

FACTORS AFFECTING FARM DIVERSIFICATION IN RICE-WHEAT

Muhammad Ashfaq, Sarfraz Hassan, Muhammad Zeeshan Naseer, Irfan Ahmad Baig
and Javeria Asma

Department of Agricultural Economics, University of Agriculture, Faisalabad

The risk in agriculture sector is due to various factors like weather and market conditions, particularly the demand of the commodities. This uncertainty can result in variable returns (farm income) to the decisions that farmers make in a particular season. Diversification is a frequently used risk management strategy that involves participation in more than one activity. It has the added advantage of mitigating price risk as well as fluctuations in outputs. The main purpose of this paper was to determine the factors affecting crop diversification. For determining the effect of different factors on diversification a multiple regression model was used. The values of Entropy index computed for measuring horizontal diversification were taken as dependent variable and different factors affecting diversification were taken as independent variables. The results showed that the main factors affecting diversification were size of land holding, age of respondent, education level of respondent, farming experience of respondent, off farm income of respondent, distance of farm from main road, distance of farm from main market and farm machinery.

Keywords: Diversification, factors affecting, rice-wheat rotation

INTRODUCTION

Agriculture is a risky business because it deals with uncertain factors such as weather and market conditions. This uncertainty can result in variable returns to the decisions that farmers make in a particular season. Therefore, farm income variability is a problem which farming households have to deal with. In Pakistan crop sector is also facing problems and crop income is subject to variations during the previous years. Table 1 given below shows that the production of the four major crops have been subject to great variability during the previous five years. So the farm income has also been fluctuating in these years.

Table 1. Production of major crops (000 Tonns)

Year	Wheat	Rice	Sugarcane
2003-04	19500	4848	53419
2004-05	21612 (10)	5025 (3.6)	47244 (-11.5)
2005-06	21277 (-1.5)	5547 (10.3)	44666 (-5.4)
2006-07	23295 (9.4)	5438 (-1.9)	54742 (22.5)
2007-08	21749 (-6.6)	5563 (2.3)	63920 (16.7)

Figures in parenthesis show the percentage change from last period
(Source: Govt. of Pakistan, 2008)

Enterprise diversification is one method of reducing farm income variability. Diversification reflects a change in business activities based on the flexible and differentiated response to changing opportunities created by new production technology or markets signals. More specifically, Pingali and Rosegrant (1995) defined diversification as "change in product (or enterprise) choice and input use decisions based on market forces and the principles of profit maximization".

There are two different aspects of diversification. One is to plan under an assumption of perfect knowledge and the second is to minimize the variance of an outcome by attempting to put a floor under the income level or by preventing the occurrence of undesirable outcomes (Dorsey, 1999). Farmers and farm managers, faced price and yield variability, may wish to select a combination of enterprises that reduce the variability of farm income (Mishra and El-Osta, 2002). Diversification is a frequently used risk management strategy that involves participating in more than one activity. It has the added advantage of mitigating price risk as well as fluctuations in outputs. The advantages of engaging in different production systems at the farm level depends upon the level of within-farm heterogeneity in soil and land resources, biological and economic factors, the extent of the sustainability effects, and the gains in fuller utilization of resources in the diversified production system. Such diversification may be constrained by the skill requirement to manage diverse entrepreneurs (Jill and Erin, 2005). Situations in which rational decision making under an unbiased public policy scenario for different crops and enterprises, taking into account various constraints and opportunities, leads to specialization in certain crops or processing activities at the farm level fall within our conceptual definition of diversification. However, diversification at the community level is likely to result in the diversity of enterprise due to within-community heterogeneity regarding resource distribution and synergies from complementary coexistence of multiple agricultural enterprises, including crop, livestock, fisheries, farm forestry, and horticulture.

Crop diversification intends to give a wider choice in the production of a variety of crops in a given area so as to expand production related activities on various crops and also to lessen risk (Imbs and Wacziarg, 2003). Crop diversification is generally viewed as a shift from traditionally grown less remunerative crops to more remunerative crops. The diversification also takes place due to governmental policies and thrust on some crops over a given time. Market infrastructure development and certain other price related supports also induce crop shift. Often low volume high-value crops like spices and medicinal herbs also aid in crop diversification. Higher profitability and stability in production also induce crop diversification, for example sugarcane replacing rice and wheat. Crop diversification and also the growing of large number of crops are practiced in rainfed lands to reduce the risk factor of crop failures due to drought or less rain. Crop substitution and shift are also taking place in the areas with distinct soil problems. There are several advantages of crop diversification (Behera *et al.* 2007, Mehta, 2005), which could be listed as follows:

- Comparatively high net return from crops.
- Higher net returns per unit of labour.
- Optimization of resource use.
- Higher land utilization efficiency.
- Increased job opportunities

The advantages of diversification to the individual farmer are numerous and are such as to recommend as a policy to most farmers; however the extent of these advantages is conditioned by the number of farmers attempting to secure themselves. Obviously if any considerable portion of the total number of farmers made similar changes, the price advantage of the particular product would quickly disappear as a result of an increased supply of that product. Consequently, greater diversification practiced by a few farmers presents opportunities for them, but greater diversification practiced by all or even a majority of all farmers is an entirely different matter. In other words, greater diversification as a policy to be followed by individual farmers is an entirely different matter from an attempt to improve agricultural conditions in general by greater diversification as a national policy applied to the aggregate agricultural production of the nation.

Despite the frequent observations that diversification plays an important role in agriculture, there are only a few empirical studies on the factors that affect diversification. The main purpose of this paper was to determine the factors affecting crop diversification. Methodology of the paper is discussed in part II. Results are given in part III. Conclusions are given in part IV followed by recommendations in part V.

METHODOLOGY

Primary data was collected from two districts of Punjab (Distt. Sheikhpura & Nankana Sahib), having irrigated agriculture system.

Out of each district two tehsils were selected and then from each tehsil two villages were selected. Villages were selected on the basis of their distance from main road and main market i.e. from each tehsil one village near market and other away from market. From district Nankana Sahib two tehsils i.e. Shahkot and Safdarabad were selected, from tehsil Shahkot two villages Muhammad pura Chak No. 174/R.B and Walipur Bora Chak No. 175/R.B and from tehsil Safdarabad two villages Abdullapur Kolar Chak No. 282/R.B and Gilwala Chak No. 170/R.B were selected. Then from district Sheikhpura two tehsils i.e. Muridkay and Ferozwala were selected, from tehsil Muridkay two villages Chak No. 29/U.C and Khanna Labhana and from tehsil Ferozwala two villages i.e. Pindi Ratan Singh and Chak No. 26/U.C were selected. The sample size for the study was 200 respondents i.e. 100 farmers from each district, 50 from each tehsil and 25 from each village.

Farm diversification was measured by using Entropy index (Pope and Prescott, 1980). An Entropy measure of farm diversification considers the number of enterprises a farm participates in and relative importance of each enterprise to the farm. The Entropy index spans a continuous range from 0 to 1. The value of index for a completely specialized farm producing one crop is 0. A completely diversified farm with equal shares of each crop has an entropy index of 1. The minimum and maximum computed values of entropy index were 0 and 0.45, respectively.

For determining the effect of different factors on diversification a multiple regression model was used. The values of Entropy index computed for measuring horizontal diversification were taken as dependent variable and different factors affecting diversification were taken as independent variables. The following econometric model was used to analyze the data.

$$D(\text{index}) = \beta_0 + \beta_1 \text{ Hold} + \beta_2 \text{ Age} + \beta_3 \text{ Edu} + \beta_4 \text{ Exp} + \beta_5 \text{ Off-Income} + \beta_6 \text{ D- Road} + \beta_7 \text{ D- Market} + \beta_8 \text{ DT} + \epsilon$$

Where,

- D (index) = Value of diversification index
 Hold = Land holding of the respondent (Acres)
 Age = Age of the respondent (Years)
 Edu = Education level of the respondent (Years)
 Exp = Farming experience of the respondent (Years)
 Off-income = Off farm income of the respondent (Rs.)

Factors affecting farm diversification

D- Road = Distance of farm from main road (Km)
 D- Market = Distance of farm from main market (Km)
 DT = Dummy for farm machinery i.e. Tractor
 (If respondent has tractor then 1 otherwise 0)
 β_0 = Intercept
 $\beta_1- \beta_8$ = Coefficients to be estimated
 ϵ = Error term

educated farmers are more likely to diversify as compared to less educated and illiterate farmers.

The results reveal that the coefficient of farming experience of the farmers is positively related to farm diversification and it is non significant. It means that experienced farmers more likely to diversify as compared to less experienced farmers, this result is also consistent with the finding of Pope and Prescott (1980). The coefficient for off farm income is inversely related to farm diversification and it is non significant. Because of low farm income and better off farm income opportunities, farm operators pay less attention to farming and diversification ultimately (Katchova, 2005).

The coefficient for distance of farm from main road is inversely related to diversification and significant at 95 percent confidence level. The coefficient for distance of

RESULTS AND DISCUSSIONS

Results of the multivariate regression model have been presented in Table 2. The F-value is 4.564 and was found overall significant. R² value is 0.18 which was sufficient keeping in view the nature of the data used in the model. Tests of auto-correlation and heteroscedasticity showed that model is free from these problems.

Table 2. Factors affecting diversification

	Coefficients	t- Stat	Sig.
Intercept	0.38386	7.00	0.00
Holding size	0.001369*	2.08	0.03
Age	- 0.00262	- 1.61	0.10
Education	0.00501*	2.23	0.02
Farming experience	0.00303	1.80	0.07
Off farm income	- 1.4185	- 1.17	0.24
Distance of farm from main road	- 0.02050*	- 2.24	0.02
Distance of farm from main market	- 0.00084	- 0.59	0.55
Dummy for Farm machinery (Tractor)	0.03854*	2.02	0.04

F-value = 4.564, R² = 0.18

*Significant at 95 percent confidence level

**Significant at 99 percent confidence level

It is evident from results that holding size is positively related to diversification (E Index), an increase in holding size increases the diversification and it is significant at 95 percent confidence level. It shows that diversification is more common among large farmers as compared to small and medium farmers, because large farmers have more land resources to divide among various crops and pay more attention to farming than any other off farm enterprise. The results are consistent with Summer and Wolf (2000).

The coefficient of age is negative and non significant. It means that older farmers are less likely to be diversified as compared to young farmers. This result is also consistent with the findings of other studies like Mishra and El-Osta (2002). The reason is that older farmers cannot manage farm properly and usually stick with old farming practices. The coefficient of education is positively related to diversification and it is significant at 95 percent confidence level. Results show that

farm from main market is also negative but non significant. It means that farms near main roads and main markets are more diversified as compared to those which are away, because it provides better opportunity to the farmers to market their farm produce. The coefficient for farm machinery (tractor) is positively related to diversification but it is non significant. It shows that farmers, which have tractors, are more likely to diversify, because they can properly perform different farming operations on time and can market their produce easily, therefore they are more likely to diversify.

CONCLUSION

This study identified the effect of different factors on diversification; all the results were according to “a priori” expectations. The main factors affecting diversification were land holding, age of respondent,

education level of respondent, farming experience of respondent, off farm income of respondent, distance of farm from main road, distance of farm from main market and farm machinery. The coefficients of holding size, education, farming experience and farm machinery were positively related with diversification that means if these variables increase diversification also increases. While the coefficients of age, off farm income, distance of farm from main road and distance of farm from main market were inversely related to diversification, which shows that as these coefficients increase diversification decreases.

RECOMMENDATIONS

Crop diversification is found as a good tool of farmers for avoiding risks and to ensure a sustainable level farm income. In order to promote diversification among farmers, it is suggested that:

1. Farm machinery should be provided through easy loan schemes especially to farmers operating in groups.
2. Farmers cooperatives working on the self help principles should be promoted through capacity building of the farmers.
3. Infrastructure like farm to market roads and access to markets can play positive role in enhancing diversification among farmers.
4. Farm markets should be made farmer's friendly.

REFERENCES

Behera, U.K., A.R. Sharma and I.C. Mahapatra. 2007. Crop diversification for efficient resource management in India: Problems, prospects and policy. *Journal of Sustainable Agriculture*, 30(3):97-127.

- Dorsey, B. 1999. Agricultural intensification, diversification and commercial production among smallholder coffee growers in Central Kenya. *Economic Geography* 75(2): 178-195.
- Imbs, J. and R. Wacziarg. 2003. Stages of diversification. *The American Economic Review* 93(1): 63-86.
- Government of Pakistan. 2008. Economic Survey of Pakistan 2007-08. Economic Advisor Wing, Finance Division, Islamabad, Pakistan.
- Jill, L.C. and O.S. Erin. 2005. Land use and income diversification: Comparing traditional and colonist populations in the Brazilian Amazon. *Agricultural Economics*, 32(3): 221-237.
- Katchova, A. 2005. The farm diversification discount. *American Journal of Agricultural Economics*, 87(4): 984-994.
- Mehta, R. 2005. An analysis of crop diversification. National Conference on Agriculture for Kharief Campaign-2005, 22-23 March, New Delhi, India
- Mishra, A. and H. El-Osta. 2002. Risk management through enterprise diversification: A farm level analysis. Paper presented at AAEA meetings in Long Beach, CA, U.S.A. July 28-31.
- Pingali, P. and M. Rosegrant. 1995. Agricultural commercialization and diversification: processes and policies. *Food Policy*, 20(3): 171-185.
- Pope, R.D. and R. Prescott. 1980. Diversification in relation to farm size and other socio- economic characteristics. *American Journal of Agricultural Economics*, 62(3): 554-559.
- Summer, D.A. and C.A. Wolf. 2000. Diversification, vertical integration and regional patterns of dairy farm size. *Review of Agricultural Economics*, 24(2): 442- 457.