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Impact of the COVID-19 Pandemic on Agricultural Production and Productivity in Banavaram Village of Vellore District of Tamil Nadu

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ABSTRACT

The objective of this study is to evaluate the impact of the COVID-19 lockdown on agricultural production and productivity in Tamil Nadu. A total of 147 farmers was surveyed in Banavaram village of Vellore district (93% male; 28% 30-39 years old; 38% literates). About one in ten farmers (10%) did not harvest in the past month with primary reasons cited being unfavorable weather (36%) and lockdown-related reasons (26%). A total of 65% of farmers harvested in the past month (primarily paddy and vegetables), but only 45% had sold their crop; 13% were still trying to sell their crop and 38% had stored their crop, with more than half (55%) reporting lockdown-related issues as the reason for storing. Seventy-nine per cent of households with wage-workers witnessed a decline in wages in the past month and 49% of households with incomes from livestock witnessed a decline. Nearly all farmers reported less productivity (97%). These values are much lower than reported previously for farmers in Banavaram village around this time of year before COVID-19. In conclusion, we found that the COVID-19 lockdown in India has primarily impacted farmers' ability to produce their crops and livestock products which directly affect their day-to-day activity and standard of living.

Key words: Agricultural product, Farmers, Lockdown, Paddy, Productivity.

In response to the coronavirus disease 2019 (COVID-19) pandemic, the Government of India imposed the largest lockdown in history: 1.3 billion people were required to shelter in place from 25 March to 8 June 2020. There is no doubt that this lockdown disproportionately affected the poor and daily wage earners including rural farmers. Even before the COVID-19 crisis, the low incomes of farmers were a critical issue in India, with the Government of India setting a goal to double farmers' income by 2022. The magnitude of the impact of the COVID-19 lockdown on farmers' agricultural production, experience of food insecurity, income from livestock and daily wages is still largely unknown. The objective of this study is to evaluate the impact of the COVID-19 lockdown on agricultural production and productivity in Tamil Nadu. A total of 147 farmers was surveyed in Banavaram village[1] of Vellore district (93% male; 28% 30-39 years old; 38% literates). About one in ten farmers (10%) did not harvest in the past month with primary reasons cited being unfavorable weather (36%) and lockdown-related reasons (26%). A total of 65% of farmers harvested in the past month (primarily paddy and vegetables), but only 45% had sold their crop; 13% were still trying to sell their crop and 38% had stored their crop, with more than half (55%) reporting lockdown-related issues as the reason for storing. Seventy-nine percent of households with wage-workers witnessed a decline in wages in the past month and 49% of households with incomes from livestock witnessed a decline. Nearly all farmers reported less productivity (97%). These values are much lower than reported previously for farmers in Banavaram village around this time of year before COVID-19. In conclusion, we found that the COVID-19 lockdown in India has primarily impacted farmers' ability to produce their crops and livestock products which directly affect their day-to-day activity and standard of living.

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Overview

Rice cultivation in Tamil Nadu

Rice is grown in 28 districts of Tamil Nadu of which 27 are in the high productivity districts. The mean productivity in HDP is over 2500 kg/ha. One district is in the low productivity group, while 27 districts are in the HPD. The triennium average area of HDP was 20.56 lakh ha, accounting 94.1 per cent of the state's total rice acreage (21.84 lakh ha). The state's average triennial rice production was 74.48 lakh tonnes, accounting for 97.6% of the state's average triennial Rice production (76.31 lakh tonnes). The triennium average productivity of the HDP, was 3,623 kg/ha, compared to the state's triennium average output of 3,494 kg/ha.

[1] https://econpapers.repec.org/article/rbarbabul/jun2011-03.htm.

The only low productivity district (LPD) has the triennium average area of 1.28 lakh ha (5.9% of the state's triennium average area) with 1.83 lakh ton (2.4% of the state's total rice production). The triennium average productivity of the LPD was 1,430 kg/ha, in comparison to state's 3,494 kg/ha. The triennium average productivity of Rice in Tamil Nadu is 3,494 kg/ha, 79 percent higher than the country's average percentage productivity (1,947 kg/ha).

Review of literature

Mr. Rahul Tongia (2019), in his work "India's Biggest Challenge: The Future of Farming"[2] observed that India is an agricultural country. But if labor is as efficient as the United States in growing crops, how many people does India need to cultivate? The United States also focuses on many crops suitable for mechanization, but uses indicators from many East Asian countries, with about 10% of the population engaged in agriculture. In contrast, half of India's workforce is hundreds of millions.

Adam Cagliarini and Anthony Rush (2011), argued that India's agricultural sector[3] remains very important to the Indian economy, although its share of the economy has declined over the last 50 years. Over the past few decades, India has made great strides in agricultural production, including the introduction of high-yielding seed varieties, increased fertilizer use and improved water management systems. Reforms in land distribution, water management and food distribution systems will help further increase productivity and meet India's growing food demand.

Survey sample

Totally 147 farmers were surveyed in Banavaram Village of Vellore District of Tamil Nadu. Eligibility criteria included being an adult aged ≥18 years and belonging to an agricultural household defined as any one or more of the following: owning land, harvesting a crop in the past month regardless of land ownership, earning a daily wage or contract-based wage from agricultural work. Thus, respondents not owned land, not harvest any crop in the past month, had no income either from wages (daily wages or contract-based work), or livestock or fishing were excluded from the study.

In Banavaram Village, the study was depended more on personal contacts *i.e.,* survey was conducted only among farmers and his family members. Snowball sampling method was followed by calling up to four additional farmers per respondent. Farmers-large and small/marginal farms, Wage labourer-men and women and inclusive of livestock and fishing. Constituted 147 respondents.

Data collection

All surveys were conducted via telephonic contact between 25 January and 31 January 2022. The interview per respondent lasted for 15 minutes. The respondents were categories into Landless (no land), Small/Marginal formers (0.01 to 2.0 ha), Medium farmers (2.01 to 4.0 ha) and Large farmers (>4.0 ha). Data were collected on crops cultivated, productivity and transportation cost, during Jan-Feb 2020 over Jan-Feb 2021. While some pre-specified options were provided for questions on reasons for not harvesting, for changes in cost to harvest, for yield loss, for storing and for how the lockdown has impacted their ability to prepare for the sowing season, open-ended text entries were also permitted. These entries were reviewed and categorized for analysis (Table 1).

Statistical analysis

Less than 5% of data were missing for all variables except caste (27% missing-asked during a follow-up survey), change in transport cost (53% missing) and awareness of government support measures for agriculture during the lockdown (57% missing), which were added partway through the baseline survey. Descriptive statistics were used to summarize demographic characteristics (state, age, gender, household size and caste), educational attainment, agricultural production and productivity (crop type, harvest, what was done with the harvest and sowing), harvest cost, transport cost, government support programs, self-reported reasons for not harvesting, storing the harvest, higher harvest costs, lower yields and concern over the upcoming sowing season, wages, livestock income, food insecurity and dietary diversity, overall and by farm size. We also presented key outcomes by state, crop type and caste. We tested for differences in these characteristics according to farm size, state, crop type and caste using chi-square tests (for binary and categorical variables) and analysis of variance (for continuous variables). *P* values less than 0.05 were considered statistically significant. In order to provide further insight into these findings, we explored the association between production and productivity during Covid 19 season.

Inference

The average age of participants was 41.9 years (range: 18 to 85), 28% were between the ages of 30 and 39 and 94% were male. Nearly one-third of participants reported having graduate degrees or above. Land ownership was, on average, 3.38 ha ranging from 0 to 263 ha (mean excluding two outliers with land ownership >100 ha was 3.13 ha); 51% of participants were small/marginal farmers. Landless farmers and small/marginal farmers were significantly female, have no formal schooling, younger and self-report belonging to a Scheduled Caste/Tribe or Other Backward Caste. Large farmers were significantly have households with 6 people or more.

Nearly two-thirds (63%) of participants had harvested in the past month (Table 2) and of those, 78% had harvested the same crop in the previous season. A total of 11% of participants did not harvest in the past month. A majority of

[2] http://www.onefivenine.com/india/villages/Vellore/Kaveripakkam/Banavaram.
[3] https://www.theindiaforum.in/article/india-s-biggest-challenge-future-farming.

participants had harvested rice in the past month (60%) followed by vegetables (15%), pulses (4%), bajra (3%) and maize (3%) (Table 2). In terms of what was done with the harvested crop for those who did harvest, 2% reported that their harvest was wasted because they could not sell it and, in few cases, due to inclement weather. A majority of participants, however, were able to sell their crops (44%) or stored them (39%); though many who stored their crops did so because of lockdown-related issues. An additional 12% were still trying to sell their crops. Landless and small/ marginal farmers were significantly less to sell their crops as compared to medium and large farmers.

In terms of changes in harvest since last season, 13% of participants reported a decline in their harvested and landless and small/marginal farmers were significantly reported more declines (17-20% compared to 10% among large farmers) (Table 2). In terms of yields harvested, 62% reported a yield loss. About 13-14% cited labour shortages, lack of storage facilities and transport as the underlying reasons for their yield loss, which compounded pre-existing weather- and pest-related risks. Over half of participants (53%) reported that the cost to harvest was higher as compared to last season. In a subset of participants (n = 35) we also asked why the cost was higher. The commonly answered reasons were higher cost of labour (60%) and mechanical operations (47%). Over half (55%) of farmers reported that the lockdown has impacted their ability to prepare for the upcoming sowing season. The reasons reported were as follows: could not afford inputs or input prices

Table 1: Demographic and socioeconomic characteristics of participants from agricultural farmers of Banavaram village, Vellore District, Tamil Nadu during the national COVID-19 lockdown.

Characteristic	Total (n = 147)	Respondent %				P value†
		Landless (n = 28)	Small/Marginal (n = 26)	Medium (n = 55)	Large (n = 38)	
Gender						
Male	94	81	93	97	97	<0.0001
Female	6	19	7	3	3	
Age Group						
<30	16	26	15	15	15	0.005
30-39	28	34	28	26	26	
40-49	28	15	29	30	27	
50-59	18	21	18	15	21	
60+	10	3	9	15	11	
Household size (person)						
1-2 people	3	9	3	3	3	0.001
3 people	7	8	8	5	6	
4 people	24	20	26	22	21	
5 people	20	30	20	19	16	
6 or more	47	33	43	50	54	
Educational attainment						
No formal schooling	9	27	9	5	7	<0.0001
Primary school	23	33	26	23	14	
Secondary school	38	25	39	40	39	
UG/PG/Professional	29	15	26	31	39	
Caste						
Scheduled Caste/Tribe	24	45	26	21	13	<0.0001
Other backward caste	38	17	45	35	30	
Other/No answer	38	38	28	45	57	
Land ownership, ha‡	3.13	0	0.88	2.63	9.59	<0.0001

***Primary data.**

1. Values are per cent (n) or mean (SD).
2. Abbreviations: ha, ha.
3. *Defined according to land ownership as landless (0 ha), small/marginal farms (0.01-2.00 ha), medium farms (2.01-4.00 ha) and large farms (>4.00 ha).
4. †P value from chi-square test (binary and categorical variables) or analysis of variance (continuous variables) comparing characteristics across farm sizes.
5. ‡Excludes n=2 farmers owning >100 ha of land.

too high (34%), shortage of labour (22%), inputs (especially seeds and fertilizer) were not available (20%) and high cost of labour (4%).

Among those aware of government support measures for agriculture during the lockdown (n =13; 9%), only 47% said that they had benefited from them. More than one-third

Table 2: Agricultural production and productivity in agricultural sector across 147 respondents in Banavaram Village during the national COVID-19 lockdown, according to farm size.

Characteristic	Total (n = 147)	Respondents %*				P value†
		Landless (n = 28)	Small/Marginal (n = 26)	Medium (n = 55)	Large (n = 38)	
Harvested in past month						
Out of season	25	31	29	26	14	<0.0001
Yes	63	48	58	67	77	
No	11	21	13	7	8	
Primary crop harvested in past month						
Wheat	60	65	52	63	71	<0.0001
Vegetables	15	4	21	14	7	
Pulses	4	4	5	2	5	
Rice	3	4	4	2	3	
Maize	3	9	4	4	2	
Other‡	14	13	14	15	12	
What was done with the harvest in past month						
Sold it	44	36	33	55	55	<0.0001
Stored it	39	23	46	33	34	
Trying to sell it	12	36	16	8	7	
Not yet decided	2	0	3	2	2	
Wasted	2	5	2	3	1	
Change in land harvested‡						
Decrease	13	20	17	8	10	0.009
Increase	16	10	12	18	21	
No change	71	70	71	74	70	
Yield loss‡						
Yes	62	55	66	58	60	0.26
No	38	45	34	42	40	
Change in cost to harvest§						
Higher	53	25	60	47	51	<0.0001
Lower	21	50	21	18	20	
No change	26	25	18	36	29	
Change in transport cost§#						
Higher	43	14	35	46	50	0.03
Lower	2	14	2	2	3	
No change	55	71	63	52	47	
Lockdown impacted ability to sow for upcoming season						
Yes	55	24	52	60	68	<0.0001
No	45	76	48	40	32	

*****Primary data.

1. Values are per cent (n).

2.*Defined according to land ownership as landless (0 ha), small/marginal farms (0.01-2.00 ha), medium farms (2.01-4.00 ha) and large farms (>4.00 ha).

3. †P value from chi-square test comparing characteristics across farm sizes.

4.‡Other crops included (in order of frequency reported): fruit, mustard, millet, cotton, groundnut, sugarcane, sesame, flowers, fodder and silk.

5.§Change relative to previous harvest of the same crop-*Rabi* 2019 or, for vegetables, January/February 2020.

6.#This question was added to the survey partway through data collection and therefore is missing for 47.1% of respondents.

of respondents had received a lockdown-specific cash transfer from the government. Those who did not receive a cash transfer were significantly (p =0.001) more to sell their crop (47% versus 37% among those who received a cash transfer) or be trying to sell it presently (13% versus 10% among those who received a cash transfer). Those who received a cash transfer were significantly (p<0.0001) less concerned about the upcoming sowing season (46% versus 61% among those who did not receive a cash transfer).

Suggestions and findings

In this sample, covering 147 farmers' primarily reported difficulty in producing their crops and livestock products during the COVID-19 lockdown, higher transport costs and drastically lower daily wages compared to before the lockdown-with wages declining, on average, by nearly 80% as compared to this time last year. This has left many without enough cash to purchase inputs for the upcoming sowing season. The situation has been compounded by weather-induced harvest disruptions and yield losses. In sum, findings reveal that COVID-19 has exacerbated pre-existing issues in the agri-supply chain ultimately resulting in increased distress among already vulnerable agricultural households.

While we cannot conclusively state that these observations are the result of the COVID-19 lockdown, the strength of the effect, the consistency of the effect across states, the temporary effect and the clear underlying mechanism through which the lockdown could affect these outcomes, together lend support to causality. In addition, our sample of 147 respondents cannot be considered a random or representative sample, particularly for a country as large and diverse as India. Majority of the respondents were male and our sample was younger age group and educated as compared to nationally representative samples of agricultural production and productivity in India.

Eleven per cent of farmers reported not harvesting a crop in the past month and 24% of these cited the lockdown as the underlying reason. This is a much lower percent than that reported in a previous study, which found 34% of farmers were unable to harvest their crop. Together, those who did not harvest in our sample was about 36%. A number of farmers (12%) in our sample reported that they were still trying to produce and sell the rice and an additional 21% of farmers had stored their produce due to the lockdown, indicating that a significant share of farmers faced market-related problems in the past month.

Limitations

There are certain limitations to this research. While we demonstrated the viability of collecting timely, policy-relevant information in the midst of a national lockdown using pre-existing farmer networks and survey interviews, our technique is limited to those with a phone and network coverage. Many groups, who were even more susceptible due to the loss of their jobs, though had phones but could not afford communication, so we couldn't reach them. And, as mentioned earlier, the sample largely consisted of male and land-owning farmers. The most recent Agriculture Census (2015-16) showed that 86% of farmers in India are small/marginal (Department of Agriculture 2020) compared to 51% in our sample.

Official estimates of the female farmers are overestimated due landownership. Female holdings account for 14 percent of operational holdings in the same Agriculture Census (Department of Agriculture 2020), compared to 6% in our sample. However, according to the most recent Census of India (2011), which tracked economic activity, women contribute 39 percent of individuals engaged in agriculture or cultivation. As only three questions of the eight FIES were asked construction of a binary variable to identify them as food insecure or secure was not possible.

In terms of next steps, we will continue to follow participants to monitor agricultural production and productivity, livelihoods and food security of this population. To date, the focus has been on the lockdown given the relatively low number of COVID-19 cases in India. However, many rural areas in India are in fact peri-urban and so it is conceivable that COVID-19 could spread in agricultural areas with additional adverse effects.

CONCLUSION

In conclusion, our baseline findings confirm that landless and small/marginal farmers were the most vulnerable to lockdown-related disruptions to agricultural production productivity and food insecurity, Government efforts to address gaps identified herein should be implemented to avoid further economic and nutritional disparities. Most of the disruptions observed in this study can be planned for to avoid similar disruptions during future lockdowns and pandemics. Emergency food rations through PDS, work guarantee schemes such as MNREGS and supply of agricultural inputs can play an important role if mobility is restricted and supply chains are severely disrupted. However, once the immediate crisis is adverted, there must be a transition from these emergency stopgap measures to concerted efforts to strengthen food supply chains, thus building longer-term resilience for agricultural production and productivity, livelihoods and food security.

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