Whether MGNREGS has affected agricultural wage rate in Andhra Pradesh? A panel modeling across 23 districts from 2000 to 2011

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Abstract

The Impact of Mahatma Gandhi National Rural Employment Guarantee Schemes (MGNREGS) on agricultural labour supply and agricultural wage rate is a hotly debated public policy concern in India. The available literature on the topic has provided mixed findings, which motivated the authors to carry out this study. In 2011-2012, about 12 % of the national annual budget of MGNREGS was spent in Andhra Pradesh (AP); therefore, we have chosen AP for this study. Panel data from 23 districts of AP for 2000 to 2011 were used in fixed effect form of panel model, with weighted least square regression model to correct for heteroskedasticity errors across the districts. We have analyzed impact of MGNREGS on both agricultural and non-agricultural wage rates (carpenter wage rate), and separately for male and female agricultural wage rate. This is done taking into account of marginal impact of other major determinants of agricultural wage rates. Our study shows that the wage rate for men are consistently higher than that of women labour force in Andhra Pradesh; instead of convergence, the divergence trend has further widen after 2006 onward. The results from panel model suggest that agricultural wages are positively impacted by rise on non-farm sector wage (proxy as carpenter wage rate), irrigation intensity, number of households covered by the MGNREGS program, and increased per capita income level in a district. Even though MGNREGS contributions to rise in male agricultural wage rate is positive and statistical significant, but its size of economic impact (elasticity) is weaker than many other factors like skill non-farm wage rate level. The study suggests that the agricultural wage in a place in India influenced more by growth on non-farm sector activities (measured by carpenter wage rate) than many other conventional factor determinants of wage. The study findings contribute on improved empirical evidences on important policy debates on recent hike on agricultural wage rate in India.

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1 Introduction

1.1 Background

With an annual expenditure of about USD8 billion, Mahatma Gandhi National Employment Guarantee Schemes (MGNREGS, or also called as MGNREGS) is providing income, employment and livelihood security to over 50 million poor households in rural India annually (in 2012-13). This has been ensured by constitutional right on cash transferred and guarantee of providing at least 100 days of wage employment in a year to all those who are willing to do unskilled manual labour work provided by the government under MGNREGS. With spread all over India and wider penetration to all districts of targeted regions in the country, this is a major flagship programme of the government of India since 2009. Even after change on the government in New Delhi in middle of 2014, the new government has decided to continue the MGNREGS, but with slight changes on *modus-operandi* of the program implementations. This involves linking the program activities with the seasonality of agricultural and allied sector activities, and with changes on material and labour ratio to implement it more pragmatically and sustainable rural infrastructure creations (23 August 2014, The Hindu). Around the time of initiation of MGNREGS in 2005-06, the real rural wage rate of unskilled agricultural labour has also just started to increase across the states of India, including in AP, after its stagnation for over more than 20 years.

Many scholars have noted that this rise in agricultural labour was due to shifting of labor forces away from farm land to do MGNREGS funded schemes like canal cleaning, road repairing, de-silting of tank, etc., (Gulati, et al., 2013). There are lots of public outrage on increased agricultural wage, especially more from network and associations linked with farmers. Therefore, we have selected panel data sets across 23 districts of AP to address these questions.

One of the objectives of initiating MGNREGS in 2005-06 was to reduce social unrests in rural India, to halt the out migration of agricultural labours and smallholding farmers from rural to urban in distress condition, and in turn, to improve rural livelihoods (MRD, 2012). Therefore, the positive contribution of the MGNREGS on increasing wage of agricultural labor will ultimately help in improving livelihoods of mass rural labour forces, which is in fact a core objective of the MGNREGS. Increased agricultural wage directly helps in reduction of income poverty, especially in raising income of ultra-poor households, who are usually agricultural labors and marginal farmers. Agricultural labor is often the bottom section of income quintile in Indian society. This fact is clearly depicted also across the trend on rural poverty (HCI) and agricultural wage rate in Andhra Pradesh, as depicted in Figure 1 below.
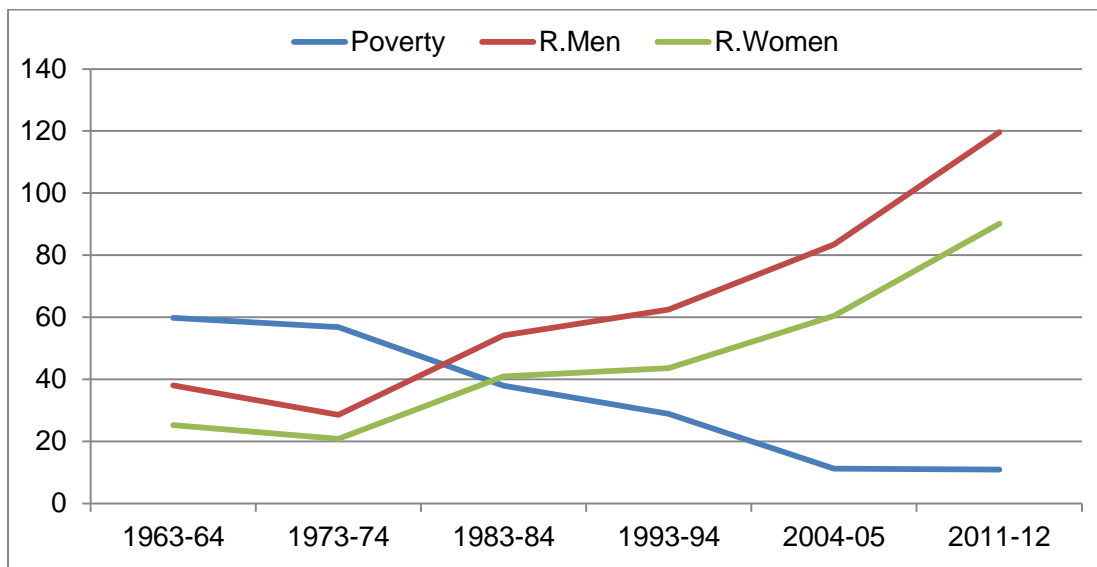
Figure 1: Relationship between Rural Head Count Ratio and Real Agricultural wages in AP, 1964 to 2011

Data source: 1) Agricultural wages from season and crop reports from DES (various issues); 2) HCR from DES and Statistical Abstract of Andhra Pradesh (various issues).

In AP, the rural poverty rate has declined gradually from 60 percent in 1963-64 to 11 percent in 2011-12, dropped on 1/6th over the period of 50 years. Whereas, the real agricultural wages for both men (also women) increased from about Rs.40 in 1963-64 to Rs.120 in 2011-12, an increased on three times over the same period. The increased on wage rate is less for women than that of men (Figure 1). As shown in Figure 1, it is obvious that when the rural real agricultural wage rate started to pick up in AP in around early 1980s, from the subsequent years onward, the rural poverty (measured by HCR) also started to decline sharply. Thus, understating the agricultural wage rate is very important for poverty alleviation and reduction of vulnerability. Thus, the level and pattern of long-term trend on agricultural wage rate has profound policy significance. Therefore, empirically quantification on the impacts of any of governmental program (including MGNREGS) on agricultural wage will provide improved information and better insight on level and intensity of poverty prevailing in India, income distribution pattern and other features of the rural economy.

In addition to implementation of MGNREGS, several other changes have also occurred in the Indian economy during the past one decade, thus, it is logical to attribute properly changes on wage rates of agricultural forces not only to MGNREGS but also to all other major factor determinants. For example, Indian economy as a whole, and per capita national GDP has grown almost by two digit level over the last 10 years, increased rate of infrastructural development across many urban centers. Likewise, during the last one decade, there has been a sustained increased on inflation of food and other commodities in India for longer period. All of these factors have led to a sustained increased on the agricultural wage rates in all India level from 2004-55 onward. However, no consensus exist in the literature on the causal factors for increased on agricultural wage rate in all India level, as we have been observed it in the last one decade. In the lack of empirical analyses and

rigorous statistical evidences, many policy makers and scholars point to MGNREGS as only a force for this increased agricultural wages in the recent time, and leading to distress on agricultural and farming sector, and reduced farm income.

Therefore, in this study, we have done an attempt to analyze marginal contribution of MGNREGS on agricultural wage rate keeping impacts of several other factors constant. Using rigorous panel form of statistical modeling, we have analyzed marginal impact of MGNREGS on agricultural wage rates across 23 districts of Andhra Pradesh state (i.e., old Andhra Pradesh). It is the state where the MGNREGS was implemented first time in 2006; subsequently it was expanded to 200 backward districts of India in the same year. Likewise, overall funding of MGNREGS in the state of Andhra Pradesh in a year of 2011-12 was over 11% of the total program funding in the country in that year, which was well above than many other states in India. Considering all of these issues, we have selected these districts of old Andhra Pradesh to analyzed wage implications of MGNREGS. This has been done by controlling marginal effect of other factors likely to affecting agricultural wage rate as suggested in the literature. The other factors likely to affect agricultural wage rate at any moment of time are level of irrigation development, increased on cropping intensity, overall income of the district, and education level of the population. In fact, we have included all of these factors in our empirical models.

Since June 2014, the old Andhra Pradesh has been split into two separate states, Telangana and Andhra Pradesh. The 23 districts were split into two respective states. Among 23 districts, 10 districts are in Telangana state, and 13 districts are with AP. While splitting the state, the district boundary has not been altered.

1.2 Objectives of the study

The overall purpose of this study is properly factor out impact of MGNREGS on variation of agricultural wage rate of male and female labor forces, taking a state of India. The specific objectives of the study are as follow.

1) To review and assess trend of the agricultural wage rate in Andhra Pradesh.
2) To analyze impact of MGNREGS on rural wage rates in Andhra Pradesh.
3) To evaluate differential impacts of MGNREGS on agricultural labor wage rates by gender, and,
4) To assess marginal impacts of factors affecting agricultural wage rate, assess linkage between farm wage rates and non-farm wage rates; and draw policy implications.

2. Literature

The poverty and vulnerability is more widespread in the developing countries, and it is more so in India. Recently, several new schemes have been implemented in India to reduce poverty, and to reduce distress among underprivileged population, and into the region left behind from the development process. This includes social safety net programs to put in place to address weather and climatic related calamities in agriculture, and program to promote rural development and rural livelihood by generation of more income and employment, and reducing out migration from rural to urban sector in a distress condition, and improving rural connectivity and rural infrastructure, etc. Among them, the employment generation and employment guarantee schemes of India is one of such social safety nets program to ensure critical employment to people in distress condition. This type of employment guarantee program started in Maharashtra state of India in early 1970, which has gone several changes on *modus operandi* in the subsequent years.

Likewise, on 7th September 2005, the government of India enacted landmark legislation with ensuring 100 days of guarantee employment to all of Indian citizen living in rural India who is ready to work voluntarily for manual work provided by the local government. This government scheme was called as National Rural Employment Guarantee Act (MGNREGS), which was implemented subsequently in phase manner, first in 200 economically backward districts (in relative term) in India, and then subsequently expanded to other districts. In all India level, then the chief minister of AP government, Y S R Reddy in 2006, first lunched this scheme in Andhra Pradesh. Since 2009, this scheme has been implemented all over India, as per need and demand from the local government. For the MGNRGES, the government of India has spent over UDS 8 billion per year expenditure in 2011/12, thus the MGNREGS scheme (or MGNREGS since 2009) has attracted a considerable interest amount of policy analysts and academicians because of its size and scale of operation, and its possible implications on various aspects of rural livelihoods in India. This program has both social safety nets and productive enhancement target.

Poverty reduction and unemployment are major concern in India and in several other developing countries; recently number of developed countries are also facing the problem of rising poverty level and rising inequality. To address these inequalities and to provide basic social safety net to all segments, many developing countries have adopted some form of public work programmes as a strategy for reducing poverty and vulnerability. This also acts as locally adapted social safety nets measures to protect poor and vulnerable from falling below certain threshold line (poverty line) in a time of crises, and indirectly assists in redistribution of the wealth among the rural poor. A public works program has a long history of creating public work to address poverty and vulnerability in the several countries. Even in the period of Roman Civilization, food and basic commodities were ensured by the state to old and retired army personnel who cannot work. So was the case in ancient kingdom in Egypt and India. As far back as 2500 years ago, Chanyakya— , the famous political and economic philosopher of ancient Indian subcontinent — has advised kings and head of the states at that time to provide adequate food and wellbeing to poor and vulnerable people in their states in his famous political economy book "Arthasastrha" written in in 4th century BC. He has summarized importance of social protection policies in a state "by saying it as 'in *the*

happiness of his subjects lies the king's happiness; in their welfare, his welfare. shall not consider as good only that which pleases him but treat as beneficial to him whatever pleases his subjects' (cited in Kannan and Pillai 2007: 8).

In modern history, the state creating charity and social welfare goes back even before pre-revolutionary period in France, which had tradition of "*charity workshops*" where the poor receive money or food for their work. In fact, in Germany, the public sponsored form of social welfare schemes were well integrated within the state welfare schemes by chancellor, Bismark, back in nineteen century. Likewise, British administrators in colonial India, frequently used public works as a tool to deliver famine related relief (Dreze, 1990). Such public employment work programs were also popular in USA during the time of Great Depression in early 1930. More recently, the concept of "workfare" was launched in United States in the late 1960s with idea of tying social benefits to work requirements (Erled Berg 2012).

In India, since independent in 1947, several programs have been initiated by the central and states governments to alleviate poverty, including increased access to crop loans, other forms of credit supports in rural areas, subsidy to agricultural inputs, price supporting policies, subsidizing on distribution of food, and various other cash and kind supports, and so on. This list of public supports in India and in other countries would be very big. Recently, not only governmental programs but also NGOs and civil societies have also started several social protection supports programs in India. Large number of these governmental welfare programs are designed by the central government, administered by the Ministry of Rural Development, but implemented by state governments, with the states generally contributing 25-30 percent to the project cost.

In India, Maharashtra state government in early 1970's first initiated employment guarantee program. It was started with the objective of providing immediate relief in drought-affected regions by providing employment to rural poor and addressing the rural poverty and food insecurity and employment insecurity through these schemes. Learning from success of these schemes, National Rural Employment Guarantee Act (MGNREGS) was first time enacted in the Parliament by the central government of India on 7 September 2005, and was gradually implemented across the states, with the joint cost sharing by central and state government. Where, the state government implemented the program then afterward the state government get reimbursement of the cost incurred for the MGNREGS programs. Thus, the state level governance factors are also important in success, or, failure of the MGNREGS activities in a place, as state machineries implement the activities in practice.

In Andhra Pradesh, the MGNREGS was started in 2006. This program aims to provide a source of income and livelihood security for the poor people in rural areas by giving a constitutional guarantee of providing at least 100 days of wage employment to a person of each rural household, who are willing to do unskilled manual labour work provided by the local government. The central government bears the entire cost of wages of unskilled manual workers, and 75 percent of the cost of material and wages of skilled and semi-skilled workers. The state governments bear the remaining 25 percent of the cost of material and wages of skilled and semi-skilled workers that are spent under the MGNREGS. However,

the states set wage rate for manual work, as per the prevailing wage rate in the state, and after 2009 onwards, all the states are setting wage as per the local situation. Since 2009, many states of India have set a *piece-wise-rates payment* for wage payment under MGNREGS, which has improved monitoring systems and to some extent leakage as well. In addition, state governments bear the cost of unemployment allowance payable in case they are unable to provide wage employment on time (Ministry of Rural Development, 2009). However, in practice, this provision of MGNREGS act has rarely been implemented in any of the states of India. Within the period of last 8 years of its operation, there have been several changes taken place in agricultural wage patterns in India, as well. We consider it is good time to assess its wage impacts of the programme comprehensively.

Earlier, Ravi and Englar (2009), using data collected from one district (Medak) of Andhra Pradesh, analyzed impact of the program on food security, savings, and health outcomes. Using cross section survey data across 1066 households (surveyed in June 2007, when MGNREGS was just operational in the district), they examined the impact of the program by using Propensity Score Matching (PSM) method. They used also a subsequent panel data of 320 households (again collected in December 2008), a double difference and triple difference method. Since MGNREGS was already operationalized in the district when their baseline data was collected, they used new participants, long-term participants, and other constructed groups to implement their double and triple difference strategy. Their study found that MGNREGS program had significantly increased participant households' expenditure on food by 40% and nonfood consumables by 69%, over their counterparts. They also reported that the MGNREGS has helped in improving the probability of household holding a saving account in a bank by over 9 percent than that of other households who have not participated in the MGNREGS program.

The past studies on wage implication of MGNREGS have focused mainly at macro level/national level issues (or using National Sample Survey Office (NSSO) data sets for analyzing national level issues); and no concluding evidence have been forwarded on this topic. In this context, we have attempted to focus our assessment on these issues in a state of Andhra Pradesh, where MGNREGS programs have been implemented more widespread than many of other states of India. Besides, Andhra Pradesh government and implementation machineries of MGNREGS were able to spent almost 12% of the national annual expenditure of MGNREGS in 2012, which was also highest level of total governmental expenditure than many other states.

3. Methodology and Data

3.1 The model specifications

We examined the historical trend on rural wage rate in AP state by gender; then we quantified marginal impact of MGNREGS on agricultural wages by controlling impact of other factor determinants. Using secondary data from 23 districts of Andhra Pradesh during the period 2000-01 to 2010-2011, we have set up panel form of regression model to address these issues.

We have used following regression model for analyzing quantifying the impact of MGMGNREGS on agricultural wage rates, controlling for marginal impact of other factors. The empirical model used is shown below.

Wage $_{it}$ = f (Skilled labour $_{it}$ + Cropping intensity $_{it}$ + irrigation intensity $_{it}$ + literacy $_{it}$ + Per capita income $_{it}$ + Agricultural productivity $_{it}$ + trend + intensit1 $_{it}$ + MGNREGS Intensity2 $_{it}$

(eq. 1)

We have used double log form of empirical model we have taken a log for all the variables except MGNREGS intensity1 and MGNREGS Intensity 2. The detailed empirically estimated regression model used is as shown in equation 2 below.

$$Wage_{it} = a_i + b_1\ Skilled\ labour_{it} + b_2 Cropping\ intensity_{it} + b_3 Irrigation\ intensity_{it} + b_4 litaracy_{it} + b_5 percapita\ income_{it} + b_6\ rice\ yeild_{it} + b_7\ Nrega\ Intensity1_{it} + b_8 Nrega\ Intensity_{it} + b_9 trend_{it} + U_{it} + e_{it} \quad (eq.\ 2)$$

The variables used in the equation are explained below and detailed on their unit and specifications are provided in Table 1 below.

Dependent variables: the male agricultural wages and female agricultural wages Rs / day.

Independent variables:

1. Skilled labour = Carpenter wage rate in the district (Rs / Day)
2. Cropping Intensity = Cropping area in (%)
3. Irrigation Intensity = irrigated area in (%)
4. Literacy rate = Intermediate student enrollment rate in (%)
5. Per capita income in (Rs / year)
6. Rice yield = productivity of rice in (%)
7. NGREGA intensity 1 = No of employment days per person per year from the MGMGNREGS (No days/per capita/ year).
8. NREGA Intensity 2 = Amount spent per person per year from MGMGNREGS work.
9. Time Trend. 1 = 2000; and 11 for 20011. This control for technology and other factors not included in the variables listed, but that have time trend effect on the wage rate.

The various years of district wise data on agricultural field labour wages for men and women was collected from Season and Crop reports and Price, wages and index numbers published by the Directorate of Economics and Statistics, Government of Andhra Pradesh. Nominal Agricultural wages of field labour will not give real picture of the wage rate. We have constructed the real wage rates by deflating the nominal wage by CPI of agricultural labors force. In practice, consumer price index numbers of agricultural labour at district level is not available; we deflated nominal wages with state level consumer price index numbers of agricultural labour. Thus, we have converted all nominal wage rates into real wages using the Consumer Price Index for Agricultural labourers (CPIAL) with the base year 2009-2010.

The major factors responsible for the increased on wages for male and female that are used in this study and the variable specifications are provided in details in Table 1. All of the variables included in equation 1 and in Table 1 have some relationship with the wage rate determination, as found from the review of previous literature on the topics.

3.2 Data and estimation

For modeling the panel form of regression model, we have used double log form of regression model. That is we have log form of variables in the model estimated with the equation1, except for variables like Intensity1 and MGNREGS Intensity 2, because the data on employment and expenditure of MGNREGS are available 2006 onwards only, and we can use log for zero number. The variables used in this paper, their measurements, averages and Standard deviations are summarized in Table 1. First, we analyze the simple trend in agricultural labor wage rate of men and women in Andhra Pradesh from 2000 to 2011, and annual fluctuation, and separately on movement of women wage rate from that of men wage rates.

Table 1 Definition and measurement, and its summary statistics of variables

Variables	Definition	Unit	Mean	S.D
Skilled labour wages	Annual Average Daily wages of Carpenter as an example	Rs/ Day	102.08	43.41
Crop Intensity (Crop)	Raising the crops more than once during one agriculture year	%	127.55	19.73
MGNREGS Intensity [1]	Number of days of employment Provide per person under the MGMGNREGS program in a year.	No.of days/ person	22.25	27.06
MGNREGS Intensity [2]	Expenditure incurred per person under MGNREGS program in a year	Rs/per son/ year	1585	1951
Irrigation Intensity (irrigation)	Percentage land irrigated in a year	In %	132.25	19.33
Male Literature	Boys enrollment rate of class XI and XII in a year	% per year	71.65	4.90
Female Literature	Girls enrollment rate of class XI and XII in a year	% per year	52.46	8.81
Per capita Income (PCI)	Income of the person per year in district	Rs/ year	27702	878
Productivity	Rice yield per hectare in a year	In t/ha	2.81	0.63

Note: SD stands for standard deviation of the variables.
[1]www.MGNREGS.nic.in, [2]www.MGNREGS.ap.gov.in

Nominal agricultural wages will not give real picture of the wage income of labor forces, so we converted nominal wages into real wages by deflating with consumer index for agricultural labour at state level with 2009-10 as the base year. Then, the wage index variables in our model also represent the real changes on the agriculture wages across the year. We calculated cropping intensity by dividing gross cropped area by net cropped area and multiplied it with hundred. It shows the intensity of crop production and agricultural activities in a district at any moment of time, with this variable, we want to explore relationship between extent of cultivated area and its relationship with the agricultural wage rate.

Irrigation intensity variable was created by dividing net-cropped irrigated area in a district in a year by the grossed cropped acreage, and multiplied it by 100, which facilitated us in quantifying dynamics of relationship between irrigation and wage in an economy. We want to assess whether level of development of irrigation (captured by irrigation intensity) has any effect on the recent increased on agricultural wages. In previous literature on agricultural wags have shown that irrigation intensity and cropping intensity were the two important factors that determined the variation of agricultural wage rates in several parts of India (Narayanamoorthy and Bhattarai, 2004), which have used historical decadal data trend for analyses from 1961 to 1991. We want to assess the same trend hold across district level analyses also in present days. Likewise, we created proxy of food grain productivity by taking rice yield in a district in a particular year and how it varies across the years. In Andhra Pradesh, rice is the main staple food and main crop, and it is grown in almost all of the districts of AP. The intensity and performance of paddy cultivation vary across the districts,

and over the years, which is a good proxy for agricultural technology available in a district at a moment of time. It's likely to have impact the agricultural wage prevailing in rural area. We got the paddy productivity statistics from the AP government statistics. Details on variables specifications are summarized in Table 1.

Proper quantification of impact of MGNREGS activities on wage rate is one of the main aim and objective of this study. Therefore, based on availability of kind and nature of data on the public domain, we have created two different kinds of MGNREGS related variables they are: MGNREGS intensity- I, which is number of days of employment that is provided to each household in a year under the MGNREGS programme activities in a district. We calculated MGNREGS Intensity -I by dividing total number of working days provided to households in a year with number of households got employment in that year in a particular district.

Likewise, MGNREGS Intensity 2 was created by taking total expenditure of the MGNREGS in a district and dividing it by number of person days that were provided employment in the district in that year. This variable is proxy of a kind of wage rate per day per person in a year that was provided by the MGNREGS program in a particular district.

Likewise, to capture effect of wage rate of skilled labour force on agricultural wage rate (unskilled wage), we have used the prevailing wage rate of carpenter in the same district, which is also a good proxy variable to capture wage effect of skilled labour forces at any moment of time. The other reason to keep carpenter wage rate is also to examine any influence of level of nonfarm wages on farm wage (agricultural) wages. The available literature has indicated that the shift of agricultural labor forces from farm to non-farm sector is one of the major reasons for recent increase on agricultural labor wage rate in India (Gulati, et al., 2013; Reddy D N 2014)

To analyze impact of rural literacy rate on agricultural wage rate, rural literacy rate related variables are reported only in census data and census in India is conducted only once in every ten years period. Therefore, we could not use this variable in our model, due to absence of year wise data trend of this variable. For getting year wise data on rural literacy rate (and its best proxy), we have taken difference between 2011 and 2001 literacy rate and divided by ten and got the values for each year through interpolation across the years. This will capture the impacts of literacy on wage rate, and it is done separately for men and women literacy rate.

Likewise, per capita income is another factor that might influence the prevailing agricultural wage rate in a place. For the per capital income across district of Andhra Pradesh for the period 2000 to 2011, we have got two series of per capita income across districts of AP of two different base years 2000 to 2004 with 1999-2000 base year, and 2004 to 2012 with base year 2004-05. We recalculate all of the data into 2004-05 base years. For the year 2011-12 per capita income for the districts is not available, for this year, we projected taking three years average.

4. Result and Discussion

In this section, we present the results and discussions of out of the empirical modeling exercise of the alternate wage models of agricultural labor as noted in the previous section. First, we present the graphical trend on agricultural wage rates, separately for men and women, in in Andhra Pradesh. We also graphically depict how the MGNREGS expenditure has been changing over the years. Then, in the subsequent section, we provide empirical findings of the panel models, separately for male wage rate models from that of the women wage rate model.

4.1 Agricultural wages in India and Andhra Pradesh

Recently, nominal prices of agricultural commodities are in sharp rising trend in Andhra Pradesh as well as in all India level. This is due to escalation in the cost of cultivation of crops, increased cost of agricultural material inputs (fertilizers, pesticides, transportation services), as well as that of wage of agricultural labor forces. There is an unsettled debate among the farmers, media, and various governmental agencies dealing with agriculture and rural development activities on the issues of factors responsible for recent surged on food prices and increased food inflation in the economy. Large numbers of people argue that the agricultural wag rate has risen due to Mahatma Gandhi National Rural Employment Guarantee Program, since this has taken agricultural forces for rural constructions work, which otherwise would be available for agricultural practices (Gulati, et al., 2013; Azam, 2012, Chand and Srivastava, 2014). The argument forward is that Mahatma Gandhi National Rural Employment Guarantee Program has pushed up the average wage of casual workers, distorted the rural labour markets by diverting rural farm labours to non-farm rural jobs. Thus creating artificial labour shortage and raising the cost of production of agricultural commodities (Gulati, et al., 2013; Berg et al., 2012). In India, other factors are also responsible for increase in the farm wages, such as migration of labor forces out of agriculture such as migration of labour from rural to urban areas. Likewise, Gross State Domestic Product growth of the economy, high growth rate in construction sector and lower growth rate in agriculture sector etc., all lead to labor moving out of rural to urban and tightening up the agricultural market (Reddy, et al., 2014; Chand and Srivastava, 2014). Indian economy has grown at an average annual rate of 8 percent in recent years during the eleventh plan (from 2007-08 to 2011-12). Construction sector has also witnessed high annual growth rate of 7.7 percent during the same period during the Eleventh five year plan (2007/8-2011/12). During the same period, agriculture sector also grew at 3.6 percent annual growth rate, which grew continuously at 2.5 percent per annum for the preceding last 20 years. All these growth on outputs of agricultural as well growth of other sectors were also responsible for slight increase on agricultural labor wage in India in the recent past.

 A recent report released by International Labour Organization (ILO, 2013) said that real farm wages declined in recent years, shrinking the purchasing power of wage earners in India. During 2008-11, real wages in India fell one percent and labour productivity grew 7.6 percent in the same period. In a seminal study, Gulati, et al., (2013) reported that the real farm wages grew at an average annual rate of 3.7 in 1990-91 to 2000-01, but in the period 2001-02 to 2011-12 real farm wages grew at a lower level 2.1 percent per annum. They also concluded that both nominal and real wage of agricultural labor at India level grew at a faster

pace in first decade of liberalization (1990-91 to 2001-02) than the 2nd decade (2001-02 to 2011-12).

In case of Andhra Pradesh, Parthasarathy and Adiseshuluin (1982) reported that nominal agricultural wages in AP increased in late seventies, but real wages remained stagnant during the all period of 1960's and 1970's. This is also shown in Figure 1 earlier. Likewise, Jose (1988) and Bhalla (1993) reported an increasing trend of agricultural wage rate in many of the states including Andhra Pradesh during the 1970's mid 1980's. There was a steady increase in nominal wages in Andhra Pradesh during 1980s and 1990s, which in fact increased to threefold from Rs.6.64 in 1981-82 to Rs. 18.48 in 1991-92, at state level, but real wages increased at much lower pace. The growth trend of male and female agricultural wage rate in Andhra Pradesh from 2000 to 2012 has been shown in Figure 2 below, which show that the agricultural wage was almost at stagnation period until 2006/7, then it started increasing trend after 2006/7 on ward.
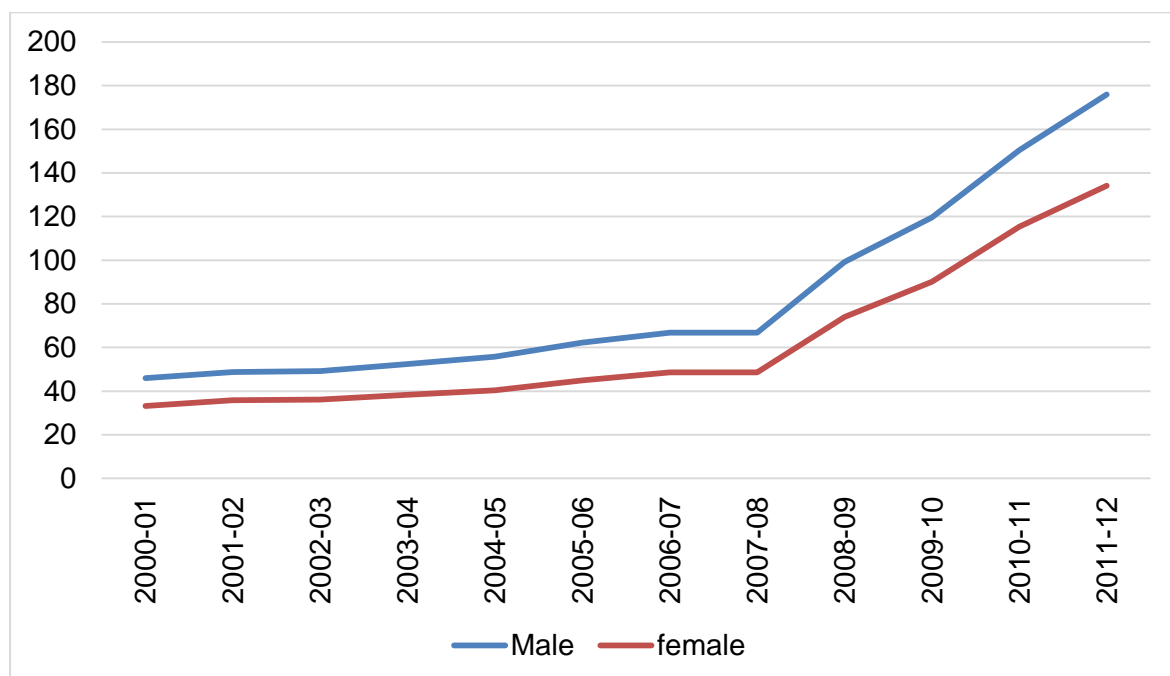
Figure 2: Nominal Wages of Agricultural Field Labour in Andhra Pradesh, 2000-12

There was a very slow pace of increase in the wages of both male and female up to 2006; however, from 2007 onwards, there was a faster increase in wages for both men and women. Interestingly, the MGNREGS was also implemented in Andhra Pradesh at the same period of 2006. However, the graphical trend is misleading to conclude on these issues. Therefore, we have detailed analyzed this issue in depth, using the disaggregated district level panel data.

The total expenditure of the MGNREGS program in AP was Rs. 58,761 lakhs in 2006-2007, which increased to Rs.547, 466 lakhs in the year of 2010-2011, nearly a 10th fold increased on MGNREGS expenditure in the state within period of 5 years. However, the agricultural wage rate did not pick up on the same pace in Andhra Pradesh as that of the expenditure.

Figure 3 shows that the real wages of men and women field agricultural wage for Men and women, and skilled labor wage rate (carpenter real wages) were almost at stagnant level during 200-06; but it started to pick up after 2007 onward; but interestingly the MGNREGS paid real wages has in fact in declining trend over the same period of 2007-11. The graphical presentation of data in Figure 3 does not support the fact that the wage payment trend under MGNREGSA has actually pushed the agricultural wage rate of field labors. The statistical analyses in the next section will provide further insight on these issues. The question is that what factors are responsible for the increase in the wage rate of agricultural labor after 2007 onward? Only few studies have analyzed impact of MGNREGS on the wage but at the macro level, and not at lower scale or at district level.
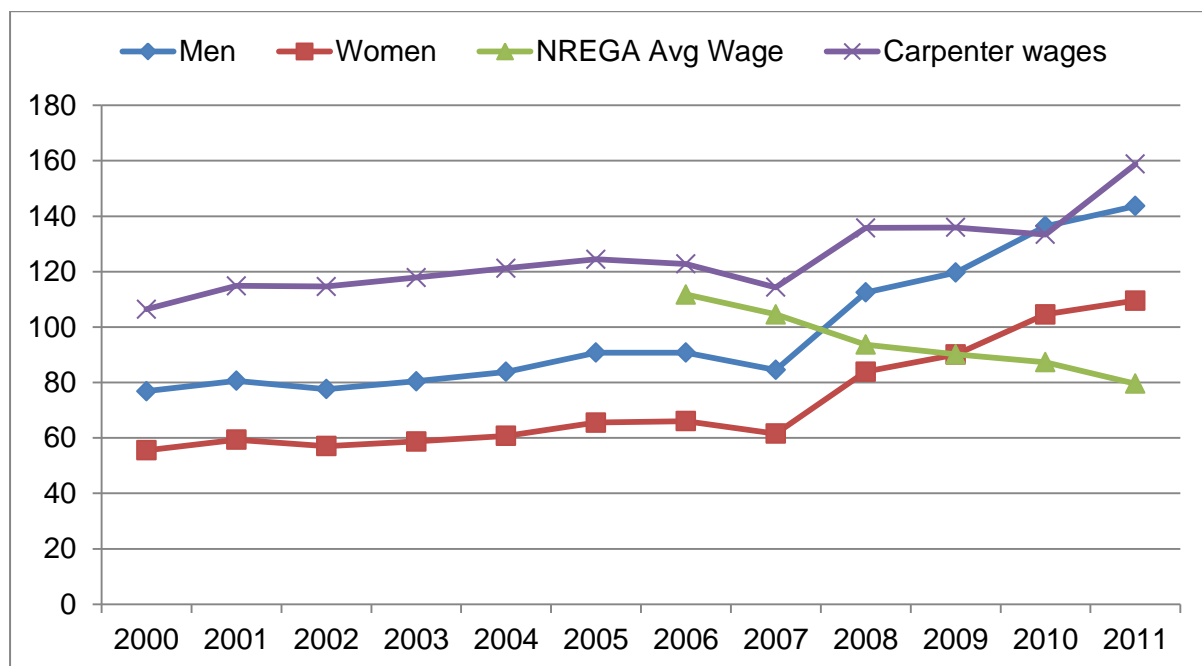

Figure 3: Real Wages of Agricultural Field Labour and MGNREGA Paid wage rate in AP, 2000-12

4.2 Econometric Analysis

4.2.1 Marginal effects

The factors responsible for variation on field labour wage were modeled using panel form of regression model, as noted in the equations 1 and 2 earlier. The results from the panel regression model are summarized in Table 3. The literature on the topic have used mostly national level modeling, with aggregate macro modeling, or NSSO unit level analyses at national level model. We believe that the wage implications of MGNREGA interventions can be best assessed at across district level analyses since wage variation at across district is substantial due to host of socioeconomic and agro-ecological factors. Keeping this in view, we have focused the analysis at district level, and also by controlling marginal impact of other factors on variation of the labor wages rate for the studied period. Two different double log panel regression models have been estimated by using Estimated General Least Square (cross section weights) fixed effect model with white cross section standard errors, and with

correction of covariance difference (for details, see in Eview software manual, 2013). We have estimated the model separately for Male Wag Rate from that of the female wage rate so that the differential impacts of the factors on male and female labor wag can be analysed in details. The results are summarized in Table 3.

Table 2 Variables affecting the real wage rates of agricultural men and women labor, AP.

Independent Variables	Model 1 (Men wage)	Model (women wage)
Constant (average value of all constant term)	5.32 (2.49) **	-2.27 (1.8)
Carpenter Wage (Rs./day)	0.51 (5.37) **	0.52 (5.67) **
Cropping Intensity (%)	-0.08 (0.41)	-0.08 (0.51)
MGNREGS Intensity _No of Days (No. of days of employment/person/year)	-0.001 (0.83)	-0.002 (1.72) *
MGNREGS Intensity_ expenditure (Expenditure/person/year under MGNREGS)	0.01 (4.51) **	0.001 (5.93) **
Irrigation Intensity (%)	0.13 (1.47) *	0.48 (3.22) **
Literacy Rate (%)	-1.90 (1.99) *	0.46 (1.41)
Per Capita Income (const. Rs)	0.45 (0.53)	0.05 (0.54)
Rice yield (kg/ha)	-0.05 (0.83)	-0.07 (1.28)
R-Squared (unweighted)	0.88	0.86

Note: 1. Both the models were run as double log form of model, except for variable NREGA intensity 1 and 2. Due to several zero value on these variables, we cannot use log form of these two variables. Due to double log form, all number can be interpreted as percentage on factors impact on dependent variable.

2. For the NREGA intensity _Days and NREGA Intensity _Expenditure, we have got percentage change level of impact of per unit change on indepent variable, by multiplying the respective coefficient of equation 2 by 100.

3. All the values in parentheses are t-value

4. For the symbol, * Indicates significance at 5 % level, ** Indicates significance at 1 % level;

The results presented in Table 3 are robust, as we have estimated with in=treated form of WLS. Besides, we have got very high unweighted adjusted R^2 = 0.88 and 0.86, respectively (see table 6). Out of eight independent variable used in the model five were turned out to be significant in determining the increase on wage rate for male and female field labourers. Of these, the variables "wage of skilled labour (carpenter)", MGNREGS Intensity _Expenditure (MGNREGS expenditure per capita per year), Irrigation intensity, Per Capita Income have shown a positive effect on wage rate, and these coefficients are also significant. Any increase in expenditure of MGNREGS, and increased on carpenter wages in a district is expected to increase the field men wage rate substantially. The results suggest that if MGNREGS Intensity 2 (wage payment per person per year received from NREGS)

increases by 1 Rupees per day, then real wage rate of male field labor (agricultural labor) would increase by about 0.12 Rupees per day.

Among all the factor inputs, the marginal effect of skilled labour wage (carpenter wage) on variation of field labor wage rate is very high, with elasticity of 0.5, suggesting that one percent increase on wage rate of carpenter will lead to 0.5% increase on wage rate of male field labour. This result also shows intersectoral relationship between farm wage and non-farm wage. In other words, also reflect the interdependence of farm labor market with the non-farm labor market. Any increased on construction activities (increased growth of construction budget share) of real estate activities may also likely to increase demand for carpenter as well, thus through that there will be an increased pressure on farm wage as well.

Historically, irrigation intensity (and better access to irrigation) and cropping intensity are two of the key factors determinants of the employment and wage rate of landless and small farmers in Indian agriculture (see Narayanamoorthy and Bhattarai, 2004; Narayanamoorthy and Deshpandey, 2004). However, in the recent past with the rapid pace of growth on national economy and other structural changes in agrarian systems, at least the analyses covering the last one decade will provide a different perspective. Our results here suggest that one percent increase in the irrigation intensity would lead to the wage of male increase 0.13%, and female wage rate increase by 0.48%, suggesting women wage rate is more responsive to irrigation access than that of men labor wage rate. Unlike the earlier literature on the topic, the relative impact of cropping intensity on wage was not strong for both of men and women labor (Table 3).

Extending the regression analyses, we also modeled effect of men wage rate on variation of women labor wage rate in a region. We found that men wage rates turnout to be positively and significantly determining the increase of women agricultural wage rates (field labour). Our analyses suggest that one percent increase in field men wages leads to by 0.9 percent increase in field women wage rate that is there is almost 1 to 1 impact of male agriculture wag to women agriculture wage. Our analyses suggest that women field wage rate highly dependent upon the prevailing wage rate of wen agricultural labor forces in the respective district. That is, there is a strong correlation between men wages and women wages as well, which turns out to be r= 0.94. This means that the field labour men wages produce highest influence on the wage rate of field labour (women) than other factors included in the model. The adjusted R2, as well weighted R2 values re very high (over 0.94), which suggests robustness of the model and appropriateness of the key variables included in the table 3.

4.2.2 District Cross Section Effects on Real men wage

Extending the model, we obtained also the cross-section effect (district specific constant term or district specific time invariant fixed effects) of the two models estimated, separately for men labor wage model from that of women labor wage model. It shows that the more irrigated district have more positive effects of fixed effect term on wage rate, whereas in the less irrigated or drought-prone districts have negative effect on variation of agricultural wage rate. In fact, the fixed effect terms of the men wage model were positive in eleven districts out of 23 districts included in the sample. The fixed effect terms is very strong on very fast pace growing district, or in agriculturally developed districts like West Godavari, Krishna,

Guntur, and East Godavari. In fact, the district specific constant-terms (fixed-effect terms) are negative to many of the agricultural under-developed districts belong into Rayalsema region of Andhra Pradesh, which are facing drought like condition in most of the years.

Table 3 District Cross Section Effects on Real men wage

District Name	District Cross Section Effects on Real Men wages		District Cross Section Effects on Real women wages	
	Positive effect	Negative effect	Positive effect	Negative effect
Andhra Pradesh				
Srikakulam	0.22		0.114	
Visakhapatnam	0.002			-0.006
East Godavari	0.115			-0.009
West Godavari	0.194		0.047	
Krishna	0.182			-0.009
Guntur	0.118		0.122	
Nellore		-0.108		-0.129
Kurnool		-0.042		-0.024
Ananthapur		-0.054	0.119	
Cuddapha	0.045		0.039	
Chttoor		-0.121		-0.108
Prakasam	0.028		0.212	
Vizanagaram		-0.078	0.010	
Telangana State				
Nizamabad		-0.019		-0.015
Medak		-0.211		-0.025
Mahabubnagar		-0.114	0.089	
Nalgonda	0.049		0.022	
Warangal		-0.035		-0.132
Khammam	0.044		0.295	
Karimnagar	0.052			-0.095
Adilabad		-0.099		-0.017
Rangareddy		-0.172		-0.267

5. Conclusions and Implications

The main objectives of this study were to review and assess trend of the agricultural wage rate across 23 districts of Andhra Pradesh, and then to analyze the impacts of MGNREGS on rural wage rates pulling the panel data across the districts in Andhra Pradesh. Then, we also evaluate differential impacts of MGNREGS on agricultural labor wage rates by gender, and then also assess linkage between farm wage rates and non-farm wage rates. Our results here show that the real wages of male and female have increased substantially after 2006/07, almost at a time, when substantial funding level have been jumped for National Rural Employment Guarantee Scheme. The rate of increase in wages rate has been found to be higher across the wage rate of female field labourers than that of their male counterparts. The increase on wages of field labourers will help the labor forces in improving their standard of living and their better rural livelihoods.

From this empirical study, we find that out of eight independent variables used in the regression model, five variables turned out significant in determining the increase of wage rates for male and female field labourers, but with varying marginal effects on the wage variables. Skilled labour (carpenter), MGNREGS Intensity 2 (MGNREGS expenditure/pc/year), Irrigation intensity, Per Capita Income, have shown positive effect on variation of wage rate of agriculture labor, both wage rate of men and women labor forces. Any increase in expenditure of MGNREGS per capita basis, increased on wage rate of carpenter in a district is expected to increase the wage rate of field labors in agriculture as well. There is a widely held notion that, after introduction of the MGNREGS scheme, the wage rate of agricultural forces have gone up, and the MGNREGS has adversely affected faring community. It is only partial true.

In fact, there is a high growth rate in agricultural wages from 2008 onwards, whereas the MGNREGS paid real wage during the same period, across the board, has been gone down. In fact, several factors are responsible on hike on agricultural wage rate in the recent past, and MGNREGS Scheme could be just one small factor in the list. In our study, we have demonstrated that MGNREGS has either negative impact or very weak impact (low elasticity) on increase in agricultural wages of both men and women.

The impacts of skilled labor wage, i.e., changes on non-agricultural wage (carpenter wage rate) on variation of field labor wage rate (for both men and women wage) across the districts are more important than the effect of employment guarantee program (MGNREGS). This suggests for the positive linkage effect of farm sector and non-farm sectors inter dependency and inter linkage as well. As wage rate of carpenter increase in village, then more youth members of the villager may be attracted to carpenter in next villages.

One of the objectives of the National Rural employment Program is to minimize the difference among wage rates received by men and women have been still growing across the districts in AP. Under the MGNREGA scheme, women labor forces also supposed to get equal wage rate as long with men. Here we find that, over the time, though both men and women agricultural labor wage is in increasing trend, but the gap between wage rate of men and women has not been converged rather the gap is in increasing trend in the recent past. The future study on the topic may be able to address this increasing gap and solutions to address this morning. There is also a need to explore what kind of impact this increased

wage rate has made on the agriculture sector like profitability of crops, the cost of production, and the living standards of the agricultural labourers.

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7. Appendixes

Appendix A: Selected studies on factor determinants of agricultural wages in India – a historical perspective

Authors and paper title	Publication	Dependent Variable used	Independent variables (Factors) used	Findings	Remarks
Bardhan, K., 1975 "Factor effecting wage rate for Agricultural labour"	Economic and Political Weekly Vol.8,no.26 June 30, 1975	Average annual wage rate of Agricultural labour	Irrigation, Cropping intensity, Daily wages for casual male labour in non-agricultural work	Agricultural wage rate responds positively to the changes in the irrigation, multiple copping. Negatively to supply and bargaining position of agricultural labour	Rural employment schemes need to be concentrate in areas of low level wages insteated of being spread out thinly over the whole country
Deepak Lal (1976) "Agricultural Growth, real wages and the Rural poor in India"	Review of Agriculture, Economic and political Weekly, June1976	Agricultural Labour real wage rate	Cereal Output, Percentage increase in the male agricultural labour force	He Presumed that agricultural Growth leads to rise in agricultural wages in India	
Reddy (1998). "Trends in Agricultural wages: An inter – Regional Analysis in Andhra	Economic and Political Weekly, March 28,1998	Real Wages of Agricultural labour Money wage per day	Lagged yield in quintals per hectare, lagged output price per quintal	The money wages are positively associated with output prices and yield. He liked that	Finally he remarks the variations in wages because of the upswings

Pradesh"				there are spatial and temporal variations in wages	and downswings of economy, price level, geographical conditions, irrigation and potential
Sidhu (1988) "Wage determination in the Rural Labour Market: The Case of Punjab and Haryana	Economic and Political Weekly, December 24-31, 1988	Actual Wage rate	Total Supply of Labour, Index of equality in the distribution of land holdings, output per acre, Unemployment prevailing among wage labour, index of relative numerical strength of wage labour in total agricultural labour	He sum up that for Punjab and Haryana demand and supply factors are major determinants of wage rat. Productivity of land and inequality in the distribution of land holdings tends to push up wage rate	Rural labour organization's and their leaders can play in uniting the labourer as class and getting their due share in increased agricultural productivity
Jose A V. (1988) "Agricultural wages in India"	Economic and Political Weekly, vol.23, June 25, 1988	Men Wage rates across states	Product per worker in agriculture at current prices	Technological changes in agriculture So long as they take place in the context of labour sacristy can extra positive influence on agricultural wages	Agriculture wages increases so for as they currently taking place in some regions might turn out to be a short lived phenomenon

Berg, 2012	CSAE working paper WPS/2012-05, 15 May 2012	Agricultural wage rates	NRGEA Employment Days	Each annual person day of additional employment generated by MGNREGS per rural household in a district had increased real daily agricultural wage rates by 1.6 percent.	
Gulati, et. Al., 2013	Discussion Paper, CACP, Ministry of Agriculture, Government of India	Agricultural wages in India	construction sector wages, MGNREGS wages, GDP,	there is slight impact of MGNREGS on recent rise on agricultural wage rate, but the marginal impact could be around 5%, and large part of the impacts on rising farm, labor wages	The money spent 26 on MGNREGS (around Rs 2 lakh crore) be better used if it was for investment in agriculture/rural-urban construction. This would have certainly helped these sectors to grow even faster
Narayanamoorthy and Deshpande, 2003	Economic and Political Weekly, August	Agricultural wages	irrigated area per agricultural labour, irrigated area per agricultural labour	The wage rate (male) of agricultural labourers belonging to relatively densely	more systematic studies at a disaggregated level need to be

30,2003	household, gross cropped area per agricultural labour (GCAPL), gross cropped area per agricultural labour household (GCA/LHs), cropping intensity, production of food grains per agricultural labour	irrigated states is closer to or above the minimum wages set by the government when compared to the states with low irrigation facility. It is also found that gender wage gap has been narrowing down at a faster rate in the states where the level of irrigation is higher.	carried out to explain the impact of irrigation on wage rate of agricultural labourers