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Effect of COVID-19 Lockdown on the Investment and Profitability in Crop Enterprises: A Cross-sectional Evidences from Uttar Pradesh

S.K. Dubey[1], Atar Singh[1], Sadhna Pandey[1], Uma Sah[2]*, Aman Kumar[1], Pandey[1] and Rajeev Singh[1]

[1]ICAR-ATARI, Zone III, Kanpur, Uttar Pradesh, India
[2]ICAR-IIPR, Kanpur, Uttar Pradesh, India
*Corresponding author email id: umasah@gmail.com

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ABSTRACT

Study was conducted among 570 farmers spreading across 57 districts of Uttar Pradesh during the period of 25 March to 10 May 2020 by telephonic contact using the pre-structured interview schedule to assess the effect of COVID-19 lockdown on the investment and profitability of major *rabi* crops of the state namely wheat, mustard, lentil, chickpea, and field pea. The effect was ascertained by comparing the lockdown status with the same period (March-May) of last year (2019). Findings showed that though the price of production inputs increased during the lockdown, albeit the variation in price jump was not very high. On the profitability front, wheat and lentil growers remained the most affected as compared to mustard, field pea, and chickpea growers. The production cost was affected more as compared to the market price of these commodities. The increased production cost was attributed to increased inputs cost due to the limited opening of input outlets despite the state Government's instruction for relaxation in complete lockdown to agricultural inputs shops in the state of Uttar Pradesh. KVK experts also opined that the COVID lockdown restricted the movement of farm labourers and inputs availability which adversely affected the farm sector of the state.

INTRODUCTION

The novel coronavirus has spread widely in India alike other countries, and the number of reported infections remained very low when compared with other countries like USA, Britain, Italy, etc. (Mahendra, 2020). Due to lockdown, the economic shock was much more severe for India mainly because of two reasons. Firstly, pre-COVID-19, the economy was already slowing down, compounding existing problems of unemployment, low incomes, rural distress, malnutrition, and widespread inequality. Secondly, India's large informal sector is particularly vulnerable (Rawal and Kumar, 2020). There are multiple implications of COVID lockdown in the Indian agricultural sector also. Preliminary reports as highlighted by various media sources revealed that the non-availability of migrant labour interrupted the harvesting activities, particularly in northwest India where wheat and pulses were being harvested. The continued restrictions on movements of people and vehicular traffic, concerns have been raised regarding negative implications of COVID-19 pandemic on the farm economy, too (ICRISAT, 2020). A group of authors from this institute also highlighted that as the end of March was the peak of *rabi* season in India and crops like wheat, gram, lentil, field pea, mustard, etc. were at a harvestable stage or almost reaching maturity (Carberry & Kumar, 2020). Considering the woos of the lockdown during that period, the Government of India and ICAR took various measures to surmount the problems arising out of this situation. Cash and food assistance to persons engaged in the informal sector, mostly migrant labourers, was also announced for which a separate PM-CARES (Prime Minister Citizen Assistance and Relief in Emergency Situations) fund was created (Rawal & Kumar,

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2020) besides PM-KISAN scheme and enhanced wages under NREGS. 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 possible action points at the ground level for strengthening the farm sector in India during this situation were also suggested by Jhajjharia et al., (2020), which include the need to schedule marketing of crops like wheat which come just after harvest. Likewise, labourers' reverse migration (influx) leading to a decline in agricultural wages in some communities and an increase in others, as well as critical losses of produces otherwise affected the rural economy (Kumar et al., 2021). The pandemic caused lowering of income while increasing expenditure for rural households (Roy & Ghosh, 2022). In the given situation, it is, therefore, imminent to get the first hand and empirical evidence on the impact of COVID-19 lockdown on economic yardsticks of the major *rabi* crops like wheat, mustard, lentil, chickpea and field pea as compared to their status in the pre-COVID period of the last year (2019). A systematic study was therefore conducted to quantify the investment and profitability of crop cultivators of the state of Uttar Pradesh during COVID 19 lockdown (2020) as compared to the same period in 2019.

METHODOLOGY

From each of 75 districts, 10 farmers were approached telephonically. However, owing to the limitations of telephonic survey in terms of non-willingness of the subject to join interview, giving inadequate information in the interview and leaving the interview in between, we could get the complete desirable data from 57 districts (76%) out of 75. Thus, the randomly sampled 570 farmers were interviewed telephonically and personally also by engaging the related Krishi Vigyan Kendras (KVKs) of the district during the period of 20 April to 25 June 2020 giving the situation of lockdown and partial unlock period. The post-stratification showed that there were 530 data points each for wheat and mustard farmers, 400 for chickpea farmers, 430 for lentil farmers and 290 for field pea farmers. The major research variables included investment and the profitability parameters affected due to COVID-19 lockdown. In order to derive the effect objectively, the same respondents were asked to furnish the information during the same period of last year (March-May, 2019) as during the lockdown period (March-May, 2020). The before-after research design (Kerlinger & Rint, 1986) was utilized for the present study. However, in this particular case of investigation, as the lockdown was spread across all the district of Uttar Pradesh state, the scope of recording data from without lockdown environment did not exist. Hence, whatever effect of lockdown (2020) could be estimated that was with reference to the same period of the previous year (2019) and hence, it was the net effect of lockdown. Thus, the robustness of the research design of the study was ensured. The indicators taken under-investment variables were the purchase price of inputs like Urea, DAP, MoP (all in Rs/q), Biofertilizer (Rs/kg), fungicide (Rs/kg), insecticide (Rs/kg) and labour charge (Rs/head/day) during lockdown period (March-May, 2020) and their purchase price during the same period of year 2019. Likewise, for profitability variable, the indicators included were average market price (Rs/q), average gross cost of production (Rs/ha), average gross return (Rs/q) and B:C ratio for all the selected five crops. Besides, the data were also collected from 110 scientists of the selected 57 KVKs on their perception of the effect of lockdown on the different *rabi* crops growers in their district to cross-validate the results. The data collected on the above parameters were subjected for descriptive analysis namely average, percentage, rank, standard deviation (SD) and coefficient of variation (CV) and also the inferential statistics of paired t-test to see the significance of difference, if any.

RESULTS AND DISCUSSION

Effect of lockdown on the investment made in crop enterprises

During the lockdown period in the state of Uttar Pradesh, major *rabi* crops affected were wheat, mustard, lentil, chickpea, and field pea. These crops were either at the maturity stage or harvested and ready for threshing and marketing during that time. Most of these crops had already consumed the production inputs either at the initial stage or at their respective growth stages. Only the farm labour was the most critical input for those crops during the lockdown period. However, the market prices with respect to the inputs taken for analysis was captured pre- and during the lockdown period as these inputs were to be used for the forthcoming *Zaid* crops and summer vegetables. Effect on the input purchase price as shown in Table 1 reflect that except for DAP and Urea, then there was the increase in the price of other inputs like potash (Rs 138/q), bio-fertilizers (Rs 45/kg), fungicide (Rs 32 /kg), insecticide (Rs 50/kg) and also the labour charges (Rs 36/head/day) during lockdown period as compared to the same period of last year (2019). The price of urea and DAP was dropped by Rs 83/ q and Rs 12 /q respectively. For the other inputs like bio-fertilizers, fungicides and insecticides, there was the gain in their price to the extent of Rs 45/kg, Rs 32/kg and Rs 50/kg respectively. Similarly, for agricultural labourers, there was an average wage gain to the extent of Rs 36/labour/day. However, statistically, these price gains were non-significant. Only for the price drop for DAP ($P<0.10$) and Urea ($P<0.05$) and price gain for Potash ($P<0.05$), a significant to highly significant difference was observed because of lockdown as compared to the last year. The results are comprehensible on the ground that during the lockdown period when data were captured (March, April and May, 2020), most of the plant nutrients were utilized and hence, their demand was reduced. Therefore, the reduction in the market price of Urea and DAP is comprehensible. Potassic fertilizers owing to its higher demand and lesser availability may have seen the increasing price trends. Similarly, due to lockdown, the village labourers were probably not coming out of their home as a fear of COVID-19, and thus the limited availability of farm labour might have increased their wages. It was again the interesting output that though the price of many inputs increased during the lockdown, their coefficient of variation in price drop was not very high. For example, in the case of potash price the CV was lowest i.e. 0.09 (2020) as compared to 0.15 in 2019. Likewise, for crop labour charges, the

CV was low 0.18 (in 2020) and 0.19 (2019). For other production inputs like bio-fertilizers, insecticides and pesticides higher CV (0.24 to 0.51) indicated that farmers experienced fluctuating higher market prices in their area but with lesser magnitude. The inputs like DAP and Urea which witnessed the decline in price also showed considerable CV (0.09 to 0.39). Regarding the price rise of agri-inputs during the lockdown, Narain (2020) also reported similar experiences across various states of India. The majorityof the non-vegetarians (80.84%) and vegetarians (55.09%) opined that the price of meat and milk products increased during the pandemic. Study by Shanabhoga et al., (2022) also established that the pandemic had an effect on consumption among non-vegetarian and vegetarian consumers but increased accessibility of products through deliveries or pick-up points at various locations might have reduced the price and also induce the consumption of these products.

Effect of lockdown on the economic indicators of various Rabi crops

Five common economic indicators were taken for selected *rabi* crops i.e., wheat, mustard, chickpea, lentil and field pea. The crop-wise estimation of these indicators is explained under the following subheads:

The average increase in the cost of production of wheat during lockdown (2020) was computed to be Rs 1365/ha which was significantly more (P<0.05) with considerably higher CV (0.29%) as compared to the previous year (0.27%) of 2019 (Table 2). The increase in the cost of production may be due to enhancing labour charges which were required in a bigger way during harvesting, threshing, packaging and transportation activities. However, the higher CV also indicates the greater extent of variation in the cost of production from farmer to farmer. Other economic indicators like average market price (Rs/q) and average gross return (Rs/ha) showed increased magnitude during lockdown period, but it was not statistically significant and also their CV was to a lesser extent (0.03 to 0.20). B:C ratio was found to be significantly more (P<0.05) during the lockdown period as compared to the last year (2019).

Not only the average cost of production (Rs/ha) of mustard increased significantly (P<0.05), the market price earned during lockdown period was also significantly more (P<0.05) as compared to the last year (2019). As a result, the profitability indicator (B:C ratio) was significantly enhanced (P<0.05 and P<0.10) during lockdown period, indicating that magnitude of increase in the cost of production (4.60%) was less than the magnitude in the increase of market price (24.5%). Also, the extent of variation in all the indicators were higher (CV: 0.24-0.36) except market price (CV: 0.03-0.14) which gave the clue that cost parameters showed greater instability and market price of mustard was more constant.

Unlike wheat and mustard, both chickpea and field pea experienced the significant gain in the average cost of production (P<0.05), average market price (P<0.05) and average gross return (P<0.10) during lockdown period as compared to last year, the B:C ratio was significantly reduced (P<0.05) indicating that the degree of change in gross return was less as compared to the degree change in the cost of production (Table 2). The variability in all

Table 1. Relative status of investment in crop production affected during the lockdown period

Inputs	Descriptive values		Inferential statistics			
	2018-19	2019-20	Mean difference	t value	P (T<=t) one-tail	P (T<=t) two-tail
DAP (Rs/q)	2512.34 (249.54) {0.09}	2429.24 (241.54) {0.09}	-83.10	1.78	0.04	0.08**
Urea (Rs/q)	643.21 (246.14) {0.38}	631.67 (247.09) {0.39}	-11.54	2.32	0.01	0.02*
Potash (Rs/q)	1637.24 (251.64) {0.15}	1775.23 (172.84) {0.09}	+138.00	-4.20	0.00	0.00*
Biofertilizers (Rs/kg)	368.58 (173.41) {0.47}	413.49 (209.28) {0.51}	+44.91	-5.18	1.87	3.74
Fungicide (Rs/kg)	566.87 (177.48) {0.31}	599.26 (196.53) {0.32}	+32.39	-5.18	1.87	-3.74
Insecticide (Rs/kg)	661.73 (160.35) {0.24}	712.02 (174.06) {0.24}	+50.29	-8.74	5.09	1.02
Crop labor charge (Rs/head/day)	235.02 (45.09) {0.19}	270.96 (50.64) {0.18}	+35.94	-9.84	1.09	2.18

Figures in () indicate standard deviation, figures in {} indicate Coefficient of variation
2019-20: Lockdown period (March-May, 2020); 2018-19: No Lockdown period (March-May, 2019)
* P<0.05; ** P<0.10

Table 2. Comparative status of economic indicators of various *Rabi* crops affected due to lockdown

Crop	Ave. Market price (Rs/q)		t value	Ave. Gross cost of Production (Rs/ha)		t value	Ave. Gross return (Rs/ha)		t Value	B:C ratio		H.M.
	2018-19	2019-20		2018-19	2019-20		2018-19	2019-20		2018-19	2019-20	
Wheat	1775.92	1881.69	-13.91[a]	37199.68	38564.68	-2.43[a]	79668.91	79689.65	-0.09[a]	2.23	2.16	2.63[a]
(530 data points)	(97.44)	(73.83)	2.72[b]	(10170.99)	(11236.97)	0.01[b*]	(14885.06)	(16225.58)	0.46[b]	(0.49)	(0.49)	0.005[b*]
	{0.05}	{0.03}	5.45[c]	{0.27}	{0.29}	0.02[c*]	{0.19}	{0.20}	0.92[c]	{0.21}	{0.22}	0.011[c*]
Mustard	3840.19	4779.06	1.38[a]	22545.83	23584.49	-3.34[a]	61426.47	69101.91	1.16[a]	2.72	2.93	2.50[a]
(530 data points)	(529.26)	(4947.42)	0.08[b**]	(6871.28)	(7198.49)	0.001[b*]	(14927.00)	(16610.25)	0.12[b]	(0.99)	(1.05)	0.01[b*]
	{0.14}	{0.03}	0.17[c]	{0.30}	{0.30}	0.001[c*]	{0.24}	{0.28}	0.25[c]	{0.36}	{0.36}	0.01[c*]
Chickpea	4764.62	5005.37	-3.92[a]	25663.55	26654.63	-3.45[a]	75181.89	68873.56	1.61[a]	3.01	2.69	2.30[a]
(400 data points)	(897.51)	(910.36)	0.0002[b*]	(5918.02)	(6544.91)	0.001[b*]	(19425.38)	(24353.34)	0.06[b**]	(0.77)	(1.02)	0.01[b*]
	{0.18}	{0.18}	0.0003[c*]	{0.23}	{0.24}	0.001[c*]	{0.26}	{0.35}	0.11[c]	(0.25)	{0.37}	0.03[c*]
Lentil	4768.14	5177.907	-6.99[a]	23967.07	24769.84	-2.42[a]	59319.29	59397.58	-0.04[a]	2.66	2.57	1.18[a]
(430 data points)	(892.97)	(979.01)	8.3[b]	(7168.34)	(7528.59)	0.01[b*]	(16415.58)	(18892.97)	0.48[b]	(0.98)	(1.04)	0.12[b]
	{0.18}	(0.18)	1.66[c]	{0.30}	{0.30}	0.02[c*]	{0.27}	{0.32}	0.97[c]	{0.37}	{0.40}	0.24[c]
Field pea	3516.21	3719.83	-3.48[a]	22657.62	23767.07	-3.83[a]	58503.76	56998.38	0.54[a]	2.65	2.46	1.46[a]
(290 data points)	(995.64)	(1081.52)	0.001[b*]	(5798.84)	(6408.61)	0.000[b*]	(24857.25)	(24440.04)	0.29[b]	(1.09)	(0.99)	0.07[b*]
	{0.28}	{0.29}	0.001[c*]	{0.25}	{0.27}	0.001[c*]	{0.42}	{0.43}	0.59[c]	{0.41}	{0.40}	0.15[c]

Figures in () indicate standard deviation, figures in {} indicate Coefficient of variation; [a]indicates t value, [b]indicates t value (one-tail) and [c]indicates t value (two-tail)
2019-20: Lockdown period (March-May, 2020); 2018-19: No Lockdown period (March-May, 2019); * P<0.05; ** P<0.10

the four indicators was also considerably high (CV: 0.18 – 0.43%). Contrary to these, lentil did not show any encouraging trends during the lockdown and therefore, not only the cost of production increased, the gross return and B:C ratio was comparable or even less even though the market price were more as compared to last year (Table 2).

The wheat and lentil growers remained the most affected group as compared to mustard, field pea and chickpea growers. The increased production cost was the bigger determinant as compared to the market price of these commodities during the lockdown as compared to the same period of last year. Greater increase in production cost may be further attributed to increased inputs cost due to limited opening of such outlet despite the state Government clear-cut instruction for relaxation of the complete lockdown of agricultural inputs shops in the state of Uttar Pradesh. Another positive impact of Government's decision to ensure the procurements of harvested produce enabled the mustard, chickpea and field pea farmers to fetch higher profitability during the lockdown period. Findings in other words also give the clue of the success of the State Government's decision to support agricultural farmers of the state by appropriate policy interventions during the lockdown period.

Perception of KVKs on the effect of lockdown

KVK experts agreed (92%) that there was fear prevailing among the farm labour to move out during lockdown (Table 3) and as a result, the farm works were getting affected with severity index of 0.24. In general, the lockdown created closure of all agri-outlets despite the notification by the state government for opening the agriculturally important input stores. This fact was also confirmed by the KVK specialists (83%) that there was limited to nil availability of agri-inputs due to shutdown of such outlets and those few who use to open created hike in the price of inputs especially the insecticides, fungicides, biofertilizers, etc as indicated in Table 1. The situation of lockdown further showed that he farms machinery especially harvesters, threshers and combine harvester and thresher were not available in adequate numbers which causes a delay in doing post-harvest operations. The severity of this issue was third-ranked with an index value of (0.21). The vegetable growers were another worst hit category of farmers who were not able to sell their vegetables and other perishable farm produce during lockdown (60%) mainly because of the disruption in supply logistics like transportation, storage and disposal (59%). In general, all the problems as highlighted by the KVK experts seem to be inter-related and holistic. The lockdown announcement by the Government stopped the movement of any kind and that worst affected the transport and finally the movement of agri-harvest from one place to another especially the vegetables and other perishable produces (Table 3) unlike wheat, mustard, chickpea, lentil and field pea which were less affected. The fear perception among the farm labour about further wooed the situations. Even the advisories issued by the Government of Uttar Pradesh and ICAR about precautions to be taken while doing the farm operations during did not seem to work initially for the vegetable growers.

Table 3. Perception of the effect of lockdown among crop and vegetable growing farmers

S.No.	Lockdown effects	Percent	Severity index
1	Fear among agricultural labourers about -19 and hence there was difficulty in getting farm work done	91.80	0.24 (I)
2	Non/limited availability of Agri-inputs due to shutdown of Agri- input shops.	82.72	0.22 (II)
3	Harvesting of mature *Rabi* crops was affected due to non-availability of the Agriculture equipment like harvester, thresher and even the combined harvester on time.	80.90	0.21 (III)
4	Sowing of *Zaid* crops was affected owing to challenges in inputs availability and labours availability	67.27	0.18 (IV)
5	Most of the farmers were not able to send their vegetables and other perishable produces to the market	60.00	0.16 (V)
6	Adverse effect on the supply chain of vegetables and fruits	58.18	0.15 (VI)

Interventions of frontline extension systems

A three-pronged strategy was executed in the state by ICAR and KVK partnership. Firstly, to make the rural farming community aware of nature and disease spread behaviour of COVID-19, two apps namely AROGYASETU and KISAN RATH were disseminated for downloading and use; secondly, these farmers were also disseminated the state-approved and ICAR approved farm advisories which may guide them to successfully perform their farm operations under this lockdown condition; and thirdly, under such stressed situation, farmers were also arranged to supply through the KVKs the quality seeds and planting materials. Further, to reinforce the decisions, three video-conferencing meetings were held with the participation of KVK Heads and Directors of Extension of various SAUS, ICAR institutes, NGOs and Educational societies. As a result of these efforts, a total of 93 thousand farmers (about 48%) of the state downloaded both the apps, out of 2.46 lakh farmers who were given this information to download them. It was also reported that in the formal education system also, it was not possible to afford lock down and therefore, online classes can effectively meet the need of the students and they are interested in having online classes (Bhati et al., 2020). The downloading is still regularly being done by the farmers. Similarly, using various channels like WhatsApp, mKISAN, print and electronic media, radio talk, KCC and other ICT platforms, as many as 18.70 lakh farmers were disseminated the various advisories related to field and horticultural crops, livestock and poultry, low-cost sanitization, etc which have immensely benefitted the rural farming community. To further consolidate the efforts, the KVKs of the state supplied 350 q of quality seeds of forthcoming summer crops and 1.23 lakh seedlings and saplings to the farmers. A study by Singh et al., (2021) reported that majority of rural girls were found to have moderate level of knowledge and were reported to have a neutral attitude towards health seeking and preventive behaviour. Nearly half of the respondents were reported to be following inappropriate practices and had few personal/familial/school related issues which needed immediate attention and help. According to Roy & Ghosh (2022), personal cosmopolite sources use, social recognition, annual family income before and during pandemic and expenditure before and during pandemic explained 63.7 per cent variation in of adaptation level. This reiterates the importance of extension advisory services to secure sustainable rural livelihoods.

CONCLUSION

As the wheat harvesting was completed with bumper production, State Govt. should develop the modality to ensure its effective procurement by opening purchase centres at the village level and it was done by the related officials. Likewise, production inputs like seeds, fertilizers, chemicals for the standing vegetable crops as well as for the forthcoming *zaid* (mungbean, groundnut, summer maize, pearl millets, etc.) and *kharif* (paddy, pigeon pea, etc) crops are to be ensured adequately and at the reasonable price during such vagaries. Vegetable growers who are the smallholders and capital-starved need special attention by ensuring their access to city *mandis* and local market so that may sell out the semi-perishable produce like a vegetable. In such time of challenge, the village, as well as city-based organizations, groups and Govt. agents, very proactively as well as voluntarily ought to come forward to help farmers so that agriculture may continue to ensure the income flow to them.

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