Impact of MGNREGA on Cropping Pattern and Labour Use: An Analysis Using Primary Survey from Rajasthan and Uttar Pradesh

Work in Progress

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Abstract

The implementation of the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) in India in 2006, has voiced concerns about the possible adverse impact on agriculture due to a shortage of casual labour in the agriculture sector and an unfavourable shift in cropping patterns. At the same time, MGNREGA is also associated with investments in rural infrastructure. The scheme especially focuses on water-related structures through asset creation. This paper examines the impact of MGNREGA on cropping patterns and labour use at the village level. The paper distinguishes between three categories of rural households viz; labourer-households, middle-farmers and large-farmers. The database for the analysis comprises a primary survey of 667 households in Dholpur and Karauli districts in Rajasthan, and Barabanki and Sonbhadra districts in Uttar Pradesh. The empirical strategy exploits the non-uniform implementation of MGNREGA and compares outcomes in high-treatment villages with those in low-treatment villages using a difference-in-difference framework in order to identify causal effects.

JEL: J21, J31, Q15

Keywords: MGNREGA, Irrigation, Cropping Patterns, Labour Use

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1. INTRODUCTION

Agriculture is the main source of income for a majority of the population in developing countries (Lipton (1977) and Mellor (2001)). The implementation of the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) in India in 2006, there have been concerns about the possible adverse impact on agriculture due to a shortage of casual labour in the agriculture sector and an unfavourable shift in cropping patterns (Rangarajan et al. (2011) and Jakhar (2012)). MGNREGA guarantees a hundred days of wage-employment in a year to a rural household willing to work in unskilled labour at the scheduled minimum wages. This may divert labour resources to MGNREGA since minimum wages are typically higher than prevailing market agricultural wage rate. As a result, agricultural wages may be bid up (Berg et al. (2012) and (Imbert and Papp (2014a)). Therefore, it is quite possible that farmers may shift the cropping pattern toward labour-saving crops.

At the same time, MGNREGA is also associated with investments in rural infrastructure. The scheme focuses specially on water-related structures through asset creation. This has been confirmed by government data which suggests that more than 50 per cent of total expenditure on assets has been spent on water-related works in 2010–2011. The utility of these assets for farmers has been documented in several studies (for example, Ranaware et al. (2015), Tiwari et al. (2011) and CSE (2008)). All these studies point towards improvement in irrigation facilities for farmers at the villages where significant water-related works have taken place through MGNREGA. Therefore, this may cause farmers to shift their cropping pattern towards more water-intensive crops.

This paper examines the impact of MGNREGA on cropping patterns and labour use, using primary survey data from Rajasthan and Uttar Pradesh. The present paper further explores the impact on cropping patterns and labour use by examining whether there is heterogeneity in the impact for different land owning households. As argued above, an increase in agricultural wages and improvement in the availability of irrigation facilities due to MGNREGA are the two main channels that may affect cropping patterns. As far as the wage channel is concerned, it is expected that the impact on cropping patterns is more likely to be seen for large farmers as

compared to the small farmers since large farmers are net-hirers-in of labour and, therefore more vulnerable to a rise in the cultivation costs. On the other hand, improved irrigation resources may lead to, lower costs of irrigation and, therefore, it may be be more beneficial for small farmers due to easing the resource constraint.

Changes in the cropping pattern are expected to lead to a change in labour use in agriculture. A shift in the cropping pattern towards labour-saving crops may reduce labour use in the agricultural sector. On the other hand, a shift in the cropping pattern towards high water-intensive crops which typically demand more labour, may increase labour use in the agriculture sector. Thus, the change in overall labour use will depend on the nature of changes in the cropping pattern. Therefore, the net effect on overall labour use in agriculture depends upon the magnitude as well as the direction of change in cropping pattern.

Alongside, several provisions in the MGNREGA make for a disproportionate participation by females. In particular, the scheme secures at least one-third participation by women in its total employment, and provides the employment at the place of residence with equal wages to males and females. All these provisions are likely to draw females not only into public works, but casual employment as well, increasing total female work force participation.

The objectives of this study are, therefore, first to examine the impact of MGNREGA on cropping patterns, that is, whether farmers are shifting towards labour-saving crops or water-intensive crops. The second objective of the study is to evaluate the impact of MGNREGA on labour use in the agriculture sector, disaggregated by gender. We evaluate the impact by distinguishing between three categories of rural household. The first category is the large farmer households which are more likely to spend time on individual farms as compared to working on other farms. The second category is the middle-level farmers who are more likely to spend time on individual farms as well as work as labourers on other farms. The third category is the labourer households which are more likely to spend majority of their time working as labourer as compared to working on their own farm.

We use primary survey data from Rajasthan and Uttar Pradesh. It uses information from 667 households from 24 villages. Our identification strategy exploits variation across sample villages to define high-treatment and low-treatment villages. The study compares high-treatment villages to low-treatment villages over the period 2005/6 and 2010/11 in a difference-in-difference framework to identify the casual effect of the scheme.

Our results suggest that there is a shift towards water intensive crops in both Rajasthan as well as Uttar Pradesh. The shift in cropping pattern in both the states has been driven by labourer-households. Additionally, we find that there is an in the increase in female labour use in the agricultural sector for Rajasthan, while no such increase is observed for Uttar Pradesh.
This study contributes to the existing literature on MGNREGA in several ways. It is the first comprehensive evaluation of the impact of MGNREGA on cropping patterns and labour use in agriculture. It also provides evidence on the heterogeneity in impact estimates by studying different type of households.

The rest of the chapter is organized in six sections and ends with the conclusion in the final section. The second section provides the background. The third section describes the sampling design. The fourth section discusses the implementation of MGNREGA and its implication for empirical strategy. The fifth section formulates the empirical strategy. The sixth section discusses summary statistics. The seventh section explicates the results. The eighth section provides the results of the robustness tests conducted to ensure validity of the estimation strategy. The final section highlights the main conclusions.

2. BACKGROUND

The first subsection presents objectives of MGNREGA, its implementation and some provision as stated in the act, which are relevant to our study. The second subsection reviews the somewhat limited evidence on casual labour in the agriculture sector. The third subsection discusses the paper that assesses the utility of assets created under MGNREGA for the agriculture sector. The fourth subsection discusses the evidence related to cropping pattern, though there is no direct study that examines the impact of MGNREGA on cropping patterns. The final subsection reviews the paper that evaluates the impact of MGNREGA by studying heterogeneity in impact estimates.

2.1. MGNREGA

The Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGA) came as an act in 2006, to enhance the livelihood security of the rural households. The scheme was rolled out in phase wise manner. In the first phase, in February 2006, the scheme was rolled out in 200 of the poorest districts of the country. In April 2007, the scheme was implemented in 130 districts of the country. From April 2008, the scheme was implemented everywhere in the country.

As noted earlier, the scheme provides an employment guarantee of 100 days to those households who are willing to do unskilled work at the scheduled minimum wages. The household which is interested can apply for a job to the village representative either orally or in written. Then, as per the act, it is the responsibility of the government to provide employment within 15 days of their application. In case the government is not able to provide employment within the stipulated time, it makes household to be entitled for unemployment allowances.

The scheme provides a special focus to female. It includes a provision to reserve at least one-third employment to female through MGNREGA. To encourage more participation in MGNREGA, it provides employment locally i.e. within the radius of 5 kilometers from the applicant's residence. Moreover, it creates rural assets with the main priority being given to water related activities followed by rural connectivity and other works.

2.2. Agricultural Labour

Rangrajan et al. (2011) compare the employment in the agriculture sector in Pre and Post-MGNREGA periods. It uses employment and unemployment survey (EUS) of the National Sample Survey Organization (NSSO) to compare 61st round (2004/5) with 66th round (2009/10), to examine the share of the work force in the agriculture sector, during the period. It finds that people are leaving agriculture sector after the implementation of MGNREGA. Jakhar (2012) based on field visits, reports a shortage of casual labour in the agriculture sector in Andhra Pradesh.

Azam (2012) and Imbert and Papp (2014a) examine the impact of MGNREGA on private employment, but the limitation is that they did not distinguish between the agriculture and non-agriculture sector. Azam (2012) examines the impact of MGNREGA on labour force participation rate (LFPR). The paper compares 61st round (2004/5) and 64th round (2007/8) of employment and unemployment survey (EUS) of NSSO. It exploits the phase wise rollout of the scheme and difference-in-differences method to evaluate the impact estimates. It finds a positive impact of MGNREGA on LFPR for females. Imbert and Papp (2014a) evaluate the impact of MGNREGA on private sector employment (self-employed, regular, casual and domestic works). It uses the same methodology, and data set as adopted in the Azam's paper. It finds that private sector employment declines by 1.6% accompanied by 1.1% increase in public sector employment, in the dry season.

2.3. Irrigation

CSE (2008) and Ranaware et al. (2015), evaluate the utility of assets for agricultural purposes created through MGNREGA based on the farmers perception in Orissa and Madhya Pradesh and Maharashtra, respectively. The CSE (2008) study is based on the primary survey conducted in Nuapada and Sidhi districts of Orissa and Madhya Pradesh respectively. With regards to the irrigation, the study finds that, in Sidhi district, about 78.6% of the respondents reported an improvement in irrigation, while this figure was about 16% for Nuapada. The study provides a lower number of water-related works under MGNREGA as an explanation for findings of Nuapada district. Ranaware et al. (2015) examine the utility of 4100 assets created under

MGNREGA by collecting the perception of 4881 users in Maharashtra. It finds about 90 per cent of the respondents reported that assets were very useful and somewhat useful, while only 8 per cent of the respondents reported asset as useless.

Kareemulla et al. (2009) study 54 assets in six villages in three mandals of Anantpur district in Andhra Pradesh. The study is based on the site visits to every asset created under MGNREGA to evaluate the quality of assets. It finds about 76 per cent of the assets created under MGNREGA are useful for the purpose they have been built. The qualities of the remaining assets are not satisfactory. Tiwari et al. (2011) evaluate the assets created under MGNREGA for their potential to enhance irrigation facilities and land development in Chitradurga district of Karnataka. It compares pre and post ground water level in the study area. It reports a significant improvement in water level in three villages out of the six study villages, consistent with the places where significant water-related work has taken place.

2.4. Cropping Pattern

There are very few studies in the literature that evaluates the impact of MGNREGA on agriculture. The only exceptions are Shah (2012) and Gehrke (2013), but they evaluate the impact of MGNREGA on household production decisions towards high-risk and high-return crops as a consequence to increase in net income through MGNREGA.

Shah (2012) examines the impact of MGNREGA on production decisions by looking at the share of land cultivated on high-risk and high-return crops. The paper uses district level data from Area, Production and Yields from 2005 to 2010. It uses instrumental variable regression to identify the impact of the program. The result suggests that farmers have increased the share of land cultivated for high-risk crops by 4 to 9 per cent.

Gehrke (2013) examines the impact of MGNREGA on the role of risk constraints in a household's production decisions. The paper exploits the phase wise implementation of MGNREGA. It uses young lives survey data for Andhra Pradesh. The result suggests that agricultural households increase the share of risky but profitable crops in their portfolio.

Aggarwal, Gupta, and Kumar (2012) evaluate cultivation costs, profits and cropping intensity arising from wells constructed under MGNREGA. Their analysis is based on a perception of households in a gram panchayat of Ranchi district in Jharkhand. The result shows that improvement in irrigation led to increase in the total cropped area.

2.5. Heterogeneity in Impact of MGNREGA

Liu and Barrett (2013) examine the heterogeneity in the participation of the scheme using employment and unemployment survey of NSS 66th round (2009-2010). The result suggests that self-selecting targeting design lead to self-selection of poorer households as compared to the richer households. Dutta et al. (2012) shows that scheme is attracting rural poor, backward classes and poorer women into the workforce. In this regard, our study contributes to the limited literature on the heterogeneous impact of MGNREGA by analyzing the impact estimates by type of households (Labourer household, Middle-farmer and Large-farmer).

3. THE SAMPLE

The study uses original data from Rajasthan and Uttar Pradesh. The primary survey data was collected between August 2011 and March 2012. And that is represented a follow-up to surveys conducted in 2006 and 2007 respectively[2]. The follow-up survey added a module on agricultural outcomes such as cropping pattern and agriculture labour use, in addition to the original module which was mainly focused on employment in private and public sectors. To create a panel, this survey asked respondents to recall their crop choices in 2005/6, in addition to asking them about the crops they planted in the reference crop year 2010/11. We discuss sample design, survey module, sample size and issues related to the attrition of households and missing data in the following sub sections.

[2] The first round of the survey was conducted in April to June 2006. The second round of the survey was conducted in April to June 2007.

3.1. Sample Design

Rajasthan and Uttar Pradesh were selected purposively in 2006, to be able to compare two adjoining states. Two districts from each state were selected. The selected districts were Karauli and Dholpur in Rajasthan and Barabanki and Sonbhadra in Uttar Pradesh. Karauli and Sonbhadra districts of Rajasthan and Uttar Pradesh respectively were chosen randomly from the list of phase 1 districts. Then, these districts were matched on the basis of literacy rate to the proximately closest districts not in the list of phase 1 districts, which resulted in the selection of Dholpur and Barabanki district of Rajasthan and Uttar Pradesh respectively. This strategy was adopted to facilitate with and without comparison of performance. The attempt has been successful just in the case of Rajasthan because as stated in the act, in 2006, MGNREGA was implemented only in Karauli district, but not in the Dholpur district here, it was implemented later in April 2008. However, in the case of Uttar Pradesh, MGNREGA was implemented in both districts Sonbhadra and Barabanki in 2006 respectively. This has happened because government subsequently added Barabanki to the list of phase 1 districts, and as a result implementation in Barabanki has started done in 2006.

Within each district, a list of all villages with population less than 500 was prepared from the 2001 census listing, and then six villages were picked at random. The only additional requirement was that the survey wanted at least one village from each block. This was done to cover as many blocks as possible in the study area. Within each village, the list of all households residing within the village was prepared, and then 30 households were picked randomly. Thus, the sample is not representative at the state level, but is representative of smaller villages in the four districts chosen.

The first two rounds of the survey focused on employment in private sector (without distinguishing between agriculture and non-agriculture sector) and public works. Gravel et al. (2010) examines the determinants of household participation in MGNREGA only in Karauli district, using second round of the survey. The result shows that almost every household is taking advantage of MGNREGA.

Because our objective is to delve into impacts on the agricultural sector, the present study is based exclusively on the follow-up survey which, as noted above, created an artificial panel by asking questions retrospectively. The questionnaire consisted of the following modules: a module addressed to cultivators, which elicited information on cropping pattern, production and sale of agricultural commodities, input and expenditure, labour use in agriculture, irrigation costs, and mechanization and another addressed to marginal farmers and landless labourers, that attempted to gather detail on employment in the agriculture and non-agriculture sectors.

3.2. Sample Size and Missing Data

The sample size in the first round of the survey was determined on the basis of power calculation.[3] From the power calculation, implied sample size was very large. However, given the budget of the survey it was decided to cover only 721 households in 2006. In this context, the sample size is underpowered because we are now studying outcomes that have been never thought when the survey has been started. However, it is unlikely to make a difference since 100 days of MGNREGA work has never been realized. The survey, nonetheless, ensured that the sample was not endogenously selected and biased.

Table 1 presents the sample size of the first round and the follow-up survey. The first round covers about 721 households - 358 households from Rajasthan and 363 households from Uttar Pradesh. The follow-up survey covers 667 households- 333 households from Rajasthan and 334 households from Uttar Pradesh. As indicated in Table 1, in Rajasthan, out of 333 households surveyed in follow-up, about 323 households are root-household, and 10 households are those which have been split from the root households. Similarly, in Uttar Pradesh, out of 334 households, about 307 households are root-household and 27 households are those which have been split from the root households. It clearly means that about 35 households in Rajasthan and 54 households in Uttar Pradesh respectively are missing in the follow-up survey.

Table 2 presents the probit regression to examine whether the follow-up households are representative of first round of households in terms of demography, social and economic profile. Since, we are examining each state separately, the probit regression implemented for

[3] The power calculation assumes a 5 percent increase in monthly per capita expenditure and assuming 100 days of MGNREGA work.

Rajasthan and Uttar Pradesh separately. The left-hand side variable equals to 1 for those households which have been surveyed in first round as well as in the follow-up survey, and otherwise 0. We use the following household's characteristics for 2006 as the right-hand side variable: age of the head, square of the age of the head, schedule caste/tribe, landholding (in acres), gender of the head of the household, education (in years), asset index, and village dummies. Age and gender of the head capture the demography of households. SC/ST captures the social profile of the households. Patterns of landholdings capture the economic profile of the household. Education variable captures the educational status or technology of the household. Asset index captures the economic status for the household. We also use village dummies to see whether there is a systematic pattern in attrition across the villages. The results for Rajasthan suggest that all variables are found to be insignificant with the exception of age of the head and square of the age of the head. It clearly indicates that follow-up households are representative of baseline households in all characteristics except age of the head and square of the age of the head. That means that socio-economic profiles of the households are indifferent. In case of Uttar Pradesh, the result suggests that all variables are found to be insignificant, which clearly mean that follow-up households are representative of baseline households in demography and social and economic profile of the households.

A second aspect relates to the "attrition" coming from recall, in Rajasthan, out of 263 households who report positive land holding, but only 170 households reported data for both reference year (2010/11 and 2005/6). In case of Uttar Pradesh, about 240 household's reports positive land holding, but only 155 households reported data for both reference year (2010/11 and 2005/6). This could be a problem if there is a systematic pattern of missing data between those households who report both year (Household with non-missing data) data with those who report only one-year data (Household with missing data).To see whether these households are representative of the households with positive land holding.

Table 3 presents results from probit regression to compare characteristics of these households. For Rajasthan, the result shows that all household characteristics are found to be insignificant; this means that there is no systematic pattern between two sets of households. It suggests that the households with non-missing data are representative of total households. In case of Uttar Pradesh, the result suggests that male head of the household is significant, which says that male

head of the household responds more as compared to female head. Age of the head and square of age of the head are also found to be significant, but at 10 percent level of significance.

4. MGNREGA IMPLEMENTATION AND ITS IMPLICATIONS FOR THE EMPIRICAL STRATEGY

Despite the universal nature of the MGNREGA, its implementation has not been uniform across all villages, and we leverage this fact to form our empirical strategy. For instance, in Rajasthan, in 2010/11, MGNREGA was implemented only in five of twelve villages, as indicated in Table 4. Among the seven villages in which there was no implementation in 2010/11, four of them had seen implementation for two years, two of them had seen implementation for one year, and one of them had seen no implementation since 2008/9.

Similarly, in Uttar Pradesh, as indicated in Table 5, out of twelve villages where MGNREGA was seen in 2010/11, four of them had seen implementation for one year.

Further, as indicated in Table 6, among villages where implementation is seen in 2010/11, the results show a huge variation in the implementation intensity defined as person-days employment provided through MGNREGA per-rural household. For instance, in Rajasthan in 2010/11, the village with the lowest intensity is found as R1 village where employment provided through MGNREGA is found to be one person-days per rural household and at the same time, in R5 village, the employment provided through MGNREGA is observed to be 54 person-days per rural household. This marks a huge variation in intensity of implementation across villages. Similarly, in Uttar Pradesh in 2010/11, the employment generated through MGNREGA in the lowest and highest intensity village is seven person-days per rural household in U10 village and 42 person-day per rural household in U11 village respectively.

Before exploiting the uneven implementation of the MGNREGA at the village level to form the empirical strategy, it is important to understand if the pattern is in any way endogenous is it the case that there was no implementation in certain years because there was no demand for the scheme, or the case that there were other exogenous factors, related to supply or administrative reasons, that may have led to this.

The questionnaire we have administered can help answer this, since there was a specific module on whether adults in the household had benefited from the MGNREGA, and if they did not, what could be the reasons for this. This information is summarized in Table 7. In Rajasthan, nearly 90% of the households had an adult with a job card, while 77% of households in Uttar Pradesh did so. Among those who did not have a job card, between 40 to 50% reported that they did not apply for one. Despite the near-universal coverage in terms of job cards, only 34% of households in Rajasthan and 71% of households in Uttar Pradesh reported participating in the MGNREGA in 2010/11. Among those who did not participate, the primary reason given for the non- participation was that work was not offered (95% in Rajasthan and nearly 70% in Uttar Pradesh reported this as the reason for their non- participation). This suggests that it was not demand that constrained participation, at least in, 2010/11. It is notable that this is despite the fact that the law mandates that work be available within 15 days of application.

Furthermore, this is corroborated by other studies in the literature. For example, Himanshu et al. (2015) examine the implementation of MGNREGA in Rajasthan using a primary survey conducted in 2013, which covers eight districts, 328 villages and 3916 households. The study finds that about 61 per cent of the total households registered their demand either orally or in written to the sarpanch. However, in Dholpur and Karauli districts, the paper finds that about 80 and 77 per cent of the total households registered their demand for MGNREGA work. The paper argues that administrative factors such as funds flow, and a supply driven approach, are relevant in explaining the performance and rationing in Rajasthan. The paper rejects the hypothesis that a decline in performance of Rajasthan is not entirely due to lack of demand.

Gravel et al. (2010) examine the targeting performance of MGNREGA in Karauli district, of Rajasthan. The paper finds that about 84 per cent of the total households have participated in MGNREGA during 2008. It clearly indicates that the participation rate was much higher earlier in 2008 as compared to our present survey in Karauli district. Thus, it can be argued that this drop out in participation in Rajasthan is not due to a lack of demand.

5. EMPIRICAL STRATEGY

5.1. Identification Strategy

Ideally, the treatment group should be defined as those villages where MGNREGA remains operational since its implementation and the control group should be defined as those villages where MGNREGA was never implemented since its implementation.[4] To define the treatment and control groups on the basis of operational status during the reference year may produce biased estimates because it is possible that if MGNREGA was operational in the previous year, then it is possible that assets created through MGNREGA in previous years may have some spillover effects in the later years.

As noted earlier, the implementation of MGNREGA was not uniform in the sample villages in Rajasthan and Uttar Pradesh. Further, even villages where MGNREGA was implemented there was a huge variation in person-days per rural household employment provided through MGNREGA. This difference in implementation across villages is not completely endogenous as argued in the previous section.

Our identification strategy exploits this variation across sample villages to define high-treatment and low-treatment villages. The treatment status of villages will be defined on the basis of whether assets creation under water-related activities has been taken place through MGNREGA since 2008/9.[5] We define high-treatment villages as those villages where employment was provided in water-related activities through MGNREGA for at least two years since 2008/9 and, similarly, low-treatment village as those villages where employment provided in water-related activities through MGNREGA for less than two years since 2008/9. As indicated in Table 4, in Rajasthan, three villages had water-related works for three years since 2008/9 and four of them had water-related works for two years since 2008/9. Thus, as per our classification, these villages constitute high-treatment villages. On the other hand, three villages had water related works for

[4] The MGNREGA was implemented in February 2006 and April 2008 in Karauli and Dholpur district respectively in Rajasthan. In Sonbhadra and Barabanki districts of Uttar Pradesh it was implemented in February 2008.

[5] Ideally, the treatment status of villages should be defined on the basis of creation of water-related activities since February 2006 and April 2008 for Karauli and Dholpur district respectively, for Rajasthan. The treatment status for Sonbhadra and Barabanki districts in Uttar Pradesh should be defined on the basis of water-related activities since February 2006. However, the data constraints restrict us to defined treatment status on the basis of creation of water-related activities since April 2008 for both the states.

one year and two villages had no water-related works since 2008/9.[6] This means that in Rajasthan high and low-treatment groups comprises of 7 and 5 villages respectively.

Similarly, in Uttar Pradesh, five villages had water-related works for three years since 2008/9 and four villages had water-related works for two years since 2008/9. This means that in Uttar Pradesh, 9 villages constitute high-treatment villages. On the other hand, one village had water-related works for one year since 2008/9. Two villages had no water-related works since 2008/9, but had rural connectivity and some other works. That yields villages in the low-treatment group in Uttar Pradesh. This means that in Uttar Pradesh high and low-treatment groups comprise of 9 and 3 villages respectively.

Further, we compare changes in outcomes in high-treatment villages with low-treatment villages over the period from 2005/6 to 2010/11. In this case, the difference-in-differences impact estimates can be interpreted as a causal effect of MGNREGA under the assumption that in the absence of MGNREGA a change in outcomes would not be systematically different, in high and low-treatment villages. The limitation of this identification strategy is that it can produce a downward bias in the impact estimates because, here, we are comparing changes with low-treatment villages, and not with the true control group. Another limitation of this classification is that it is possible for a village that had MGNREGA in the current reference year 2010/11 to be classified as a low-treatment group. In that case, the effect on public works may not be seen. However, this may not be a problem here because the focus of the present study is not on the participation in public works.

Table 8 presents the employment generated in person-days per rural household, in high and low-treatment villages, through MGNREGA in water-related activities, rural connectivity and others, for Rajasthan and Uttar Pradesh respectively. The results suggest that in Rajasthan in high and low-treatment villages employment generated in person-days per rural household is 41 and 4 person-days respectively. That clearly depicts a huge variation in high and low-treatment

[6] These villages had rural connectivity and some other works.

villages. Similarly, in Uttar Pradesh, in high and low treatment villages employment generated in person-days per rural household is 17 and 3 person-days respectively.

To identify the causal effect, we compare changes in high-treatment villages as compared with the low-treatment villages over the period 2005/6 and 2010/11, under the assumption that there should be no differential trend in high and low-treatment villages, in the absence of the scheme.

Difference-in-differences Causal Effect =

{[Village (High-treatment) – Village (Low-treatment)] in 2010/11]} –

{[Village (High-treatment) – Village (Low-treatment] in 2005/06]}

We use the following specification to find the impact of MGNREGA in high-treatment villages:

$$Y_{hvdt} = \alpha_0 + \alpha_1 T_t + \alpha_2 (T_t * NH_v) + \alpha_3 (X_{hvdt} * T_t) + \lambda_h + \mu_{hvdt} \quad (1)$$

where *h* stands for household, *v* stands for village, *d* stands for district and *t* is time period {2005-06, 2010-11}. *T* is a time dummy (takes value 1 for t=2010-11 and 0 for t=2005-06). *NH* takes value 1 when village v belongs to the high-treatment group, and takes value 0 when it belongs to the low-treatment group. *X* are household controls such as SC/ST, education, age and age squared. λ is the household level fixed effect. μ is the error term.

Our outcome variables are: share of crop acreage in total cropped area disaggregated by kharif and rabi seasons; time spent in man-days worked in the reference year as casual labour in agriculture, non-agriculture sector and public works, disaggregated by gender.

5.2. Impact Heterogeneity

To study the impact heterogeneity for labour use outcomes, we classify rural households into three categories. Large farmers, who owns land greater than 2 acres of land and are most likely to spend more time on their own farm as compared to working on other farms. Middle farmers are those who own land equal to or greater than 1 acre and less than 2 acres and are most likely to spend their time both, on their own farm and working as labourers. Labourer households comprise households who are landless or farmers with less than 1 acre of land. This category of household is most likely to spend their major time as labourer as compared to being on their own

farm. It is expected that we will see a greater impact on casual labour in agriculture and public works on labourer households as compared to middle and large farmers. As indicated in Table 9.2, for Rajasthan, the participation in MGNREGA is highest for labourer-household followed by middle farmers and large farmers. For Uttar Pradesh, the participation in MGNREGA is highest for labourer -households followed by large- farmers and middle- farmers.

5.3. Pre-MGNREGA Trends

We do not have a pre-programme data at the household level to test the validity of the identification strategy. Ideally, we need the same data set from our primary survey to examine the differential trends in treatment and control groups, for the pre-MGNREGA period. Instead, we construct a district-season level data set that comprises of the same crops (as identified in our primary survey), disaggregated by season, for each of the sample states. There are three main issues in using a district-season level data set to examine the pre-MGNREGA trends. First, the unit of observation in the household level data is the household while in the district-season level data set, unit is a district. This may cause a problem since the distribution of outcomes defined at the household level is different from outcomes defined at the district level. Second, the identification strategy for household level data exploits non-uniform implementation of MGNREGA implementation across the villages to define high and low-treatment villages. This may be a problem because we cannot define high and low-treatment districts in a same way as we defined at the village level. Instead, we define high and low-treatment districts based on the employment generated per rural household in 2010/11.Third, the household level data corresponds to two districts belonging to each of the selected states. While, a district-season level data set corresponds to all districts within each state.

Appendix Table A5 presents the MGNREGA implementation intensity defined as employment generated per rural household for sample villages and for the districts that correspond to the district-season level data set. In Rajasthan, the results show that the difference in MGNREGA intensity amongst the lowest and highest intensity villages for sample villages is 49 days per rural household. At the same time, the difference in MGNREGA intensity between the lowest and highest intensity districts is 50 days per rural household. Further, the standard deviation of MGNREGA intensity for village and district units is 13 and 15 respectively. This clearly

indicates that the district level data set is very similar in terms of variation in MGNREGA intensity as compared to the village-level data.

For Uttar Pradesh, the difference in intensity is 35 and 32 days per rural household for village and district level data sets respectively. It clearly indicates that the distribution of variation in intensity of implementation at the village level is similar to district level.

Appendix Table A6 presents the share of major crops in the total cropped area from the household level district level data set, to examine whether household level data from our primary survey shows similar patterns as government data. For Sonbhadra district, the share of wheat in the total cropped area is 0.63 and 0.59 from household and district level data sets respectively. For Dholpur, the share of wheat in the total cropped area is 0.37 and 0.48 from household and district data set respectively. We find similar patterns for other districts and crops.

To the extent that there is similarity in outcomes and MGNREGA intensity between household level and district-season level data set, the first two issues would not matter in examining the pre-MGNREGA trends. Nevertheless, the issue of differential coverage of the household level data and the district-season level data remains there. However, it is possible that if the sample districts exhibits similar trends for the states, then, this may not be a problem.

In order to gauge the pre-MGNREGA trends in labour use outcomes, we use unit record data of employment and unemployment survey (EUS) of NSSO, Government of India. The main difference between the household level data set and the EUS data set is in terms of its coverage. For example, the household level data corresponds to two districts belonging to each of the selected states. However, the EUS data set corresponds to all the districts within each state.

6. DESCRIPTIVE STATISTICS

6.1. Sample Profile

Table 9.1 presents the social group, ration card, land-class, and education category of the sample households. In Rajasthan, out of 333 households, 15 per cent households belong to general category (GEN), 34 per cent belong to other backward classes (OBC), 10 per cent belong to schedule caste (SC) and 41 percent belong to schedule tribe (ST) category. The most surveyed households in Rajasthan belong to ST category followed by OBC followed by GEN and SC households. In Uttar Pradesh, out of 334 households, 17 per cent households belong to GEN, 36 per cent belong to other backward classes (OBC), 43 per cent belong to schedule Caste (SC) and 4 percent belong to Schedule tribe (ST) category. The most surveyed households in Uttar Pradesh belong to SC category followed by OBC followed by GEN and ST households. It suggests that the Rajasthan sample mostly comprises schedule tribe (ST) category households, and the Uttar Pradesh sample mostly comprises schedule Caste (SC) category households.

In Rajasthan, out of 333 households, 37 percent hold the below poverty line (BPL) card. 56 per cent hold the above poverty line (APL) card, and 4 per cent hold the Antyodaya card, where the Antyodaya card was provided to the lowest category of poor households. However, in case of Uttar Pradesh, out of 334 households, 37 percent hold below poverty line (BPL) card, 27 per cent hold above poverty line (APL) card and 28 percent hold Antyodaya card. In terms of ration card, it means that Uttar Pradesh sample comprises of poorer households as compared to Rajasthan.

In Rajasthan, out of 333 households surveyed in Rajasthan, 51 per cent are labourer-household, 25 per cent are middle-farmer and 23 percent are large-farmers. However, in Uttar Pradesh, out of 334 households, 72 per cent are labourer-household, 17 percent are middle-farmers and 11 percent are large-farmers. It clearly suggests that consistent with the ration card status, in this criterion also UP sample seems to be more disadvantaged as compared to Rajasthan.

As far as the educational category of the head of the household is concerned, the result suggests that 49 and 59 percent of the household are illiterate in Rajasthan and Uttar Pradesh respectively. This clearly suggests that in terms of literacy also UP seems to be more disadvantaged as compared to the Rajasthan.

6.2. Participation in MGNREGA

Table 9.2 presents the participation of household in MGNREGA by social group, ration card, land-class, and educational category of the sample households. The overall participation rate is about 30 and 55 percent in Rajasthan and Uttar Pradesh respectively.

By social group, the result shows that participation rate among the general category households is 19 and 52 percent respectively in Rajasthan and Uttar Pradesh respectively. Among OBC, the participation rate is about 28 and 44 percent in Rajasthan and Uttar Pradesh respectively. Among Schedule caste (SC) and Schedule category (ST) households, the participation rate is more than 60 percent for each category of the social group in both Rajasthan and Uttar Pradesh. It clearly indicates that participation in MGNREGA is higher among SC/ST households in both the states.

By ration card, the result shows that among BPL category households, participation rate is about 45 and 60 percent in Rajasthan and Uttar Pradesh respectively.

By land-class, the result shows that participation rate goes down with land holding. In Rajasthan, about 35 percent household has participated among laborer-household followed by middle (30%) and large (22%) farmers. In Uttar Pradesh, about 60 percent household has participated in MGNREGA among laborer-household followed by large (44%) and middle farmers (43%).

As far as education is concerned, for Rajasthan, the highest participation rate is noted for household with 1 to 5 year of education followed by 6-10 year of education, more than 10 year of education and illiterate households. Similarly, in case of Uttar Pradesh, the participation rate goes down with an increase in education years of the household.

6.3. Pre-MGNREGA trends in High and low-treatment Villages

Table 10 presents the summary statistics for share of crop in the total cropped area in low and high-treatment villages for 2005/6, for Rajasthan and Uttar Pradesh, disaggregated by kharif and rabi season. It also presents the summary statistics separately for laborer-household, middle and large farmers.

For Rajasthan, in rabi season, for all households, the result shows that share of wheat in the total cropped area is significantly lower in high-treatment villages as compared with the low-treatment villages. The share of mustard and gram in the total cropped area is higher in high-treatment villages as compared with the low-treatment vllages. We find similar patterns of result for wheat, mustard and gram for labourer-household, middle and large farmers respectively.

In kharif season, for all households, the result shows that share of pearl millet in the total cropped area is significantly lower in high-treatment villages. For laborer-household and middle farmers, the result for pearl millet shows insignificant difference between high and low treatment villages. The result for large farmer shows that share of pearl millet in the total cropped area is significantly lower in high-treatment villages. The share of pigeon pea and sesamum is significantly higher in high-treatment villages. The results are similar for large farmers. For laborer-household and middle farmers, the result shows insignificant difference.

In Uttar Pradesh, in rabi season, for all households, the result shows that share of wheat, mustard and gram in the total cropped area are insignificantly different in high and low-treatment villages. We find similar patterns of results for all these crops in laborer-household, middle and large farmers respectively.

In kharif season, for all households, the result shows that share of paddy in the total cropped area is lower in a high-treatment villages. We find similar patterns of a result for laborer-household and middle farmer, but the result is significant at 10 percent level of significance. The result for large farmers suggests the share of Paddy is insignificantly different between high and low treatment villages.

Table 11 presents the summary statistics of casual labour use in agriculture, non-agriculture and public works in low and high-treatment villages during 2005/6. It also presents the summary statistics separately for laborer-household, middle and large farmers.

In Rajasthan, for casual labour use in agriculture, for all households, for both genders, the result shows an insignificant difference in low and high-treatment villages. We find similar patterns of results for labourer-household, middle and large farmers.

For casual labour use in public works, for all households, for males, the result shows significantly greater labour use in high-treatment villages. We find a similar patterns of result for labourer-household (at 10 percent l.o.s.) and large farmers, and for middle farmers, the result shows an insignificant difference between high and low-treatment villages. For females, for all household, the result shows significantly greater labour use in high-treatment villages. We find similar pattern of results for labourer-household, middle and large farmers.

For casual labour use in non-agriculture, for all household, for both genders, the result shows an insignificant difference in low and high-treatment villages in Rajasthan. We find similar patterns of results for labourer-household, middle and large farmers.

In Uttar Pradesh, for casual labour use in agriculture, for all households, for males, the result shows an insignificant difference between low and high-treatment villages. The results are similar for laborer-household, middle and large farmers. For females, for all household, the result shows an insignificant difference between low and high-treatment villages. The results are similar for large farmers. For laborer-household and middle farmers, the result shows lower labour use in high-treatment villages, though results are significant at 10 percent level of significance.

For casual labour use in public works, for all households, for both genders, the result shows an insignificant difference between low and high-treatment villages. The results are similar for labourer-household, middle and large farmers.

For casual labour in non-agriculture, for all households, for males, the result shows that labour use is significantly higher in high-treatment villages as compared to low-treatment villages, though result is significant at 10 percent level of significance. For females, the result shows insignificant difference between high and low-treatment villages. We find similar patterns of results for laborer-household, middle and large farmers.

Table 12 presents the summary statistics of household characteristics in low and high-treatment villages during 2005/6 in Rajasthan and Uttar Pradesh.

For Rajasthan, for all households, the result shows that age and age square are statistically indifferent. The result shows a similar pattern for labourer-household, middle and large farmers.

For education, for all households, the result shows education years are significantly lower in high-treatment villages as compared to low-treatment villages. The result shows a similar pattern for middle farmers, but at 10 percent l.o.s. It shows insignificant difference for labourer-household and large farmers.

For all households, the result shows that share of SC/ST households are significantly higher in high-treatment villages. We find a similar pattern of results for large farmers. For labourer-household and middle-farmer, the result shows an insignificant difference between high and low-treatment villages.

For Uttar Pradesh, the result shows that age and age square are statistically indifferent. We find similar patterns of results for laborer-household, middle and large farmers.
For all households, the result shows that education (in years) is significantly lower in high-treatment villages than low-treatment villages. The result shows a similar pattern for middle farmers, but at 10 percent l.o.s. For labourer-household and large-farmers, the result shows an insignificant difference between high and low-treatment villages.

For all households, the result shows that share of SC/ST households are insignificantly different between high and low-treatment villages. We find similar patterns of results for laborer-household, middle and large farmers.

6.4. Comparing Primary Survey with Government Administrative Data

Table 7 also compares primary survey data with the government administrative data, to examine the person-days of employment per rural household provided for 2010/11, across each village, to ensure the comparability with government data. The results show that top five villages are same from both data sets in terms of person-days per rural household generated through MGNREGA. Furthermore, in terms of poorest villages in terms of person-days per rural household generated through MGNREGA implementation in lowest two villages are found to be same. This suggests consistency in these data sets. In terms of magnitude, in Uttar Pradesh, primary survey data suggests that 23 person-days per rural household, administrative data suggests that 20 person-days per rural household. In Rajasthan, primary survey data suggests 11 person-days per rural household as compared to 32 person-days per rural household. The possible explanation for the

huge difference in Rajasthan is due to R5 village. It shows employment generated through MGNREGA for R5 village is found to be 174 person-days per rural household from the government data as compared 54 person-days per rural household from the primary survey data. This is not possible because act mandates 100 days of employment. After removing this R5 village, the government data shows 12 person-days of employment has been generated in 2010/11, for Rajasthan, which is quite comparable with primary survey data. Hence, the primary survey data from Rajasthan and Uttar Pradesh are comparable in terms of person-days of employment generated in 2010/11, with an exception of R5 village.

In terms of household participation in MGNREGA, in Uttar Pradesh in sample districts, government data suggests about 50 percent of the total households have participated as compared to 51 percent of the total household in Rajasthan. At the same time, primary survey data suggests that about 30 percent of households have participated in Rajasthan as compared to 55 percent participation in Uttar Pradesh. It clearly meant that for Uttar Pradesh primary survey data seems to comparable with government data. However, in case of Rajasthan, there is huge difference in magnitudes in terms of participation. Hence, in terms of participation, Uttar Pradesh data is comparable with government data. However, in terms of participation, Rajasthan government data is not comparable with primary survey data.

7. RESULT

7.1. Impact of MGNREGA on Cropping Patterns

This section presents the results on impact of MGNREGA on cropping patterns for both Rajasthan and Uttar Pradesh, disaggregated by season.

For Rajasthan, Table 13.1 presents the impact on the cultivation of wheat, mustard and gram respectively in rabi season.[7] Our impact estimates can be interpreted as the difference in change in crop shares in percentage points between high and low-treatment villages.

We find a 23.6 percentage point decline for mustard accompanied by a 21.3 percentage point increase for wheat cultivation. We cannot reject the hypothesis that mustard falls one to one with rise in wheat cultivation. Since wheat cultivation requires more water and labour as compared to mustard, this result can viewed as a change in cropping pattern towards more water-intensive crops. This finding can be corroborated with the studies that suggest improvement in irrigation facilities for farmers as consequence to MGNREGA (for example Tiwari et al. (2011), Aggarwal et al. (2012)). However, there are studies that observe increase in wages as a consequence of MGNREGA (for instance see Imbert and Papp (2014a)), and therefore the expectation is that there could be a shift towards labour saving crops.[8] Therefore, the observed shift towards water intensive crops (which are also labour intensive) implies that the relative increase in profits due to improvements in irrigation facility outweighs relative decrease in profits due to increased labour cost.

Table 13.2 presents the impact on the cultivation of pearl millet, pigeon pea and sesamum, respectively in kharif season, for Rajasthan.[9] The results show no impact of MGNREGA on the cultivation of either of three crops. This result could be explained by two important aspects of the study area. First, pearl millet and sesamum cultivation depends mainly on rainfed irrigation

[7] These are the major crops that cover more than 90 percent of the total cropped area in rabi season in the study area.
[8] Imbert and Papp (2014a) finds positive impact on star states. They have classified star states on the basis of performance of MGNREGA implementation. Their classification of star states includes Rajasthan.
[9] The cultivation of pearl millet and sesamum in Rajasthan mainly depends upon rainfed irrigation. Pigeon pea is cultivated in dry land areas.

in Rajasthan. Pigeon pea grows mainly on dry land areas. Thus, the effect through irrigation channel is not to be expected for kharif crops in Rajasthan. At the same time, the literature finds increase in wages in dry season (roughly corresponds to rabi season), but not in rainy season (roughly corresponds to kharif season) (see Imbert and Papp (2014a)). Therefore, it is possible that neither the irrigation nor wage channel is operative in kharif season.

For Uttar Pradesh, Table 15.1 presents the impact estimates on the cultivation of wheat, mustard, gram and barley, for rabi season. The results show no impact on the cultivation of either of these crops. Table 15.2 presents the impact on the cultivation of paddy, maize, little millet and kodo millet.[10] We find 8.3 percentage point increase in the cultivation of paddy accompanied by a decline of 7.7 and 3.6 percentage points in the little millet and kodo millet, respectively.[11] In other words, increase in share of paddy is offset by decrease in little millet and kodo millet, suggesting shift in cropping pattern towards high-water-intensive crop. Here as well, we cannot reject the hypothesis of substitution between little millet and kodo millet with paddy cultivation.

The above analysis shows a shift in cropping pattern towards water-intensive crops (which are also labour-intensive) for both Rajasthan and Uttar Pradesh. This clearly suggests an increase in overall labour requirement in agriculture as consequence of MGNREGA.

7.2. Impact of MGNREGA on Labour Use

For Rajasthan, Table 14 presents the impact on labour use for casual labour in agriculture, non-agriculture and public works respectively, disaggregated by gender. Our impact estimates can be interpreted as the difference in change in man days between high and low-treatment villages.

For males, the results show no impact on casual labour use in the agriculture sector. For females, it shows an increase of 4.1 man-days of casual labour used in the agriculture sector. This result is consistent with the findings of previous section, where we find a shift in the cropping pattern toward water-intensive crop and suggests an increase in overall labour requirement in the

[10] Little millet and kodo millet requires less labour and water as compared to paddy. It is mainly cultivated in the hilly areas. Among our sample, it was mainly cultivated in Sonbhadra district in Uttar Pradesh.
[11] Paddy requires more labour and water as compared to little millet and kodo millet.

agriculture sector. Our results are contrary to the concerns that have been raised in the literature about MGNREGA for crowding out of casual labour towards public works.

For Uttar Pradesh, Table 16 presents the impact on labour use for casual labour in agriculture, non-agriculture and public works respectively, disaggregated by gender. For both the genders, we find did not find any impact on casual labour either on agriculture, non-agriculture or public works, respectively. This is an intriguing result because even in Uttar Pradesh we observe changes in cropping pattern towards more water-intensive crops. We expected to see changes in labour use as a consequence of MGNREGA. However, at this point, we do not have an explanation for why the results for Uttar Pradesh show an insignificant impact on labour use.

7.3 Heterogeneity in Impact of MGNREGA

This section discusses the results of the impact of MGNREGA on cropping patterns and labour use, separately for labourer-household, middle-farmer and larger-farmer.

7.3.1. Cropping Patterns

Table 13.1 and 13.2 present the result on cropping patterns for rabi and kharif seasons respectively for Rajasthan, separately for labourer-household, middle-farmer and larger-farmer.

For Rajasthan, in the rabi season, for laborer-households, the results show a 32.2 percentage point decline for mustard accompanied by 42.1 percentage point increase for wheat cultivation, that is, there is a one to one shift between wheat and mustard.

For middle farmers, the results shows a 38.7 percentage points decline for mustard accompanied by 6.1 percentage points increase (at 10 per cent l.o.s) for gram cultivation. Since gram requires less labour and water than mustard and wheat, this result can be viewed as a shift in the cropping pattern towards labour-saving crops, although the substitution is not one-to-one. At the same time, this finding is consistent with the hypothesis that middle and large farmers are net-hirers-in of labourers and we expected them to shift their cropping pattern towards labour-saving crops.

For large farmers, we find an increase of 9.0 percentage point of wheat cultivation (at 10 percent l.o.s). The result shows no impact on mustard and gram cultivation.

For Rajasthan, in kharif season, for laborer-household, the results show an 8.1 percentage points increase in pearl millet cultivation accompanied by a decline of 7.4 percentage points in sesamum cultivation. Pearl millet cultivation requires more labour and water as compared to sesamum. This suggests a shift in cropping patterns toward labour-saving crops.

For middle-farmers, the result shows a 2.6 percentage point increase in sesamum cultivation (at 10 percent l.o.s). There is no impact on pearl millet and pigeon pea cultivation. For large-farmers, the results show no impact on either pearl millet, pigeon pea or sesamum cultivation.

For Uttar Pradesh, Tables 15.1 and 15.2 present the result on cropping patterns for rabi and kharif season respectively, separately for labourer-household, middle-farmer and larger-farmer.

For rabi season, the results show no impact on the cultivation of either wheat, mustard, gram or barley for any of the landclasses, as was observed for the full sample.

For kharif season, for laborer-households, the results indicate a 6.9 percentage points increase in paddy cultivation (at 10 per cent l.o.s) accompanied by a decline of 4.7 and 4.6 percentage points (at 10 percent l.os.) in little millet and kodo millet cultivation, respectively, as was observed for full sample. For middle-farmers, the results show a decline of 14.9 percentage point for little millet cultivation but no impact for other crops. The coefficient on paddy shows an insignificant increase of 13.7 percentage points. For large farmers, the results do not show impact on any of the kharif crops as well.

7.3.2. Labour Use

Tables 14 and 16 present the results for labour use in the states of Rajasthan and Uttar Pradesh respectively, separately for labourer-household, middle-farmer and larger-farmer.

For Rajasthan, for labourer-household, across genders, the results show no impact on casual labour employment in either agriculture sector, non-agriculture sector and public works, respectively.

For middle farmers, who are males, the results show an 8.9 man-days increase (at 10 percent l.o.s.) in casual labour in the agriculture sector. For females, who were casual labourers in the non-agriculture, the result shows an increase of 1.4 man-days.

For large farmers, for females, there is an increase of 10.1 man-days in casual labour in agriculture (at 10 percent l.o.s).

For Uttar Pradesh, for laborer-households and middle farmers, and across the genders, the results show no impact on casual labour in the agriculture sector, non-agriculture sector and for public works respectively, for both genders.

For large farmers, for females, the results show an increase in 6.8 man-days in casual labour in the agriculture sector. For casual labour in public works, the result shows a decline of 5 and 9.3 man-days for males and females respectively. This result is counter intuitive. One possible explanation for this finding may be the definition adopted to classify high and low-treatment villages.[12]

[12] As noted earlier, our definition of high and low-treatment villages depends not only on the present implementation status but on the cumulative performance of MGNREGA since 2008/9. Thus, it is possible that some villages where MGNREGA was active in 2010/11 may not belong to the high-treatment villages.

8. ROBUSTNESS TEST

Appendix Table A1 presents the pre-MGNREGA trends on cropping patterns for Rajasthan for rabi and kharif season, respectively.[13] The result shows no differential trends between high and low-treatment districts for wheat and mustard cultivation, respectively, in the rabi season. For kharif season; the result shows a significant impact on pearl millet cultivation. At the same time, we didn't find evidence on significant impact on kharif crops in Rajasthan.

Appendix Table A2 presents the pre-MGNREGA trends on cropping patterns for Uttar Pradesh, for rabi and kharif season, respectively. The result shows no differential trends between high and low-treatment districts in rabi season crops in Uttar Pradesh. For kharif season, the result shows a significant impact for Maize (at ten per cent l.o.s). However, we did not find significant impact on Maize from the main analysis.

Appendix Table A3 presents the pre-MGNREGA trends for casual labour in agriculture, non-agriculture and public works for Rajasthan and Uttar Pradesh respectively.[14] For casual labour in agriculture, the result shows no pre-MGNREGA trend for casual labour in agriculture for both genders for both states. For casual labour in non-agriculture, the result shows pre-MGNREGA trend for Uttar Pradesh, but not for Rajasthan. For public works, the results show no pre-MGNREGA trend for both genders for both states.

This means that pre-MGNREGA trends between high and low-treatment group for cropping patterns and labour use is not a concern for our analysis.

[13] We test for Pre-MGNREGA trends by comparing high and low-treatment districts over the period 2000/01 and 2005/6. We construct district-level data sets for outcomes from Directorate of Economics and Statistics, Ministry of Agriculture, Government of India. We use our main specification to estimate pre-MGNREGA trends.

[14] We use EUS survey 1999/2000 and 2004/5 unit record data to examine pre-MGNREGA trends for casual labour in agriculture, non-agriculture and public works, respectively. We define high and low- treatment districts on the basis of average employment per rural household generated through MGNREGA in 2010/11. We use our main specification to estimate pre-MGNREGA trends.

9. CONCLUSION

We examine the impact of MGNREGA on cropping patterns and labour use for Rajasthan and Uttar Pradesh using data from a primary survey. Our results suggest that the cropping pattern shifted towards water intensive crops in both Rajasthan and Uttar Pradesh. Our results show an increase of female labour use in the agriculture sector for Rajasthan. However, we find no impact on labour use in agriculture for Uttar Pradesh.

We also examine the heterogeneity in impact estimates by the type of households. Our results suggest a shift in the cropping pattern towards water intensive crops in both the states has been driven by the labourer-household. For Rajasthan, we find some evidence of shift in cropping pattern towards labor-intensive crops for the middle-farmers.

For Rajasthan, our results show an increase in casual labour in agriculture for females is driven by large-farmers.

The scheme has a huge potential to enhance livelihood security of the rural households through its positive impact on cropping patterns on the one hand and on the other by enhancing the employment opportunities in agriculture.

REFERENCES

Aggarawal, A., A. Gupta, and G. Kumar. 2012. "Evaluation of NREGA Wells in Jharkhand." *Economic and Political Weekly* 47(35): 24-27.

Azam, M. 2012. "The Impact of Indian Job Guarantee Scheme on Labor Market Outcomes: Evidence from a Natural Experiment." IZA Discussion Paper 6548. Bonn, Germany: Institute for the Study of Labor.

Berg, E., S. Bhattacharyya, R. Durgam, and M. Ramachandra. 2012. "Can Rural Public Works Affect Agricultural Wages? Evidence from India." Working Paper 2012-05. Oxford, UK: Centre for the Study of African Economies.

Bhargava, A. 2014. "The Impact of India's Rural Employment Guarantee on Demand for Agricultural Technology." Working Paper. Davis, USA: University of California.

Bhaskar, B.2012. "Farmers switching from Paddy to Cotton." *The Hindu*, June 23.

CSE (Centre for Science and Environment). 2008. *An Assessment of the Performance the National Rural Employment guarantee in terms of its potential for creation of Natural wealth in villages*. New Delhi.

Dutta, P., R. Murgai, M. Ravallion, and D.V.D. Walle. 2012. "Does India's Employment Guarantee Scheme Guarantee Employment." *Economic and Political Weekly* 47(16): 55-64.

Gehrke, E.,2013. "Does the Indian Employment Guarantee reduce Household's Risk Exposure? Assessing the effects of the NREGA on crop choice."Germany : German Development Institute.

Gravel, N., Himanshu, A. Mukhopadhyaya. 2010. "Targeting the Poor by Volunatry Participation : Evidence from the National Guarantee Scheme in India." Working Paper. New Delhi : Indian Statistical Institute

GOI (Government of India) 2005. *The National Rural Employment Guarantee Act: The Gazette of India, Extraordinary.* New Delhi.

Gupta, S. 2006. "Were District Choices for NFFWP Appropriate?" *Journal of Indian School of Political of Political Economy* 18(4): 641-648.

Himanshu, A. Mukhopadhayay, and M.R.Sharan. 2015. "NREGS in Rajasthan: Rationed Funds and Their Allocation across Villages." *Economic and Political Weekly* Vol. L No 6: 52-60.

Imbert, C., and J.Papp.2014a. "Labor Market Effects of Social Programs: Evidence from India's Employment Guarantee." Working Paper. Paris: Paris School of Economics.

Imbert, C., and J.Papp.2014b. "Short-term Migration, Rural Workfare Programs and Urban Labor Markets: Evidence from India." Working Paper. UK: University of Oxford.

Jakhar, A. 2012. "Provide 100 days employment only during lean agricultural season." *The Hindu,* January 2.

Jha, R., R. Gaiha, and M. Pandey. 2009. "Net Transfer Benefits under India's National Rural Employment Guarantee Scheme." *Journal of Policy Modelling* 34: 296-311.

Kareemulla, K., K.S. Reddy, C.A.R. Rao, S.Kumar, B.Venkateswarlu. 2009. "Soil and Water Conservation Works through National Rural Employment Guarantee Scheme in Andhra Pradesh-Analysis of Livelihood Impact." *Agricultural Economics Research Review* 22: 443-50.

Lipton, M. 1977. "Why poor people stay poor? Urban bias in world development". London: Temple Smith.

Mellor, J. 2001. "Faster more equitable growth— agriculture, employment multipliers and poverty reduction.", paper prepared for USADD/G/EGAD.

MORD (Ministry of Rural Development).2012. *MGNREGA Sameeksha: An Anthology of Research Studies on the Mahatma Gandhi National Rural Employment Guarantee Act, 2005, 2006–2012*. Government of India. New Delhi.

NSSO (National Sample of Survey Organization) 2006. *Employment and Unemployment Situation in India, 2004-05 (Part-I).* Technical Report. Ministry of Statistics and Programme Implementation, Government of India. New Delhi.

Rangarajan, C., P.I. Kaul, and Seema. 2011. "Where is the missing labour force?" *Economic and Political Weekly* 46 (39): 68-72.

Ranaware, K., U.Das, A.Kulkarni, S.Narayanan.2015. "MGNREGA Works and Their Impacts: A Study of Maharasthra." *Economic and Political Weekly* L (13): 53-61.

Shah, V. 2012. *"Managing Productivity Risk Through Employment Guarantees: Evidence from India"* ISB Working Paper. Hyderabad, India: Indian School of Business.

Tiwari, R., H.I. Somashekhar, V.R. Ramakrishna Parama, I.K. Murthy, M.S. Mohan Kumar, B.K.Mohan Kumar, H. Parate, M. Varma, S. Malaviya, A.S. Rao, A. Sengupta, R. Kattumuri, N.H. Ravindranath. 2011. "MGNREGA for environmental service enhancement and vulnerability reduction: Rapid appraisal in Chitradurga district." *Economic and Political Weekly* 46(20): 39-47.

Table 1: Sample size for Rajasthan and Uttar Pradesh

	Number of blocks	Number of villages	Number of household in baseline survey (2006)	Follow-up survey		
				Number of root household	Number of split household	Total number of household
Rajasthan						
Dholpur	3	6	180	166	3	169
Karauli	6	6	178	157	7	164
Total	9	12	358	323	10	333
Uttar Pradesh						
Barabanki	6	6	181	162	16	178
Sonbhadra	4	6	182	145	11	156
Total	10	12	363	307	27	334
All sample	19	24	721	630	37	667

Source: MGNREGA survey (2006 and 2011/12)

Table 2: Probit regression to model attrition of households in the follow-up survey

Dependent variable : Equals to 1 for those households who were surveyed in both rounds (2006 and 2011/12),and otherwise 0				
	Rajasthan		**Uttar Pradesh**	
	Model 1	**Model 2**	**Model 1**	**Model 2**
Age	0.093**	0.076*	0.041	0.054
	(0.040)	(0.042)	(0.041)	(0.051)
Age square	-0.001**	-0.001**	-0.001	-0.001
	(0.000)	(0.000)	(0.000)	(0.001)
Male head of the household , dummy	0.353	0.330	0.048	0.074
	(0.372)	(0.366)	(0.338)	(0.353)
Education (years)	0.004	-0.003	0.027	0.034
	(0.024)	(0.023)	(0.025)	(0.030)
Schedule caste/tribe (SC/ST) , dummy	0.047	0.010	0.350*	0.371*
	(0.389)	(0.416)	(0.186)	(0.218)
Land owned (acres)	0.065	0.034	-0.004	0.109
	(0.070)	(0.046)	(0.064)	(0.074)
Asset Index	-0.056		0.073	
	(0.040)		(0.069)	
Below poverty line (BPL) card holder , dummy		0.090		0.455
		(0.280)		(0.320)
Constant	-0.861	-0.431	-0.014	-0.967
	(1.163)	(1.171)	(1.059)	(1.358)
Village dummy	Yes	Yes	Yes	Yes
No. of Observation	357	352	353	264

Note: The regression is conducted at household level using data from 2006 survey. Age and education has been considered for the head of the household. Asset index has been constructed using principal component analysis. Dummy variable for each village has been included in the regression. For Uttar Pradesh, the village U17 is found to be significant. Robust standard errors in parentheses. *significant at 10%; ** significant at 5%; ***significant at 1%.

Table 3: Probit regression to model households who reported data for both years vs. who reported data for current year, in the follow-up survey

Dependent variable : Equals to 1 for those households who reported data for both year (2010/11 and 2005/6), on the agricultural module in the follow-up survey, and otherwise 0				
	Rajasthan		**Uttar Pradesh**	
	Model 1	**Model 2**	**Model 1**	**Model 2**
Age	-0.005 (0.040)	-0.012 (0.042)	0.054* (0.032)	0.040 (0.033)
Age square	0.000 (0.000)	0.000 (0.000)	-0.001* (0.000)	-0.000 (0.000)
Male head of the household, dummy	0.419 (0.310)	0.444 (0.320)	0.846** (0.331)	1.005** (0.355)
Education (years)	-0.003 (0.020)	-0.010 (0.020)	-0.222 (0.235)	-0.245 (0.252)
Schedule caste/tribe (SC/ST), dummy	-0.407 (0.349)	-0.430 (0.346)	-0.040 (0.025)	-0.024 (0.027)
Land owned (acres)	-0.010 (0.024)	0.003 (0.019)	-0.071 (0.076)	-0.093 (0.075)
Asset Index	0.000 (0.040)		0.030 (0.038)	
Below poverty line (BPL) card holder, dummy		0.283 (0.200)		0.076 (0.244)
Constant	0.379 (1.076)	0.615 (1.106)	-1.159 (0.933)	-1.001 (1.016)
Village dummy	Yes	Yes	Yes	Yes
No. of Observation	261	256	236	215

Note: The regression is conducted at household level using data from 2011/12 survey. Age and education has been considered for the head of the household. Asset index has been constructed using principal component analysis. Dummy variable for each village has been used in each state has been used as a right-hand side variable. For Rajasthan, the dummy for Village R13 is found to be significant. Robust standard errors in parentheses. *significant at 10%; ** significant at 5%; ***significant at 1%.

Table 4: Implementation of MGNREGA in sample villages in Rajasthan, from 2008/9 to 2010/11

Village	MGNREGA implementation				Asset creation in water related activities		
	2008/9	2009/10	2010/11		2008/9	2009/10	2010/11
R1	Yes	Yes	No		Yes	No	No
R2	No	No	No		No	No	No
R3	Yes	Yes	Yes		Yes	Yes	Yes
R4	Yes	Yes	No		Yes	Yes	No
R5	Yes	Yes	Yes		Yes	Yes	Yes
R6	Yes	No	No		No	No	No
R7	Yes	Yes	No		Yes	Yes	No
R8	Yes	Yes	No		Yes	Yes	No
R9	No	Yes	No		No	Yes	No
R10	Yes	Yes	Yes		Yes	Yes	Yes
R11	Yes	Yes	Yes		No	Yes	No
R12	Yes	Yes	Yes		Yes	Yes	No

Source: The information on implementation status for 2010/11 has been use from the follow-up survey. The information on implementation of MGNREGA for 2008/9 through 2009/10 has been taken from MGNREGA website. http://nrega.nic.in/netnrega/statepage.aspx?check=R&Digest=+qXIRymgwwUBieh6Mf3EUg

Notes: The status of each village for MGNREGA implementation has been decided on the basis of employment provided through MGNREGA in a corresponding year. We assume five person-days per rural household employment provided through MGNREGA as the cut-off to decide whether MGNREGA has been implemented in the village or not. The village where MGNREGA was implemented and no water-related activities taken place, in those villages, the main activity of asset creation is rural connectivity. The original village name is changed to R1, R2 and so on, just to maintain the right to confidentiality of villagers.

Table 5: Implementation of MGNREGA in sample villages in Uttar Pradesh, from 2008/9 to 2010/11

Village	MGNREGA Implementation				Asset creation in Water related activities		
	2008/9	2009/10	2010/11		2008/9	2009/10	2010/11
U1	Yes	Yes	Yes		Yes	Yes	Yes
U2	No	Yes	Yes		No	Yes	Yes
U3	Yes	Yes	Yes		Yes	Yes	Yes
U4	No	Yes	Yes		No	Yes	Yes
U5	Yes	Yes	Yes		Yes	Yes	Yes
U6	Yes	Yes	Yes		Yes	Yes	No
U7	Yes	Yes	Yes		No	Yes	Yes
U8	No	Yes	Yes		No	No	Yes
U9	Yes	Yes	Yes		Yes	Yes	Yes
U10	Yes	No	Yes		No	No	No
U11	Yes	Yes	Yes		Yes	Yes	Yes
U12	Yes	Yes	Yes		No	No	No

Source: The information on implementation status for 2010/11 has been use from the follow-up survey. The information on implementation of MGNREGA for 2008/9 through 2009/10 has been taken from MGNREGA website. http://nrega.nic.in/netnrega/statepage.aspx?check=R&Digest=+qXIRymgwwUBieh6Mf3EUg

Notes: The status of each village for MGNREGA implementation has been decided on the basis of employment provided through MGNREGA in a corresponding year. We assume five person-days per rural household employment provided through MGNREGA as the cut-off to decide whether MGNREGA has been implemented in the village or not. The village where MGNREGA was implemented and no water-related activities taken place, in those villages, the main activity is rural connectivity. The original village name is changed to U1, U2 and so on, just to maintain the right to confidentiality of villagers.

Table 6: Person days per rural household employment generated through MGNREGA for the reference year 2010/11, according to MGNREGA survey (2011/12) and government administrative data from the MGNREGA website

Village	Primary survey data (MGNREGA survey 2011/12)				Administrative data (MGNREGA website)			
	Other	Rural connectivity	Water related activities	Total	Other	Rural connectivity	Water related activities	Total
Rajasthan								
R1	0	1	0	1	0	7	2	10
R2	0	0	0	0	0	1	0	1
R3	8	10	12	30	0	9	7	16
R4	0	2	0	2	0	0	0	0
R5	0	7	47	54	2	1	171	174
R6	0	0	0	0	0	0	0	0
R7	0	0	0	0	0	8	3	11
R8	0	0	0	0	0	0	8	8
R9	0	0	0	0	0	0	0	0
R10	0	3	11	13	0	2	30	32
R11	0	22	1	23	0	34	0	34
R12	0	10	0	10	0	21	0	22
Total	1	5	6	11	0	6	26	32
Uttar Pradesh								
U1	3	7	31	41	3	2	67	73
U2	0	0	22	22	0	1	17	18
U3	0	8	18	25	5	17	26	48
U4	0	2	13	15	0	5	7	12
U5	3	4	10	18	4	0	15	19
U6	4	3	17	25	2	3	2	7
U7	2	11	10	24	1	1	17	19
U8	0	3	11	14	0	2	14	16
U9	1	6	8	15	2	4	23	29
U10	1	3	3	7	0	0	3	3
U11	1	7	34	42	0	6	21	27
U12	5	24	2	32	1	32	1	34
Total	2	7	15	23	2	4	14	20

Source: MGNREGA survey (2011/12) and MGNREGA website data
http://nrega.nic.in/netnrega/statepage.aspx?check=R&Digest=+qXIRymgwwUBieh6Mf3EUg

Notes: The original village name is changed to R1, R2 and so on, for Rajasthan and U1, U2 and so on for Uttar Pradesh, just to maintain the right to confidentiality of villagers. The reference year for both primary survey and government data is 2010/11. R5 village information on person-days generated for 2010/11 is exceptionally high in the administrative data.

Table 7: Household participation in MGNREGA in sample villages, for 2010/11

	Rajasthan		Uttar Pradesh	
	Household (#)	**Per cent (%)**	**Household (#)**	**Per cent (%)**
Household possess MGNREGA job card				
No	39	12	76	23
Yes	294	88	258	77
Total	333	100	334	100
Reason for no job card				
Not applied	15	38	38	50
Applied but not received	5	13	5	7
Wanted to apply but was not possible	14	36	30	39
Not reported	5	13	3	0
Total	39	100	76	100
Whether household participated in MGNREGA in 2010/11				
No	193	66	74	29
Yes	101	34	184	71
Total	294	100	258	100
Reason for no participation				
Wage rate too low	2	1	1	1
Work not offered	182	94	51	69
Other	8	4	17	23
Not reported	1	1	5	7
Total	193	100	74	100

Source: MGNREGA survey (2011/12)
Note: The option for reason for no job card and reason for no participation are exactly presented here as were asked in the questionnaire. The 'other' category includes newly-married households etc.

Table 8: Person days per rural household employment generated through MGNREGA in low and high-treatment villages, for Rajasthan and Uttar Pradesh

State	Person days per rural household employment generated through MGNREGA, from 2008/9 through 2010/11			
	Other	Rural connectivity	Water related activities	Total
Rajasthan				
Low-treatment villages	0	16	4	20
High-treatment villages	0	19	41	60
All	0	18	26	44
Uttar Pradesh				
Low-treatment villages	1	3	3	8
High-treatment villages	2	3	17	22
All	2	3	15	20

Source: MGNREGA website, accessed on 1st July 2015
http://164.100.129.4/netnrega/loginframegp.aspx?salogin=Y&state_code=31

Note: High-treatment villages are defined as those where water-related works had been taken place through MGNREGA for two or more years, between 2008/9 and 2010/11. Low treatment villages are defined as those villages where water-related works had been taken place for less than two years, between 2008/9 and 2010/11.

Table 9.1: Social group, ration card status, land-class and education of the sample households in Rajasthan and Uttar Pradesh, for 2010/11

	Rajasthan		Uttar Pradesh	
	No. of households	**Per cent (%)**	**No. of households**	**Per cent (%)**
Social group				
General	50	15	56	17
Other backward classes (OBC)	114	34	120	36
Schedule Caste (SC)	33	10	144	43
Schedule Tribe (ST)	136	41	14	4
Total	333	100	334	100
Ration Card				
Antyodaya	13	4	92	28
APL (Above poverty line)	188	56	91	27
BPL (Below poverty line)	123	37	124	37
No ration card	9	3	27	8
Total	333	100	334	100
Land-class				
Less than 1 acre (Labourer-household)	171	51	240	72
1-2 acre (Middle-farmer)	84	25	58	17
More than 2 acres (Large-farmer)	78	23	36	11
Total	333	100	334	100
Education				
Illiterate	162	49	196	59
1-5 year	48	14	51	15
6-10 year	83	25	61	18
More than 10 year	40	12	26	8
Total	333	100	334	100

Source: MGNREGA survey (2011/12)
Note: Antyodaya cards are issued to those households which have an income of less than Rs. 250 per capita per month.

Table 9.2: Household participation in MGNREGA in Rajasthan and Uttar Pradesh for 2010/11, by social group, ration card status, landholding and education category of the sample households

Household characteristics	Rajasthan			Uttar Pradesh		
	No. of household	MGNREGA Participation		No. of household	MGNREGA Participation	
		No (%)	Yes (%)		No (%)	Yes (%)
Social group						
General	50	81	19	56	48	52
Other backward classes (OBC)	114	72	28	120	56	44
Schedule Caste (SC)	33	76	24	144	35	65
Schedule Tribe (ST)	136	63	37	14	36	64
Total	333	70	30	334	45	55
Ration card						
Antyodaya	13	86	14	92	28	72
APL (Above poverty line)	188	77	23	91	68	32
BPL (Below poverty line)	123	55	45	124	40	60
No ration card	9	100	0	27	48	52
Total	333	70	30	334	45	55
Land-class						
Less than 1 acre (Labourer-household)	171	65	35	240	40	60
1-2 acre (Middle-farmer)	84	70	30	58	57	43
More than 2 acres (Large-farmer)	78	78	22	36	56	44
Total	333	70	30	334	45	55
Education						
Illiterate	162	75	25	196	36	64
1-5 year	48	54	46	51	59	41
6-10 year	83	67	33	61	51	49
More than 10 year	40	70	30	26	69	31
Total	333	70	30	334	45	55

Source: MGNREGA survey (2011/12)

Note: Antyodaya cards are issued to those households which have an income of less than Rs. 250 per capita per month

Table 10: Summary statistics on share of crop in total cropped area in low and high-treatment villages, for Rajasthan and Uttar Pradesh

	All household			Labourer-household			Middle-farmer			Large-farmer		
	Difference	Low treatment village	High treatment village	Difference	Low treatment village	High treatment village	Difference	Low treatment village	High treatment village	Difference	Low treatment village	High treatment village
Rabi season, Rajasthan												
Share of wheat in total cropped area	0.307***	0.67	0.36	0.294*	0.73	0.44	0.313*	0.66	0.35	0.326**	0.59	0.26
Share of mustard in total cropped area	-0.270***	0.12	0.39	-0.291*	0.08	0.37	-0.290**	0.12	0.41	-0.225*	0.17	0.40
Share of gram in total cropped area	-0.079*	0.02	0.10	-0.066	0.02	0.09	-0.08	0.02	0.10	-0.095	0.01	0.11
Observation		64	72		22	30		25	20		17	22
Kharif season, Rajasthan												
Share of pearl millet in total cropped area	0.167***	0.97	0.81	0.120*	0.98	0.86	0.102	0.95	0.85	0.323***	0.98	0.66
Share of pigeon pea in total cropped area	-0.066**	0.01	0.08	-0.036	0.00	0.04	-0.004	0.03	0.04	-0.191***	0.00	0.19
Share of sesamum in total cropped area	-0.088***	0.01	0.10	-0.097*	0.00	0.10	-0.079*	0.01	0.09	-0.085*	0.02	0.1
Observation		84	93		31	42		30	26		23	25
Rabi season, Uttar Pradesh												
Share of wheat in total cropped area	0.053	0.676	0.624	-0.009	0.686	0.695	0.098	0.658	0.560	0.087	0.600	0.513
Share of mustard in total cropped area	-0.049	0.106	0.155	-0.011	0.099	0.109	-0.066	0.133	0.199	-0.222	0.000	0.222
Share of gram in total cropped area	0.000	0.045	0.045	0.012	0.051	0.039	-0.038	0.019	0.058	0.158	0.200	0.042
Share of barley in total cropped area	-0.046	0.000	0.046	-0.056	0.000	0.056	-0.032	0.000	0.032	-0.039	0.000	0.039
		46	107		32	57		13	31		1	19
Kharif season, Uttar Pradesh												
Share of paddy in total cropped area	0.177**	0.986	0.809	0.147*	1.000	0.853	0.259*	1.000	0.741	-0.403	0.375	0.778
Share of maize in total cropped area	-0.069	0.000	0.069	-0.059	0.000	0.059	-0.063	0.000	0.063	-0.111	0.000	0.111
Share of little millet in total cropped area	-0.070*	0.000	0.070	-0.042	0.000	0.042	-0.157	0.000	0.157	-0.022	0.000	0.022
Share of kodo millet in total cropped area	-0.033	0.000	0.033	-0.036	0.000	0.036	-0.021	0.000	0.021	-0.044	0.000	0.044
		44	102		30	56		13	28		1	18

Note: *significant at 10%; ** significant at 5%; ***significant at 1%.

Table 11: Summary statistics on casual labour in agriculture, non-agriculture and public works (man-days in a year) in low and high-treatment villages respectively, for Rajasthan and Uttar Pradesh, disaggregated by gender

	All household			Labourer-household			Middle-farmer			Large-farmer		
	Difference	Low treatment village	High treatment village	Difference	Low treatment village	High treatment village	Difference	Low treatment village	High treatment village	Difference	Low treatment village	High treatment village
Male, Rajasthan												
Casual labour in agriculture	3.1	7.5	4.4	5.8	12.1	6.3	3.3	6.1	2.7	-1.0	1.7	2.7
Casual labour in public works	-7.9***	1.4	9.4	-7.1*	2.2	9.3	-8.1	1.1	9.2	-9.1**	0.5	9.7
Casual labour in non-agriculture	-1.7	55.9	57.5	0.0	69.2	69.2	-2.4	54.4	56.7	-2.3	35.2	37.6
		134	176		55	80		47	52		32	44
Female, Rajasthan												
Casual labour in agriculture	-0.4	6.8	7.2	2.3	9.2	6.9	-1.7	8.1	9.9	-3.4	2.0	5.5
Casual labour in public works	-12.3***	0.2	12.5	-12.9***	0.4	13.4	-11.6**	0.0	11.6	-11.3**	0.0	11.3
Casual labour in non-agriculture	0.3	2.1	1.9	-1.9	1.3	3.2	-0.8	0.0	0.8	5.6	5.6	0.0
		93	170		39	90		27	37		27	43
Male, Uttar Pradesh												
Casual labour in agriculture	4.6	20.9	16.4	8.0	28.8	20.8	-3.8	6.0	9.8	0.1	6.7	6.6
Casual labour in public works	-2.0	7.2	9.2	0.0	9.6	9.6	-5.2	3.6	8.8	-7.8	0.0	7.8
Casual labour in non-agriculture	-16.6*	29.2	45.8	-17.9	39.8	57.7	-15.7	10.0	25.7	-15.0	6.7	21.7
		98	247		64	160		25	46		9	41
Female, Uttar Pradesh												
Casual labour in agriculture	4.4	20.2	15.7	10.4*	28.0	17.6	-15.2*	0.0	15.2	-3.3	2.7	6.1
Casual labour in public works	-3.1	4.4	7.4	-1.3	6.2	7.4	-7.5	0.0	7.5	-7.5	0.0	7.5
Casual labour in non-agriculture	-1.3	1.0	2.3	-1.0	1.3	2.4	-2.0	0.0	2.0	-2.1	0.0	2.1
		89	221		63	153		15	40		11	28

Note: *significant at 10%; ** significant at 5%; ***significant at 1%.

Table 12: Summary statistics on household characteristics in low and high-treatment villages, for Rajasthan and Uttar Pradesh

	All household			Labourer-household			Middle-farmer			Large-farmer		
	Difference	Low treatment village	High treatment village	Difference	Low treatment village	High treatment village	Difference	Low treatment village	High treatment village	Difference	Low treatment village	High treatment village
Rajasthan												
Age (in years)	1.6	46.0	44.4	-0.3	41.8	42.1	1.3	48.7	47.4	2.8	50.1	47.3
Age square (in years)	144.6	2274.2	2129.6	2.0	1918.9	1916.8	97.1	2511.8	2414.6	255.3	2628.9	2373.6
Education(years)	1.5**	5.3	3.8	1.1	5.0	4.0	2.2*	5.1	2.9	1.9	5.9	4.1
Schedule caste/tribe(share of household)	-0.17**	0.40	0.57	-0.13	0.38	0.50	-0.16	0.46	0.62	-0.32**	0.38	0.70
		129	204		58	113		39	45		32	46
Uttar Pradesh												
Age (in years)	1.5	49.3	47.8	1.5	48.1	46.6	3.2	52.5	49.3	0.5	54.2	53.7
Age square (in years)	111.9	2611.5	2499.6	84.8	2480.1	2395.3	420.3	2980.9	2560.6	2.2	3028.8	3026.6
Education(years)	1.5**	4.4	2.9	0.7	3.4	2.7	4.5***	7.5	2.9	2.2	6.2	3.9
Schedule caste/tribe(share of household)	0.08	0.53	0.45	0.10	0.62	0.52	0.05	0.31	0.26	-0.13	0.17	0.30
		86	248		64	176		16	42		6	30

Note: *significant at 10%; ** significant at 5%; ***significant at 1%.

Table 13.1: Impact of MGNREGA on Cropping Patterns in Rajasthan in Rabi season: Difference in change in crop shares between high and low-treatment villages (in percentage points)

	Rabi season		
	Wheat	**Mustard**	**Gram**
Impact on all household			
High-treatment*Time (NH*T), α_2	0.213** (0.086)	-0.236** (0.092)	0.009 (0.027)
Observation	276	276	276
Impact on labourer-household			
High-treatment*Time (NH*T), α_2	0.421** (0.104)	-0.322** (0.146)	0.009 (0.045)
Observation	104	104	104
Impact on middle-farmer			
High-treatment*Time (NH*T), α_2	0.199 (0.124)	-0.387** (0.121)	0.061* (0.028)
Observation	92	92	92
Impact on large-farmer			
High-treatment*Time (NH*T), α_2	0.090* (0.043)	-0.011 (0.153)	-0.067 (0.115)
Observation	80	80	80

Notes: The crops chosen for each season together cover at least 90 per cent of the total cropped area in 2005/6. The dependent variable is the share of crop acreage in the total cropped area. The coefficient α_2 in specification 1 measures the impact of MGNREGA. Labourer-household are the households which are most likely to spend their major time as labourer, as compared to on their own farm. Housheolds belonging to middle-farmer category are likely to spend their time on own farm as well as working as labourer. Large- farmers are most likely to spend more time on own farm as compared to work as labourer on other farms. Robust standard errors in parentheses. *significant at 10%; ** significant at 5%; ***significant at 1%.

Table 13.2: Impact of MGNREGA on Cropping Patterns in Rajasthan in Kharif season : Difference in change in crop shares between high and low-treatment villages (in percentage points)

	Kharif season		
	Pearl Millet	**Pigeon Pea**	**Sesamum**
Impact on all household			
High-treatment*Time (NH*T), α_2	0.027 (0.033)	0.005 (0.027)	-0.034 (0.026)
Observation	354	354	354
Impact on labourer-household			
High-treatment*Time (NH*T), α_2	0.081* (0.042)	-0.033 (0.038)	-0.074* (0.040)
Observation	146	146	146
Impact on middle-farmer			
High-treatment*Time (NH*T), α_2	-0.054 (0.068)	0.051 (0.045)	0.026* (0.014)
Observation	112	112	112
Impact on large-farmer			
High-treatment*Time (NH*T), α_2	0.038 (0.065)	0.024 (0.036)	-0.057 (0.057)
Observation	96	96	96

Notes: The crops chosen for each season together cover at least 90 per cent of the total cropped area in 2005/6. The dependent variable is the share of crop acreage in the total cropped area. The coefficient α_2 in specification 1 measures the impact of MGNREGA. Labourer-household are the households which are most likely to spend their major time as labourer, as compared to on their own farm. Housheolds belonging to middle-farmer category are likely to spend their time on own farm as well as working as labourer. Large- farmers are most likely to spend more time on own farm as compared to work as labourer on other farms. Robust standard errors in parentheses. *significant at 10%; ** significant at 5%; ***significant at 1%.

Table 14: Impact of MGNREGA on labour use in Rajasthan: Difference in change in man days between high and low-treatment villages

	Casual Agriculture		Public works		Casual Non-Agriculture	
	Male	**Female**	**Male**	**Female**	**Male**	**Female**
Impact on all household						
High-treatment*Time (NH*T), α_2	2.5 (2.8)	4.1** (1.8)	-1.2 (2.3)	-4.8 (3.8)	-6.7 (6.6)	3.0 (1.8)
Observation	548	418	548	418	548	418
Impact on labourer-farmer						
High-treatment*Time (NH*T), α_2	3.5 (4.9)	1.8 (4.5)	4.6 (5.5)	-2.2 (5.1)	-6.6 (10.7)	2.8 (3.0)
Observation	238	200	238	200	238	200
Impact on middle-farmer						
High-treatment*Time (NH*T), α_2	1.9 (1.2)	5.6 (5.0)	-5.3 (6.5)	-6.9 (4.0)	-10.2 (14.1)	-0.3 (0.3)
Observation	172	104	172	104	172	104
Impact on large-farmer						
High-treatment*Time (NH*T), α_2	-0.6 (1.3)	6.8** (2.1)	-5.0** (2.2)	-9.3** (3.3)	-1.7 (8.0)	6.5 (7.8)
Observation	138	114	138	114	138	114

Note: Dependent variable is the number of days worked in a year. The coefficient α_2 in specification 1 measures the impact of MGNREGA. The coefficient α_2 in specification 1 measures the impact of MGNREGA. Labourer-household are the households which are most likely to spend their major time as labourer, as compared to on their own farm. Housheolds belonging to middle-farmer category are likely to spend their time on own farm as well as working as labourer. Large-farmers are most likely to spend more time on own farm as compared to work as labourer on other farms. Robust standard errors in parentheses. *significant at 10%; ** significant at 5%; ***significant at 1%.

Table 15.1: Impact of MGNREGA on Cropping Patterns in Uttar Pradesh in Rabi season: Difference (in percentage points) in change in crop shares between high and low-treatment villages

	(1)	(2)	(3)	(4)
	Wheat	**Mustard**	**Gram**	**Barley**
Impact on all household				
High-treatment*Time (NH*T), α_2	-0.01 (0.09)	-0.07 (0.07)	0.00 (0.05)	0.01 (0.02)
Observations	298	298	298	298
Impact on labourer-household				
High-treatment*Time (NH*T), α_2	-0.04 (0.11)	0.03 (0.09)	-0.02 (0.06)	-0.02 (0.02)
Observations	174	174	174	174
Impact on middle-farmer				
High-treatment*Time (NH*T), α_2	-0.01 (0.18)	-0.16 (0.15)	0.04 (0.04)	0.09 (0.07)
Observations	86	86	86	86
Impact on large-farmer				
High-treatment*Time (NH*T), α_2	0.03 (0.36)	-0.37** (0.17)	0.11 (0.13)	0.16 (0.12)
Observations	38	38	38	38

Notes: The crops chosen for each season together cover at least 90 per cent of the total cropped area in 2005/6. The dependent variable is the share of crop acreage in the total cropped area. The coefficient α_2 in specification 1 measures the impact of MGNREGA. Labourer-household are the households which are most likely to spend their major time as labourer, as compared to on their own farm. Housheolds belonging to middle-farmer category are likely to spend their time on own farm as well as working as labourer. Large- farmers are most likely to spend more time on own farm as compared to work as labourer on other farms. Robust standard errors in parentheses. *significant at 10%; ** significant at 5%; ***significant at 1%.

Table 15.2: Impact of MGNREGA on Cropping Patterns in Uttar Pradesh in Kharif season: Difference (in percentage points) in change in crop shares between high and low-treatment villages

	(1)	(2)	(3)	(4)
	Paddy	**Maize**	**Little Millet**	**Kodo Millet**
Impact on all farmer				
High-treatment*Time (NH*T), α_2	0.083** (0.030)	0.020 (0.021)	-0.077** (0.026)	-0.036** (0.015)
Observations	292	292	292	292
Impact on labourer-household				
High-treatment*Time (NH*T), α_2	0.069* (0.037)	0.023 (0.021)	-0.047* (0.024)	-0.046* (0.024)
Observations	172	172	172	172
Impact on middle-farmer				
High-treatment*Time (NH*T), α_2	0.137 (0.086)	0.049 (0.040)	-0.149** (0.069)	-0.044 (0.045)
Observations	82	82	82	82
Impact on large-farmer				
High-treatment*Time (NH*T), α_2	-0.050 (0.187)	-0.148 (0.171)	0.037 (0.032)	0.087 (0.079)
Observations	38	38	38	38

Notes: The crops chosen for each season together cover at least 90 per cent of the total cropped area in 2005/6. The dependent variable is the share of crop acreage in the total cropped area. The coefficient α_2 in specification 1 measures the impact of MGNREGA. Labourer-household are the households which are most likely to spend their major time as labourer, as compared to on their own farm. Housheolds belonging to middle-farmer category are likely to spend their time on own farm as well as working as labourer. Large- farmers are most likely to spend more time on own farm as compared to work as labourer on other farms. Robust standard errors in parentheses. *significant at 10%; ** significant at 5%; ***significant at 1%.

Table 16: Impact of MGNREGA on labour use, by landclass, in Uttar Pradesh: Difference in change in man days between high and low-treatment villages

	Casual Agriculture		Public Works		Casual Non-Agriculture	
	Male	**Female**	**Male**	**Female**	**Male**	**Female**
Impact on all household						
High-treatment*Time (NH*T), α_2	0.7 (4.0)	5.1 (5.0)	1.4 (4.5)	0.8 (2.5)	2.4 (6.6)	-0.3 (2.0)
Observations	626	568	626	568	626	568
Impact on labourer- household						
High-treatment*Time (NH*T), α_2	-1.3 (4.8)	7.3 (5.8)	3.3 (4.3)	1.2 (2.9)	2.2 (7.6)	-0.6 (2.6)
Observations	420	404	420	404	420	404
Impact on middle- farmer						
High-treatment*Time (NH*T), α_2	8.9** (3.4)	0.6 (5.1)	8.6 (5.3)	-0.4 (1.3)	4.5 (6.3)	1.4** (0.4)
Observations	114	96	114	96	114	96
Impact on large-farmer						
High-treatment*Time (NH*T), α_2	13.1 (8.7)	10.1* (4.9)	-26.7 (18.3)	-0.4 (4.3)	13.4 (15.5)	1.1 (1.1)
Observations	92	68	92	68	92	68

Note: Dependent variable is the number of days worked in the reference year (2010/11 and 2005/6). The coefficient α_2 in specification 1 measures the impact of MGNREGA. Labourer household are the households which are most likely to spend their major time as labourer, as compared to on their own farm. Housheolds belonging to Middle farmer category are likely to spend their time on own farm as well as working as labourer. Large-farmers are most likely to spend more time on own farm as compared to work as labourer on other farms. Robust standard errors in parentheses. *significant at 10%; ** significant at 5%; ***significant at 1%.

Appendix Tables

Table A1: Pre-MGNREGA trends in treatment and control districts for cropping Patterns in Rajasthan: Difference in change in crop shares between high and low-treatment districts (in percentage points)

	Rabi season		
	Wheat	**Mustard**	**Gram**
High-treatment*Time (NH*T), α_2	-0.03 (0.03)	-0.04 (0.04)	0.07* (0.03)
Observation	58	58	58
	Kharif season		
	Pearl Millet	**Pigeon Pea**	**Sesamum**
High-treatment*Time (NH*T), α_2	-0.05** (0.02)	0.01* (0.00)	-0.02 (0.02)
Observation	58	58	58

Note: The dependent variable is the share of crop acreage in the total cropped area. The estimation has been on the basis of specification 1. The data has been collected from Directorate of Economics and Statistics, Ministry of Agriculture, Government of India. The data for 2000/1 and 2005/6 have been used for the analysis. The high and low- treatment has been defined on the basis of average employment per rural household generated through MGNREGA in 2010/11. Robust standard errors in the parentheses. *significant at 10%; ** significant at 5%; ***significant at 1%.

Table A2: Pre-MGNREGA trends in treatment and control districts for cropping Patterns in Uttar Pradesh in Rabi season: Difference (in percentage points) in change in crop shares between treatment and control districts

	(1)	**(2)**	**(3)**	**(4)**
Rabi season				
	Wheat	**Mustard**	**Gram**	**Barley**
High-treatment*Time (NH*T), α_2	0.03 (0.02)	-0.00 (0.00)	-0.01 (0.01)	-0.00 (0.01)
Observations	140	140	140	140
Kharif season				
	Paddy	**Maize**	**Little Millet**	**Kodo Millet**
High-treatment*Time (NH*T), α_2	0.01 (0.02)	0.02* (0.01)	NA	NA
Observations	140	140	NA	NA

Note: The dependent variable is the share of crop acreage in the total cropped area. The estimation has been on the basis of specification 1. The data has been collected from Directorate of Economics and Statistics, Ministry of Agriculture, Government of India. The data for 2000/1 and 2005/6 have been used for the analysis. The high and low- treatment has been defined on the basis of average employment per rural household generated through MGNREGA in 2010/11. Robust standard errors in the parentheses. *significant at 10%; ** significant at 5%; ***significant at 1%.

Table A3: Pre-MGNREGA trends in treatment and control districts for labour use, in Rajasthan and Uttar Pradesh: Difference in change in time shares between high and low-treatment districts

	Casual Agriculture		Casual Non-Agriculture		Public Works	
	Male	Female	Male	Female	Male	Female
Rajasthan						
High-treatment*Time (NH*T), α_2	-0.004 (0.026)	0.000 (0.011)	-0.007 (0.024)	0.003 (0.008)	0.000 (0.005)	0.006 (0.005)
Observations	8264	9280	8264	9280	8264	9280
Uttar Pradesh						
High-treatment*Time (NH*T), α_2	-0.016 (0.021)	-0.010 (0.011)	-0.025* (0.013)	-0.004 (0.003)	0.000 (0.001)	-0.000 (0.000)
Observations	19087	22193	19087	22193	19087	22193

Note: The dependent variable is the fraction of unit time spent in a particular activity. The analysis is based on employment and unemployment survey of NSS for 55th and 61st round conducted in 1999/0 and 2004/5 respectively. The high and low-treatment has been defined on the basis of average employment per rural household generated through MGNREGA in 2010/11.Robust standard errors in parentheses. *significant at 10%; ** significant at 5%; ***significant at 1%.

Table A4: Impact of MGNREGA on labor-saving machinery use, for Rajasthan and Uttar Pradesh (Difference in change (in percentage points) between treatment and control villages)

	All household		Large farmer	
	Tractor	Thresher	Tractor	Thresher
Rajasthan				
High-treatment*Time (NH*T), α_2	-0.06 (0.08)	-0.02 (0.08)	-0.04 (0.12)	0.01 (0.12)
Observation	508	508	136	136
Uttar Pradesh				
High-treatment*Time (NH*T), α_2	0.04 (0.08)	-0.01 (0.08)	-0.09 (0.24)	0.00 (0.20)
Observation	660	660	70	70

Note: The dependent variable is the dummy variable takes value equals to one for households who use a particular machine and other wise zero. Robust standard errors in parentheses. *significant at 10%; ** significant at 5%; ***significant at 1%.

Table A5: Intensity of MGNREGA implementation from survey data at village level, and from administrative data at the district level

	Unit	No. of observation	Mean	SD	Min	Max	Range
Household data							
Rajasthan	Village	12	10	15	0	49	**49**
Uttar Pradesh	Village	12	23	11	7	42	**35**
District data							
Rajasthan	District	29	31	13	9	59	**50**
Uttar Pradesh	District	68	13	7	0	33	**32**

Source: MGNREGA survey (2011/12) and Ministry of rural development, Government of India

Note: Intensity is defined as person-days per rural household employment provided through MGNREGA for 2010/11

Table A6: Share of acreage from survey data at village level, and from administrative data at the district level

	Government data (District)	Primary survey data (Village)		
Sonbhadra	**Mean**	**Mean**	**Minimum**	**Maximum**
Share of Wheat in total cropped area in Rabi season	0.63	0.59	0.35	0.77
Share of Paddy in total cropped area in Kharif season	0.62	0.74	0.00	1.00
Barabanki				
Share of wheat in total cropped area in Rabi season	0.83	0.71	0.63	0.95
Share of paddy in total cropped area in Kharif season	0.88	1.00	1.00	1.00
Karauli				
Share of wheat in total cropped area in Rabi season	0.32	0.44	0.15	0.72
Share of mustard in total cropped area in Rabi season	0.65	0.29	0.15	0.66
Share of pearl millet in total cropped area in Kharif season	0.91	0.86	0.64	1.00
Dholpur				
Share of wheat in total cropped area in Rabi season	0.37	0.48	0.00	0.87
Share of mustard in total cropped area in Rabi season	0.61	0.33	0.03	0.70
Share of pearl millet in total cropped area in Kharif season	0.92	0.92	0.73	1.00
Observation	1	6	6	6

Source: MGNREGA survey (2011/12) and Ministry of agriculture, Government of India