

Assessing the impacts of COVID-19 pandemic on agricultural and food systems in Badulla District, Sri Lanka

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Abstract

Despite the health condition, the global pandemic COVID-19 resulted in various negative impacts such as threats to the sustainability of agricultural and food systems on a global scale. It is therefore necessary to analyse and comprehend the immediate consequences of current pandemic on agricultural and food systems in order to develop necessary actions. This study was carried out to assess the impact of COVID-19 pandemic on agricultural and food systems in Badulla district, Sri Lanka where the study was conducted in four Agriculture Instructor (AI) regions namely Badulla, Bandarawela, Welimada and Mahiyangana, from September 2020 to March 2021. AI regions were selected using cluster sampling technique and data were collected from randomly selected 209 farmers by administering a structured questionnaire. Data were analysed using quantitative techniques and text analysis. Results revealed that the key issue faced by the farmers was marketing and distribution. Other main problems were associated with labor, quality raw-material, finance, prices of the raw-material and quality degradation at postharvest stage including storage. Importantly, farmers have received enough farming consultancy during the pandemic. The majority of the farmers had not attempted any innovative approach to mitigate these issues but some farmers had adopted temporary solutions. In conclusion, innovative approaches in making farmers more engaged in risk management similar to COVID-19 pandemic are needed in future.

Keywords: Agriculture, Badulla district, COVID-19, Farmers, Food system

Introduction

COVID-19 pandemic, which is caused by Corona virus, is a global health crisis that made short-term and long-term as well as direct and indirect devastating impacts on the world economy. After its first occurrence in China in 2019, the pandemic invaded the entire world spreading its power in diverse industries and on human beings. The virus entered Sri Lanka in March 2020 and the Sri Lankan government adopted various measures since then to control the condition and reduce its adverse effects. It was apparent that the Sri Lankan government was very aggressive in responding to the

outbreak at the early stage. As a result, island-wide curfew was declared on March 20, 2020 when only 59 infected cases were reported (Ministry of Health and Indigenous Medical Services, 2020). As far as agricultural production activities are concerned, farmers were not subjected to many restrictions because, Agriculture was declared as an essential service, allowing farmers and key allied industries to continue operations during the periods of island-wide lockdown. Exemptions to the curfew allowed planting, transport of planting material, plucking, harvesting, labour transport, transport products to warehouses, and export activities for food and plantation crops to continue

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without disruption (Weerahewa et al., 2021). Yet, on the other hand, movement restrictions of consumers and basic aversion behaviour by workers negatively affected approaching the markets by producers and food processors (FAO, 2020).

According to certain findings, the COVID-19 pandemic has affected all elements of the food system, from primary supply to processing, to trade and national and international logistics systems, to intermediate and final demand (Sunny et al., 2021; Schmidhuber et al., 2020; Workie et al., 2020; Hossain, 2020). The effect on factor markets, i.e., labour and capital, and intermediate inputs are important. For instance, low supply of pesticides and fertilizers is already affecting crop production and lower yield (productivity) resulting in lower production later in the year. The lockdown and shutdown led to untold misery for poor workers in the informal sector (Workie et al., 2020).

Thus, the COVID-19 pandemic (an acute health shock) and its associated social and policy responses (broader production and economic shocks) are exceptional in that they potentially affect multiple food system drivers at the same time; affect the food system from inputs and production to trade and marketing to price and affordability to consumer demand; and affect almost every scale, from local to global. Though COVID-19 is a health crisis, it could also lead to a food security problem if proper measures are not taken. The pandemics that the world has experienced earlier, have shown that quarantines and panic not only affect human activities and economic growth (Hanshima and Tombe, 2012; Bermejo, 2004; Arndt and Lewis, 2001) but also affect all sorts of agricultural activities that induce an increase in hunger and malnutrition (Sar et al., 2021; Burgui,

2020). Global outbreaks like Ebola, SARS, and MERS all had negative impacts on food and nutrition security, particularly in developing countries and for vulnerable populations like children, women, old, and the poor (Hossain, 2020). Agricultural production is input-intensive and a long process from planting, nurturing, harvesting to commodity shipment, which involves labour at various stages. The food and agricultural sectors are therefore considered less resilient due to their dependency on the market value chains. These activities are hampered by travel limits imposed by governments across the globe to stem the spread of coronavirus (Schmidhuber et al., 2020).

Therefore, it is crucial to understand how farmers have experienced the shock of the COVID-19 pandemic in their agricultural activities. Studies on how the COVID-19 pandemic has affected food security and farmers' livelihoods in Sri Lanka are lacking. Therefore, this study aims to bridge this gap by analysing impact of the COVID-19 pandemic on the Agriculture sector in Badulla district, Sri Lanka. Badulla, district which is predominantly an agriculture-based district, employs about 55.4% of its labour in the sector and there are 188,739 agriculture operators in the rural agriculture sector in Badulla district (Annual Labor Force Survey, 2019). Accordingly, farmer perceptions of the impacts of this severe issue of COVID-19 on agricultural and food systems in Badulla district were studied through this research.

Materials and Methods

The study was conducted in four agriculture-based regions in Badulla District, Sri Lanka, i.e. Badulla, Bandarawela, Welimada and Mahiyangana giving particular attention to potential vulnerabilities and

resilience in the region, from September 2020 to March 2021. Following the geographic boundaries of the study area, using cluster sampling technique, Agriculture Instructor (AI) regions were selected as study locations and data were collected from randomly selected 209 farmers by administering a structured questionnaire. Sample size for the research was calculated for a large and known population ratio using Yamane's (1973) formula, as given below. Primary data were collected following a semi-structured questionnaire.

$$n = (K * S)^2 / E^2$$

where n=sample size

K=the confidence level in standard error unit or z score

S=the sample standard deviation

E=the level of precision required

The questionnaires were pilot tested with a small sample of respondents. The final questionnaire was improved, rearranged, and modified following the experience of the pilot-test. The final questionnaire focused questions on the socio-economic profile of the farmers, farming activities and, impacts of COVID-19 on their production, processing and marketing-related activities. Quantitative data were analyzed by SPSS using descriptive statistics in the form of frequencies and percentages. Qualitative data were analyzed through text analysis.

Results and Discussion

General characteristics of the farmers

The selected 209 sample farmers were distributed according to Figure 1. Accordingly, the highest proportions of the farmers represented in Bandarawela

(36%) and Welimada (35%) agriculture regions. Figure 2 depicts the gender distribution of the farmers in the selected agriculture regions of Badulla district. From the whole sample, it was evident that males play a significant role in farming (78.9%) (Figure 2).

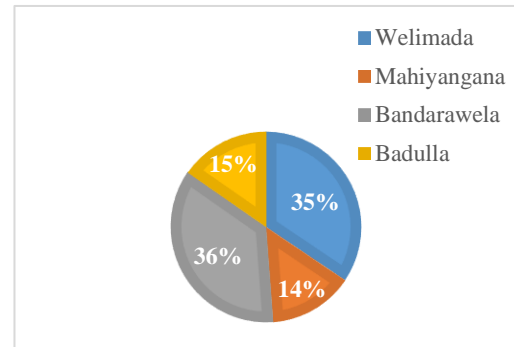


Figure 1: Distribution of farmers based on the agriculture region

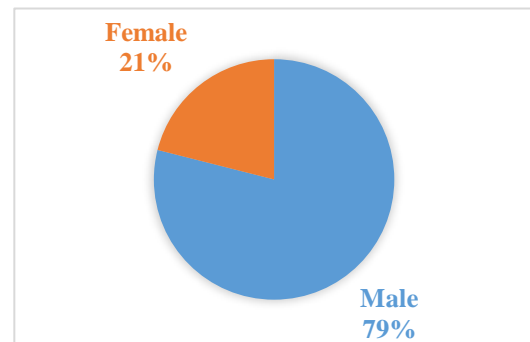


Figure 2: Gender distribution of farmers

Table 1 depicts the descriptive statistics of the other socio-demographic information about the study sample.

Age of the farmers ranged from 19 to 76 years (Table 1) and the average age was 47.4 years which indicates middle-aged farmers. On average, the farmers had 15 years of experience related to farming (Table 1). It indicates that the farmer group has a considerable level of farming experience. Most of the farmers had education levels varying from grade 6 to G.C.E. (A/L) and only

Table 1: Sample statistics for socio-economic factors

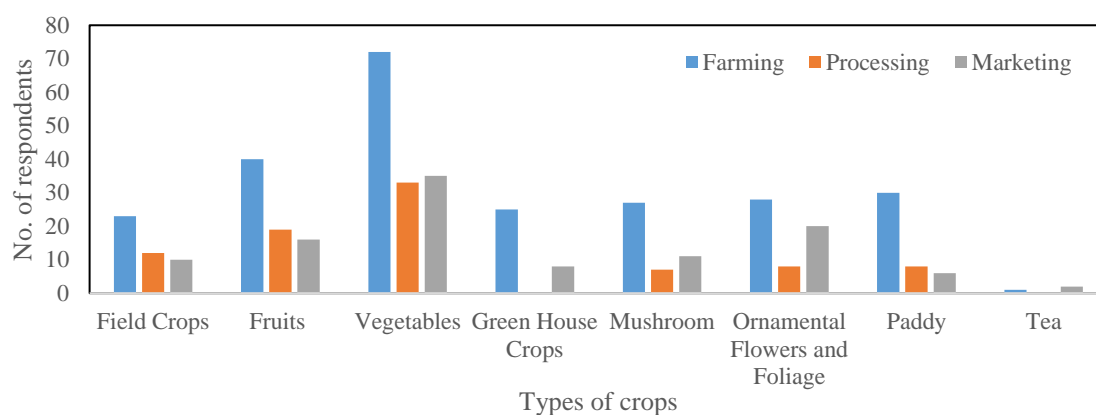
	Number of responses	Minimum	Maximum	Mean	Standard Deviation
Age (years)	206	19.00	76.00	47.74	11.76
Experience in farming (years)	195	0.50	65.00	14.97	12.56
Education (years)	201	0.00	17.00	11.09	2.71
Family members	176	1.00	10.00	4.23	1.43

a few farmers had earned Diplomas and/or Bachelor's degrees and the average education of the sample was 11 years (Table 1). The number of members in a family varied from one to 10 and thus the average was four members per family (Table 1).

Farmers' involvement in agriculture

The majority of the farmers in Badulla district are involved in cultivations such as vegetables, fruits, ornamental

flowers and foliage, field crops, paddy, mushroom, and greenhouse crops. Even though crop cultivation is prominent in the area, a considerable number of farmers engage in processing and marketing-related activities as well (Figure 3). However, cultivation of field crops, fruits and paddy seem prominent in their marketing, while marketing of vegetables, greenhouse crops, mushroom and ornamental flowers appear to be popular in their processing and marketing.

**Figure 3: Types of crops/production by the selected farmers**

Moreover, in Badulla district, farming is the principal income source of many people who engage in agricultural activities (81%) while the rest depends on agriculture and related activities as a secondary occupation. In addition, when referred to Figure 4, it is evident that most of the farmers (179) utilize

family labors (85.6%) for their routine farming activities but certain farmers make use of hired labor (107) and/or labor on a tenure basis (30). Nonetheless, compared with the use of labor, the use of machinery for production activities is considerably low (26.7%) (Figure 4).

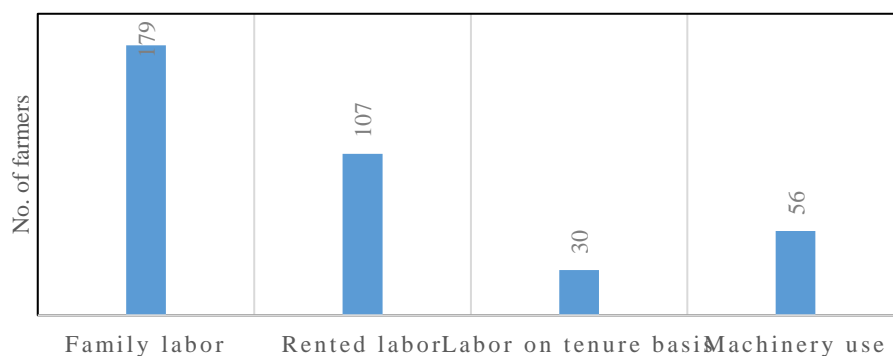


Figure 4: Use of labor/machinery by the selected farmers.

COVID-19 Pandemic and Agriculture Production in Badulla District

Impact on agricultural inputs

Table 2 summarizes responses related to agricultural inputs which were affected during the COVID-19 pandemic period of the study concerned.

For majority of the farmers, labor availability became a considerable issue during the COVID-19 pandemic period. This could be due to the condition that most farmers depended on human labor instead of machinery and other technologies for their agriculture-related activities (Figure 4). Financial difficulties are a known fact with the farmers all around the year since most of them rely on credit. Similarly, during the pandemic period, they have faced issues in both applying for credit facilities and repaying previously received credits. As importation, manufacturing and distribution of certain agricultural raw materials were seized during this time, farmers have encountered numerous problems. Specially, fertilizer, seeds and other specific inputs used in production have become main constraints in terms of raw materials.

This again suggests a new avenue for farmers to innovate their own methods of supplying alternative solutions. Problems with use of agri-machinery were deemed to be less as its usage was not prominent.

Farmers seem much price sensitive with the raw materials and the majority has emphasized that the agricultural input prices have been increased during the pandemic period. It is obvious that when the availability of products is decreased the prices are increased simultaneously. However, in relation to the quality of raw materials, farmers have raised neither positive nor negative concerns. It implies that they are satisfied with the quality of raw materials. Nevertheless, a considerable portion of farmers has faced difficulties with the quality reduction in either imported or locally produced raw material. Although, travel restrictions and services during the pandemic were limited to a certain extent farmers have been protected by the agricultural extension authorities. Majority of the respondents have effectively utilized the extension services rendered by the government organizations like the Department of Agriculture. Hence, they have been able to survive in the sector at least with the minimum production level.

Table 02: Responses related to agricultural inputs usage during the COVID-19 pandemic

Issue	Strongly agree (%)	Agree (%)	Neither agree nor disagree (%)	Disagree (%)	Strongly disagree (%)
Labor availability					
1 Reduced labor availability	16.9	47.7	33.7	1.7	0.0
Finance					
2 Issues in applying for loans	27.4	45.8	24.4	2.4	0.0
3 Issues in repaying loans	33.3	45.6	19.3	1.8	0.0
Availability of raw-material					
4 Lack of fertilizer for production	25.9	54.1	18.9	1.1	0.0
5 Lack of agro-chemicals for production	20.7	42.5	33.5	2.8	0.6
6 Lack of agricultural machinery for production	11.0	45.1	40.7	3.3	0.0
7 Lack of seeds for production	22.0	49.5	23.1	5.4	0.0
8 Lack of other unique raw-materials for processing	21.1	51.1	26.7	1.1	0.0
Prices of raw-material					
9 Increased fertilizer prices	25.1	44.1	21.2	8.9	0.6
10 Increased agro-chemical prices	26.4	46.7	18.7	7.7	0.5
11 Increased equipment prices	21.9	48.1	21.4	7.5	1.1
12 Increased seed prices	21.5	47.8	20.4	8.6	1.6
13 Increased prices of other raw-materials	18.9	48.6	23.2	9.2	0.0
Quality of raw-material					
14 Reduced quality of fertilizers	4.7	36.7	50.3	5.9	2.4
15 Reduced quality of agro-chemicals	7.1	33.7	53.3	4.7	1.2
16 Reduced quality of seeds	5.5	27.9	53.3	11.5	1.8
17 Reduced quality of other raw-materials	3.0	26.0	63.3	7.7	0.0
Consultancy					
18 Lack of consultancy in production	4.7	18.1	49.1	24.6	3.5

Impact on production

Of problems associated with production, most cited issue was crop protection (Figure 5). The causes of this issue seem to stem from a lack of

required agrochemicals and increased agrochemical prices. Other issues on land preparation, crop cultivation and harvesting also considerably remained with the farmers (Figure 5).

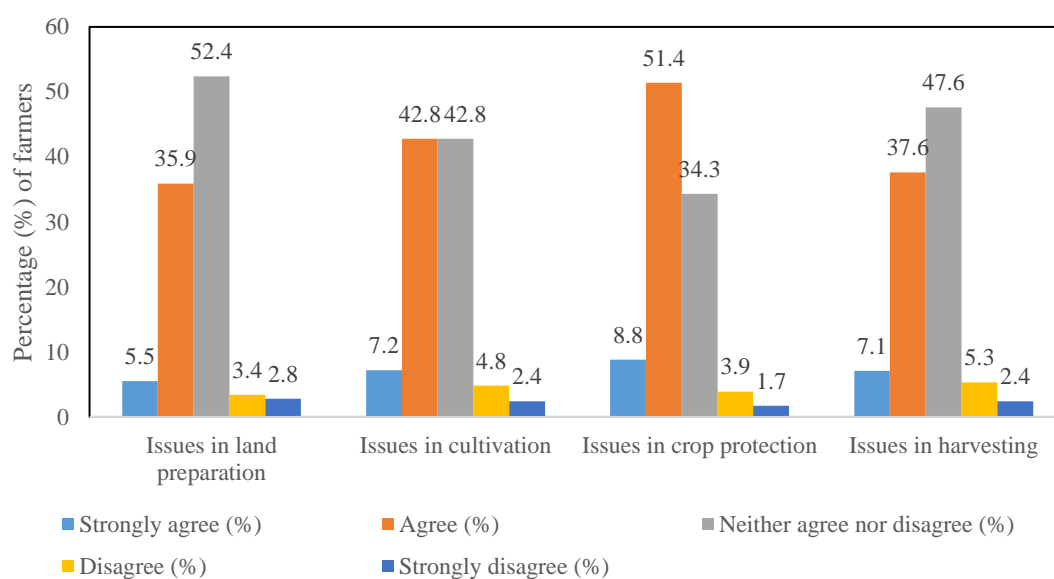


Figure 5: Responses related to major production issues.

Impact on processing

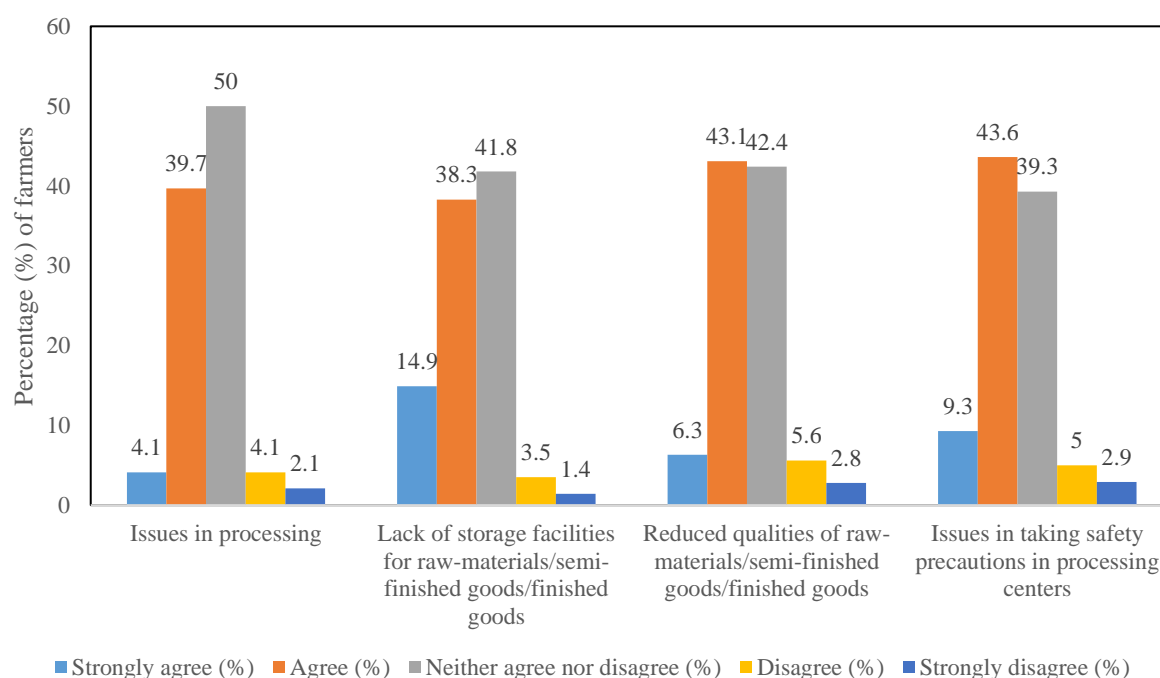


Figure 6: Responses related to processing activities of agriculture and related aspects

Figure 6 shows the responses related to processing activities of agriculture and related aspects

As far as processing-related issues are concerned (Figure 6), most farmers have recognized quality degradation as

a considerable problem in storing and inventory management. Similarly, due to the increased safety concerns, applying those measures at the processing premises had also raised problems. Since demand and supply fluctuations and difficulties in

distribution prevailed during the pandemic, difficulties in storing and preserving commodities had also been a critical issue.

Impacts on marketing

Table 3 provides details taken from the responses of the selected farmers of Badulla district.

Table 03: Responses related to marketing of agricultural products during COVID-19 pandemic.

	Issue	Strongly agree (%)	Agree (%)	Neither agree nor disagree (%)	Disagree (%)	Strongly disagree (%)
Distribution						
1	Lack of distribution facilities	30.9	45.5	21.8	1.8	0.0
2	Issues in using normal transportation routes	38.3	39.5	20.4	1.9	0.0
Demand						
3	Reduced demand from marketing intermediaries	41.8	41.8	11.9	4.1	0.5
4	Reduced demand from end-customers	40.2	39.7	15.9	3.2	1.1

The majority of the farmers have identified difficulties in agricultural commodity distribution during the pandemic, along with the issue of blocking normal distribution routes because of long-held travel restrictions. Farmers who experience a reduction in sales due to COVID-19 have sold their produce through multiple marketing channels, such as roadside marketing and direct marketing. More importantly, marketing issues were the most prominent among all the identified issues since majority of the respondents

strongly agreed with the fact that they could not approach both Business-to-Business (B2B) markets and Business-to-Consumer (B2C) markets as they planned, because of reduced demand derived from the problems during the pandemic.

Coping and mitigation of the issues of COVID-19

Figure 7 shows the responses related to adoption of new practices after experiencing COVID-19 outbreak.

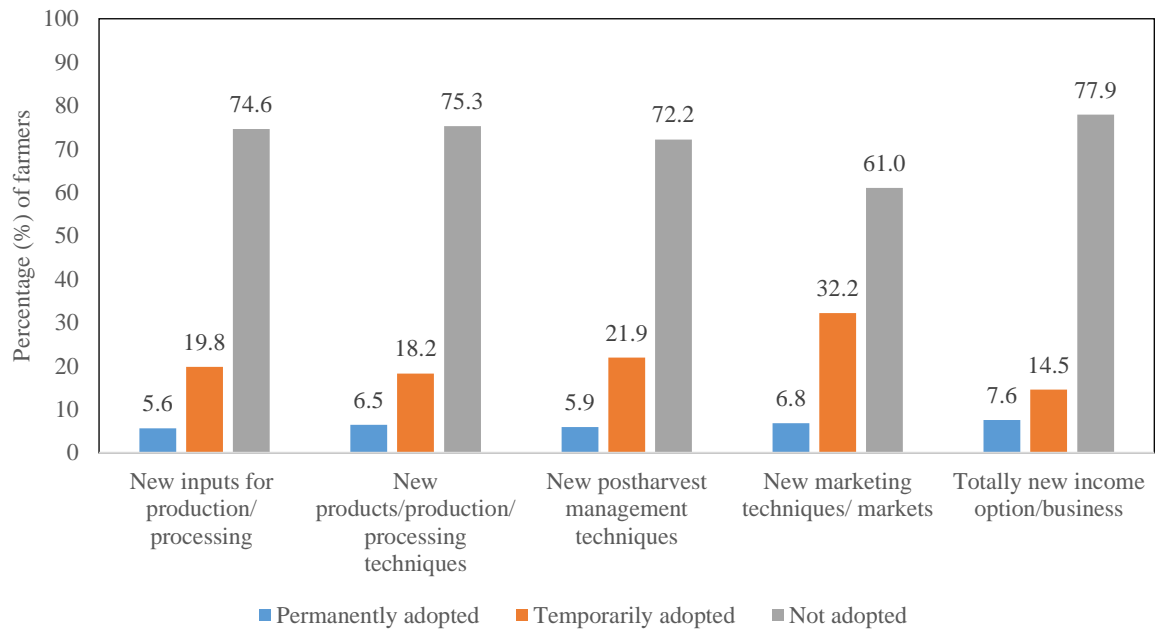


Figure 7: Adoption to new practices after experiencing COVID-19 outbreak

Most farmers have not attempted any innovative approach to bring back their lives to normal or to improve further. Above 61% of farmers agreed with this fact in terms of recognizing alternative raw materials, production techniques, postharvest management techniques, marketing techniques, and new business opportunities. It clearly indicates that most of the farmers do not find any option other than staying with conventional what they have been following so far under whatever the circumstance occurs. Nevertheless, the second-highest majority of the farmers have recognized temporary solutions for the issues. While some farmers have temporarily moved to new trades, inputs, production, processing and postharvest management techniques, a considerable number of farmers (32%) have adopted new marketing techniques provisionally during the pandemic. Meantime, only a few respondents (less than 8%) have permanently capitalized opportunities from the COVID-19

outbreak, by adopting long-term solutions to the above-mentioned issues.

Conclusions

COVID-19 had detrimental impacts on agriculture sector and food systems around the world. Food demand and in turn the food security are severely affected due to movement restrictions, reduced purchasing power, and further impact on the most vulnerable small-scale farmers. This study analysed the impact of the COVID-19 pandemic on agricultural and food systems in Badulla district, Sri Lanka. As results reveal, COVID-19 pandemic has made considerable impacts on the rural agricultural and food systems in Badulla district. Although the COVID-19 pandemic provided opportunities creating new avenues for farmers to innovate their own methods of bringing alternative solutions for the issue; yet, majority of the farmers in Badulla district did not find any option other than staying with what they have been conventionally doing so far under

whatever the circumstance occurs. The governments must promptly plan to enhance their capacity in the agricultural sector by implementing new risk management programs, introducing alternative income generating opportunities and training and motivational programs.

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