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Indian farm wages: Trends, growth drivers and linkages with food prices

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Abstract

This study looks at trends in Indian farm wages, analyses their linkage with food prices, and identifies factors which drove their growth in real terms. We employ quantitative and qualitative analysis techniques for this purpose. A vector-error correction model (VECM) is used to determine the linkage between farm wage inflation and food inflation, and a pooled mean group (PMG) estimation method, used for dynamic heterogeneous panels, is used to identify the drivers of growth in real farm wages.

In last 20 years (1998-99 to 2017-18), wages of India's farm labourers increased at an average annual rate of 9.3 per cent in nominal and 3.2 per cent in real terms. For an average agricultural labourer, the daily wage rates increased from less than INR 45 in 1998-99 to about INR 229 in 2017-18. In real terms (2004-05 prices), this increase was from INR 50 to about INR 90 per day. The empirical analysis of the monthly wage time series identified a structural break in January 2007. Specifically, the curve is near-flat before this break-point subsequent which it rises sharply.

On the relation between food inflation and wage growth, evidence was found of a food-wage spiral where changes in food prices and farm wages were estimated to impact each other. However, the impact of food inflation emerged to be stronger on wages than vice-versa and this impact was observed to strengthen post 2007-08.

The panel study (1987-88 to 2015-16) on the drivers of real wage growth was conducted around the January 2007 structural break. Before this *break*, growth in real wages was estimated to be mostly driven by growth in the agriculture sector. Any influence of non-agricultural sectors (manufacturing and construction) did not emerge significant during this period. However, post the *break*, the growth witnessed in both- non-agricultural (manufacturing and construction sectors) and agricultural sectors explained the sharp increases in real farm wages. The large public rural employment program, MGNREGA (introduced in 2005) was identified as a third potential force of influence on rural wages; however, among other significant factors, its contribution to farm wage growth was estimated to be low and with a lag.

Policy implications based on these findings are that for faster growth in real farm wages, focus needs to be on augmenting labour productivity in agriculture. In order to pursue that, one needs to lead reforms in agriculture that can accelerate agri-GDP growth and ensure that the rest of the economy, especially the manufacturing and construction sector, grow much faster pulling labour out from the agricultural sector to higher productivity jobs in manufacturing, construction, and possibly also services.

Keywords: farm labour, wages, MGNREGA, food inflation, real wages, agricultural productivity, rural non-farm employment, India

JEL codes: I38, J01, J20, J20, J31

Contents

List of abbreviations

AGCF	Agricultural fixed capital formation.
CACP	Commission for Agricultural Costs and Prices
CAGR	Compound annual growth rate
CPI	Consumer price index
CPI-AL	Consumer price indices for agricultural labour
DES	Directorate of Economics and Statistics
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
GFC	Global food crisis
GOI	Government of India
GSDP	Gross state domestic product
INR	Indian Rupee
LB	Labour Bureau
M&C	Manufacturing and construction
MGNREGA	Mahatma Gandhi National Rural Employment Guarantee Act
MoRD	Ministry of Rural Development
NSSO	National Sample Survey Office
PMG	Pooled mean group
WPI	Wholesale price index
WPIFA	Wholesale price index food articles
WPIFP	Wholesale price index food products

Definitions

- **Economic Activity** – Any market activity that is done for pay/profit resulting in the production of goods and services and adds to the national product (Labour Bureau (LB) and National Sample Survey Office (NSSO)). Additionally, it can also include non-market activities such as the production of primary products for the producers' own consumption and the construction of fixed assets for their own use.
- **Worker** – Any person actively engaged in an economic activity is called a worker.
- **Labour Force** – Persons working and those that are actively seeking for work are defined to constitute the labour force.
- **Worker Population Ratio (WPR)** – Share of population classified as workers. In other words,

  WPR = Number of workers/total population
- **Cultivator** – The national Census defines cultivators as those engaged in cultivation of land that is owned or leased from the government or private institutions for payment in money, kind or share. The NSSO, however, defines cultivators as ones having an agricultural income of more than INR 3000 and having autonomy over what, when and where they produce.
- **Agricultural Labour** – Workers in agriculture earn a daily wage and do not own or lease land but work on farms owned by others in return for wages paid to them in cash or kind. Labourers do not bear any risk in the cultivation. The NSSO defines agricultural labourers more or less in the same manner.
- **Minimum Wages Act** – Introduced in 1948, the act enables both the central and the state governments to notify minimum wage rates in scheduled employments (to be determined by both the central and the state government).
- **Consumer Price Indices (CPI)** – General measure of prices of goods and services that are consumed by households. CPI is generally used as a measure of inflation and is published for different categories of persons such as agricultural labourers, rural labourers, and industrial workers.
- **Labour Productivity in different sectors** – Labour productivity measures the output per labourer expressed in terms of (Indian Rupee) INR. It is estimated by the formula:

  Labour productivity = GSDP/Number of workers

  Here, GSDP is the Gross State Domestic Product at constant prices (with the base year of 2004-05). In the case of the agricultural labour productivity, number of workers

refer to agricultural labourers while in the case of manufacturing and construction it refers to the all workers in these sectors.

- **Mechanisation in Agriculture** – Represents the level of adoption of agricultural machinery in cultivation. It is expressed in terms of the cost incurred for using machines to cultivate 1 hectare of land. Machine labour cost has been used as a proxy for mechanisation in this paper.

1. Introduction

Agriculture in India is a largely labour-intensive activity. The expenditure on farm labour constitutes a substantial share of total cost of cultivation of a crop. Depending on the crop type, expenditure on labour (both hired and family labour) ranges between 20 and 50 per cent of the total cost of cultivation (Figure 1).

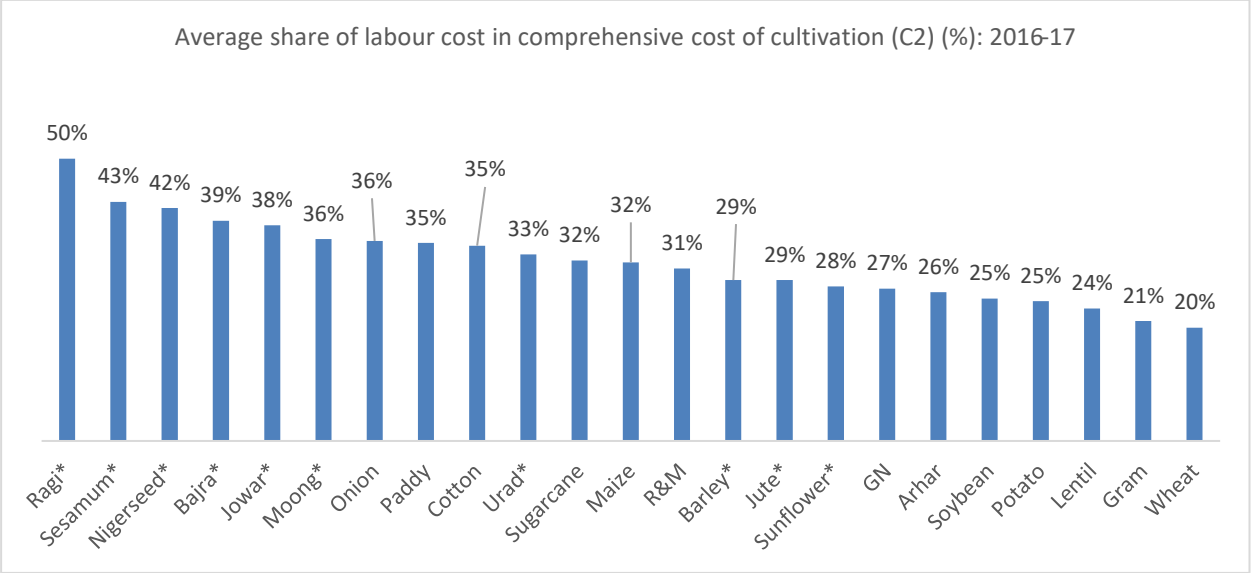

Figure 1: Share of cost of cultivation spent on labour for major Indian crops

Note: (i) * the share of labour cost in comprehensive cost of cultivation is calculated as simple average of the state shares. These states are amongst the largest producers of the crop. (ii) The share of cost spent on labour for all other crops is estimated as the weighted average. The weight is the share of the state in the total national production of the crop. The states together comprise more than 80 per cent of the national production of the crop.

Source: DES, GOI.

With centrality of labour in the cultivation process, fluctuations in wages (paid to the farm labourers) become critical for an average Indian farmer. Together, farmers (or cultivators) and agricultural labourers comprise India's agricultural workforce.

1.1. Composition of India's workforce

In 2011, India's total workforce was 481.7 million, i.e., about 39 per cent of its population of 1.2 billion (Census, 2011). In the 50 years between 1961 and 2011, India added close to 6 million workers to its workforce on average every year or more than 16,000 workers daily.[1]

[1] In the last seven decades, the total workforce in India has expanded consistently, barring one decade (1960s). In this decade, although the number of male workers increased, the number of female workers fell by more than 28 million (from 59.5 million in 1961 to 31.3 million in 1971). Among other factors, this fall is attributed, interestingly, to a change in the method of estimation that resulted in the exclusion of several female marginal workers from the count (Raju & Bagchi, 1993: Sinha & Zacharia, 1984). The national workforce is largely male dominated with women accounting only for 31 per cent of the total labour force (in 2011).

As per the 2011 data, India's workforce was largely rural (as over 72 per cent resided in rural areas) and agrarian (more than half i.e. about 54.6 per cent or 263 million workers were engaged in agriculture) in nature (Figure 2).

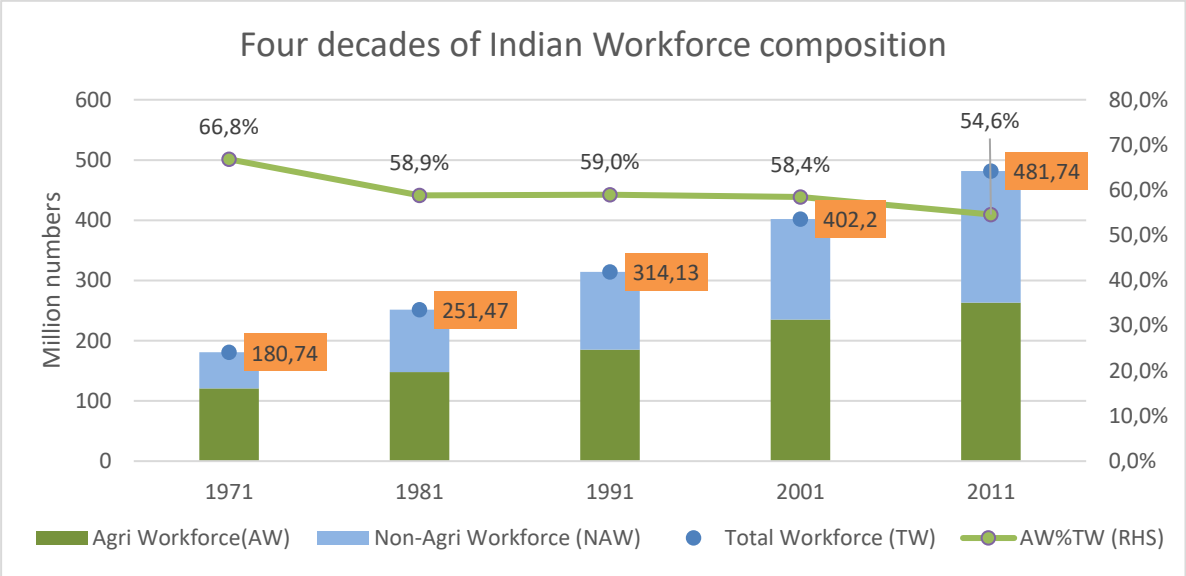

Figure 2: Agricultural worker population

Source: Census of India (1971, 1981, 1991, 2001, 2011)

In the four decades since 1971, India's workforce grew at a compound annual growth rate (CAGR) of 2.5 per cent and its agricultural workforce grew at a CAGR of close to 2 per cent.

Reviewing historical trends, two important aspects of India's workforce emerge:

1. *Total workforce is undergoing a structural transformation*: Based on the employment statistics across sectors (see the National Sample Survey Office (NSSO)[2] reports for 1999-2000, 2004-05 and 2011-12), we find that growing numbers of workers are getting employment in non-agricultural sectors (Table 1).

[2] Data on the Indian labour force can be collected from three Government of India (GOI) sources: The Census of India (Census), the National Sample Survey Office (NSSO), and the Ministry of Labour and Employment's Labour Bureau (LB). Comparison of the three sources can be seen in Annexure 1.

Table 1: Employment across sectors

Sectors	Employment across various sectors (Million)			Absolute increase in employment (Million)		CAGR (%)	
	1999-00	2004-05	2011-12	1999-00 to 2004-05	2004-05 to 2011-12	1999-00 to 2004-05	2004-05 to 2011-12
Agriculture	237.7	258.9	232.3	21.3	-26.6	1.73	-1.54
Manufacturing	44.1	55.8	59.9	11.7	4.1	4.83	1.02
Construction	17.5	26.0	50.4	8.5	24.3	8.21	9.89
Non-manufacturing (other)	3.3	3.9	5.0	0.6	1.1	3.61	3.57
Services	94.2	112.8	123.7	18.6	10.9	3.67	1.32
Total	396.8	457.5	471.3	60.7	13.8	2.89	0.43

Source: NSSO (2001, 2006, 2013).

From 17.5 million workers in 1999-00, total employment in the construction sector tripled to 50.4 million by the end of the decade. CAGRs between the survey periods (1999-00 to 2004-05, 2004-05 to 2011-12) in the construction sector are greater than 8 per cent and exceeded the growth of employment in the service sector.

Even though agriculture retains national prominence as the dominant sector, labour-related rural-urban migration has affected its position. About 27 million agricultural workers moved away from agriculture within the seven years between 2004-05 and 2011-12.

2. *The agricultural workforce itself is undergoing a structural transformation:* The Indian agricultural workforce comprises **cultivators** and **agricultural labourers**. As per the Census (2011), the difference between them is in terms of land ownership, i.e., the "right of lease" or "contract on land". While a cultivator will own the land or has a lease or a contract to operate on it, an agricultural labourer does not as he or she works on land owned by others in return for wages paid in cash or kind. Over the years, the share of cultivators in India has declined and a greater share of agricultural workers are now working as labourers on farms owned by others (Figure 3).

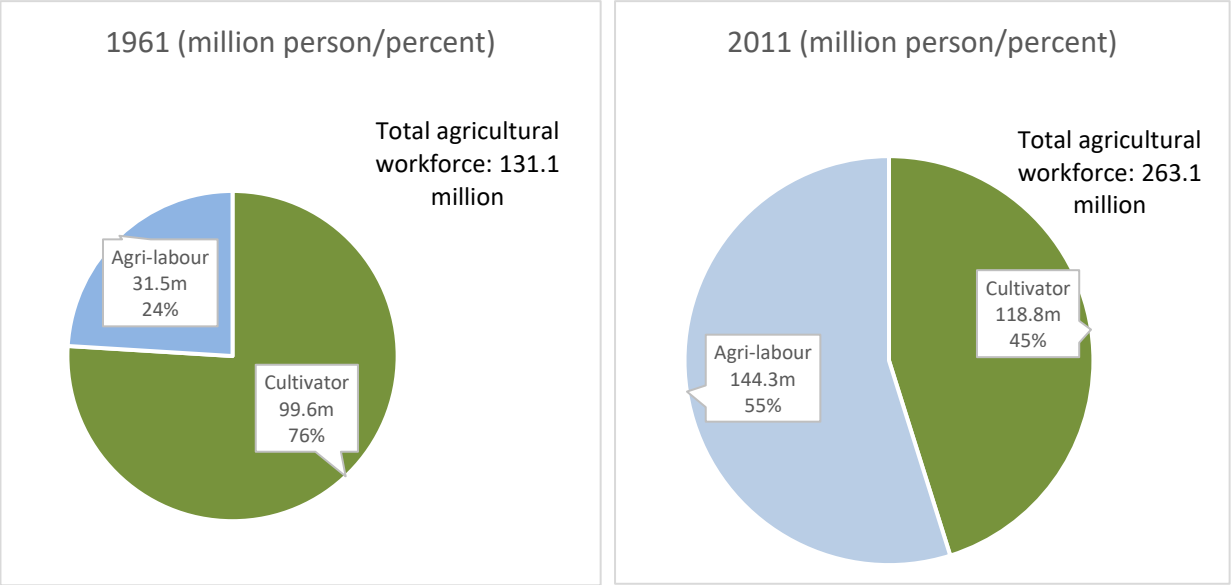

Figure 3: India's agricultural workforce: number and composition (1961 and 2011)

Source: Census of India (1971, 2011).

In the four decades between 1960 and 2001, the number of cultivators had always exceeded the number of labourers in the total agricultural workforce. However, in 2011 (Census, 2011), for the first time in Indian history this trend was turned around. Out of the total agricultural workforce of 263 million in 2011, the share of cultivators was less than half (about 45.2 per cent) and that of agricultural labourers was close to 55 per cent. If back in 1961 there were about *33 labourers for every 100 cultivators*, in 2011, there were now about *121 labourers for every 100 cultivators*.

More than 93 per cent of these agricultural labourers[3] belong to the informal sector (NSSO, 2012). They are mostly daily wage earners who, in the absence of any formal contract, are adversely impacted by wage rate fluctuations, erratic payment schedules, uncertainty of regular employment and erosion of real wages due to inflation.

1.2. Objectives and outline of this paper

This paper focuses on agricultural labourers and their wages. They are an important constituency of India's agricultural workforce not just because of their growing share in total agricultural workforce but also because most cultivators are dependent on them for undertaking various agricultural activities.

[3] Engaged in all agricultural activities except "growing of crops, market gardening (small-scale commercial production of cash crops like fruits, vegetables, flowers etc.), horticulture" and "growing of crops combined with farming of animals". It includes animal farming, agricultural and animal husbandry service activities, except veterinary activities (this class includes specialised activities, on a fee or contract basis, mostly performed on the farm, hunting and trapping and forestry, logging and related services).

Wages received by these agricultural labourers or the farm wages as we will call them in this paper, have undergone large fluctuations in the recent past. Between 2007-08 and 2015-16, these wages grew at a steep rate, but that was not the case for the 10 years leading up to 2006-07. Which factors explain these changes in farm wages? Are drivers of these changes internal to the agriculture sector or are structural changes in the overall economy contributing to the changes? Interestingly, the period that witnessed sharp growth in farm wages was also the time when food inflation peaked in the country. But are the two correlated? Even the causal factors behind that movement are unclear. Did rising wages **push up** the costs of cultivation, thereby pushing up the prices of food items or did rising food prices cause wage inflation, i.e., **pull up** farm wages as wages might have been indexed to the economy's inflation (within the consumer price index, CPI, the food component has a weight of about 46 per cent).

The overall aims of the paper are threefold:

1. To estimate Indian farm wages and study their trends over time;
2. To explore the relation between wage inflation and food inflation; and
3. To identify factors that caused changes in Indian farm (real) wages.

The paper attempts to achieve these by undertaking the following steps: 1) By estimating farm wages at state-level and studying their trends over time; 2) By undertaking an econometric analysis to test the relationship and causal direction between food inflation and wage inflation; and 3) By undertaking a panel analysis to determine factors that explain changes in real wages of farm labourers. Towards the end, this paper presents results from the analyses and provides policy implications for addressing the problem of fluctuations in wages and for promoting efficiency in the Indian farm labour market and the overall agriculture sector.

2. Section I: Wages of agricultural labour: Data and trends

In this section, patterns and trends in the wage rates of Indian agricultural labour are explored.

The data on wages of agricultural labour are taken from the Labour Bureau of the Government of India (LB, GOI) that publishes average daily wage rates for every month for each state under various agricultural and non-agricultural occupations for men and women. This data is available from 1996 onwards, and data prior to 1996 is taken from the Directorate of Economics and Statistics of the Government of India (DES, GOI).

The wage data has been collected and analysed for 20 Indian states and Union Territories that together account for close to 93 per cent of agricultural labourers in India. These 20 states are Andhra Pradesh, Assam, Bihar, Gujarat, Haryana, Himachal Pradesh, Jammu & Kashmir, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Orissa, Punjab, Rajasthan, Tamil Nadu, Tripura, Uttar Pradesh, and West Bengal. The daily wage rate data has been collected for seven main agricultural activities – ploughing, sowing, weeding, transplanting, harvesting, winnowing, and threshing.

The steps of calculating the time series for nominal and real wages are as follows:

1. The month-wise daily wage rate data for men and women is averaged (simple) across the seven occupations;
2. The wages of men and women are then combined using their proportionate share in the agricultural labour force in the state (taken from Census 1991, 2001 and 2011) as weights. This way the monthly weighted average daily wage rates at the state-level are estimated;
3. The state-level averages are combined using the share of the individual state in the national agricultural labour force as weights and we get the national series;
4. These wages are in nominal terms. Using the LB's consumer price indices for agricultural labour (CPI-AL) values, these are converted into real values.[4] The base year is 2004-05. (The estimated state-wise data on nominal and real wages can be found in Annexure 3.)

2.1. Trends in agricultural wages

In the 20 years from 1998-99 to 2017-18 (till February 2018), average daily wages for an agricultural labourer increased from INR 43.90 to INR 228.36. In real terms, they grew from INR 50 per day to little less than INR 90 per day. This implies an annual average growth rate of more than 9 per cent in nominal terms and 3.14 per cent in real terms (Figure 4).

[4] The LB publishes CPI-AL for each month and for each state. It is computed as a weighted expenditure basket consisting of (i) food; (ii) pan, supari, tobacco, and intoxicants; (iii) fuel and light; (iv) clothing, bedding, and footwear; and (v) miscellaneous.

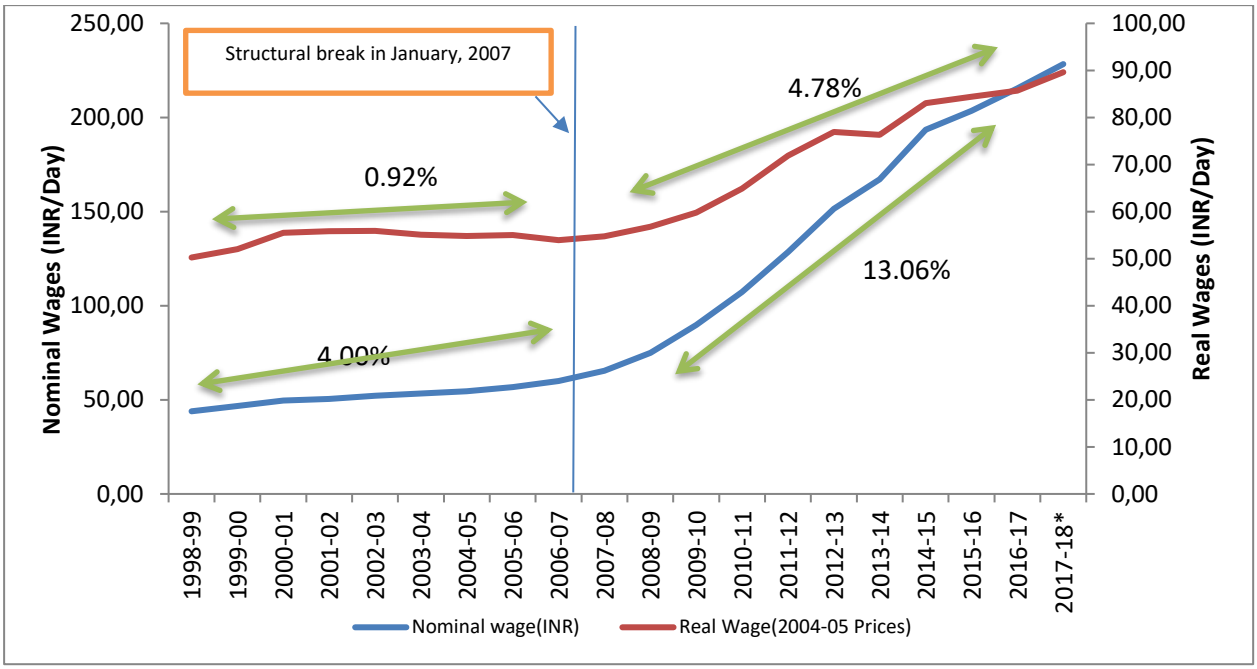

Figure 4: Trends in real and nominal wages in agriculture

Note: Years refer to financial years. * until February 2018.
Source: LB, GOI (2020).

2.2. Structural break in the national time series

To test for the existence of a structural break, we used the Bai and Perron (2003) technique that endogenously determines a structural break in time-series data by testing the best combination of possible breaks to minimise the squared residuals. The results yielded **January 2007** as the break point. As can be seen in the figure above, the level of farm wages appears to plateau before the structural break point in January 2007 and thereafter increases sharply.

According to Nagaraj et al. (2016) and Berg et al. (2012), daily wages of agricultural labourers rose sharply after the introduction of the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) in 2005. According to them, the scheme created a shortage in agricultural labour supply especially during the peak months of cultivation. We analyse this scheme and its role in sections to follow.

2.2.1. The Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA)

MGNREGA is the world's largest public works programme by way of legislative action.[5] It was notified in September 2005, launched in February 2006 in 200 districts of the country and was later rolled out across almost all of India in 2008-09, with the exception of those districts that

[5] While the central and state governments have introduced other employment generation schemes, MGNREGA is the biggest in terms of financial outlay and outreach.

were 100 per cent urban. It is a social security measure that assures the 'right to work' for all those above 18 years of age who seek work (MoRD, 2017).

The scheme provides direct supplementary wage-employment to the under-employed and surplus rural labour force. In particular, the scheme:

- Guarantees 100 days of unskilled manual employment (which was later increased to 150 days in drought-affected areas by the ruling central government due to the onset of two consecutive droughts in 2014 and 2015) in a financial year at a certain notified minimum wage rate (decided by central and state governments) to whomsoever seeks it;
- All people who are above the age of 18 years and reside in rural areas can work under MGNREGA. Any person seeking (and willing) to do manual unskilled work can register;
- In case no employment is available within 15 days of the application for work, the person is entitled to an unemployment allowance, making employment under MGNREGA a legal entitlement.

Between 2008-09 and 2018-19, about 2,257 million person days of employment on average were created in each financial year under MGNREGA. About 14 to 16 per cent of all Indian workers benefitted under the programme.

2.2.2. MGNREGA and farm wages

Incidentally, the estimated structural break in farm wages observed for January 2007 lies between the time MGNREGA was launched (February 2006) and the time it spread to the entire nation (March 2008). Sharp trends in farm wages can be observed around this *break*. As shown in Figure 4, the average annual growth rate of wages for the period between 1998-99 and 2006-07 was 4 per cent in nominal terms and about 0.92 per cent in real terms. But for the post-*break* period from 2006-07 to 2017-18, these growth rates were 13.06 per cent in nominal terms and 4.78 per cent in real terms.

Daily wage rates given under the MGNREGA scheme are notified for each Indian state by the central government. Since 2005-06 (when MGNREGA was first rolled out as a pilot scheme), these wage rates have undergone several changes. From 2005-06 to 2008-09, these wage rates were set equivalent to the minimum wage rates for agricultural labour (under the Minimum Wage Act[6]). In 2009, the central government delinked minimum wages with wages under the scheme. Later beginning in 2011-12, it indexed the wages under the scheme to CPI-AL. Since then the Ministry of Rural Development, Government of India notified wage rates for all states at the start of each financial year, adjusting for changes in CPI-AL. This implied that the wage rates under MGNREGA had gotten fixed in real terms (Drèze & Khera, 2017).

[6] The Minimum Wage guarantee was withdrawn in 2009, after which the central government started announcing state-level MGNREGA wage rates

For our analysis, we took the data for wage rates under MGNREGA from 2008-09 onwards.[7] The state-level wage rates were averaged to estimate the national average wage rate under the scheme.

Upon comparing the average daily MGNREGA wage rate[8] with the actual farm wage rate prevailing in the country, we find interesting results (Figure 5). First, both wage rates, when seen over a longer period, appear to move together. Second, the agricultural wage rate is consistently above the MGNREGA wage rate (barring 2009-10) and the gap has been widening in the recent years. In fact, in terms of nominal wage rates, the MGNREGA wage appears to behave like a base wage rate for the overall farm wages.

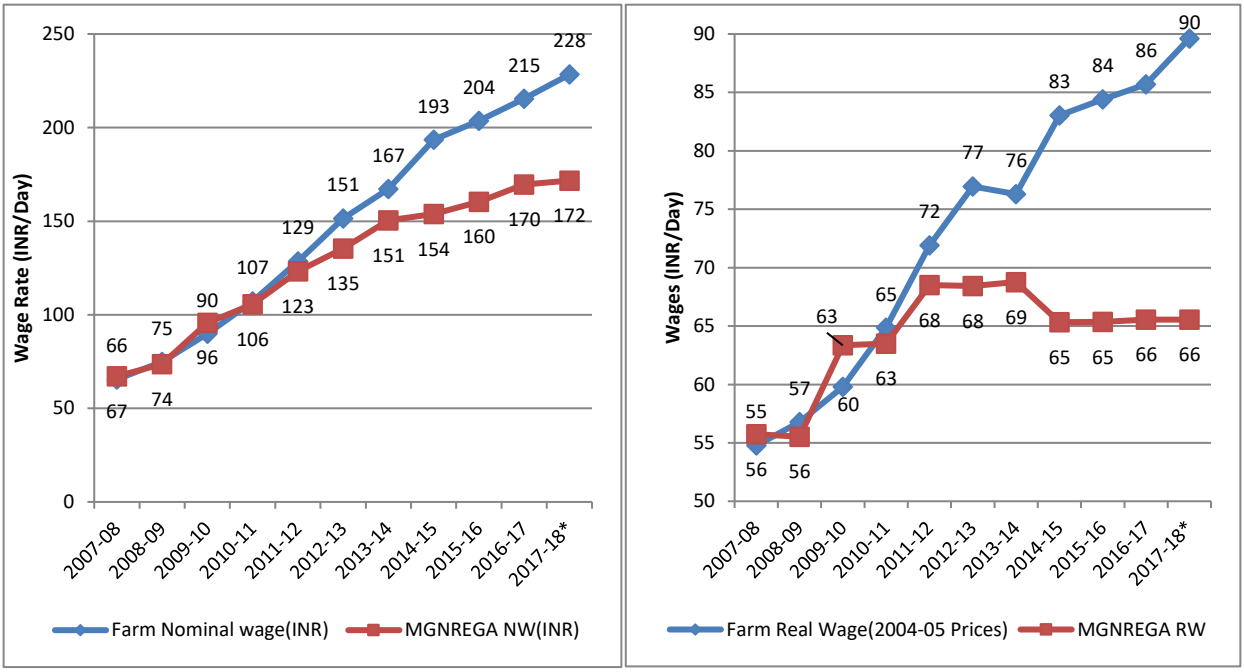

Figure 5: Comparing MGNREGA and farm wage rates – nominal and real

Note: *Data for farm wages for 2017-18 is until February 2018.
Source: LB, GOI (2020).

[7] Revisions in the wage rates under the scheme in 2009 have been taken into account by taking a weighted average of the months it was in effect in those years using the number of months as weights.

[8] Daily wage rates under MGNREGA have been taken for each state as notified by the central government. Since 2005-06 (when MGNREGA was first rolled out as a pilot scheme), wage rates under the scheme have undergone several changes. Wage rates set in 2005-06 were equivalent to the minimum wages for agricultural labour (under the MW Act) till 2009. The central government in 2009 revised the wage rate to INR 100 in all states (and later even capped the wage rates to INR 100). However, beginning in 2011-12, wages under the scheme were indexed to the consumer price indices for agricultural labour (CPI-AL) and since then the MoRD has notified wage rates for all states at the start of each financial year, adjusting for changes in CPI-AL. For our analysis, data for wage rates under MGNREGA have been taken from 2008-09 onwards. Revisions in the wage rates under the scheme in 2009 have been taken into account by taking a weighted average of the months it was in effect in those years using the number of months as weights. Subsequently, wage rates for different states were averaged to estimate the national average wage rate under the scheme.

Even though both wage rates have grown since MGNREGA was launched, the agricultural wage rate grew much faster with an annual average rate of 13 per cent as compared to the wage rate under MGNREGA, which grew at about 10 per cent.

In real terms (Figure 5), barring a slight drop in 2013-14, real farm wages have been rising over the entire period. But this is not the case with the MGNREGA real wage rates which have been stagnant in the last four years, and have even fallen below their 2011-12 level.

A state-wise analysis of the two wage rates reveals that the relation between farm wages and MGNREGA wages varied with, *inter alia*, the supply of agricultural labour. For example, it was observed that in states like Punjab and Kerala, from where a minuscule share of national farm workers come, agricultural wages were much higher than the MGNREGA wage rates. However, for states like Uttar Pradesh and Bihar (which together account for more than one-fourth of India's agricultural labourers) both the wage rates were mostly at par up until 2014-15. In fact, between 2008-09 and 2010-11, wages in the agricultural labour market in Bihar were actually below the declared MGNREGA wage rate; in the case of Uttar Pradesh, farm wages in these years were almost at level with MGNREGA wage rates or below (seen in 2009-10). Even in Madhya Pradesh, another state with a large population of agricultural labourers (about 8 per cent of India's agricultural labourers are from this state), farm wage rates have on average been below the prevailing MGNREGA wage rate.

Such a scenario is expected to incentivise workers to register for employment under MGNREGA. But based on an analysis of the average number of days of employment under MGNREGA in the three states, this does not appear to have happened. In terms of a state's share in total person days created under MGNREGA scheme annually, none of the three states rank highly; it is states like West Bengal, Andhra Pradesh, Rajasthan and Tamil Nadu who have generated highest employment under the scheme.

At this point, it is worth re-asking if the MGNREGA wage rates could be behind the sharply rising agricultural wage rates (as claimed for instance by Berg et al., 2012, and Nagaraj et al., 2016). Perhaps, with near-flat real wages under MGNREGA (Figure 5), particularly since 2011, its contribution to the sharply rising farm wages appears low. However, we explore this further in Section III by empirically testing the strength of MGNREGA as a driver of wages, because there may be other factors among the drivers of agricultural wages, such as demand for agricultural labourers from non-agricultural sectors like construction and manufacturing, and also other supply side factors. Before that, in the next section (II), we study linkages between farm-wages and food inflation in the country.

3. Section II: Food inflation in India

According to the NSSO (2013), an average Indian spends about 45.5 per cent of his monthly expenditure on food; for the poorest 30 per cent, this share increases to 60 per cent. Since most Indian farm labourers belong to the poorest category, any increase in food prices will have a significant adverse impact on their food and social security unless a wage increase compensates the loss. In this section, we study the trends in food prices and the structure of food inflation in India and then explore if food prices have risen because of rising labour wages or if labour wages were rising in response to the rising food prices.

3.1. Food prices: Data and analysis

As the study is based on time-series analysis, we use the monthly wholesale price index (WPI) data from the Ministry of Commerce and Industry, Government of India (OEA, GOI). Food prices are captured under two WPI sub-indices, namely food articles (wholesale price index food articles, WPIFA) and food products (wholesale price index food products, WPIFP). While the 'WPI-food articles' sub-index tracks price movement in commodities like cereals, rice, wheat, pulses, vegetables, and meat, the 'WPI-food products' captures price trends for processed commodities like edible oils, sugar, ghee, tea leaves, and coffee.

We estimate a WPI food index series by combining the two WPI sub-indices using WPI weights of 14.33 (WPIFA) and 9.97 (WPIFP). Upon plotting the three WPI series for the period between 1998-99 and 2016-17[9] (with 2004-05 set as the base year) (Figure 6), three inferences emerge:

1. The WPI food index curve lies between the curves of WPIFA and WPIFP (owing to greater weight of WPI food articles (WPIFA), the WPI food curve is much closer to the WPIFA curve) and all indices follow a similar trend, particularly since 2007.
2. There appears a break in the WPI food time series around 2007-08 and 2008-09, after which the WPI food index appears to rise sharply mainly because of the pull from inflation in food articles.
3. Inflation in food products (WPIFP) has been lesser than inflation in perishables (WPIFA).

A structural break in July 2008 was statistically identified in the WPI food series (using Bai and Perron, 2003). In the period prior to July 2008, the three curves were close to each other. Barring a few years like 1998-99 and 2004-05 when the WPIFP was above the WPIFA, the latter has been higher than both the WPI food and the WPIFP in all years. Trends are clearer for the period post the structural break of July 2008 when food prices began to rise sharply, mostly

[9] WPI for 2016-17 averaged for April to October 2016.

driven up by the rising prices of food articles. Before July 2008, the WPI for food index rose by an annual average rate of 4 per cent but thereafter, at a rate of 7 per cent (Figure 6).

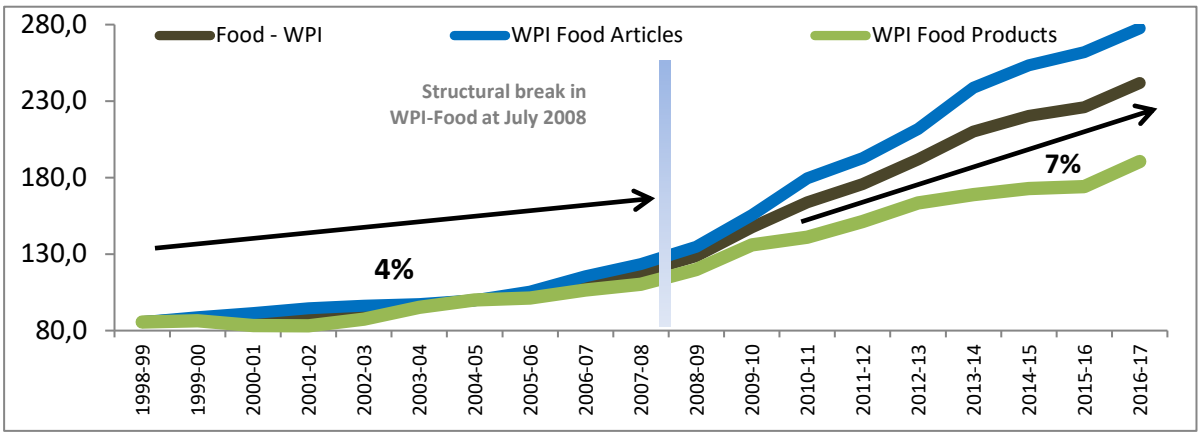

Figure 6: Trends in WPI indices (2004-2005=100)

Note: Years refer to financial years.
Source: OEA, GOI.

The structural break in food inflation data in July 2008 coincides with the global food crisis (GFC) of 2007-08. The sharp rise in food prices during and after this break point is not just attributable to global forces but also to domestic factors. Domestically, the mismatch between supply and demand, incomplete value-chains, restrictive domestic trade policies, and inadequate storage facilities contributed to the surge in food prices during 2008-09 and 2009-10 (Gulati & Saini, 2013; Mohanty and John 2015). During the GFC, India's global agricultural trade polices fluctuated between free trade and restrictions like minimum export prices and absolute bans for selected agricultural commodities. These restrictive policies delayed the transmission of global price hikes into domestic markets (Saini & Gulati, 2017). India was able to protect its domestic markets from global food price volatility in the short run with these restrictive trade policies (refer to circled area in Figure 7), but eventually the domestic prices caught up with global food price trends in the medium to long run (Saini & Gulati, 2016). The transmission was swifter after trade was re-opened in September 2011. Incidentally, domestic policies that aggressively increased minimum support prices of staple crops like rice and wheat under the National Food Security Mission 2007 facilitated this convergence between domestic and global food price trends (Saini & Gulati, 2016).

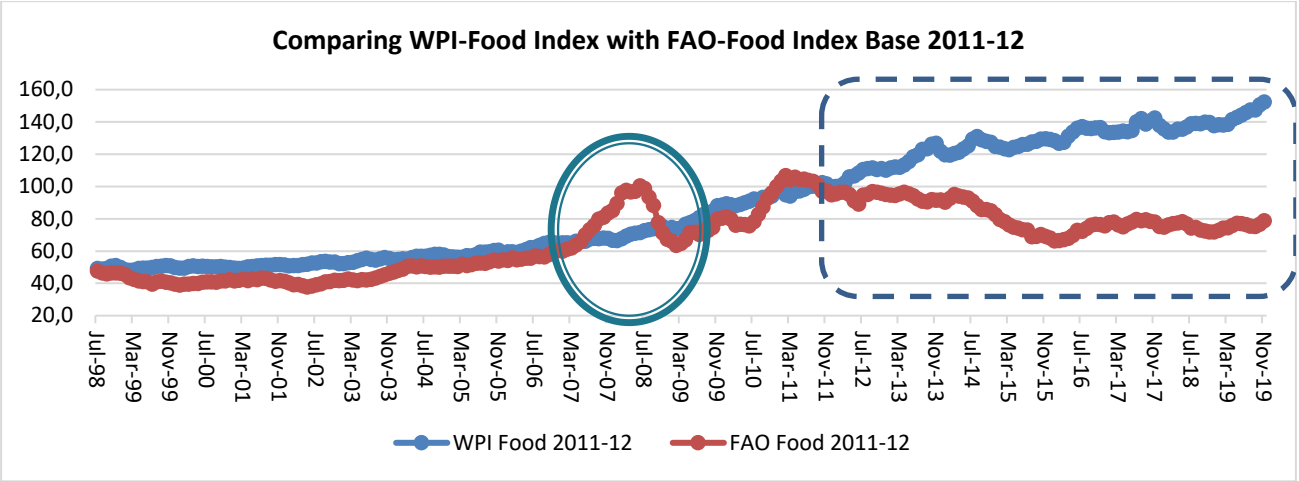

Figure 7: Monthly FAO food and WPI-food trends

Source: Data from FAO and OEA, GOI.

Figure 7 reveals another interesting aspect. While Indian prices seem to follow the upward trend in global prices, *albeit* with a lag, they seem to be downward sticky (refer to area within the rectangle highlighted in Figure 7). Consequently, it appears that India could not benefit from the moderation in global food price, particularly since 2013-14. The reasons for this trend will need further probe and that is beyond the scope of this paper.

3.2. The wage-food inflation linkage

Both farm wages and food prices have been rising in the last four decades. Determining the causality of their movements and their potential relation is a complex task. Is the observed wage increase a response to rising food inflation, or is food inflation caused by rising costs of production induced by increasing farm wages, or do both influence each other, for instance via a spiral or a cyclical trend where each feed into the other? We attempt an answer to these questions. Using Indian food inflation and wage inflation monthly data, we test for their interlinkage.

We approach the questions in two steps:

1. Based on the Bai and Perron (2003) structural break results for nominal wages, we divide the period of analysis into two – Period 1 is from July 1998 to June 2007, and Period 2 is from July 2007 to March 2017.
2. The linkage between wages and inflation in the two periods is then estimated by setting an error correction model, using the average nominal daily wage rates and WPI-food (WPIF) data.

Using the Augmented Dickey Fuller test for stationarity, we found that our data sets for both food price index and nominal wage rates (monthly data from July 1998 to March 2017) were

non-stationary at *levels*.[10] Before fitting a vector-error correction model (VECM) on the two variables, we do two things:

- Estimate the optimal lag length: Using the Schwarz criterion (or SBIC), we estimate the optimal lag length that comes out to be one month in Period 1, which we then apply to both periods. (Details of the calculation are available in Annexure 2.)
- Test for co-integration: We test the series for the existence of co-integrating equations by using the Johansen's test for co-integration using trace statistics or Eigen values.[11] The presence of co-integration indicates a long-run relationship between the tested series. Our results from Johansen's test (after applying appropriate lag lengths) show evidence of nominal wage rates and food inflation being co-integrated, which means there is evidence that in the long run both variables are 'co-moving'.[12]

We next fit the VECM to shed light on the relation between the two variables. Tables 2 and 3 summarise the results of the short-run and long-run relationships for the two periods.

Table 2: Results of VECM fitted for WPIF and nominal wages: Long run

	Variable	Constant	Food articles	Nominal wages
Period 1	Nominal wages	-0.783	1.034**	-
	Food articles	0.757	-	0.967**
Period 2	Nominal wages	-3.844	1.664**	-
	Food articles	2.311	-	0.601**

Note: **Significant at 5 per cent.
Source: Authors' calculations.

Table 3: Results of VECM fitted for WPIF and nominal wages: Short run

	Variable	Constant	ΔFood articles$_{t-1}$	ΔNominal Wages$_{t-1}$	ECT$_{t-1}$
Period 1	ΔNominal wages$_t$	0.005***	-0.118**	-0.168**	-0.082**
	ΔFood article$_t$	0.003	0.197**	0.067	-0.154**
Period 2	ΔNominal wages$_t$	0.011***	-0.136**	0.00	-0.063***
	ΔFood article$_t$	0.001***	0.381***	-0.254**	-0.117***

Note: **Significant at 5 per cent. ***Significant at 1 per cent.
Source: Authors' calculations.

[10] Logs of both series have been taken and used for the subsequent analysis.

[11] In econometric theory, two I(1) non-stationary variables are said to be co-integrated if their linear combination is I(0).

[12] Despite its clear disadvantages, the Granger causality Wald test using a VAR framework was applied to food inflation and nominal wages. The test showed bidirectional causality between the two variables. Also, the VAR was tested for stability and as all Eigen values were inside the unit circle, the VAR satisfied the stability conditions.

Acknowledging the limitations of the VECM results, we observe that in both Periods 1 and 2, food inflation and nominal wages are found to influence each other. However, the findings need to be interpreted with caution.

In Period 1, both food inflation and nominal wages have a nearly similar impact on each other. In the long run, a 10 per cent increase in food inflation caused wages to rise by 10.3 per cent, whereas a 10 per cent increase in nominal wages caused food inflation to rise by about 9.7 per cent. In the short run, this phenomenon, however, is the opposite. Nominal wages in the present month were negatively affected by changes in wages and food inflation in the previous month. On the other hand, food inflation is only influenced by its own lag. The coefficients of the ECT terms in both the wage and food inflation model indicate that there is a slow adjustment to the long-term equilibrium.

In Period 2, however, food inflation appears to have a stronger pull-effect on nominal wages. An increase in food inflation by 10 per cent caused nominal wages to increase by 16.6 per cent whereas a 10 per cent increase in nominal wages pushed up food inflation by only about 6 per cent. This means that while wages are largely responding to food inflation, food inflation is responding to rising farm wages and to other factors. In the short run, last month's food inflation is alone significant and influences nominal wages in the present period. However, food inflation is influenced by both wages of farm labour and by the previous month's inflation. The latter, however, is a stronger determinant.

These estimates suggest that food inflation seems to have a greater influence on nominal wages than nominal wages have on food inflation. This means that farm wages have been responding to inflation in the economy, but food inflation is happening in excess of what can be explained merely by the cost-push hypothesis (where costs of production have been rising due to farm labour becoming expensive). Now if most of the nominal wage increase is explained by food inflation, then what will explain the increases in real wages i.e. growth beyond the inflation rates? We next proceed to answer these questions.

4. Section III: Drivers of real wage growth

This section addresses the third objective of this paper, i.e., identifying factors that explain the sharp growth witnessed in real farm wages of the country. The factors that are being explored for likely influence on farm wages are divided into three broad categories: (i) factors representing changes from within the agriculture sector, for example growth in the agricultural gross domestic product, growth in labour productivity or growth in the rate of mechanisation in agriculture; (ii) factors representing changes outside the agriculture sector, for example in the construction or manufacturing sector; and (iii) factors representing effects of government interventions like MGNREGA.[13] Each of these are briefly discussed below.

4.1. Factors from within the agricultural sector

There is ample evidence from existing literature that shows the strong and positive relation between real wages and labour productivity in agriculture. According to the efficiency wage theory, by increasing the opportunity cost of a job loss, a rise in real wages induces higher worker productivity. With higher wages, the unit labour cost also rises, leading to the substitution of labour with capital. This substitution should increase labour productivity (Wakeford, 2004). Klein (2012) and Emran and Shilpi (2014) find long-run links between labour productivity and wages in South Africa and Bangladesh. Eswaran et al. (2009) studied this link for India and found evidence to conclude that productivity in both the farm and the non-farm sectors positively influence real wages in agriculture. We will test if this is the case even during the years covered by this study.

As labour productivity in agriculture is not directly observable, we identify variables that can represent it or that influence it directly. Two variables are taken, namely, *productivity of an agricultural labourer*, estimated as the ratio of agricultural gross state domestic product (GSDP) per farm worker and *mechanisation*, measured as the machine labour cost[14] for different crops[15] (this is the cost occurring through the use of machines on farms). While the former is a more direct measure of agricultural productivity, the latter represents a crucial variable that directly promotes farm-labour productivity.

[13] We neglect the labour-leisure choice of the household, although one could theoretically expect a change in overall household labour supply due to raising income; yet this is not the case for low income levels (Mapira et al 2017).

[14] Bhattarai et al. (2017) state that farm mechanization can be measured either through the machine labour cost for different crops or by taking the hours of use of machinery for crop cultivation. Since the former is available in reports published both by the CACP and DES, GOI, we chose to use it as the proxy for mechanization.

[15] Machine Labour Cost – expressed in INR/ha – for our purposes has been estimated as the simple average for 9 crops – paddy, wheat, maize, sugarcane, gram, rapeseed and mustard, safflower, cotton, and jute. The choice of these crops was due to the availability of data from the starting year of our analysis. Data has been taken from CACP reports for the years.

For our analysis, for each of the 20 states, we estimate labour productivity, i.e., agricultural GSDP per farm worker[16] (expressed in INR 1000) and the machine labour cost[17] (expressed as INR per hectare) for the years between 1986-87 and 2015-16. Below we plot their values for the national level (Figure 8).

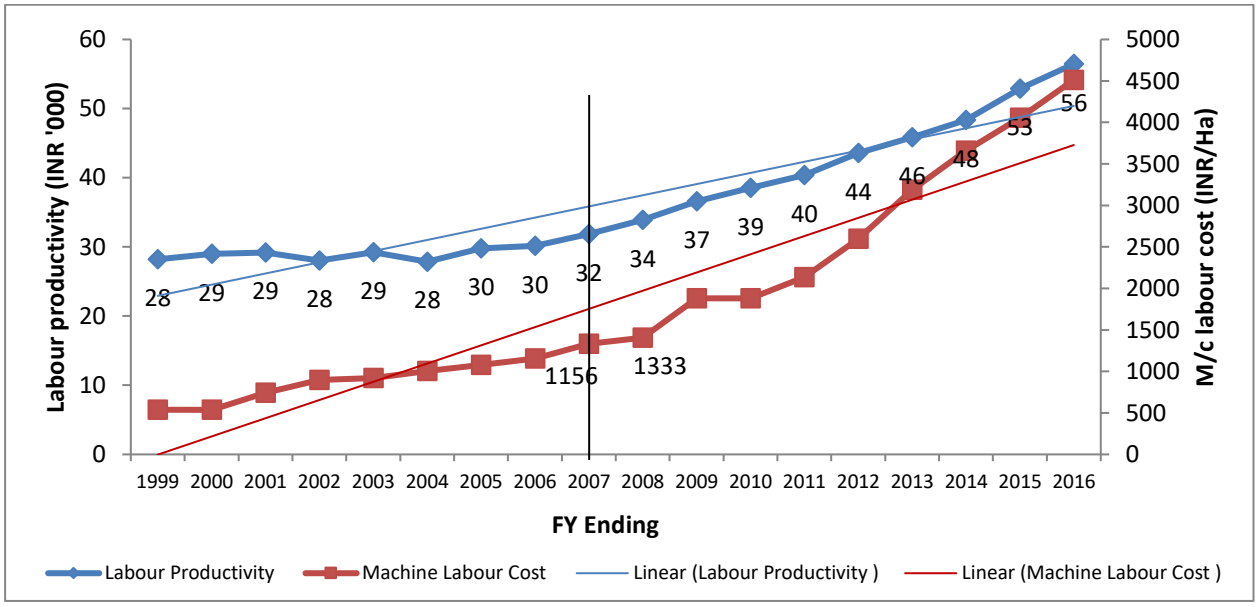

Figure 8: Labour productivity and mechanisation in agriculture

Note: The years are financial years (FY) where 1999 represents the 1998-99 FY.
Source: Data from NAS, NSSO (2001, 2006, 2011, 2012, 2013) and CACP, GOI.

Interestingly, both the time series in Figure 8 show similar trends as observed in the nominal farm wage curve (Figure 4). In both curves, we identify a structural break[18] statistically around 2006-07 (Figure 4) and 2007-08 (Figure 8) respectively.

Rising agricultural productivity implies a rising marginal product of labour leading to higher demand for labour, thereby pushing up wages. Similarly, mechanisation or adoption of technology in the agricultural sector is likely to increase agricultural productivity, which may lead to higher employment by increasing the level of operations such as sowing, ploughing, and tilling, and thus pushing up wages due to higher demand if the scale effect outweighs the substitution effect (Wang et al., 2016; Hassan & Kornher, 2019; NCAER, 1973, IIMA, 1975; Sindhu & Grewal, 1991; and Verma, 2006). It is with caution, however, that we interpret the trends as the actual relation between mechanisation and wages is more complex and may

[16] NSSO reports (2001, 2006, 2011, 2012, 2013) give estimates of the number of persons by age (all ages) and sex in rural and urban areas; by multiplying this with the worker population ratios (WPRs), we compute the number of workers in rural and urban areas (all ages). Using the sectoral distribution of workers data from the NSSO, we get the total number of workers in each sector. For the years the NSSO data is unavailable (only 5 NSSO reports came out in the period of study), the data was interpolated.

[17] Due to paucity of data at the state-level, we could not estimate weighted average, using, for instance, crop acreage in each state for this variable, which would have been an ideal representation of the situation being analysed.

[18] Estimated using Bai and Perron's (2003) methodology.

vary between countries, and is likely to be a function of availability of labour, type of mechanisation, type of labour (hired or family), *inter alia*.

In addition to these two variables, we also included the value added from the agricultural sector. All these three variables are taken as a proxy for growth in the agricultural sector and will be used to quantify the impact on farm labour wages in the panel data analysis section below.

4.2. Factors from the non-farm sectors

As shown before (Table 1), India's workforce is undergoing a structural transformation. Further using data from the NSSO and the LB we can show how Indian workers are migrating between sectors.

According to the data from the NSSO (2001, 2013), the share of the labourers employed in the agricultural sector has fallen from close to 60 per cent in 1999-2000 to about 49 per cent in 2011-12. For the same period, the share of labourers that are employed in the manufacturing and construction (M&C) sectors has increased from 15.5 per cent to 23.2 per cent.

Similar trends can be corroborated using data from LB, GOI, according to which in 2011-12, 53.1 per cent of workers were employed in agriculture which got reduced to 46.9 per cent by 2015-16 (for year 2011-12, estimates of the share of workforce employed in agriculture differ between three government of India data sources, namely Census 2011, NSSO 2012 and LB. The reason for the difference is explained in Annexure 1).

The data from LB also showed how the share of workers employed in the construction, manufacturing and services sectors was progressively growing during the same period. The unskilled manual labour from the agricultural sector appears to have been absorbed in the M&C sectors. Such a movement between sectors is bound to influence the labour supply for the agricultural sector and thus the farm wage rates.

The importance of these non-farm sectors in explaining the Indian farm labour wage growth is documented by various research studies. Gulati et al. (2013) undertook an empirical analysis to find evidence of growth in the construction sector (operationalized as growth in construction GDP) strongly influencing farm labour supply consequently pushing up farm wages. Additionally, Eswaran et al. (2009) show a positive relation between productivity (and incomes) in non-farm sectors and agricultural wages.

Both the manufacturing and construction (M&C) sectors offer higher wages to manual unskilled labourers than the agricultural sector (based on actual data, it was found that the minimum wages as per the prevailing Minimum Wages Act for employment in M&C sectors were higher than in the agricultural sector). As a result, impoverished farm labourers migrate

to these sectors upon getting opportunities, shrinking the supply of farm labour, and pushing up the equilibrium wage.

We profile below a set of two variables, namely level of employment and the level of labour productivity in the M&C sectors. Intuitively, growth in both these factors should lead to a rise in agricultural wages.

Like in the case of agriculture, we estimate the level of productivity in M&C by dividing the GSDP in M&C by the number of workers employed in the sectors. The level of employment itself is estimated using data from the NSSO (2001, 2006, 2011, 2012, 2013).[19]

The two estimated time series are plotted in Figure 9 below. We can make two inferences from it:

1. The employment in the M&C sectors (red line in Figure 9) shows a sharp change in trajectory in the year 2010-11. Between 1998-99 and 2010-11, employment in the M&C sectors grew at a consistent annual rate of about 5 per cent, but beginning 2011-12, the annual growth rate increased to about 9 per cent;
2. Labour productivity in these sectors has fluctuated in the studied period. The productivity surged from 2007-08 onwards and peaked in 2010-11, and declined consistently thereafter. Perhaps, the sharp increase in employment since 2011 not leading to commensurate increases in the GSDP in the M&C sectors could be the reason for this drop.

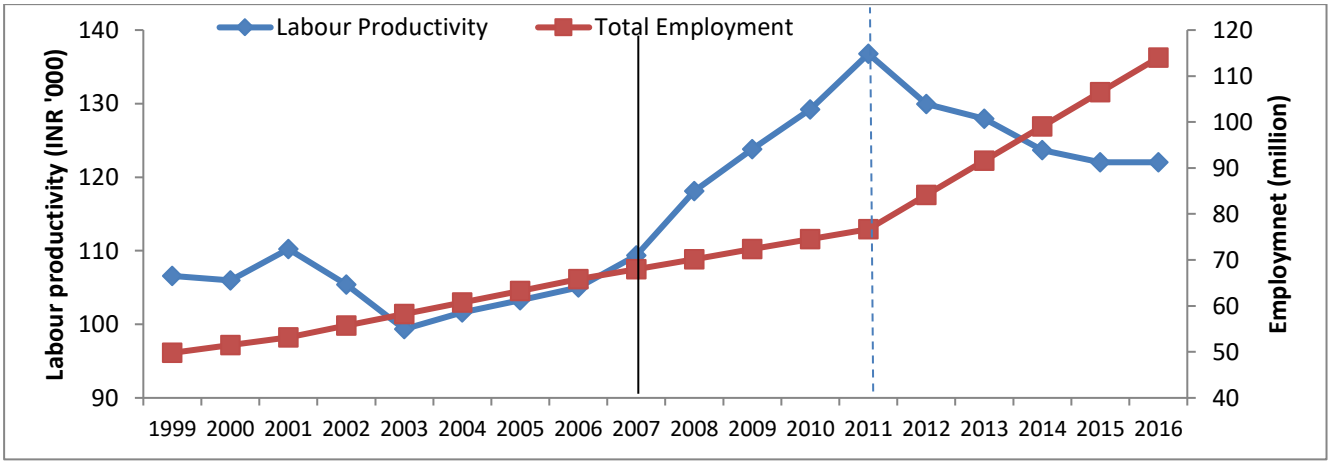

Figure 9: Employment and productivity in manufacturing and construction

Source: NAS and NSSO (2001, 2006, 2011, 2012, 2013).

In addition to the above two variables, we also studied the 'GSDP in manufacturing and construction sector' as a proxy variable for our econometric analysis.

[19] See Footnote 16.

4.3. Variables representing MGNREGA

We have already explained the scheme in Section I and analysed the interaction between the MGNREGA wage rate and the national farm wage rates in Section II. From Figure 4, we derived that since the introduction of the MGNREGA scheme in February 2006, farm labour wages in India equalled the MGNREGA wage rates in the initial years (2007-08 to 2010-11) and exceeded them thereafter. This brings us to the hypothesis that we put forward initially about the role played by MGNREGA in contributing to the wage growth by acting as a base rate.

Indisputably, the purpose of the government intervention scheme is to provide income and social security to its workers by giving them security of employment. An assurance of a second source of income is likely to have a direct impact of labourer's negotiation power thereby pushing up farm wages. A study by JP Morgan (2011) shows that wages for both agricultural labourers as well as for the rural non-farm sector have accelerated after the introduction of MGNREGA. Berg et al. (2012) empirically proved that employment under MGNREGA increased real daily wages in agriculture by 5.3 per cent.

In order to undertake our panel-data analysis to establish the drivers of growth in real agricultural wage rates, we identify two variables that can be used as a proxy for evaluating the impact of MGNREGA. These variables are (i) the *MGNREGA real wage rate* that is computed for the 20 states by using the nominal MGNREGA wage rates; and the state-wise CPI-AL (2004-05 as a base year) and (ii) the *MGNREGA real income* that is computed by multiplying the total number of person days (as discussed in Section I) created under the MGNREGA with the MGNREGA real wage rates. Their trends can be seen in Figure 10.

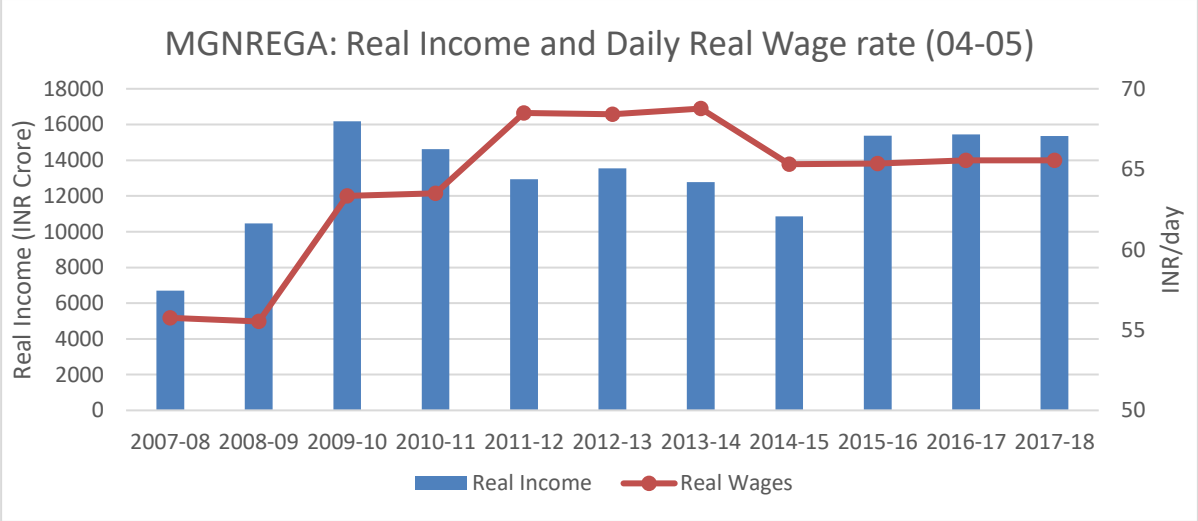

Figure 10: Real wage rates and incomes from MGNREGA

Note: Years refer to financial years.
Source: MGNREGA, GOI.

Since 2008-09 (the year of the national MGNREGA roll-out), real incomes generated under MGNREGA were found to be the highest and lowest in the two drought years 2009-10 and 2014-15, respectively.

We next proceed to the panel-data modelling exercise.

4.4. Model: Panel regression

4.4.1. Model framework

Using the financial year data for 16 Indian states (Andhra Pradesh, Assam, Bihar, Gujarat, Haryana, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, West Bengal), we undertake a panel-data exercise to determine the drivers of growth in real agricultural wage rates.[20] The study was done on data from 29 years, i.e. from 1987-88 to 2015-16. Since we earlier showed a structural break in the time series of nominal wages in January 2007, we separate the quantitative analysis into two periods around this break. These are Period 1 between 1987-88 and 2006-07 and Period 2 between 2007-08 and 2015-16 (and 2017-18[21]).

For Period 1, we are hypothesising that:

Real wages = f (Agri, MC)

where

- *Agri* represents a variable from the agricultural sector (either GSDP, labour productivity or rates of mechanisation measured as average machine labour cost/hectare); and
- *MC* represents a variable from a non-farm sector, here we are considering the M&C sectors (either GSDP, labour productivity or rates of employment).

For Period 2, we are hypothesising:

Real wages = f (Agri, MC, MGNREGA)

where we add one additional variable representing the MGNREGA (either MGNREGA wage rates, employment generated through MGNREGA or income generated through MGNREGA)

4.4.2. Methodology

We test for stationarity of the variables and their co-integration. Based on the results (Table 4), we specified a non-stationary heterogeneous panel model (pooled mean group (PMG) estimator) to evaluate the drivers of growth in real farm wages. Causality between variables

[20] By using real agricultural wages, we indirectly control for the level of food prices.

[21] With access to more recent data, we extended the analysis for Period 2 by adding data for two more years. The results are presented in a footnote to the main results.

was checked using the Granger causality test, and a national-level regression analysis was done because of a two-way causality identified in Panel 2.

- *Testing for unit roots*

Using the Breitung unit root test, the variables were found to be non-stationary (results for Panel 1 are presented in Table 4).

Table 4: Results of the Breitung unit root test for Panel 1

Variable	Statistic	p-value
Real Wages	0.8575	0.8044
Agriculture Productivity	2.0472	0.9797
Manufacturing Productivity	3.6774	0.9999

- *Testing for co-integration*

Before running the panel regression, a *co-integration* test was done to evaluate if the relation between the variables to be studied is in fact real or spurious. We used the Pedroni test (1997, 1999, 2004) on the Panel 1 data set and, based on the group-specific Augmented Dickey Fuller (adf) and Phillips-Perron (t) test statistics, which were lower than their critical values, we rejected the null hypothesis of no co-integration. We then proceeded to the heterogeneous non-stationary panel model.

- *Panel-data analysis*

As the data is non-stationary and the panel data had a large number of cross-sectional (state) and time-series observations, relying on fixed- or random-effect estimators, or a combination of fixed-effect estimators and instrument-variable estimators was not appropriate as these methods required pooling individual groups while allowing only the intercepts to differ across groups (Blackburne & Frank, 2007). Literature on the subject (Pesaran & Smith, 1995; Phillips & Hyungsik, 1999) shows that this practice is not appropriate because for large dynamic models (like in this case), the practice of assuming the homogeneity of slope parameters is unsuitable. Thus, to understand the dynamics that have affected real agricultural wages through the period under study, we used a non-stationary panel technique known as the pooled mean group (PMG) estimator. While this technique allows the intercept, coefficients (short-run), and error variances to differ between groups, it assumes that the long-run coefficients are equal across groups.

The PMG estimators for Panels 1 and 2 are presented below (Boxes 1 and 2). We modelled real wages and regressed them with variables mentioned in the previous section. As PMG estimators allow for heterogeneous short-run dynamics and common long-run agriculture (in

Panels 1 and 2), M&C (in Panels 1 and 2) and MGNREGA (in Panel 2) elasticities, only the long-run estimates are of interest to us.[22]

Box 1: PMG results for Panel 1: 1987-88 to 2006-07

Ln real wage s=	0.076 Ln Agri	+	0.012 Ln M&C
p-value	0.000		0.619

number of observations: 284

where

Ln real wages = Real wage rates in agriculture, log,

Ln Agri = Rate of mechanisation in the agricultural sector, log

Ln M&C = Productivity in manufacturing and construction sectors, log

With a high p-value of the coefficient, variables representing the non-farm sector (in this case, the M&C sectors) did not emerge significant in Panel 1. During the 20 years between 1988 and 2007, both employment and productivity growth in the M&C sectors were muted. In fact, in the states studied, even though labour employed in the M&C sectors grew at an average annual rate of 4.4 per cent from about 30 million to 68 million, due to the plateauing of GDP of the two sectors, the growth rate of labour productivity was low at only 1.6 per cent. It is not surprising that the factor does not emerge as a driver of real agricultural wage growth in Period 1.

We also tested for the significance of other variables for the agricultural and M&C sectors. Although *labour productivity in agriculture* was one of the variables taken into consideration for analysis, its impact in Period 1, though significant, was not as strong as that of mechanisation (for the purposes of econometric modelling, both the variables of mechanisation and agricultural productivity cannot be taken together due to multi-collinearity between the two). Due to the multi-collinearity, we cannot rule out that the coefficient estimate of mechanisation also captures the impact of other related variables. Therefore, we conclude that mechanisation represents the structural transformation of the agricultural sector and higher agricultural productivity.

Both mechanisation and real agricultural wages are highly correlated (0.86) in this period of 20 years. The PMG estimates establish the impact that improving rates of mechanisation have on agricultural wages. However, we also know from the *efficiency wage theory* that an increase in real wages increases the cost of labour and induces greater substitution of labour with capital. This means that the relation between the two variables – mechanisation and real

[22] Default results of the PMG model include both long-run parameter estimates and averaged estimates for the short run.

wages – could be two-way, with each one influencing the other. In order to test this, we ran a Granger Causality Test (Dumitrescu-Hurlin Test) on the two series, with the null hypothesis that there is no causal relation between the two variables. At 5 per cent level of significance, for the panel 1, we found no proof of real wages Granger-causing changes in the rate of mechanisation,[23] while the direction of causation from mechanisation to real wages found complete support (Table 5).

Table 5 Granger Causality Test results for Panel 1

Variables	Z-Bar
MC productivity Granger causes Real wages	2.254**
Real wage Granger causes MC productivity	0.352
Mechanisation Granger causes Real wages	2.967**
Real wages Granger cause Mechanisation	0.637

Note: ** Significant at 5 per cent.

We next proceed to analysis of data in Panel 2. Its PMG results are given in Box 2.

Box 2: PMG result for Panel 2: 2007-08 to 2015-16 [24]

Ln real wages=0.46LnAg (GDSPA) + 0.30LnMC (GSDPMC) + 0.012LnMGY

Z-value 0.000 0.000 0.28

number of observations: 144

where,

Ln real wage = Real wage rates in agriculture, log taken

Ln Ag (GSDPA) =Gross domestic product of the agricultural sector, log

Ln MC(GSDPMC) = Gross domestic product of the manufacturing and construction sectors, log

Ln MGY = Real income under the MGNREGA, log

[23] This might not be the case of individual states like Punjab where the two-way relation is likely to find support.

[24] A panel was evaluated for the period between 2007-08 and 2017-18, and the PMG result of the panel was:
Ln Real Wages = 1.271ln Ag(GSDP) + 0.392ln MC(GSDPMC) + 0.197ln MGPd
p-value 0.000 0.000 0.000
Number of observations = 160
where, ln Real Wages = Log of Real Wage Rate in Agriculture; ln Ag(GSDP) = Log of Gross Domestic Product of the Agricultural Sector; ln MC(GSDPMC) = Log of Gross Domestic Product of the Manufacturing and Construction sectors; and ln MGPd = Log of Person days generated under the MGNREGA.

The result is that farm wage growth in real terms in Period 2 is explained by growth in agricultural GDP and in GDP of the M&C sectors. With high p-values, the coefficient of the variable representing the MGNREGA is not significant.

We ran the PMG iterations using several other variables like agricultural productivity (measured as productivity of agricultural workers and expressed in terms of INR/worker), employment in the M&C sectors interpolated using data from the Employment Unemployment survey reports (NSSO, 2006, 2011, 2012, 2013; EUS, LB, n.d.), the MGNREGA wage rates, and the MGNREGA employment (number of person days generated for each financial year since 2007-08). As the coefficients for these variables did not appear significant, they were dropped from the analysis.

The impact of the MGNREGA needed further analysis. We tried another iteration by introducing lags in the independent variables[25] and found the scheme to have a small and lagged impact on farm wages (results of the iteration were presented in Footnote 25). Another interesting dimension of MGNREGA is the seasonality of the employment opportunities it offers. Results of an analysis involving seasonality are presented in Appendix 4.

As in the case of Panel 1, we tested for a bi-directional relation between variables also in Panel 2. Using the Dumitrescu-Hurlin test statistic, we found (Table 6):

- In the case of the GSDP in the M&C sectors, uni-directional causality was estimated where the GSDP in the M&C sectors was estimated to be Granger causing real wages.
- In case of GSDP Agriculture, there was a bi-directional relation with real wages: In order to estimate the impact of real agricultural wages on the country's agricultural GDP, a simple time-series regression exercise at the national level was undertaken for a period of 18 years between 1999 and 2016 (Box 3).

[25] We did find a result that showed the positive contribution of MGNREGA to real farm-wages. After introducing a one-period lag in two of the three variables, we got a significant result:

Ln real wages = 0.40 Ln $Ag_{(t-1)}$ + 0.63 Ln MC + 0.033Ln $MGY_{(t-1)}$

p-value 0.000 0.000 0.001

where, Ln $Ag_{(t-1)}$ = Rate of mechanisation in the agricultural sector, log, lag of 1 period; Ln MC = Productivity in manufacturing and construction sectors, log; Ln $MGY_{(t-1)}$ = Real income under MGNREGA, log, lag of 1 period. According to this equation, growth in productivity of M&C labourers was the most crucial factor explaining the sharp growth in real agricultural wages; following this was growth in agricultural mechanisation that had a lagged impact on real agricultural wages; mechanisation increased the demand for labourers pushing up their wages. With a small yet statistically significant coefficient, with a one-period lag, MGNREGA appeared to contribute least to growth in real wages. We can thus infer that income from MGNREGA improved labourers' bargaining powers and induced a rise in farm wages albeit at a small rate and with a time lag.

Box 3: Results of national simple time-series regression, 1989-99 until 2015-16

Log Agri-GDP = 3.38 + 0.354 Log Rainfall + 0.281 Log AGCF (t-1) + 0.18 Log Real wages				
p-value	0.000*	0.003*	0.000*	0.079**

Note: AGCF refers to the agricultural fixed capital formation. *Significant at 5 per cent; **Significant at 10 per cent. Value of Adjusted R square: 0.9453.

At the national level, agricultural GDP growth in the 18 years between 1998-99 and 2015-16 is explained mostly by the level of monsoon rains received annually by the country, the level of investment in the sector (AGCF) with a one-period lag and real agricultural wages (Box 3).

Table 6: Granger Causality Result Panel 2

Variables	Z-Bar
GSDP Agri Granger causes real wages	4.17**
Real wages Granger causes GSDP Agri	5.967** (there is a causal relation)
GSDP MC Granger causes Real wages	4.310**
Real Wages Granger causes GSDP MC	0.15 (no causal relation)

Note: **Significant at 5 per cent

4.4.3. Conclusion from the quantitative analysis

Results from the panel regression in Period 1 indicate that the growth rate, *albeit* slow, in agricultural wages was explained largely by the *rate of mechanisation in Indian agriculture.* Here mechanisation represented the structural transformation of the agricultural sector and higher agricultural productivity.

In Period 2, most of the growth in real agricultural wages was explained by growth in the agricultural sector and in the M&C sectors. According to the estimated model, a 1 per cent increase in agricultural GDP resulted in a 0.46 per cent increase in real wages.[26] The pull factor from the M&C sectors (with a coefficient value of 0.30), which absorbed the manual unskilled farm labourers contributed in driving up real agricultural wage rates. The impact of this variable, however, is observed to be much stronger in Period 2 than in Period 1.

The contributing role of the MGNREGA in increasing farm wages was the smallest. Even though the estimated coefficient of the MGNREGA variable was significant in the model stated in the footnote 24, the impact on real wages was small and with a lag. Our analysis further shows that wage rates under the scheme do not even have a base effect on wages in the labour market (the analysis is expanded in Annexure 4). The farm labour market, thus, is

[26] Owing to the cyclicality of the relation, real wages were also identified to have contributed to growth in agricultural GSDP – a one per cent increase in real wages induced an increase of 0.15 per cent in agricultural GSDP.

mostly found to be independent of the government's intervention through the scheme. This leads to the larger question about the implementation issues related to the scheme, which are beyond the purview of the current research.

5. Section IV: Summary of findings and policy implications

5.1. Summary of findings

Our analysis points at four important patterns and developments:

1) Increase in farm-labour wages has been a recent phenomenon:
    a) Between 1998-99 and 2006-07, nominal wages grew at an average annual growth rate of 4 per cent and real wages at about 1 per cent. In this period, nominal wage growth was offset by high rates of inflation (CPI-AL registered a growth rate of about 3.1 per cent) that suggests that the wages may have grown in response to inflation;
    b) However, between 2007-08 and 2017-18, the nominal wage grew at an average annual rate of 13.06 per cent and real wages at about 4.8 per cent per annum, indicating factors other than inflation driving wage growth.
2) The MGNREGA wages have been lower than or equal to farm-labour wages at the national level:
    a) The agricultural wage rate has been consistently above the MGNREGA wage rate (barring 2009-10), with the gap widening in recent years.
    b) The MGNREGA's contribution to rising rural farm wages seems small and is likely to have occurred only with a lag.
3) There existed a food-wage spiral in India such that the inflation in food items (food articles and products) and nominal wage growth impacted each other bidirectionally. However, more recently, evidence was found of a stronger influence of rising food prices on nominal wages:
    a) Between July 1998 and December 2006, food price inflation and nominal wage growth had a nearly equally strong impact on each other. A 10 per cent increase in the prices of food items caused farm wages to rise by 11 per cent, whereas a 10 per cent increase in farm wages caused food prices to rise by about 9 per cent;
    b) However, between January 2007 and March 2017, food prices were found to have a stronger pull-effect on nominal wages. An increase in food prices by 10 per cent caused nominal wages to increase by 16 per cent, whereas a 10 per cent increase in nominal wages pushed up the food prices by only about 6 per cent, indicating to a role of *additional* factors in explaining the sharp rise in food prices.
4) Three factors drove the rising real agricultural wages in the country. Those were:
    a) Growth in the agricultural sector: Both in Period 1 (1986-87 to 2006-07) and Period 2 (2007-08 to 2017-18), this factor emerged as the most important factor driving up real farm wages. The rise in the rate of mechanisation, especially in Period 1, and the

overall growth of the sector in Period 2 have emerged as key contributors to the growth of farm wages.[27]

b) Contribution from growth in non-farm sectors of construction and manufacturing: Although this factor was not as relevant in explaining the growth in agricultural wages in Period 1, it emerged as a very important factor in Period 2. This could be attributed to the increased number of infrastructure projects taken up by both the public and the private sectors during the period.

c) Base effect of the MGNREGA: After its national implementation in 2008, the scheme's impact on farm wages has been small and with a lag. Its impact was not as significant as the contribution made by growth in the agricultural sector and the growth in productivity and employment in the non-farm sectors. The observed impact of the MGNREGA was also low compared to that documented by several other researchers. Possible reasons for the low impact included:

   i) An analysis of the number and seasonality of jobs created under the scheme, revealed that MGNREGA jobs were not displacing or competing with agricultural labour during the important months of sowing and harvest;

   ii) Only 14 to 16 per cent of all Indian workers benefitted from the MGNREGA in the studied years; and

   iii) In several states, the MGNREGA wage rate was found to be lower than even the stipulated minimum wage under the Minimum Wage Act.

5.2. Policy implications

From this analysis, we can conclude that policies that improve agricultural productivity and promote labour-intensive sectors like manufacturing and construction, which can absorb manual unskilled farm labourers, would support the growth of farm wages and help in improving rural livelihoods. Moreover, based on these findings and extrapolating from them with other insights on Indian agriculture, interesting policy implications emerge.

- As rising wages are likely to put pressure on the profitability of farmers, the government may consider:
    - Investment in improving labour productivity so that increased labour costs are balanced by improved farm productivity. Three measures – *access to better and high yielding variety seeds*, *assured access to deeper global and domestic*

[27] The roles of possibly more broadly expanding access to technology (seeds, dairy, solar irrigation, etc.) and of information and digital technology need to be further explored

markets, and *improvement in farm practices (supported by extension) – inter alia*, can improve yields and productivity.

- Improving *physical and economic access to relevant farm machinery and equipment* that suit the needs of 86 per cent of Indian agri-landholders, who have small and marginal holdings of less than 2 hectares; support precision farming like drip irrigation and sprinklers that can go a long way to help farmers improve yields.
- *Investment in improving the skills of farmers and farm labourers* by vocational training and extension to improve agricultural productivity. This should be in addition to new technology (information and communication technologies) and institutional innovation.
- *Improving resource or input use efficiency:* the focus may be on the degrading quality of soil, fragmenting landholdings and overexploited water reserves. Governments need to undertake concerted efforts to estimate (i) economic value of the scarce resources and (ii) re-design the farming ecosystem so that farming is both financially and environmentally sustainable.
- Investment in improving the financial, economic, and environmental sustainability of farms and farmers.
- There is also an urgent need to revisit existing agricultural support policies to ensure that the Indian agriculture remains financially viable.

- To avoid rural wage inflation that could push up farming costs, labour laws should be revisited to open labour markets, and labour contracts should be formalised and strengthened to ensure mutual security of the contract between labourer and cultivator.
- The MGNREGA may not have contributed much to supporting unskilled manual workers on farms: The limited number of actual job days created under the scheme may have restricted its impact on the overall labour market. Yet, once the scheme is fully implemented in its true spirit in future, it has potential to create shortages in the casual labour market. However, if the scheme is designed judiciously then the scheme can create a good fall-back option for vulnerable labourers while avoiding to trigger sharp increases in farm-labour costs.
- *Job creation* is most critical for income- and employment-insecure rural farm workers. An important sign of inclusive growth is the number of new jobs that are created each year vis-à-vis the number of people who enter the labour market. In this regard, concerted efforts are needed to improve opportunities for and skills of unskilled manual farm labourers for non-farm employment. To create alternate models of employment, there is a need to foster the following:

- *Growth of sectors that are labour-intensive*, particularly sectors like infrastructure and construction, that can absorb the unskilled workforce of the country;
- Improvement of the skillset of these unskilled workers:
    - To become more efficient in the agricultural sector: By learning processing, grading, packaging skills, etc., these labourers can add value to existing farm operations and contribute to the value-chain.
    - To be absorbed in other sectors: Their skills can be improved so that they can be absorbed in sectors like manufacturing, small services, hotels and travel.

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Annexure 1: Different sources of labour data

Data on the Indian labour force can be collected from three Government of India (GOI) sources: The Census of India (2011), the NSSO (2013), and the Ministry of Labour and Employment's Labour Bureau (2020). All three sources detail trends in the Indian labour market, however, their estimates differ. For example, for the year 2011-12, the estimates for the share of workers employed in the agricultural sector is 54.6 per cent according to the Census, 48.9 per cent according to the NSSO, and 53.1 per cent according to the LB. This difference according to our analysis can be attributed to three reasons, *inter alia*: period of study, enumeration methodology, and definition of variables (7).

Table 7: Methodological and definitional differences between NSSO, Census, and LB

Census	NSS	LB
Total population enumeration Published and released every decade Labour Force: >5 years	Based on sample survey (multi-stage stratified sampling) Published and released every five years Labour Force: >5 years	Based on sample survey (multi-stage stratified sampling) Published and released every year since 2011-12 (barring 2014-15) Labour force: >15 years
54.6 per cent of total workforce in 2011 was employed in agriculture	48.9 per cent of total workforce in 2011 was employed in agriculture	53.1 per cent of total workforce in 2011 was employed in agriculture; by 2015-16, it was 47 per cent

Note: "Labour force" refers to the minimum age of profiled workers.
Source: Compiled by authors based on information given in the Census (2011), NSSO (2013) and LB, GOI (2020).

A Census survey report is released every decade, an NSSO report every five years and a LB report annually since the year 2011.[28] The second difference derives from the enumeration methodology. The Census is a very exhaustive study that profiles each citizen of the country; the NSS and LB reports, however, are based on sample surveys. The third difference is the minimum age of the profiled workers. Both the Census and NSSO reports take into consideration all workers over the age of 5 years. The LB's estimates, in contrast, are only for workers over the age of 15 years.

Even though the absolute levels of the estimates presented in each of these reports differ, the larger trend of people moving out of agriculture is echoed systematically by all. Each data set

[28] The first Employment Unemployment Survey report by the LB was published in 2009-10; however, unlike subsequent surveys, this was not a national level study.

has its pros and cons, and we used them coherently to produce and highlight different aspects of India's labour market. In particular, we use the Census data to understand the historical trends and evolution of India's labour market, LB data for recent estimates, and the data from the NSSO reports to understand the structural transformation of the Indian economy.

Annexure 2: Comparing lag lengths

STATA conducts a whole measure of tests simultaneously to determine the number of lag lengths using different information criteria – AIC, SBIC, HQIC, LR tests, etc. The following table (Table 8) shows the results for determining lag lengths.

Table 8: Results from different Information Criterion for Lag Lengths

Information Criterion	1st Period - Lag Length*	2nd Period - Lag Length*
AIC	2	3
SBIC	1	2
HQIC	1	2

Note: *1st Period – July, 1998 to December, 2006; 2nd Period – January, 2007 to October, 2016.

While the benefits of using AIC, SBIC and HQIC are all different and each method has adequate literature advocating its use, for convenience we use the shortest lag lengths suggested in both periods by the three methods. Therefore, for the 1st period, the lag length we use is 1 month and, for the 2nd period, the lag length we use is 2 months (as determined by the SBIC technique).

Annexure 3: State-level data on nominal wages

Table 9: State-level data on nominal wages per financial year

State wise average daily nominal wage rates for a Financial Year (INR/day)

	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
Andhra Pradesh	37.7	38.4	40.0	42.0	43.1	42.7	44.9	47.9	53.8	64.4	82.8	105.6	136.7	156.7	176.4	187.7	202.5	202.5
Assam	49.8	53.2	55.2	56.1	55.8	60.4	62.0	63.4	67.6	75.4	77.6	87.0	110.8	124.1	147.7	178.4	213.1	255.3
Bihar	36.1	38.6	40.9	43.8	49.4	51.1	52.3	55.2	56.7	58.8	65.9	79.4	93.3	113.8	142.4	179.7	213.4	287.5
Gujarat	46.8	47.6	49.1	52.3	54.1	54.9	56.7	57.9	61.2	65.5	71.4	77.5	86.6	112.3	123.3	153.8	186.3	201.4
Haryana	63.8	74.6	77.9	79.9	84.1	83.0	87.1	93.6	99.6	108.0	124.5	159.5	192.3	208.2	228.6	313.7	341.0	433.8
Himachal Pradesh	77.7	84.4	94.9	99.3	102.2	110.3	114.0	124.2	136.5	154.4	160.7	169.7	199.2	236.3	258.6	319.6	347.5	371.1
Jammu & Kashmir	76.0	79.7	96.1	108.4	113.1	118.0	117.2	116.1	117.8	120.1	128.1	155.2	205.2	232.8	263.3	301.7	380.8	417.3
Karnataka	37.6	39.8	41.5	42.7	42.9	43.3	43.8	44.7	47.3	52.8	60.2	70.8	91.1	113.7	143.8	183.4	200.6	211.1
Kerala	113.8	126.1	148.1	164.6	173.2	172.1	166.5	168.4	176.8	173.2	191.1	232.6	276.8	338.2	400.4	496.2	553.6	677.4
Madhya Pradesh	39.0	40.9	40.2	40.4	42.3	42.5	43.1	44.0	44.2	48.3	55.0	63.5	81.7	96.4	118.9	141.6	170.9	180.8
Maharashtra	38.6	38.9	44.0	45.9	46.7	48.4	48.3	49.2	53.0	59.1	63.2	75.2	100.1	129.1	151.6	178.1	189.2	189.0
Manipur	46.1	48.5	37.8	55.2	49.2	54.9	57.8	57.8	57.7	62.1	74.1	84.8	109.0	140.4	184.9	232.1	267.1	232.0
Meghalaya	48.3	48.9	51.5	50.0	58.3	65.4	66.9	74.3	71.6	72.8	73.6	77.5	87.4	92.1	103.9	148.9	176.6	208.5
Orissa	38.8	35.9	40.8	39.7	43.4	46.0	48.6	51.9	52.8	50.0	60.9	79.3	110.6	126.1	131.6	161.2	180.1	185.8
Punjab	66.5	68.8	74.1	79.1	83.1	86.1	88.2	87.0	93.7	98.8	117.0	139.2	178.8	228.4	266.2	239.8	289.5	344.1
Rajasthan	62.6	63.2	72.6	75.1	63.2	62.0	65.1	69.7	71.2	80.4	97.6	113.7	142.0	175.4	201.4	225.6	255.8	232.7
Tamil Nadu	49.1	55.4	59.3	59.1	58.8	60.3	60.9	62.1	64.2	72.1	80.6	101.7	138.7	168.8	180.6	251.5	317.3	306.7
Tripura	42.8	50.3	53.6	58.2	60.2	54.8	58.3	78.3	89.2	89.9	99.7	109.8	109.6	114.6	146.4	194.6	210.0	210.0
Uttar Pradesh	43.2	47.5	50.0	50.6	51.5	54.0	54.9	56.4	59.2	65.8	74.8	86.5	106.1	123.7	148.7	178.4	193.2	251.5
West Bengal	42.8	48.1	50.0	51.0	53.4	55.7	56.5	61.7	67.9	72.6	78.6	88.4	112.1	141.8	167.8	206.1	226.0	298.0
India	43.9	46.7	49.6	50.4	52.1	53.4	54.5	56.7	60.0	65.5	74.9	89.8	107.2	128.6	151.4	179.2	210.6	221.8

Table 10: State level data on real wages per financial year

State wise average daily real wage rates for a Financial Year: base 2004-05 (INR/day)

	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
Andhra Pradesh	43.18	43.38	44.49	46.15	45.21	43.61	44.90	45.87	48.62	54.21	62.36	70.14	82.41	84.99	88.07	82.73	83.49	78.65
Assam	55.58	57.79	59.35	60.67	59.43	61.13	61.99	60.81	61.65	63.98	61.06	59.99	68.13	70.77	76.35	85.85	94.32	110.84
Bihar	40.65	41.54	45.79	48.85	53.42	52.70	52.29	50.99	48.39	46.81	48.37	52.16	57.09	66.91	76.12	86.03	94.91	127.48
Gujarat	54.16	54.24	54.11	56.52	56.99	55.97	56.66	54.20	53.78	53.79	55.17	51.53	52.10	63.36	63.24	69.77	79.44	81.04
Haryana	73.55	85.72	88.93	88.43	91.48	86.57	87.12	88.39	89.51	88.18	91.25	100.02	108.37	109.49	108.77	135.30	137.01	167.73
Himachal Pradesh	89.30	93.70	104.65	108.82	108.89	111.35	113.98	117.43	122.19	133.71	131.03	124.38	134.78	152.88	153.43	172.81	172.50	176.52
Jammu & Kashmir	87.54	87.09	102.05	114.13	115.34	118.61	117.17	112.11	106.76	102.17	101.00	106.12	127.81	135.22	139.52	146.43	174.05	185.07
Karnataka	42.02	43.53	46.45	47.85	45.94	43.57	43.76	44.89	45.27	45.65	46.35	46.98	54.27	60.13	68.06	77.13	79.71	78.02
Kerala	130.04	143.33	161.28	179.17	185.20	175.85	166.46	165.21	167.14	154.36	150.39	168.10	177.25	198.81	218.54	231.42	234.35	273.65
Madhya Pradesh	42.42	42.99	42.12	42.40	43.69	43.51	43.08	40.70	37.81	38.96	40.17	40.44	47.67	52.11	58.48	64.32	75.95	77.03
Maharashtra	45.93	45.15	50.05	52.54	51.15	50.05	48.32	46.38	46.69	48.46	47.26	48.29	57.87	66.29	70.75	77.96	77.41	73.16
Manipur	49.45	48.94	36.97	55.79	51.11	55.36	57.76	54.79	53.74	53.61	58.20	59.46	66.67	75.45	91.38	103.61	106.99	89.42
Meghalaya	54.15	52.46	53.37	51.04	60.65	66.74	66.87	69.61	63.50	60.46	55.96	52.29	55.49	53.33	53.87	71.86	79.88	91.15
Orissa	43.07	36.62	42.01	41.81	46.60	46.57	48.60	49.27	47.15	40.72	45.13	52.27	66.29	72.45	68.39	73.61	75.48	79.55
Punjab	76.14	77.99	82.41	86.08	88.85	88.37	88.24	80.61	80.77	79.54	84.35	86.35	102.65	120.69	126.79	104.57	119.08	136.97
Rajasthan	73.35	70.11	78.84	82.24	66.41	64.95	65.13	62.49	59.51	62.86	69.40	68.98	80.66	90.80	93.73	94.60	100.69	87.31
Tamil Nadu	58.58	64.21	68.55	66.87	60.98	59.92	60.91	60.66	60.80	63.60	63.00	70.80	87.35	98.59	94.93	115.49	135.37	120.58
Tripura	46.88	51.98	54.80	61.63	62.08	56.73	58.33	75.27	80.06	75.54	79.24	80.78	74.05	71.62	85.47	98.56	98.36	94.18
Uttar Pradesh	49.40	53.00	56.75	55.53	54.88	55.55	54.91	51.88	50.46	52.68	55.43	56.44	65.01	71.90	77.63	84.71	86.61	107.05
West Bengal	45.84	51.45	56.79	55.64	58.06	57.23	56.49	59.49	62.41	62.25	61.20	60.34	67.16	80.25	86.97	95.42	98.87	129.30
India	50.24	52.05	55.46	55.81	55.89	55.12	54.83	54.98	53.93	54.77	56.78	59.79	64.86	71.91	76.95	81.67	89.99	90.76

Annexure 4: Evaluating MGNREGA projects and their impact on farm labour

Work under the MGNREGA is available all around the year, not just during the lean agricultural season. This means that there could be a high probability of the MGNREGA assignments displacing or competing with agricultural labour requirements during the sowing and/or harvesting of crops. We test this assumption using the MGNREGA data for the last five years on "employment pattern during the year" from the Ministry of Rural Development of the Government of India (MGNREGA, GOI, 2020).

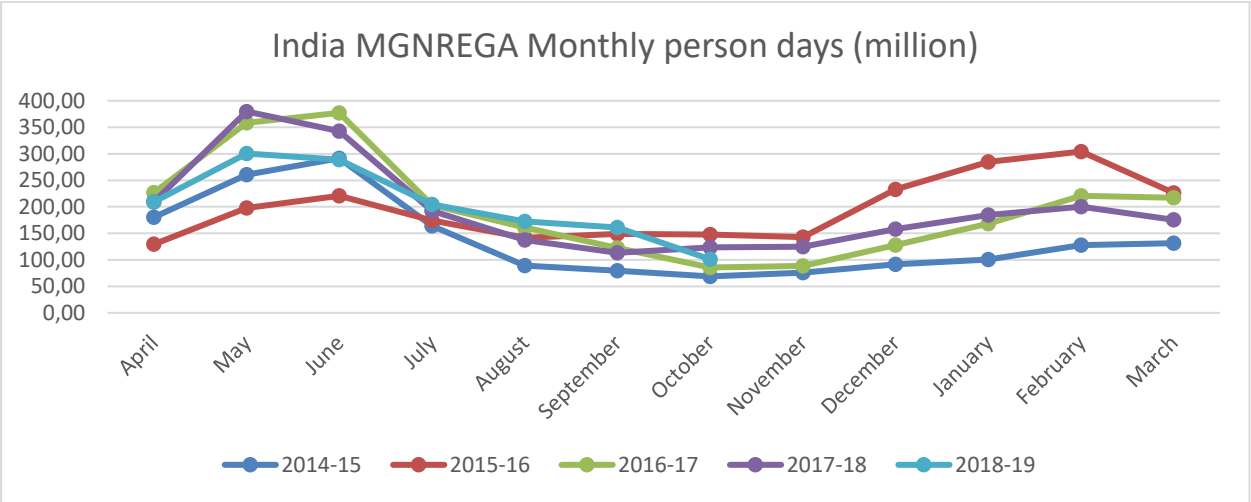

Figure 11: Monthly pattern of the MGNREGA jobs

Source: Data from MGNREGA, GOI (2020).

A clear cyclical pattern emerges from Figure 11. Employment under the MGNREGA peaks in the months of May and June, starts to fall from July onward, and reaches bottom in the months of October and November, before beginning to rise thereafter peaking around February to fall yet again till April, before it begins to rise again. To evaluate if historically the MGNREGA jobs have displaced labour from farms we compare Figure 11 with Figure 12 below.

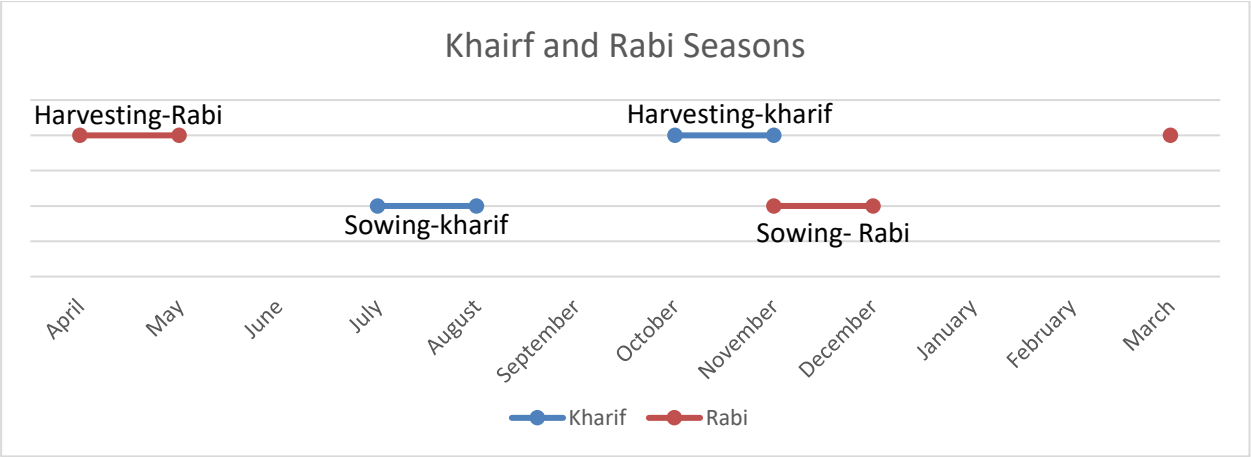

Figure 12: Mapping agricultural seasons in India

Source: Authors' interpretation based on paddy (*kharif*) and wheat and gram (*rabi*) marketing seasons.

The country mainly has two marketing seasons - *kharif* and *rabi*. Under *kharif*, the crop is sown in the months of July-August and harvested around October-November and in the *rabi* season, the crop is sown around November-December and harvested in the months of March-April-May. This crop calendar varies between states based on their climatic conditions, types of crops, and type of seeds used, among other things.

India's main agricultural season is *kharif* because more than half of the country's gross cropped area (GCA) of 198 million hectares depends on rain for irrigation (only 48 per cent of the country's GCA is irrigated). Inadequate access to irrigation limits the country's cropping intensity (which is about 41 per cent as per DES, GOI for TE 2014-15) and its ability to take on a *rabi* crop. This means that for most of the year and for most states, the labour will be required mainly during the *kharif* season. A relook at Figures 11 and 12, shows that for most of the *kharif* marketing season, i.e., the period from July/August to October/November, the number of person days created under the MGNREGA was low. That means that farm labour is available and is not absorbed under the MGNREGA.[29]

Overall, it appears that MGNREGA jobs may not actually be displacing or competing with agricultural labour. In fact, a limited impact of MGNREGA on the overall rural labour market was observed, because:

a. A lower number of employment days were provided under the scheme as the average number of days per year delivered to a participating household were less than 50 days. Less than 10 per cent of households who participated under the MGNREGA completed 100 days of work.

[29] However, a strain caused by the MGNREGA is visible in case of rabi. For states which take rabi crops, higher numbers of MGNREGA jobs during the sowing months of November and December reduce the labour available on farms. Nevertheless, this situation improves with the arrival of the rabi harvest months of March-April-May when jobs under the MGNREGA are back at a low level.

b. Only 14 to 16 per cent of all Indian workers benefitted under the MGNREGA.

c. In several states, the MGNREGA wage rate was found to be lower than the stipulated minimum wage under the Minimum Wage Act. The gap was the largest in the case of Andhra Pradesh, where the MGNREGA daily wage was about INR 56 below the stipulated minimum wage.

d. The MGNREGA is not likely to displace or competing with agricultural labour during the important months of sowing and harvest.