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Kundu, Amit

Department of Economics, Jadavpur University , Kolkata, West Bengal, India

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# **IMPACT OF NATIONAL RURAL EMPLOYMENT GUARANTEE SCHEME ON CROP DIVERSIFICATION IN WEST BENGAL AGRICULTURE**

**AMIT KUNDU<sup>1</sup>**

**Professor, Department of Economics, Jadavpur University, Kolkata, West Bengal, India**

**E-mail: akundu29@gmail.com, akundu1970@gmail.com**

**PUBALI GOSWAMI**

**Ph.D. Scholar, Department of Economics, Jadavpur University.**

**E0MAIL: goswamipubali2014@gmail.com**

## **Abstract**

The National Rural Employment Guarantee Scheme (NREGS) is acclaimed as the largest public works programme in the World. Based on its vast potential for creation of productive works, high expectations have raised in terms of augmentation of rural connectivity and rural water and land resources that would improve agricultural productivity. This paper investigates whether different kinds of expansion of infrastructure related to agricultural under NREGS have any impact on the crop diversification of West Bengal over the years .We have taken 18 districts of West Bengal. District level trends and patterns in crop diversification in West Bengal between the periods 2006-07 to 2013-14 are calculated using Simpson Index of Diversification (SID). The study revealed that cropping pattern at district level is transforming from food grains to high-value crops but the transformation is not uniform across the districts. The results of Fixed Effect Model revealed that ‘micro irrigation’ and ‘rural connectivity’ work under NREGS have created a positive but small impact on crop diversification. It is further observed that average rain fall and average harvest price of principal crops in the previous period also play a significant role to enhance the crop diversification of West Bengal.

**Key words:** Crop diversification, Simpson index of diversification, panel data estimation, fixed effect model.

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<sup>1</sup> Communicating author.

## **IMPACT OF NATIONAL RURAL EMPLOYMENT GUARANTEE SCHEME ON CROP DIVERSIFICATION IN WEST BENGAL AGRICULTURE**

**Introduction:** The agricultural sector in India still contributes to the overall growth of the economy and provides livelihood and food security to a majority of the population. National Rural Employment Guarantee Scheme (NREGS) has been designed to address seasonal unemployment in the agricultural economy, mainly during post rainy season through creating assets which are organically linked to agriculture. Government of India wants to utilize NREGS as a complementary scheme to agriculture. According to the policy makers, there should be a convergence between agricultural activities and the Employment Guarantee Scheme to minimize the deficiencies of rural infrastructure necessary for cultivation in the post rainy season. The scheme is intended to create permanent agricultural infrastructure in rural areas for future needs like water conservation, water harvesting, drought proofing, irrigation cannels, land development works, flood control and protections. It is found that water conservation works are the major part created under the scheme, followed by providing irrigation facility to the weaker sections like BPL/beneficiaries under IAY of the society, rural connectivity and land development works. The NREGS Act indicates the kinds of works that may be taken up for this purpose. As per Schedule I of the Act, the focus of the NREGS shall be on the following works.

- Water conservation and water harvesting;
- Drought proofing (including afforestation and tree plantation);
- Irrigation canals (including micro and minor irrigation works);
- Provision of irrigation facility to land owned by households belonging to Scheduled Castes and Scheduled Tribes or to land of beneficiaries of land reforms or that of the beneficiaries under the Indira Awas Yojana of the government of India;
- Renovation of traditional water bodies (including desalting of tanks);

- Land development;
- Flood control and protection works (including drainage in water-logged areas);
- Rural connectivity to provide all-weather access;

Indeed, NREGS gives the government an opportunity to reverse the prolonged neglect of productive rural infrastructure. Watershed development, restoration of water bodies such as tanks and canals, land development, and soil erosion and flood control, construction of roads, drought proofing measures like forestation can realize the potential of the programme in diverse conditions. Micro Irrigation works and ‘provision of irrigation facility’ have an important focus under NREGS. The Act, by permitting activities on private land up to a point, significantly increases the scope of the programme. Water Conservation and Water Harvesting in recent days is the most public funded programme in India. There is considerable scope for water conservation and water harvesting in rural areas. NREGS is playing a crucial role in this regard. Rural connectivity can have tremendous influence on the agricultural development for a country like India, since majority of the rural households are still depending on agriculture and allied activities. Hence rural connectivity is one of the important types of works to be undertaken under NREGS. It is expected that all these items will lead to a sustainable agriculture development in the rural economy.

### **NREGS in West Bengal:**

West Bengal is one of the 23 states of India. It is an agriculturally developed state where large section of population still depends on agriculture. But after successful implementation of land reform, and due to law of inheritance, most of the farm households become either small or

marginal households. The backdrop of the significant role of agriculture in West Bengal economy and taking into account the emphasis given in the NREGS Act to create long term agricultural inputs with a view to enhance agricultural productivity, we consolidate the matter of selection of West Bengal as the subject of present study. Here within West Bengal, we have taken each NREGS implemented district as the unit of study and three infrastructures relevant to agriculture viz, provision of irrigation facilities, micro irrigation works and rural connectivity works whose impact on agriculture would be evaluated. We consider only the said agricultural inputs because only these inputs related to agriculture were mainly done in the entire reference periods through NREGS in West Bengal.

Major three types of asset creation work happening in West Bengal through NREGS are (i) micro irrigation work, (ii) provision of irrigation facility and (iii) rural connectivity. Table-1 will show the progress of all those total number of asset creation work completed through NREGS in West Bengal different years:

Table-1: Total number of works completed through NREGS in 2006-07 and in 2013-14.

Type of work	2006-07	2013-14
Micro Irrigation work	1517	32176
Provision of Irrigation facility	402	102539
Rural Connectivity	8223	3541908

Source: NREGA official website:[www.nrega.nic.in](http://www.nrega.nic.in)

Table-1 indicates high enhancement of different types of asset creation work though NREGS in West Bengal after implementation. It is expected that all those works possibly help the farmers to enjoy positive externalities during the time of cultivation mainly in the post rainy season. In this back ground one can investigate whether expansion of NREGS is able to help the farming class to move towards crop diversification.

Initially, we have to investigate whether the expansion of NREGS works in all districts has done in proportionate way or there is any discrimination during the time of expansion. This can be reflected if co-efficient of variation is calculated for all those three above mentioned type of work.

**Table-2:** Coefficient of Variation across districts in the works has completed under provision of irrigation, micro irrigation facilities and rural connectivity in NREGS in different years.

Year	Coefficient of Variation across districts in the works done under provision of irrigation facilities	Coefficient of Variation across districts in the works done under micro irrigation facilities	Coefficient of Variation across districts in the works done under rural connectivity
2005-06	199.21	206.81	123.23
2006-07	184.75	214.63	134.01
2007-08	184.75	163.24	134.01
2008-09	110.23	102.24	90.2
2009-10	149.29	115.72	105.22
2010-11	143.53	68.84	77.91
2011-12	184.05	75.87	84.58
2012-13	186.63	80.12	66.18
2013-14	195.45	75.44	49.15

Source: Calculation made by the authors on the data from [www.nrega.nic.in](http://www.nrega.nic.in)

The above Table-2 shows that there seems wide scale variation across the district in the number of completed works like provision of irrigation facilities, micro irrigation facilities and rural connectivity in almost all the years. Rural connectivity covers construction of village roads through NREGS works. Rural connectivity works through NREGS have been done more or less uniformly across districts in the relevant years. Micro irrigation means construction of irrigation canals for micro irrigation activity in the public land. It is observed that for most of the years, a downward trend in the degree of variation over the finished works done across districts under this head. Provision of Irrigation facility implies arranging irrigation facility through NREGS work in the land

owned by the households belonging to the SC, ST or in the land of the beneficiaries of land reform or that of the beneficiaries of IAY of the government of India. It is observed from the above table that district wise variation has decreased in ‘provision of irrigation facility’ work. .

### **Research Question:**

Crop diversification is a procedure to give a wider choice in the production of variety of crops in a given area so as to expand production related activities on various crops. It is actually a shift from the dominance of one crop to number of crops to meet ever increasing demand of cereals, pulses, horticultural products, oil seeds etc. The present study has tried to investigate whether introduction of different kinds of asset creation work related to agriculture under NREGS has helped the farmers of West Bengal to take any initiative to move towards crop diversification or not.

### **Review of Relevant Literature:**

Kareemulla et al. (2009) on the basis of their study in six villages of Anantpur district in Andhra Pradesh found that only about 25 percent of the ponds that were taken up under NREGS were being utilized for irrigation. The main reason for such low utilization was due to absence of provision of channeling water to the farm. They note however that the investment in ponds was helping in recharging ground water. Verma and Shah (2012) examine the potential of the irrigation assets constructed through NREGS in Bihar, Gujarat, Rajasthan and Kerala for the year 2009-10. Using cost benefit analysis the study found that 80 percent of the assets created through NREGS had recovered their investment in the first year itself. A study undertaken by the Indian Institute of Science (2013) finds a significant improvement in ground water levels and irrigation facilities for farmers as a consequence of NREGS in Andhra Pradesh, Karnataka, Madhya Pradesh and Rajasthan. Comparatively little evidence is available on the effect of the scheme on cropping patterns and crop yields. Walker *et al.* (1983) has found that the kind of crop

diversification and its consequences and implications are strongly conditioned by different regional agro-climatic and soil environments. Differences in the quantity and quality of resource basis were largely responsible for variation in diversification. Gupta *et al.* (1985) found that irrigation intensity, farm net worth, price risk, and farm size were strong variables affecting the level of crop diversification. Singh *et al.* (1985) at micro-level has found diversification inversely related to the size of farm. Joshi, P.K (2005) evaluated that Indian agriculture was gradually diversifying in favor of high value food commodities, and the production in particular of fruits, vegetables, milk, meat, poultry, and fish had increased remarkably. His study showed that agriculture diversification towards high value food commodities augmented income, generated employment opportunities, empowered women farmers and conserved natural resources. Promoting agricultural diversification towards high value commodities, doing value addition through their processing and creating appropriate markets for them can be used as effective measures to alleviate rural poverty, generate rural employment and conserve natural resources in the niche areas. De and Chattopadhyay (2010) had shown that marginal and small farmers had played an effective role in crop diversification in West Bengal since 2005 and local infrastructure had supported this diversification. But all the studies are pre-NREGS implementation period. No proper investigation has done to enquire whether expansion of NREGS after 2006 is helping the small or marginal farmers to take the initiative of cultivation of different types of crop mainly in the post rainy season. That will be investigated here on the basis of West Bengal.

### **Crop-diversification in different districts of West Bengal in the post NREGS implementation periods:**

Crop diversification can be regarded as a proper measure of multiple cropping on a specific plot of arable land. Enhancing crop diversification is primarily the decision of the farmer because

crop diversification is the solution to several problems associated with agriculture including sustainability of farm income, agricultural employment and management of soil productivity and reduction in fluctuation and uncertainty of farm earning. But it is very much dependent on local infrastructure like ‘irrigation facility’ and ‘road connectivity’. It is observed that all the farmers in West Bengal cultivate paddy in the rainy season where little amount of fertilizer as well as irrigation facilities are required. But in the post rainy season, the farmer has to decide whether he will continue his production or not. If a large number of farmers agree to do that, then the crop diversification of the district would increase. The performance of West Bengal agricultural sector in terms diversification has followed an unsteady path and showed huge variations between different geographical locations across the country at the disaggregated level (Radhakrishna and Panda, 2006). These variations across the districts have remained a subject of concern. To propel the agriculture sector towards further growth and development, it is imperative to identify the levels of crop diversification after implementation of NREGS at the district level for making specific strategies. In this context, the present study will analyze the trends and extent of crop diversification at district level along with identification of determinants of crop diversification at the district level after gradual expansion of NREGS activities in all the districts.

Eighteen districts (except the Kolkata Metropolitan) of West Bengal are here considered for investigation. NREGS was started in West Bengal from 2006-07. So we have taken 2006-07 as the initial year and subsequently studied the progress through different years up to 2013-14. In this way, we track the chronological variation in crop diversification after implementation of NREGS starting from the initial year. We could not proceed beyond 2013-14 due to unavailability of data necessary for calculation of crop diversification index.

During the time of calculation of crop diversification index, both the cash crops and food crops are considered simultaneously. Actually the variation in crop diversification within food crops and cash crops has been discussed here. Measurements of diversification can be examined using the variables: (i) number of crops and (ii) area of land under production of certain crop. The extent of crop diversification at a given point of time can be examined by using various indices like, (i) Herfindahl Index (HI), (ii) Simpson's Index (SI), (iii) Entropy Index (EI) and (iv) Modified Entropy Index (MEI). Among these indices the HI, SI and the Entropy index are widely used in the literature during the time of calculation of crop diversification. All these indices are computed on the basis of proportion of gross cropped area under different crops cultivated in a particular geographical area. It should be noted that the Herfindahl index is the index of concentration and thus the higher the value of it is an indication of specialization of crop activities. If the value of this index is subtracted from 1 we can get the index of diversification, which is known as Simpson Diversification Index (SID). Each method has some special features and some limitations. Considering the objective of this study of assessing the extent of diversity, Simpson index of crop diversification (SID) here has been calculated. It provides a clear dispersion of commodities in a geographical region and is easy to compute and interpret. The Simpson index of crop diversification (SID) is given by Equation

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

where, N = Total number of crops<sup>1</sup>

$P_i$ =Proportionate area of the  $i^{th}$  crop in the Gross Cropped Area where  $P_i = \frac{X_i}{\sum X_i}$ . Here  $X_i$  the area of cultivation of the  $i^{th}$  crop. During the time of calculation of crop diversification both food crops and cash crops are considered here simultaneously. In food crops, we consider cereals(including rice, wheat, other cereals), pulses(including gram, arhar, mung, masur),and

vegetables(including potato, sugarcane). In cash crop, fruits, jute are taken. Actually these are the major crops which are cultivated across the season in the state in different districts. The Simpson index of diversification (SID) ranges between 0 and 1, wherein the value closer to 1 indicates high diversification and the value closer to 0, indicates no diversification. Table-3 shows the value of Simpson crop diversification index of different districts in the different post NREGS implementation period.

**Table-3:** The value of Simpson crop diversification index in chosen districts of West Bengal in different time periods (between 2006-07 and 2013-14).

Districts/year	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
Burdwan	.17	.23	.22	.23	.36	.31	.25	.24
Bankura	.24	.25	.26	.19	.32	.29	.21	.23
PurbaMedini pur	.10	.21	.19	.17	.24	.28	.20	.21
PaschimMed inipur	.26	.32	.37	.42	.39	.41	.39	.38
Howrah	.18	.27	.26	.33	.38	.41	.45	.49
Hoogly	.41	.44	.44	.42	.41	.35	.33	.32
North 24 pg	0.71	0.72	0.71	0.75	0.79	0.82	0.82	.83
South 24 pgs	.19	.20	.15	.17	.16	.21	.21	.22
Nadia	.47	.46	.49	.52	.48	.39	.44	.39
Murshidabad	.44	.40	.42	.41	.44	.34	.34	.35
D Dinajpur	.41	.40	.33	.29	.36	.35	.39	.35
Malda	.33	.46	.38	.34	.40	.36	.25	.31
Jalpaiguri	.51	.52	.51	.53	.52	.53	.52	.50
Darjeeling	.66	.68	.67	.68	.70	.66	.66	.79
Purulia	.14	.13	.12	.10	.16	.19	.20	.20
Birbhum	.42	.50	.51	.77	.78	.75	.74	.76
U Dinajpur	.46	.57	.56	.41	.46	.45	.45	.51

Cooch Behar	.33	.40	.39	.30	.37	.30	.37	.39
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Source: Calculated by the authors from the “Estimates of Area & Production of Principal Crops in West Bengal” of different years compiled by Evaluation Wing, Directorate of Agriculture, and Government of West Bengal.

This table shows the variations in crop diversification under NREGS in West Bengal across different time periods and there has been a wide district wise variation of the value of Simpson indices and all of them show a similar pattern for all the chosen years. If the value of SDI increases over time, it is an indication of more diversification of crop production. To identify the increment of crop diversification over time in different districts, the average growth rate of crop diversification index of all the considered districts are calculated. The values of it are shown in Table-4. The positive side of calculation of average growth rate is it captures the trend.

**Table-4:** Average Annual Growth Rate of Crop diversification of different districts during the period 2006-07 to 2013-14

Districts/year	Average Annual Growth Rate( in % term)
Burdwan	6.73
Bankura	31
PurbaMedinipur	17.7
PaschimMedinipur	61.22
Howrah	60.18
Hoogly	-3.6
North 24 pg	22.54
South 24 pgs	3.22
Nadia	2.77
Murshidabad	-.27
D Dinajpur	-.12
Malda	17.22
Jalpaiguri	2.22
Darjeeling	28.44
Purulia	25.10
Birbhum	10.99
U Dinajpur	26.71
Cooch Behar	41.51

Source: Calculated by the authors from the “Estimates of Area & Production of Principal Crops in West Bengal” of different years compiled by Evaluation Wing, Directorate of Agriculture, and Government of West Bengal.

It is observed from the table that in majority of the districts except Hooghly, Murshidabad and Dakhin Dinajpur, crop diversification has increased during the post NREGS implementation period. High crop diversification is observed in North 24 Parganas and Darjeeling district. But enhancement of crop diversification is observed in Paschim Medinipur District and Howrah district of West Bengal. Hence, we make an apprehension that this increase in crop diversification might be a positive response that the farmer may be encouraged to cultivate highly remunerative crops depends on the availability of various infrastructure related to agricultural.

In West Bengal, a major percentage of the farming households are marginal farming households whose members remain immensely concerned about the marketability of their produce. Again, the exposure to market of their produce badly depends on availability of rural infrastructure consisting largely of rural connectivity. Rural connectivity works can improve the condition of rural infrastructure, and the farming households may become confident enough to go for the second crop production which in turn will increase in crop diversification.

Pingali and Rosergrant (1995) had shown that diversification out of staple food was triggered by rapid technological change in agricultural production, improved rural infrastructure and diversification in food demand. Here to investigate the role of NREGS on crop diversification in different districts of West Bengal, it is expected that expansion of NREGS in a particular district means better expansion of agricultural production related infrastructure. In this investigation to get a more robust result, we have to consider both NREGS related factors and non-NREGS related factors simultaneously to investigate any impact on crop diversification.

The considered NREGS related factors are: (i) Provision of irrigation facility; (ii) Micro-irrigation work, (iii) Road connectivity. All the items are measured in terms of total number of works completed in that head in the previous accounting year. Apart from that the two non-NREGS related factors are (i) average rain fall in that year<sup>2</sup> and (ii) average harvest price<sup>3</sup> of the previous year.

Average rainfall is considered here to assess the impact of climate on crop diversification. It is an indicator of the overall agro-climatic condition of the state. To capture the effect of local infrastructure developed through NREGS on crop diversification, the chosen variables are Road connectivity, Provision of irrigation facilities, and Micro irrigation works. Understandably, better road network can induce diversification in favor of agricultural commodities and offer low marketing cost and easy and quick disposal of these commodities. A farmer may take the initiative of cultivation in the post rainy season if and only if local irrigation facility is properly developed. It is observed that major part of NREGS work is centered on development of Minor irrigation and arrangement of ‘provision of irrigation facility’ in the locality. So one can expect that larger number of NREGS work related to irrigation can encourage the local farmers to proceed towards cultivation of different types of crop in the post rainy season because they can expect better availability of water for the irrigation purpose.

In this study, the lagged value of the indicators like ‘provision of irrigation facility’, ‘micro irrigation’ and rural connectivity’ are taken. Actually most of the NREGS work is done in the

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<sup>2</sup>Month wise rainfall data are collected from various issues of Statistical Abstract published by Bureau of Applied Economics and Statistics, Government of India. Average rainfall of the  $i^{th}$  district in the  $t^{th}$  year is the simple average of rainfall of that district recorded in different months.

<sup>3</sup>Average harvest prices of different principal crops cultivated in the post rainy season are calculated by taking simple average of prices of principal crops except rainy season crop(s) in each year of each district on the basis of constant price considering 2005 as the base year. The conversions were done on the basis of consumer price index of the rural labourers of West Bengal published by Ministry of labour, Government of India in different years.

post rainy season which is expected to give agricultural benefit at least in the next farming season. Hence the agricultural inputs through NREGS in the  $(t-1)^{\text{th}}$  period in a particular district may influence crop diversification of that district in the  $t^{\text{th}}$  period because the farmer can enjoy the benefit of these agricultural infrastructure in the next period at the earliest. Likewise, farmers' general decision of a particular district to go for second crop and so on in the  $t^{\text{th}}$  period would depend on the average harvest price of principal crops of the previous period, i.e.,  $(t-1)^{\text{th}}$  period of that district. Only for 'rain fall' we consider the data of the  $t^{\text{th}}$  period. Different combinations of these variables were tried to arrive at the best fit equations. The estimated values of the parameters provide indication towards the relative importance of each factor in the process of diversification.

Several forces influence the nature and speed of agricultural diversification from staple to high-value food commodities or cash crops. Causes of crop diversification are broadly classified as demand and supply forces. The demand side forces that have been hypothesized to influence the agricultural diversification include per capita income and urbanization. On the supply side, this decision of crop diversification is largely influenced by local infrastructure, average rain fall and the average price of the harvest of that particular district in the previous year. In this section, we want to identify the key drivers of agricultural diversification mainly from the supply side. The model used to identify the determinants responsible for crop diversification first and then the results have been presented. For best model selection between Fixed Effect Model (FEM) and Random Effect Model (REM)

Hausman specification test is used to check the suitability of the technique for regression analysis. The regression equation specification was used to find association between SID and average harvest price of the previous year, average rain fall of present year and number of

NREGS work related to micro irrigations, provision of irrigation facility, rural connectivity completed in the previous year. The more specialized is the cropping pattern; the closer is the value of Simpson diversification index to zero.

### **The Model and its Results:**

Here both the cross sectional unit and time series dimensions are observed where 18 districts of West Bengal is treated as cross sectional units. Hence for this investigation Panel data regression is required. Eq.(1) indicates that SID may be influenced by total completed work in rural connectivity, provision of irrigation facilities and micro irrigation work through NREGS. Besides that average rainfall, and harvest price on the crop diversification can be conceptualized as follows:

$$SDI_{it} = f(proirrifclty_{i(t-1)}, microirriwrks_{i(t-1)}, ruralconctvty_{i(t-1)}, avgfall_{it}, hprice_{i(t-1)}) \dots \text{Eq}(1)$$

Where  $i = 1 \dots 18$  and  $t = 1 \dots 8$

Here  $SID_{it}$  is the value of crop diversification index of the  $i^{\text{th}}$  district in the  $t^{\text{th}}$  period, ‘proirrifclty $_{i(t-1)}$ ’ implies total number of works completed under ‘provision of irrigation facilities’ in the  $i^{\text{th}}$  district in the  $(t-1)^{\text{th}}$  period. Similarly ‘microirriwrks $_{i(t-1)}$ ’ and ‘ruralconnctvty $_{i(t-1)}$ ’ are total number of works completed under micro irrigation scheme and under ‘rural connectivity scheme’ through NREGS in the  $i^{\text{th}}$  district in the  $(t-1)^{\text{th}}$  period respectively. ‘avgrnfall $_{it}$ ’ is average rain fall of the  $i^{\text{th}}$  district in the  $t^{\text{th}}$  year and  $hprice_{i(t-1)}$  is average harvest price of the  $i^{\text{th}}$  district in the  $(t-1)^{\text{th}}$  period. Here ‘provision of irrigation facility’, ‘micro irrigation’ and ‘rural connectivity’ are considered as proxy of local rural infrastructure because only these three inputs are mainly done in the entire reference periods through NREGS in West Bengal. In the panel regression, we have to adopt fixed effect estimation techniques because according to Hausman test,  $\chi^2(5) = 16.56$  and that is significant at 1% level.

Results of Fixed Effect Estimation:

Table-5 :Dependent variable:SDI

Variable	coefficient	Standard error
proirrifclty	.00000411	.00000847
microirriwrks	.000034***	.000019
ruralconnectvty	.0000126*	.0000053
avgrnfall	.0003219**	.0001699
hprice	.0000733*	.0000283
Constant	.50689*	.04860

Number of observations = 143

$R^2$ : within = 0.36      Wald  $\chi^2(5)^*$  = 21.10

\* implies level of significance at 1% level, \*\* => significant at 5% level and \*\*\*=> significant at 10% level.

On the basis of the results presented in Table-5, we can draw the following inferences:

#### **Discussions:**

- (i) ‘Provision of irrigation facility’ has no impact in enhancing crop diversification.
- (ii) Micro irrigation work has created an impact on crop diversification. But the impact is very small because the value of the co-efficient is very small (though it is statistically significant)
- (iii) Same thing also happens in ‘rural connectivity work. Its impact is very small so far as the value of the coefficient is concerned, but the estimated value is statistically significant.
- (iv) Average rain fall plays a significant role to enhance the crop diversification of West Bengal.
- (v) Average harvest price in the previous year also plays a significant role to encourage the farmers to take the initiative of enhancing crop diversification in West Bengal agriculture.

#### **Conclusions:**

The paper has examined the trends of crop diversification towards high-value crops in the different districts of West Bengal along with identification of major factors influencing crop diversification. The study has observed that the areas under high-value crops have recorded significant growth during the study period. The trends in area growth and value of SID (Simpson Index of Diversification) have shown that West Bengal agriculture is transforming from

traditional subsistence agriculture to high-value agriculture. However, this transformation is not evenly distributed across all the districts. The extent of crop diversification has displayed very little SID in Purulia. Moderate crop diversification are observed in the districts like Burdwan, Bankura, Purba Medinipur, Paschim Medinipur, Howrah, Malda, Cooch Behar, South 24 pgs., Murshidabad, Nadia, Hoogly and high crop diversification is observed in Jalpaiguri, Darjeeling, Birbhum, Uttar Dinajpur, N 24 pgs. The results of fixed effect model proved that asset creation through NREGS has created positive but small impact on crop diversification in West Bengal. Actually NREGS work in West Bengal got a momentum after 2010-11 and the consider time period is up to 2013-14. So the results are showing little but significant impact. Besides that average rainfall and average harvest price of the previous year have significant impact on crop diversification at the district level

### **Policy implications:**

The NREGS is considered as the most powerful initiative ever undertaken for transformation of rural livelihoods. The exceptional commitment of the Central Government by spending huge financial resources on NREGS should match only by the sincere efforts of the different stakeholder in implementation could realize its potential in raising the productivity of agriculture particularly in backward regions and also to strengthen the rural infrastructure which finally leads to sustainable development agricultural sector. Even though NREGS is already making a substantial impact on the lives of the agricultural sector in West Bengal, there are some problems that need to be addressed to bring out overall development .One of the major obstacles for proper implementation of NREGS is lack of trained manpower and also lack of people participation. It is also observed that the number of ongoing works was on the rise in successive periods. If those works were completed in subsequent periods, then the positive influence on productivity of

agriculture might not be done away with which the present study has not exercised. So the productive value of agricultural inputs can be enhanced with proper monitoring and maintenance activities.

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