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Risk Perception of Pineapple Farmers in the Context of Covid-19 in Kerala

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Aims : To assess the risk perception of pineapple farmers in the context of Covid 19.
Place and Duration of the Study: Muvattupuzha block panchayat in Ernakulam district in Kerala between September 2021 to September 2022.
Methodology: The data relating to the study were collected during September 2021 from 120 pineapple farmers, using a well-structured interview schedule. Based on a four-point Likert scale, a Standardized Covid -19 Risk Perception Index (SCovRPI) was developed to assess the risk perception against fourteen identified risks faced by pineapple farmers during Covid 19. Farmers were asked to score the risks based on their level of perception.

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Results: Realisation of low price, restrictions in transportation, low demand for pineapple in market, disruption in farming activities and non-availability of adequate hired labour are the major risks perceived by pineapple farmers during Covid 19.
Conclusion: findings of the study are relevant for policymakers as they work to seek remedial measures that enhance the living standards and resilience of pineapple farmers.

Keywords: Covid 19; Likert scale; Agricultural risk; Risk perception; Risk perception index; Pineapple farmers; Ernakulam

1. INTRODUCTION

The world has experienced never-before-seen consequences as a result of the novel corona virus outbreak (Covid-19). This pandemic had a significant negative impact on all sectors of human life, including the economy, food security, and health [1]. The deaths of thousands and the severe impact on the global economy compelled the world to take emergency plans and measures to contain the spread of the virus [2]. Consequently, this has brought the world into lockdown which shut down all the factories, industries, and businesses of human life. Currently, it poses a threat to the food security of billions of people around the world, particularly in developing countries [3].

India is one of the worst affected countries due to Covid 19. The Covid-19 induced lockdown started across the country in March 2020 and is still ongoing with restrictions in one form or the other. It stalled the economy with complete closure imposed on enterprises across all sectors. Even though agricultural activities were exempted from the lockdown, after a certain period, there were widespread disruptions in the agricultural supply chain at the beginning of the lockdown [4], which further led to the scarcity of labour, disrupted supply chains, and lack of demand and logistics restrictions in the agricultural sector [5].

Kerala, the southernmost state in India is mainly a consumer state. Crops, livestock, fishing, and forestry contributed only 8.03 per cent at constant prices to Kerala's Gross State Value Added in 2019-20 [6]. Pineapple (*Ananas comosus*, family: Bromeliaceae) is one of the important commercial fruit crops in Kerala, cultivated in an area of 9,152 ha with a production of 93,007 tonnes and productivity of 10.1 t ha^{-1} [7]. Pineapple is mostly grown in the districts of Ernakulam, Kottayam, Pathanamthitta and the low elevation areas of Idukki district in Kerala. Vazhakulam pineapple in Ernakulam district is considered the best in quality, sweetness, aroma and flavour [8]. Pineapple produced from the region has a long value chain and is marketed fresh in several parts of the country, besides entering into processing activities. From here, fresh pineapple is being sent to various states such as Karnataka, Tamil Nadu, Maharashtra, Gujarat, Madhya Pradesh, Rajasthan, Andhra Pradesh, Delhi etc. mainly by lorry transport. Limited quantity of fresh pineapple is being exported to Gulf countries in special packings [9].

Pineapple as a horticultural crop and its higher perishability made this crop worst affected agricultural crop during this pandemic in Kerala [10]. The pandemic shock posed several risks to pineapple farmers which were production risk, price risk or any such type. Some of these risks include loss of demand for pineapple in the market from other states. Due to the steep fall in pineapple market price, many farmers could not pay off their debts [11]. In addition to this majority of migrant labourers, who managed the farms, left for their hometowns when covid surge gripped the state. Many of the farmers hired, labourers on daily wage basis which caused an increase in production costs. All these had put the farmers in distress and there was also a report of farmer suicide due to financial losses in pineapple cultivation.

Risk perceptions play a key role in the production and investment behaviour of farmers. Farmers' management response to risks is influenced by their perception of the risks concerned. Based on how they perceive risks, farmers implement a wide range of strategies to limit the impacts of agricultural risk [12]. Knowledge of farmers' perception of risk, risk aversion and preferred risk management strategies is essential for creating policy instruments to support agricultural risk management [13]. Hence the present study is focused on the study of risk perception of pineapple farmers during Covid 19 pandemic in Kerala.

2. MATERIALS AND METHODS

2.1 Study Area

The study was conducted in Ernakulam district of Kerala. The study area was selected purposively as it has the largest area under pineapple cultivation in Kerala. Out of the total area under pineapple in Kerala, 58.73 per cent lies in Ernakulam district which produces about 63 per cent of the production of the state in the year [7]. From the district, Muvattupuzha Block Panchayath was purposively selected based on the maximum area under pineapple cultivation. Three pineapple-growing grama panchayats *viz.,* Avoly, Manjalloor, and Kalloorkkad were selected from the block panchayat randomly. Forty farmers each were randomly selected from these grama panchayaths making a total sample size of 120 farmers.

2.2 Sampling and Data Collection

The study used both primary and secondary data. A pretested well-structured interview schedule was used to collect primary data from farmers. Secondary data was collected from government offices and official records. According to the interview schedule, the type and frequency of risks in pineapple farming and marketing during the lockdown, and the risks perceived by the farmers.

2.3 Empirical Model

2.3.1 Measurement of risk perception and index

A pilot study was conducted during September 2021 to identify the risks faced by pineapple farmers in the context of Covid 19. Major risks as perceived by farmers were listed for the main study. They were fourteen in number. The four-point Likert scale as developed by Ahmed et al. [14] was followed with some modifications and the farmers were asked to score the risks based on their level of perception. The scale ranges from “no risk perception” to “high risk perception” and in between these two boundaries, “low risk perception” and “medium risk perception” were added. Values were assigned to each perception scale in increasing order to make analysis easier, such as 0 for no risk perception, 1 for low risk perception, 2 for medium risk perception, and 3 for high risk perception. The respondents’ overall perception score was then calculated. Covid-19 Risk Perception Index (CovRPI) was developed in this study to assess farmers’ perceptions of potential risks based on their own experiences. In order to understand how the respondents perceived risk sources, the respondents were asked to rate their opinions on the fourteen identified risks. Equation. 1 was used to calculate the Covid - 19 Risk Perception Score (CovRPS).

$$\text{Covid 19 Risk Perception Score (CovRPS)} = \text{CovRPn} * 0 + \text{CovRPl} * 1 + \text{CovRPm} * 2 + \text{CovRPh} * 3 \quad (1)$$

Where CovRPn represents the number of respondents having no risk perception, CovRPl shows the number of respondents having low risk perception, CovRPm describes the number of respondents with medium risk perception, and CovRPh indicates the number of respondents with high-level risk perception. As the responses were gathered from 120 farmers, the Covid-19 Risk Perception Score (CovRPS) for each given constraint may fall between 0 and 360, with 0 denoting the minimum level of risk perception and 360 denoting the maximum level of risk perception. CovRPS was then modified into a standardised index in order to further interpret the findings. Equation. 2 was used to calculate Standardized Covid Risk Perception Index (SCovRPI).

$$\text{Standardized Covid-19 Risk Perception Index (SCovRPI)} = \text{(Total CovRP score)/(Maximum attainable CovRP score)} * 100 \quad (2)$$

Standardized CovRP score was derived by dividing the Total CovRPS value by the maximum attainable CovRPS value and multiplying it by 100. The Total CovRPS score was obtained by multiplying each perception score with the total perception frequency for the respective constraint. The SCovRPI value ranges from 0 to 100, with 0 denoting the minimum level of standardized risk perception and 100 denoting the maximum level of standardized risk perception.

3. RESULTS AND DISCUSSION

The results of the study are presented in two segments: the first segment discusses the socio-economic characteristics of pineapple farmers in the Ernakulam district of Kerala and the second segment explains the risk perception of pineapple farmers during covid 19 pandemic.

Table 1. Risk Perception of pineapple farmers during Covid – 19 in Ernakulam district

	Sl. No	Covid – 19 risks	High perception	Medium perception	Low perception	No perception	CovRPS	SCovRPI	Rank
High-risk perception	1	Realisation of Low price	99	19	2	0	337	93.61	1
	2	Restrictions in transportation of inputs and produce	97	20	3	0	334	92.78	2
	3	Disruption in farming activities	89	21	9	1	318	88.33	3
	4	Low demand for the produce	86	27	5	2	317	88.06	4
	5	Non availability of adequate hired labour	82	24	14	0	308	85.56	5
Medium-risk perception	6	Losses due to unsold produce	60	42	15	3	279	77.50	6
	7	Difficulty in loan repayment	57	33	18	12	255	70.83	7
	8	Higher labour cost for domestic labour	21	70	28	1	231	64.17	8
	9	Lack of processing facility	18	49	48	5	200	55.56	9
	10	Lack of storage facility	20	34	51	15	179	49.72	10
Low-risk perception	11	Health issues due to Covid 19	16	37	55	12	177	49.17	11
	12	Unavailability of credit	5	33	50	32	131	36.39	12
	13	Export Restrictions	4	14	72	30	112	31.11	13
	14	High rent paid for land	3	17	54	46	97	26.94	14

3.1 Risk Perception of Pineapple Farmers during Covid-19

Covid-19 is one of the most serious hazards to life on earth. However, the risk perception of farmers varies significantly amongst individuals depending on their socioeconomic status and their education [15]. Many researchers used the Likert scale to measure farmers' risk perception [16-18]. In this study also Likert scale was used to measure the risk perception of farmers.

The risk perception of pineapple farmers during COVID-19 is described in table 1 along with scores and index values against respective pre-identified risks. Based on this score and index value these risks were ranked from 1 to 14. From the calculated data, it was observed that CovRPS on fourteen risks ranged from 97 to 337 (minimum score was 0 and maximum attainable score was 360). After analysing the CovRPS values, risks were classified based on quartiles as high-risk perception, medium-risk perception and low-risk perception. The first five risks were categorised as high risk perception (scores 308 to 337), the next five risks as medium risk perception (scores 179 to 279) and the last four risks were categorised as low risk perception (scores 97 to 177). The SCovRPI values for the fourteen constraints varied significantly, from 26.94 to 93.61, demonstrating the heterogeneity of the risk perception categories within pineapple farmers.

Findings presented in the table showed that the major risks due to Covid 19 faced by pineapple farmers were realisation of low prices, restrictions in the transportation of inputs and produce, disruptions in farming activities, low demand for the produce and non-availability of adequate hired labour. All of these have SCovRPI above 80. Bolarin et al. [18] conducted a similar study on the challenges of Covid 19 pandemic among the small-scale farmers of Nigeria. The study also delineated the restrictions in transportation, labour shortages and difficulty in marketing as the major effects of Covid 19 pandemic.

Among the risks, realisation of low prices for the produce ranked first (SCovRPI=93.61). It implied that lockdown and travel restrictions caused poor marketing and low demand for agricultural produce in the market but the supply of pineapple to the market remained the same. This led to the realisation of low prices and huge economic losses to farmers. According to Kumar [11], the farm gate price has come down to ₹10 per kg compared to ₹40 per Kg in the previous year, due to the lockdown. Similar effects were also observed in other countries. A study conducted in Somalia claimed that most of the respondents faced difficulties in selling their produce in the market due to the drop in both demand and prices [9]. Saha and Bhattacharya [20] also reported that sudden fall in prices of fruits and vegetables was the major difficulty faced by farmers at the beginning of the lockdown.

Restrictions in the transportation of inputs and produce (SCovRPI=92.78) ranked second. It is expected that quarantine restrictions and intra-state or inter-state border closures affected transportation of inputs for agriculture as well as the marketing of agricultural produce in the market. Rai [21] revealed that out of the total production of pineapple from Kerala, only 9.5 per cent was consumed within the state and 90 per cent of pineapple is transported to other states outside Kerala. But due to the closure of borders, interstate transportation of pineapple was stopped. So, farmers and dealers were unable to find a market for their produce which led them to a huge financial loss. Similarly, the survey report on impact of Covid 19 among Indian farmers conducted by NABARD reported that 74 per cent of the all-India sample districts had an adverse impact on the marketing of their goods to APMCs/mandis through road transport [22].

Another important constraint due to Covid 19 lockdown was disruptions in farming activities which has SCovRPI value of 88.33. Interstate restrictions in transportation had affected the timely availability of adequate inputs for farming operations. Local quarantine measures within the state and districts affected the movement of farmers and labours to fields. These restrictions ultimately led to the disruptions in carrying out different farming operations in a timely manner. It affected the yield of pineapple.

Low demand for the product in the market was another important constraint. Due to uncertainty and a reduction in people's spending capacity, demand for pineapple among consumers has dwindled. FAO [23], also reported the reduction in demand for horticultural products in the global market. The closure of restaurants, and processing factories and the restrictions on celebrating festivals and special occasions during the pandemic also reduced the demand for pineapple in the market. This result

corroborates with a similar study by Pandya et al. [24], which also found that the reduction in demand for agricultural produce in the market caused a 70 per cent drop in the prices of agricultural products.

Non-availability of adequate hired labour ranked fifth among the 14 constraints due to covid 19 with a SCovRPI value of 85.56. Migrant labourers make up the majority of the workforce in pineapple farms in Kerala. But strict quarantine measures and fear of viral transmission during the lockdown caused widespread reverse migration of these labourers back to their home states, which led to a severe labour shortage in the agricultural sector, especially in the pineapple sector of Kerala. It caused severe disruptions in different farming activities including marketing. Similar findings were also observed in a study conducted by Muthukumar and Salini [25] on the impact of covid 19 on Indian agriculture with special reference to Kerala that labour shortage was one of the major effects of Covid 19 in pineapple farming in Kerala. It is also close to the findings of the study conducted by Deconinck et al. [26] on the impact of covid 19 on food supply chains in different countries.

Next major difficulty was losses due to unsold produce. Summer months are the peak harvesting season of pineapple in Kerala. Even though pineapple is harvested throughout the year, a majority of farmers made their better part of produce ready to harvest in summer months in order to take the advantage of the demand for pineapple in the ramdhan season. But unfortunately for the last two years, strict lockdown measures coincided with this peak harvesting time. Pineapple as a horticultural crop is highly perishable and needs to be harvested and marketed without delay. But due to the strict lockdown measures and curbs on movement, pineapple fields remained unharvested. Tonnes of pineapple fruit rotted within the fields without being harvested and many trucks filled with pineapple remain halted in various parts of the country due to the unanticipated shutdown. Farmers and dealers were unable to sell their produce which led them to a heavy financial crisis and debt trap. Several researchers in various parts of the world have observed the same risk in their studies as one of the major impacts of Covid 19 in agricultural sector particularly for fruits and vegetables [27-30].

Nearly three fourths of the sample farmers (74.16 %) were dependent on credit for pineapple farming. But as a result of the consecutive lockdown for the last two years (2020 and 2021), the financial viability of farmers was destroyed. During the pandemic, farmers were unable to find market for their produce and the demand for pineapple in the market was very low, which forced the farmers to sell their produce at very cheap prices. Some farmers had to dispose of their crops in the field itself by spraying chemicals due to the heavy financial loss. It affected the prompt repayment of credit. So many farmers had to sell their land and houses for loan repayment and there were also reports of farmer suicide due to the financial crunch. Difficulty in loan repayment among pineapple farmers during this pandemic was also noticed during the study in Uttar Dinajpur district, West Bengal [31]. Some farmers reported that failure in repayment of credit also affected their credit score, which further caused difficulties in availing fresh credit from banks.

High labour cost was attributed due to the peculiar situations in Kerala. It was revealed from the study that the majority of pineapple farmers in Kerala employ permanent migrant labours in their fields due to relatively cheaper labour costs and the non-availability of adequate local labours. The average wage of permanent migrant workers per day is Rs. 500, whereas local labours have a wage rate of Rs. 900 to 1,000 per day. But during the lockdown due to reverse migration, most of the migrant workers went back to their home states which caused severe labour shortages in pineapple fields. It forced the farmers to employ local labourers in their fields which further resulted in higher production costs.

From the study, it was observed that the lack of proper processing and storage facilities was another important risk faced by farmers during the pandemic. Even though there was a good demand for processed fruit products in the market, processing companies were unable to take advantage due to the reduced capacity of food processing firms [28]. The average production of pineapple in the Ernakulam district of Kerala per year was 68457.5 metric tonnes (2020-21) [6]. Compared to the supply of fresh pineapple to the market, the quantity of pineapple taken by the processing firms was very less which was not enough to help the farmers from the distress situation. Pineapple as a horticultural crop is highly perishable and it has to be marketed within a week after harvest. There was no infrastructure or techniques

available for farmers to extend the storage life of pineapple, which aggravated the situation of farmers during the pandemic.

Farmers and agricultural labourers are very crucial for ensuring food security during the lockdown yet these populations are also highly vulnerable to getting Covid – 19 diseases. According to Lusk and Chandra [32], as the major farm operation and value chain activities are laborious, farmers had to work in close proximity which made farmers and farm workers vulnerable to covid 19 disease. Even though the government has given some relaxation for agricultural activities after initial periods of lockdown, farmers and farm labourers were unable to work in the field due to health issues of Covid 19. Due to the fear of viral transmission, many farmers reduced their farming operations in the field. Some farmers have completely stopped farming. It was noticed that the pandemic not only affected the physical health of farmers but also lead to mental stress. Budiman et al. [33] conducted a study on the mental health of farmers during the covid – 19 pandemic and claimed that out of 149 respondent farmers 95 respondents (63.8%) were under severe psychological pressure which had an impact on their individual health, family life, crop productivity and farm income.

A limited quantity of pineapple produced in Kerala (0.5 % of total production) was exported to Gulf countries such as Oman, Saudi Arabia, Qatar, UAE and Nepal [21]. But the closure of international borders during the pandemic and reduced demand in world markets caused reduction in pineapple export from India. Some farmers and dealers of pineapple in the study area also reported reduction in export during Covid 19. According to FAO reports, global export of pineapple has reduced by 13.4 per cent in 2020 compared to the total exports of pineapple in 2019 [34].

The study revealed that nearly 88 per cent of total sample farmers are cultivating pineapple on leased land and some of the farmers reported that, they had faced difficulties in paying higher rent during the lockdown as their returns and yield has reduced drastically. Some had to walk out of their contracts with landowners before the expiry of contract. But some other farmers noticed reductions in rent for land due to decreased demand during the pandemic [35].

4. CONCLUSION

Pineapple is one of the major Covid 19 affected crops of Kerala. The present study mainly assessed the risk perception of pineapple farmers in Ernakulam district of Kerala during the lockdown period. Because of the higher perishability and lack of storage facilities, pineapple farmers were at high risk due to various lockdown measures. The study observed 14 risks faced by the farmers and found that realisation of low prices, restrictions in the transportation of goods, disruptions in farming activities, low demand for the produce and non-availability of adequate hired labour were the major risks perceived by the farmers. It had a great effect on the yield and revenue of pineapple farmers during the pandemic. It was also revealed that, although the government has completely withdrawn all the lockdown and related restrictions, the farmers had not fully recovered from their hardships. Thus, the findings of the study are relevant for policymakers as they work to seek remedial measures that enhance the living standards and resilience of pineapple farmers. It was found from the survey that there was low demand and price for pineapple in the market. Hence the procurement of fruits by Horticorp (Kerala State Horticultural Products Development Corporation) and other agencies may be ensured especially during the periods of low demand. Also, the average cost of production was estimated as ₹ 17.33 per kg from the study. Base price fixed by the Government of Kerala for pineapple is ₹ 15 per kg. So, the base price fixed by the government may be revised to at least ₹ 20-22 per kg in order to make pineapple farming more profitable.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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