Journal of
Economics and Political Economy
www.kspjournals.org
Volume 4 September 2017 Issue 3

National rural employment guarantee programme and marginal farmer households: An assessment

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Abstract. An important objective of National Rural Employment Guarantee Programme (NREGP) is to create durable community asset and private asset which can enhance agricultural production as well profitability of the farmers through increasing their Gross Cropped area. It can also help the farm households to generate few extra incomes through seeking employment in this programme. An investigation is here done to evaluate the impact of this programme on marginal farmer households of West Bengal. On the basis of difference-in-difference method, it has shown that rapid expansion of NREGP indicates more asset creation in a village economy which becomes helpful for the marginal farmer households to enhance their net farm income and overall income.
Keywords. National rural employment guarantee progarmme, Marginal farm households, Impact evaluation, Difference-in-difference method, Gross cropped area, Net farm income, Total income.
JEL. Q12, R28, C33, C36, C93.

1. Introduction

Government of India has initiated National Rural Employment Guarantee Programme (NREGP), where the basic objective is to provide 100 full man-days of employment to each willing rural household. It is expected that NREGP can generate income support for the poor and can raise net farm income of the farm households in the long run through creating different productive assets related to agriculture. The 'productive asset' includes water harvesting, constructing irrigation canals, land development, flood control to reduce vulnerability of rural people and improve rural connectivity (Reddy, 2012). Actually NREGP has demonstrated as an immense potential to reach the rural population and benefit agriculture through public work like water and irrigation work etc. mainly in public land[1]. This is the agricultural productivity enhancing aspect in agriculture through this programme. Provision for water is vital for ensuring water security in rural areas. It is expected that water-related assets created through NREGP will help the farmers to avail water throughout the year. Hence, it is expected that after expansion of NREGP, there is an increase in the Gross Cropped Area (GCA) as well as cropping intensity of the farm households because due to easy availability of water, the farmers can now cultivate even in the agricultural slack season. So demand for agricultural labour will increase even in the agricultural lean season provided farm households cultivate their land with the help of hired labour and that will be possible if sufficient family labour force is not available among the farm households.

Though initially it was decided that the employment through NREGP will be provided mainly in the agricultural slack season, but to reach the target and for

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proper utilization of funds the local panchayat sometimes offer job under NREGP even in the agricultural peak season. Hence, farmers face labour shortage throughout the year. Expansion of NREGP and other non-farm occupations raises the agricultural wage rate in an imperfectly competitive labour market in that region mainly during the agricultural slack season. So it is told that small and marginal farmers may be badly affected by NREGP due to labour shortage and the steep hike in agricultural wage rate. It is observed that there has been a significant change in the daily wage rates for the agricultural labourers after implementation of NREGP. This NREGP wage has increased across states since 2006. Actually the introduction of NREGP, with minimum and equal wages for male and female workers did bring about not only an increase of overall agricultural wage, but also reduces the male-female wage differential. For instance, hike of farm wage were reported in the number of states right from Punjab, Haryana, Gujarat and West Bengal after implementation of NREGP (Banerjee, & Saha, 2010). In the financial year 2011-12 per person-day NREGP wage in West Bengal was Rs.136 and the minimum agricultural wage in that financial year became Rs.167. Expansion of NREGP has not only increased the agricultural wage rate but also other private wage rate or wage rate in different non-farm activities. The rural labourers may prefer to work as an agricultural labourer but not less than NREGP wage even in the rainy season. This directly affects the cost of production in agriculture. So implementation of NREGP can affect not only in private rural employment market but also into the net farm income of the small and marginal farmers through creating an impact on wage bill. Dev (1995) reported that Maharastra EGS and agricultural employment are complementary in the sense that EGS employment is high in lean season (April-July) and low in peak season (October-January). He had shown that in two villages within Maharastra, negative correlation was observed between the EGS employment and agricultural employment where the values were -0.68 and -0.33 respectively.

A significant share of NREGP work is also taken upon private land[2] mainly at the families lying below the poverty line or of the small and marginal farmers. This NREGP work mainly wants to improve irrigation facilities in the neighborhood areas through digging tanks. The private households can also cultivate different horticultural products around the tank and can cultivate fish in that tank. Sometimes they depend on organic method of cultivation where cost of production is not high but selling price of the crop is very high. In fact the development of private property under NREGP has the potential to contribute the more sustainable livelihood creation.

It is told that agricultural production in India is not profit oriented mainly due to high cost of production and low price of produced crop. It is expected that proper thrust on NREGP work can augment the agricultural productivity and can make agricultural activity profit oriented. So expansion of NREGP may create to opposite forces on the farm households: one side it plays a significant role to enhance productive capacity of land and on the other side it is responsible for gradual hike of daily farm wage.

Impact of NREGP on farm income is not uniform. Districts and villages which have performed better in implementation of this programme and used funds seem to demonstrate a visible growth in agricultural productivity and farm income. Individual case studies also suggest an increase in productivity on the land of farmers where NREGP work was undertaken. In Bastar, Chhattisgarh a marginal farmer with one acre of land increased his yield from 1.5 quintals to 7 quintals such that his income went up from Rs.1200 to Rs.5600. However, impact of NREGP on agricultural productivity is neither uniform nor conclusive. In some areas the expansion of NREGP enhances the agricultural productivity and in some areas the expansion did not make any positive impact on agricultural productivity. Rather there is a possibility that due to high price of hired labour and other inputs of agricultural production and lack of availability of family labour force, the marginal farmer household may be compelled to stop agricultural production. But still now,

no proper 'impact evaluation exercise' has done to investigate the effectiveness of NREGP on the life of the marginal farmer households or to investigate whether expansion of this programme becomes useful for the marginal farmer households to improve their livelihood. Actually the influence of NREGP on agriculture including farming as well as of farmers should be analyses in terms of three broad dimensions namely (i) augmentation of productivity enhancing factors through improving irrigation facilities and other assets creation, (ii) influence on agricultural labour market and (iii) work on private land of the marginal farm households. This paper will try to do that on the basis of two period panel data. It will try to analyze whether expansion of NREGP can help the small and marginal farmer households to improve their livelihood through enhancing their aggregate annual net return from different agricultural activity (mainly from agricultural production and fisheries) and average monthly income.

Apart from introduction; the paper is divided into three sections. In Section-1 we shall discuss the sample selection design and methodology, in Section-2 we shall discuss on the impact of NREGP on agricultural profitability and in Section-3 we shall discuss about the impact this public policy on the livelihood of the farm households.

2. Sample design and methodology

In India, we observe the dominance of small and marginal farmers. According to Agricultural Census, 2005-06, small and marginal farmers hold the major share of the total agricultural land of India. In West Bengal, 83% of the land holding class are small and marginal farmers and they produce 86.2% of the total agricultural output (Dev, 2012). Expansion of land reform is one of the major causes behind it. Hence to do the impact evaluation of NREGP on marginal farm households, West Bengal is a suitable state for study.

In any impact evaluation study, we have to investigate how have outcomes changed with the intervention relative to what would have occurred without intervention. But it is difficult to judge the outcome of the same individual without intervention because people can only be in one circumstance at a time. So in the standard form of impact evaluation, one can compare a group got the benefit of intervention with an identical group who are deprived from getting the benefit. But NREGP in a public policy initiated by Government of India and that has already expanded in every Gram panchayat in India. So it is not possible to find a gram panchayat now where we can observe total absence of NREGP. In this circumstance for proper impact evaluation we have to identify areas where the spread of the public policy is good and an area where the progress of NREGP is slow and then we will have to compare between the two.

In West Bengal, out of 19 districts we have chosen South 24 Parganas district as sample district and Mandir Bazar block as sample block of that district. Now in Mandir Bazar block, we have selected two gram panchayats, Krishnapur and Ghateswar. The population size and the agro-climatic condition of those two gram panchayats are almost identical. Identical socio-economic and agro- climatic condition is necessary for evaluation because here the outcome indicators are related to agricultural production. In this investigation, accounting year 2010-11 is considered as base line period and 2012-13 as end line period[3]. In the financial year 2010-11, total households got job through NREGP in Krishnapur gram panchayat was 538 and total person-days created was 12136 (i.e 22 man-days per household). In Ghateswar gram panchayat the number was 461 and 9633 respectively (i.e. 21 man-days per household) in 2010-11. This establishes the fact that controlling other factors the performance of NREGP in both the gram panchayats in our baseline period was almost same. Again in the financial year 2012-13 i.e. after two years, total number of households got the benefit of NREGP in Krishnapur Gram panchayat was 859 (60% more than the baseline period) and total man-days created was 40676 (235% more than base line period) i.e. 48 man-days per household (118% more than baseline period). Besides that in Ghateswar

gram panchayat the figure was 699 (51% more than baseline period) and 20941 (117% more than baseline period) i.e. 30 man-days per household (43% more than baseline period) respectively. Hence, we can easily claim that within this experimental time period, expansion of NREGP in each term was much better in Krishnapur gram panchayat than Ghateswar gram panchayat. It was also observed that asset creation through NREGP including work in private land was much better in Krishnapur gram panchayat than Ghateswar gram panchayat with in our evaluation time period. Here the experimental group is only the marginal farmer households[4] who are chosen randomly from both the gram panchayats. Hence, the sample selection technique is purposive sampling. It actually starts with a purpose in mind and the sample is thus selected to include people of interest and exclude those who do not suit the purpose. The question of economic sustainability of the marginal farmer households after the expansion of NREGP will be examined.

Actually through this micro level study, we have wanted to quantify the definite impact of NREGP on aggregate net farm income per *bigha* from different cultivated crops with in specific time period (an accounting year is considered as reference period) and average income per month of the farm households. Through this it was investigated whether this employment policy initiated by the government of India becomes helpful of the farm households for their economic sustainability or not. In this impact evaluation difference-in-difference approach is applied because in this approach, the values of the outcome indicator are observed both for the treatment group and for the control group. The method has an advantage because here the 'treatment' and 'control or comparison' group does not necessarily need to have the same pre-intervention conditions. In this investigation, pre-intervention condition should be 2004-5 (just before implementation of this public work programme) and the post intervention time period should be 2012-13. But here the units are farm households and outcome variables are related to agricultural production. Climate change, rain fall variation, soil erosion, political and demographic factors can create impact on agricultural production in the same area over the eight years time period. As the evaluation is done on primary data, it is very difficult to get socio-economic information of the same set of households in 2004-5 and 2012-13. Hence in this type of impact evaluation, the time gap between the baseline and the end-line period should not be very wide because we have to minimize the presence of different unobserved heterogeneity among the farm households. In this investigation the time gap between the baseline and end line period is two years. So time-varying unobserved heterogeneity among the households between the baseline and the end line period can be removed. Fortunately, in the baseline period, the expansion of NREGP was not so wide in both the areas under consideration. But within two periods we have observed rapid expansion of this programme in one region relative to other region. It came out from the field investigation that 83.33% of the sample households of Krishnapur gram panchayat had claimed that due to expansion of NREGP work in public land in their locality, their irrigation facilities have improved within reference time period. Besides that, more improvement is observed in road connectivity. A good number of sample farm households in that region have done NREGP in their private land through excavation of tank which have helped them to improve irrigation facilities, to initiate fish cultivation and more horticultural production. But among the farmers of Ghateswar gram panchayat, the picture is not so impressive. Only 38% of the sample households have claimed improvement of irrigation facilities and road connectivity within the experimental time period. In that gram panchayat also only 15% of the sample households have done NREGP work in their own land. Hence we can say that within experimental time period, more rapid expansion of NREGP work in terms of asset creation was observed in Krishnapur Gram panchayat than Ghateswar gram panchayat. On the basis of the above observations, the marginal farmers of Krishnapur gram panchayat are chosen as treatment group and those of Ghateswar gram panchayat are chosen as comparison group. Total sample size of our household is 314. Out of which, 204

samples belong to treatment group and remaining 110 samples belongs to control group. We have collected data of the sample farm households both belong to treatment group as well as control group in both the time periods i.e. in the base line period and in the end line period. So we have two period panel data of a particular set of marginal farm households both belong to treatment group and control group. Then on the basis of difference-in-difference method it is investigated whether the marginal farmers of Krishnapur gram panchayat can improve their livelihood in much better way in the end-line period in compare to the marginal farmers of the Ghateswar gram panchayat.

To apply difference-in-difference method, it is required is to measure the outcome variables in the group who enjoys the benefit of the programme much better way than the group who is deprived from getting much benefit of the programme. Here the observational data are generated through primary survey on the basis of a well designed questionnaire. In this 'impact evaluation' the two chosen outcome indicators are, 'Aggregate profit per bigha' or net aggregate farm income per bigha from land owned [5] by the marginal farmer households (AGPFTBG) and his 'Aggregate income per month' (AVINCOME). The econometric model can be explained through Eq.(1)and Eq.(2) respectively:

$$AGPFTBG_{it} = \alpha_0 + \alpha_1 GP + \alpha_2 Year + \alpha_3 GP.Year + \alpha_4 GCROPAR_{it} + FLF_{it} + \mu_i \quad (1)$$

$$GCROPAR_{it} = \beta_0 + \beta_1 PVTLAND_{it} + u_i \quad (1a)$$

$$AVINCOME_{it} = \delta_0 + \delta_1 GP + \delta_2 Year + \delta_3 GP.Year + \delta_4 AFM_{it} + \varepsilon_i \quad (2)$$

The explanatory variables used in the above equations are as follows:

GP: It is treated here as dummy variable and will take the value '1' if the marginal farmer household belongs to treatment group i.e. of Krishnapur gram panchayat and 0 if the sample household lives in Ghateswar gram panchayat.

Year: It is another 'dummy variable'. In this quasi-experiment, 2010-11 is considered as base line period and 2012-13 is considered as end line' period. So 'Year' will take 1 for the 'end line' period and 0 for the base line.

FLF_{it}: Total full person-days the family labourers of the i^{th} household were engaged in domestic production in the entire 't^{th}' period without sacrificing their alternative occupation. Actually NREGP has resulted in substantial increase in the wage rate of the agricultural labourers. The villages covered in our investigation are not an exception. In the villages under Krishnapur gram panchayat, the daily agricultural wage rate was Rs.140 in our base line period but that enhanced up to Rs.200 in the end line period. The enhancement of daily farm wage from Rs.130 to Rs.170 was observed in different villages under Ghateswar gram panchayat. Due to hike of farm wage sometimes it becomes difficult for the marginal farm households to cultivate their own land with the help of hired labourers because that will bring down their profitability from agricultural activity. Lack of availability of credit, proper mechanization in the agricultural activity was not always possible for the marginal farm households. In this situation, the family labour forces, mainly the woman labour force of the households play a significant role to beat the rising labour costs. It has come out from field investigation that availability of the family labour force in agricultural activity has helped the households to take the initiative and risk of more cultivation in their own land. Actually in the surveyed villages, the female job card holders are not generally allowed to work by the male members in NREGP or in any other private non-farm occupation. But they are allowed to do agricultural work in their own field. Hence their opportunity cost is zero. Sometimes the male members of the farm household also do half man-day work sometimes full man-day work in their own field during the time of farming. So we have to check whether more involvement of family labour force of the sample farm household in terms of man-day can play a supplementary role of NREGP to improve gross cropped area and per bigha net farm income of the sample households more in treatment gram panchayat than 'control'' gram panchayat within the experimental time period.

$GCROPAR_{it}$: It represents Gross Cropped area of a i^{th} farm household in the t^{th} period. This represents total area sown once and more than once in a particular year i.e. the area is counted as many times as they are sowing in that year. It has already been mentioned that there is no situation of land lease-in or lease-out of any farm household either belongs to the treatment group or control group. Hence, Gross Cropped area will be more than land owned by the farm household if and only if the farm household adopts multiple cropping in a particular year. Agriculture was predominantly mono-cropped in these study regions in baseline period. Most of the land was not properly irrigated in the base-line period in both Ghateswar and Krishnapur gram panchayat. So land was almost unutilized. Similarly only a small fraction of land was used for horticultural production. Expansion of NREGS work mainly in Krishnapur gram panchayat (through digging small cannels in public land and excavation of tank in the private land of the marginal farmers) have helped to bring more proportion of owned land under irrigation facilities. This may encourage the marginal farm households to bring more owned land under cultivation and move towards multiple cropping.

PVTLAND: NREGP can be carried out not only in the public land but also in the private land, of the small and marginal farmer households provided the farm household wants to carry out this work in their own land. The main work is digging of pond which is assumed to be helpful for water conservation, water harvesting, drought proofing and to cultivate fish. The job card holders of the land owner can also participate in this NREGP work through which they can earn few additional incomes. We have found several situations, where in the baseline period due to different hindrance, the marginal farmer households had to keep a certain portion of their land un-cultivated mainly in the agricultural lean season. But after digging of pond in those lands they can cultivate fish throughout the year i.e. their gross cropped area has increased. Due this reason, PVTLAND is here used as an instrumental variable of GCROPAR when the outcome variable is AGPFTBG. In this equation, PVTLAND is treated as dummy variable and it will take '1' if pond digging was done on the land of the sample farm household. Otherwise it will take the value '0'.

AFM: Total number of family members of a sample household (including male and female) between the age group 15 to 50[6]. They can seek employment through NREGP or can engage themselves in different private non-farm activities in their own locality or in other locality. It is expected that more working members of a household, more will be its earnings.

It has to be mentioned that in Eq.(1) and Eq.(2) we control some extra explanatory variables. The 'controls' can also influence the outcome variables and gives the parameter estimate of the difference-in-difference estimate with smallest standard error. Initially we shall discuss the impact on net aggregate farm income per *bigha* of land due to NREGP followed by Average monthly income.

3. Impact on Net farm income per bigha

The net farm income was calculated by deducting the operational cost of cultivation (excluding the value of family labour) from the gross value of agricultural output, considering both sold or self-consumed amount. The operational cost of cultivation covered items like cost of ploughing, wages paid for hired labour, cost of machinery, irrigation, fertilisers, seeds, interest on capital, etc. whether purchased or self-supplied but excluded the value of family labour and interest on own capital. It came out from our field investigation that the 'opportunity cost' of the family labour force is 'zero' and the farmers got interest free credit from local traders. So these costs are excluded during the time of calculating farm income. Income from animal husbandry and fisheries are here considered as agricultural income. The reference period during the time of calculation is entire base line period and end line period.

Initially, net farm income of each farm household from each agricultural activity was calculated. For fisheries we have calculated the net profit in the entire

reference period. Aggregate net farm income in the entire reference period divided by land owned by the farm household in terms of bigha gives us AGPFTBG. Now we have to investigate whether expansion of NREGP has played any significant role to enhance AGPFTBG of the marginal farm households. To do that, y instrumental variable estimation is applied in the difference-in-difference equation mentioned in Eq.(2) because one of its covariate GRCROPAR (which is expected to be played positive role in farm income of the household) is endogenous in nature and highly dependent on PVTLAND and μ_i. This estimation procedure will give us the best possible estimated value of $\widehat{\alpha_3}$ with lowest standard error which is also statistically significant. The values of the parameter estimate are given in Table 1.

Table 1. *Difference-in Difference result*

	Dependent variable: AGPFTBG	
Explanatory variables	Coefficients	Standard Errors
GP	3273.31**	1452.075
YEAR	4468.116*	1480.997
GP.YEAR	3727.619**	1868.443
FLF	16.785	17.132
GCROPAR	2560.517*	729.016
Constant	19603.25	2949.308
$\overline{R^2}$	0.244	

Notes: *=> significant at 1%, **=> significant at 5% and ***=> significant at 10% level.

We observe from Table-2 that difference-in-difference estimater $\widehat{\alpha_3}$, the parameter estimate of GP.YEAR is statistically significant at 5% level which establishes the fact that per bigha net aggregate farm income (profitability) of the marginal farmer households of 'treatment area' through producing different types of agricultural commodities is more than that of the marginal farm households of 'control area' in the experimental period after expansion of NREGP. It is also observed from the above table that higher gross cropped area also helped the farm households to improve their per bigha farm income. It is also established that NREGP work in private land plays a significant role to enhance gross cropped area of the farm households

Better expansion of NREGP in 'treatment gram panchayat' causes much better crop yield than 'control gram panchayat' because most of the sample marginal farmers in the 'treatment' area have improved intensity of cultivation mainly through cultivating horticultural crops. Getting wage income through NREGP also helped the farm households to take the initiative to invest more on agriculture. NREGP work in private land has also helped to promote fish farming. At the same time renovation and digging of ponds at the private land of the marginal farm households and improvement of water availability through digging canals in public land can help the farm households to improve agricultural productivity and profitability in the same places. An integrated crop and fish farming system has improved the potential of raising farm income quite significantly in the treatment gram panchayat. So it can be said that expansion of NREGP can help even the farm households to enhance their agricultural activities and earnings.

4. Impact on overall income of the farm households

Most of the marginal farmer households in India rely heavily on wage employment, mainly due to lack of capacity to invest and improve their own land. It has observed that expansion of NREGP not only can help the farm households to enjoy positive externalities during the time of agricultural production but also can help them to get employment through this programme.

In the previous section it is proved that implementation of NREGP undoubtedly creates a positive impact on agriculture. It is also true that expansion of NREGP in domestic villages can help the marginal farmer households to earn few extra incomes in our entire reference period through seeking employment through NREGP. Hence to evaluate the importance of NREGP to improve the livelihood of

the marginal farmer households we have to consider Average monthly income of a farm household as an output indicator. Here it has to be mentioned that during the time of calculating annual income of a sample household, we had to consider both the farm and non-farm income of all the earning members of the household in the entire reference period (both in the 'baseline' period and the 'end line' period) including earnings in terms of wage income through NREGP. The result of Eq.(2) is given in Table 2.

Table 2. *Dependent variable: A VINCOME*

Name of the Explanatory variable	Value of the Co-efficient	Standard Error
GP	1773.423*	297.919
YEAR	948.1633*	337.983
GP.YEAR	719.654***	421.472
AFM	15.4707*	2.5985
$\overline{R^2}$	0.26	

Notes: *=> significant at 1%, **=> significant at 5% and ***=> significant at 10% level.

The above table shows that $\widehat{\delta_3}$ (= 719.654) i.e. the parameter estimate of GP.YEAR of Eq.(2) is statistically significant (at 10% level). So we can say claim that MGNREGP is playing a significant role to improve the livelihood of the marginal farmer households through enhancing their total income.

5. Conclusions

The beneficiaries of 'treatment gram panchayat' have claimed during the time of field investigation that after expansion of NREGP in their locality, their cropping pattern has changed, irrigation facilities have developed and overall income level have improved. NREGP work in private land; have improved the horticultural plantations due to ready availability of water. All of these helped them to earn a good amount of profit. Livelihood of the sample marginal farmer households in treatment area has improved within the experimental time period due to enhancement of gross cropped area, per bigha net farm income and average monthly income. NREGP work on private land also plays a significant role behind this. Hence, expansion of NREGP is helpful for the marginal farmer households for sustainabity of their agricultural activities and improving livelihood.

Notes

[1] Public land refers to government land or community land which does not belong to only one individual.
[2] Private assets were found to be better maintained and hence more sustainable due to definite ownership and rights.
[3] The time gap between the 'base line' period and 'end line' period is only two years.
[4] A household will be classified as 'marginal farm household' if it owns less than one hector or 2.5 acre or 7.5 bighas land.
[5] Here it is required to be mentioned that within our experimental time period there is no incidence of land lease-out or lease-in among the sample households.
[6] Actually these family members of a household are possible earning members.

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