



Impact of COVID-19 Lockdown on Indian Agriculture: A Review

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ABSTRACT

More than 10 million laborer have been displaced from their usual workplaces during the suddenly announced lockdown by the government of India in 2020 in order to prevent and control the spread of one of the deadliest diseases of our times namely; COVID 19, popularly known as Sars Corona Virus in March - June 2020; as per the official figures provided by the GOI. There has not been a single sector that remained unaffected from the devastating impacts of COVID-19, not even agriculture. The impact of lockdown on agriculture is hard to measure as it involves a complex relationship between multiple direct and indirect factors like labour availability, lack of supply of raw materials from the agro-industrial sector *etc.* The lockdown period created severe economic implications (negative) for farmers (small, marginal and large), landless laborer and all the other agricultural stakeholders who had to face new challenges for earning their livelihood. The direct loss to the agriculture sector was estimated to multi-corers by various government officials while the indirect losses may be many folds of the direct loss. The marginal income of laborers in the agriculture sector was believed to be coming close to zero due to lockdown conditions. In addition to this, smart investments, improved technologies and standardized model frameworks must be designed for the agriculture sector to combat the COVID 19 impact. The current analytical review is focused on all the major factors associated with the agriculture sector that have been highly impacted by the COVID-19 pandemic, ranging from production, storage to procurement and selling. The lockdown has choked off almost all economic activities. In urban areas, COVID-19 forced widespread loss of jobs and incomes for informal workers. Estimated by the Centre for Monitoring Indian Economy, unemployment shot up from 8.4% in mid-March to 23% in the first week of April 2020 further soaring to 30.9% by the end of April, 2020. We have also looked into the possible strategies that can be taken into consideration by the government as well as those associated with the agricultural-food sector. This pandemic has emerged several new challenges to the agricultural sector but has given us time to think and strategize things for better management in future. Suggestions have also been made to adopt alternate approaches and work in this newly created world with the ability of better resource handling.

Key words: Agriculture, COVID-19, Corona virus, Economy, Migration, Pandemic.

Agriculture has a very respectable place in India as it is the source of income for more than 60% of people (FAO, 2020, Grewal and Goel, 2015). The agricultural sector is still working with age old norms by being hugely dependent on natural resources, poor coordination with e-markets and other sectors which have caused increased susceptibility of the farming community towards economic fluctuations (Sharma *et al.*, 2020). Value addition, timely payment of minimum support price, rural infrastructure and agriculture research play an important role in lifting rural people out of poverty but due to COVID various restrictions aroused (such as reduction in value addition process as skilled labor was unavailable, MSP was not properly available as mandis were not functioning to their full potential *etc.*) in the proper functioning of these support systems. The growth of the agricultural sector particularly in India depends upon the migrant laborer community for several operations like transplanting, inter-cultivation, harvesting, threshing, loading, unloading post-harvest activities *etc* (Dev, 2020).

Understandably, more than 50 million migrant laborers returned to their native places during the lockdown period due to pandemic induced lockdown that ended their employment opportunities (Dev, 2020). This accounts for about 11% of the non-self-employed labor force. The

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lockdown has choked off almost all economic activities. In urban areas, COVID-19 forced widespread loss of jobs and incomes for informal workers. Estimated by the Centre for Monitoring Indian Economy, unemployment shot up from 8.4% in mid-March to 23% in the first week of April 2020

further soaring to 30.9% by the end of April, 2020. The shutdown has caused untold misery for informal workers and the daily wage laborers, who lead precarious lives facing hunger and malnutrition. The best way to address this urgent need is to use social safety nets extensively to stabilize their lives with food and cash.

Reverse migration of laborers due to COVID-19 leverages labor-intensive sectors of agriculture, dairy, livestock, protected cultivation, fisheries and processing industries making it extremely challenging to maintain food, feed, fiber and raw material for sowing and its security in present pandemic situations. The negative impact of labor migration was observed on agricultural sectors of many states like Uttar Pradesh, Haryana and Punjab mainly during the harvest of *Rabi* crops like wheat and mustard that was in progress at the time of lockdown. Also, in the rainy season coinciding with the *Kharif* cropping season, sowing and other agricultural operations of *Kharif* crops including rice were adversely affected resulting in a drop in the total production by 3% (Narayanan and Saha, 2020). The primary effect on crops would lead to secondary, tertiary and other effects on associated partners like fertilizer industry, pesticide industry, farm machinery, to name a few. The chain may extend further impacting all those companies that are directly/indirectly dependent on agricultural products as their raw materials (agricultural produce such as grains, fruits, vegetables, dairy products, fisheries etc) which was not be available at the same price as well as quantity as before the lockdown period because the supply chains were adversely affected. Hence, this is the actual time to think and implement several long-term mitigation strategies for India so as to increase labor availability, ensuring sufficient flow of institutional credit to agriculture and small-scale industries so that our system do not crash ever again like the way it did during this COVID19 pandemic times hitting the economy too hard to sustain. In this review we have attempted to analyze all the aspects of agriculture, workers and possible strategies as well. Long-term strategies for agro-based industries and contingency plan implementation would be the key elements for improving productivity. Sustainable models for land and water development, food processing, value addition and rural industries should be evaluated and adopted that will harness economies in rural areas leading to mass absorption of laborers. Reviving the policies of the agricultural sector for the post-COVID-19 situation will be the key element for improving the Indian economy.

Issues at various levels of farming and mitigation options

Crop harvesting

The lockdown in India coincided with the harvesting time of the *Rabi* season crops. Initially, the government did not include the agricultural sector related work in the list of the essential activities but soon all the agriculture and allied sector activities were given exemption from the lockdown rules. Unfortunately, the farmers continued facing problems like labor shortage, lack of storage facilities, inability to transport goods and decline in the demand, price and selling their products in the market. (<https://www.deccanherald.com/national/north-and-central/coronavirus-lockdown-farmer-commits-suicide-after-no-labourers-to-harvest-crop-824579.html>). According to the International Labor Organization estimate, there are more than 30 lakhs migrants workers (Table 1) in the field all across the country (Hurst *et al.*, 2005). In April 2020, the Ministry of Home Affairs allowed the field workers to travel within the state with certain conditions but this “within the state exemption” proved useless because of the fact that that 80% of the agricultural laborer in Punjab, Haryana and Rajasthan have come from the states of Bihar, Uttar Pradesh and Madhya Pradesh. Due to the non-availability of equipment, machinery and agricultural laborers, the farmers faced problems of timely harvesting the field (Athnere *et al.*, 2020). The harvesting by a machine takes around one or two days and with labor, maximum up to one week but due to the absence of both the laborers and the machinery, harvesting time was prolonged by a great extent. As the harvesting time is a yield determining factor for crops, late harvesting decreased the yield of various crops from 5% to 20% which had a great impact on the farm output (Kharbikar *et al.*, 2015). A report stated that even the yield of our staple crop wheat has decreased this year as compared to the previous three years (<https://www.thehindu.com/news/national/other-states/farming-under-lockdown-short-on-labourers-a-long-harvest/article31370176.ece> 2). A large number of farmers left their crops in the field by these unprecedented circumstances as the cost of harvesting would have gone more than the Minimum Support Price (MSP) for that particular crop which in turn resulted in a complete loss of the income to the farmer.

Table 1: State wise numbers (approximate) of the migrant laborer displaced during the lockdown of COVID-19.

State	Number of migrants potential	Number of migrants sent back	Reference
Uttar Pradesh	21.69 lakhs	1.35 lakhs	Chisti, 2020
Bihar	10.00 lakhs	-NA-	Chisti, 2020
Maharashtra	-NA-	11 lakhs	Chisti, 2020
Gujarat	-NA-	20.5 lakhs	Chisti, 2020
Karnataka	-NA-	3.0 lakhs	Chisti, 2020
All India	31.69 lakhs	35.35 lakhs	

Source: <https://indianexpress.com/article/explained/coronavirus-how-many-migrant-workers-displaced-a-range-of-estimates-6447840/>.

Transportation

After overcoming the problems of the harvesting, the farmers were to encounter the problems of transportation and storage due to the restricted movement on the roads. The lockdown imposed restricted movement on the roads that too only for people with special passes. The passes were issued by the governing bodies which were located in the cities; that left the farmers living in the villages helpless and in despair. This was not only a major shortcoming of the policy makers who designed the lockdown system to tackle COVID (Padhee and Pingali, 2020). The relaxation was given to the farmers carrying their production. A well organized coupon system was organized by the government. However, it had several disadvantages. The limited number of allowed transport vehicles resulted in increased transportation charges and the farmers chose to sell the products within the village or with the local traders. The perishable products were altogether wasted and in most states the farmers threw their production of grapes, vegetables and other goods on the roads as they were not able to transport them to the buyers, resulting in a higher loss. Similar cases were observed for the cereal crop of wheat and oil crop of mustard whose long-distance supply chains were adversely affected causing a fall for the prices in the international market (Sharma *et al.*, 2020).

Not only the farmers but various sections of the society including the traders, buyers, companies dealing with the agricultural commodities all suffered. The companies and the traders were unable to transfer the goods from the warehouses and Mandis to the production houses due to delayed and low-quality standard protocols followed during transportation. The quality of the product produced was affected to a greater level. Lasalgaon, located in western Maharashtra, is known for Asia's largest onion trading market struggled to transport the freshly harvested crop across the country or ship it to countries like Malaysia and Middle East because the tens of thousands of daily wagers who came from neighboring states fled to their villages due to panic in the wake of the unprecedented lockdown (Erokhin and Gao, 2020). Even when some movement began, the supply chains started getting back into motion but the amount of harvest was not able to meet the demand and efficiency of the transportation due to absence of labor. To combat these issues the union agriculture ministry started an "All India Agricultural Transport Call Centre" for coordination between states for inter-state movement of perishables - vegetables and fruits, agricultural-inputs like seeds, pesticides and fertilizer, *etc.* The call center could be accessed from any mobile or landline phone (Manida and Nedumaran, 2020). This finally facilitated the inter-state transportation of fruits and vegetables by truck drivers, traders, retailers, transporters, or other stakeholders.

Storage

Late harvesting and poor transportation resulted in storage issues by influencing the respiration rate in the horticultural

crops and moisture content of the agronomical produces. The delayed harvesting results in accumulation of the ethylene in the fruits which over-ripen the products and the post-harvest shock due to poor transportation degrade the quality of the produce as high moisture content makes the produce unfit for storage. The storage availability of the various crops is pre-defined by the government and warehouses are made available but due to the lockdown, concerned departments working with skeleton staff failed to manage the storage of products. Primarily the crops harvesting got delayed and secondly the rain showers further deteriorated the quality of produce that failed to meet the specified parameters of sale and storage of the agricultural commodity for both perishable and non-perishable produce of the farm (Shirpi and Thirumoorthi, 2020). For reference, wheat is supposed to have a moisture level of less than 13% for storage in the warehouses but due to the rain at the time of delayed harvest, the moisture level increased and farmers were not allowed to store their produce in the warehouses leading to further low market values and low sale of the commodity (Ma *et al.*, 2020). The fear of corona virus among the buyers has in many ways resulted in overall diminished demand in the market. Due to a panic in the minds of people, they feared that the commodities touched by multiple people in the process of storage, marketing and then in supply may cause Coronavirus infection and they avoided all sorts of purchases for a couple of months. Due to the increasing number of corona patients, people denied buying the goods from the warehouse which does not provide a satisfactory sanitation and safety standards certificate (<https://www.news18.com/news/india/diminished-agricultural-selling-may-now-impact-indias-ability-to-feed-after-coronavirus-pandemic-2596237.html>) 9). Owing to this uncertainty, farmers preferred selling off their products at petty rates rather than storing because they required quick cash in hand for the next crop.

To overcome such problems, publicization of electronic Negotiable Warehouse Receipts (eNWR's) needs to be done as a prime step. Over the last one year, the Warehousing Development and Regulatory Authority (WDRA) has brought several Primary Agriculture Co-operative Societies (PACS) and State, Central and private warehouses from across the country under its fold. Some of these are closer to villages and can ensure farmers find a nearby warehouse, that too without spending much money. Being registered under WDRA, these warehouses can issue electronic Negotiable Warehouse Receipts (eNWRs) (Sathisha, 2018). By placing stock in WDRA-accredited warehouses, farmers get eNWRs which can be easily pledged for loans. Unlike the physical warehouse receipt, in the case of eNWRs, it is possible to break up and avail finance for one portion of the stock. Further, the farmer may also get a better price for his produce when he finally sells it, as the stock stored in a WDRA-accredited warehouse is sorted and graded. The use and applicability of any scheme is only when people get aware and start using it so awareness needs to be done at a very large scale.

Constraints in marketing

A challenge in the Indian farm sector is the inability of farmers to get reasonable prices for their produce, even though the government of India has fixed Minimum Retail Price (MSP) for various products. It has been empirically observed that farmers often do not get a fair price for their produce and are forced to sell it at lower than MSP to traders if production is higher due to the procurement constraints of government agencies (Aayog, 2018). The primary factor behind the supply and price distribution of products in India is the inefficiency in the Agriculture Produce Market Committee (APMC) structure in our country. Effective implementation of higher support prices *via* MSP has remained a challenge over the years with the APMCs not being able to ensure a fair price to the farmers through the mandi (local market) auctions. Although this constraint has prevailed in the agricultural sector from the initial years of MSP but the COVID lockdown exaggerated the impacts, the working of the mandis with skeleton staff and poor procurements shadowed the benefits of MSP. In our opinion, this can be alleviated by taking advantage of the eNAM or electronic national agriculture market, one of the digital initiatives of the government that can bring about significant efficiencies in the system and act as an effective tool to fight inflation or price distortions and also reduce the procurement burden on the exchequer simultaneously (Chaudhary and Suri, 2020). eNAM will allow prices to be governed by market forces by keeping the middlemen at bay allowing buyers and sellers a fair price. The mechanism, when fully operational, will allow free movement of food commodities across the country while mitigating the problems related to regional level hoarding. According to estimates, the share of eNAM in India's total food grain production (including oilseeds) is only 8.6% on average since inception in April 2016 (<https://www.businessinsider.in/business/news/COVID-19-crisis-opportunity-for-agricultural-marketing-reforms-report/articleshow/75160492.cms>). This is surprisingly low, given the Government impetus on Jan-Dhan, Aadhaar and Mobile (JAM) based transactions and the renewed focus on Direct Benefit Transfers (DBT).

Farmers primarily auction their produce physically at the 6,900 APMC *Mandis* spread over the country where the buyers are mostly local traders. The legacy structure in APMC has not only been unable to provide fair prices to the farmers but has rather led to divergent inflationary trends across India. Many states have given relaxation to farmers from the APMC act so that they can sell their produce by themselves to the traders or within the village. In the hope of having security, the farmer sells his produce locally to the next village traders or through online platforms (<https://www.brookings.edu/research/is-india-ready-to-jam>). Agriculture in India is a "state subject" and the policies too vary from one state to the other. A uniform national level policy is much needed to give the farmers their much deserved due. To meet these challenges new farm laws were

designed by Indian Government to deepen farmer's indulgence within the countryside by liberalizing agricultural trade in the country. It also highlighted the issues and challenges of Indian farmers and provides probable solutions defining political economic logics (Joshi, 2020).

There is a dire need to support the small and local businesses as they are the ones that are most vulnerable to the impact of lockdown. Farmers should also unite to sell their produce at online platforms and in bulk, as the export is coming back to motion. Also; the corona pandemic has drastically reduced meat consumption in India, thereby indirectly enhancing the vegetable market (Harris *et al.*, 2020). Having good storage facilities *yet alone* is not a benchmark to be taken care of in order to sustain every possibility of reaching out of the field and produce all the way to the parts of the country. The key is to make sure that all these daily needed perishable products reach the public consumers everyday too. The new norm of social distancing and the appointing of the controlled time periods for the marketing has disturbed the whole set up because people need fresh supplies each day for which they are standing in long queues. So proper marketing has a role to play that should not be ignored (Sharma *et al.*, 2020). The government is currently focusing on the emphasis of food grains and has prioritized the production of already mentioned. This has led to the decline or at part complete fall of other fiber and plantation crops like cotton, jute, rubber. These act as raw materials for all the major industries for which agriculture is the prime dependency for the income. These Industries using agriculture-based raw materials eventually end up producing good quality outputs which when exported to other countries fetch a high net income of the Indian economy (Cook *et al.*, 2020). In a way, every loophole in various aspects of farming is hampering the country's economy that will need time to repair. This fall will ultimately lead to affecting the gross domestic product (GDP) of India that is not in a very good position today. It has now become a matter of paramount importance for the smooth functioning of the supply chain, with adequate safety measures for the people involved and the food grains, fruits and vegetables and other essential items available to consumers, both in rural and urban areas (Mahajan *et al.*, 2020). Transportation of public distribution system (PDS) items to target delivery agents, by both rail and roads, has to be insured by respective government agencies. Lockdown has cut off all the major ties of the flourishing industries that need to get unbolted so that processed and post-harvest products can be made available to the population. Marketing adds value to the sale of goods and needless to mention adds up the quality assurance with the brand tag mark (Dev, 2020). According to Agricultural Produce Marketing and Export Development Agency (APEDA), India's overall agriculture exports in 2018-19 were to the tune of Rs 685 billion, while the big impact of shutdown all a sudden choking of exports affects the farming community income and employment.

Ventralized floriculture business

Corona virus has not only proved deadly for people but it has caused the flower industry to dry out and wilt around the world, as lockdown measures have turned major cities motionless. As the deadly virus spread, it came with its own rules. Social distancing grounded flights, shuttered hotels and restaurants; it has also nibbled away at spending power and destroyed the sales of flower markets, among others. From Ecuador to Kenya to the Netherlands, the world's major flower distributors have fallen on hard times (Beckmann *et al.*, 2021). India, though not being a large producer of flowers, is still facing many issues caused by this coronavirus pandemic and multiple floriculturists have experienced heavy losses due to the lockdown. Unlike the food, pulses and cereals, the flowers are not included in the list of the essential items. Also, there is almost no demand for flowers in the market owing to complete closure of the temples, hotels, resorts and spas which were the prime demanders of flowers in our country (SN, 2020). The Horticulture department is trying to find out ways and means to somehow minimize the losses incurred by the flower growers by giving them alternatives of storing dried rose flower petals, converting Marigold into seeds and *Lilium* into bulbs but it is a labor-intensive exercise and not many farmers can afford to do so. Loss of exotic flower species can be overcome by making extracts. Floriculturists have taken the decision of changing their flower farming, instead of the flower plants they are planning to go for olericulture which is more trustable in this extreme situation.

Obstacles in assessing input for *Kharif* and *Rabi* crops

The government-imposed country wide lockdown to stop the spread of the coronavirus pandemic affected the inputs to the *Kharif* season crops of 2020. Summer fruits and vegetables have ripened, a bumper crop of wheat was ready for harvest in India, but hobbled by the severe labour shortages, transport bottlenecks and limiting demand due to nationwide coronavirus lockdown, millions of farmers were staring at a huge loss. The all-way downfall of the *Rabi* season crops will indeed mark the difficulties for the supply of the needed materials which have acted as an input for the flourishing of the crops grown during the month of June (Mishra *et al.*, 2020). With the *Rabi* crop standing ready in the fields for harvesting the question arises how the outputs from the *Rabi* crops will be a hurdle for the *Kharif* production. It can be answered in the way that all the income that the farmers usually make from the sale of the *Rabi* are generally used as an input for *Kharif* crop preparation (Kamath *et al.*, 2020). Farmers lack laborers, daily wage earners and have got no one in specific that could help them with the harvesting. But the question is how the field will even get all the input it needs to sustain good ongoing crop production. It is all known that India as a whole is a flourishing and sustained country for growing agricultural crops but when it comes to state-wise distribution; it lacks all major resources

confined in that particular boundary and hence requires the raw materials from other states. With the expected reduction in meat consumption due to the virus, the demand for vegetables is expected to shoot up. Farmers will need more vegetable seeds for *Kharif*. Some of it has to be imported. The ports and airports should operate quickly to import such seeds. Similarly, care should be taken that the export of seeds should not suffer which could be catastrophic for the companies (Sharma *et al.*, 2020). Rice being the staple food of India, a lot of people out there will be struggling for the daily meal if growing of *Kharif* crops would be hampered. Transportation facilities with social distancing can still be worked and can be dealt with but what cannot be dealt with is the purchasing of the needed raw materials coming from the other countries because right now, the speed with which cases in India of coronavirus is increasing, is something which can be easily dealt with but with the foreign exchange of Agricultural goods this thing put a mark of question on its speed communication and cannot be taken up with any changes (Erokhin and Gao, 2020). Due to this rising problem of no transportation between two regions there has been yet another major problem of the sowing of the *Kharif* crops and that draws major attention towards the major pesticides needed in the field for the standing crops to get the protection of. The pesticide industry in India heavily depends on the import of around 15 technical insecticides from China. Technical insecticides are an intermediate product used in the manufacturing of commercial pesticides. In the absence of these pesticides, the *Kharif* crop had faced a large production decline and not to mention that this led to the higher price of the sell despite this negative impact the Indian manufactures can utilize this opportunity for development on complete indigenous insecticides but this will take some time duration and trials to become completely make it sustainable and in this duration the insecticide demand will still remain same therefore, currently the import strategies need to be focused to overcome the problem. (<https://www.thehindu.com/business/pesticide-sector-hit-by-input-issues/article31043301.ece>). In this pandemic situation when people are suffering from job losses and the government is trying to put up with affordable prices for grain purchase, this failure in crops. However, the government sponsored schemes will provide ration to the needy and hungry is believed. Preventing this to happen the government is planning a lot and the farmers are advised to make one thing sure that they should practice all the needed item with the amount of input they have in hand, starting with the practice of zero tillage where no laborers are practically needed, the soil gets to hold a lot of already present nutrients which do not get washed away (<https://www.usda.gov/>). These activities will surely evolve a great crop with a minimum of inputs and laborers and will lead to the no loss of the standing crops. Life cannot hold a standstill it needs to go on, so basically the food must be grown no matter what the situation or circumstances are it is put up in, lockdown, or Corona outbreak. Sustaining agriculture will

be of prime need today, tomorrow and always with or without the downfall of the economy and social distancing.

Challenges, opportunities and mitigation strategies

The Union Home Ministry, in a very significant move, has notified to exclude movement of farmers, farm laborers and harvesting and sowing-related machines from the purview of lockdown. Immediately after the nation-wide lockdown was announced, the Indian Finance Minister declared an INR 1.7 trillion package, mostly to protect the vulnerable sections (including farmers) from any adverse impacts of the Corona pandemic. The announcement, among a slew of benefits, contained an advance release of INR 2000 to bank accounts of farmers as income support under the PM-KISAN scheme (SN, 2020). The government also raised the wage rate for workers engaged under the NREGS, which is the world's largest wage guarantee scheme. Under the special scheme to take care of the vulnerable population, *Pradhan Mantri Garib Kalyan Yojana* (Prime Minister's scheme for welfare of the poor), has been announced. Additional food grain allotment to registered beneficiaries was also announced for the following three months. Cash and food assistance to people engaged in the informal sector, mostly migrant laborers, have also been announced for which a separate PM-CARES (Prime Minister Citizen Assistance and Relief in Emergency Situations) fund has been created (Sengupta and Jha, 2020). The Indian Council of Agricultural Research (ICAR) has issued state-wise guidelines for farmers to be followed during the lockdown period. The advisory mentions specific practices during harvest and threshing of various *rabi* (winter sown) crops as well as post-harvest, storage and marketing of the farm produce. The 85% of Indian farm households being small and marginal farmers are always the hardest hit in any disaster or pandemic situation (Ceballos *et al.*, 2020). These measures may help in limiting the health crisis, but as in other countries-the complete shutdown of all economic activities except essential services will create an economic crisis and misery for the poor, with massive job losses and rising food insecurity. However, people living on agriculture and allied activities, mostly those losing their income from informal employment at this lockdown period, have to be provided with alternative avenues (cash transfers) till the economy bounces back (when this health crisis is successfully overcome) (Dev, 2020). To sustain the demand for agricultural commodities, investments in key logistics must be enhanced. Moreover, e-commerce and delivery companies and start-ups need to be encouraged with suitable policies and incentives. To obviate the immediate concerns of scarcity of farm labor, policies must be in place so as to facilitate easy availability of machinery through state entities, Farmer Producer Organizations (FPOs) or custom hiring centers (CHCs) with suitable incentives. It is also suggested to explore leveraging NREGA funds to pay part of the farm labor to lessen the monetary burden on the farmer

and ensure wage employment to the landless laborers and workers. Governments must gear up their machinery for smooth procurement operations of farmers' marketable surpluses at MSP (minimum support price) or through other price support schemes, adjustment in credit and repaying policies for the small and marginal farmers (Ceballos *et al.*, 2020). Labor shortage not only affects the *Rabi* crops but also sowing of the *Kharif* season requires the facilities for sufficient credit flow to borrowing agricultural inputs – seeds, fertilizers, agro-chemicals, *etc.* Relaxation of the norms by Agricultural Produce Market Committees (APMCs) allowing farmers to sell their produce beyond the designated Mandis will certainly ease the burdens of farmers. At this critical stage, where climate change is already adversely impacting the agriculture sector, productive investments, including on research and innovation, would be very purposeful. Structural reforms such as land leasing, contract farming and private agricultural markets, *etc.* have long been advocated to bring enhanced investments into the agriculture sector and to push its growth. These reforms need significant political will and zeal of states, post-COVID scenario could be tackled with suitable incentive mechanisms (Kumar *et al.*, 2020).

There have been global concerns, rather speculations, on restriction of exports of agricultural commodities by a few global players. India's agricultural exports are valued at 38 billion US Dollars in 2018-19 and can rise up further with constructive policies (FAO, 2020). Development of export-supportive infrastructure and logistics for commodities like rice, meat, milk products, tea, honey, horticultural products, *etc.* has to be promoted for long term interests of farmers in boosting their income. The economic shock is expected to be more severe for India, because of slow growth of the economy that prevailed even in pre-COVID-19 due to problems of unemployment, low incomes, rural distress and malnutrition (Sharma *et al.*, 2020; Dev, 2020, Padhee and Pingali, 2020 and Lal, 2020). Long-term strategies should be focusing on having symbiotic relationships with other sectors. Government needs to work towards the reframing in the organization of land, water development, food processing, value addition and rural industries will be important. The *Kudumbashree* model of Kerala is worth examining that harnesses economies in rural areas and mass absorption of laborer. To summarize, we put forwards a few measures that may be considered to keep the agricultural sector and supply chains working smoothly to undo the lockdown impact:

1. As even animals are reported to be affected by coronavirus, we must take care to prevent this coronavirus from spreading to the farm animal populations which are again a source of livelihood for many people in India (Csiszar *et al.*, 2020).
2. Farmers must be given continued access to the markets. This can be a mix of private markets and government procurement centers

3. Small poultry, dairy farmers and vegetable growers should not be neglected, as their pandemic-related input supply and market-access problems are directly linked to their survival.
4. The government should promote trade by avoiding export bans and import restrictions.
5. The Government authorities must seek relief in regulatory clearances/approvals in subsidies, deferral schemes, export incentives and concessions for sale in specific geographies.
6. Financial agencies have to evaluate their funding strategies and debt repayment obligations that provide immediate financial relief to the farmers.
7. Structural reforms such as land leasing, contract farming and private agricultural markets, procurement process, easy and time payment of produce, *etc.* must be reformed to push growth of the agriculture sector.

CONCLUSION

Due to the recent breakout of the corona pandemic the society at large and farmers, landless laborer as well as other stakeholders of agriculture have come across the various impacts of this deadly virus on the different sectors of the world. The outbreak of novel coronavirus seized day to day activities of the people around the globe, restaurants and the cinema halls are locked down, even the traffic on the road standstill but the crops in the field do continue to grow. India is today a global leader in agricultural production. The contingency plan prepared to combat these issues should be periodically tested, to ensure whether the solutions for various scenarios are workable or not. The planning strategy should be responsive and malleable to accommodate any ensuing situational changes and varying government policies and protocols.

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