

Impact of COVID-19 on food security: Insights from Telangana, India.

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Abstract

COVID-19 undermines food security both directly, by disturbing food systems, and indirectly, through the impacts of lockdowns on household incomes and physical access to food especially in the developing nations. The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) a telephonic survey based on a questionnaire developed by the NNEdPro Global Centre for Nutrition and Health, during July -August 2020 to understand the different perspectives of prevailing COVID-19 crisis in urban, peri-urban, rural and tribal areas of Telangana, India. About 40 households were randomly selected for this survey covering urban, peri-urban, rural and tribal locations of Telangana. These households were recruited as respondents for previous surveys by ICRISAT for different projects. The NNEdPro survey questionnaire was adapted and translated into local language for better understanding of the surveyor as well as the participant and probe questions were added to elicit detailed information. Informed audio consent was undertaken through a secure mobile phone system and individual interviews were conducted to elicit data regarding the agriculture and food security situation during the COVID-19 crisis in their respective locations. The recorded data were transcribed by enumerators and later translated into English language. Mixed responses evolved regarding agriculture and losses incurred during COVID-19 crisis.

In case of urban and peri-urban locations, information on agriculture, especially post-harvest losses, due to lack of access to markets was projected and the source of information was mostly through media such as television news, newspaper, and radio. In case of tribal areas, millets and cereals were procured by the government agricultural department at the farm gate and thereby no losses were incurred by farmers who grew cereals and millets. The farmers who grew vegetables incurred losses due to lack of transport to the nearby markets during the complete lockdown. As the vegetables are perishable goods, and due to shortage of labour for harvesting the produce, they incurred postharvest losses.

Consumption of cereals and pulses distributed through the Public Distribution System (PDS) has increased at the household level in peri-urban areas. Consumption of fresh fruits and vegetables and spices has also increased in both urban and peri urban locations. There was no change in the number of meals consumed; quantity of meals was voluntarily reduced due to low physical activity and being confined to homes; home cooking was the most preferred way of cooking meals. Outside food and junk food were almost eliminated in the diets of the urban and peri-urban areas. In case of tribal areas, the adolescents and school age children lost their nutritious meals that were served either in their residential schools or midday meals in the government schools.

There also emerged some differences between complete lockdown that was in place in late March and early April 2020 and the lockdown with fewer restrictions during June-July 2020. Similarly, the effect of food security at the household and individual level emerged differently across locations as well as during different periods.

Key Words: COVID-19, agriculture, food security, urban, peri-urban, rural, tribal

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Introduction

COVID-19 and responses to the pandemic could undermine food production, processing and marketing, but the most concerning impacts are on the demand-side – economic and physical access to food (Devereux et al, 2020). Disruption to food systems has been brought into sharp focus by the COVID-19 pandemic, but such disruptions are a persistent feature of these complex systems, so it is important that we learn from the current crisis to be better prepared for the next one (Harris et al, 2020). Importantly, different foods are likely to be affected differently by food system shocks. Four months into the COVID-19 pandemic, the UN Food and Agriculture Organisation (FAO 2020) stresses that global stocks of staple food crops such as rice and wheat are adequate and 2020 looks set for a good harvest, depending on how long the pandemic and restrictions last.

COVID-19 has had an instant effect on food systems in developing countries. Restrictions to the movement of people and goods have impaired access to markets, services and food. Unlike other concurrent crises, rather than threatening the material hardware of food systems, COVID-19 has so far affected the ‘software’ of food systems, highlighting again that connectivity is at the heart of these systems. Drops in demand, the loss of markets and employment and growing concerns about international cooperation are indications of possible deeper disruptions to come. Amidst this uncertainty, strategies to safeguard food and nutrition security of the world’s poor need to prioritize diversification of production and markets (Heck et al, 2020).

The vulnerabilities in agricultural supply chains and depleted workforces caused by the COVID-19 crisis have hurt farms of all sizes in India, especially high-value farm enterprises. Most affected have been dairy farming, floriculture, fruit production, fisheries, and poultry farms. Food availability in rural parts of India during the lockdown⁴ became a problem for administrators, researchers, and civil society as poor people’s resilience reached a breaking point in the face of prolonged unemployment. The central and state governments have acted quickly to help agriculture navigate this unprecedented crisis (Anjani et al, 2020).

Many early rapid assessment surveys, perspectives, articles, rapid response opinions, viewpoints, were published to understand the impact of COVID-19 crisis on the food security of households, livelihoods, migrants, Indian economy and very few on agriculture (Kesar et al, 2020; Narayanan and Saha, 2020, Dev MS, 2020; Mishra K and Rampal J, 2020; Singh et al, 2020; Kumar et al, 2020; Mukhopadhyaya BR, 2020; Naja, F and Hamadeh R, 2020; Dev SM

⁴ A lockdown in this context mainly refers to the restrictions being imposed by the governments on movement of people and goods to prevent the spread of infections.

and Sengupta R, 2020). This paper documents a range of narrative insights on the impacts of COVID-19 crisis on the agriculture and thereby its effect on household food security on different sections of the population – urban, peri-urban, rural and rural-tribal.

Data and Methods

International Crops Research Institute for the Semi-arid Tropics (ICRISAT) as a part of the TIGR2ESS⁵ project under the flagship project component entitled “Impacting Wellbeing in Rural and Urban Communities: Education, Empowerment and Entrepreneurship leading to improved Human Nutrition” undertook a telephonic survey during July-August 2020 to understand the different perspectives of prevailing COVID-19 crisis in urban, peri-urban, rural and tribal areas of Telangana.

About 40 households were randomly selected for this survey as follows:

- Urban locations in Hyderabad – 10 households
- Peri-urban locations in and around Hyderabad – 10 households
- Tribal locations in Adilabad – 10 households
- Rural locations about 70-100 kms from Hyderabad – 10 households

These households were recruited as participants for previous research carried out by ICRISAT for different projects. The survey questionnaire was adapted and translated into local language for better understanding of the surveyor as well as the participant and probe questions were added for eliciting detailed information. Informed audio consent was undertaken through mobile phone methods and the personal individual interviews were conducted to elicit the data regarding the agriculture and food security situation during the COVID-19 crisis in their respective locations.

The recorded data were transcribed by the enumerators and later translated into English language. The qualitative data collected was inferred using content analysis technique (done manually) and the insights of the findings in different locations were detailed in the findings.

⁵TIGR2ESS-Transforming India's Green Revolution by Research and Empowerment for Sustainable food Supplies. A Global Challenges Research Fund project. <https://tigr2ess.globalfood.cam.ac.uk/>

Findings and discussion

1. Agricultural value chains: who gained, who lost, due to COVID-19

In urban and peri-urban regions, very few had indicated that there might be negative effects of COVID-19 on the agricultural value chain while the majority were not even aware and did not feel that they might have been affected due to the crisis which hit during the harvesting period with a resultant labour shortage. This information was mainly acquired from social media and newspaper and television by the urban and peri urban respondents. Farmers fetched low prices for their grain crops. In case of perishables (fruits and vegetables) they incurred losses as they couldn't find proper markets to sell their produce similar to findings of Harris et al, 2020. There were implications on the export market as the fresh products such as fruits and sea food were not marketed timely due to COVID-19 restrictions. The export market for seafood was affected during COVID-19 and the shrimps were locally sold in Hyderabad for a very low price and were available in abundance during May-June 2020 especially in the urban areas. In response to the formidable challenges associated with food retail during the lockdown, several new initiatives have emerged. For example, many farmers, braving the lockdown, have taken to delivering produce directly using WhatsApp to secure aggregated orders in housing societies. Similarly, as Narayanan and Saha (2020) opine, some farmers chose to travel to the cities to set up shop at roadsides and sell their produce.

The rural agrarian communities reiterated that it is too early to indicate the effect of COVID-19 on agricultural value chains. The data from the telephonic surveys revealed that while farmers who grew cereals and pulses did not incur losses as their produce was procured by the agriculture department at their farm gate, the other farmers who grew vegetables and fruits they did not have that provision and hence they incurred losses. This was more pronounced in the tribal communities that were part of the survey as most of them incurred losses as they produced perishables such as vegetables. It was mainly due to lack of access to markets, transportation facilities and storage services of vegetable crops during the COVID-19. The traders and the middlemen were missing in these times of COVID-19 and thereby farmers were left with little choice to either market their produce within the village and neighbouring villages with marginal profits.

2. Food/food groups affected by agricultural losses

Across all the study regions, the most affected food groups were the vegetables and fruits group followed by poultry, meat, milk and dairy products as they are perishable goods. The procurement prices of cereals and pulses were not affected as they were procured at minimum support price (MSP)⁶ which did not increase. There was an increase in the prices of the vegetables and fruits because of the losses incurred by farmers. Poultry farming incurred heavy losses during April-May 2020 as no one was consuming it and later it gained its normalcy. Limited marketing of milk produced by the livestock resulted in loss of income to the farmers owing livestock.

Several factors were indicated to be the contributors of agricultural losses such as labour shortage during harvesting, lack of transport facilities, lack of proper markets and lack of information to market their harvest led to the agricultural losses across all the four study locations. Lack of storage facilities for the perishable goods (fruits and vegetables) and absence of local markets have contributed to agricultural losses during COVID-19-19. The farmers near the city brought their produce and sold in the cities. For example: Sweet lime was sold directly by the farmers to the retail consumers. The profits were less, farmers did not have much choice.

3. Influence of agricultural losses on the crop choices in the short (e.g., this year) and medium term (e.g., next year)

COVID-19 crisis led to migration from cities to villages. Agriculture may intensify, labour shortage may reduce. Agriculture may intensify and more area would be under production. However, availability of transport facilities, inputs and seeds, markets would be very uncertain in the next agricultural season. Agriculture continues but the crop choice for production would be calculated to combat risks by the farming communities. As indicated by the rural participants, farming community is anticipating the uncertainty in the prices of inputs and seeds, labour wages and marketing as there is no clarity yet on the COVID-19 situation. Agriculture would definitely receive a set back and this will hit the farmer's economy very badly. Even though government of Telangana is providing support to the farmers, continuity of the same is doubtful as the most of the funds would be diverted to tackle COVID-19-19. Lack of or surplus of agricultural labourers may also be a concern to the farming community.

⁶ The **minimum support price (MSP)** is an agricultural product price set by the [Government of India](#) to purchase directly from the farmer. This rate is to safeguard the farmer to a minimum profit for the harvest, if the [open market](#) has lesser price than the cost incurred. The Indian government sets the price for 23 commodities twice a year. <https://farmer.gov.in/mspstatements.aspx>

4. COVID-19 influences on diets of the individuals

There is a direct relation between agricultural production and consumption. In case of urban and peri-urban communities, there was an increase in food prices. The diets mostly consisted of cereals, pulses, oils and vegetables. There has been no increase in the prices of cereals and pulses but there has been increase in the prices of vegetables, oils, poultry, meat during the COVID-19-19. During the strict lockdown period, bulk buying created artificial scarcity of foods and commodities as well. Agricultural losses would lead to shortage in food supply which lowers the consumption. So far in the COVID-19 there has been not much influence in terms of cereals and pulses but vegetables and fruits were hard hit (even though produced) as they could not reach the targeted markets during the COVID-19-19.

However, the rural participants indicated no loss during the COVID-19 crisis as they grew cereal crops only. If COVID-19 crisis continues then the stark losses might occur that might definitely influence the individual diets. During COVID-19, the individual's diets were not affected. In case of tribal region, the individual diets were not much influenced by the agricultural losses in these locations.

Implications of inflation of food prices and limitations in food access on individuals' diets

There was an inflation especially in food prices due to strict lockdown. Bulk buying in advance due to the corona crisis has resulted in increase in the food prices. Also there was limited stock available with the vendors which created more demand for non-food items like sanitizers, soaps and masks. Reduction in the business hours also led to increased prices during the lockdown. The major spike in prices was found among the perishables such as fruits and vegetables. The price of the poultry and meat decreased in the early phase of lockdown but increased later. The diets did not change much as the prices of cereals, pulses, oils were stable in the urban and peri-urban areas.

The consumers in the peri-urban areas mentioned that the quantity of food consumed decreased due to low affordability (increased prices) and loss of employment (decreased incomes) especially in case of pulses. They managed with the pulses (Pigeonpea dal) distributed by the PDS during the crisis period. In rural areas, there was an increase in food prices. In spite of that most of them indicated no change in their individual diets as they were food source was mainly their own produce, wild forage and PDS. The only food items that were been purchased were vegetables, fruits and meat. Whereas in tribal areas, the consumption was restricted to the

availability of the food items. There was no change in the prices of cereals, pulses, oils. The increase in prices has been in vegetables and fruits due to lack of transport.

Factors limiting individuals' access to foods

There have been several factors limiting the individuals access to food. In urban areas, long waiting hours, queue systems at the local groceries made food inaccessible at times. They had to make 2-3 visits to get the food items. In most of the super markets, incoming stock of food items was less and scarcity of transportation was cited as a reason for the unavailability of the food items. While in peri-urban areas, the accessibility of vegetables and fruits was reduced during the strict lockdown and some indicated that low income and loss of economic activity has made their bargaining power still weaker in the community. Mixed responses evolved in rural areas, indicating either no change in the accessibility of food items but were unable to reach the markets due to lack of transport facilities and had to manage with the groceries and vegetables available within their village local provisional/general stores.

In the tribal areas, most of the responses indicated no change in the individual's access to food while a few indicated that their low accessibility is due to their low purchasing power as they lost their economic activities during the pandemic

Implications of changes in consumer behaviours

Urban consumers mostly relied on eating the protective foods i.e, fruits and vegetables and they reached out to local markets instead of ordering them at home. This might be attributed to their income levels. Bulk buying was practised initially and now it is back to normal. Eating freshly made hot meals and avoiding outside cooked food has been the new normal in the urban areas. Eating homemade freshly prepared hot meals was observed in the peri-urban areas. No change in the quantity and sometimes lesser quantity was consumed as the household members were leading a sedentary life with no productive work. More of poultry and meat was consumed as [protein rich foods were advocated through the social media, newspapers by the local government. There was increase in the consumption of fruits and vegetables and also spices. Outside food was completely avoided.

Diets of the rural communities included vegetables, pulses and were cooked for each meal. Frequency and quantity of meals did not change. Demand for vegetables increase and thereby resulting in increase in demand for those commodities. Cereals were mostly procured from PDS for free or their own home produce Milk and milk consumption increased due to its availability within the village. Livestock owners sold the milk at reduced prices within the

village. Most of the diets in the tribal communities include home produce or from wild forage, there was no change. Limited access to markets during COVID-19 provided little access to other fruits and vegetables. After the restrictions were lifted, the diets continued to be normal. They also celebrated the harvest festivals and all other festivals in the usual way.

5. Shifts in food supply and demand

In the urban and peri-urban areas, there was shortage of fruits and vegetables in the initial lockdown period. The other cereals and pulses supply was low due to lack of transportation. After the lockdown restrictions were removed, the supply of all the food items was normal. Cereals, pulses, sugar, turmeric, salt and oil were distributed through the Public Distribution System (PDS). Consumption of PDS rice has increased as it was distributed free. Also some of the elite class arranged free distribution of rice, pulses, vegetables and oil.

In rural areas, milk was more in supply as it was not received by the dairy cooperatives due to transportation constraints. The vegetable hawkers and local vendors stopped getting vegetables in the village, so they were bought from the main market. Increased supply of cereals and pulses as they were distributed through PDS. In the tribal location, the food supply of cereals and pulses was increased only for the below poverty line target beneficiary households. Also the supply of mid-day meals, free meals for school going children was not there during COVID-19-19. And the adolescents residing in the residential school returned due to COVID-19. The overall consumption of food items per household has increased during COVID-19.

The food demand varied across all the four locations. Urban, peri-urban and rural consumers mostly relied on eating the protective foods i.e, fruits and vegetables, so demand for these foods increased. Also the demand for consumption of poultry, meat and eggs and spices increased during COVID-19-19. These were advocated as the protective foods against corona virus.

In the tribal location, there was no perceived demand for any food items but scarcity of vegetables was observed during the initial lockdown. They managed with pulses and other locally available forage vegetables and vegetables from their kitchen gardens.

Factors contributing to shifts in supply and demand

Supply and demand of different food groups was affected by availability, accessibility and affordability during the pandemic in both urban and peri-urban areas. The supply of cereals and pulses through PDS for free has led to its consumption at the household and individual level. The supply of fresh vegetables and fruits was limited in the earlier stages of lockdown, while the supply is quite stable and the prices have evened out. Earlier the supply was also

affected by lack of transportation from the farmers' fields. In terms of demand, urban respondents indicated increased demand for consumption of fruits (enhances immunity against the COVID-19) and spices (herbal teas to ward off COVID-19 transmission). The demand for consumption of spices also increased during this period and the prices have been increased extensively.

In rural and tribal locations, lack of access to transport and marketing strategy led to change in the supply and demand of the food supplies in these locations. There was a change in demand from low to high in terms of poultry consumption. As the supply was low, the prices were hiked that which went very low in the initial days of COVID-19

6. Food shortages during the COVID-19-19

Majority of the urban and peri-urban consumers did experience food shortage in the initial restricted lockdown period. However, in rural areas, even during the initial lockdown period all the food items were available in the market, local groceries within the village. Whereas in the tribal locations, especially vegetables and fruits were the food groups that have been facing shortage due to closure of weekly markets and lack of transport facilities

Food shortage was in the initial days of lockdown due to reduced market hours, reduced accessibility in the urban and peri-urban areas. In rural areas, there was no shortage of any of the food groups but the intake reduced due to temporary spike in food prices during the initial complete lockdown period. However, consumption of vegetables has reduced due to its unavailability in tribal areas. The quantity consumed at both individual and household level has also decreased for vegetables during the crisis.

7. Effect on the functioning of the social protection mechanisms

In urban areas, mixed responses evolved as some of them do not know about Anganwadi⁷ and its activities and some of them do not avail any benefits from either Anganwadi or PDS. Some of them did mention of doubling of the distribution of rice under PDS. Apart from rice they also received supplies of pulses, soaps, salt as well during the pandemic. Earlier, six kilograms of rice per each member was provided while during the pandemic starting June 2020, the beneficiaries received 12 Kgs of rice per each member of the household per month free of cost. They also received pulse of 1-2 Kgs free during these months.

⁷ **Anganwadi** is a type of rural child care centre in [India](#). They were started by the Indian government in 1975 as part of the [Integrated Child Development Services](#) program to combat child hunger and [malnutrition](#). *Anganwadi* means "courtyard shelter" in Hindi.

In Peri-urban areas, PDS has been distributing 12 kgs of rice/member, cooking oil-1 litre, turmeric powder- 100 gms, Sugar-1 Kg Pigeonpea dal-2 kgs were distributed free during the months of May and June and from July onwards they started charging the subsidised price for the above mentioned items. Detergent soaps and salt were charged at subsidised prices as regulated by government of Telangana. Anganwadis have been distributing eggs to the targeted beneficiaries during the pandemic and dry take home rations were provided only recently. The government schools were closed and therefore no mid-day meal was provided to the school aged children starting 6-15 years.

In rural areas, INR 1000 from central government and INR 500 from state government was transferred to the bank accounts of the below poverty line beneficiaries during the months of May and June 2020 as a social protection initiative by the respective governments. The Indian government quickly responded to the crisis by announcing a `1.7 trillion (USD 22.6 billion) bailout for the country's poor on March 27. The package includes free rice, wheat and pulses for beneficiaries, a scheme that was extended from an initial 3–8 months on June 30, and small cash transfers of `500 (USD 6.5) for those have Pradhan Mantri Jan Dhan (PMJDY) bank accounts, a state financial inclusion programme (Summerton, 2020).

Through PDS received double the amount of rice (12 kgs/member/month) and dal (2kgs per month) for free. Anganwadi centres distributed eggs to target beneficiaries and schools did not provide any meals/ dry rations during the pandemic in the rural areas. While in tribal areas, Anganwadi that provides snacks and meals has been closed due to pandemic and thereby the households with children under 5 years, pregnant and lactating mother have been receiving dry take home rations instead of cooked meals. In case of schools, and residential schools, no food distribution as they are closed completely and they do not have any rationing system as per the rules and regulations of the midday meals program.

The PDS has been providing rice and pulses free of cost during the pandemic and have also increased the portion size rationing by 2 kilograms for each member of the household during the pandemic. Earlier 4 Kgs of rice was given to each member of the household per month at the cost of INR 2 per Kilogram.

Food emergency solutions through local government programs

In urban and peri-urban areas, food banks concept is till new in the urban communities while free meals program has been in place since 2014 which is called as Annapurna Scheme. The Annapurna meals programme is now serving free lunch and dinner to the poor and needy, especially migrant and daily wage workers, in these testing times. From just 40,000 meals a

day earlier, the State government's Annapurna meals programme⁸ has now been scaled up by more than three times and is currently serving close to 1.5 lakh meals a day in the Greater Hyderabad Municipal Corporation (GHMC) limits. More importantly, the lunch and dinner are being offered for free and all this has happened in less than a month.

When enquired, most respondents said that the poor, labourers and migrants have been availing this facility in their locations. Two times free meals are being offered. Also some of the elite class members have done free distribution of dry home rations such as rice, pulses and vegetables to the poor and needy during the pandemic.

Mixed responses were observed in peri-urban locations. Most of them who were availing the meals, they were not free and were priced at INR 5 for each meal even during the COVID-19 crisis. In some suburbs, demand for free food decreased as they were scared to consume the outside food and looked out for dry home rations. The Annapurna scheme is not in place in rural and tribal areas and they weren't much aware of it.

8. Concerns around food

There evolved several misconceptions about the foods that were and that were not to be consumed during the COVID-19 crisis. Consumption of poultry, eggs and meat has been on the surge as it is said to enhance the immunity but care was taken to boil it for more time. Increased intake of warm water, with lemon and other spices has emerged during the pandemic. Increased intake of citrus fruits due to its abundant availability (especially sweet lime) was also observed in the urban areas. In peri-urban areas, beliefs were widespread that the perceived "hot foods" should be consumed such as poultry, eggs, spices and avoid cold foods such as ice creams, pastries and so on. Increased consumption of spiced tea, fruits and vegetables as it is supposed improve the immunity against the pandemic. Mixed responses were observed in rural areas. Consumption of fruits and vegetables was supposed to increase the immunity so they were mostly consumed. Inclusion of milk and dairy products, dry fruits also increased as it said to enhance the immunity against the COVID-19. While some of them indicated that there has been no change in diets. However, it was indicated that the meals should be consumed hot and cold leftover food should not be consumed. Decreased or no intake of outside food consumption as it leads to transmission of COVID-19 was strongly believed by the rural communities. While in tribal areas, most of them indicated no change in their usual diets and

⁸ <https://pmmodyojana.in/mobile-annapurna-canteen/>

no new practices regarding food consumption. They haven't heard and were not aware of any apprehensions around their food during the crisis.

Home cooking during the pandemic

Increased home cooking and frequency of meals increased among the urban communities. Hygiene during food preparation was strictly followed such as washing vegetables in salt solution, turmeric solution or lukewarm water either before cooking or storing in the refrigerator. The use of spices has increased as herbal teas with lots of spices were consumed and in the preparation of meat and poultry. The non-vegetarian food is boiled properly before the intake. Increased consumption of vegetables and fruits was observed among the urban respondents. While in peri-urban areas, home cooking involved cooking and consuming hot meals for every meal. Increased awareness in food preparation, especially soaking and cleaning the fresh fruits and vegetables in salt solution. Vegetable consumption has relatively increased during this period but meat and poultry was avoided during the complete lockdown while poultry was consumed later on in the relaxed lock down period.

Reduced intake of outside food except for packed biscuits, buns and breads in the rural communities. Enhanced intake of vegetables and spices during this period. Reheating the leftover food before consumption and avoiding the consumption of leftover food by cooking fresh meals for every meal.

There is not much change in the home cooking during the COVID-19 crisis in the tribal communities. Enhanced intake of freshly cooked hot meals, decreased consumption of leftover foods or feeding the leftovers to the livestock has been in practice earlier and was the same even during the COVID-19 crisis.

Conclusions

Mixed responses evolved regarding agriculture and losses incurred during COVID-19 crisis. In case of urban and peri-urban locations, information on agriculture especially post-harvest losses due to lack of access to markets was projected and the source of information was mostly through secondary source of information through media such as television news, newspaper and radio. From the insights of the communities involved in the study, the paper makes the following conclusions:

- Traders were reluctant to transport produce because of uncertainties in moving goods, and in

- the face of a collapse in demand, especially in large urban centers, prices crashed. The situation was particularly grim for those in animal rearing, i. e., producers of milk and meat. Many cooperative dairies slashed the prices they paid milk producers. Poultry farmers faced a substantial decline in demand, not only due to closure of eateries and income losses among consumers, but also because of initial rumors that COVID-19 is transmitted via birds. Many fisher folk who were at sea when the lockdown was announced were left with unsellable catch. Evidence based on data, newspaper reports, and detailed narrative accounts from villages confirm large-scale disruptions in agri-food chains (Rawal and Kumar 2020; Narayanan and Saha 2020; Mahajan and Tomar 2020; Seth and Vishwanathan 2020; Ramakumar 2020; Singh 2020).
- In case of tribal areas, millets and cereals were procured by government agricultural department at the farm gate thereby no losses were incurred by farmers who grew cereals and millets. The farmers who grew vegetables incurred losses due to lack of conveyance/ transport to the nearby markets during the complete lockdown. As the vegetables are perishable goods, and due to shortage of labour for harvesting the produce, they incurred huge postharvest losses. Perishable foods however – such as dairy, meat, fruit, and vegetables – cannot be easily transported and stored and are more vulnerable to food system disruption. Restrictions to movement – whether of people, trucks or ships – have significant potential to disrupt production and trade in vegetables and their inputs, and their perishability means this may result in vastly increased food waste at a time when production is uncertain. It is precisely these perishable foods that are the most nutritious (having the most nutrients per calorie) (Beal et al. 2017) so concerns about food system disruptions also play out in concerns over reductions in diet quality (Harris et al, 2020).
- Consumption of cereals and pulses distributed through Public Distribution System (PDS) has increased at the household level in peri-urban areas. Consumption of fresh fruits and vegetables and spices has also increased in both urban and peri urban locations. There was no change in the number of meals consumed and quantity of meals (although quantity was reduced due to low physical activity and being confined to homes) while home cooking was the most preferred choice. Outside food and junk food was almost eliminated in the diets of the urban and peri-urban areas.
- In case of tribal areas, the adolescents and school age children lost their nutritious meals that were served either in their residential schools or midday meals in the government schools. The tribal households are mostly dependent on the PDS for their supply of

cereals for consumption. The PDS has the widest reach in providing relief. But there still are many households, especially amongst the most vulnerable groups, that do not receive rations due to lack of ration cards. Governments should issue temporary ration cards or through other means universalise PDS for the next six months. India has enough food reserves for this. Governments should also open cooked meal centres for the hungry. The mid-day meal scheme in schools, 'Anganwadi' (auxiliary health/social workers) centres, and public feeding programmes existing in several states can be utilised for this effort (Kesar et al, 2020). The political dynamics relating to excessive price support and the PDS favoring few calorie-rich crops need to change for a diversified agricultural production system (Anjani et al, 2020).

- The pregnant women, lactating mothers and young children were found to be receiving dry take home rations through Anganwadi in the tribal areas, which was beneficial in some ways.
- There was no or little experience of food shortage as bulk buying and stocking of essential groceries was undertaken in both urban and peri-urban areas. Some of the vegetables and fruits were less priced as they were dumped into the city market by the farmers as they could not transport it to other regions because of complete lockdown. e.g. sweet lime, watermelon.
- Nutritious, bio fortified crops such as potato, sweet potato, but also wheat, maize, and beans among others, can play a more significant role to provide key micronutrients (vitamin A, iron, zinc) at a large scale. Strong local market chains, robust smallholder production systems and increasing commercial utilization make these crops powerful vehicles for securing nutrition when markets and mobility look uncertain. The evolving impacts of COVID-19 provide an opportunity to focus agricultural innovations, including the development and delivery of biofortified crops, on new and more specifically defined 'jobs to be done' throughout the food system. This will help bridge some of the current disruptions in supply and demand and will help prepare food systems for future crises (Heck et al, 2020)
- There also emerged some differences between complete lockdown that was in place in late March and early April 2020 and the lockdown with fewer restrictions during June-July 2020. Similarly, the effect of food security at the household and individual level emerged differently across locations as well as during different periods.
- The pandemic has created rapid disruptions to food environments caused by both external aspects, such as food availability, prices and vendors and personal aspects,

including geographical access, affordability, convenience and desirability (United Nations System Standing Committee on Nutrition, 2020, p. 1). The post-COVID-19 landscape will offer a unique opportunity to repurpose existing food and agricultural policies for resilient and healthier food systems in India (Padhee and Pingali 2020). Therefore, it is imperative to better understand the multi-dimensional implications of food insecurity while formulating policies related to food insecurity and hunger.

Study Limitations

The current study has several limitations as it is a rapid and subjective survey of available individuals within a limited geographical sampling frame. Different factors might have impacted the lives and well-being of the participants during the COVID-19 crisis, however, the present study tried to look at the agricultural sector and the household food security. Another limitation is lack of gender perspective as very few participants were women. One main reason behind this, especially in case of tribal women is neither they own a mobile nor they are habituated to exchanges through mobile phones with the outsiders. There are also limitations associated with using qualitative data which in this paper has been looked at in terms of emerging themes from content analysis only, and any conclusions related to cause and effect cannot be drawn. This study was conducted using a small sample size. Additional in-depth research with an extended adequate sample and mixed methods design is recommended for drawing proper inferences.

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