Sustainability, Agri, Food and Environmental Research, (ISSN: 0719-3726), 12(2), 2024:
http://dx.doi.org/10.7770/safer-V13N1-art563

Efficacy of Lockdown on Agripreneurship Market and Agripreneur's Income: Evidence from Uttar Pradesh, India.

Eficacia del bloqueo en el mercado de agroempresarios y los ingresos de los agroempresarios: evidencia de Uttar Pradesh, India

Kamlendra Kumar Verma* Prof. (Dr.) C.B. Singh

Research Scholar, Department of Banking, Economics and Finance, Bundelkhand University, Jhansi (U.P.), INDIA. Email: kamlendra.verma86@gmail.com; Mobile: 9616934487
Head, Department of Banking, Economics and Finance, Bundelkhand University, Jhansi (U.P.), INDIA.

ABSTRACT

Background- The paper studies impact of lockdown on agricultural supply chain, its subsequent impact on farmers' income and identifies gaps to be investigated about agrarian supply chain (SCM) practices. Methods- Primary data come from survey interviews led from August to September 2021 with a sample of 367 farmers of the different farming fields in Uttar Prades, India. Studying how much lockdown restricted admittance to inputs, work and markets to produce, cultivate and sell theirs produces. The secondary data is sourced from semi-exact research that joins distinctive quantitative and qualitative sources of data, including master elicitation, to distinguish, portray and dissect the various components influencing Indian farming frameworks, and more extensively agricultural area, following the COVID-19 lockdown. Result- Agri-food supply chain network is a drive towards this bearing, which may serve a ton in conquering issues experienced by Indian farming. The issues arising in Indian agriculture are novel, mind-boggling and extreme because of the presence of a larger part of them among the majority of Indian agriculturists. Consequently, progressed procedures should be a gadget to resolve these issues which warrant quickly evolving techniques, advances and the executives rehearse in the supply chain network component.
Keywords: Agribusiness, Agriculture, Bundelkhand, COVID-19, Farmer's Income, Lockdown.

RESUMEN

Antecedentes: el documento estudia el impacto del bloqueo en la cadena de suministro agrícola, su impacto posterior en los ingresos de los agricultores e identifica las brechas que deben investigarse sobre las prácticas de la cadena de suministro agrícola (SCM). Métodos: los datos primarios provienen de entrevistas de encuestas realizadas de agosto a septiembre de 2021 con una muestra de 367 agricultores de diferentes campos agrícolas en Uttar Prades, India. Estudiar cuánto restringió el confinamiento el ingreso a insumos, trabajo y mercados para producir, cultivar y vender sus productos. Los datos secundarios provienen de investigaciones semiexactas que unen fuentes de datos cuantitativas y cualitativas distintivas, incluida la elicitación maestra, para distinguir, retratar y diseccionar los diversos componentes que influyen en los marcos agrícolas indios y, más extensamente, en el área agrícola, luego del bloqueo de COVID-19. . Resultado: la red de la cadena de suministro agroalimentaria es un impulso hacia este rumbo, que puede servir mucho para superar los problemas que experimenta la agricultura india. Los problemas que surgen en la agricultura india son novedosos, alucinantes y extremos debido a la presencia de una gran parte de ellos entre la mayoría de los agricultores indios. En consecuencia, los procedimientos avanzados deberían ser un dispositivo para resolver estos problemas que

requieren técnicas que evolucionan rápidamente, avances y los ejecutivos practican en el componente de red de la cadena de suministro.

Palabras clave: agronegocios, agricultura, Bundelkhand, COVID-19, ingresos de los agricultores, confinamiento.

INTRODUCTION

The pandemic occurred due to COVID-19 has influenced numerous areas of the economic framework and the actions set up to diminish it has negatively affected economies around the world. India executed a severe lockdown beginning March 2020 and further, in April 2020 the development projections for the nation were modified descending from 6% to 2%, with huge anticipated effects on the agriculture area from both interest and supply withdrawals (IMF, 2020). Such a slump in economic activity would have significant ramifications for neediness decrease and food security the nation over, as India's agricultural area addresses practically 15% of GDP and gives occupations to an expected 126 million small farmers (Bisht *et al.*, 2020) and in excess of 100 million farming workers and other worth chain workers. As states are being encouraged to give help to farmers and backing their recuperation (Narayanan and Saha, 2020), and as they are searching for ways of limiting the antagonistic outcomes of arrangements to contain future flare-ups, it is basic to see what a lockdown means for agrarian worth chains.

In any case, exact proof of the particular effects on food and agrarian business sectors is as yet arising. Adhikari *et al.* (2020) and Mahajan and Tomar (2020) revealed a drop of around 10% in the internet-based accessibility of different food sources with no effect on retail costs in the prompt outcome of the primary Indian lockdown. An equivalent measure is done by Balwinder Singh *et al.* (2020) utilizing a spatial ex-ante demonstrating structure. Assessing various situations of opposite work movement, Balwinder Singh *et al.* (2020) estimates the misfortune in all-out framework usefulness at somewhere in the range of 9% and 21%.

The important exercises of a great many people in non-industrial nations generally identify with farm-level frameworks and farming produces (Singh *et al.*, 2020b), which are characteristically connected to their livelihoods, the economy, social frameworks and the climate. In provincial regions specifically, farming is frequently the prevailing wellspring of business, pay and nourishment for local networks. In the non-industrial nations of South Asia, the agrarian area by and large offers over 20% to Gross Domestic Product (GDP) (IMF, International Monetary Fund, 2020) and is a characteristic point of convergence for financial exercises pointed toward encouraging pretty much supportable improvement as far as making development, occupations, exchange and new organizations and alleviating neediness.

To give a more profound understanding of the components at play and educate the plan regarding recuperation strategies, we dissect how agricultural production and farmer livelihood were disturbed during the lockdown. To do this, the paper plans to respond to three principal research questions. To start with, we mean to survey how much farmers' yield pay declined during the lockdown, focusing on two kinds of producers in a similar geological setting: wheat makers, who were going to collect their harvests when the lockdown was declared and for whom strategies were set up to ensure a business opportunity for their reap; and rice makers,

who were in the midst of the developing season—and may in this manner have seen effects on their production—and for whom no approaches were set up to help to promote.

In this sense, we anticipate possibly bigger unfriendly impacts of the lockdown for rice farmers. Second, to decide the degree to which farmers had the option to ingest any subsequent transient pay shocks, we study whether decreases in agriculture pay are related to changes in getting and food instability, with possibly long-haul government welfare impacts. Third, we are keen on portraying income decreases by farmer profiles; specifically, we investigate which farmer ascribes assist with clarifying contrasts, assuming any, in income decreases across rice and wheat makers. The paper further attempts to distinguish and depict the different staggered ramifications of the COVID-19 lockdown and related consequences for farming frameworks considering the related crisis reactions of the public and state legislatures in India. All things considered, the current circumstance in India can possibly slow down the improvement of the agricultural area for a long time to come and additionally lead it toward a path that isn't lined up with the Sustainable Development Goals (SDGs). On the other hand, illustrations gained from adapting to COVID-19 might start the improvement of more vigorous supply chains.

We study these questions by collecting the survey data gathered from 367 wheat and rice farmers spread across the Bundelkhand region of Uttar Pradesh, India. These surveys were conducted after lockdown with regards to a continuous board study on agrarian risk management. On account of wheat farmers, the survey incorporated a progression of questions correlated with the impacts of the lockdown on crop cultivation, harvesting, its cost & expenses and commercialization of produce later reap. On account of rice, a multi-picking crop, we regulated a similar arrangement of questions through a few subsequent surveys all through the harvesting season, permitting us to investigate the impacts of the lockdown limitations. For both wheat and rice farmers, we got some information about borrowing and remembered a short module for the family's admittance to food prior and then afterwards the lockdown, giving insights of knowledge on lockdown-related borrowing and disruptions in food security. This information gives experiences on the linkages between diminished agribusiness income and risks adopting practices.

This paper adds to the literature in three different ways. To begin with, our review connects with developing writing dissecting the impacts of the COVID-19 pandemic and related limitation measures on agricultural livelihoods (Ceballos et al., 2020; Kumar et al., 2020; Rawal et al., 2020), farming worth chains (Hailu, 2020), the agricultural grain (Brewin, 2020) and rice (Richards and Rickard, 2020) areas, and food security (Abate et al., 2020; Alvi and Gupta, 2020). We add to this writing by measuring decreases in pay for producers of two unique kinds of harvests, wheat, and rice, in a similar region, and showing that the degree to which pay was brought down changes generally across these two diverse worth chains.

Apparently, very few studies on the impacts of the COVID-19 pandemic and related limitation measures on agrarian livelihood evaluate pay impacts of the pandemic for various periods of production and marketing, while at the same time breaking down what a similar lockdown in a similar topographical setting meant for producers of various kinds of harvests. Second, this paper connects with a few strands of the agricultural financial aspects literature around risk management and adapting to shocks. Farmers for the most part have extremely restricted choices for keeping away from pre-collect production misfortunes (Moschini and Hennessy,

2001; Oerke and Dehne, 2004; Savary et al, 2012) or post-production misfortunes (Affognon et al., 2015; Hodges et al., 2011). In this light, rural family versatility to variances in farming wages is a critical part of country improvement.

While the literature features different formal and casual methods for dealing with stress accessible to farmers (Dercon, 2002; Wik, 1999), these are by and large restricted and will more often than not be less accessible among the weakest families (Gao and Mills, 2018; Harvey et al., 2014; Ols-child et al., 2015). In this light, huge decreases in pay, similar to the ones we notice for rice makers, can have significant government welfare suggestions in the long haul; farmers might see an expansion in future risk, possibly prompting under-interest in beneficial advancements (Cai et al., 2013; Cai et al., 2009; Cai, 2016; Cole et al., 2017; Kar-lan et al., 2014; Mobarak and Rosenzweig, 2012), and such a one-time shock can have long haul results on pay ways and human resources improvement (Barrett and McPeak, 2006; Dercon and Hoddinott, 2004).

In this paper, we concentrated on a fundamental shock. Studies that recognize peculiar and fundamental shocks observe the previous connection to family resource exhaustion as a pay smoothing procedure, and the last option as having more tough impacts on utilization (Börner et al, 2015; Nguyen et al., 2020). This is not out of the ordinary since a significant number of the casual adapting methodologies accessible to country families, (for example, borrowing from nearby moneylenders or relatives or taking advantage of different kinds of revenue like non-agrarian work) will more often than not fail when most families in space are impacted by a similar shock (Dercon, 2002).

Such experiences are especially significant in the light of a worldwide foundational shock like the COVID-19 pandemic, which might achieve desperate results as far as food uncertainty and sustenance. We observe that for the time being, compared with wheat farmers, rice farmers are bound to acquire or become food unreliable when enduring lockdown-related decreases in agri-pay. Given this, it will be critical to present recuperation arrangements focused on these farmers to try not to long-keep going effects on utilization.

We add to a new increase in the writing around cost risk in agribusiness (Bellemare et al., 2020; Boyd, 2020; Boyd and Bellemare, 2019). The study identifies farmers' expressed view of risk find that market risk, including value risk, is perhaps the main challenge to the farmer (Duong et al., 2019). This is significant in the light of an expansion in food value unpredictability somewhat recently, with repeating times of value discouragement (FAO, 2018). Reliable with this literature, the primary figure decreasing agrarian pay the setting of our review has been a fall in rice costs. We presume that the approach endeavours to give calamity alleviation and construct strength should think about the differential effects of disturbances to agribusiness market sectors on farmers livelihood. Also, future approaches for building flexibility should be focused on creation risk management as well as, significantly, set value risk decrease as a key need pushing ahead.

The Figure 1 represents the growth rate of agricultural production in Bundelkhand by category of farms before COVID-19 lockdown and the fluctuations happening from 2006 to 2019. Due to broad COVID-19 relieving activities broadly, monetary exercises related not exclusively to Indian farming frameworks yet to farmers all over South Asia have confronted a few serious hits because of the surprising conditions that have ostensibly offset the immediate effects of COVID-19 (Mahendra Dev, 2020; Pothan et al., 2020). For instance, during the lockdown in India transportation has generally been ended, in this way diminishing yields and compromising

food security. During the pinnacle of the spring harvest, produce could regularly not arrive at the rustic business sectors or "mandis", consequently seriously upsetting typical inventory chains. The shortfall of agrarian and other transient work has likewise influenced planting, collect and post-reap activities (Saha and Bhattacharya, 2020; Pothan et al., 2020). Likewise, the current pandemic has made difficulties for acquisition activities.

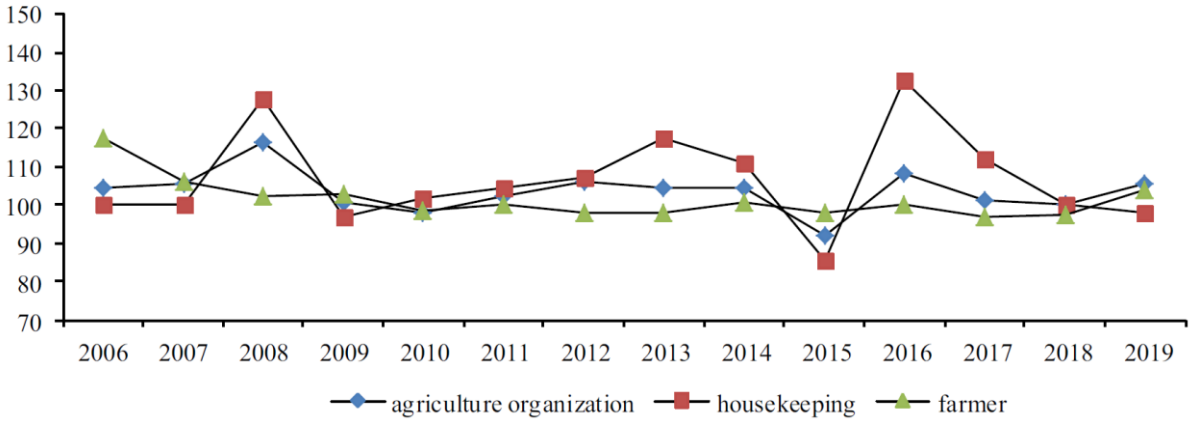

Figure 1. Growth rate of agricultural production in Bundelkhand by category of farms before COVID-19.

MATERIALS AND METHODS

This study connects with a more extensive continuous effect assessment to survey the impacts of risk management instruments to shield farmers from agrarian produce shocks: Picture-Based Insurance (Ceballos, Kramer *et al.*, 2019). As a component of this review, the undertaking is publicly supporting pictures of farmers' yields to screen crop development, the board practices, and harvest harm through a committed cell phone application named KisanCam. Taking an interested farmer are spread across 109 towns in four bordering areas: Jhansi, Jalaun, Lalitpur and Mahoba. These districts have a place with blocks having groups of rice producers and were recognized by block-level officials as those with higher centralizations of rice producers.

The primary data utilized in this paper come from survey interviews led from August to September 2021, later the COVID-related lockdown measures came full circle. This survey filled in as a development with partaking concentrate on farmers near the finish of the rabi gather season and was gone before by other in-person information assortment adjusts in prior seasons. The survey remembered an overall module for cultivating exercises, input use, and yield harm during the rabi season, trailed by a COVID-explicit module on the impacts of the lockdown on the circumstance of reap, advertising exercises, and expenses and accessibility of farming data sources, work, machinery and transport. Also, a little module on food security previously, then after the fact the lockdown was incorporated, in light of a changed and decreased variant of the Household Food Insecurity Access Scale (HFIAS, Coates et al., 2007). Where accessible, we supplement the information from this survey information gained through the KisanCam application, and, as a heartiness check, with information on caste collected as a feature of a benchmark study for a little subsample of study farmers. At last, we depend on key source interviews with agrarian specialists in Uttar Pradesh to comprehend the general degree and reach of

the COVID-related measures forced in the state and to get setting explicit data in regards to wheat and rice reaping and commercialization.

The rest of this segment gives more subtleties on how we tested farmers for the studies, and how we build our last investigation test. Surveys were directed with two arrangements of farmers: all farmers who had partaken in KisanCam during the rabi 2019–20 season, sending in pictures of their wheat and rice crops and, as choice into the previous example could be affected by varieties in the program across villages, we additionally chose an irregular example of producers from farmers who had been welcome to take an interest in KisanCam toward the beginning of the rabi season. This example of the welcomed farmers was built to be as illustrative of producers in the study region as could be expected while grouping on the districts and defining on quartiles for a farmer's functional land size.

The primary justification behind whittling down was being not able to arrive at farmers (22% of wheat farmers and 7% of rice farmers), trailed by farmers not growing one of our designated crops. Generally, in any case, these are high reaction rates for a study, because of significant degrees of compatibility between the survey group and study farmers, just as an efficient convention to settle on numerous decision backs at various occasions during the day.

Wheat farmers were interviewed a single time later the reap had been finished. Every rice farmer was asked a more limited poll, with inquiries concerning timing, volume, expenses, and commercialization (amount and expenses) of the item in each picking. When the farmer said that they had completed the last picking for the season, they finished the more drawn-out module that wheat makers had finished also, asking about all-out production costs, crop loss, and ways of dealing with challenges and the COVID-explicit and food security modules. Weakening, for this situation, was related to being a more youthful farmer, having a later rice relocating date, and announcing expanded machinery costs in the main review. In what follows, we remember just the 92 rice farmers for our principal examinations to guarantee a reliable example all through the paper. To address for weakening, we apply converse likelihood loads to the example to appoint a higher load to rice farmers with beginning attributes like the people who didn't react to the last survey.

The secondary data has been sourced from semi-exact research that joins distinctive quantitative and qualitative sources of data, including master elicitation, to distinguish, portray and separate the various components influencing Indian farming frameworks, and all the more extensively the agricultural area, following the COVID-19 lockdown. Sources of data utilized for this distinct research combine information from the National Statistical Office of India, publications, writings, including reports and official data delivered by public and state legislatures and associations in India, media articles. A critical assessment of earlier work led on a particular subject will reveal intriguing issues which probably won't be very much caught or taken note of. The course of literature assortment started comprehensively with looking for the keywords of agriculture supply chain management and farming and the interaction step by step expected particularity.

Subsequently, the paper utilizes a mix of deductive and inductive methodologies. To start with, literature like published peer-reviewed journal papers, white papers, doctoral dissertations, introductions made in conferences and industry manuals relevant were collected from the web and non-web sources. The starter phase of literature comprises more than a great many research articles and other sources. In any case, the

essential thought process is to survey the literature applicable to the agribusiness supply chain network, many types of research identifying with farming and supply chains were gathered.

In the following stage to distinguish the specific articles from the primer information assortment, three-way separating conditions are adjusted. First depends on the period, the research considered papers distributed on the agriculture supply chain. Next depends on catchphrases utilized for scanning articles and papers for the reason incorporate Supply Chain Management of Agribusiness. The last channel is done dependent on reputed publications accessible in three data sets viz. Scopus, EBSCO and Google Scholar. In light of these conditions absolutely of 161 articles are chosen for the critical literature review. The four stages continued in this interaction are presented in Table 1 and Table 2.

Table 1. Secondary Data Sources

Material Collection	All papers fulfilling the three criteria set down as restricting variables were taken for examination
Descriptive Analysis	We isolated the identified papers utilizing Nvivo 11 dependent on the wellspring of material and given creators
Category determination	We then, at that point ordered the papers like an overall writing survey of the agribusiness supply chain, approaches influencing the fragments of the agribusiness supply chain, individual sections of agribusiness SCM and management of supply chain portions
Material Assessment	The sifted articles were investigated on the scenery of the primary credits and relevant issues were dissected to investigate the research gap in the earlier literature

Table 2. Search Strings

Search String	No. of studies
“agriculture supply chain during COVID-19” OR “agribusiness supply chain in COVID-19” OR “food supply chain during COVID-19” OR “food traceability” AND “supply chain network during COVID-19*”	73
“rural supply chain during COVID-19*” AND “agri-food transportation during COVID-19”	88

OBSERVATIONS

The paper has distinguished the issues in agriculture supply chain network practices and their effect after COVID-19. The circumstance brought about by the pandemic emergency and expanded lockdown period has seriously influenced both the stockpile of and interest for agro-food sources (Mahendra Dev, 2020), straightforwardly affecting the monetary circumstance of 140 million Indian farmers. The rural produce of Rabi oats (spring crops) is set in cool stockpiling or food banks as well as straightforwardly provided to the market

from neighbouring farmers, when the majority of cereal produce can't advertise, food costs take off, particularly in metropolitan markets. This causes an undeniably challenging circumstance.

In our study region, in four districts of the Bundelkhand region of Uttar Pradesh, farmers were dependent upon fundamentally unique strategy settings relying upon the sort of crop they developed. In the wheat case, the state government applied a stunning acquisition framework. Under such a plan, wheat farmers could sell their reap at the MSP at authorized mandis, and the number of mandis was expanded from 466 to above 2000, with just 100 farmers permitted each day (Ceballos *et al.*, 2020). The MSP at which wheat farmers could sell their harvest was Rs. 1936 for each quintal, up from 1746 and 1851 in, separately, 2018 and 2019. Conversely, on account of rice, no guaranteed public procurement scheme was given, and farmers needed to sell their harvest at the running market rate.

Figure 2 shows the advancement of discount rice costs around the rabi harvest season from 2018 through 2020 for markets in our study area. While costs at first expanded (however turning out to be very unpredictable) later the announcement of the lockdown measures in late March, these therefore diminished until arriving at comparative levels to 2018 least costs by around mid-May, when rice harvest ordinarily arrives at its pinnacle (Varshney *et al.*, 2020). This value decline appears to have been connected with a lower presence of dealers—who regularly go about as mediators to bring rice harvest from the farm gate to local market—because of versatility limitations or to them offering lower costs than ordinary. As a result, farmers moved to the local retail market, expanding nearby supply and initiating lower strain on costs.

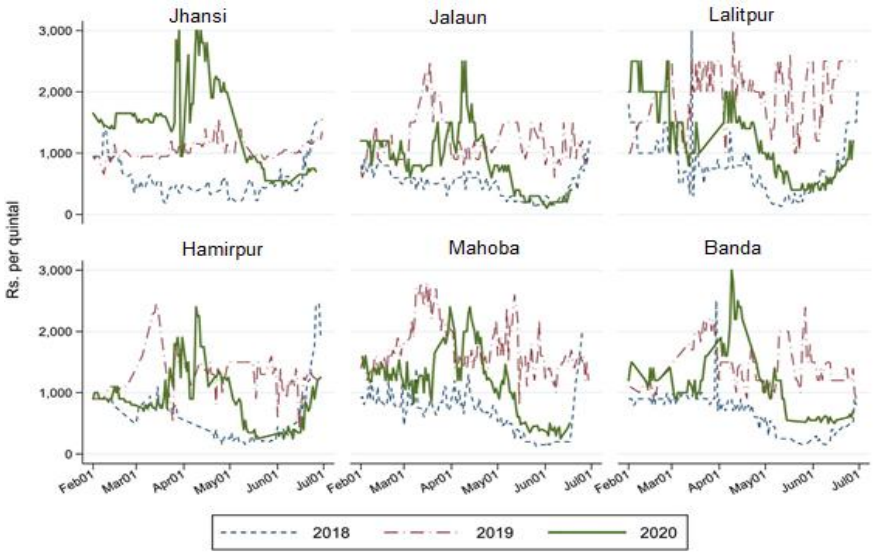

Figure 2. Rice prices at selected markets in the study area

Note: Daily prices at select official state markets in the study region.

This differentiation between commercialization conditions experienced by wheat and rice makers compounds with existing contrasts in cultivating practices and farmer characteristics (Table 3). While wheat is developed by a greater part of farmers and is by and large viewed as a generally protected harvest, rice is a high-

risk crop with greater expenses of production and are significantly more reliant upon difficult work. As far as cultivating exercises, wheat is developed at a bigger scope and commonly gathered in one go utilizing exceptionally employed consolidate farm trucks, while more limited size rice fields go through a progression of pickings all through the most recent 2 months of the developing season which are directed solely manually. Farmers developing these harvests are likewise altogether different overall, with most rice farmers not claiming the land they develop (by and large depending on sharecropping plans) and confronting a far higher occurrence of yield harm than wheat, especially from nuisances and illnesses. Since the national crop insurance scheme (Pradhan Mantri Fasal Bima Yojana, or PMFBY) doesn't cover rice production and private protection arrangements are not far-reaching, rice farmers likewise resort to totally different adapting procedures like contribution their work or casual credit.

Table 3. Comparison of key rice and wheat farming variables

	Wheat	Rice
Production cost	INR 12,150	INR 28,818
Average yield / acre	20.0 quintals / acre	72.6 quintals / acre
Average expected price/quintal	INR 1936 / quintal	INR 1200 / quintal
Projected revenue/acre	INR 38,720 / acre	INR 87,120 / acre
Average area under crop	4.8 acres	1.7 acres
% Affected by crop loss	24%	67%
Crop loss caused by pest and disease	18%	64%
Average harshness of loss caused by pests and diseases	38%	54%
Economics actions through loans and credits	Informal credit: 47% Formal credit: 23%	Informal credit: 29% Formal credit: 5%

Note: For most information presented in this table, we draw upon Ceballos, Kannan, and Kramer (2019). Average yields, expected costs, and accordingly projected income rest on the data gathered through survey information and introduced in this paper.

Based on the contrasts between crops, we estimate that the lockdown and related limitations will affect wheat and rice farmers. To begin with, considering that rice is a transitory yield, reliant upon physical work, and more presented to harm from climate or irritations and illnesses, a decrease in the inventory of work confined admittance to data sources, and restricted transportation around the lockdown ought to convert into higher pre and post reap crop loss. Second, while the state government endeavours to introduce an amazing procurement framework with MSPs and an expanded number of mandis may have benefited wheat farmers, permitting them to get the acquisition of their harvest at MSP, rice farmers falling back on the open market might have needed to acknowledge comparable or lower costs than earlier years because of the lower presence of brokers and the lower costs at the nearby retail market, which saw a sharp expansion in supply. Subsequently, we expect bigger abatements in agricultural earnings for rice farmers than for wheat farmers, with a related expansion in getting, and, among those for whom acquiring may not be reasonable, a decrease in food security, with possibly hurtful ramifications for family members drawn out sustenance and wellbeing, notwithstanding future productivity. Consistently during the initial 21 days of the lockdown, India has been assessed to lose over INR 32,000 crore

(4.5 billion US$) (The Hindu Business Line, 2020). Different assessments propose that the lockdown has influenced around 53% of all undertakings the nation over (The Indian Express, 2020) and affected practically all monetary exercises (Kumar *et al.*, 2020b). These bundles essentially designated food security and medical services frameworks, included state-and area explicit motivators and expanded cutoff times for charge instalments (Mahendra Dev, 2020; Ray *et al.*, 2020). Further, Figure 3 shows the Bundelkhand's contribution to agricultural products before and after COVID-19 that leads to a better clarification of the concept.

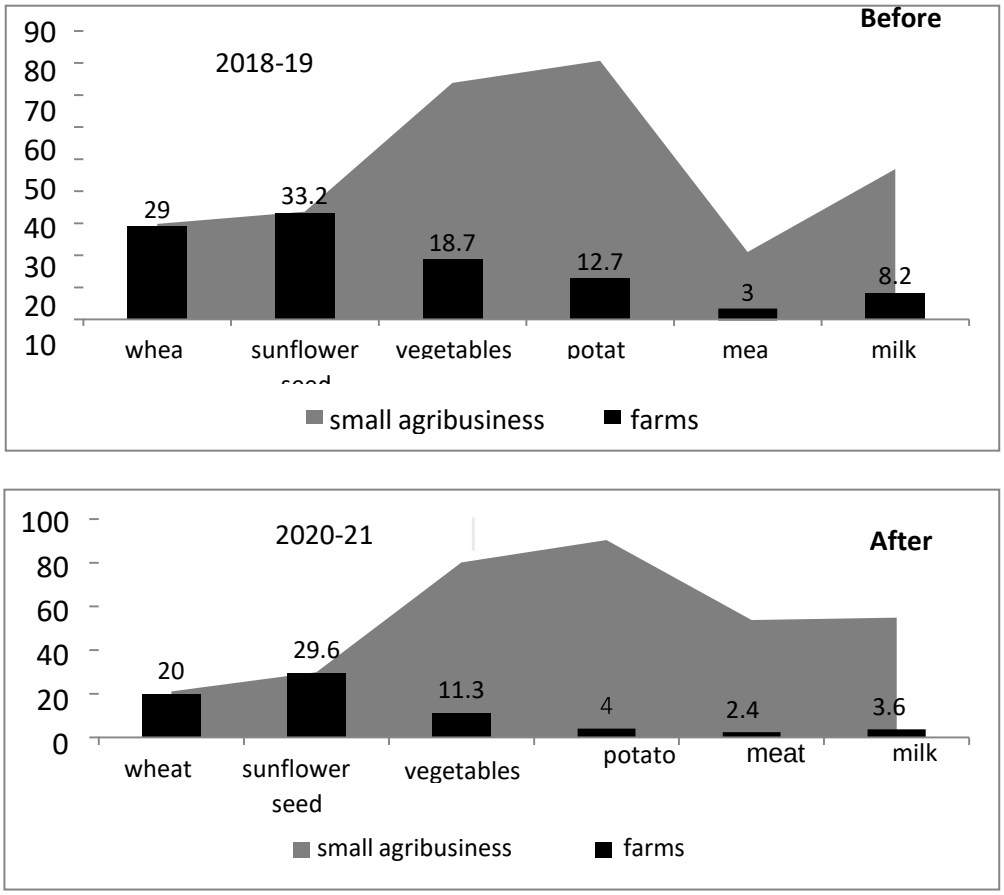

Figure 3. Bundelkhand's contribution to agricultural products before and after COVID-19

RESULTS AND DISCUSSION

The paper has distinguished gaps and issues in agriculture supply chain network practices and the effect of COVID-19 on the same. Mixes of most of these issues amplify the wasteful working of the agricultural area in India. An assortment of measures might be embraced to conquer these issues of Indian farming. Some of such measures might be: Farmers might be urged to shape affiliations, consortiums, cooperatives and self-help groups which will upgrade effective use of available resources. Further, contract farming is a decent advancement towards this course; advertising facilities for agri-items and the market for agri-wares ought to be improved; handling focuses ought to be made more proficient; careful execution of the model demonstration;

figuring and executing successful and determined agricultural approaches to set up a great climate for quick improvement of farming; refined warehousing with adequate refrigeration facilities ought to be set up to limit wastage of agrarian produce; transportation should be grown unfathomably, power deficiencies must be earnestly tended to by investigating the age of force through non-regular sources, for example, sun oriented, wind, and so forth. Banks and financial organizations ought to be urged to offer monetary help to farmers for making interests in provincial framework and agribusiness.

We measure crop pay decrease during the primary months of the lockdown and break down how much these are related to food sustainability. We track down that wheat maker for whom state-drove procurement ensured market access at fixed costs, experienced insignificant decreases in pay. For rice producers—an all-around weaker populace—pay fell by half comparative with their normal pay in an ordinary year, generally because of a precarious fall of costs as they moved from discount markets to nearby retail advertises, bringing about a sharp expansion in neighbourhood supply. Comparative with wheat makers impacted by the lockdown, diminished pay for rice producers was related to an increment in getting and decreased food security. The expected findings reveal that focusing on producers of harvests that face significant value risk and presenting approaches that balance out market costs are significant in endeavours to help recuperation and construct versatility of small farmers.

We track down significant interruptions to agriculture during the lockdown with income decreases changing across crops and over the long run. On account of wheat, income decreases stay unassuming, as these farmers had the option to receive the benefits of state procurement approaches that permitted them to keep selling their harvest at least ensured costs. On account of rice, we notice higher-pay decreases across production, collection, and post-collection stages. We noticed significant decreases connected with the commercialization of rice harvest; we hypothesized decreases of half comparative with the normal pay in an ordinary year, fundamentally because of result costs tumbling to around 33% of farmers' normal costs.

Related literature and key interviews recommend that costs fell as traders, who typically serve to interface farmers' production with wholesale markets, could presently don't travel or be offered lower costs because of an increment in their functional expenses (Varshney *et al.*, 2020). Thus, farmers moved to the nearby retail market, expanding neighbourhood supply comparative with request and discouraging costs for their produce. Decreased pay is additionally connected with an increment in getting and diminished food security. This proof features the extreme results of a lockdown and related market terminations for the makers of this short-lived green harvest and, specifically, the significant job that value risk plays in getting benefits from cultivating. Against this foundation, we contend that the improvement of reasonable agro-approaches and dynamics in light of the anticipation of future pandemics desperately should be established in examples gained from the current COVID-19 pandemic.

CONCLUSION

Late March 2020, as COVID-19 had begun spreading across India, a cross country restriction to the development of goods and individuals was organized because of mounting fears around a fast spread of the

pandemic and the nation's weak health system framework—with inadequate ability to satisfy the extended need for medical care given its high populace thickness. Limitations were presented not long before the rabi (winter) season collect window for some yields. Soon after, the government loosened up the lockdown for various fundamental agricultural exercises, including cultivating tasks, input production, and commercialization, intra- and between state development of planting and reaping apparatus, and acquisition of farming wares. During April and May, the government further stretched out these exceptions to different stakeholders of the agricultural and agribusiness worth chain.

Of every one of the actions set up because of the COVID-19 pandemic, it was the unexpected boycott set on the transportation of yields that at first and truly affected agricultural frameworks in India. Harmonizing with the March lockdown, farms were turning out to be intensely occupied with collecting the spring crops all around the country. Notwithstanding, the unexpected change achieved by the lockdown abruptly restricted the transportation of products harshly, pretty much completing it starting with one day then onto the next. Because of the absence of adequate stockpiling among working-class farmers specifically, grains and vegetables kept on ageing in the fields during the lockdown, bringing about a portion of the current year's collection prone to be harmed. In like manner, the lockdown shut the vast majority of the mandis to ordinary business, and huge scope obtainment tasks were promptly halted by the Indian government. Some private agro-food markets were as yet permitted to remain open, however few out of every odd thing has been accessible during the current pandemic. Thus, supply chains have quit working, and the restricted accessibility of vegetables has turned into a difficult issue for everybody, particularly in the significant urban communities (Mahendra Dev, 2020).

Regardless of the actions to restrict the impact of the lockdown on agrarian practices, various impediments upset typical harvest activities. While the government had considered the normal activity of authorized market yards (mandis), where most agrarian produce is sold, many state showcasing sheets, responsible for running mandis, kept them shut during the primary week of April (Narayanan, 2020). The inter-state stream of farming goods and tools experienced required line checks and general disarray around the specific subtleties of the approaches set up. The accessibility of agrarian labour was to a great extent impacted as well. Fully expecting the lockdown, huge migration streams happened, with individuals from urban areas getting back to their residence. This, along with serious limitations to agricultural workers' versatility, brought about harvest activities turning out to be straightforwardly reliant upon the nearby supply of work and machinery.

The above-suggested actions might add to catalyzing agrarian development in India by further developing the supply chain network measure. Agri-food supply chain network is a drive towards this bearing, which may serve a ton in conquering issues experienced by Indian farming. The issues arising in Indian agriculture are novel, mind-boggling and extreme because of the presence of a larger part of them among the majority of Indian agriculturists. Consequently, progressed procedures should be a gadget to resolve these issues which warrant quickly evolving techniques, advances and the executives rehearse in the supply chain network component.

REFERENCES

Abate, G. T., de Brauw, A., & Hirvonen, K. (2020). *Food and nutrition security in Addis Ababa, Ethiopia during COVID-19 pandemic: June 2020 report*. ESSP Working Paper 145. Washington, DC: International Food Policy Research Institute (IFPRI). https://doi.org/10. 2499/p15738coll2.133766

Adhikari, J., Timsina, J., Khadka, S.R., Ghale, Y., Ojha, H., 2020. COVID-19 impacts on agriculture and food systems in Nepal: implications for SDGs.

Affognon, H., Mutungi, C., Sanginga, P., & Borgemeister, C. (2015). Unpacking postharvest losses in Sub-Saharan Africa: A meta-analysis. *World Development*, *66*, 49–68.

Alvi, M., & Gupta, M. (2020). Learning in times of lockdown: How Covid-19 is affecting education and food security in India. *Food Security*, https://doi.org/10.1007/s12571-020-01065-4

Arumugam, D.U., Kanagavalli, D.G., 2020. COVID-19: impact of agriculture in India. AEGAEUM J. 8 (5), 2020.

Bala Subrahmanya, M. H. (2006). Small Scale Industries in India under Globalization: Does Solace Lie in Technology and Innovation?.

Balwinder-Singh, Paresh B., Shirsath, M.L. Jat, McDonald, A.J., Srivastava, Amit K., Craufurd, Peter, Rana, D.S., Singh, A.K., Chaudhari, S.K., Sharma, P.C., Singh, Rajbir, Jat, H.S., Sidhu, H.S., Gerard, B., Braun, Hans, 2020. Agricultural labor, COVID-19, and potential implications for food security and air quality in the breadbasket of India. Agric. Syst. 185 (102954), 2020. https://doi.org/10.1016/j. agsy.2020.102954.

Barrett, C., & McPeak, J. (2006). Poverty traps and safety nets. in *Poverty, inequality and development: Essays in Honor of Erik Thor- becke*, A. de Janvry and R. Kanbur (eds.), 131–154. New York: Springer.

Bellemare, M. F., Lee, Y. N., & Just, D. R. (2020). Producer attitudes toward output price risk: Experimental evidence from the lab and from the field. *American Journal of Agricultural Economics*, *102*(3), 806–825.

Bisht, I. S., Rana, J. C., & Ahlawat, S. P. (2020). The future of small-holder farming in India: Some sustainability considerations. *Sustainability*, *12*(9), 3751.

Börner, J., Shively, G., Wunder, S., & Wyman, M. (2015). How do rural households cope with economic shocks? Insights from global data using hierarchical analysis. *Journal of Agricultural Economics*, *66*, 392–414. https://doi.org/10.1111/1477-9552.12097

Boyd, C. M. (2020). Why not insuring output price? *Insights from a lab-in-the-field experiment in Peru*. Mimeo.

Boyd, C. M., & Bellemare, M. F. (2019). The microeconomics of agri- cultural price risk. *Annual Review of Resource Economics*, 12.

Brewin, D. G. (2020). The impact of COVID-19 on the grains and oilseeds sector. *Canadian Journal of Agricultural Economics*, 1–4. https://doi.org/10.1111/cjag.12239

Cai, H., Chen, Y., Fang, H., & Zhou, L. (2009). *Microinsurance, Trust and Economic Development: Evidence from a Randomized Natural Field Experiment*. NBER Working Papers, 15396.

Cai, J. (2016). The impact of insurance provision on household production and financial decisions. *American Economic Journal: Economic Policy*, *8*(2), 44–88.

Cai, J., de Janvry, A., & Sadoulet, E. (2013). *Social networks and the decision to insure: Evidence from randomized experiments in China*. Mimeo. University of Michigan.

Carberry, P., Padhee, A.K., 2020. Containing COVID 19 impacts on Indian agriculture. Agri-buzz. ICRISAT-April 18, 2020.

Ceballos, F., Kannan, S., & Kramer, B. (2019). *Picture-based crop insurance: A randomized control trial evaluating the impacts of using smartphone camera data for claims verification in India*. Baseline Report. Washington, DC: International Initiative for Impact Evaluation.

Ceballos, F., Kannan, S., & Kramer, B. (2020). Impacts of a national lockdown on smallholder farmers' income and food security: Empirical evidence from two states in India. *World Development*, *135*(11).

Ceballos, F., Kannan, S., & Kramer, B. (2021). Crop prices, farm incomes, and food security during the COVID-19 pandemic in India: Phone-based producer survey evidence from Haryana State. *Agricultural Economics*.

Ceballos, F., Kramer, B., & Robles, M. (2019). The feasibility of picture-based insurance (PBI): Smartphone pictures for affordable crop insurance. *Development Engineering*, *4*, 100042.

Chaddha, N., Das, A., Gangopadhyay, S., Mehta, N., 2017. 'Reassessing the Impact of Demonetisation on Agriculture and Informal Sector', India Development Foundation (IDF), New Delhi, January. Duflo, Esther, Abhijit Banerjee (2020), "A prescription for action: nine steps after the next 21 days". Indian Express. March 29, 2020.

Chandrasekaran, N., & Raghuram, G. (2014). *Agribusiness supply chain management*. CRC Press.

Chandrashekar, H. (2009). Supply Chain Management of Fruits and Vegetables in Karnataka—A Study of Safal Market, Bangalore, Karnataka, India. *Interdisciplinary Journal of Contemporary Research in Business*, *1*(3), 43.

Chichaibelu, B. B., & Waibel, H. (2018). Over-indebtedness and its persistence in rural households in Thailand and Vietnam. *Journal of Asian Economics*, *56*, 1–23.

Coates, J., Swindale, A., & Bilinsky, P. (2007). Household Food Insecurity Access Scale (HFIAS) for measurement of food access: Indicator guide: version 3. http://www.fao.org/fileadmin/user_ upload/eufao-fsi4dm/doc-training/hfias.pdf

Cole, S., Giné, X., & Vickery, J. (2017). How does risk management influence production decisions? Evidence from a field experiment. *The Review of Financial Studies*, *30*(6), 1935–1970.

Costanza, R., d'Arge, R., De Groot, R., Farber, S., Grasso, M., Hannon, B., Limburg, K., Naeem, S., O'Neill, R.V., Paruelo, J., 1998. The value of ecosystem services: putting the issues in perspective. Ecol. Econ. 25, 67–72.

Dercon, S. (2002). Income risk, coping strategies and safety net. *The World Bank Research Observer*, *17*(2), 141–166.

Dercon, S., & Hoddinott, J. (2004). Health, shocks, and poverty persistence. In S. Dercon (Ed.), *Insurance against poverty*, (pp. 123–136). Oxford, UK: Oxford University Press.

Deshingkar, P., Kulkarni, U., Rao, L., & Rao, S. (2003). Changing food systems in India: resource sharing and marketing arrangements for vegetable production in Andhra Pradesh. *Development Policy Review*, *21*(5-6), 627-639.

Duong, T. T., Brewer, T., Luck, J., & Zander, K. (2019). A global review of farmers' perceptions of agricultural risks and risk management strategies. *Agriculture*, *9*(1), 1–16.

Elbers, C., Gunning, J. W., & Kinsey, B. (2007). Growth and risk: Methodology and micro evidence. *The World Bank Economic Review*, *21*(1), pp.1-20.

Food and Agriculture Organization (FAO) (2018). *The state of agricultural commodity markets 2018: Agricultural trade, climate change and food security*. Rome: Food and Agriculture Organization.

Ganesh Kumar, C., Murugaiyan, P., & Madanmohan, G. (2017). Agri-food supply chain management: literature review. *Intelligent Information Management*, *9*, 68-96.

Gao, J., & Mills, B. F. (2018). Weather shocks, coping strategies, and consumption dynamics in rural Ethiopia. *World Development*, *101*, 268–283.

Ghai, S. (2012). Value Chain Financing: Strategy towards augmenting growth in agriculture sector in India. *Journal of Economics and Sustainable Development*, *3*, 184-191.

Gulati, A., Chatterjee, T., & Hussain, S. (2018). *Supporting Indian farmers: Price support or direct income/investment support?*. Work- ing paper No. 357, Indian Council for Research on International Economic Relations.

Hailu, G. (2020). Economic thoughts on COVID-19 for Canadian food processors. *Canadian Journal of Agricultural Economics*, 1– 7. https://doi.org/10.1111/cjag.12241

Harvey, C. A., Rakotobe, Z. L., Rao, N. S., Dave, R., Razafimahatratra, H., Rabarijohn, R. H., Rajaofara, H., & MacKinnon, J. L. (2014). Extreme vulnerability of smallholder farmers to agricultural risks and climate change in Madagascar. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *369*(1639), 20130089.

Hobbs, J. E. (1998). Innovation and future direction of supply chain management in the Canadian agri-food industry. *Canadian Journal of Agricultural Economics/Revue canadienne d'agroeconomie*, *46*(4), 525-537.

Hodges, R. J., Buzby, J. C., & Bennett, B. (2011). Postharvest losses and waste in developed and less developed countries: Opportunities to improve resource use. *The Journal of Agricultural Science*, *149*(S1), 37.

International Monetary Fund (IMF) (2020). World Economic Outlook, April 2020. https://www.imf.org/en/Publications/WEO/Issues/2020/04/14/weo-april-2020, accessed July 2020.

K. Goodwin, J.W. Glauber (Eds.), *Agricultural policy in disarray*, American Enterprise Institute.

Karlan, D., Kutsoati, E., McMillan, M., & Udry, C. (2011). Crop price indemnified loans for farmers: A pilot experiment in rural Ghana. *Journal of Risk and Insurance*, *78*(1), 37–55.

Karlan, D., Osei, R., Osei-Akoto, I., & Udry, C. (2014). Agricultural decisions after relaxing credit and risk constraints. *The Quarterly Journal of Economics*, *129*(2), 597–652.

Kumar, A., Padhee, A. K., & Kumar, S. (2020). How Indian agriculture should change after COVID-19. *Food Security*. https://doi.org/ 10.1007/s12571-020-01063-6

Kumar, P., Singh, S. S., Pandey, A. K., Singh, R. K., Srivastava, P. K., Kumar, M., ... & Drews, M. (2021). Multi-level impacts of the COVID-19 lockdown on agricultural systems in India: The case of Uttar Pradesh. *Agricultural Systems*, *187*, 103027.

Kumar, S., Maheshwari, V., Prabhu, J., Prasanna, M., Jayalakshmi, P., Suganya, P., Jothikumar, R., 2020b. Social economic impact of COVID-19 outbreak in India. Int. J. Pervasive Comput. Commun. 16 (4), 309–319.

Mahajan, K., Tomar, S., 2020. Here Today, Gone Tomorrow: COVID-19 and Supply Chain Disruption. Working Paper No. 28, 2020.

Mahendra Dev, S., 2020. Addressing COVID-19 Impacts on Agriculture, Food Security, and Livelihoods in India. IFPRI Blog. April 8, 2020. https://www.ifpri.org/blog/addressing-covid-19-impacts-agriculture-food-security-and-livelihoods-india.

Mobarak, A. M., & Rosenzweig, M. (2012). *Selling formal insurance to the informally insured*. Working Paper No. 97, Economic Growth Center Discussion Paper No. 1007. Economics Department. New Haven, CT, US: Yale University.

Moschini, G., & Hennessy, D. A. (2001). Uncertainty, risk aversion, and risk management for agricultural producers. *Handbook of Agricultural Economics*, *1*(A), 87–153.

Mutsonziwa, K., & Fanta, A. (2019). Over-indebtedness and its welfare effect on households: Evidence from the Southern African countries. *African Journal of Economic and Management Studies*, *10*(2), 185–197.

Narayanan, A., & Tomar, S. (2018). *Price deficiency payments mechanism: Evidence from the Indian agricultural market*. Mimeo.

Narayanan, S. (2020). Food and agriculture during a pandemic: Managing the consequences. Blog published by Ideas for India. https://www.ideasforindia.in/topics/agriculture/food-and-agriculture-during-a-pandemic-managing-the-consequences.html, Accessed May 2020.

Narayanan, S., & Saha, S. (2020). One Step Behind: The Government of India and agricultural policy during the Covid-19 lockdown. *Review of Agrarian Studies*, *10*(1).

Nguyen, T. T., Nguyen, T. T., & Grote, U. (2020). Multiple shocks and households' choice of coping strategies in rural Cambodia. *Ecological Economics*, *167*, 106442.

NICR, NCDEX Institute of Commodity Markets and Research (2018). *A study on market behaviour during Bhavantar Bhugtan Yojana*. Mimeo.

Nuthalapati, C. S., Sutradhar, R., Reardon, T., & Qaim, M. (2020). Supermarket procurement and farmgate prices in India. *World Development*, *134*, 105034.

Oerke, E. C., & Dehne, H. W. (2004). Safeguarding production— losses in major crops and the role of crop protection. *Crop Protection*, *23*(4), 275–285.

Olsson, L., Opondo, M., Tschakert, P., Agrawal, A., Eriksen, S., Ma, S., Perch, L., Zakieldeen, S. A., Cutter, S., Piguet, E., & Kaijser,

Pingali, P., & Mittra, B. (2020). How Did COVID-19 Impact India's Food Prices?, Tata-Cornell Institute for Agriculture and Nutrition blog post, https://tci.cornell.edu/blog/ how-did-covid-19-impact-indias-food-prices

Porter, J.R., Xie, L., Challinor, A.J., Cochrane, K., Howden, S.M., Iqbal, M.M., Lobell, D. B., Travasso, M.I., 2014. Food security and food production systems. Clim. Chang. 2014 Impacts. Adapt. Vulnerability. Part A Glob. Sect. Asp. Contrib. Work. Gr. II to Fifth Assess. Rep. Intergov. Panel Clim. Chang. 485–533. https://doi.org/10.1111/ j.1728-4457.2009.00312.x.

Punjabi, M. (2007). Initiatives and issues in fresh fruit and vegetable supply chains in India. *Lotus Pang Suan Kaeo Hotel, Chiang Mai, Thailand*, *115*.

Rawal, V., Kumar, M., Verma, A., & Pais, J. (2020). *COVID-19 lockdown: Impact on agriculture and rural economy*. SSER Monograph 20/3, New Delhi: Society for Social and Economic Research, http://archive.indianstatistics.org/sserwp/sserwp2003-rev.pdf

Richards, T. J., & Rickard, B. (2020). COVID-19 impact on fruit and rice markets. *Canadian Journal of Agricultural Economics*, 1–6. https://doi.org/10.1111/cjag.12231

Saha, T., Bhattacharya, S., 2020. Consequence of Lockdown amid COVID-19 Pandemic on Indian Agriculture Food and Scientific Reports, 1, pp. 47–50.

Savary, S., Ficke, A., Aubertot, J., & Hollier, C. (2012). Crop losses due to diseases and their implications for global food production losses and food security. *Food Security*, *4*(4), 519–537. https://doi.org/10. 1007/s12571-012-0200-5

Schicks, J. (2013). The sacrifices of micro-borrowers in Ghana–a customer-protection perspective on measuring over-indebtedness. *The Journal of Development Studies*, *49*(9), 1238–1255.

Shee, A., & Turvey, C. G. (2012). Collateral-free lending with risk- contingent credit for agricultural development: indemnifying loans against pulse crop price risk in India. *Agricultural Economics*, *43*(5), 561–574.

Smith, V. H., Glauber, J. W., Goodwin, B. K., & Sumner, D. A. (2018). Agricultural policy in disarray: An overview." In V. H. Smith, B.

Van der Vorst, J. G., Beulens, A. J., De Wit, W., & van Beek, P. (1998). Supply chain management in food chains: Improving performance by reducing uncertainty. *International Transactions in Operational Research*, *5*(6), 487-499

Varshney, D., Roy, D., & Meenakshi, J. V. (2020). Impact of COVID-19 on agricultural markets: assessing the roles of commodity characteristics, disease caseload and market reforms. *Indian Economic Review, 55*(1), 83–103.

Wik, M. (1999). Coping with risk in agriculture: Income- and consumption-smoothing strategies in LDCs. *Forum for Development Studies, 2*, 329–344.

Wooldridge, J. M. (2002). Inverse probability weighted M-estimators for sample selection, attrition, and stratification. *Portuguese Economic Journal, 1*(2), 117–139.

Received: 10th January 2022;Accepted: 01th October 2022; First distribution: 04th February 2023