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COVID-19 Pandemic: Impact of Agricultural Labour Migration on Income Levels of Farmers in Telangana

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ABSTRACT

The present study was undertaken during 25th March 2019 to 25th March 2021 to examine the impact of agricultural labour migration due to COVID-19 pandemic on the income levels of farmers. Both primary and secondary data were used in the study, multistage sampling technique was used in selection of district, mandals and villages. Tools and techniques like tabular analysis, gross returns and net returns were used. Economic impact on farmers in the study area was studied by selecting three major crops viz., Paddy, Cotton and Maize. During the COVID-19 pandemic, in the *kharif* and *rabi* season, in all the three major crops, the labour availability was increased when compared with the period of before the pandemic. This situation was appeared due to reverse migration during pandemic. The average wage rates received by the agricultural labourers for almost all farm operations in case of paddy, maize and cotton crops were decreased due to increase in labour supply due to reverse migration. The available man days also clearly got increased for almost all the operations except harvesting of paddy and cotton crops. In case of paddy and cotton crops, net returns were found to increase. In case of Maize crop, the gross and net returns were decreased due to increase in total operation costs and decrease in price per quintal during *rabi* season of the pandemic period respectively.

KEYWORDS: Agriculture, COVID-19, farm income, labour migration, wage rates

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1. INTRODUCTION

Agriculture is not merely a profession in India; it is a way of life for the natives. It plays a significant role in deciding the well-being of the people of the nation.it provides employment to 48% of population. Due to the sudden global pandemic that started in 2019 and spread across the globe in 2020, the Indian economy in general and the farm sector, in particular, were affected severely (Harris et al., 2020, Ceylan et al., 2020). The COVID-19 pandemic was considered a big global health sector disaster of the century and the biggest challenge faced by mankind after World War-II. It was caused by the novel SARS Corona virus and it emerged in a city named Wuhan in China (Ives and Bozzuto, 2021, Ivanov, 2020). It has swept over the globe like wildfire. More than 246 million cases have been confirmed as of October 2021, with more than 4.99 million deaths, and it has become a global economic issue too (Phillipson et al., 2020, Cash and Patel, 2020, Stephens et al., 2020).

Due to the lockdown imposed in view of this COVID-19 pandemic since 25th March 2020, there emerged conditions like shortage of labour supply, breakage of farm product supply chains at global level and domestic disruption in collection of farm produce from farms by the routine setup, disruption in logistic network, interstate blockage in the transport of commodities, closed down of many retail markets and also during this period, farmers faced difficulties in mobilizing of labour for various farm operations like harvesting, threshing, packing etc. (Mishra et al., 2021, Roubik et al., 2022, Dandekar and Ghai, 2020, Kumar and Anwer, 2020). The lack of labour has hampered agricultural operations in the variety of crops (Unni, 2020, Workie et al., 2020). Some crops that benefit from technology for harvestings such as paddy and wheat were insulated against these abrupt changes as they do not require a huge number of manual labourers (Srivastava et al., 2017, Lindsay, 2021). The increased usage of automated paddy harvesters has aided during the situation though their interstate movement had been severely hampered (Singh et al., 2020).

As a result of supply chain disruption and fall in the aggregated demand in the farm market, the average price received by the farmers has also decreased for many crops. The trends in retail prices were markedly different for many crops, the price of certain food crops too hiked mainly due to supply chain disruption (Eileen et al., 2021, Lin and Zhang, 2020, Reardon et al., 2020). The affects were more distinct in the case of allied activities such as dairy, poultry and fisheries, particularly during the lockdown (Galanakis, 2020, Lese et al., 2021) The demand for milk decreased due to the procurement of milk by co-operatives was disrupted. Many of the people faced food insecurity (Barichelle, 2020, Singh et al., 2020 Torero, 2020, Weersink et al., 2021). The government took a number of quick actions, including increasing the effectiveness of healthcare and management, implementing lockdowns to confirm social exclusion, advising suspected individuals to remain at home, delivering essential services to residents' homes, recommending effective surveillance and tracing, etc. (Jha et al., 2020).

The COVID-19 pandemic and the lockdown are already having a devastating impact on the economy as it has pushed the economy into the recession stage and there is every possibility of moving into depression, if the system fails to control the present situation. At the present juncture, Indian agriculture is facing the problems of labour scarcity, high input costs low remunerative prices to cultivators, low capital formation etc. and due to the effect of the present pandemic, the scenario is going to be changed, but in which direction and in what magnitude is not certain as of now. Hence, by keeping all these issues in consideration, a study on the impact of agricultural labour migration on income of farmers before and during the COVID-19 pandemic.

2. MATERIALS AND METHODS

Primary data required for evaluating the specific objective designed for the study was collected from sample farmers. The data collected covers the period of 25th March 2019 to 25th March 2021. Multistage sampling technique was used in selection of districts, mandals and villages. In the first stage Mahabubnagar district (16.7488° N, 78.0035° E) of Telangana state was purposively selected, as it is one of the districts with highest labour force partition rate with 723 out of 1000 persons. (as per perioric labour force survey 2017-18) Similarly, in the second stage two mandals namely Devarakhadra and Jadcherla were selected based on highest registered agricultural labour population. In the third stage, two villages from each selected mandal were selected based on highest registered agricultural labour population *viz.*, Kodgal, Gangapur villages were selected from the Jadcherla mandal and Nagaram and Koukuntla villages were selected from Devarakhadra mandal. From each selected village, 15 farmers were selected randomly thus totally 60 farmers were selected. The required primary data was collected from sample farmers by using a pre-tested questionnaire and secondary data collected from various related public organizations, reports published by different institutions and official websites of different organizations. Various tools and techniques like cost concepts and tabular analysis (Figure 1).

2.1. Tabular analysis

Tabular analysis involving the computation of means, percentages and ranges *etc.* were used to present the data.

2.2. Gross returns

Value of main product plus byproduct was estimated. The

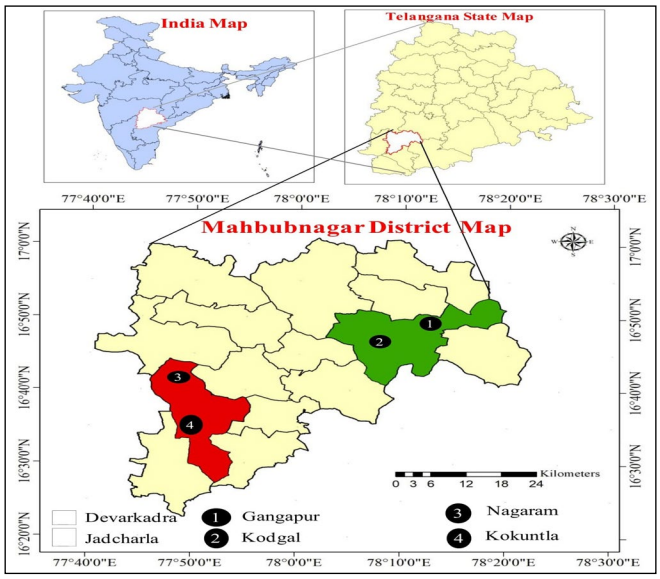

Figure 1: Pictographical representation of study area

main productsand byproducts were imputed taking into the actual market priceor the village level prices prevailed at the time of enquiry.

Net returns=Gross income-Total cost of cultivation …. (1)

3. RESULTS AND DISCUSSION

The migration of labour primarily engaged in farm and non-farm activities reduced during COVID-19 pandemic except for few months of lockdown. This has created an impact on income levels of farmers. As there was lockdown in the urban areas, migrant agricultural labourers returned to their native places, which resulted in increase in availability of agriculture labour to the farmers and decrease in labour costs.

3.1. Impact of agriculture labour migration on income levels of farmers due to COVID-19 pandemic

The migration of labourers primarily reduces the availability of labour for agricultural activities at the village level, which was happening even before the COVID-19 pandemic and has created a scarcity of labour available for farm work. As there was a shortage of labour, the agricultural labourer wages had increased the cost of cultivation in the agriculture sector. Whereas there was a different situation during the COVID-19 pandemic. Due to the return of migrant agricultural labourers to their native villages during the pandemic lockdown, the availability of agricultural labourers was increased and wage rates and cost of cultivation were decreased. The details of labour utilization patterns during the *kharif* season are presented in Table 1.

It was noticed from Table 1 that before the COVID-19 pandemic i.e., during 2019–2020, in case of Paddy crop, majority of the agricultural labourers were utilized for intercultural operations (36.59%) followed by transplanting (24.68%), harvesting (14.21%), manures and fertilizer application (8.57%), pesticide/fungicide application (8.15%) and land preparation (7.78%) respectively. There was a

Table 1: Labour utilization pattern of sample farmers during kharif season before and during COVID-19 pandemic (Operation wise)

Sl. No.	Farm operation	Paddy (ha^{-1})			Cotton (ha^{-1})		
		Before COVID-19 pandemic (Man days)	During COVID-19 pandemic (Man days)	Change over (Man days)	Before COVID-19 pandemic (Man days)	During COVID-19 pandemic (Man days)	Change over (Man days)
1.	Land preparation	4.61 (7.78)	5.45 (8.69)	+0.84 (18.22)	2.71 (3.39)	2.83 (3.42)	+0.12 (4.42)
2.	Sowing/ Transplanting	14.62 (24.68)	15.83(25.21)	+1.21 (8.27)	4.96 (6.20)	6.14 (7.42)	+1.18 (23.79)
3.	Manures and fertilizers	5.08 (8.57)	5.97 (9.51)	+0.89(17.51)	5.55 (6.95)	5.90 (7.12)	+0.35 (6.30)
4.	Intercultural operations	21.68 (36.59)	23.65(37.67)	+1.97 (9.08)	37.74 (47.24)	40.74(49.22)	+3.00 (7.94)
5.	Pesticide/fungicide application	4.83 (8.15)	5.40 (8.60)	+0.57 (11.80)	8.03 (10.05)	7.67 (9.26)	-0.36 (-4.48)
6.	Harvesting/ Picking	8.42 (14.21)	6.48 (10.32)	-1.94 (-23.04)	20.90 (26.16)	19.48(23.53)	-1.42 (-6.79)
	Total	59.24 (100.00)	62.78 (100.00)	+3.54 (5.97)	79.89 (100.00)	82.76 (100.00)	+2.87 (3.59)

Note: Figures in the parentheses indicate %

change observed during the COVID-19 pandemic i.e., in 2020-2021, majority of the agricultural labourers were utilized for inter cultural operations (37.67%) followed by transplanting (25.21%), harvesting (10.32%), manure and fertilizer application (9.51%), pesticide/fungicide application (8.60%) and land preparation (8.69%) respectively. The positive change was observed in land preparation, transplanting, manures and fertilizers, intercultural operations and pesticide/fungicide application with 18.22, 8.27, 17.51, 9.08 and 11.80% respectively. A negative change was observed in case of harvesting with -23.04%.

In cotton crop before the COVID-19 pandemic i.e., during 2019–2020, majority of the agricultural labourers were utilized for intercultural operations (47.24%) followed by picking (26.16%), pesticide/fungicide application (10.05%), manures and fertilizer application (6.95%), sowing (6.20%) and land preparation (3.39%) respectively. There was a slight change observed during the pandemic i.e., in 2020–2021, the majority of the agricultural labourers were utilized for intercultural operations (49.22%) followed by picking (23.53%), pesticide/fungicide application (9.26%), sowing (7.42%), manures and fertilizer application (7.12%) and land preparation (3.42%) respectively. The positive percentage change was observed in land preparation, transplanting, manures and fertilizers and intercultural operations with 4.42, 23.79, 6.30 and 7.94% respectively. The negative change was observed in picking and pesticide/fungicide application with -6.79 and -4.48% respectively. It can be concluded that, during the COVID-19 pandemic, in the *kharif* season, both in the paddy crop and cotton crop, the labour availability has increased by 5.97% and 3.59% respectively when compared to before the pandemic period, it is mainly due to an increase in return migration of migrant agricultural labour.

The details of labour utilization patterns of sample farmers during *rabi* season, before and during the pandemic were presented in Table 2.

It was noticed from Table 2 that before the COVID-19 pandemic i.e., in 2019-2020, in case of paddy crop, the majority of the agricultural labourers were utilized for intercultural operations (36.06%) followed by transplanting (26.47%), harvesting (12.01%), pesticide/fungicide application (9.31%), manures and fertilizer application (8.20%) and land preparation (7.93%) respectively. The scenario was different during the pandemic i.e., in 2020-2021, majority of the agricultural labourers were utilized for intercultural operations (33.72%) followed by transplanting (28.85%), harvesting (14.52%), pesticide/fungicide application (8.43%), manures and fertilizer application (7.43%) and land preparation (7.02%) respectively. A positive percentage change was observed in transplanting, manures and fertilizers, intercultural operations, pesticide/fungicide application and harvesting with 21.62, 1.11, 4.34, 0.97 and 34.90% respectively. A negative change was observed in case of land preparation with -1.14%.

In the case of maize crop before the COVID-19 pandemic i.e.,

Table 2: Labour utilization pattern of sample farmers during rabi season before and during COVID-19 pandemic (Operation wise)

Sl. No.	Farm operations	Paddy (ha^{-1})			Maize (ha^{-1})		
		Before COVID-19 pandemic (Man days)	During COVID-19 pandemic (Man days)	Change over (Man days)	Before COVID-19 pandemic (Man days)	During COVID-19 pandemic (Man days)	Change over (Man days)
1.	Land preparation	4.35 (7.93)	4.30 (7.02)	-0.05 (-1.14)	2.52(5.61)	2.57 (5.04)	+0.05 (1.98)
2.	Sowing/ Transplanting	14.52 (26.47)	17.66 (28.85)	+3.14 (21.62)	6.96(15.50)	8.14 (15.96)	+1.18 (16.95)
3.	Manures and fertilizers	4.50(8.20)	4.55 (7.43)	+0.05 (1.11)	3.70 (8.24)	3.75 (7.35)	+0.05 (1.35)
4.	Intercultural operations	19.78 (36.06)	20.64 (33.72)	+0.86(4.34)	16.37 (36.45)	17.27 (33.87)	+1.10(6.71)
5.	Pesticide/fungicide application	5.11(9.31)	5.16 (8.43)	+0.05 (0.97)	4.20(9.35)	4.25 (8.33)	+0.05(1.19)
6.	Harvesting	6.59 (12.01)	8.89 (14.52)	+2.30 (34.90)	11.25 (25.05)	15.00 (29.42)	+3.75 (33.33)
	Total	54.85 (100.00)	61.20 (100.00)	+6.35 (11.57)	44.90 (100.00)	50.98 (100.00)	+6.08 (13.54)

Note: Figures in the parentheses indicate %

in 2019-2020, the majority of the agricultural labourers were utilized for intercultural operations (36.45%) followed by harvesting (25.05%), sowing (15.50%), pesticide/fungicide application (9.35%), manures and fertilizer application (8.24%) and land preparation (5.61%) respectively. There was a slight change observed during the pandemic i.e., in 2020-2021, majority of the agricultural labourers were utilized for intercultural operations (33.87%) followed by harvesting (29.42%), sowing (15.96%), pesticide/fungicide application (8.33%), manures and fertilizer application (7.35%) and land preparation (5.04%) respectively. The positive percentage change was observed in case of land preparation, sowing, manures and fertilizers, intercultural operations/fungicide application and harvesting with 1.98, 16.95, 1.35, 6.71, 1.19 and 3.33% respectively.

It can be concluded that during the COVID-19 pandemic, in *rabi* season in both paddy crop and maize crops, the agricultural labour availability was increased by 6.35 and 6.08% respectively when compared to before the pandemic period mainly due to an increase in return migration of migrant agricultural labourers.

The details of operation wise average wage rate in major crops are presented in Table 3. It was found that in paddy crop before the pandemic i.e., in 2019–2020, high wage rate existed for pesticides and fungicide application (₹ 652.60 man day^{-1}) followed by harvesting, transplanting, land preparation, manures and fertilizer application and intercultural operations at the rate of ₹ 485.58, ₹ 460.11, ₹ 459.36, ₹ 452.62 and ₹ 296.62 man day^{-1} respectively. There was a slight change seen during the pandemic i.e., in 2020-2021, highest wage rate was given for pesticides and fungicide application (₹ 511.73 man day^{-1}) followed by transplanting, land preparation, harvesting, manures and fertilizer application and intercultural operations at the rate of ₹ 431.87, ₹ 423.14, ₹ 414.96, ₹ 383.20 and ₹ 280.28 man day^{-1} respectively. Overall, during the COVID-19 pandemic a change of -7.88, -6.13, -15.33, -5.50, -21.58 and -14.54% was seen for land preparation, transplanting, manures and fertilizer application, intercultural operations, pesticides/ fungicide application and harvesting operations respectively.

For cotton crop before the pandemic i.e., in 2019–2020, highest wage rate was given for pesticides and fungicide application (₹ 656.81 man day^{-1}) followed by land preparation, harvesting, sowing, manures and fertilizer application and intercultural operations at the rate of ₹ 465.98, ₹ 460.11, ₹ 373.82, ₹ 347.61, ₹ 346.40 and ₹ 326.21 man day^{-1} respectively. There was a slight change seen during pandemic i.e., in 2020-2021, the highest wage rate was given for pesticides and fungicide application (₹ 516.40 man day^{-1}) followed by land preparation, manures and fertilizer application, intercultural operations, picking, sowing at the rate of ₹ 418.54, ₹ 314.22, ₹ 311.03, ₹ 304.63 and ₹ 301.96 man day^{-1} respectively. Overall, during the pandemic a change of -10.18, -13.13, -9.28, -4.65, -21.37 and -18.50% was seen for land preparation, transplanting, manures and fertilizer application, intercultural operations, pesticides/fungicide application and harvesting operations respectively.

In case of maize crop before the pandemic i.e., in 2019-2020, highest wage rate was given for pesticides and fungicide

Table 3: Details of wage rate (Operation wise)

Sl. No.	Farm operations	Paddy (ha^{-1})			Cotton (ha^{-1})		
		Before COVID-19 (₹ man day^{-1})	During COVID-19 (₹ man day^{-1})	Change over (₹ man day^{-1})	Before COVID-19 (₹ man day^{-1})	During COVID-19 (₹ man day^{-1})	Change over (₹ man day^{-1})
1.	Land preparation	459.36	423.14	-36.22 (-7.88)	465.98	418.54	-47.44 (-10.18)
2.	Sowing/ Transplanting	460.11	431.87	-28.24 (-6.13)	347.61	301.96	-45.65 (-13.13)
3.	Manures and fertilizers	452.62	383.20	-69.42 (-15.33)	346.40	314.22	-32.18 (-9.28)
4.	Intercultural operations	296.62	280.28	-16.34 (-5.50)	326.21	311.03	-15.18 (-4.65)
5.	Pesticides/fungicides application	652.60	511.73	-140.87 (-21.58)	656.81	516.40	-140.41 (-21.37)
6.	Harvesting/ Picking	485.58	414.96	-70.62 (-14.54)	373.82	304.63	-69.19 (-18.50)
	Average	467.81	407.53	-60.28 (-12.88)	419.47	361.13	-58.34 (-13.90)

Table 3: Continue...

Sl. No.	Farm operations	Maize (ha^{-1})		
		Before COVID-19 (₹ man day^{-1})	During COVID-19 (₹ man day^{-1})	Change over (₹ man day^{-1})
1.	Land preparation	450.63	372.20	-78.43 (-17.40)
2.	Sowing/ Transplanting	318.99	390.05	+71.06 (+22.27)
3.	Manures and fertilizers	459.61	431.44	-28.17 (-6.12)
4.	Intercultural operations	356.69	333.73	-22.96 (-6.43)
5.	Pesticides/fungicides application	569.38	571.02	+1.64 (+0.28)
6.	Harvesting/ Picking	445.86	395.61	-50.25 (-11.27)
	Average	433.5267	415.675	17.85 (+4.11)

Note: Figures in the parentheses indicate %

application (₹ 569.38 man day^{-1}) followed by manures and fertilizer application, land preparation, harvesting, intercultural operations and sowing at the rate of ₹ 459.61, ₹ 450.63, ₹ 445.86, ₹ 356.69 and ₹ 318.99 man day^{-1} respectively. There was a slight change seen during the COVID-19 pandemic i.e., 2020-2021, highest wage rate was given for pesticides and fungicide application (₹ 571.02 man day^{-1}) followed by manures and fertilizer application, harvesting, sowing and intercultural operations with ₹ 571.02, ₹ 395.61, ₹ 390.05, ₹ 372.20 and ₹ 333.73 man day^{-1} respectively. Overall, a % change of -17.40, +22.27, -6.12, -6.43, +0.28 and -11.27 was observed in case of land preparation, transplanting, manures and fertilizer application, intercultural operations, pesticides/fungicide application and harvesting operations respectively during the pandemic year when compared to its previous normal year.

Costs and returns of major crops grown by sample farmers before and during the COVID-19 pandemic were presented in Table 4. It revealed that in paddy crop before the COVID-19 pandemic i.e., in 2019-2020, the expenditure on owned family labour was ₹ 1535.94, expenditure on hired labour, machinery labour and material cost and total operational costs were ₹ 25,659.38, ₹ 14,433.60, ₹ 24,301.52 and ₹ 83,984.61 respectively. Further, yield, price t^{-1}, gross returns and net returns were 5.90 tonnes, ₹ 1751.63, ₹ 1,03,451.26 and ₹ 19,466.65 respectively. During the pandemic i.e., in 2020-2021, expenditure on owned family labour was ₹ 3044.88, the expenditure on hired labour, machinery labour and material and total operational costs were ₹ 24940.84, ₹ 12908.40, ₹ 22,947.13 and ₹ 69,653.94 respectively. Further, yield, price t^{-1}, gross returns and net returns were 6.23tonnes, ₹ 1801.06, ₹ 1,12,287.63 and ₹ 42,633.69 respectively. During the pandemic, a positive change was seen in owned labour, yield, price t^{-1}, gross return and net return with 98.24, 5.51, 2.82, 8.54 and 119.00% and a negative change was seen in case of hired labour cost, machine cost, material costs and total operational costs at the rate of -2.80, -10.56, -5.57 and -17.06% respectively.

When costs and returns in cotton crop before the pandemic i.e., in 2019–2020 was observed, the expenditure on owned family labour was ₹ 2380.95, expenditure on hired labour, machinery labour and material and total operational costs were ₹ 33,511.46, ₹ 6,607.12, ₹ 30,824.52 and ₹ 80,479.73 respectively. Moreover yield, price t^{-1}, gross returns and net returns were 2.18 t, ₹ 51811.74, ₹ 1,12,949.60 and ₹ 32,469.87 respectively. Whereas during pandemic i.e., in 2020-2021, the expenditure on owned family labour was ₹ 4,175.84, expenditure on hired labour, machinery labour and material cost and total operational costs were ₹ 29,887.12, ₹ 5916.65, ₹ 29,577.50 and ₹ 74,619.50 respectively. Furthermore, yield, price t^{-1}, gross returns and net returns were 2.57, ₹ 44,638.12, ₹ 1,14,764.60 and ₹ 40,145.10 respectively. During pandemic positive change was observed in owned labour, yield, gross return and net return with 75.38, 0.32, 1.60 and 23.63% and negative change was seen in hired labour cost, machine cost, material costs and total operational costs and price t^{-1} with -2.80, -10.56, -5.57 and -16.07% respectively.

When it comes to costs and returns in maize crop before the pandemic i.e., in 2019-2020, the expenditure on owned family labour was ₹ 1625.64, expenditure on hired labour, machinery labour and material cost and total operational costs were ₹ 19,465.35, ₹ 3,656.25, ₹ 22,755.62 and ₹ 51,997.41 respectively. Moreover yield, price t^{-1}, gross returns and net returns were 6.07 tonnes, ₹ 14,987.45, ₹ 95,549.99 and ₹ 43,552.58 respectively. During the pandemic, expenditure on owned family labour was ₹ 3,562.34, the expenditure on hired labour, machinery labour and material cost and total operational costs were ₹ 21,191.11, ₹ 5093.75, ₹ 18,327.50 and ₹ 52,733.21 respectively. Furthermore yield, price t^{-1}, gross returns and net returns were 6.48tonnes, ₹ 14,729.46, ₹ 90,029.86 and ₹ 37,296.65 respectively. During the pandemic, a positive change was seen in owned labour, machine cost and yield with 119.13, 39.31 and 6.32%, a negative change was seen

in hired labour cost, material costs, total operational costs, price t^{-1} gross return and net return with -8.80, -19.45, -1.41, -1.75, -5.77 and -14,36% respectively.

It can be concluded that, during the pandemic, the net income levels were increased in both Paddy and Cotton crops due to decrease in labour costs and increase in yields whereas, net income levels were decreased in maize crop mainly due to increase in total operation costs and decrease in price t^{-1} during *rabi* season of the pandemic period.

From the figure 2 it was found that before the pandemic in paddy crop, wage rate for pesticide application was highest i.e., ₹ 652.60 and lowest was for intercultural operations i.e., ₹ 296.62 and during the pandemic wage rate for pesticide application activity was highest i.e., ₹ 511.73 and lowest was for intercultural operations i.e., ₹ 280.28 and man days utilization was highest for intercultural operations i.e., 21.68 and 23.65 man days before and during the pandemic.

Regarding the cotton before the pandemic, wage rate for pesticide and fungicide application was highest i.e., ₹ 656.81 and lowest was for intercultural operations i.e., ₹ 326.21 and during the pandemic wage rate for pesticide application activity was highest i.e., ₹ 516.40 and lowest was for sowing i.e., ₹ 301.96 and man days utilization is highest for intercultural operations i.e., 37.74 and 40.74 man days before and during the pandemic.

When it comes the maize crop, before the pandemic, wage rate for pesticide and fungicide application was highest i.e., ₹ 569.38 and lowest was for sowing i.e., ₹ 318.99 and during the pandemic wage rate for pesticide application activity was highest i.e., ₹ 571.02 and lowest was for sowing i.e., ₹ 333.73 and man days utilization was highest for intercultural operations i.e., 16.37 and 13.47 man days before and during the pandemic.

It can be concluded that there was a decrease in the wage rates for almost all farm operations in case of paddy, maize and cotton during the pandemic when compared to the before pandemic condition and available man days also clearly got increased for almost all operations except harvesting of paddy and cotton crops. This decrease in wage rate and increase in man days may be due to the increase in labour supply due to reverse migration during the pandemic.

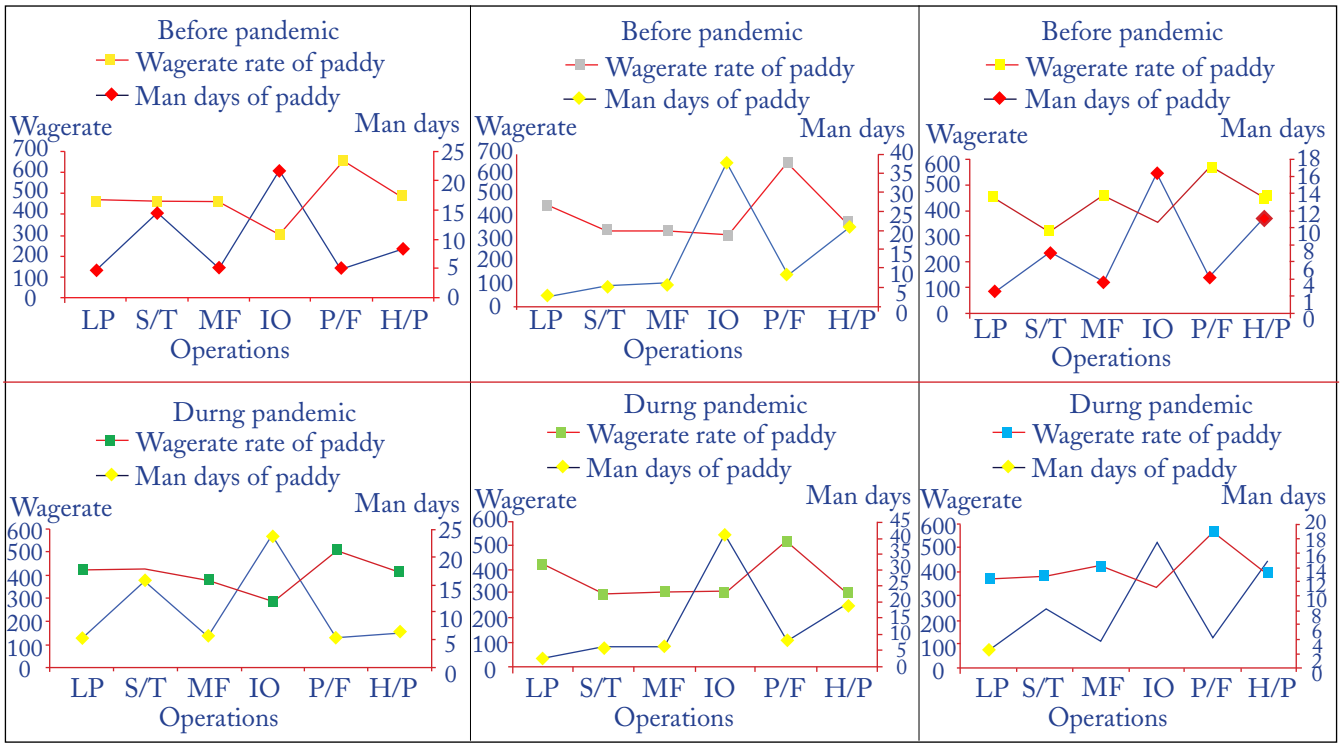

Figure 2: Details of labour utilization pattern and wage rate; LP: Land preparation; S/T: Sowing/ Transplanting; MF: Manures and fertilizers; IO: Intercultural operations; P/F: Pesticides/fungicides application; H/P: Harvesting/ Picking

4. CONCLUSION

In the study area among the farmers, gross and net income levels were increased in case of both the paddy and cotton crops during the COVID-19 pandemic mainly, due to an increase in availability of labour, decrease in labour costs and an increase in yields levels. Similarly, gross and net income levels were decreased in case of maize crop, mainly due to an increase in the total operation costs and a decrease in price t^{-1} during the *rabi* season of the pandemic period.

5. POLICY MEASURES SUGGESTED

As agriculture sector has shown resilience despite the many challenges of the pandemic, including mobility restrictions that impacted labour supply and input availability, it is suggested that the government should increase investments in agricultural sector for strong economy. As the rural areas lack employment opportunities which led to migration and worsen the situation during the COVID-19 pandemic necessitated the priority to be creation of more employment opportunities in the rural areas. The farm as well as non-farm opportunities based on the skills of rural people should be prioritized such as allocation of more funds for MGNREGA and establishment of agro processing industries in the farm sector.

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