**Sig = 0.012**
***10%significant level, **5% significant level, *1% significant level		

Farmer's literacy rate showed positive significant effect on the food security, with 1 unit increase in livestock population there will be 10.5 units increase in the food security. Hence as expected literate farmer will have more awareness about new production techniques and methods to increase food output. Livestock population has positive relationship with food security. These findings are similar to the (Bashir, et al. 2012).

MODEL-V:

Table-5: Agricultural Labor and Food Security.

Dependent Variable = Food Insecure Population (%)		
Independent Variable	**Coefficient**	**P-Value**
(Constant)	106.76	0.000
Agricultural Labor	-0.366	0.045*
Operational Farm Holding	-39.510	0.213
Farmer's Literacy Rate	-0.220	0.010*
R = 0.384	**F = 6.24**	**Sig = 0.00**
***10%significant level, **5% significant level, *1% significant level		

Increase in the male permanent to casual workers can effect in the increase in the agricultural output as they are more aware of the farm working and pay more attention in the farm. All the included variables in the model are jointly significant, and Increase in the male labor in agriculture and farmer literacy leads to significant reduction in food insecurity by 0.3% and 0.2% respectively. Hence more male workers available for farming practice the more intensive work can be done efficiently and their education will help in their productivity.

Conclusions

Food insecurity being major cause of concern for the high population countries, this study is constricted to highlight what is the scenario of food related indicators for the districts of one of the most economically active province of Pakistan. it is describing the severity or prosperity of each district with respect to the indicator. So we will be able to see what is scenario of the poorest performing district as compared to the average performing district in terms of the dispersion of the variable. Post estimation analysis led this study to following conclusion.

- Farmers' Literacy rate came out to be most important variable in this study having negative impact on food insecurity. The results show that farmer's literacy rate in all the models has significant contribution, have expected sign in all the models.
- Farmer must enhance education access for the rural communities to increase literacy and consequently alleviate food insecurity.
- The regression analysis showed the importance of the efficient use of fertilizers and the literacy of the district. Which directs on the importance of education as it surely increases the awareness among farmers for timely use of fertilizers. Many farmers in Pakistan are stuck with the norms and they are reluctant toward acquiring agricultural credit and machinery for higher productivity and adopting, increase in literacy rate can help in countering this problem.

Moreover in order to tackle the food insecurity, individuals and government have to focus on many fronts as with the increase in population, the current 40% food insecure population of Punjab will be facing higher degree of problems for their survival. Agricultural departments of each district should urge the farmers to learn and adopt latest techniques, and the commercial banks should ensure that credit should only be provided to the neediest districts like Rajanpur which is most poor.

Recommendations

The analysis on farmers education on food security in this study reveals that there are some policy related factors which are root determinants for the higher agricultural production and hence higher food security, these factors include land available for cultivation, water available for irrigation, education level of farmers and credit available on time with which Agricultural output is very sensitive, disturbing them will lead to undernourishment of the food crop and hence lower productivity. The regression coefficients will direct the policy makes about what is the optimal combination of resources in terms of their importance for the food security. The benefits of education are well advocated in this study, hence Government should promote rural education so that future farmers are well educated who will be aware about new production techniques.

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