

## Diversification towards High Value Crops: A micro level analysis of various Economic and Non

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### Abstract

Diversification has emerged as one of the important source of agricultural growth in agriculture. It is largely viewed as a shift of resources from staple crops to more remunerative or high value crops that helps in accelerating the income and enhancing the purchasing power. The diversification of agriculture towards high value crops analyzed at macro level using several indices, only reflects the extent of diversification. However the decisions to diversify are taken at household level. The decisions are influenced by a whole set of economic and non-economic factors. The study analyzed the role of various economic and non-economic factors in diversification towards High Value crops. The analysis reveals that Food self-sufficient households have higher propensity to allocate more area towards high value crops than staple food deficient households. The dependency ratio has inverse relation with the diversification, higher the dependency ratio of a household, lower is the propensity of the household to diversify into cash crops. The availability of household labour reduces the cost of production and increases the household income. Therefore availability of family labour has a positive impact on diversification towards high value or cash crops. The cropping intensity also increases the resource allocation towards cash crops. Understanding the role of factors helps in formulation appropriate policies to promote the diversification towards high value crops.

**Keywords:** Diversification, Growth, High Value Crops, Decisions, Policies

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### I. Introduction

In the post-reform period, agriculture diversification has emerged as one of the important source of agricultural growth in India. A diversified agricultural economy generates the needed opportunities in the rural areas. It adds value in the agriculture by increasing the total crop productivity and at the same time stabilizes the farm income, minimizes the risk and also earns foreign exchange for the country. Thus diversification of agriculture is seen as an effective strategy in accelerating the income and enhancing the purchasing power of the poor (Joshi et.al. 2004). It is also viewed as a remedy to the challenges emerging out of liberalization and globalization and to increase the competitiveness of agriculture at international level (Radhakrishna and Reddy, 2004). Agriculture diversification in India is gradually taking place in favour of high value crops and livestock activities. There is a marked shift in consumption patterns in favour of high value food commodities not only in the urban areas and in the high-income groups but also in rural areas among the poorest section of the population. The consumption patterns are fast changing from staple food such as rice, wheat and coarse cereals to high value food commodities like fruits, vegetables, eggs, meat and fish products, mainly because of rising per capita income, fast growing urbanization, changing tastes and preferences of consumers and sustained economic growth. The demand and supply of these high value products have grown much faster than those of food-grains (Kumar et al. 2003 and Joshi et al. 2004). Diversification of agriculture in favour of high value commodities are emerging as a promising source of income acceleration, employment generation, poverty alleviation and export promotion (Jha, Ramesh Chand, Vyas, 1996; Delgado and Siamwalla, 1999; Ryan and Spencer, 2001; and Joshi et al., 2002).

Agriculture diversification is largely viewed as a shift of resources from staple crops to more remunerative or high value crops in India. Many studies have documented an increase in agricultural diversification towards high value crops. The state of Bihar best endowed with appropriate climatic conditions are suitable for diversification and cultivation of wide varieties of crops. But agricultural economy of Bihar is marked by structural rigidity in area allocation among various crops. The agriculture is still subsistence in nature and foodgrains dominate the cropping pattern in the state. The subsistence nature and dominance of food crops reflects the traditional character of the state agriculture.

The diversification of agriculture towards high value crops can be analyzed at both micro and macro level using several indices. The analysis at macro level provides an overall view of diversification in the state.

The value of indices only reflects the extent of diversification. However the decisions to diversify are taken at household level. The decisions are influenced by a whole set of economic and non-economic factors. The household wealth and assets is likely to have a favourable impact on diversification towards cash crops. The poorer households may not be able to bear the cost of ensuring the food security through market purchase (Delgado and Siamwalla, 1997). The infrastructure particularly roads, markets, agriculture extension services, irrigation etc. will influence the household resource allocation decisions. Many of the studies have attributed the dominance of subsistence cropping to poor infrastructure facilities, resulting in high transaction costs and higher self-sufficiency levels by households. The absence of financial institutions, research and extension also induces the households for maintaining higher subsistence levels (Von Braun *et al.*, 1994; Joshi *et al.*, 2003; Rahman, 2009).

The study aims at analyzing the role of various economic and non-economic factors in diversification towards High Value crops

## II. Data Source and Methodology

The study is based on household cross-sectional data from two villages of North Bihar. The North Bihar is dominant agriculture belt and the surveyed villages are from Darbhanga district, located at the core of this agricultural region. Two villages namely Dhamsain (Village I) and Kursoo (Village II) are selected based on their centrality and representative character of agriculture production of both the food and cash crops. This agriculture belt is dominant in production of food crops mainly rice and wheat and some cash crops like litchi, mango and mustard. One hundred samples are drawn from each village by stratified and proportional random sampling approach. The selected households are agricultural households. The primary activities of the households are crop and livestock production. Apart from income generated by sale of crops, the labour (wage) income has significant contribution in household's gross income and a few households also have salaried income. The villages are accessible by public transport and tarred road and roads to fields are mostly untarred. The market for purchase and sale is about 5 km from both the villages. The descriptive statistics of variables used in the analysis is presented in Table 1.

**Table 1: Descriptive Statistics of Variables**

Variable	Village I		Village II		Combined	
	Mean	St.Dev	Mean	St.Dev	Mean	St.Dev
Area under non-staples	22.83	12.16	30.94	16.12	23.93	16.35
Food self-sufficiency dummy (1 = food self-sufficient)	0.48	0.502	0.84	0.368	0.66	0.47
Food security dummy (1=food secure)	0.96	0.197	0.98	0.14	0.97	0.17
Marketing cost (Rs/kg/km)	0.57	0.48	0.25	0.17	0.41	0.32
Distance to an all-weather road (km)	1	0.01	1	0	1	0.01
Distance to main market outside Village	1	0.01	1	0	1	0.01
Land rights measure (1= complete control)	0.98	0.10	0.99	0.10	0.98	0.10
Credit access (1 = has access)	0	0	0	0	0	0
Sex of farm manager (1 = male)	0.98	0.14	0.98	0.14	0.98	0.14
Household size	7.97	2.78	10.47	6.75	9.26	5.26
Dependency ratio	0.32	0.15	0.31	0.09	0.32	0.12
Age of farm manager	48.35	10.33	55.75	7.44	52.05	9.72
Education level of farm manager (years of schooling)	7.41	3.42	5.8	3.21	6.61	3.38
Total area under cultivation (farm size in katha)	44.04	39.30	93.04	51.98	69.26	52.24
Share of non-farm income in total household income (%)	73.05	22.17	63.10	21.32	68.07	22.26
Family Labour	1.3	0.522	2.05	0.642	1.67	0.69

Source: primary survey data

## III. Analytical Framework of the Study

The analytical frame work is developed analyzing the role of various economic and non-economic factors in diversification towards High Value crops. The food security measure based on formula is given by Thomson and Metz (1998). If the household's food entitlements are greater than its needs, it is classified as food

secure and if household food needs are greater than entitlements the household is classified as food insecure. To estimate household food self-sufficiency requirements we use FAO's rule of 200 kg of refined cereal equivalent per capita per annum. The household food needs are estimated by multiplying per capita per annum requirements by the size of the household. While estimating the household food entitlements the household own production and household food expenditure as a percentage of income is taken into account.

Let FN be the household food needs and FE be the entitlements

$FN = 200 * Hsz$ , where Hsz is Household family size.

Let Hp be the households own production, then

Gap = Hp - FN, represents the gap in food security to be met as food expenditure from household income.

Since average household food expenditure is around 53 percent of an average rural Indian's household consumption<sup>1</sup>. If this share of income meets the gap, then household is food secure. If the share of food expenditure falls short of gap, then household is food insecure. i.e.

If  $FE > FN$ , Household is food secure

If  $FE < FN$ , Household is food insecure

The diversification into cash crops is measured as the percentage share of land allocated to cash crops and also by using diversification index. The rice and wheat are taken as staple crops and crops other than these such as fruits, vegetables, oilseeds, etc. are taken as cash crops or high value crops. The diversification index is a measure of multiple agriculture productivity and the Simpson Index which has been used severally in the literature (Joshi *et al.*, 2003; Minot *et al.*, 2006) is used as a measure of diversification, as

$$SID = 1 - \sum_{i=1}^n P_i^2$$

Where  $P_i$  is the proportionate area of the  $i^{th}$  crop in gross area cultivated.

#### IV. Data Analysis

We use regression analysis with land allocation towards cash crops as dependent variable and various independent variables to determine the factors influencing diversification. The analysis is carried out separately for data obtained from both the villages and on combined data also.

The specification of regression equation is as following:

$$A_{HVC} = f(F_{SSL}; A_G; Q_{LF}; D_{PN}; F_{LBR}; C_{IN})$$

Where,

$A_{HVC}$ - Area under cash crops or high value crops

$F_{SSL}$  – Food self-sufficiency level

$A_G$  - Age of household head

$Q_{LF}$  - Qualification of household head (No. of schooling years)

$D_{PN}$  – Dependency Ratio

$F_{LBR}$  – Family Labour (Adult Family members involved in farm activities)

$C_{IN}$  - Cropping intensity

The food self-sufficiency is a measure of gap in annual household food production and consumption requirements. The annual consumption requirements of households are measured as household size multiplied by 200 kg of refined cereal equivalent (FAO's Rule). The level of food self-sufficiency is measured as food self-sufficiency gap as a percentage of food consumption requirements of households. The variable food self-sufficiency level assumes the sign of positive or negative depending on self-sufficiency gap. The sign and magnitude of this variable determines the level of food self-sufficiency or deficiency. The dependency ratio is measured as the ratio of family members below 16 and above 65 years of age, to family size.

#### 4.1. Analysis of Data obtained from Village I:

Table 2 presents the analysis of data obtained from Village I. The variable Food Self-sufficiency Level has positive coefficient and is significant. It implies that staple food self-sufficient households have higher propensity to allocate more area towards high value crops than staple food deficient households. The results are consistent with the literature (Jayne, 1994).

#### Model Summary and ANOVA

R	R Square	Adjusted R Square	Std. Error of the Estimate	F	Sig.
.706	.499	.467	9.75874	15.430	.000

<sup>1</sup>[https://www.business-standard.com/article/economy-policy/rural-india-tops-consumption-charts\\_114040300969\\_1.html](https://www.business-standard.com/article/economy-policy/rural-india-tops-consumption-charts_114040300969_1.html)

**Table 2: Factors influencing diversification towards high value crops (Village I)**

Area Under HVC's (Dependent Variable)	Coefficient	t-Values
Constant	-7.995	-0.838
Food Self-Sufficiency Level	.061	4.427*
Age of Household Head	.135	1.289
Qualification of Household Head	.069	2.054**
Dependency Ratio	-.208	-2.703*
Family Labour	.680	3.001*
Cropping Intensity	.501	2.525*

Source: primary survey data

\* 1% level of significance; \*\* 5% level of significance; N = 100

The other variables of significance are Dependency Ratio, Family Labour and Cropping Intensity. The dependency ratio has a negative sign, indicating that higher the dependency ratio of a household, lower is the propensity of the household to diversify into cash crops. The higher dependency ratio increases the vulnerability of households and makes the more food insecure. The family labour has a positive coefficient indicating that higher is the labour available at household level more likely is that household will diversify towards high value or cash crops. The reason is that cash crops are more intensive and require higher labour. The availability of household labour reduces the cost of production and increases the household income. The cropping intensity also increases the resource allocation towards cash crops. The higher cropping intensity makes it possible for a household to allocate sufficient land towards both the staples and cash crops.

**4.2. Analysis of Data obtained from Village II:**

The analysis of data from Village II reveals almost similar results as that of Village I (Table 3). The variable Food Self-sufficiency Level has positive coefficient and is significant at 1% level. The other variables of significance are Qualification of Household Head, Dependency Ratio, Family Labour and Cropping Intensity. The variables Dependency Ratio, Family Labour and Cropping Intensity have varying coefficients but have same level of significance. The coefficients of variables have same sign as in case of village I. The Qualification of Household Head has a positive coefficient and the level of significance is 10%. The qualification exerts a positive influence in diversifying towards cash crops.

**Model Summary and ANOVA**

R	R Square	Adjusted R Square	Std. Error of the Estimate	F	Sig.
.770	.592	.566	10.61637	22.527	.000

**Table 3: Factors influencing diversification towards high value crops (Village II)**

Area Under High Value Crops (Dependent Variable)	Coefficient	t-Values
Constant	1.786	0.161
Food Self-Sufficiency Level	.036	5.037*
Age of Household Head	.078	0.493
Qualification of Household Head	.064	1.851***
Dependency Ratio	-.544	-4.242*
Family Labour	1.023	5.635*
Cropping Intensity	.671	1.930**

Source: primary survey data

\*1% level of significance; \*\* 5% level of significance; \*\*\* 10% level of significance, N =100

**4.3. Analysis of Combined Data obtained from Village I and Village II:**

The analysis of combined data of Village I and Village II, combined sample size of 200 is presented in Table 4. The results of combined data are in confirmation to the separate analysis at village level. The Food Self-sufficiency Level has positive coefficient and is significant at 1% level. The staple food self-sufficient households allocate more area to high value crops than staple food deficient households. The results are consistent with the literature (Jayne, 1994).

**Model Summary and ANOVA**

R	R Square	Adjusted R Square	Std. Error of the Estimate	F	Sig.
.786	.617	.605	10.27318	51.874	.000

**Table 4: Factors influencing diversification towards high value crops**

Area Under High Value crops	Coefficient	t-Values
Constant	-3.409	-0.495
Food Self-Sufficiency Level	.047	8.667*
Age of Household Head	.092	1.061
Qualification of Household Head	.052	2.340**
Dependency Ratio	-.305	-4.727*
Family Labour	.962	7.433*
Cropping Intensity	.047	2.920*

Source: primary survey data

\* 1% level of significance; \*\* 5% level of significance; \*\*\* 10% level of significance; N = 200

The other factors that influence the resource allocation of households are Qualification of Household Head, Dependency Ratio, Family Labour and Cropping Intensity. All other factors except the dependency ratio have positive coefficients, implying that these factors are favorable for resource allocation and diversification towards high value crops. The dependency ratio as in case of analysis at village level has a strong negative impact on diversification towards cash crops in the combined data analysis also. The higher dependency ratio acts as a barrier and impedes the diversification at the household level.

**V. Conclusion**

Diversification of agriculture in favour of high value commodities are emerging as a promising source of income acceleration, employment generation. The diversification decisions are taken at household level. The decisions are influenced by a whole set of economic and non-economic factors. The analysis reveals that Food self-sufficient households have higher propensity to allocate more area towards high value crops than staple food deficient households. The dependency ratio has inverse relation with the diversification, higher the dependency ratio of a household, lower is the propensity of the household to diversify into cash crops. The higher dependency ratio increases the vulnerability of households and makes the more food insecure. The cash crops are more intensive and require higher labour. The availability of household labour reduces the cost of production and increases the household income. Therefore availability of familylabour has a positive impact on diversification towards high value or cash crops. The cropping intensity also increases the resource allocation towards cash crops. The higher cropping intensity makes it possible for a household to allocate sufficient land towards both the staples and cash crops. Understanding the role of factors helps in formulation appropriate policies to promote the diversification towards high value crops.

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