COVID-19 and food security in Malaysia: implications on smallholding agriculture

[1]Rashidi, M.N.H., [1,*]Abdul Fatah, F., and [2]Saili, A.R.

[1]*Faculty of Plantation and Agrotechnology, Universiti Teknologi MARA, Cawangan Melaka Kampus Jasin, 77300 Merlimau, Melaka*
[2]*Faculty of Plantation and Agrotechnology, Universiti Teknologi MARA, Cawangan Sarawak Kampus Samarahan, Jalan Meranek, 94300 Kota Samarahan, Sarawak*

Abstract

Over the last two decades, the world has been confronted with several outbreaks of infectious diseases. Ebola, influenza A (H1N1), SARS, MERS, Zika and most recently, COVID-19, have had a serious global impact on economic instability, local and global public resources and above all, people's health. As the effect of COVID-19 is significant to the world market, it has also indirectly impacted the agricultural sector and hence has significantly exposed the strengths and limitations of the farming systems in terms of resiliency, production and food security which offers important lessons for policymakers. Hence, this study was conducted to analyse the impact of COVID-19 pandemics on the agricultural industry especially the smallholders who are more vulnerable during or post-pandemic due to the lack of resilient supply networks, low periphery of market access and limited production. In doing so, a survey was conducted, which began in May 2020, consisting of online questions that contain information about the impact of COVID-19 on the smallholding sector and the challenges faced by smallholders including crops, livestock, fisheries and aquaculture in Malaysia. A total sample of 217 smallholders or farmers from several states in Peninsular Malaysia was obtained within the Movement Control Order (MCO) period and later extended to the Conditional MCO (CMCO). Almost 86% of respondents answered that COVID-19 had heavily affected agriculture-related activities in Malaysia. Using a principal component analysis, our findings reveal four major issues or challenges those farmers faced during the MCO/CMCO namely income, uncertainties of supply and price, logistics and marketing activities.

1. Introduction

The agriculture sector plays an important role in the growth and development of the nation. It is directly and indirectly connected to other industries and has the main objective of supporting the overall growth and development of the economy. The results of the Leading Index for the reference month of February 2020 revealed that Malaysia would experience slower economic growth in the second quarter of 2020 following the COVID-19 pandemic from 23 January 2020 until the end of the year (DOSM, 2020a). COVID-19 has had a serious global impact on economic instability, local and global public health resources and above all, people's health.

According to Food and Agriculture Organizations (2020), COVID-19 is going to affect agriculture in two key aspects: food supply and demand. These two aspects are directly linked to food security; therefore, food security is also at risk. While Stephens *et al.* (2020) further elucidated the impact could substantially reduce demand for restaurant and commercial food services in combination with labour, processing capability and/or storage constraints thus leading to farmers discarding their production. The quarantine or restricted movement order is affecting labour availability for key time-critical farming from sowing vegetable plants to picking fruits.

Since the effect of COVID-19 is significant to the world market, it has also indirectly impacted all the players involved in agricultural production and hence give major limitations to the players to continue their production and gain profits. In 2018, export and import in the agriculture sector amounted to RM114,451 million and RM93,313 million respectively. Both of the external trade in agriculture showed a reduction from the previous

*Corresponding author.
Email: fazleen5201@uitm.edu.my

year which was RM126,492 million for export while an increment of about RM95,222 million in imports. According to The Star (2020), exports of agricultural goods dropped 21.3% due to lower exports of palm oil and other palm oil value-added products.

In 2018, about 1,570.3 thousand people were working in the agricultural industry and the number was dominated by 77.7% (1,220.6 thousand) male workers. Out of the number, there were 492.4 thousand non-citizen working individuals. As published in the survey entitled "the effect of COVID-19 on economy and individual" conducted by DOSM (2020b), the agriculture sector holds the highest percentage (21.9%) of workers that lost their jobs. This includes oil palm, livestock, fishing, forestry and rubber. Those workers lost their jobs due to the COVID-19 pandemic. Therefore, some issues related to employment, finance, safety and health of the workers or smallholders and farmers during the period had arisen.

The movement restriction had also limited travelling between countries. On 16 March 2020, the Malaysian Government had taken an initiative by implementing the Prevention Act and Infectious Disease Control 1988 and Police Act 1967, which states that restrictions were made for the entry of foreigners within 14 days (New Straits Times, 2020). Non-citizens contributed to 50% of agricultural workers, which in turn created a greater economic burden on the agricultural industry when these non-citizen workers could not travel. Thus, it will give a huge impact on employment in the agriculture industry while resulting in less production due to labour shortages. Migrant workers made up more than 30% of the workforce in the agriculture sector (DOSM, 2020c), of which half of them are low-skilled or semi-skilled workers in Malaysia. As firms in the agricultural industry are already grappling with the economic consequences of the pandemic, this could further complicate their efforts to reduce unemployment due to manpower disruption as there is an outflow of these migrant workers and a shortage of local workers to fill the vacancies.

Movement restrictions limit farmers' market access to buy inputs and sell goods. Malaysia, for example, as of 13 April 2020, had enforced a shutdown of several sectors such as education, transport and tourism; which would affect the economics of certain sectors; thus leading to disruptions of the nation's economy. The agricultural sector mostly involves a supply chain process where a majority of its activities involved would be restricted during the Movement Control Order (MCO). For most of the supply chain, product/services must undergo several processes such as transportation, warehouse and retailers from the supplier to the

consumer (Albastroiu and Felea, 2013). If one of the processes is being disrupted, then it will give an impact on the economics of that particular product. The input cost of that particular product/service will be affected whenever there is one process disrupted. An example for the agriculture sector is when the retailers failed to meet their sales in a specific time for that agriculture product which will affect the retailer's input cost. Because agricultural products are mostly perishable, a pandemic crisis may rapidly put pressure on food supply chains, which entails a complex series of interactions comprising farmers, farm inputs, processing plants, shipping, retailers and more. Fresh produce would then accumulate in farms and causes food loss.

The shipping industry was also reported to be slowing down due to port closures, and logistics hurdles could interrupt the supply chains (FAO, 2020). As the shipping industry shuts down, it gives an impact on the import and export of food and agricultural products. As being shown by a survey conducted by DOSM (2020b) on the effects of COVID-19 on the economy and individuals, activities of buying raw materials for cooking at market/supermarket/groceries has reduced significantly. When these activities are limited, it means that food and agriculture economics had also been affected by the fewer buying and selling activities. From the same data, it also shows that 94.8% own account worker also suffered the impact of COVID-19 by facing a reduction in income. This includes the smallholders' farmers. Due to financial issues that arise because of COVID-19 pandemics, smallholders face problems to continue the production of agricultural goods. Because of this financial issue, several nations are implementing aid programs for smallholder farmers who lack incentives (Abdul Fatah and Cramon-Taubadel, 2017). Smallholders need cash handouts and safety net services which can increase productivity. As a result, banks need to waive fees for farmers' loans and prolong payment deadlines. Capital injections in the agricultural industry are essential to help small and medium-sized agribusinesses continue to operate during the pandemic.

Though several scientific studies have addressed the response of the countries related to the COVID-19 issue, there are very few studies that analyse the impact of COVID-19 on agriculture particularly in Malaysia. Considering this fact, the study is aimed to make up the gap by addressing the existing situation of COVID-19 associated with the challenges and status of farming or smallholding communities in agricultural sectors as well as examining the factors that trigger the challenges or further aggravate the situation. The study is significant, where like in other developing countries, Malaysia also faced a question as to whether the real crisis from

COVID-19 would affect food security, or to what degree the crisis could set back the achievement of the Sustainable Development Goals (SDGs) by 2030 (UN, 2015) especially their consequences on the vulnerability of the related livelihoods of farming and smallholding communities in the country.

2. Materials and methods

2.1 Sampling method

For this study, the data was gained by conducting an online survey, with the help of a structured questionnaire provided to selected smallholders in Malaysia. The questionnaire was circulated in the Malay language and distributed using two different sampling methods which are convenient sampling and respondent driven sampling (Kaliszewski *et al.*, 2020). Social media platforms such as WhatsApp and email were used to share the survey link. Convenience sampling is a type of non-probability or non-random sampling where members of the target population who meet certain practical criteria, such as easy accessibility, geographical proximity, availability at a given time, or willingness to participate, are included for the purpose of the study (Dörnyei, 2007). Moreover, this type of sampling technique was also chosen due to its suitability to be used as samples, which were selected based on the subjective judgment of the researcher.

In a setting where the sampling design and inference in hard-to-reach populations (Gile and Handcock, 2010) are challenging during the pandemic, the respondent driven sampling method was carried out through selecting an existing sample (listed by The Federal Agricultural Marketing Authority (FAMA) from previous online communication), and getting feedback and consultation to distribute the questionnaire through a web link, Google Drive, or WhatsApp while incentivises respondents not only to participate in the survey themselves but also to get their contacts from other farming community they might know to participate. In such designs, networks from sampled members of the target population would link to the subsequent population such that previously sampled individuals can facilitate the sampling of others in the particular farming community.

As a result, a total sample of 217 smallholder farmers from several states in Peninsular Malaysia was obtained in the online survey within the Movement Control Order (MCO) period and later extended to the Conditional MCO (May-August 2020).

2.2 Data collection

To carry out this study, a set of questionnaires using an online Google Form was structured with five main sections to assess the economic impacts and limitations faced by smallholders during the MCO. Section 1 describes the background of the respondents. Section 2 and 3 comprise the impacts of COVID-19 on crops and poultry/aquaculture while Section 3 also asks issues on logistics and transportations barriers that were faced by the respondents. The remaining Section 4 is a set of questions on the health and safety of respondents and their perceptions on COVID-19 while Section 5 provides information on financial issues and wages of the respondents before and during the pandemic. The questionnaires are based on the following details:

2.2.1 Section 1: respondents' background

Data and information such as gender, age, race, education level, cultivated area, monthly income, costs and profits.

2.2.2 Section 2: crops

In this section, the data is regarding the economic problems that were faced by the respondents in terms of quantity harvested, price expectation and ability to sell the crop.

2.2.3 Section 3: poultry, fisheries and aquaculture related

Section 3 consists of several questions which focus on the respondents' logistics and transportation such as type of transportations used, how often they commute to the workplace and duration to the workplace as well as the postharvest mechanism. Furthermore, this section asked respondents either they have to change to a new normal based on their logistics and transportation operation during COVID-19 pandemics.

2.2.4 Section 4: questions for all types of crops/ livestock/aquaculture

Section 4 provides data on the impacts on health faced by respondents, which will be based on their health and safety. This section consists of questions that relate to the fear of respondents against the Coronavirus outbreak and how their health and fear issues affect the harvest and profits.

2.2.5 Section 5: wages

Section 5 is related to respondents' wages and their household income. This section provides data about respondents' financial issues during COVID-19 pandemics.

2.3 Statistical analysis

2.3.1 Descriptive analysis

Descriptive analysis was used in this study to

summarise the respondents' demographic data, such as race, age, educational level, family member, experience and agricultural types. Additionally, it was also used to minimize the impacts of COVID-19 and the challenges faced by smallholding farmers during MCO.

2.3.2 Factor Analysis

Factor analysis is a series of approaches used to analyse how underlying constructs influence the responses to a variety of variables measured. By analysing the sequence of associations (or covariances) between the measurements found, factor analyses are conducted to further examine the impacts or influence of COVID-19 on various factors in agriculture including income, supply chain, logistics and others. Measures that are strongly correlated are likely to be impacted by the same influences (either positively or negatively), whereas those that are relatively uncorrelated are likely to be affected by different factors.

3. Results and discussion

3.1 Demographic profile of respondents

Table 1 shows the gender frequency distribution and percentage of respondents. The number of male respondents is 185 (85.3%) while the number of respondents is only 32 (14.7%). The number of male respondents contributes to a higher percentage in this study since they are more prominent and significant in agriculture as compared to females.

Table 1. Gender of respondents

	Frequency	Percent
Male	185	85.3
Female	32	14.7
Total	217	100

According to Figure 1, 26 respondents or 12% of the total subject are Indians, while about 27 or 12.4% of the respondents are Chinese, and majority of 150 people or 69.1% are ethnic Malays, while the remaining 14 people or 7% are from other ethnic groups. Based on Figure 2, a total of 62 respondents or 28.6% of the total subjects are in the suburbs, while 9 respondents or 4.1% are in urban areas, whereas 146 people or 67.3% consist of respondents from rural areas.

Table 2 shows a total of 217 responses obtained from every state in Malaysia within the MCO/CMCO period. The highest percentage comes from Sabah and Negeri Sembilan which hold the highest respondents with 23 respondents in both states (10.6%), followed by Pahang with 22 respondents (10.1%), Johor and Selangor (9.2%) respectively, Terengganu with 15 respondents (6.9%) while Sarawak and Perlis shared similar percentages of (6.5%). Less than 6% come from respondents who live

in Kelantan, Melaka, Kedah, Perak, Pulau Pinang, Wilayah Persekutuan, Wilayah Labuan and Putrajaya. The result shows that most respondents were from Sabah, Negeri Sembilan and Pahang in which the distribution depends variedly on the number of farms or agricultural activities in Malaysia.
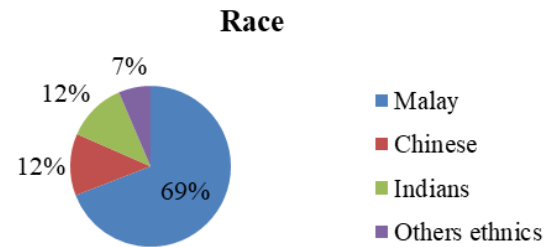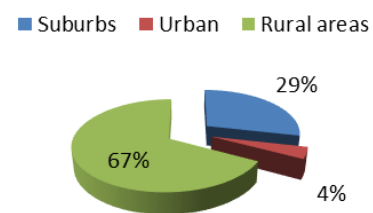

Figure 1. Race of respondents

Figure 2. Location of respondent's residence

The distribution of respondents based on their level of education is shown in Figure 3. Only 1 respondent complete a primary school, 34 respondents complete lower secondary education (PT3/PMR/SRP), 106 finish their higher secondary education (SPM), 18 respondents complete STPM/Pre-University/Matriculation/A-level while 58 respondents completed tertiary education including Certificate/Diploma (32 respondents), a Bachelor's Degree (19 respondents), a Master's Degree (5 respondents) and a Doctor of Philosophy Degree (2 respondents).
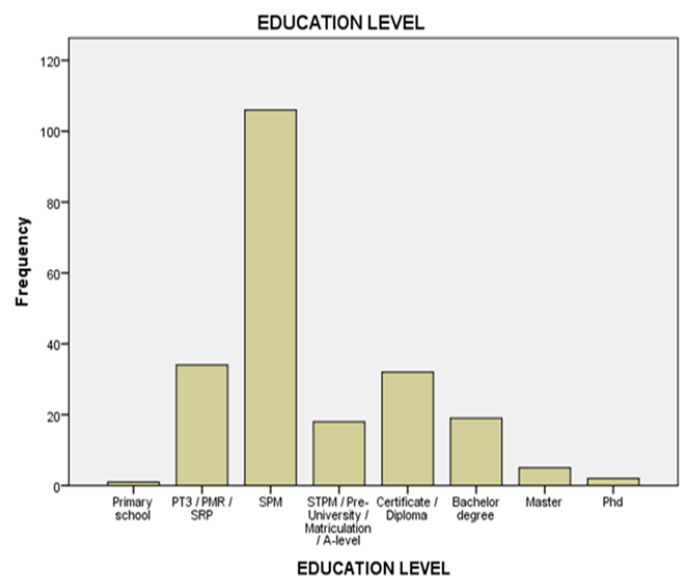

Figure 3. Education level

Table 2. States of the respondents

State	No of respondent	Percentage of respondents (%)
Johor	20	9.2
Kedah	10	4.6
Kelantan	13	6
Melaka	12	5.5
Negeri Sembilan	23	10.6
Pahang	22	10.1
Perak	9	4.1
Perlis	14	6.5
Pulau Pinang	8	3.7
Putrajaya	2	0.9
Sabah	23	10.6
Sarawak	14	6.5
Selangor	20	9.2
Terengganu	15	6.9
WP KL	6	2.8
WP Labuan	6	2.8
Total	217	100

Figure 4 shows the fields ventured by the respondents in the agricultural sector; in which the majority of respondents were involved in crops planting (147 respondents or 67.7%), followed by fisheries and aquaculture (45 respondents or 20.7%) and livestock (25 respondents or 11.5%).
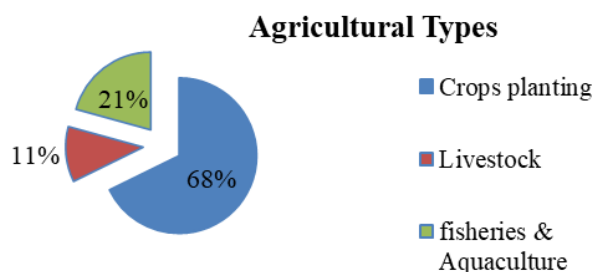

Figure 4. Types of agricultural activities

3.2 Impacts of COVID-19 on crop

According to studies, the method of movement restriction is seen as the best approach in controlling the spread of infectious diseases such as Coronavirus (Chinazzi *et al.,* 2020). As for the COVID-19 pandemic crisis, most countries have direct travel restrictions, social distances, and event delays for periods not less than 14 days. Emergency or quarantine orders carried out not only affect human behaviour and psychology such as depression, anxiety and stress (Irfan *et al.,* 2020) but also impact economic activities due to the closure of retail premises and disruption of product delivery chains and food (Karabag, 2020).

Based on Figure 5, the majority of the respondents (186 respondents or 80%) have responded and stated that COVID-19 gave an impact on agriculture, while the other 31 respondents have denied that statement. In rural Sabah for example, there is a report in the newspaper (The Borneo Post, 2020) stating that farmers in Kundasang have experienced more serious problems since the first day of MCO implementation on March 18, 2020, following the restriction of wholesale vegetables from outside the highlands to enter Kundasang. The problem was also shared by the Chairman of Kundasang Hawker Association, Mariana Taliban, where more than 300 upland vegetable traders in Kundasang suffered losses after the subsequent dumping of vegetables due to the implementation of MCO (Bernama, 2020).
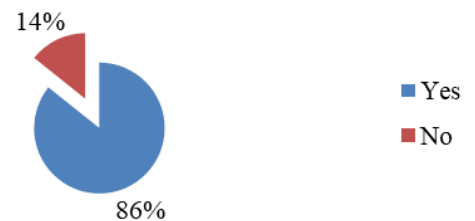

Figure 5. Impacts of COVID-19 on agriculture

Figure 6 shows the frequency of respondents' production based on 5 categories of productions. For RM0-1000, 28 respondents produce agricultural productions in April, while the average production categories consist of only 6 respondents. This can be stated that in the lowest production category, more respondents produce the production in April. For a category of more than RM4000, there are 7 responses from April production, while there are 14 responses for
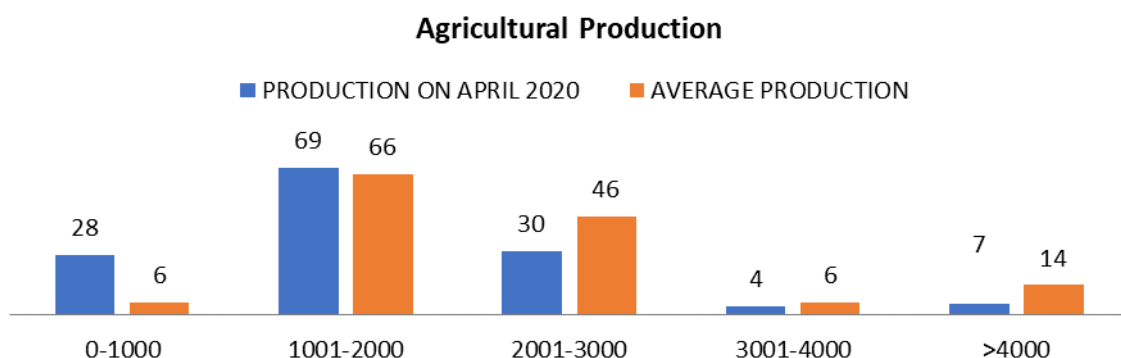

Figure 6. Agricultural production in April 2020 versus average production for months before MCO

average production. In the lowest category, April production shows the highest response. In contrast with the highest category, average production has the highest responses. As a conclusion from Figure 6, respondents get a higher production before MCO compared to in April when the government started to announce the closure of food and business premises.

Table 3 shows a dichotomy group tabulated at value 1; dichotomies refer to multiple variables with only 2 possible values that are 'yes' or 'no'. From a total of 568 responses, 81 respondents (14.3%) mostly stated that the most significant reason leads to less or low harvest were due to barriers to getting or reach to their farms on time, followed by 68 respondents (12%) who stated that crops were not ready to be harvested on that particular time. While some of them had to lease their landholdings during the MCO, which represented the least significant reason in which only 8 persons or (1.4%) had given such answer.

Table 3. Reason of less harvest

	N	Percentage (%)
Did not plant any crop during that time	43	7.6
Crops were not ready to be harvested	68	12
Weather	50	8.8
Pest	45	7.9
Higher labor cost	44	7.7
No labor	63	11.1
Low market price	56	9.9
Limited access for cash	68	12
Government did not allow	42	7.4
Lease my land	8	1.4
Did not reach the farm on time	81	14.3
Total	568	100

Based on Figure 7, a total of 138 respondents have responded about whether there is a yield decrease in April 2020. A total of 131 (95%) respondents have stated that there was a decrease in yield in April 2020 while the remaining 7 (5%) respondents stated there was no significant yield decrease in April 2020.

According to Dube and Kathende (2020), during the closure and social restraint order, not all sections of society can stay at home without doing any economic activities to generate income for their families. Most communities, especially those who depend on informal economics such as small businesses in the agricultural sector such as vegetables, fruits, or even household goods or trade, were unable to carry out their business activities during that period. In African countries, for example, almost 80% to 90% of the population works in informal economies. During the COVID-19 pandemic period, it was estimated that most countries in Africa lost output up to 79 billion during that period (Dube and
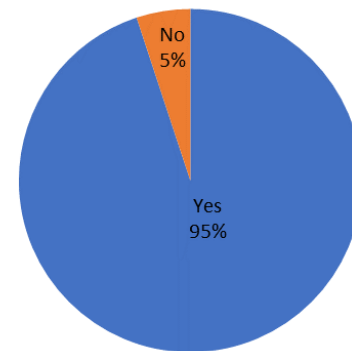
Kathende, 2020).

Yield decrease

Figure 7. Yield decrease

In Table 4, a dichotomy group has been used to explain why losses happen. From a total of 512 responses, a majority of farmers responded that they do not have storage facilities, which holds the highest responses of 106 (20.7%), followed by not having drying facilities that account for about 101 (19.7) responses. A total of 5 responses hold the lowest percentage with the statement that they do not suffer losses on that particular month or during the MCO.

Table 4. Reason of why losses happen

	N	Percentage (%)
Not suffer losses	5	1
No labor	83	16.2
Do not have machinery	33	6.4
Do not have vehicle	44	8.6
Do not have drying facilities	101	19.7
Do not have store facilities	106	20.7
Weather	71	13.9
Pests	69	13.5
Total	512	100

Even with the increase in cases of COVID-19 and decrease in yield, farmers still need to do agricultural work to cover their daily expenses as well. In addition, the respondents also responded that they had to continue to increase the supply of food in agriculture to cover the supply of national food or food security reason. Some of these reasons include:

"I grow rice because this is a source of basic crops that everyone eats".

"Vegetables are increasingly in high demand because an average person works at home during MCO and they save money by cooking only at home".

3.3 Impacts of COVID-19 on livestock/aquaculture

Based on Figure 8, 60 responses have responded to the difference in income between April 2020 and the previous months. The mean income in April 2020 was

RM1682.50 while the mean income for the previous months was RM1868.33. Income in April 2020 holds the higher responses for categories of income between RM0-RM1000 with 4 respondents, while there is no response for average income in the previous months' category. For an income level of >RM1500, there is 1 response for income from livestock/aquaculture in April 2020 while the average income from livestock/aquaculture in the previous months consists of 7 responses. From the figure above, it can be concluded that respondents gain higher income in the months before April 2020 than in April 2020 when the government started to implement MCO.
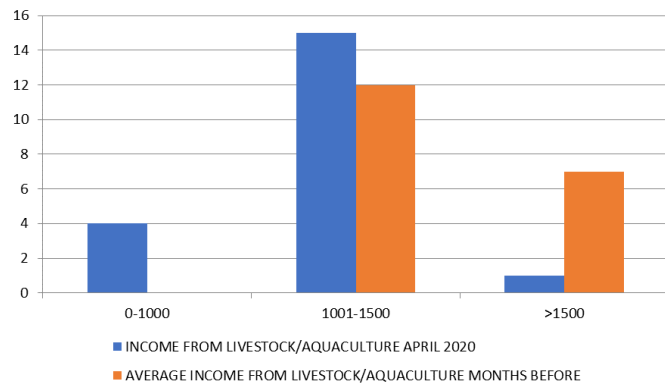

Figure 8. Income difference for livestock/aquaculture in April 2020 versus income for months before MCO

Based on Figure 9, there is a significant difference in the market prices in April 2020 and the months before April/MCO. With a total of 80 respondents, the mean for the market price was valued at RM9.98 during April 2020 while the mean market value before MCO was RM10.70. Note that the unit being used here is RM/kg. From this observation, it could be concluded that the average market price before MCO is higher than in April 2020. COVID-19 pandemics give an indirect impact on the market price of agricultural products, in which most of the livestock or agricultural products remain unsold due to restriction movement and there was an oversupply of fish or aquaculture in early April or the beginning of MCO.
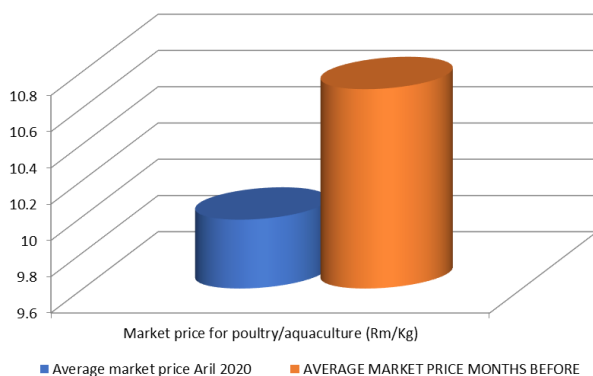

Figure 9. Market Price for livestock/aquaculture in April 2020 versus months before MCO

3.4 Impacts of COVID-19 on smallholders' income

Figure 10 shows the household income before and after COVID-19 movements control order. A total of 217 respondents have given their income information, which shows a slight difference before and after MCO. Before MCO, the mean value was RM7547.00, while the mean value after MCO was RM6483.87. It can be seen that the average income of farmers has decreased during the MCO order. Based on Figure 10, the household income for respondents is categorized into 5 categories. For RM0-RM2000 household income, there are 20 responses for April 2020, while those with an average income in the months before MCO consist of only 5 respondents. As for the >RM10000 category, there are 27 responses for April 2020 and 50 responses for average household income before MCO. From Figure 10, it can be stated that there is a significant decrease in respondents' household income during the MCO.
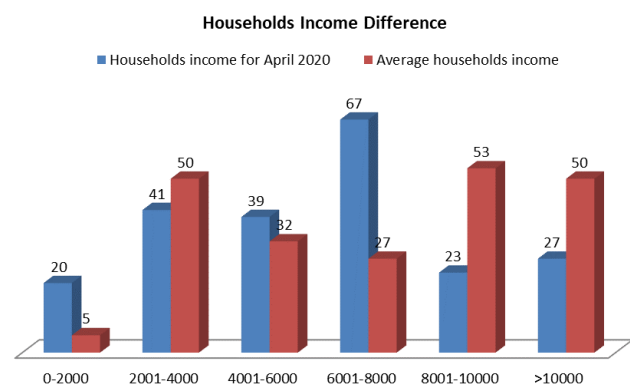

Figure 10. Households' income before and after MCO

3.5 Factor analysis

The Kaiser-Meyer-Olkin (KMO) and Bartlett's Test played a significant role in the suitability of the study. According to Kaiser (1974), the absolute minimum is 0.5 and the value between 0.5 and 0.7 is acceptable, the value between 0.7 and 0.8 is better, the value between 0.8 and 0.9 is fantastic and the value between 0.9 and beyond is outstanding (Hutcheson and Nick, 1999). Meanwhile, Bartlett's sphericity test checked the theory that the correlation matrix was an identity matrix, suggesting that the variables were unrelated and thus unsuitable for structural identification (IBM, 2019). The significant value of less than 0.05 suggests that these results do not generate an identity matrix and are thus roughly regular multivariate and suitable for further analysis (Field, 2000; Pallant, 2013). In this analysis, the KMO value was 0.528, which defined that the data are suitable for factor analysis (Table 5). While the Bartlett test value was significant, with a value of 0.000.

The results in Table 6 show the factor loadings of items for 5 factors. The five factors are income, price uncertainty, logistics and supply chain, types of

Table 5. KMO and Bartlett's Test

KMO and Bartlett's Test		
KMO Measure of Sampling Adequacy.		0.528
Bartlett's Test of Sphericity	Approx. Chi-Square	442.075
	df	55
	Sig.	0

marketing channel, and other marketing issues. However, significant increases in the alpha value for the scale have been achieved by eliminating some items. All factors fall in the acceptable range of 0.5. Cronbach's alpha score shows a good correlation among the items which also explains cumulative variances in the data.

Specifically, Table 6 indicates that the highest factor loading value for the first factor (income) is 0.891 which is 'COVID-19 affects my income', followed by 'COVID-19 causes household food supply to be reduced or affected' with a factor loading of 0.867 while the lowest value is –0.610 which is 'COVID-19 causes conflict in decision making between entrepreneurs/breeders/stakeholders' entrepreneurs/breeders/stakeholders. Based on the results, it is observed that the COVID-19 pandemics affect the agriculture smallholders' income and their agricultural activities. According to Tamru et al. (2020), farmers suffer income losses and reduce production due to overstocked products. Additionally, a shortage of important inputs also leads to less income.

The second factor was labelled as 'price uncertainty'. The factor was extracted by three items. The factor loading of items was acceptable where all items were greater than 0.6. All the items were acceptable since they fall in the acceptable range. The items included for the price uncertainty factor were; 'COVID-19 caused the market price to be uncertain', 'COVID-19 made me afraid of getting sick and unable to work' and 'COVID-19 caused me to sell my sales

online'. During MCO/CMCO, most respondents faced the uncertainty of prices due to abrupt changes in supply and demand. Due to this reason, the respondents also answered that they had to switch to online marketing due to the restrictions in movement and uncertain demand for physical selling.

The third factor was labelled as 'logistics and supply chain'. The logistics and marketing factor was extracted by two items. The factor loading of items was acceptable with two items greater than 0.8 and they fall in the acceptable range. The items included for this factor were 'COVID-19 affects marketing activities' and 'COVID-19 caused logistical and transportation difficulties'. According to Mingzhe and Zhong (2020), the marketing quantity of most agricultural products in China has dropped devastatingly. The closing of traditional commercial sales outlets resulted in consumers struggling to make purchases. On the other side, the supply chain was broken because of logistics constraints.

The fourth factor was labelled as 'types of marketing channel'. The type of marketing channel factor was extracted by two items as well. The factor loading of items was acceptable with two items greater than 0.6. The items included for this factor were 'I relied on middlemen' and 'I made my own call to the customer'. Since most agricultural farmers did not own transportation, they mostly relied on middlemen to transport and distribute all agricultural produce to the distribution centre, processing or mills, or supermarkets. Their dependency on middlemen was significantly higher during the restrictions of MCO. In extreme cases, rural roads were totally impassable and the smallholders were not able to market their products, which in turn led to great losses. Alternatively, some respondents had to make their own efforts to directly reach the consumers by calling their regular customers to take orders or to confirm the purchases.

Table 6. Factor loading

	Rotated Component Matrix[a]				
	Component				
	1	2	3	4	5
COVID-19 affects my income	0.891				
COVID-19 causes household food supply to be reduced or affected	0.867				
COVID-19 caused the market price to be uncertain		0.823			
COVID-19 made me afraid of getting sick and unable to work		0.738			
COVID-19 caused me to sell my sales or supply online		0.64			
COVID-19 affected marketing activities			0.889		
COVID-19 caused logistical and transportation difficulties			0.845		
I made my own call to the customer				0.881	
I relied on middlemen	-0.303			0.609	
COVID-19 affected crop and aquaculture revenue					0.821
COVID-19 caused conflict in decision making between entrepreneurs/					-0.61

The fifth factor is labelled as the 'other marketing issues'. The type of other marketing issues factor was extracted by two items as well. The items included for this factor were 'COVID-19 has affected crop and aquaculture revenue' and 'COVID-19 causes conflict in decision making between entrepreneurs/breeders/ stakeholders'. The decrease in sales due to the pandemic was the biggest problem for many smallholders. For aquaculture and livestock, for example, the pandemic has caused the reduction in importations and distribution of fish or feed, as well as aquaculture products due to the international and domestic travel and transport restrictions and lockdowns (FAO, 2020). Although aquaculture and other agricultural activities such as crops are listed as essential services under the food security sector, working/opening hours and demand from customers were limited by the curfew/confinement (FAO, 2020). Other findings made by Dao (2020) indicated that domestic demand for luxury seafood dropped and markets collapsed for shrimp and many other aquaculture products in Vietnam. Additionally, our result also reveals that some respondents also raised an issue related to decision making which has a severe negative impact on agriculture activities and revenues since MCO has restricted their abilities to communicate effectively and to make decisions promptly. Most agricultural products are perishable and have a short shelf-life. Therefore, communication barriers may inhibit their decisions on logistics, marketing and distribution effectively.

4. Conclusion

During the COVID-19 pandemic, food demand and agricultural supply chain system have been severely compromised due to movement restrictions, reduced purchasing power and income, and further impact on the most vulnerable small-scale farmers and associated community. Agricultural supplies have been disrupted through the closure of local markets and restaurants, combined with the limited capacity of farmers to store harvested crops that have led to wastage and spoilage of perishables. Additionally, most of harvesting activities were delayed due to local labour shortages as a result of local and international border restrictions. The study revealed that a majority of respondents experienced a reduction in yield during the COVID-19 pandemic. Fewer profits are made by the agricultural smallholders due to limited harvesting activities, restricted movement and transportation, fewer working or opening hours, limited input supplies, low demand from customers, higher production cost and low market price as a result of MCO. However, the issues discussed above pose challenges not only on the yields of the smallholders but also on how to improve value chains, logistics and

storage and mitigate blockages to supply chains. An integrated approach that works with all stakeholders including local, private and international commitments (such as the Sustainable Development Goals) would enable the country to efficiently deliver on the current commitments. In response to enhance resilience to unanticipated shocks, the relevant government agencies associated with agriculture and food production may facilitate the construction of public service platforms for agricultural products that provide the prompt flow of information among agents involved in food chains.

Conflict of interest

The authors declare no conflict of interest.

References

Abdul Fatah, F and Cramon-Taubadel, S.V. (2017). Profitability and Competitiveness of Rice Farming in Malaysia: A Policy Analysis Matrix. *Asian Journal of Agriculture and Development,* 14(1362-2017-3060), 31-48.

Albastroiu, I. and Felea, M. (2013). Defining the concept of SCM and its relevance to Romanian academics and practitioners. *Amfiteatru Economic*, 15, 74-88.

Bernama (2020). Sabah urged to resolve vegetable dumping in Kundasang during MCO. Retrieved on 12 July 2020 from Bernama website: https://www.bernama.com/en/general/news_covid-19.php?id=1828902

Chinazzi, M., Davis, J.T., Ajelli, M., Gioannini, C., Litvinova, M., Merler, S., Pastore Y Piontti, A., Mu, K., Rossi, L., Sun, K., Viboud, C., Xiong, X., Yu, H., Halloran, M. E., Longini, I.M., Jr. and Vespignani, A. (2020). The effect of travel restrictions on the spread of the 2019 novel coronavirus (COVID-19) outbreak. *Science*, 368 (6489), 395–400. https://doi.org/10.1126/science.aba9757

Dao, T. (2020). Coronavirus outbreak to hit Vietnam's Pangasius, shrimp exports in short-term. Retrieved on February 5 (2020) from Seafood Source Website: https://www.seafoodsource.com/news/supply-trade/coronavirus-outbreak-to-hit-vietnam-s-pangasius-shrimp-exports-in-short-term

Dörnyei, Z. (2007). Research methods in applied linguistics. New York, USA: Oxford University Press.

DOSM (Department of Statistics Malaysia). (2020a). Malaysia Economic Statistics Review. Vol2. 2020. Retrieved on January 4, 2020 from DOSM Website: www.dosm.gov.my/v1/uploads/files/1_Articles_By_Themes/External_Sector/

MESR/Malaysia_Economic_Statistics_Review-Vol22020.pdf

DOSM (Department of Statistics Malaysia). (2020b). Report of Special Survey on Effects of Covid-19 On Economy and Individual - Round 1. Retrieved on January 4, 2020 from DOSM website: https://www.dosm.gov.my/v1/index.php?r=column/coneandmenu_id=d3pnMXZ4ZHJjUnpnYjNyUnJhek83dz09

DOSM (Department of Statistics Malaysia). (2020c). Labour Force Survey Report 2019, Putrajaya: Department of Statistics Malaysia. Retrieved on January 4, 2020 from DOSM Website: https://www.dosm.gov.my/v1/index.php?r=column/cthemeByCat&cat=126&bul_id=dTF2dkJpcUFYUWRrczhqUHVpcDRGQT09&menu_id=Tm8zcnRjdVRNWWlpWjRlbmtlaDk1UT09

Dube, K. and Kathende, C.N. (2020). An inclusive response to COVID-19 for Africa's informal workers. Africa Can End Poverty in World Bank Blogs. Retrieved on February 2, 2020 from World bank website: www.blogs.worldbank.org/africacan/inclusive-response-COVID-19-africas-informal-workers

FAO. (2020). COVID-19 and the risk to food supply chains: How to respond? Retrieved on January 10, 2020 from FAO Website: http://www.fao.org/3/ca8388en/CA8388EN.pdf

Field, A. (2000). Discovering Statistics using SPSS for Windows. USA: Sage Publications Ltd.

Gile, K.J. and Handcock, M.S. (2010). Respondent-driven sampling: An assessment of current methodology. *Sociological Methodology*, 40(1), 285–327. https://doi.org/10.1111/j.1467-9531.2010.01223.x

Hutcheson, G. and Nick, S. (1999). The Multivariate Social Scientist: Introductory Statistics Using Generalized Linear Models. Thousand Oaks, California, USA: Sage Publications. https://doi.org/10.4135/9780857028075

IBM. (2019). KMO and Bartlett's Test. SPSS Statistics. Retrieved on February 2, 2020 from IBM Website: www.ibm.com/support/knowledgecenter/SSLVMB_23.0.0/spss/tutorials/factoranalysis_table.html

Irfan, M., Faizah S., Vincent, J.H., Waqar, A. and Rosmaiza, A.G. (2020). The psychological impact of coronavirus on university students and its socio-economic determinants in Malaysia. medRxiv, 2020, 20220723. https://doi.org/10.1101/2020.10.27.20220723

Kaiser, H.F. (1974) An index of factorial simplicity. *Psychometrika*, 39(1), 31-36. https://doi.org/10.1007/BF02291575

Kaliszewski, A., Kozłowski, A., Dąbrowski, J. and Klimek, H. (2020). Survey data on global shipping lines assessing factors of container port competitiveness. *Data in Brief*, 30, 105444. https://doi.org/10.1016/j.dib.2020.105444

Karabag, S.F. (2020). An unprecedented global crisis! the global, regional, national, political, economic and commercial impact of the coronavirus pandemic. *Journal of Applied Economics and Business Research*, 10 (1), 1-6.

Mingzhe, P. and Zhong, Y. (2020). Rising concerns over agricultural production as COVID-19 spreads: Lessons from China. *Global Food Security*, 26, 100409. https://doi.org/10.1016/j.gfs.2020.100409

Pallant, J. (2013). SPSS Survival Manual. A step by step guide to data analysis using SPSS, 4th ed. United KingdomL Routledge.

Stephens, E.C., Martin, G., van Wijk, M., Timsina, J. and Snow, V. (2020). Editorial: Impacts of COVID-19 on agricultural and food systems worldwide and on progress to the sustainable development goals. *Agricultural Systems*, 183, 102873. https://doi.org/10.1016/j.agsy.2020.102873

Tamru, S., Hirvonenen K. and Minton, B. (2020). Impacts of the COVID-19 crisis on vegetable value chains in Ethiopia. Washington DC. Retrieved on January 4, 2020 from IFPRI website: https://www.ifpri.org/blog/impacts-covid-19-crisis-vegetable-value-chains-ethiopia https://doi.org/10.2499/p15738coll2.133762_18

The Borneo Post. (2020). Kundasang Farmers Overcome MCO Challenges. May 29, 2020, Friday. Retrieved on January 4, 2020 from The Borneo Post Website: www.theborneopost.com/2020/05/29/kundasang-farmers-overcome-mco-challenges/

The Star. (2020). Lower Palm Oil Exports and Prices Expected. Wednesday, 25 Mar 2020. Retrieved on January 4, 2020 from The Star website: www.thestar.com.my/business/business-news/2020/03/25/lower-palm-oil-exports-and-prices-expected

UN. (2015). Envision2030: 17 Goals to Transform the World for Persons with Disabilities. Retrieved on January 16, 2020 from UN website: https://www.un.org/development/desa/disabilities/envision2030.html