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NREGS, Gram Panchayats and Inclusive Climate-Smart Agriculture: Evidence from South India

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This paper assesses the potential of NREGS, India's flagship rural public works programme, to contribute to a shift towards climate-smart agriculture with the help of primary data from one South Indian district. It analyses the role of institutions (local elected councils and village assembly meetings) addressing collective action issues in the planning, implementation, oversight and evaluation of NREG works, as well as on the importance of property rights. It has been found that incidence and type of irrigation, dependence on agriculture and governance within collective action institutions influence the quality of assets created, and that this will affect the prospects of climate-smart agriculture. The lack of clearly demarcated ownership rights on common property resources impede the progress towards climate smart-agriculture, while the tenancy market makes it less inclusive.

Keywords: Rural public works, Natural Resources, Collective action institutions, Property Rights

1. INTRODUCTION

Climate-smart agriculture means "being able to adapt and transform agriculture to feed a growing population in the face of a changing climate without hindering the natural resource base ... More productive and resilient agriculture will need better management of natural resources, such as land, water, soil, biodiversity ... " (FAO 2012: 1). Climate-smart agriculture, which is rooted in sustainable agriculture and rural development objectives, is expected to reduce hunger and improve environmental management. Meinzen-Dick *et al* (2010) note that the response strategies addressing the two main manifestations of climate change, namely, global warming and an increased number of extreme environmental events, are mitigation and adaptation. Adaptation "involves actions that communities and individuals can undertake in response to changing conditions. These approaches include strategies within agriculture such as ... implementing water harvesting or irrigation schemes. Adaptation strategies within agriculture are connected with effective natural resource management (NRM), such as improved land and water management practices" (Ibid: 2). Mitigation strategies "reduce the probability of climate change through sustainable practices that mitigate the increased occurrence, severity, and unpredictability of weather patterns resulting from climate change" (Ibid: 1). The focus of the paper will be adaptation rather than mitigation.

With an expenditure of $ 28.44 billion over the period 2008-09 to 2011-12, the National Rural Employment Guarantee Scheme (NREGS), implemented in India since 2006, has considerable potential for the promotion of climate-smart agriculture in India. This is because one of the thrusts of the scheme is to improve the management of natural resources leading to more productive and resilient agriculture. This will, in turn, lead to climate-smart agriculture. Of nine permissible types of works under the scheme, the top seven are (i) water conservation and water harvesting, (ii) drought proofing, (iii) micro and minor irrigation works, (iv) provision of irrigation facility, plantation, horticulture and land development to poor households, (v) renovation of traditional water bodies, (vi)

land development and (vii) flood-control and protection works. All these works have potential to improve natural resource base in rural areas. Most NREGS expenditure has been incurred on these categories, so depending on the quality of the work done, Indian agriculture might by now be on the road to become more productive and resilient. However, World Bank (2011: 84) notes that, in practice, the NREGS objective of natural resource management "runs a very distant second to the primary objective of employment generation".

Rigorous empirical studies on the impact of NREGS on employment generation and wages have been recently undertaken. Berg *et al* (2012), using *Agricultural Wages in India* data on month- and district-wise agricultural wages for 19 major states in India for the period 2000-2011, find that NREGS has led to a 5.3 per cent increase in the real agricultural wages. Imbart and Papp (2012), using NSSO data, show that public employment increased by 0.3 days per prime-aged person per month after the introduction of NREGS, especially in those districts where the scheme was introduced during the first phase. Azam (2011) shows that NREGS has had a positive impact on labour market outcomes, especially women's labour market participation and wages. These studies, based on nation-wide data, show that NREGS has had a positive impact on the labour market. However, in the context of almost stagnant agricultural productivity[1] in India over the last few decades, it is often asked whether the increase in agricultural wages and employment generation can be sustained. There is, therefore, a need to look at the potential of NREGS to contribute to natural resource management, and thereby, to climate-smart agriculture and to agricultural productivity.

In this paper, we look at the hitherto neglected aspect of creation and rejuvenation of natural resources under NREGS. This has considerable promise for moving towards climate-smart agriculture. In doing so, we will pay particular attention to institutions of collective action and property rights. We will look into the role of local elected councils, grama panchayats (GPs), which have been entrusted with the responsibility of planning and implementing the NREGS. We will also look at gram sabhas (meetings of voters in the village). These institutions are specifically aimed at facilitating collective action at the local level, and in the context of NREG they have an important role to play in the planning, oversight and evaluation of public works. We argue in this paper that incidence and type of irrigation, dependence on agriculture and good governance in the GPs and gram sabhas influence the quality of assets created, and that this will affect the prospects of climate-smart agriculture. Role of property ownership patterns is also seen to gain insights into how the tenancy market (especially crop sharing arrangements) affects access to NREGS benefits for the poorest.

This paper uses primary data collected from 150 villages from the same number of GPs in Bellary district in Karnataka, India in 2011. One village was randomly selected from each GP, and two NREGS works were randomly selected from each of these villages. Structured questionnaires were used to collect data from each GP on governance-related aspects and the quality of works, and checklist to elicit information from key informants[2] on the implementation of NREGS, role of grama panchayats and on the sample works. In addition, the field team consisting of one civil engineer and social scientist visited all the sample works along with some key informants to verify the existence, status and quantum of work undertaken.

The paper consists of five sections. After this introductory section, a brief introduction to NREGS is provided in the second section. In Section 3, we will discuss the caste-wise distribution of the

[1] The growth of Indian agriculture declined from 4.8 per cent during the Eighth Plan period (1992-97) to 2.5 and 2.4 per cent, respectively, during the Ninth Plan period (1997-2002) and Tenth Plan period (2002-2007).

[2] Key informants included agricultural and non-agricultural labourers, cultivators, SHG members, anganawadi teacher and so on.

households in the sample villages, irrigation and cropping pattern, and occupational distribution as these would have bearing on the type of natural resource assets needed and provided. In Section 4, the quality of public and private works and factors that influence the quality are discussed with the help of data from 300 sample NREGS works in 150 sample villages. Discussion and Conclusions are provided in Section 5.

2. THE NATIONAL RURAL EMPLOYMENT GUARANTEE SCHEME (NREGS)

The National Rural Employment Guarantee Act (NREGA), passed in 2005, is considered a landmark piece of legislation. It establishes livelihood security for the rural poor as a legal right. This right to work is new compared to previous provisions for public employment generation and poverty alleviation. The Act provides for 100 days of guaranteed wage employment to every rural household whose adult members volunteer to do unskilled manual work. There is a provision for payment of an unemployment allowance should the government fail to provide employment within 15 days of an application for work. The Act also stipulates that wages should be no less than the minimum wages fixed by the state governments, that there should be equal wages for men and women, and compensation if work is provided beyond 5 kms from the applicant's village, and that worksite should have a number of minimum welfare facilities, etc.

Another important objective of the Act is to revitalize the rural economy by facilitating investment in local public goods while empowering the poor in the process. The thrust of the Act is to pave the way to sustainable livelihood activities by creating natural resource assets such as farm ponds and rejuvenating the existing natural resource base of the rural economy that will eventually make wage employment programmes redundant and alleviate chronic poverty in rural India. Schedule I of the Act provides the list of works permitted under NREGS. Table 1 shows that barring 8 and 9, all these types are related to the creation and management of natural resources, and that they have potential to provide local, regional and global environmental services.

The grama panchayat is the key institution facilitating collective action for planning, implementation and monitoring of NREGS works. In order to ensure greater decentralisation, democratisation, participatory planning, implementation and social audits, GPs are assigned the role of principal implementing agency with the legal provision that they should implement at least 50 per cent of the works[3] in their jurisdiction. Contractors are banned from undertaking any NREGS work under the Act. In order to enable GPs to mobilise the people, a minimum of 60% of expenditure should be on labour, the remainder being material.

[3] Other agencies that can implement the works are line departments, cooperatives, etc.

Table 1—Works permitted under NREGS

Sl. No	Works	Activities	Environmental services	
			Local	Regional and global
1	*2*	*3*	*4*	*5*
1	Water conservation and water harvesting [WC]	Farm ponds, percolation tanks	Groundwater recharge, soil moisture retention and protection (erosion control), flood control (reduced risk), providing irrigation and drinking water and improving soil quality (nutrient recycling)	Water conservation
2	Drought proofing [DP]	Afforestation (including plantation and seeding), forest protection by digging drenches and land development	Soil moisture retention, protection (erosion control) and soil quality (nutrient recycling), flood control (reduced risk) , biomass production (fuel wood) and local climate regulation	Water conservation, carbon sequestration, biodiversity conservation
3	Irrigation works [IC]	Construction, repair and desilting of distributary canals, diversion drains, feeder channels, field channels, lift irrigation, main canal and supply channels, and desilting of open wells.	Providing irrigation, improved agriculture and livelihoods, increased crop production	Need for methane producing large dams is reduced due to construction of irrigation works
4	Works on land owned by poor households [IF]	Irrigation, land development, horticulture and plantation		
5	Renovation of traditional water bodies [WH]	Desilting, excavation and strengthening of embankment of irrigation tanks, etc.	Improved storage capacity, irrigation availability, groundwater recharge, soil quality (nutrient recycling), biomass production and crop production	Water conservation
6	Land development [LD]	Boulder removal, earthen bunding, earthen gully plugging, land levelling, loose boulder structures, pebble bunding, stone bund, stone terracing and play ground.	Land reclaimed for agriculture, improved irrigation availability, and hence, agriculture and livelihood improvement	
7	Flood-control and protection works, including drainage in waterlogged areas [FP]	Cement lining, desilting, construction of cross bund and diversion weirs, and strengthening of embankment of water channels such as canals, drainage, *nallah* (stream), rivers and others.	Better drainage, higher land productivity (erosion control) and flood control (reduced risk)	Water conservation
8	Rural connectivity [RC]	Construction of cement and gravel roads.		
9	Other works [OP]			

Sources: Column 3 from NREGS guidelines and Columns 4 and 5 from Tiwari *et al* (2011).

Grama sabha – people's assembly comprising of all the voters in the village – is an institutional arrangement that seeks to translate needs and priorities of the people in the jurisdiction of GP in relation to natural resources and other infrastructure into implementable action plans. Grama sabha meetings[4] are to be convened following the introduction of NREGS in a district to provide detailed information on the provision of the Act. The function of capturing the people's needs in relation to creation and rejuvenation of natural resources in the village, prioritisation and recommendation of the same to the GP is entrusted to Grama Sabha. An Action Plan, which is prepared by GP based on the recommendation of the grama sabha, will be submitted to the Taluk Panchayat (local government above GP but below district) for scrutiny and approval. Engineers will scrutinise the technical aspects of the NREGS works. This plan should be ready before the commencement of the year of execution of the works.

Functions of GPs are to receive applications from households interested in obtaining employment, verify and register the same within 15 days of time, issue job cards within 15 days of registration, accept applications for employment from registered households, issue dated receipts for such applications and allot work during the period specified by the applicant (up to 100 days per year). It will also pay wages (and unemployment allowance, if applicable), maintain muster rolls and manage funds.

The grama sabha, to be convened by the GP, will monitor the execution of works within the jurisdiction of the GP, registration and issue of job cards, payment of wages and employment provided to each applicant. For conducting social audit, it will identify and appoint members to Vigilance and Monitoring Committees and Social Audit Committee. It will also ensure that there is adequate representation of women and those belonging to depressed castes in these committees. At different stages of the implementation, members of these two committees will inspect the worksites and seek to ensure that the implementation is as per the design principles and that the quality of the works is adequate. A social audit report should be presented to the grama sabha when all the works are complete.

In addition to recommending the NREGS works to be undertaken in each village, the grama sabha should also specify the location of the work including brief details such as survey number of the land where the work is to be taken up. These public works are to be directly implemented by the GPs.

The fourth category of work in Table 1 is applicable to private land. Facilities of irrigation, plantation, horticulture and land development can be provided on private land belonging to Scheduled Caste/ Scheduled Tribe (SC/ST), Below Poverty Line households, those benefiting from the housing programme and land obtained under the Land Reform programme of the 1960s and 1970s. The households will have to be identified by the grama sabha and recommended to the GP.

Table 2 presents an overview of the distribution of completed NREGS works by type during the four-year period from 2008-09 to 20011-12. Numbers are provided for Bellary district, the state of Karnataka, and India as a whole. During this period, 7.6 million NREGS works were completed in India, 325,220 in Karnataka and 21,703 in Bellary district. The number of works completed per village is much higher in Bellary at 40 compared to 12 in the country and 9 in Karnataka. Furthermore, 79 per cent of the works completed in India were related to natural resource management. This proportion is 86 per cent in Karnataka and 93 per cent in Bellary. The proportion of works given to private persons and on land development is relatively high in Bellary district.

[4] In Karnataka, ward meetings are held in each village, while grama sabha is at the grama panchayat levels.

MoRD (2012) has undertaken a review of studies on all the aspects of NREGS including awareness, planning, implementation and impact on wages, employment and incomes, and gender and socio-economic discussions. The studies focusing on NREGS assets are only a few, but growing. Verma (2011) concludes that the return on investment has been positive for 117 out of 143 water-related assets (irrigation, ponds and wells) examined, and varied on the basis of type of work, technical design (IIFM 2010) and geological differences in the areas of implementation. Some studies (NSSO 2010-11; Kareemulla *et al* 2009) found that assets relating to natural resources created under NREGS are widely used by the rural households. MORD (2012) shows that NREGS works have contributed to a rise in groundwater, improvement in soil quality and reduction in vulnerability of production systems to climate variability, although the extent and kind of positive impact depended on scale of activities, technical design, quality of assets, and ownership and use of physical structures. Basi *et al* (2011) note that the positive impact cannot be attributed to NREGS, and that external factors such as rainfall can influence the outcome. Despite these studies, the need for in-depth and rigorous studies on NREGS assets is often stressed.

Table 2—Completed NREGS works (%) during 2008-09 to 2011-12 - India, Karnataka and Bellary

Work categories	India	Karnataka	Bellary
Water conservation and water harvesting	21.8	15.1	4.9
Drought proofing	6.0	13.9	3.0
Micro irrigation works	7.0	5.5	2.3
Works on land owned by poor households	16.1	17.7	39.7
Renovation of traditional water bodies	7.7	5.1	3.9
Land development	15.8	20.1	32.4
Flood Control and Protection	4.7	8.5	6.8
Rural Connectivity	18.7	10.0	6.9
Other works	2.3	4.2	0.1
Total number of works	***7558,222***	***325,220***	***21,703***
Estimated number of completed works per village	**12**	**9**	**40**

Source: www.nrega.nic.in

3. SOCIO-ECONOMIC BACKGROUND OF THE STUDY AREA

Bellary district, which is in the eastern part of Karnataka, has population of 2.5 million. Of them, about 64 per cent live in rural areas. The literate population in the district is 68 per cent. There are seven taluks (sub-district administrative units) in the district.

With large semi-arid and arid areas, this district forms part of the backward North Karnataka region. The district is primarily agrarian; of about 800,000 hectares, about 61 per cent is cultivated land while 12 per cent is forested. Rainfall in the district is scanty and uncertain; as a result, historically, famines have regularly struck the district leaving permanent marks on population growth and agrarian expansion. However, with the construction of a dam across the Thungabhadra river in the 1950s, parts of the district started receiving irrigation water from the 1950s onwards.

The sample villages in Bellary, Hospet and Siruguppa taluks are highly irrigated with 59 to 71 per cent of the total net sown area irrigated (Table 3). We classify these as irrigated taluks. On the whole, canals account for a significant proportion of irrigated area; especially in the irrigated taluks. In the other four taluks, the proportion of irrigated area was not only smaller but also primarily depended on

ground water or rainfall dependent wells or tanks (irrigation reservoirs). We refer to these as less irrigated taluks, although a significant proportion of area is irrigated in these taluks. Interestingly, tanks, once dominant sources of irrigation, contribute to almost nothing in the sample villages.

The above implies that, in sample villages receiving canal irrigation, the potential for the creation and rejuvenation of natural resources may be perceived to be less as most of the area receives assured irrigation. In the case of less irrigated taluks, on the other hand, the potential of renovation of traditional bodies such as tanks, creation of water ponds to recharge and supplement well irrigation, construction of check dams may be perceived to be high.

Table 3—Source-wise area irrigated in sample villages of Bellary district

	Area irrigated (%) by					
Name of the Taluk	**Canals**	**Wells**	**Tanks**	**Other sources**	**Total (in acres)**	**Irrigated area (%) to total cropped area**
			Irrigated taluks			
Bellary	87.6	12.4	0.0	0.0	62486	71.1
Hospet	71.4	27.8	0.7	0.2	14155	59.4
Siruguppa	47.2	22.0	0.1	30.7	34530	62.9
			Less irrigated taluks			
Hadgalli	2.1	83.8	6.2	7.8	14490	27.9
Hagaribommanahalli	26.4	71.5	2.2	0.0	14975	28.4
Kudligi	0.0	99.3	0.7	0.0	4175	17.7
Sandur	19.7	59.0	21.3	0.0	7044	31.8
All taluks	57.1	33.2	1.9	7.8	151855	47.9

Note: The source for this and the following tables and charts is the primary data.

The cropping pattern also differs across irrigated and less irrigated taluks. Paddy and cotton, together accounting for 43 to 72 per cent of the total cropped area, are dominant crops in the irrigated taluks. In the less irrigated taluks, maize is widely grown followed by the cultivation of oil seeds such as groundnut and sunflower. These crops are grown using well irrigation, and hence NREGS works related to recharging the groundwater are of interest.

The caste-wise distribution of households in 150 sample villages shows that households belonging to SC/ST categories account for about 41 per cent followed by backward castes (37.3%) and upper castes (23.2%) in the sample villages. Sample villages are, thus, typically multi-caste villages, and this introduces heterogeneity among the households. There is no marked difference between the irrigated and less irrigated taluks, implying possible collective action problem in all sample villages.

The principal occupation of about 73 per cent of the households in sample villages is either cultivation or agricultural wage labour. There are no marked differences between irrigated and less irrigated taluks. About 10 per cent of households pursue non-farm work as the principal occupation especially in those villages which are large. Households belonging to upper castes are typically landowners, while those belonging to SC/ST categories are mainly wage labourers in agriculture or non-agriculture. There is considerable heterogeneity among households belonging to backward castes with many being small farmers or part-labourers, although several among them are wealthy farmers in some of the villages. Muslim households are mainly involved in non-farm activities such as small business and trade. This means that there is considerable heterogeneity among households in the sample villages.

4. NREGS WORKS IN THE SAMPLE VILLAGES

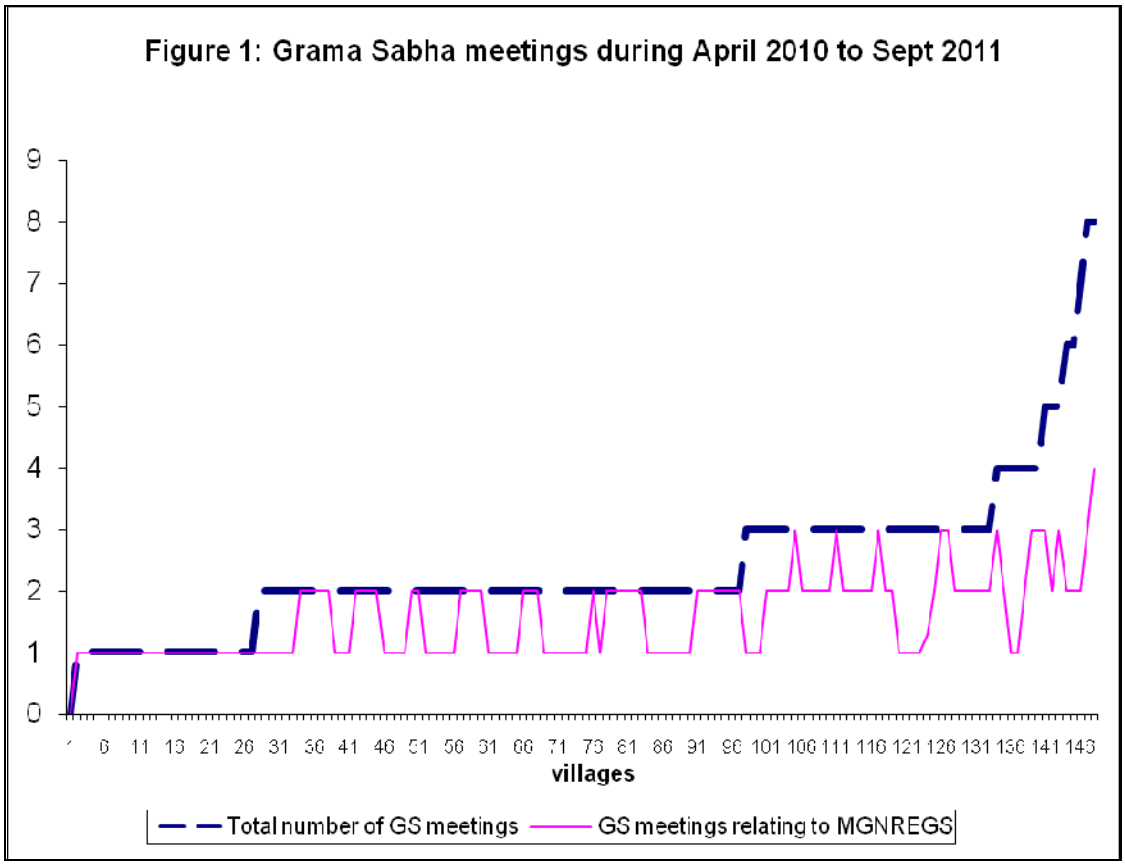
Wherever the village community has taken enthusiastically to NREGS, and where this enthusiasm is supported by an able, well-staffed administration and capable local governance institutions and leadership, results have been positive (MORD 2012: 30). Such enthusiasm depends on the provision of awareness about the scheme, the holding of grama sabha meetings to discuss issues relating to NREGS, the preparation of sound action plans.

NREGS was introduced in Bellary district in the financial year 2007-08. In more than 73 per cent of sample villages, awareness on the scheme was provided in grama sabha meetings in the first year of implementation. Key informants from several of these villages reported that awareness on NREGS is, however, low because information provision was seen by GPs as a one-off undertaking. The use of machines in the works also came in the way of people's awareness and their enthusiastic participation in the scheme.

Effective planning is important to ensure the usefulness and sustainability of NREGS works and to contribute towards climate-smart agriculture. In this, grama sabha meetings play an important role by enabling the community to air grievances, creating community awareness on climate change and its impact, identifying adaptability options and assessing sustainability of these options. We have collected information on the number of grama sabha meetings held during the 18-month period between April 2010 and September 2011. A minimum of three grama sabha meetings should have been held in each GP, and all of them should have taken up a discussion on NREGS.

Data show that the number of grama sabha meetings was 'zero' in two GPs, one in 19 per cent of GPs, two in 47 per cent and three in 24 per cent (Figure 1). Thus, the actual number of grama sabha meetings was smaller than the required number, and the number of meetings relating to NREGS was even smaller. Reasons cited for the inability of the GP to conduct required grama sabha meetings include intense political rivalry in the village that cannot be handled by the GP leadership, charges that some households received undue NREGS benefits, allegations of corruption on GP leaders and charges that the quality of the NREGS works is poor. It appears that where good governance is practiced and leadership is strong, the grama sabha meetings are likely to be held regularly. Thus, the number of grama sabha meetings can be taken as an indicator of good governance and leadership.

The qualitative evidence on the process followed in the preparation of an action plan shows that in places where the governance is good, local problems are presented by either people directly or their representatives, and NREGS works are accordingly included in the action plan. Where the governance is poor, citizens do not either attend the meetings or express their needs. In such cases, the action plan prepared by GP cannot be said to represent the views of the people.



4.1 WHAT IS THE TYPE OF SAMPLE NREGS WORKS?

Of 300 sample NREGS works, about a third were on road construction, while the rest were related to natural resources (Table 4). Seven works were not undertaken at all, while one work could not be located despite best efforts by the field team and Panchayat Development Officer (PDO), highest ranking official of the GP. The field team, however, visited and made a detailed assessment of the remaining 292 works.

About 19 per cent of 300 sample works were found to be different from those mentioned in the official website. In other words, there has been deviation of work category between the action plan approval and actual implementation. It should be noted that when an action plan on NREGS works recommended by grama sabha is approved, each work is assigned a unique identifier[5] which includes two letters indicating the category to which it belongs (Table 1). For instance, the two-letter abbreviation `WC' stands for `water conservation and water harvesting', `DP' for `Drought Proofing' and so on. We have found that only for 81 per cent of the sample works does the type mentioned in the unique number correspond to the type of work actually undertaken in the field.

Table 4 shows that the proportion of works that were found to be different was the highest in the case of land development, renovation of traditional water bodies, flood control and protection, drought proofing, irrigation canals, and water conservation and harvesting. In other words, a work classified as land development in the action plan would actually be on road construction. Note, however, that the proportion of misclassified cases is low at two per cent in the case of rural connectivity (i.e.,

[5] This number is always used to enter and retrieve the data relating to the work.

construction of cement roads) and none in the case of private works. The proportion of cases which are `different' is higher in irrigated taluks than in less-irrigated taluks. This is particularly so in the work categories of flood control and protection, water conservation and harvesting, and other works.

Table 4—Distribution of works (%) by work categories as per official classification and as per field verification

Work categories	Categorisation as per official classification (%)	Cases (%) where categorisation was found to be different from official classification	Categorisation as per field verification
Water conservation & Harvesting	11.0	9.1	11.0
Drought proofing	11.0	12.1	10.3
Irrigation Canals	6.7	10.0	6.5
Facilities to poor households	4.7	0.0	4.5
Renovation of traditional water bodies	2.2	42.9	1.4
Land development	11.7	48.6	6.2
Flood control and protection	18.7	30.4	14.0
Rural Connectivity	31.0	2.2	38.3
Other works	3.0	77.8	1.0
Construction of compound wall	0.0		6.8
Total	**100.0 (300)**	**18.3**	**100.0 (292)**

Note: Figures in parentheses are number of works.

We have, therefore, reclassified the works and the same are presented in the last column of Table 4. When we do that, the percentage of works on roads increases, and that on land development and flood control and protection declines. It was found that several works originally classified under flood control or land development were, in reality, the construction of compound wall to the local school or temple. As a result, the proportion of works relating to natural resources declines from 69 per cent in the official classification to less than 55 per cent in the actual implementation. The works that will replace those relating to natural resource management are construction of road, and compound walls.

Why are these two activities preferred at the expense of those related to natural resource management? Key informants provided two reasons.

Officials prefer works that are less complicated, and it is widely perceived that these are construction of roads, drainage and compound walls. This is because of the following reasons. First, since these works are implemented on government land, there will not be disputes. On the other hand, works such as land development and desilting of tanks often involve contesting claim on land ownership. Second, though officially prohibited, contractors are the ones implementing NREGS works. The profit margins are considered to be high in the case of natural resource management works such as bunding, desilting, deepening of rainwater channel, etc., not only because of the possibility of employing labour saving machinery but also there is an opportunity to claim that the `work was washed out after rains' even in the case of non-implementation. Third, officials perceive that works like construction of cement road will provide solid proof that the work has been completed and that the measurement can easily be made for making the payment. Likewise, the construction of embankment to irrigation tank, cement check dam, protection wall to prevent soil erosion, etc., are also preferred.

The local politicians prefer works that are visible and remembered by voters. If works relating to natural resource management happen to be such visible assets, they do not mind. But, their preference is for those that are present in the village, can be seen by the people every day.

The distribution of 292 works by two broad categories of public and private (Table 5) shows that about 8 per cent of the sample works are private, while the rest are public works. Although all the works relating to `facilities to poor households' are private works, these works are not restricted only to this sub-category. In some cases, private works were sanctioned even under water conservation and harvesting, drought proofing and land development.

Table 5—Distribution of works (%) by private and public and type of work

Work category as per official classification	Private	Public	Total (N)
Water conservation & Harvesting	6.7	93.3	30
Drought proofing	15.6	84.4	32
Irrigation Canals	0.0	100.0	18
Facilities to poor households	100.0	0.0	13
Renovation of traditional water bodies	0.0	100.0	7
Land development	5.7	94.3	35
Flood control and protection	0.0	100.0	56
Rural Connectivity	1.1	98.9	92
Other works	0.0	100.0	9
Total	7.9	92.1	292

4.2 WHAT IS THE QUALITY OF PUBLIC WORKS IMPLEMENTED IN THE SAMPLE VILLAGES?

The three methods used to study the quality, durability and utility of assets created under NREGS are return on investment, beneficiary perceptions and quality and soundness of technical design. In this paper, perceptions of key informants have been used to rate the quality of 269 public NREGS works as good, average and poor.

About 42 per cent of 269 public works have been rated as ‘good’ across all the sample villages (Table 6). The proportion of works rated as ‘good’ is low in the case of renovation of traditional water bodies, rural connectivity, drought proofing, and flood control and protection. Let us look at public works relating to natural resource management in some detail below.

Drought proofing in the sample villages involved planting of trees along roads and close to schools and, in a few cases, on common land. Though it is claimed that several hundreds or thousands of trees have been planted, we found that the survival rate is low and benefit stream is poor. The following are commonly cited for low survival rate. i) Lack of protective cover or fencing, so that the trees have been eaten or destroyed by animals; ii) No provision for care and maintenance after completion of the work; iii) No diversity in the type of plants; iv) Plants along the road and fields have been destroyed by farmers as it is perceived that trees obstruct cultivation. The fact that these well-known problems have not been addressed in the planning and implementation suggests that poor governance in GPs has resulted in low people's participation and ineffective planning and implementation.

Flood control and protection works involve the construction of a stone wall along the rainwater channel to prevent the overflow of flood water to farmers' fields and the erosion of fertile soil. There were a few successful cases. However, in several cases, the utility of these is greatly reduced on account of insufficient height of the protection wall or faulty construction. But, the most important problem is that most of the works falling under this category were related to the construction of drainage in the village as this is expected to prevent rain water gushing into the houses. Key informants expressed that the quality of construction is poor and that the problem is not completely solved because the drainage channel is not only small but does not get connected to a stream or main channel. When asked why drainage works are mainly undertaken under this category, GP officials explained that the contractors are unwilling to undertake flood control works along farmers' fields because of perceived problems from farmers.

Table 6—Public works (%) rated as `good' to total works in a category in the sample villages

	Public works rated (%)			
Work categories as per field verification	**Good**	**Average**	**Poor**	**Total number of public works**
Water conservation & Harvesting	56.7	16.7	26.7	30
Drought proofing	32.0	20.0	48.0	25
Irrigation canals	47.4	42.1	10.5	19
Renovation of traditional water bodies	25.0	50.0	25.0	4
Land development	75.0	6.3	18.8	16
Flood control & protection	41.5	12.2	46.3	41
Rural Connectivity	31.5	42.3	26.1	111
Other works	66.7	33.3	0.0	3
Construction of compound wall	55.0	20.0	25.0	20
Total	41.6	29.0	29.4	269

Three out of four works relating to ***renovation of traditional water bodies*** are average or poor because of small quantum of silt removed, contrary to what is claimed, or technical defects. When asked why the proportion of the renovation works is small, two reasons were cited. First, the tendency of equal distribution of the NREGS budget by GP members among themselves leads to a situation where the amount available to each ward becomes small and, as a result, high cost works such as renovation of traditional water bodies cannot be undertaken. Second, encroachment of tank bed by the powerful in the village is a general problem. Contractors do not prefer to undertake these activities as it involves the eviction of encroachers.

Water conservation and harvesting works typically include the construction of check dams, farm ponds and drinking water ponds for cattle and forest animals. Although several of these works were found to have technical and quality flaws, about 57 per cent of them were perceived to be good by the key respondents as they improved the ground water levels, provided irrigation water and drinking water to livestock animals.

The work relating ***irrigation channels*** typically included the construction, repairs and desilting of channels so that irrigation water flows easily to farmers' fields. Open wells are also constructed and repaired under this category. In some cases, tanks are also constructed. About 47.4 per cent of these works were ranked as good. Works on the desilting of irrigation channels are rated as poor, because although in many cases it was claimed that the work was over and payment was obtained, the desilting work in fact never took place or was not finished. In addition, many open wells were constructed too far from the village to be of any use.

4.3 WHAT FACTORS INFLUENCE THE QUALITY OF NREGS PUBLIC WORKS?

A regression analysis (logit) was carried out to establish the factors that influence the quality of NREGS public works. The total number of public works is 269 after removing private works from a total of 292. The dependent variable is the quality of NREGS public works, as assessed by a village focus group: 1 = Good or very good quality, 0=others (average or poor). The independent variables, which are all continuous and constructed at the level of village or GP, are shown in Table 7.

Table 7—Logit regression results

Dependent Variable: Quality of NREGS works	
Variables	**Coef.**
Irrigated area (%) to total area in the village	0.0138**
Canal-irrigated area (%) to total irrigated area in the village	-0.0116**
Area under paddy and cotton (%) to total cropped area in the village	-0.0099
SC/ST households (%) to total households in the village	0.0014
Cultivators and agricultural labourers (%) to total households	0.0217**
Number of grama sabha meetings	-0.1986
Number of grama sabha meetings pertaining to NREGS	0.3404*
Fixed effects at the district level	**Yes**
Number of observations	**269**

** Significant at 5% level; * Significant at 10% level

The regression results show that the proportion of irrigated area has significant positive impact. This can be explained as follows. The larger the proportion of irrigated area, the more farmers are interested in participating in NREGS works, because undertaking works relating to water conservation and harvesting, irrigation canals, renovation of traditional water bodies and land development will contribute to the recharging of ground water, improved storage capacity and improved irrigation availability. This will directly benefit the farmers.

The variable on the proportion of canal-irrigated area to total is negatively associated with quality. This might be because the greater the canal-irrigated area, the lower is the vulnerability among farmers on account of irrigation availability. However, the proportion of area dedicated to paddy and cotton is not significant.

The proportion of cultivators and agricultural labourers to total households has significant positive impact on the quality of NREGS public works because these groups stand to benefit directly from such works. We anticipated that the proportion of SC/ST households to total households would have positive impact on quality because these households, being generally poor and dependant on wage employment, would be interested in the qualitative implementation of NREGS works. However, the lack of significance in this case can be explained in terms of heterogeneity among these households.

The total number of grama sabha meetings does not have significant effect, whereas the number of grama sabha meetings relating to NREGS has significant positive impact on quality. This can be explained as follows. Meetings pertaining to NREGS are more relevant as these meetings provide more direct opportunity for the citizens to participate, and present and secure interests specifically relating to the scheme.

Thus, the incidence of irrigation, dependence on agriculture and number of grama sabha meetings specifically focusing on the NREGS programme have significant positive association with the quality of works. On the other hand, larger area irrigated through canals making assured irrigation and mono-cropping possible does not enthuse farmers to show interest on NREGS works. Agricultural labour households in such villages also may not show much interest as they are likely to have good employment opportunities due to multiple annual harvests and the labour-intensive nature of crops grown under canal irrigation.

4.4 ARE TENANT FARMERS BENEFITING FROM THE NREGS WORKS?

Of 292 sample works, about 8 per cent were private works providing benefits of horticulture, land development, irrigation (especially farm ponds) and water harvesting infrastructure to individual farmers. Nearly 48 per cent of these works have been rated 'good'.

What type of households are able to take up private works? As per the programme guidelines, only poor households, especially those belonging to the SC/ST category, can benefit from private works. About 40 per cent of total households in the sample villages belong to SC/ST category. Of 57,898 SC/ST households in the sample villages, only 28.2 per cent of SC/ST households, pursuing owner-cultivation, are eligible to receive private NREGS works (Figure 2). About two-thirds of SC/ST households agricultural or non-agricultural wage labourers; a significant proportion of them are also tenant farmers.

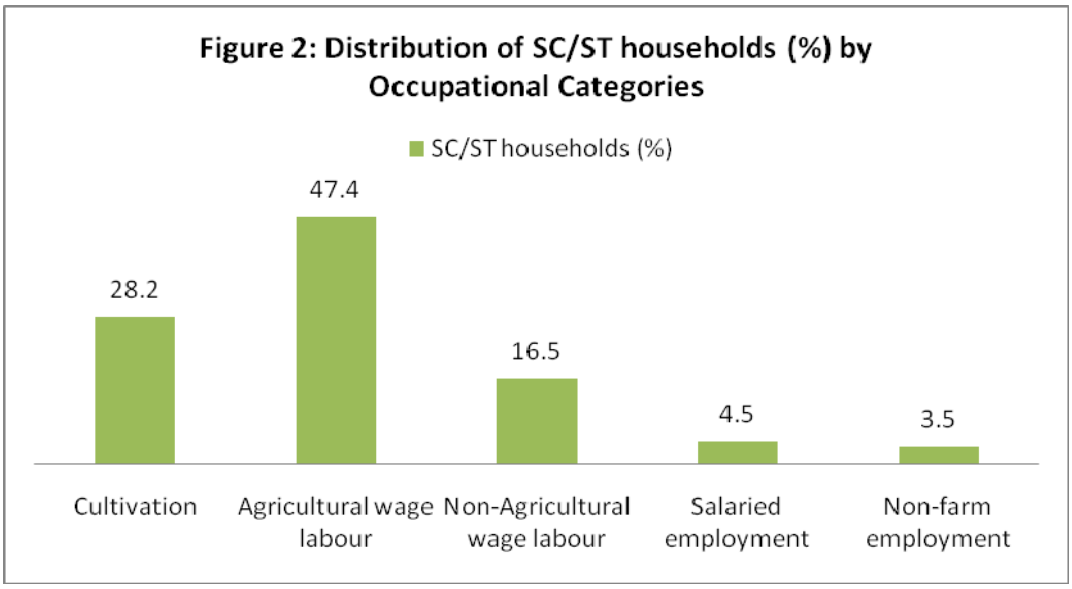
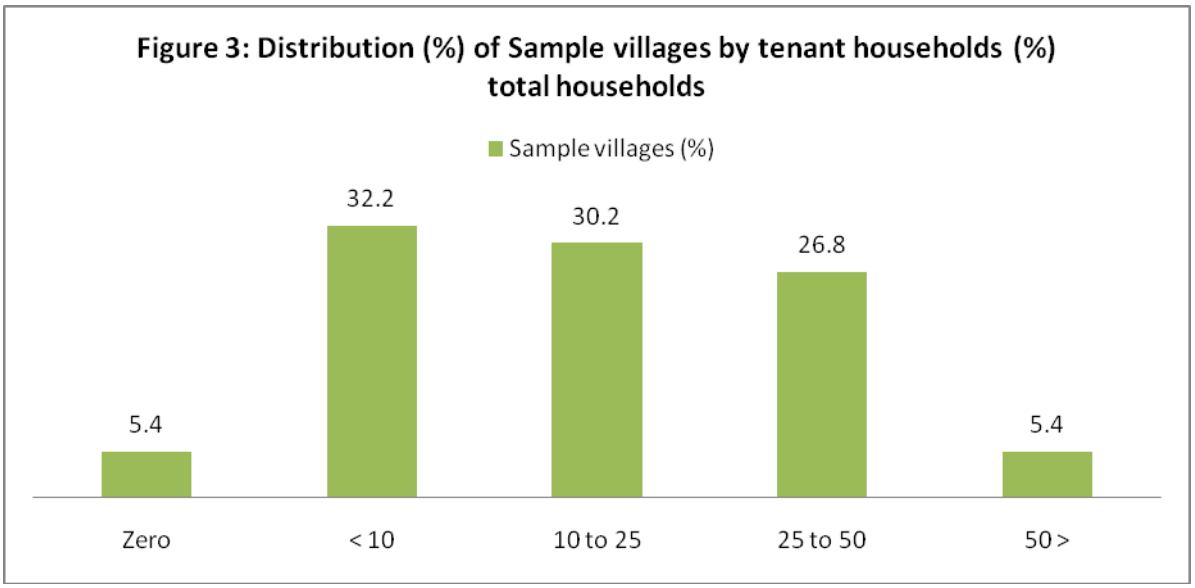


Figure 3 shows the proportion of households depending on tenancy across the sample villages. Although the proportion of tenants is less than 10 per cent in about 32 per cent of the villages, it ranged between 10 and 70 per cent in about two-thirds of the villages. Thus, the tenancy market is active in a majority of the sample villages. Key informants have revealed that share-cropping is the dominant form of tenancy. Those who rent out land for share-cropping live either in villages or in towns. In both the cases, oral agreements are common. Fixed tenancy agreements have been entered in a few cases, but these, too, are typically not formalised.



We asked grama panchayat officials whether tenants are eligible to obtain private works under NREGS. The secretary to one GP noted that "share croppers should belong to SC/ST category or obtained housing benefit under the central government housing scheme of IAY. In addition, they should bring certificate that they will be cultivating the land for, at least, the next couple of years". But, PDO of another GP remarked that "even if share croppers belong to SC/ST community or obtained IAY benefits, benefits cannot be extended to them […] because the land should be [in] the name of the beneficiary. Only after examining the *pani* [official document proving the land ownership], do we provide the private benefit to them". In another village, a tenant (sharecropper) made an attempt to obtain private NREGS works. Since he was an IAY beneficiary, he approached the landlord to give a certificate that he is the tenant; but, the landlord refused. This is surprising because this work would have benefited the land owned by the landlord; When we asked the landlord why he was afraid, he stated that this may cause problem to his land ownership. He added that `I do not know how the legislative provisions are going to be in the future. Hence, I do not want to give the certificate'.

In another village, a tenant's attempt to obtain private NREGS benefits also met with failure. This tenant had leased the land for three years for the cultivation of banana. The landlord, living in far-off city, gave his oral consent to lease out the land for a fixed sum. The tenant has approached the local GP for support for cultivation of banana and provided the survey number of the land. The GP sanctioned NREGS funds for land levelling, purchase of saplings, plantation and installation of drip irrigation. The tenant has also completed the plantation. However, when the landlord learnt about this, he protested in the GP and evicted the tenant.

Thus the landownership pattern is not congenial for tenant farmers, who comprise a significant proportion of actual cultivators. Marginal farmers also do not benefit from private works as they do not have the required clout in the GP. The qualitative evidence shows that the private benefits under NREGS are usually obtained by households with political connections or membership in the social audit committees, large landowners and sometimes the elected representatives themselves.

5. DISCUSSION AND CONCLUSIONS

This paper has reviewed and assessed the potential of NREGS, India's flagship rural public works programme, to contribute to a shift towards climate-smart agriculture by analysing primary data from 150 villages in one South Indian district. It has focused on the role of institutions (local elected councils and village assembly meetings) addressing collective action issues in the planning, implementation, oversight and evaluation of NREG works, as well as on the importance of property rights.

On paper, it appears that the importance of NREGS for adaptation to climate-smart agriculture could be very substantial indeed. It has a large budget, reaches across all of rural India and most of its priority work categories can be related to the management of natural resources such as irrigation reservoirs and agricultural land.

However, in practice there are several problems. The collective-action institutions analysed here have been given important tasks in NREGS, but for a number of reasons these are not always implemented as intended. Corruption or a lack of capacity may prevent village assembly meetings from being held in many cases, and this paper shows that this tends to result in lower-quality work.

Several problems have also been identified relating to property rights. First, the comprehensive survey of the land by the government was last undertaken during the colonial rule in India. As a result, the ownership rights are not clearly demarcated especially in the case of common property resources such as rain-water channels, tanks, etc. With contesting claims on land ownership surrounding common property resources, there is reluctance on the part of GPs to undertake natural resource management works relating to these resources. This also leads to the preference to take up works not relating to natural resource management and assigning higher priority to private lands having clear-cut property rights. While the former impedes the progress towards climate-smart agriculture, the latter makes it less inclusive. Second, the high proportion of tenanted land is also a hindrance. In one case encountered in the field, the owner of a plot of resisted the tenant's agricultural investments, including drip irrigation, because he perceived that the investment might dilute his property rights in the long run. We also find that the quality of works undertaken tends to be higher when the land is owner-cultivated, presumably because if the people operating the land are also the owners then they have a more direct long-term interest in natural resource management. However, with tenants comprising 10 to 50 per cent of the households in a majority of the sample villages, many poor farmers will be left out, and this will adversely affect the inclusive climate smart agriculture.

Nevertheless, despite imperfections, it appears to us that NREGS has been and will continue to be an important driver of climate-smart agriculture in India, by funding natural resource improvement and management on a large scale. The preservation and improvement of agricultural land, water table and irrigation infrastructure are important climate-change adaption strategies.

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