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Labour Demand and Labour-saving Options: A Case of Groundnut Crop in India

G. Govindaraj* and A.P. Mishra
Directorate of Groundnut Research (ICAR), Junagadh-362 001, Gujarat

Abstract

Groundnut is a labour-intensive crop, especially for operations like sowing, weeding, harvesting, and drying. But, of-late, due to timely unavailability of labour, many farmers are not able to exercise timely operations resulting in low yield realization. The present study conducted in two major groundnut-growing states, viz. Gujarat and Andhra Pradesh, has revealed that farmers employ more human labour in weeding and harvesting operations in groundnut than in other operations. The practise of manual decortication and stripping is followed by a larger number of farmers in Andhra Pradesh than in Gujarat, indicating less mechanization in the former. For weeding, though, the human labour-use in weedicide + bullock inter-cultivation + hand weeding technique is almost half of that of the bullock inter-cultivation + hand weeding, only 13 per cent of the farmers practise this labour-saving technique and hence this method should be disseminated in both the regions to reduce human-labour demand. In Andhra Pradesh, for all the operations in groundnut cultivation except harvesting, the cost as well as labour-use has been reduced substantially due to use of partial/complete mechanization methods. Hence, the necessary infrastructure (labour-saving machineries) should be created at the village or block level to reduce the human-labour demand.

Key words: Labour demand, Groundnut cultivation, Labour-saving techniques

JEL Classification: J23, J21

Introduction

Labour is an important input in the agricultural sector. In India, the labour force was of 520 million people during 2009-10, which is likely to increase to 574 million by 2014-15 (GoI, 2010a). Two-thirds of present workforce is employed in agriculture and rural industries, and one-third of rural households are agricultural labour households, subsisting on wage employment. Till the 1990s, Indian agriculture was considered as a labour-intensive agriculture due to high labour-capital (L/K) use. The employment elasticity in agriculture was 0.50 during 1987-88 to 1993-94 and it declined to 0.02 during 1993-94 to 1999-00, whereas, during the same period the employment elasticity in industries increased from 0.25 to 0.28 and in construction industry from -1.10 to 1.00 (Papola, 2006). It implies that employment generation was high in other sectors vis-à-vis agriculture, resulting in labour-pull from agriculture. The increased labour-pull caused strain in farm labour availability as well as raised wages in agriculture (Gupta and Sidhartha, 2011). It affected the performance of timely farm operations and thereby growth of the sector.

Groundnut (*Arachis hypogaea* L.) is an important leguminous oilseed crop grown in India. It occupies an area of 5.2 million ha with productivity of around 1180 kg/ha (2008-09). It is grown in semi-arid regions, especially, in the states of Gujarat, Andhra Pradesh, Tamil Nadu, Karnataka and Maharashtra (Basu and Singh, 2004). In India, 80 per cent of the groundnut crop is grown during *kharif* season under rain-dependent conditions. In the rainfed cultivation, the timely operation is very crucial to harvest better yields. Any delay in timely operations results in lower yields. Mostly it is the small and marginal farmers in the semi-

* Author for correspondence,
Email: mggraj@yahoo.co.in

arid regions of India who grow groundnut. The investment capacity of these farmers is limited. For several years, the labour, the important asset of these small and marginal farmers has been the major input investment in groundnut production. However, migration of labour (skilled, semi-skilled and unskilled) to urban areas for better-paid employment coupled with policy changes like implementation of Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) has made a profound impact on labour availability in the rural areas (Gupta and Sidhartha, 2011). Besides other resource constraints in groundnut cultivation, the un-availability of labour is also affecting the timely operation of different practices. On the other hand, though there are technology options to mitigate the human labour-demand in groundnut cultivation, small and marginal farmers are not able to adopt these technologies. The studies on labour-demand and cost of technology options especially in groundnut crop are limited in India. Hence, the present study was aimed at (i) assessing the expenditure pattern on different sources of labour in groundnut cultivation in the two major states of India, (ii) quantification of labour-use from different sources in groundnut cultivation, and (iii) estimation of cost incurred in labour-saving techniques, by operation.

Methodology

Both primary and secondary data were used in the present study. Secondary data on cost incurred on different labour sources in groundnut cultivation was collected from the report of Commission for Agricultural Costs and Prices (CACP), Directorate of Economics and Statistics, Ministry of Agriculture, Government of India, New Delhi. Multi-stage random sampling technique was adopted for the primary survey. At the first stage, states of Andhra Pradesh (1.5 M ha) and Gujarat (1.8 M ha) were selected purposively as these two states account for 53 per cent (3.3 M ha) of the total groundnut area in the country (GoI, 2010b). Then, one major district in each state [Anantapur (0.8 M ha) in Andhra Pradesh and Junagadh (0.4 M ha) in Gujarat], one taluk in each selected districts, one block in each selected taluks and three villages in each selected blocks were randomly selected. At the final stage, 90 respondents (45 in each of the selected districts) were randomly selected and interviewed using the pre-tested questionnaire during *kharif*-2010. Measures of central tendency and percentage analysis were used to assess the labour-demand and cost incurred on labour-saving techniques, by operation.

Results and Discussion

Expenditure on Different Sources of Labour in Groundnut Cultivation

In Gujarat, the expenditure on major labour sources in groundnut cultivation revealed that cost on human labour (23.0%) was highest, followed by bullock (9.3%) and machine (6.7%) labour. The same trend was observed in Andhra Pradesh state also (Table 1). In both the states, around two-fifths of the cost of cultivation was spent on different labour inputs. It could also be observed from Table 1 that the expenditure on mechanization energy sources was higher in Gujarat than Andhra Pradesh, implying higher mechanization in the Gujarat state. But, still there is lot of scope in both the states to adopt modern human labour-saving techniques in groundnut cultivation.

Table 1. Expenditure on different sources of labour in groundnut cultivation in Gujarat and Andhra Pradesh: 2005-06

(per ha)

Sources	Gujarat		Andhra Pradesh	
	Expenditure (₹)	Share in total cost of cultivation (%)	Expenditure (₹)	Share in total cost of cultivation (%)
Human labour	4554	23.0	5742	29.0
Bullock labour	1842	9.3	1640	8.3
Machine labour	1334	6.7	745	3.8
All labour sources	7731	39.0	8128	41.0
Total cost of cultivation	19812	100	19812	100

Source: *Report of Commission for Agricultural Costs and Prices* (2005-06), Directorate of Economics and Statistics, Ministry of Agriculture,Government of India, New Delhi.

Extent of Labour-use across Operations

The mean use of human, bullock and machine labour for different operations in groundnut cultivation by techniques are presented Table 2. The human labour hours used in groundnut cultivation across different operations, by techniques varied significantly (Table 2). In both Gujarat (Junagadh) and Andhra Pradesh (Anantapur), the weeding and harvesting operations used more human-labour hours vis-à-vis other operations in groundnut cultivation.

Decortication

Around 82 per cent of sample farmers in Andhra Pradesh practised manual decortication, which indicated little mechanization and more of drudgery. In contrast, 93 per cent of the farmers in Gujarat used machine decortication, indicating high mechanization. The difference between use of human labour in the two states was due to difference in capacity as well as access to machine (engine /electrical power)-operated decorticator. In all the surveyed villages in Gujarat, at least three machine decorticators were available, whereas in Andhra Pradesh, the decorticator was available in small towns and hence farmers had to travel long distances to decorticate groundnut pods and thus ending up in high transaction cost. Hence, mechanization of decortication operation is essential in Andhra Pradesh also to reduce the human labour-use and drudgery.

Land Preparation

In both the states farmers used either bullock or bullock + tractor or tractor as the means for land preparation. Majority of the farmers (62%) in Andhra Pradesh used bullock power alone for ploughing, whereas in Gujarat only 33 per cent of the farmers used bullock power. The use of partial mechanized methods (bullock+ tractor) was 44 per cent in Gujarat compared to only 13 per cent in Andhra Pradesh. However, tractor-use for land preparation was marginally higher in Andhra Pradesh than in Gujarat. The human labour-use between the two regions varied due to differences in soil type, number of ploughings undertaken and breeds of draught animal used for ploughing. The draught power used in Gujarat (Junagadh) is Gir cattle breed, which is larger in size compared to the Hallikar breed used in Andhra Pradesh (Anantapur). But, despite larger size of Gir cattle, the bullock power required for ploughing in Gujarat was high; it could be due to black cotton soil of this region, which needs more traction power vis-à-vis red soils in Andhra Pradesh.

Sowing

About 87 per cent farmers in Gujarat and 69 per cent in Andhra Pradesh used bullock-drawn seed drill for sowing groundnut. Around 20 per cent and 11 per cent of farmers used tractor drawn seed drill in Gujarat and Andhra Pradesh, respectively. Around 17 per cent farmers in Andhra Pradesh were still following non-mechanized method. It showed that there is a need of adoption of labour-saving techniques (partial or complete mechanization) by farmers in Andhra Pradesh.

Weeding

In groundnut, the loss in yield ranges from 13 per cent to 100 per cent depending on the season, cultivar, weed competition and package of practices adopted (Yaduraju *et al*., 1980; Kalaiselvan *et al*., 1994; Devidayal and Ghosh, 1999). To control weeds in the groundnut crop, about 83 per cent farmers in both the regions followed bullock-drawn inter-cultivation and hand weeding. Though, the human labour-use in weedicide + bullock inter-cultivation + hand weeding technique was almost half of that in the bullock inter-cultivation + hand weeding, only 13 per cent of the farmers practised this labour-saving technique in Gujarat. Hence, necessary efforts should be made to transfer this technique to farmers to reduce human-labour demand in groundnut cultivation. In Andhra Pradesh, human labour-use in manual weeding was almost twice that of bullock inter-cultivation + hand weeding and four-times that of the weedicide + hand weeding. Hence, the weedicide application in combination with other methods can reduce the labour demand significantly in the study regions.

Harvesting

In partially mechanized methods, the human labour-use reduces is almost 75 per cent than in the manual method. It was observed (Table 1) that in Andhra Pradesh, the majority of the farmers (90%) practised manual harvesting, while in Gujarat their number was small (13%). Hence, Andhra Pradesh farmers need to be trained and educated on adoption of labour-saving harvesting techniques. The necessary infrastructure

Table 2. Operation-wise human, bullock and mechanical labour-use in groundnut cultivation in Gujarat and Andhra Pradesh

Operation and technique	Gujarat					Andhra Pradesh				
	Number of samples (N=45)	Share (%)	Labour hours/ha			Number of samples (N=45)	Share (%)	Labour hours/ha		
			Human labour	Bullock pair	Machines			Human labour	Bullock pair	Machines
Decortication (150 kg pods)										
Manual	-	-	-	-	-	37	82.2	48.4	-	-
Hand decorticator	03	6.7	15.5	-	6.5	-	-	-	-	-
Machine decorticator (engine operated)	42	93.3	4.3***	-	1.6	08	17.8	9.6***	-	1.5
Land preparation										
Bullock	15	33.3	34.3	34.3	-	28	62.2	31.1	31.1	-
Bullock + tractor	20	44.4	17.0***	15.6	2.0	06	13.3	22.5**	18.0	2.5
Tractor	10	22.2	6.6***	-	6.6	11	24.4	5.5***	-	5.5
Sowing										
Behind country plough	-	-	-	-	-	09	20.0	36.0	18.0	-
Bullock drawn seed drill	36	80.0	6.5	3.5	-	31	68.9	14.5***	14.5	-
Tractor drawn seed drill	09	20.0	4.0	-	2.0	05	11.1	4.5***	-	2.5
Weeding										
Hand weeding	-	-	-	-	-	06	13.3	199.3	-	-
Bullock inter-cultivation + hand weeding	34	75.6	115.6	11.6	-	35	77.8	97.0***	7.0	-
Tractor inter-cultivation + hand weeding	06	13.3	102.0	-	6.0	-	-	-	-	-
Weedicide (pre-emergence) +Bullock inter- cultivation + hand weeding	05	11.1	62.0***	6.0	-	-	-	-	-	-
Weedicide (pre-emergence)+ hand weeding	-	-	-	-	-	04	8.9	59.0***	-	3.0
Harvesting										
Manual	06	13.3	84.0	-	-	41	91.1	72.0	-	-
Bullock digger + Manual	27	60.0	48.0***	6.0	-	-	-	-	-	-
Tractor drawn + Manual	12	26.7	42.5***	-	5.5	04	8.9	40.0***	-	5.0
Stripping/Threshing										
Manual	-	-	-	-	-	27	60.0	160.0***	-	-
Threshers	45	100	32.0	-	8.0	18	40.0	28.0	-	07

Note: * t-test for human labour use (pair-wise comparison, i.e. conventional vs improved) in different improved techniques was done seperately for Gujarat and Andhra pradesh; *** and ** indicate 1per cent and 5 per cent significant levels, respectively

Table 3. Operation-wise cost incurred in groundnut cultivation in Gujarat and Andhra Pradesh

(per hectare)

Operation and technique	Gujarat		Andhra Pradesh	
	Cost* (₹)	Change over conventional techniques (%)	Cost* (₹)	Change over conventional techniques (%)
Decortication (150 kg pods)				
Manual	-	-	500	-
Hand decorticator	300	-	-	-
Machine decorticator (engine operated)	380	+26.7	250	-50.0
Land Preparation				
Bullock	2613	-	2400	-
Bullock + tractor	2869	+9.7	2200	-8.3
Tractor	3125	+19.6	2000	-16.7
Sowing				
Behind country plough	-	-	2400	-
Bullock-drawn seed drill	937	-	1500	-37.5
Tractor-drawn seed drill	1187	+26.7	1400	-41.6
Weeding				
Hand weeding	-	-	2500	-
Bullock inter-cultivation + hand weeding	3600	-	2300	-8.0
Tractor inter-cultivation + hand weeding	3600	0.0	-	-
Weedicide (pre-emergence) + Bullock Inter- cultivation + hand weeding	2145	-40.4	-	-
Weedicide (pre-emergence)+ hand weeding	-	-	1750	-30.0
Harvesting				
Manual	2800	-	2200	-
Bullock digger + manual	2000	-28.6	-	-
Tractor drawn + manual	2575	-8.0	2400	+9.0
Stripping/Threshing				
Manual	-	-	3000	-
Threshers	1225	-	1500	-50.0

Note: *Costs were calculated based on the market wage rates, rental value of the machineries and chemicals prevailing during *kharif* 2010 in the study area

should be created at the village or block level for dissemination of higher adoption of improved techniques.

Stripping/Threshing

In Gujarat, almost all the sample farmers and in Andhra Pradesh only 40 per cent farmers practised mechanical threshing to separate groundnut pods. The manual stripping method requires about 160 human labour hours per hectare, whereas only one-fifth of it is required in mechanical threshing. Hence, the necessary infrastructure has to be developed and awareness has to be generated among farmers in Andhra Pradesh to reduce the labour-requirement for threshing operation.

Operation-wise Cost Incurred across Techniques in Groundnut Cultivation

In Gujarat, the cost incurred for a given operation was found to differ considerably between the techniques. For decortication, land preparation and sowing operations the cost incurred in improved

techniques (partial/complete mechanization) was higher than conventional methods (Table 3). However, the human labour use was substantially low for these operations in the improved techniques (Table 2). It is concluded that there is marginal increase in cost, in the labour-saving techniques compared to the conventional methods. However, the savings due to less labour hours used/required (e.g. in Gujarat, the human labour hours needed for hand decortication were 15.5 and only 4.3 with engine-operated decorticator and thus, there was a saving of 11.2 person-hours) will outweigh the incremental cost incurred on improved techniques. Hence, depending on the investment capacity of farmers, the extent of labour demand-supply gap for a particular operation and cost on improved techniques, the farmers can adopt the appropriate improved methods. In weeding and harvesting, the cost as well as the human labour-use in improved techniques reduced substantially. Hence, the least cost- production techniques in weeding (pre-emergence weedicide + hand weeding) and harvesting (bullock/tractor digger) have to be popularized among the farmers. In Andhra Pradesh, for all the operations in groundnut cultivation except harvesting, the cost as well as labour-use reduced substantially due to use of partial/complete mechanization methods. The maximum reduction in cost (50%) and labour-use was observed in machine decortication and stripping/threshing operations over the conventional methods. Hence, the promotion of low-cost improved techniques is necessary not only to reduce human labour-use, but also to reduce the cost of different operations.

Summary and Conclusions

Despite a large labour force in India, the labour shortages are acute in agriculture. It has not only increased the base wage rates but has also affected the timely operations and thereby productivity levels. The farm-wages have shot up in many states indicating switching towards improved techniques. In the groundnut cultivation, the adoption of partial/ mechanization methods has been found high in Gujarat *vis-a-vis* Andhra Pradesh showing moderate mechanization in Gujarat state. But still there is lot of scope in both the states to adopt modern labour-saving techniques in groundnut cultivation. In Anantapur, for all the operations in groundnut cultivation except harvesting, the cost as well as labour-use have been substantially less due to use of partial/complete mechanization methods. Since most of the groundnut-growing farmers are marginal and small, the investment on improved techniques, especially machines is a costly affair and hence a mechanism of "custom hiring of machines" has to be evolved and popularized at "village or block level" to reduce the labour demand for different operations in agriculture.

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