

Role of Advance Agri-Technologies in Reducing the Rural Poverty in Central Punjab, Pakistan

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Abstract

The study was conducted in the Central Punjab for the year 2009-10. The main objective was to find out some strategies to pick up small farmers from their poverty status. For this purpose, a sample of 300 respondents was taken from districts Jhang, Faisalabad and T.T Singh for final data collection. Seven strategies; enhanced level of urea application to cash crops (S1), the enhanced level of DAP to cash crops (S2), enhanced urea to cash crops plus livestock units (S3), addition of hybrid tomato plus livestock units (S4), enhanced DAP plus livestock units (S5) and addition of cut flowers plus livestock units (S6) were practiced through the LP Model. The objective values obtained through LP model with S1 to S3 strategies indicate that these have reduced the poverty gap up to 48%, 34% and 20%, respectively. While S4 and S5 both were successful but S5's impact was greater than S4. Through S6 the gap remained only 3.95 percent. Thus, the strategy of addition of short duration crops like hybrid tomato and productive live stock units were the agri-enterprises and their combination can reduce the small farmer's poverty successfully.

Keywords: Advanced agri-technologies; rural poverty; Punjab

JEL classification: Q12, Q14, Q16

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I. Introduction

Agriculture is a major contributor to the Punjab's economy, accounting for roughly 28 percent of its output and providing employment to over 40 percent of the work force. The performance of the sector is therefore crucial to any strategy for generating higher incomes. (Punjab Economic Report March 2005)

Successive governments in Pakistan have taken numerous policy initiatives to alleviate poverty, yet the latter has continued to increase. The International Fund for Agricultural Development's Rural Poverty Report 2011 says that poverty is widespread in Pakistan and is pre dominant in the rural areas, holding that "nearly 80 per cent of the country's poor people live in rural parts of the country".

Agriculture is the heart of the rural economy. The sector is not just a source of food but also foreign exchange earnings and has done well in the past few years. Nevertheless, small landholders and landless peasants, whose work makes the country produce a surplus of grain, live in abject poverty. The basic reason is being the unequal land distribution, particularly in Sindh. Whether in power or out of it, it is this class that less benefits from governmental subsidy policies, could not extension services and most importantly, has access to water. The powerful farmers bring their entire holding under cultivation by usurping the water rights of small farmers and tail-enders.

Improving the lot of the rural poor would involve focusing on increasing yields per acre, generating self-employment activities and encouraging industrialization. There is a need to search for alternate sources of income, preferably indigenous ones to which rural people are familiar. Of these, the most common is livestock farming. Animal rearing is traditional in rural societies.

Despite all these positive indicators, the livestock sector has been neglected. Small farmers, who contribute about 80 per cent of the milk production, have never been given a priority with successive governments. Assistance and the extension of services have remained restricted to big farmers.

1.1. Objectives of study

Keeping in view the presence of masses in poverty in rural areas following were the main objectives of this study.

- i) To identify the proportion of poor and non poor among the small farming community in rural areas.
- ii) To identify different strategies that can help reduce the rural farmer's poverty.
- iii) Based on study findings, the suggestions and recommendations to reduce the rural poverty.

II. Review of Literature

Kemal (1995) focused on evaluation of public strategies and policies for poverty alleviation. He explained four mechanisms to reduce poverty. First was the introduction of new technologies and promotion of large or small – scale firms. Second, the taxation policy should be reasonable. Third, the poor members of society should get more opportunities so that income equality among households should be improved.

Malik (1996) used micro survey data from a Punjab village and considered a large number of rural and household specific variables besides land holding in an attempt to determine their role in raising levels of living of rural masses and subsequently to alleviate rural poverty.

Ali and Tahir (1999): developed three consistent time series on rural, urban, and total poverty that covers all Household Expenditure. They highlighted the econometric problems in using the survey data in conjunction with aggregate data on poverty and income to derive the conclusions. Their study provided a conceptual framework for the analysis of growth, poverty. They provided long-run elasticity of poverty with respect to growth and inequality which are useful for policy purposes. They concluded that systematic analysis of Growth has always helped in poverty reduction.

Ali and Abdullah (2002) concluded that enhanced vegetable production and consumption in Asia can play a catalytic role in the overall economic development by improving the nutritional status, learning capabilities and managerial capacities of farmers, generating incomes and jobs in both farms and non-farms sectors. It will also enhance resource use efficiency in Agri sector.

Datt and Ravallion (2002) in their article “Growth and redistribution components of changes in poverty measures” concluded that how changes in poverty measures can be decomposed into growth and redistribution components in Brazil and India during the 1980s. According to them the

redistribution alleviated poverty in India, though growth was quantitatively more important. They further commented that improved distribution countervailed the adverse effect of monsoon failure in the late 1980s on rural poverty.

Chaudhry et al. (2005) conducted a study on the correlates and profile of poverty in the areas of Cholistan in Southern Punjab. They empirically analyzed and concluded that Cholistan land should be distributed based on equality, improvement in livestock sector, improvement in socio-economic and demographic variables are considered for reduction in poverty in remote areas of Pakistan like Cholistan.

Chaudhry et al. (2006) also conducted a study on urban poverty alleviation through good governance in southern Punjab. They identified that good governance of economic infrastructural facilities among others will alleviate poverty in urban areas of south Punjab based on the results of a household survey data.

Chaudhry (2009) investigated the factors affecting rural poverty using Logit regression modeling based on primary source of data in the project area of Asian Development Bank. He proved that the rural poverty can be alleviated by lowering the household size, persons per room and dependency ratio, improving education, more female labor force participation, higher household participation rate, improving assets and household's access to market especially in remote areas. He suggested to the government to pay special attention to basic infrastructure and market access facilities beside some other socio-economic and demographic variables to alleviate rural poverty in remote areas of Pakistan.

Apata1 et al (2010) Accessed to micro-credit, education, participation in agricultural seminars, livestock assets and extension services significantly reduce chronic poverty among rural households in Nigeria. On the other hand, female headed households and households located far away from local markets have a high probability of staying below chronic poverty line. However, gender disparities in property rights has a consequence on poverty, as women empowerment through legal rights to property as key chronic poverty ameliorating factors among the farming communities.

III. Methodology

The main thrust of this study was the rural area of the three districts, namely Faisalabad, Jhang, and T.T.Singh of Central Punjab. The main idea behind the study

was to identify the different enterprises or some mix of them with the help of which rural farming community income could be increased, leading to poverty reduction. For this purpose some strategies were identified and practiced through L-P model.

Their strategies included:

- i) Application of enhanced level of urea fertilizer to cash crops (S1)
- ii) Application of enhanced level of DAP to cash crops. (S2)
- iii) Enhanced urea to crops + Livestock units (S3)
- iv) Addition of Hybrid Tomato + Livestock units (S-4)
- v) Addition of cut flower + Livestock units(S-5)
- vi) Enhanced DAP + Livestock units (S-6)

These were the strategies which were practiced along with the base model. The base model was estimated through existing set up of the farmer's crops and livestock settings. For this purpose small farmer net income was estimated through Farm budgeting Technique. Through this techniques farm gross income was estimated by adding all the income from different sources. i.e. crops, livestock and off farm income. Similarly farm cost of production of crops and livestock at their farms was also estimated. The net income was estimated by deducting farm cost from their respective gross income. After estimating the farm net income, per capital income per annum was estimated. Then it was compared with national poverty of Rs. 1375. In this way poor were identified from non- poor class of rural community sampled in this study.

After identifying the poor, a base model objective value estimated through Linear Programming model, was obtained. Linear programming model approach is the approach which is commonly used to get the maximum objective value of the function facing some constraints. In this case the major constraints were the availability of land, Urea, DAP, irrigation water and livestock animals.

3.1. Linear Programming Model

Mathematical Form of LP model

$$\begin{aligned}
 & \text{Maximize} && \sum_{j=1}^n g_j y_j + \sum_{i=1}^m h_i s_i \\
 & \text{Subject to} && \sum_{j=1}^n a_{ij} y_j + f_i s_i \leq c_i \quad , \quad 1 \leq j \leq n \\
 & && e_j y_j + \sum_{i=1}^m a_{ij} y_j \leq d_j \quad , \quad 1 \leq i \leq m \\
 & && y_j \geq 0 \quad , \quad s_i \geq 0
 \end{aligned}$$

Note that we assume in our calculations steps that the program is in standard form. However, any linear program may be transformed to standard form and it is therefore not a limiting factor

The strategies which were practiced to boost up the net income of the poor respondents belonging to the area of Faisalabad, Jhang & TTS were:

- a. Base Model (BM) – Existing cropping pattern of Crops + Livestock – objective value.
- b. BM + S1 ----- Objective value
- c. BM + S2 ----- Objective value
- d. BM+ S3----- Objective value
- e. BM+ S4----- Objective value
- f. BM+ S5----- Objective value
- g. BM+ S6----- Objective value

The Results obtained through such analysis helped to identify the strategy which was the most powerful in reducing the poverty of poors class of rural areas.

IV. Results and Discussion

The data collected through personal survey of the areas of central Punjab was analyzed by using linear programming through Solver in Excel. Some basic descriptive obtained through Excel were:

Table: 1. Poverty Estimation through Head Count Index

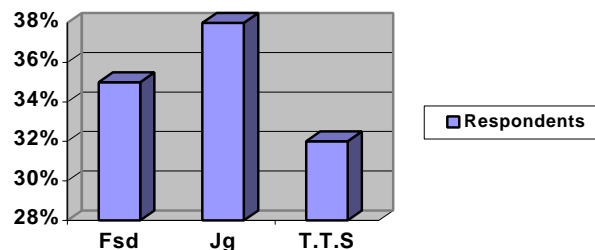
Description	Faisalabad	Jhang	T. T. Sing	Overall
Poor (%)	35	38	32	35
Non Poor (%)	65	62	68	65

The data given in table-1 demonstrated the poverty estimate made through H.C. Index.

$$H.C.I = \frac{P_N}{T_P}$$

Where P_N = No. of the Poor identified
 T_P = Total Population (sample)

It indicates that majority of the respondents (38%) was poor in district Jhang, in Faisalabad 35% and in District Toba Tek Singh only 32% of the total respondents were found poor. Overall in the central Punjab 35% respondents were poor.

Fig: 1. Poor porportion in different districts of Central Punjab

The application of different strategies and their impact on their net income of small farmers in different districts of central Punjab was practiced and the results so drawn are depicted in the following table:

Table: 2. Threshold level of income and gap between poor farmers' income in central Punjab

Description	Faisalabad	Jhang	T.T.Sing	Overall
Total Family Size (No)	6.27	7.52	5.32	6.37
Threshold income based on poverty level Rs.1375/-P.M*	107385	124080	87780	105215
Existing income from Crops+ Live Stock (Rs)	42642	47461	37526	42339
Poverty GAP	-60.29	-61.75	-57.25	-59.76

*Poverty line-Estimated through trend analysis based on Poverty lines from 1998-2006, Economic Survey of Pakistan 2009-10.

The data given in table-2 depicts the threshold level of income depending upon their respective family structure and income being generated through their existing crops and livestock sectors. In all the districts, about 60% gap was formed between their threshold and existing income. To reduce this gap, different strategies were practiced through LP model and their impact was recorded.

Table: 3. LP-Model objective values through the application of different strategies in central Punjab

Description	Faisalabad	Jhang	T.T.Sing	Overall
Base Model (Rs.)	42642	47461	37526	42339
BM + S ₁ (Rs.)	55670	58470	42905	52348
BM + S ₂ (Rs.)	70540	65290	52410	62747
BM + S ₃ (Rs.)	85285	79992	75872	80383
BM + S ₄ (Rs.)	110214	142410	90570	111398
BM + S ₅ (Rs.)	108205	112640	88907	103250
BM + S ₆ (Rs.)	99207	105409	86411	101058

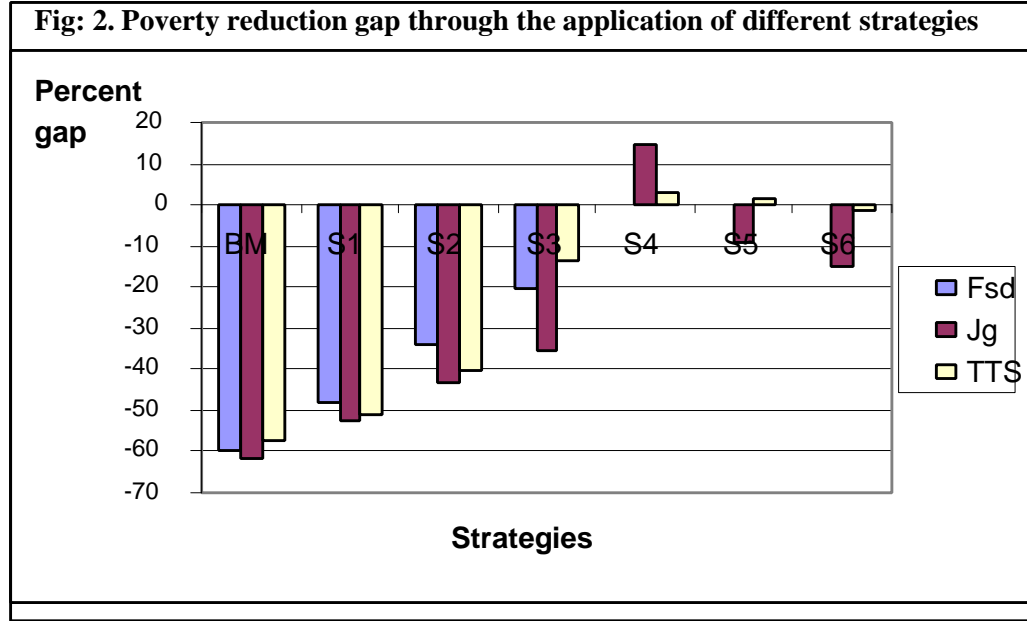
Results given in table 3 reveal that all the strategies had positive impact on the net income of respondents in all the districts. The BM+S₁ Scenario picked up the poor but not out of the poverty status. Similarly, BM+S₂ also reduced the gap up.

Table: 4. Gap reduction through the application of different poverty reducing strategies

Scenarios	Faisalabad	Jhang	T.T.Sing	Overall
Threshold	107385	124080	87780	105215
Base Model	-60	-61.74	-57.24	-59.76
Scenario 1	-48	-52.57	-51.12	-50.24
Scenario 2	-34	-43.38	-40.29	-40.36
Scenario 3	-20.5	-35.53	-13.56	-23.60
Scenario 4	+0.02	14.77	3.18	5.87
Scenario 5	+0.07	-9.0	1.28	-1.86
Scenario 6	-0.07	-15.04	-1.55	-3.95

Data statistics given in table-4 show the impact of different strategies in the improvement of income by reducing gap between threshold level of income and farm income. Base model results revealed that almost there was a gap of about 60% between income being earned by poor farmers and their threshold level of income. When with the base model enhanced level of Urea was applied to cash crops, their net income increased and consequently objective value of function obtained through LP model also increased. It reduced the gap up to 50% but was not satisfactory.

Scenario S₂ reduced the gap up to 40% and S₃ up to 23% while S₄ after filling the gap picked the poor out of poverty. Similarly S₅ almost filled the gap. The whole mechanism has been elaborated in the figure below:



V. Conclusions

These study findings conclude that about more than 35% rural farmers were poor and with addition of poverty reducing strategies they could improve their income. The addition of hybrid tomato along with livestock to the base model was a successful strategy in reducing the poverty of small farmers. Moreover, addition of cut-flower was also another strategy that could pick the poor farmers out of poverty. These findings are also consistent with Mandere et al. (2011).

Based on study conclusions it is recommended that poor farmers poverty could be eliminated through the maintenance of crops especially short duration crops, like hybrid tomato along with livestock productive unit. The cultivation of cut-flower at small farms was also another strong innovation. It can also benefit to the farmers living in pre-urban areas.

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