**Determinants of Output and Input Market Orientation and Its Effect on Agricultural Production**

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1. **Introduction**

Many developing countries in Asia have agricultural based economy. The evidence shows that a 1% growth in per capita agricultural gross domestic product (GDP) in developing countries leads to 1.61% increase in per capita income of the bottom quintile of the population, whereas a similar 1% growth in industrial GDP increases the income of the poor by 1.16% (Timmer, 1997, cited by Norton, 2004). Thus, agricultural development is indispensible to reduce widespread poverty and hunger in developing countries. Agricultural growth Agricultural development is more important in the low-income country like Nepal, where more than 70% people are engaged in agriculture and 40% of national GDP is shared by the sector (HMG, 1995). Thus, the sector is given a top priority in the development plan and program. Increasing agricultural production and productivity is the most sought after agendas in the mid-term and long-term annual development plan. However, the performance of agriculture in Nepal has not been as expected. Many rural farmers are still engaged in subsistence farming that is blamed for the cause of low productivity in agriculture. This warrants the transformation of traditional farming to a modern commercial farming.

Various theories on agricultural productivity in developing countries have emerged. The human needs or subsistence needs based theory proposed by Boserup (1965, 1981) posits that agricultural productivity is driven by the immediate biological needs of a population to feed itself. According to this thesis, as population increases, agricultural productivity will increase as a result of innovation and improved agricultural technology. Another competing theory, known as market demand theory, posits that farmers participating in commodity production respond to market demand in an effort to maximize profit. Thus, smallholder production is divided between subsistence path (produce for consumption) and market demand path (commodity farm products), with differing motivation behind each. Turner, Hyden and Kates (1993) and Turner and Ali (1996) combined two strands into consumption-commodity or induced-intensification theory, which posits that intensification is induced by the need to produce food for both consumption and market. In this study, we assumed that the motivation for being more productive is higher when farmer produce for the market. In this backdrop, this study is conducted to assess how farm characteristics and market distance affect commercialization and its impact on productivity considering the case of Rice farms in Nepal.

1. **Methodology**

**2.1 Study Area and field survey**

The study area comprises Dhading and Chitwan districts of Nepal. Both districts differ substantially in terms of rural infrastructure, market development, and urbanization. Production zones in Dhading district are far away from the main road network and market centers. Apart from this, many production zones at the northern part of the district do not have road access. In contrast to this, all the production zones of Chitwan district are well connected to the motorable road network. Village development committees (VDCs) are selected purposively from each district. A village development committee (VDC) represents the lowest administrative unit of government. 5 VDCs from each district were selected for the study. The information for this study was obtained through a household survey conducted in the selected VDCs from December, 2009 to January, 2010. Each VDC in Nepal is divided into 9 small wards. Due to resource and time constraints, it was not feasible to survey all households of all wards. Thus, two wards from each VDC were selected purposively. Households within wards were selected on the basis of random sampling. However, the sample size from each selected ward was drawn so that it was proportional to the size of ward population. The number of households covered in this study was 120; 60 from Dhading and 60 from Chitwan. Structured questionnaire was developed and administered at farmers’ level after pre-testing the questionnaire. Detailed information on socioeconomic conditions, cropping patter, cost of cultivation of crops grown, marketed volume, consumption volume, gross income, market distance, linkage to input and output service providers were collected. Additional information was collected from the key informants like farmer cooperatives, farmers groups, wholesaler, and middleman.

**2.2 Model Specification**

Multiple regression method is used to estimate the effect of independent variables on the dependent variable. Following functional form is used in the analysis.

Do = β0 + βi xi+ λ1 d + e (1)

Ii = δ0 + δi xi + λ2 d + e (2)

where Do represents the degree of rice commercialization (in terms output market transaction) and Ii represents the investment on modern input per farm, while, xi  represents the household characteristics and d represents the market distance.

As we defined the commercialization as the proportion of farm output sold in the market, there were many farm households in rice farming that did not sell in the market which caused the data series truncated at zero. Thus, Tobit regression method is used to estimate equation 1.

Do\* = β0 + βi xi + λ1 d + e (3)

Do (4)

To measure the factors affecting agricultural productivity, following model is used.

Yi = α0 + α1 Do+ α i xi (5)

where Yi is the level of rice productivity

In equation 5, agricultural productivity and degree of rice commercialization are endogenous to the model. To solve the problem of endogeneity, we used two stage regression considering market distance as an instrumental variable.

1. **Results and Discussions**

The result is presented in table 1. The result indicated that market distance, family size and land size have significant impact on the output market commercialization. The effect of land size is found positive. This indicates that small farm holders may not be able to integrate into the mainstream of agricultural commercialization. The impact of market distance on commercialization of rice is negative. This indicates that many farm household residing in rural areas at greater distance from the urban markets has less opportunity to commercialize their farm. The family size has significant negative impact on the level of commercialization. This indicates that in a staple crop like rice, the family demand for food has greater role to define the level of commercialization. While, other household characteristics like education, age of household, sharecropping, share of agricultural income and gender ratio did not exhibit statistically significant relationship.

In the second stage, we tried to see the factors affecting input market integration. The investment on modern biological inputs and mechanical inputs were considered as the indicator of input market integration. The result is presented in the second and third column of table 1. The result indicated that land size and market distance are the main explanatory variables to define the level of investment on biological and mechanical inputs. Market distance has negative impact while land size has positive impact on the investment of modern input. This shows that with the increase of market distance, the investment on modern inputs per unit land decreases. In case of biological inputs like chemical fertilizer and seed, the age of household head has positive impact. This shows that experienced farmers invest more on modern biological inputs than that of the non-experienced .

The last column of table 1 illustrates the relationship between rice productivity and various household and market related factors. As productivity and degree of commercialization are simultaneously determined in the model, instrumental variable is used. The result indicated that the impact of both degree of commercialization and investment of input per unit land are positive. The result showed that 1 per cent increase of degree of commercialization increases the land productivity by 1.7kg per katha land. Similarly there is 0.17kg productivity increment with every Rupee investment on modern input. Another significant variable is the land size of a farm. Its impact on productivity is positive. 1 katha increase of land size increases the productivity by 3.73 kg. The impact of percentage of household income from agriculture is positive and statistically significant. This showed that the farm household which income source is primarily dependent on agriculture has more positive impact on productivity. Age of household head is found to have positive impact on productivity. This could be due to higher experience represented by the age of household that could have positive impact on productivity. Gender structure of a household, represented by the ratio of number of male and female, has significantly negative impact on the productivity. With every doubling the number of male relative to female, the productivity is found to be decreased by 10.73 kg/katha. In rural areas, male member of households are mainly engaged in non-farm activities. Many rural male workers are working as laborers in foreign country these days. This might be the reason for negative impact of increase proportion of male member in a household.

Table 1: Determinants of input and output market orientation and productivity of rice farms

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Variables | Degree of Commercialization | | Investment on mechanical input/farm | Investment on fertilizer and seed/ farm | Productivity  (Kg/Katha) |
| Coefficient | Marginal effect |
| Highest Education in family (school year) | -0.41  (1.34) | 0.11  (0.38) | -35.93  (89.63) | 6.06  (55.21) | 0.20  (1.40) |
| Market distance (km) | -0.47\*\*\*  (0.11) | -0.13\*\*\*  (0.02) | -24.11\*\*\*  (5.89) | -8.82\*\*\*  (3.78) |  |
| %of HH income from agriculture | 0.12  (0.20) | 0.03  (0.05) | -15.46  (13.38) | 8.48  (8.18) | 0.91\*\*\*  (0.22) |
| Land size  (katha) | 2.64\*\*\*  (0.36) | 0.75\*\*\*  (0.10) | 187.46\*\*\*  (25.72) | 232.13\*\*\*  (16.39) | -3.73\*\*\*  (1.09) |
| Family size (number) | -2.92\*  (1.73) | -0.83\*  (0.50) | -67.93  (109.28) | 42.31  (66.59) | 2.71  (2.17) |
| Age  (number) | 0.02  (0.32) | -0.007  (0.09) | -12.71  (21.46) | 29.62\*\*  (13.14) | 0.60\*  (0.33) |
| Share cropping (katha) | 0.39  (0.49) | 0.11  (0.14) | -46.91  (37.66) | 0.237  (23.11) | -0.64  (0.57) |
| Commercialization |  |  |  |  | 1.69\*\*\*  (0.58) |
| Investment on chemical and seed per katha |  |  |  |  | 0.13\*\*\*  (0.03) |
| Contact to service providers |  |  |  | 662.33\*\*  (294.51) | 2.56  (7.61) |
| Male-Female ratio | 1.96  (4.05) | 0.56  (1.16) | 208.90  (287.03) | 181.51  (176.14) | -10.73\*\*  (4.66) |
| Constant | -17.87  (28.79) |  | 2972.40  (1925.82) | -2658.9  (1278.05 | 1.45  (31.58) |
| Sigma | 26.98 |  |  |  |  |
| Mc Fadden’s pseudo R2 | 0.17 |  |  |  |  |
| R2 | 0.69 |  | 0.48 | 0.76 | 0.40 |
| Adj R2 |  |  | 0.44 | 0.74 | 0.34 |
| F |  |  | 13.14\*\*\* | 35.18\*\*\* | 9.66\*\*\* |
| LR chi2 | 93.66\*\*\* |  |  |  |  |

*Note*: \*, \*\* and \*\*\* represent significant at 10%, 5% and 1% level of significance; the figure inside parenthesis represents standard error.

1. **Conclusion**

Degree of rice commercialization is mainly affected by market distance, family size and land size. Market distance has negative impact on the commercialization of Rice. The farm, operating at faraway place from the urban center, has less opportunity to integrate farm economy to the market economy due to diseconomies of scale in marketing. Apart from this, missing information due to missing or imperfect market could have been the reason for negative impact. As expected, land size has significant positive impact on the commercialization. This suggests that the small land size in Nepal due to massive land fragmentation and unequal land distribution is one of the bottlenecks to commercialize rice farm in rural area. The government policy should be directed to minimize the missing market due to larger market distance. Specifically, cooperative marketing can be introduced to minimize the diseconomies in marketing and information gap. Government should enact appropriate land policy so that inequality in land distribution could be reduced. The development of rural transportation should be given a due priority to connect rural production pocket to the urban centers. The size of farm family has negative impact on commercialization. This could be due to availability of less marketable surplus with the increase of family size. In general, rural household has higher average family size relative to the farm size that poses difficulty in generating large amount of marketable surplus. .

The result indicated that land size has positive impact on the investment of modern biological and mechanical inputs per farm. Market distance has negative impact on the investment of modern inputs. This indicates that the farm, residing at faraway place from urban center, involves in subsistence agriculture and more depend on the traditional agricultural inputs. Family size has positive impact on the investment on modern biological inputs. The higher food demand due to bigger family size could be the reason for increasing the investment on modern biological inputs as family size increases. In Nepal, the level of input use in agriculture is the lowest in South Asia. Government long term development plan, APP, has mainly focused on input intensification on potential agricultural area. This study suggests that without solving the structural problem in agricultural like small land size, higher market distance, the government intervention to expedite the input intensification program may not be successful.

The degree of rice commercialization has positive and statistically significant impact on the productivity of rice. Farmers may move to better technological frontier or they may utilize the given input and technology more efficiently as the degree of commercialization increases. Land size and male-female ratio have negative impact on productivity. Many past studies have also shown that productivity decreases with the increase of land size. The negative relation between land size and productivity could be due to a decreased efficiency once the land size increases. The negative impact of higher number of male member in a household is linked with the involvement of male member in non-farm activities like working in urban area, and going abroad as a foreign labor. The result suggests that agricultural development program should target female farmers rather than male farmers so that it will have positive impact on productivity. Similarly, other variables like share of agricultural income in total household income, age of household head have positive impact on the productivity of rice. Age is related with the experience of farmers while percentage of income from agriculture is related to the involvement as a full time and part time agricultural business. As expected the use of more input per unit land has positive impact on productivity. Thus, it is very important for Nepalese rice farm to use more modern inputs per unit land.

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