Estimation of seasonal surplus labour in agriculture in different agro-climatic regions of Rajasthan

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ARTICLE INFO	ABSTRACT
	The present investigation was undertaken with a view to estimate the total surplus labour in agriculture to get an idea of how far agriculture provides employment to those who are fully engaged in it. The author then estimates the extent of surplus labour which is removable and the extent of seasonal surplus labour in different agro-climatic regions of Rajasthan as well as state as a whole. For this study, the primary data were collected from 200 households of 10 villages during 2018- 2019 and secondary data were used from census 2011. The results showed that there exists the total surplus labour ranging from 49.45 % in arid western and northern plain region to 80.13 % in semi-arid and flood prone region with the state level estimate of 68.33 % of labour availability. It was estimated that at the state level seasonal surplus labour is 10.51 % of the labour availability. Across the regions, the seasonal surplus labour ranges from 5.93 % in sub-humid and humid southern plain region to 19.61 % in arid western and northern plain region. This cause the unemployment, lower productivity of labour and migration of labour. To overcome such type of problems initiative to integrate MGNREGA with agriculture, create additional income opportunities for agricultural labourers, entrepreneurship training, small scale industries, and establishment of agri-business units.

Introduction

The term labour absorption means the total labour that is used or utilized in the process of production. The terms absorption and utilization, which are interchangeably used, refer to the labour employed rather than the labour required in agriculture. The actual labour employed may be more or less than the labour required. Labour required is the amount of labour to be put in the production process to get the optimum production. Due to seasonality factor in agriculture, it is very difficult to use the necessary amount of labour required. Farmers may employ less than the required number of workers in the peak season due to shortage of labour at higher

wage rates and more in the lean season due to social obligations that would force the farmers to accept extra hands every day (Chand and Srivastava, 2014). Inelastic supply of labour in peak season leading to mechanization and lack of demand for labour in lean season is the major problem in agriculture sector. Peak season being of very short duration the stress is always on the demand side of labour market. According to population census 2011, the total population of Rajasthan state is 6.85 crore of which male and female are 3.55 crore and 3.29 crore, respectively. Out of the total population in Rajasthan, the total

workers comprise 43.60 % (i.e. 2.99 crore). Out of these total workers, cultivators and agricultural labourers are 1.36 crore (45.6%) and 0.50 crore (16.5%), respectively. Agricultural workers constitute the most neglected class in Rajasthan's rural economic structure. Their income is low and employment is irregular. Since, they possess no skill or training, they have no alternative employment opportunities. Fragmentation of land holdings is major reason for increase in agricultural labour over the years.

Despite a large labour force in India, the labour shortages at peak period of agricultural activities are acute in agriculture. This problem has been compounded by the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA). It seems that MGNREGA has made a perceptible difference to the 'choice of work' of the casual labour in rural and semi urban areas. It has not only increased the base wage rates but has also affected the timely operations in agriculture and thereby productivity levels. The farm-wages have shot up in many states indicating switching over towards improved techniques. According to ISEC, Bangalore, India's flagship rural wage employment scheme is causing a labour shortage for agriculture, besides increasing farm production costs by about 20 percent. The study also said that the National Rural Employment Guarantee Scheme launched in 2006 "has weaned away agricultural labour during the *kharif* sowing season that lasts from July to August during the southwest monsoon period". Ever since the scheme came into being, daily wages in the farm sector have shot up by a whopping 50 percent (Kumar and Maruthi, 2011).

Surplus labour is not really surplus unless it is such as could be mobilized for development need. For instance, it is not proper to compute surplus labour by assuming 365 days available per worker, because in reality a worker is not available for farm work for all the day in a year. Similarly, one has taken into account the labour days spent in different activities in agriculture. Farm workforce does not confine itself to crop production, & so any attempt to compute surplus by considering labour spent in crop production only would to an upward bias of surplus. One more important activity to be consider i.e., tending of cattle; considerable amount of labour is utilized for this purpose. Likewise, an estimate of surplus labour of the farm family

workers engaged in self cultivation should also considering days spent in crop production and related activities. Any attempt to estimate surplus without considering the seasonality of employment would again give an incorrect picture of the real situation. The surplus estimated, thus, would not be free from the seasonality factor and any idea of removing the surplus from any farm work would affect the peak period labour requirement.

The surplus or redundant labour in agriculture, which is a typical feature of developing countries, is believed to be one of the consequence of or causes of economic backwardness. Most of the developing countries undergo from excess population growth, and the quantum of labour surplus varies from region to region depending on the structural characteristic of the region. In this context the present study investigated the region wise labour absorption in principal crops & livestock activities, labour availability and seasonal surplus labour in each agro-climatic region as well as state level in Rajasthan.

Material and Methods

In Rajasthan there are five agro-climatic regions which is subdivided into 10 agro-climatic zones. In the first stage, one district from each agro-climatic zones were selected on the basis of highest gross cropped area. From 10 agro-climatic zones, total 10 districts were selected for the study. The selected districts were Hanumangarh, Bikaner, Nagaur, Jodhpur, Jaipur, Alwar, Bhilwara, Udaipur, Baran and Jhalawar. In the second stage, one tehsil from each selected district was selected randomly. Thus, 10 tehsils were selected randomly from 10 districts for the study. The name of 10 selected tehsils were Hanumangarh, Nokha, Nawa, Luni, Bassi, Bansur, Shahpura, Vallabhnagar, Krishnganj and Jhalrapatan. In the third stage one village from each selected tehsil was selected randomly. And in the final stage twenty farmers from each village were selected according to five standard size classes i.e. marginal (<1 ha), small (1-2 ha), semi-medium (2-4 ha), medium (4-6 ha) and large (>6 ha) making random selection within each category size. Thus, 200 farmers were selected from the chosen 10 districts of five agro-climatic regions, respectively. The systematic flow chart of sampling procedure is given in Figure 1. The principal crops those covering more than 75 % of the gross cropped area
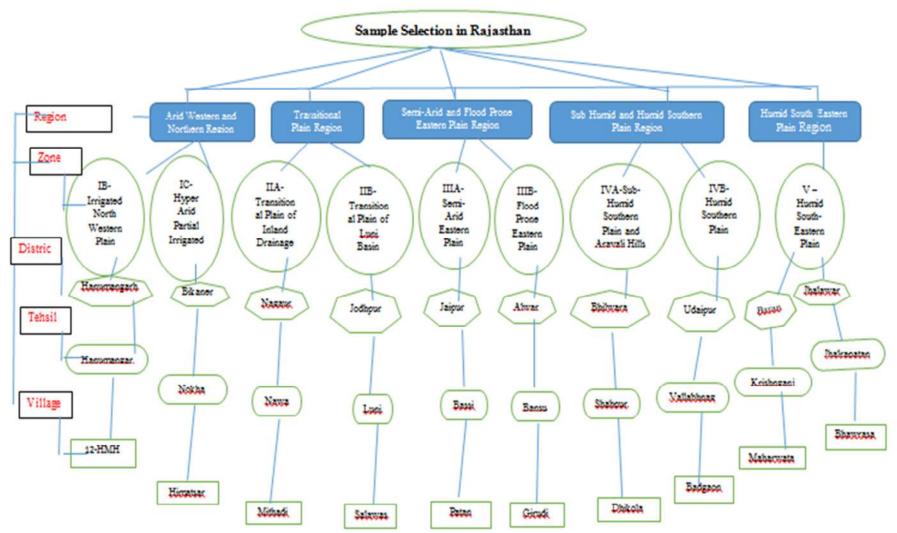
Figure 1: Five Agro-climatic Region of Rajasthan State

(GCA) in each district were selected purposively to estimate the labour absorption in crop production. The study was based on both primary and secondary data for the analysis. The primary data from the farm household was collected by personal interview based on specially designed comprehensive schedule. Secondary data were collected from the various administrative reports, government publications, surveys, records, articles, and official documents from 1981 (three decades) onwards and primary data for the year 2018-2019 was used for the present study.

Estimation of surplus labour in agriculture

The method of estimation of surplus labour in various studies can be categorized as "Indirect" and "Direct" methods. The indirect method has been used in its three variants;

(i)   The number labour hours required to produce a given output is subtracted from the number of labour hours available from the active agrarian population.

(ii)   The density of population deemed adequate for a given type of cultivation is subtracted from the actual density of the population, and

(iii)   The number of hectares required under a given type of cultivation to provide one person with a standard income is contrasted with the number of hectares and the agrarian population available.

However, Roden (1957) described that out of these two methods, direct method is the only satisfactory method based on empirical investigations with questionnaires distinguishing different cultivation practices, size and forms of property and composition of labour force. Indirect method does not give any clear idea about the extent of surplus labour. At the most, these methods can be used to test whether there exists surplus labour or not. Therefore, the present study chose direct method of estimation procedure was chosen for the study as used by Roden (1957), Rudra (1973), Reddy (1988) and Parthasarthy (1990) with some modifications in their assumptions.

The present study estimated the available labour time of agricultural work force and total labour time actually utilized in crop production and other allied activities with the current level of technique and organization. The difference between the two would provide the extent to which available labour time is actually unemployed and hence the study estimated the resultant surplus labour. Three sets of surplus labour estimates were made separately, namely, total, removable and seasonal (non-removable) surplus for each of the agro-climatic region and for the state as a whole.

Estimation of available labour time in agriculture: Cultivators and agricultural labourers are the two main constituents of agricultural work force. Though, there is some seasonal migration of agricultural labourer to agriculturally developed regions from agriculturally backward regions. Due to absence of any such reliable data region wise, it was not included in the present study. Gender wise population of cultivators and agricultural workers in each district were obtained from population census report of 2011. This census data was then extrapolated by the annual rate of growth of population to get the figure for 2018-19. Total number of labour available in agriculture sector were then converted into man-days considering availability for employment 300 days for male workers and 270 days for female workers. A lower level of female labour availability was considered because in traditional Indian household, irrespective of being employed or not, females manage most of the household responsibilities including bringing up the children and maternity related demands. Besides, female labour demand is by and large, seasonal/operation specific (Parthasarthy, 1990). It is pertinent to mention here that estimates of available labour time in the present study were made by accounting main and marginal workers. Main workers are the workers who work for more than six months in a year, while marginal workers are those who work for less than six months in a year.

Estimation of surplus labour: The difference between total available labour time as estimated in Table 1 and total labour time actually utilized for carrying out crop production and livestock activities as estimated in Table 2 was taken as an estimate of surplus labour. These region wise estimates show the extent to which agriculture provides employment to agricultural work force. This is known as disguised unemployment as this surplus is not altogether removable. This surplus includes both seasonal (non-removable) as well as removable surplus. Therefore, three sets of surplus labour estimated consisting of total, removable and

seasonal (non-removable) surplus were separately worked out for five agro-climatic regions as well as state level as a whole.by summing up estimates of all the regions, estimates at the state level was arrived.

To arrive at region wise peak operational labour requirement in the crop production, the per hectare coefficient of peak operation labour use was worked out for each crop and multiplied by the respective area under different crops in each region. In order to compute peak operation labour use coefficient, the study considered labour use per hectare in peak operation of each crop multiplied by its crop duration. The estimates of peak operational labour requirement were deducted from the total available labour time to arrive at an estimate of removable surplus in the given region. The procedure can be expressed mathematically as follows.

$$L_{pi} = \sum_{c=1}^{J} A_{ic} . l_{pic}$$

Where,

L_{pi}= Total peak operational labour requirement in i^{th} region (man-days)

A_{ic}= Area under c^{th} crop in i^{th} region (hectares)

l_{pic} = Peak operational labour use per hectare throughout c^{th} crop duration in i^{th} region (man-days)

C= Number of crops grown in the region (1, 2, ----------j)

Removable surplus estimates in crop production were obtained in the following manner

$$L_{Ri} = L_{Ti} - L_{pi}$$

Where,

L_{Ri} = Removable surplus labour in i^{th} region (man-days)

L_{Ti} = Labour time availability in i^{th} region (man-days)

L_{pi} = Peak operational labour requirement in crop operation in i^{th} region (man-days)

Seasonal surplus labour in crop production is the extent of labour which is either not engaged or partially engaged during the lean season but is fully engaged during the peak seasons. Hence, this seasonal surplus is non-removable. In order to arrive at the seasonal surplus estimates, the difference between the peak operational labour requirement and the average labour use in crop production was estimate. Algebraically, the method can be expressed a s follows;

$$L_{Si} = L_{Pi} - L_{Ti}$$

Where,

L_{Si}= Seasonal surplus labour in the ith district/zone/region in man-days.

L_{Pi}= Peak operational labour requirement in the ith district/zone/region in man-days.

L_{Ti} = Average labour use throughout the year in i^{th}district/zone/region in man-days.

Results and Discussion
Estimates of Surplus Labour in Agriculture in Different Agro-Climatic Regions

The study follows the direct estimation procedure for surplus labour estimation as used by Reddy (1988) and Parthasarthy (1990). Focusing on the time dimension aspect of underemployment, the present study attempted to empirically estimate the magnitude of surplus labour engaged in agriculture in terms of utilized man-days across different agro-climatic regions of the state of Rajasthan. The estimates of surplus labour were worked out by comparing the total labour availability and total labour utilization in agriculture. First, total surplus labour was calculated considering labour use in crop production activities only (Table 1). In the crop production activities from land preparation, input procurement, sowing, inter-culture, fertilizer/manuring application, plant protection measures, irrigation, harvesting/picking, threshing upto marketing of farm produce were considered. Secondly, total surplus labour was estimated considering both labour use in crop production as well as livestock activities. In the third set peak operational labour usage in crop production was taken for the estimation of surplus labour. Seasonal surplus labour was also estimated as the gap between peak operational labour use and average labour use in crop production. This estimate shows the amount of seasonal unemployment in agriculture sector. For calculating total labour availability the number of cultivators and landless agricultural laborers were aggregated (including both main workers as well as marginal workers) from the census 2011 extrapolated by the annual rate of growth of population to get the figure for 2018-19 for Rajasthan.

Total available labour man-days in agriculture sector were 2416.30 million man-days in Rajasthan. Thus, 2416.30 million man-days of labour were

Table 1: Region wise Estimates of Surplus Labour in Rajasthan, 2018-2019 (million man-days)

SN.	Particulars	Arid Western and Northern	Transitional Plain	Semi-Arid and Flood Prone	Sub Humid and Humid Southern	Humid Southern Eastern Plain	State
				Regions			
1	Labour available	367.23	595.01	665.85	479.29	308.92	2416.30
2	Labour usage in crop production	131.15	163.19	92.91	62.55	50.62	500.42
3	Total surplus labour considering crop production only (1-2)	236.08	431.82	572.94	416.74	258.29	1915.88
4	Row 3 as % of row 1	64.29	72.57	86.05	86.95	83.61	79.29
5	Labour use in livestock activity	54.48	63.27	39.36	49.48	58.18	264.77
6	Total surplus labour considering crop production and livestock activity (3-5)	181.60	368.55	533.58	367.26	200.11	1651.11
7	Row 6 as % of row 1	49.45	61.94	80.13	76.63	64.78	68.33
8	Peak operational labour usage in crop production	203.15	244.82	135.20	90.95	80.33	754.44
9	Removable surplus considering crop production only (1-8)	164.08	350.19	530.65	388.34	228.59	1661.86
10	Row 9 as % of row 1	44.68	58.86	79.70	81.02	74.00	68.78
11	Removable surplus labour considering crop production and livestock (9-5)	109.60	286.92	491.29	338.86	170.41	1397.09
12	Row 11 as % of row 1	29.85	48.22	73.78	70.70	55.16	57.82
13	Seasonal surplus labour (8-2)	72.00	81.63	42.29	28.40	29.70	254.01
14	Row 13 as % of row 1	19.61	13.72	6.35	5.93	9.61	10.51

Table 2: Region wise Comparison of Total Human Labour Utilization between Crop Activity and Livestock Activity in the State of Rajasthan

SN	Particulars	Arid Western and Northern Region		Transitional Plain Region		Semi-arid and Flood Prone Eastern plain Region		Sub humid and Humid Southern Plain Region		Humid Southern Eastern Plain Region		State	
	Total human labour absorption	LACA	LALA	LACA	LALA	LACA	LALA	LACA	LALA	LACA	LALA	LACA	LALA
1	Male	12.84 (32.48)	12.60 (23.13)	17.50 (36.89)	17.28 (27.31)	15.70 (32.22)	8.76 (22.26)	20.51 (33.84)	9.53 (19.26)	11.16 (19.26)	40.05 (28.79)	14.67 (32.58)	13.70 (33.18)
2	Female	26.69 (67.52)	41.88 (76.87)	29.95 (63.11)	45.99 (72.69)	33.02 (67.78)	30.60 (77.74)	40.10 (66.16)	39.95 (80.74)	27.60 (80.74)	18.13 (71.21)	30.36 (67.42)	27.58 (66.82)
3	Total Labour Absorption	39.53 (100.00)	54.48 (100.00)	47.45 (100.00)	63.27 (100.00)	48.72 (100.00)	39.36 (100.00)	60.61 (100.00)	49.48 (100.00)	38.76 (100.00)	58.18 (100.00)	45.03 (100.00)	41.29 (100.00)
4	Share of Total Labour Absorption	42.05	57.95	42.86	57.14	55.31	44.69	55.05	44.95	39.98	60.02	52.17	47.83

LACA=Labour absorption in crop activities (man-days/hectare); LALA= Labour absorption in livestock activities (man-days/animal/year)
Figures in parentheses denote percentage of total labour absorption

available in Rajasthan in agriculture sector in 2018-19. Out of five regions of the state the highest labour availability was in semi-arid and flood prone (665.85 million man-days) followed by transitional plain (595.01 million man-days), sub-humid and humid southern plain (479.29 million man-days), arid western and northern plain (367.23 million man-days) and the lowest in humid southern and eastern plain (308.92 million man-days) (Table 1).

Labour utilization in crop production (row 2) is estimated to be 500.42 million man-days at the state level. Of this, transitional plain region accounts for the highest share (32.61 %) followed by arid western and northern plain (26.21 %), semi-arid and flood prone (18.57 %, sub-humid and humid southern plain (12.50 %) and humid southern and eastern plain (10.12 %).

The variations in labour availability across the regions is essentially because of agricultural work force availability differentials, while labour usage in crop production is the result of per hectare labour use, cropping pattern and gross cropped area of the respective regions (Reddy, (1989). Considering surplus labour estimates based on the crop production only (row 4), the results showed that there exists surplus labour ranging from 64.29 % in arid western and northern plain region to 86.95 % in sub-humid and humid southern plain region with the state level estimate of 79.29 % of labour availability respectively. A relatively lower level of surplus labour found in arid western and northern plain region is mainly on account of the fact that this region has availability of irrigation from Indra Gandhi Nahar Pariyojana (IGNP). Thus, relatively higher level of irrigation, fertilizer use, cropping intensity and cultivation of high labour intensive crops as compared to other regions. These results imply that cropping pattern in favour of the labour intensive crops and higher level of farming technology tends to enhance labour use.

Apart from crop production, 'livestock activity' constitute the other important engagements, especially carried out by agricultural workers. Thus, any attempt to estimate surplus labour by considering labour time spent only crop production alone would lead to an upward bias. Therefore, at the state level (row 7) total surplus labour taking into account crop production and livestock activity, turns out to be 68.33 % of the available labour. Across the regions, the total surplus labour ranges

from 49.45 % in arid western and northern plain region to 80.13 % in semi-arid and flood prone region. Out of five regions of the state, two regions namely, semi-arid and flood prone region and sub-humid and humid southern plain region have surplus labour higher than that at the state level (row 7). The labour utilization on livestock based activities in relation to other farm activities in different size groups of different regions under study indicated that labour utilization per farm family for livestock based activities is remarkably very high. This confirms the fact that livestock is an integral component of economic activities for income and employment generation in all the regions of the state. It provided an important economic base of farm families in rural areas as evidenced by the large share of employment by this activity. The estimates of total surplus labour seem to be high because it includes both removable as well as seasonal (non-removable) surplus labour. Removable surplus labour is the extent of surplus labour that can be removed from agriculture without affecting the output. In other words, this surplus labour is estimated by deducting peak operational labour usage from the labour availability. The estimates of removable surplus (row 12) turns out to be relatively higher in semi-arid and flood prone region (73.78 %) and sub-humid and humid southern plain region (70.70 %) compared to arid western and northern region (29.85 %) with the state level estimate of 57.82 %. Out of five regions of the state, two regions namely, semi-arid and flood prone region and sub-humid and humid southern plain region have higher percentage of removable surplus labour than that of state average.

The results broadly point out that the region with lower proportion of removable surplus labour (arid western and northern region) mainly comprise of developed region either agriculturally (by using new tools and techniques) and/or industrially. In contrast to this, higher proportion of removable surplus labour in semi-arid and flood prone region (73.78 %) and sub-humid and humid southern plain region (70.70 %) may perhaps be due to low level of agricultural development (use of new technology) which was due to water scarcity problem and fact that these regions from the hinterlands which explain the relatively large

proportion of worker's dependent on agriculture (Pal *et al.* (2018) and Kwan *et al.* (2018).

Seasonal surplus labour reflects that the labour are partly and wholly unemployed during the lean season but employed during the peak season. Therefore, removal of seasonal surplus labour would affect the peak season labour operations. Therefore, it is estimated as the difference between the peak period labour requirement and the average labour requirement throughout the year. The results (row 14) showed that at the state level seasonal surplus labour is 10.51 % of the labour availability. Across the regions, the estimates ranges from 5.93 % in sub humid and humid southern region to 19.61 % in arid western and northern region. The results indicated that in relatively developed region, i.e. arid western and northern region the seasonal surplus labour turn out to be higher due to larger peak operational labour requirement. In sub-humid and humid southern plain region and humid southern eastern plain region, the incidence of seasonal surplus labour is found to be relatively less. Out of five regions of the state, two regions namely, arid western and northern region and transitional plain region have higher percentage of seasonal surplus labour than that of state average.

The demand for labour in agriculture is characterized with high seasonality followed by inelastic supply of labour at peak season and lack of demand for labour in lean season. Inelastic supply of labour at peak season leading to mechanization and similarly lack of demand for labour in lean season is one of the major causes of poverty. Thus, result revealed the existence of surplus labour in the all regions of the state. However, nature and magnitude of surplus labour seem to be associated with development and socio-economic character of each region. In relatively developed region (arid western and northern region), there is higher seasonal surplus labour (i.e. more non-removable surplus) along with lower removable surplus labour. As against this, in relatively backward region sub-humid and humid southern region, the incidence of removable surplus labour is found to be relatively high along with relatively low level of seasonal surplus labour (non-removable). The high level of removable surplus in this region perhaps explains the generally observed phenomena of migration of agricultural labour to other developed

regions of the state and the country. These results were in conformity with Venu *et al.* (2016), Gunabhagya *et al.* (2017), Pal *et al.* (2018) and Kwan *et al.* (2018).

Conclusion

1. The study showed existence of seasonal surplus labour to the tune of 10.51 % of labour availability. This labour can be utilized through initiative to integrate MGNREGA with agriculture. This will improve the productivity of labour and also may check the seasonal migration of labourers.

2. The study emphasised the role and importance of livestock sector as the major employment generation sector of state economy. The potential of livestock sector for employment generation can be utilized by framing policies for creation of milk processing facilities, developing supply chains, cold chains and improvement of breeds.

3. Total available labour in agriculture sector was 2416.30 million man-days in Rajasthan in agriculture sector in 2018-19. Due to mechanization, labour absorption is being reduced and surplus labour is enormous in the state. Therefore, absorb this surplus labour by created through developing agricultural services, small scale industries, establishment of agri-business units to make them atmanirbhar.

4. The results showed that there exists surplus labour. This unemployment of agricultural labourers has negative impact on their income, consumption expenditure and savings. So there is need to create additional income opportunities for agricultural labourers.

5. In relatively developed region (arid western and northern region), there is higher seasonal surplus labour (i.e. more non-removable surplus) along with lower removable surplus labour. As against this, in relatively backward region sub-humid and humid southern region, the incidence of removable surplus labour is found to be relatively high along with relatively low level of seasonal surplus labour (non-removable).

Conflict of interest

The authors declare that they have no conflict of interest.

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