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Risk Management in Agriculture Value Chain amid COVID-19: Insights from Progressive Farmers of Developing States

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Abbreviations

AVC	:	Agriculture Value Chain
GDP	:	Gross Domestic Product
NGOs	:	Non-Government Organizations
FPOs	:	Farmer Producer Organizations
AIF	:	Agri Infrastructure Fund
BGREI	:	Bringing Green Revolution to Eastern India
DoA	:	Department of Agriculture
KVK	:	Krishi Vigyan Kendra
ATMA	:	Agriculture Technology Management Agency
BHU	:	Banaras Hindu University
GAP	:	Good Agriculture Practices

Risk Management in Agriculture Value Chain amid COVID-19: Insights from Progressive Farmers of Developing States

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Abstract

Purpose

There is a huge potential for the production of fruits and vegetables. The need for factories and the processing industries has not only helped in generating revenue from fruits and vegetables but also increasing employment for the youth. One District one Focus product has resulted in the entire efficient value chain of the product. The necessary awareness and promotion activities have to be planned through marketing agencies for building an export-oriented production environment. Infrastructure facilities for primary processing, packaging, storage, etc. – create an opportunity for market linkage backed by strong market intelligence. The research question for the study is What are the insights from the farmers of developing states for the risk management for the agriculture value chain. The study aims to explore the agriculture value chain performed by the farmers during COVID-19.

Methodology

The study is based on a literature review and interviews conducted with 10 progressive farmers from the developing states. The farmers have been selected from the list based on the excellent performance during COVID-19. The study is based on a Qualitative approach.

Findings

The study explores that Affiliation is needed at various levels, with technology partners for access to a new and appropriate choice of technology for production; with experts for knowledge and support on an agriculture production activity and climate. Small farmers have the disadvantage of a lack of technical knowledge. Deficiency of technical skills and awareness about cold chain facilities is needed at present. With different drivers' progressive farmers have been able to manage their risks in agriculture.

Originality

An enabling ecosystem that enhances the market power of farmers must be created for smallholders to take advantage of the reform measures. There are immense possibilities to make farmers of developing states like Uttar Pradesh and Bihar self-sufficient. Be it the fruits of Bihar, be it litchi, zardalu mango, amla, makhana, or Madhubani paintings, many such products are in the districts of Bihar, which can make Bihar self-sufficient on the lines of 'Vocal for Local'. Taking a step in this direction, the 'Self-reliant Campaign' can be seen.

Keywords: farmers, agriculture, value chain, revenue, COVID-19, risk management

1. Introduction

Indian Agriculture has transformed from Ancient traditional agriculture from the 1950s to modern Smart Agriculture. Indian Agriculture in ancient days was dependent on manpower. The study of the economic framework reveals that the traditional low agricultural production processes have now increased to high production of agriculture due to modern technology. There is a huge potential for the production of fruits and vegetables. The need for factories and the processing industry has not only helped in generating revenue from fruits and vegetables but also increasing employment for the youth. One District one Focus product has resulted in the entire efficient value chain of the product. We need to improve the shelf life of agricultural commodities and work on the knowledge gap. Make in India in terms of technology, branding, and quality assurance will help in sustaining agriculture. Recent field studies have also reported traders and farmers both being charged market fees in private unregulated markets, even though infrastructure for weighing, sorting, grading, and storage is missing. The necessary awareness and promotion activities have to be planned through marketing agencies for building an export-oriented production environment. Infrastructure facilities for primary processing, packaging, storage, etc. – create an opportunity for market linkage backed by strong market intelligence.

The growth rate of the developing state's Gross Domestic Product (GDP) has considerably accelerated during the past 10 years, with the state economy growing at about 10 percent per annum. Once regarded as a backward state on the agriculture front, Bihar is now hogging the limelight at the national level and the farmers are receiving national awards due to their hard work and spirited efforts. This results in the research question that What are the insights from Bihar and Uttar Pradesh farmers that need to be explored for the agriculture value chain. The study aims to explore the risk management in the agriculture value chain performed by the farmers and stakeholders during COVID-19.

The study is based on a qualitative approach for conducting 10 interviews with progressive farmers. The study is divided into six sections. The next section is the literature review followed by the research methodology. The result and discussions of the interviews are shown in the fourth section followed by the implications of the study. The final section includes the conclusion, limitations, and future research directions.

2. Literature Review

Farmers have recently seen that management often creates new paradigms in addition to development and that situation needs more interaction with environmental factors. (Fountas et al., 2010). The farming definition means saving water, smart agriculture, high-quality, productive, polluting free agriculture. The solution for small-scale farmers is the need to digitally turn agriculture itself to achieve more crops – per drop, per acre, per rupee. Adding state-of-the-art technologies such as machine learning, IoT, urban farming, hydroponics, aeroponics, aquaponics, and blockchain, etc., is of great importance, such that a global market is acknowledged for digital agriculture that offers both a full and a relevant solution for all farmers' ecosystems. Digitization has established a ground-breaking platform for sustainable agriculture, which will make farmers more competitive (Kumari and Patil, 2019). The project seeks to combine digital technology (big data, machine learning, IoT, blockchain, computer view, etc.), creative business models (Agriculture Platform as a Service), and concentrated human efforts to support small farmers. This will also help farmers' ecosystem players, such as the Government, non-government organizations (NGOs), AgTech, commodity buyers, businesses, banking and financial institutions, extension service providers, cooperatives, Farmer Producer Organizations (FPOs), and agri-input companies deliver their products/services via data-driven decisions that hold farmers at the core. Farmers have moved towards progressive farming with the application of artificial intelligence and technology (Kumari et al., 2018). Inadequate knowledge of the advantages of digital agriculture, lack of system integration, ease of use of the application and language barriers, low access to farm sites, lack of technical motivation, lack of digital government information, and lack of infrastructure are the challenges that farmers have been facing (Mittal, 2012).

The Central Government restricted all activities from 25th March 2020. The movement of the population remained restricted till mid-May (Ceballos et al., 2020). In developing states like Bihar and Orissa, mechanization and digitalization are limited, therefore, farmers spent more on labor and spent most of their time in the field. The manpower requirements in agriculture worked out in developing states due to the reverse migration of laborers (Kumar et al., 2020). The pandemic situation led the migrants to find opportunities in agriculture. The efforts of farmers during COVID-19 have been in shadow and need to be highlighted (Timilsina et al., 2020). The pandemic period was followed by a severe locust attack which again led to the disruption of the

field. The multiplication of locust eggs during the rainy season was again an alarming sign for the farmers. The progressive farmers of developing states like Bihar have shown remarkable performance in agriculture production and value chain. The crisis of COVID-19 has accentuated the need for agricultural reforms in the country. Dairy, floriculture, fruit production, poultry, and fisheries have been severely affected due to the crisis. The central and state Government have supported the farmers by coming up with reforms and letting the farmers sell their products anywhere. This has also driven the agriculture value chain to sustain during COVID-19 (Kumari et al., 2021). Farmers need real-time price information with the recent agriculture reforms (Kumar et al., 2020).

3. Research Methodology

Primary data was collected through telephonic interviews. The survey was based on the interviews of the progressive farmers of developing states like Uttar Pradesh and Bihar. The survey-based questions mainly focused on the agriculture practices during COVID-19. The study is based on extensive interviews conducted with 10 farmers in Uttar Pradesh and Bihar (Figure 1).

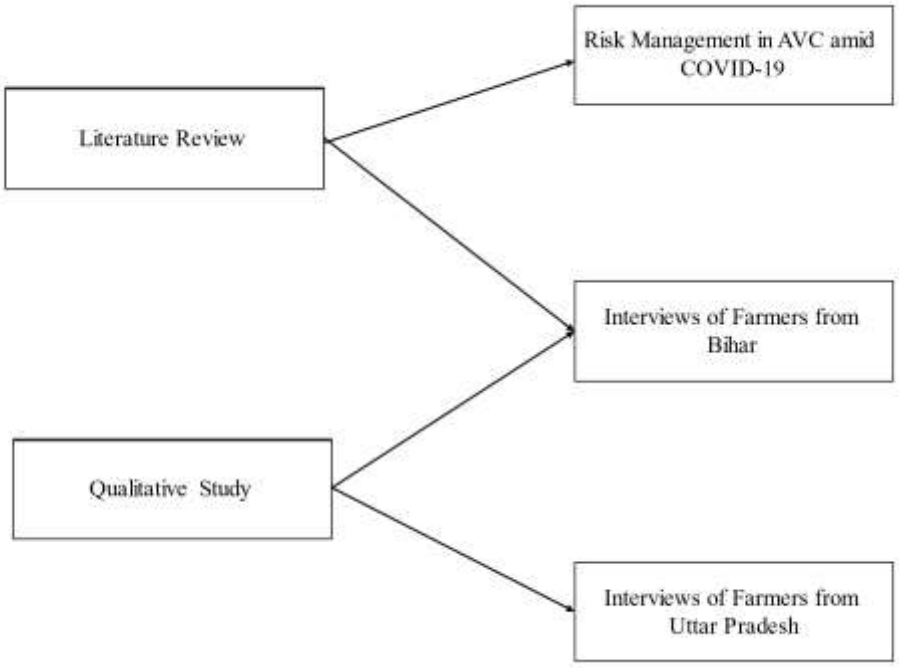

Figure 1: Research framework followed for the research study

The farmers have been selected from the list based on the excellent performance in risk management during COVID-19 (Table 1). The data collected from the interviews have been analyzed using a Qualitative approach. Interview based survey is the most appropriate here as the study needs in-depth research on the agriculture value chain farmers during COVID-19. The study is based on a Qualitative design. Questions asked to the farmers during the interview were

What are the crops cultivated from April to November 2020?

How did you manage for Agri value chain during covid?

What were the challenges and their remedy during the period?

Did you receive any support from any scheme or government body?

Table 1 Farmers participated in the Interviews

S.N	Farmers	Location
1	Kishor Jaiswal	Kalyanpur village of Munger District
2	Sudhanshu Kumar	Nayanagar village in Samastipur
3	Jaya Devi	Munger district in Bihar
4	Shalini Kumari	Kutlupur village in Munger district of Bihar
5	Urvashi Kumari	Purnea district
6	Ajay Kumar Singh	Mirzapur district of the state Uttar Pradesh
7	Udai Bahadur Singh	Tikri village in Varanasi district of Uttar Pradesh
8	Shailendra	Uttar Pradesh
9	Ajay	Uttar Pradesh
10	Babloo Kumar	Bihar
11	Arpana Singh	Uttar Pradesh
12	Kailash Kumar	Uttar Pradesh

4. Result and Discussion

The section represents the results obtained from the literature and interviews conducted with 10 farmers.

The COVID-19 crisis has pushed the distressed agricultural sector further down the economic ladder and brought to fore the problem of volatile income of the farmers. Indian farmers have suffered losses in different segments. A primary focus during the ongoing pandemic is on how

COVID-19 has affected agricultural production and food security. Agricultural activities comprise dairy, poultry, fisheries, and crop production. People have migrated from Frozen Food to Hot Food and have increased the consumption of horticultural products. In the AVC, Input Companies, farmers, and traders played an important role. The agriculture Sector became technology-driven, where farmers were provided input on mobile phone applications. The weather forecast, irrigation, harvesting, and guidance are available online through the Krishi Mobile app. Mobile applications were used to measure the grain moisture content. ATMA NIRBHAR BHARAT also led to ATMA NIRBHAR KRISHI. ATMA NIRBHAR KRISHI is a 7000 crore scheme. The Cooperative and FPO revolution has been instrumental in achieving the government's goal of **Atma Nirbhar Bharat**. To achieve the goal of Atma Nirbhar Bharat, the union budget laid a major focus on integrated agricultural development. The COVID-19 economic package, with announcements worth Rs 1.63 lakh crore for agriculture and allied sectors aimed at strengthening agri-infrastructure, logistics, and capacity building. The Government's strategy is to enable FPOs to collectivize communities' efforts and to empower the farmers by providing means and ways towards their economic stability. The government has rolled out Rs 1 lakh crore Agri Infrastructure Fund (AIF) for aggregators, FPOs, Primary Agriculture Cooperative Societies, Agri Entrepreneurs, and Startups. The FPOs, Collectives, and Cooperatives need to focus on the agriculture value chain to create opportunities in the agriculture sector. Under this scheme farmers, themselves will manage their farming, harvesting, production, and equity grand building. Under this scheme, skill-building measures will be taken at all levels. Kisan Transport Logistics Mobile applications helped to connect traders to hire transportation & other facilities.

4.1 Insights from Farmers of Bihar

Bihar, once regarded as a backward state on the agriculture front, is now hogging the limelight at the national level and farmers are receiving national awards due to their hard work and spirited efforts. Bihar is among the leading producers of maize in India and the third-largest producer of fruits and vegetables after Uttar Pradesh and West Bengal. Bihar is among the top 5 rice and wheat producers in the country and topped in the yield rate of rice. Value addition is a very good initiative for increasing income from crops.

4.1.1 Horticulture

In fruit cultivation, it is the largest producer of Litchi and 3rd largest producer of pineapple in the country as well as a major producer of Mango, Banana, and Guava. For increasing farmers' income there is a need to diversify agriculture into horticulture. Bihar soil has good potential for growing fruits and vegetables. There is a scope for generating income and employment from fruits and vegetables.

4.1.2 Floriculture

Kishor Jaiswal initiated Floriculture. The marketing link was not so strong and the absence of solid infrastructure and cold storage facility led to the failure of floriculture. There is a need for the delegation of services for an integrated model of floriculture.

4.1.3 Dairy

The technology adoption for cold chains in the dairy sector helps to increase the income. The increase in milk procurement and processing capacity has the potential to create jobs for many unemployed and casual laborers in the rural areas of Bihar.

4.1.4 Animal Husbandry

The animal husbandry department has fixed many subsidies for generating income and employment from poultry and farm. This sector too has a huge potential for income generation.

4.1.5 Fisheries

In few districts of Bihar, fisheries seed and seedling are missing. There is a need for the conversion of stakeholders, the role of the bank, and training for income generation from fisheries.

4.1.6 Organic Farming

Farmers in many districts make their fertilizers. They use AmritPaani, Jeevamrutham, and vermicompost to avoid the use of chemicals and pesticides. There is an untapped potential for export of the products which can be harnessed through 'natural farming'. This has led to the Bringing Green Revolution to Eastern India (BGREI).

4.1.7 Value Addition

Bihar has a huge potential for the production of fruits and vegetables. There is a need for factories and the processing industry. This will not only help in generating revenue from fruits and vegetables but also increasing employment for the youth. One District one Focus product will result in the entire efficient value chain of the product. There is a need to improve the shelf life of agricultural commodities and work on the knowledge gap. Make in India in terms of technology, branding, and quality assurance will help in sustaining agriculture in Bihar.

4.1.8 Cold Chain

There has been an increase and upscaling of modern cold storage in Bihar. Bihar is dominated by smallholder farmers and there is a need for cold storage structure. The investments for the cold chain have been triggered by market reform, investment subsidies, public service provision, and

governance. Farmers participate in cold storage. Cold storage is associated with improved efficiency in value chains and low wastes (Kumari and Jeble, 2020).

Affiliation is needed at various levels, with technology partners for access to a new and appropriate choice of technology for production; with experts for knowledge and support on an agriculture production activity and climate. Small farmers have the disadvantage of a lack of technical knowledge. Deficiency of technical skills and awareness about cold chain facilities is needed at present.

4.1.9 Technology

Department of Agriculture (DOA) implements agriculture development projects for the transfer of technology along with Krishi Vigyan Kendra (KVK) and Agriculture Technology Management Agency (ATMA). Farmers in Bihar have a dedicated mobile application. Bihar Agriculture University, Sabour (Bhagalpur), has come up with a mobile app called Bihar Krishi App, which can be downloaded from Playstore on one's smartphone. The app helps farmers in different ways including crop management, horticulture, opportunities in the agriculture sector, weather-related information, expert advice on questions asked by farmers, and even specific information about the quality of soil one is practicing farming and the use of fertilizers needed for the given soil. Agriculture needs to be supported by technology to increase income.

4.1.10 Insights from Farmers

Inadequate market facilities and institutional arrangements were responsible for low price realization and instability in prices. Recent field studies have also reported traders and farmers both being charged market fees in private unregulated markets, even though infrastructure for weighing, sorting, grading, and storage is missing. The necessary awareness and promotion activities have to be planned through marketing agencies for building an export-oriented production environment. Infrastructure facilities for primary processing, packaging, storage, etc. – create an opportunity for market linkage backed by strong market intelligence. The private sector is ready to provide training to the farmers. They can give them the lead. If farmers get an opportunity to be trained, things will be better.

During the lockdown, Bihar farmers made the harvesting of the rabi crops. The farmers had farm machinery like combined harvesters where they required drivers from Punjab and Haryana. Farmers in the 12 districts in South Bihar brought the drivers from Punjab and Haryana. All drivers were quarantined and tested for COVID. They tested negative and then harvesting was

done maintaining social distancing and sanitizing all the machinery. Home delivery of agriculture inputs was made to the farmers. Bihar Agriculture website displayed the guidelines for agriculture farmers during COVID. The farmers were also provided training for crops like mango, papaya, litchi, garlic, ginger, onion, potato, tomato, green chili, peas, and mushroom. The agriculture markets have been replaced by roadside wholesale markets that have come up in every part of the state and where farmers sell their produces without any regulatory protection but to anyone, they want unlike in the APMC system, where they were bound to commission agents. The local municipal bodies, which have set up these markets, charge 1% of the selling price each from the farmer and the buyer as a facilitation fee. It is (through a) direct marketing module approach that ITC, makers of Ashirwad flour, is procuring 2-3 lakh metric tonnes of wheat yearly directly from farmers. The state has started producing seeds of maize, paddy, and vegetables. This will again make available the seeds for the farmers and save them from any malpractice. Every FPO registered organization may take in new employees or those who had lost jobs from March 1 and September 30. The capacity building of the farmers needs to increase.

Kishor Jaiswal – a Post Graduate from Delhi University left lucrative job offers and decided to go back to his native Kalyanpur village of Munger District to take up farming. Transforming drought-hit farmland into a green belt was a prime challenge. His timely and effective water conservation approach coupled with soil, seed, and fertilizer management witnessed quality bumper production of horticulture and pulses – which brought a pleasant surprise to the fellow farmers of Kalyanpur. Right applications of technology and knowledge in the farm field have not only made him a progressive farmer but took him to be an integral part of the governing body of a World Bank-sponsored National Agriculture Technology project launched in 28 districts in 2001. He became the governing body of Munger district. He shifted into Agriculture diversification and marketing coordination. He set an example of need articulation for farmer leadership.

Sudhanshu Kumar – from Nayanagar village in Samastipur completed postgraduation in History from Delhi University. He did his diploma in computer Applications from NIIT. He worked as Assistant Manager in Tata Tea Garden, Munar in 1988. He left the job and for 31 years he has been working in farming. His younger brother joined Officers Training Academy, Chennai in 1987 who also left his job and they started farming together. His father did not like

that his sons left the white-collar job. He wanted him to become an IAS officer. Sudhanshu left the Mains exam of IAS and started with the agriculture profession. Everyone had a perception that there is no income from agriculture. They started working in Mango production. The land for the same was in the worst condition and was deliberately given to them so that they will leave agriculture and think for lucrative jobs. They worked consistently for one year and with the support from scientists from Agriculture University, Pusa they adopted scientific techniques like pruning, cutting, fertilizer, etc. In a year, they increased the income from the Mango field from Rs. Twenty-five thousand in 1991 to Rs. One Lakh Thirty-five thousand in 1992. This was an encouragement and an eye-opener for the farmers of Samastipur. Last year they sold it in Rs. Thirteen lakhs. Then they started with the production of Litchi with the help of drip irrigation and micro-sprinkler. They controlled the microclimate for litchi. They were in touch with Muzapparpur processors and for 8 days the whole night, they harvested the litchi. This helped them to increase income from Rs. Eighty-Five thousand to Rs. Three lakhs Sixty-Five Thousand in 2000. In 15 acres of land, the litchi today is sold at Rs. Thirty-Two lakhs. Agriculture has a huge potential with technology for increasing income. He took the help of government subsidies to set up the complete automatic technology. There are twenty-eight thousand plants in around 40 bigha land. In 18 bigha, banana, 4 bigha guava, pomegranate, sarifa, mausambi, bel, ber, and Jamun. They have good broadband and subscribed farm ERP system for the digitization of agriculture. Indian Council for Agricultural Research (ICAR) awarded Sudhansu Kumar from Bihar with Jagjivan Ram Kisan Puraskar for his innovative scientific techniques and methods of farm management and farming. He has been awarded many rewards for smart agriculture and online marketing. Sudhanshu has evolved a new technique for mango farming like pruning trees and dismantling diseased branches and other innovative methods in the basic process. The result helped him to increase his income from Rs 10,000 to Rs 6,00,000 in eight years. The turnover of his farm is Eighty lakh which will increase to 2 crores in the coming 5 years. During COVID, Sudhanshu managed the agriculture risks through the adoption of digital technology and automation in his field.

Jaya Devi – one of the farmers was troubled by the barren lands of Munger district in Bihar. Jaya Devi got married at the age of 12 and delivered a baby girl when she was 16 years. She met a social worker Kishor Jaiswal. She ran a self-help group and with the help of a self-help group she was able to build up watersheds, tanks, check dams, and rainwater harvesting systems. All

this helped her to make the farm green and improve the water problems in the villages of Munger district. Her initiatives towards making the villages green removed the barriers of water for the crops. She helped in managing the droughts during the COVID period.

Shalini Kumari – is a farmer at Kutlupur village in Munger district of Bihar. The crops grown are wheat, coriander, mustard, and maize. During the crisis of COVID-19, she tried to store agricultural commodities to avoid wastage. As there were restrictions, therefore they did not find access to the market for the ready crops.

Urvashi Kumari – is a farmer from the Purnea district. They grow maize, paddy, wheat, oats, and pulses. During COVID-19, the major challenge was the procurement of Agri inputs like seed, fertilizer, and tractor-trailers. This case tells us that agriculture has the potential to become viable. The need of the hour is to guide the farmers for effective pre-harvest and post-harvest management along with the right market linkages. This is more so for low-income states in the eastern part of the Country. She mentioned that let's examine how the farmers' issues and challenges will be amicably resolved and how farming can become a profitable business proposition for the youth of eastern States like Bihar.

4.2 Insights from Farmers of Uttar Pradesh

Uttar Pradesh has a rich diversity in terms of agriculture and farmers. The state has a large share in the cultivation of rice, wheat, leguminous crops, potato, fruits like mango, guava, and sugarcane. Uttar Pradesh has contributed towards the production of the major crops for the country. The sector has helped to generate employment for the farming and non-farming community. To bring relief to the farmers, the Chief Minister of the state contacted the authorities at the center to allow the farmers and laborers to work in the field during the national lockdown. Farmers who cultivated onion, banana, cotton, flower, and other cash crops were worst hit since they were perishable commodities.

Ajay Kumar Singh, a young graduate, is now a well-known progressive and innovative farmer of Ranipur village in the Mirzapur district of the state Uttar Pradesh. Mr. Singh was initially not interested in agriculture and was involved as a contractor in different construction projects till the year 2012-13. After that, he entered into the centering sheets /materials business. He had leased out his land to other local farmers as he couldn't devote time to agriculture. His entry into agriculture was inspired by some leading personalities of the district including his teacher. He

met with agricultural scientists of the Banaras Hindu University (BHU) where he got motivation and encouragement for commercial agriculture. He mentioned in the interview "I was exposed to improved knowledge and good agriculture practice which has changed my attitude towards agriculture and I started taking agriculture as agribusiness".

In 2018, with the suggestions from agricultural scientists, he cultivated mustard on 12 acres and produced approx 104 quintals of mustard, earning a good profit. Mr. Ajay also claimed for producing certified mustard seed on his farm. Apart from the above, he has also cultivated high-yielding paddy on 9 acres of land and produced about 260 quintals of paddy in the last cropping season.

In 2019-20, he saw the cultivation of dragon fruits on social media and was attracted to cultivate the same. In search of the dragon fruits plant, he visited the dragon fruits farm in the Kaushambi district and purchased 20 plants for his farm. Later on, he met with the District Horticulture Officer of Mirzapur who encouraged and supported him for dragon fruits farming at a larger scale. Currently, about 170 dragon fruit plants were planted on 1.5 acres of his land. He is hoping to earn high profit from the dragon fruits considering high market demand and attractive rates. As a result of long-term planning and smart agriculture works, his agribusiness enterprise was least affected with COVID-19. He is further planning for agribusiness into polyhouse horticulture and poultry farming.

Udai Bahadur Singh is a 65-year-old agriculture graduate of Tikri village in the Varanasi district of Uttar Pradesh. He is into basil (Tulsi) farming since 1992-93 when for the first time he saw naturally grown Tulsi on his 2-biswa chili farm.

He said "I decided to harvest Tulsi leaves and sell into local mandi and luckily earned 10 times more profit than chili in that year", It initially looks like a high return with almost zero-investment business which attracted me". He further added that "I decided to go for commercial farming of Tulsi from the very next year on a little larger scale". Accordingly, he had started cultivating Tulsi on his 2 bigha land along with traditional crops wheat and paddy.

Mr. Udai said that, initially, my family members and many villagers questioned the intent when he started tulsi cultivation but now with my success over the years, everyone feels proud of me and even my son involved in the marketing of tulsi leaves". He stated that Tulsi leaves were harvested approximately 12 times in a year with a total quantity of 50 quintals from 2 bigha land.

His annual earnings are estimated to be about 1.0 lakh rupees considering the market rate of approx Rs. 20/kg. However, the market rates of Tulsi leaves oscillates between Rs.15-60 per kg depending upon season and festive occasions. During the Navratri festival, the market rates become the highest. The production becomes low during the cold season. "The tulsi plants require a very smaller quantity of fertilizers, less irrigation and there is no need for insecticides or pesticides," he added. According to him, tulsi cultivation requires less investment and gives a high return.

During the lockdown period, although the supply of tulsi in the market was initially interrupted later on he received an order to supply dried tulsi leaves from some Ayurvedic companies. Now, his farm business has further gained momentum. "In the market, due to Covid-19, there is high demand for tulsi leaves and tulsi made products", he added. He explained how Tulsi became an integral part of his livelihood and sustainability.

4.3 Business Potential from Agriculture

Guiding farmers in performing Good Agriculture Practices (GAP), especially guiding them in soil preparation, cropping patterns, farmer's hygiene, etc, and train them in adopting the latest technology will help in creating a huge potential for agriculture.

Shashi Kumar of Gaya got the Jagjivan Ram Kisan Puraskar award for his excellent work in Honey Production in 2010 and Santosh Kumar from the same district in 2012 for his excellent work in Dairy. Like Black Rice, the progressive farmers in Bihar have also tried cultivating black wheat variety and were successful in this venture as well. Experts have confirmed that black wheat is rich in antioxidants and good for diabetic people, along with other health benefits. Black wheat farming in Bihar had also given good returns to the progressive farmers. Known for its high nutritional value, Black Wheat is a source of iron, vitamin E, antioxidants, calcium, magnesium, and zinc.

In the last few years, nearly 5,000 farmers in Bihar had got associated with "Awaz Ek Pahal", an NGO working to change the farming habits of farmers. This NGO also helps Growers to cultivate exotic fruits like kiwis, dragon fruit, strawberries, etc. Lots of farmers associated with this NGO have made serious efforts to interact with farmers to bring innovations to the sector. Scientists were invited for visits for explaining the methods of Black Rice/Black wheat farming and sharing their knowledge.

An enabling ecosystem that enhances the market power of farmers must be created for smallholders to take advantage of the reform measures. There are immense possibilities to make the farmers of Bihar and Uttar Pradesh self-sufficient. Be it the agriculture production of Uttar Pradesh or fruits of Bihar, be it litchi, zardalu mango, amla, makhana, or Madhubani paintings, many such products are in the developing states, which can make the farmers self-sufficient on the lines of 'Vocal for Local'.

5. Implications of the Study

In the present era where farmers are always seen as small and marginal and considered to be the most backward in terms of income and poverty, the study can help develop a road map for the youths to increase the income from agriculture. The study paves few theoretical and managerial implications

5.1 Theoretical Implications

The study is a pioneer work to highlight the farmers and the measures taken to sustain the livelihood during COVID-19. First, the study can add academic value for the scholars and youths to understand the strategies developed by the farmers. The study discusses an in-depth interview with 10 farmers of Uttar Pradesh and Bihar.

Second, the study through qualitative methodology brings out the perception of the farmers and their agriculture practices. The study documents the best practices adopted by the farmers which will add to the knowledge of scholars and academicians.

Third, the study has developed a road map for the generation to choose agriculture as a source of employment. The study has highlighted the best practices in terms of revenue generation, technology adoption, and agriculture practices from the underdeveloped sectors of the country.

Fourth, the study paves a way for the scholars to research the management of agriculture done by the small and marginal farmers. At the time when everyone was working from home, it was difficult for the farmers to do the same. The study is an encouraging motivational case for the farmers and practitioners who need to be appraised.

5.2 Managerial Implications

First, the study paves a lot of scopes for the practitioners and unemployed generation to look into agriculture as a source of revenue generation. The interview of the farmers discusses the agriculture practices resulting in increased income for the farmers.

Second, the study paves a way for the policymakers to understand the benefits received by the farmers and the challenges for the same. The agriculture policies have provided benefits to the farmers who have opted for them.

Third, the study can be beneficial for the cooperatives, collectives, and farmers in undergoing the best practices. The practices highlighted in the discussion section can be replicated by them to increase revenue and make agriculture a source of business.

Fourth, the study will help highlight the farmers who became self-reliant and as models for the rest of the country. The study can also be useful for the non-practitioners to understand how the farmers worked for fulfilling the demand for food for the country.

6. Conclusion

The study is a pioneer work that has highlighted the agriculture value chain performed by the farmers. The study has highlighted the best practices of farmers for increasing revenue during COVID. Many of the very well-educated young persons with diverse fields have come into farming. They are taking up agriculture as an entrepreneur with the right mix of ecology, technology coupled with sound entrepreneurial management. A good number of people are coming up with a more innovative and upward-looking perspective in terms of system development. There is a need to create decentralized food systems and derive solutions for developing connections between farmers and markets. COVID has affected the farmers as the national lockdown was announced at the time of harvesting of the Rabi crops and there was a sudden shortage of agriculture laborers. Performing agriculture practices with extra precautions maintaining social distancing was a challenge for the farmers. Regular marketing and price slash of perishable commodities were severely affected. This led to inconvenience and surplus cost in the transportation of the crops. Agriculture being an occupation of apparent timings were performed remarkably during COVID-19.

The study is limited to the interviews conducted by the farmers. The study can be extended by surveying a large sample size of the farmers to understand the best practices and challenges faced during COVID-19.

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