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Impacts of Novel Corona Pneumonia 2019-nCov (Covid-19) On North East Farmers of Botswana and Mitigation Strategies

Gagopale Bosekeng[1], Lambani Chabo Bosekeng[2] and Moagisi Innocent Ithuteng[3]

[1]Department of Agricultural Research, Horticulture Program, P.O. Box 10275 Francistown, Botswana
[2]Department of Agricultural Research, Cereal Improvement Program. P.O. Box 10275 Francistown, Botswana
[3]Department of Agricultural Research, Biometrics Section. Private Bag 0033, Gaborone, Botswana

Correspondence Author: Gagopale Bosekeng, Department of Agricultural Research, Horticulture Program, P.O. Box 10275 Francistown, Botswana
E-mail address: rotlheboseg5@gmail.com

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ABSTRACT

The whole world is in great shock due to The Novel Corona pneumonia 2019-nCOV (COVID-19) which was first reported in Wuhan, China in December 2019, and spontaneously spread to all continents. Due to its quick spread, it was declared a pandemic by World Health Organization in February 2020. The economic effects of COVID-19 were first manifested in governments, and non-government sectors then rippled outwards to business communities, demanding urgent actions for containment. The first option for containing this pandemic was movement restrictions, shutting down of non-essential services and extreme social distancing. It is expected that these measures will have adverse effects on food production activities and marketing. Therefore, the objective of this study was to assess the impacts of this pandemic on farmers and the mitigation strategies in the north east district of Botswana. A proportionate stratified random sampling was used in this study. A total of 148 farmers was sampled for the survey, of which 96 were from rain-fed and 52 from horticulture. A full structured questionnaire was used to collect data. Movement restrictions had a significant impact ($p < 0.012$) on farm operations such as controlling pests and harvesting on time. Rain-fed respondents (70.8%) and 84.6% of horticulture farmers were expected to get a travel permit to their fields, on which some days they would not get it due to daily restricted numbers. National lockdown resulted in 68.2% of the respondents pausing production and 78.6% losing their crops due to pest damage while some crops were too ripe to be sold. The restrictions on movement also affected distribution, market and prices of agricultural produce. The use of mobile phones, adhering to COVID-19 protocols and absorption of farmer's produce by the government, helped some farmers in continued production and sales. The adverse impacts of COVID-19 on agricultural production can be minimized by waiving movement restriction on farmers.

Keywords: COVID-19, pandemic, lockdown, mitigations, rain-fed, horticulture.

INTRODUCTION

Throughout human history, there have been outbreaks of pandemics. Pandemics can be caused by a wide variety of infectious agents and can unexpectedly leave the countries at dispersing. Often such pandemics are devastating and takes the countries as well as international communities by surprise. Global pandemics like Ebola, Severe Acute Respiratory Syndrome (SARS), Middle East Respiratory Syndrome (Mers) and HIV/AIDS severely threatened human lives, food, and nutrients security. Recently, the Novel Corona pneumonia 2019-nCOV (COVID-19) outbreak that was first reported in Wuhan, in Hubei, Province of China, quickly spread to all continents, causing more than 294 046 deaths worldwide, including one death in Botswana in the space of five months (World Health Organization, 2020). In February 2020, World Health Organization declared COVID-19 a pandemic and like other pandemics, it has created severe economic impacts across the universe. It is expected that the pandemic will have adverse effects on food production and marketing (Seleiman et al., 2020).

The economic effects of COVID-19 were first manifest in governments and non-government sectors, then rippled outwards to business communities, demanding urgent actions for containment. Imposing restrictions on human movements has effectively contained pandemics (Espinoza et al., 2020). But this remedy can exert enormous pressure and diversion of resources if long durations are needed to deal with the pandemic, particularly if it is coupled with fatalities. Enormous fatalities characterize COVID-19; it rapidly invaded the universe without even sparing the lives of valuable personnel such as the front line workers. This led to fundamental unprecedented control measures such as the shutdown of non-essential services, restriction of movements and extreme social distancing (quarantine) to prevent contagion (Siche, 2020). Though the COVID-19 pandemic is primarily a public health crisis, experts are concerned that the virus could have a much broader impact on the economy, leading to socio-economic disruptions and increase the risk of disruption in the global food trade system.

Since COVID-19 outbreak created some unprecedented situations, governments, including Botswana, swung into action. Botswana declared 28 days of lockdown (movement restrictions), shutting down non-essential services coupled with extreme social distancing, which commenced on 02 April 2020 till 28 April 2020 in the initial phase, and was subsequently extended to end by 20 May 2020 for achieving satisfactory containment of the disease. Unfortunately, these actions geared toward winning an invisible war in the health sector coincided with an autumn season in Botswana when agriculture activities of rain-fed and irrigated (horticulture) farming were at their peak. During a pandemic, the agricultural sector should strive more not to suffer hunger or malnutrition. The link between agriculture and health are bidirectional: agriculture influences health and health influences agriculture (Kwadwo et al., 2010). In irrigated farming, other than harvesting, seeding and transplanting for winter vegetables take place in autumn. Thus, a significant loss of production, particularly at the harvesting phase, can be encountered if labour is lost due to deaths or restrictions aiming to contain the virus. Lockdown due to pandemics can severely disrupt the agricultural sector (Jάmbor et al., 2020) if situations are not addressed adequately and appropriately. As the ongoing lockdown coincides with the harvest and other critical farm activities across the country, farmers had hope in the Government to ensure uninterrupted day-to-day field activities and, most importantly, harvest their crops. Therefore, the focus of this study was to evaluate the impact of COVID-19 on North East farmers of Botswana and the mitigation strategies implored.

MATERIALS AND METHODS

Site Description

The study was undertaken in the North-East District of Botswana. North-East District borders the southern part of Zimbabwe in the north and east sides while in the south and west, it borders the Central District of Botswana. The district is about 915 m above sea level. The district had 3330 landholdings for rain-fed (Statistics Botswana, 2015) and 80 holdings for horticulture farmers (Ministry of Agricultural Development and Food Security, 2016).

Sampling method

A proportionate stratified random sampling was used in this study. Farmers were stratified into two levels according to the farming types (i.e. rain-fed and horticulture). From these types, the respondents were then randomly selected such that the sample size of each stratum is proportional to the population size of the stratum when viewed against the entire population. This means that each stratum had its own sampling fraction. This provides 148 farmers households for the survey, of which 96 were from rain-fed and 52 from horticulture. The sampling frame list was constructed with the help of agricultural extension officers in the district. Farmers were interviewed individually. The researchers and technicians were responsible for the administration of the questionnaire.

Data collection

A questionnaire was used to collect data related to socio-economic characteristics (gender, age, farm size, education and farming experience), movement restrictions, production factors, market and information access for both rain-fed and horticulture farmers in the district. The questionnaire consisted of both closed and open-ended questions. The questionnaire was pre-tested with the farmers in Mapoka village in the North East District thereafter, refined and appropriate corrections were effected to avoid biasness and maintain the confidentiality of respondents.

Data Analysis

The collected data was analyzed using Statistical Package for Social Sciences (SPSS) Packages Version 23. Descriptive statistics analysis was performed and presented in tabular and graphic forms. Analysis of variance (ANOVA) using TUKEY test was used for comparison of means. *P*- value was considered statistically significant at < 0.05.

RESULTS AND DISCUSSIONS

Demographic of the study

Gender, education, age, and the experience characteristics in farming influence how people are affected by different conditions and how they respond to such conditions (Akinyemi, 2017). The socio-economic factors of respondents were looked into (Table 1) to see and understand how they were affected by the COVID-19 outbreak and the national lockdown.

Table 1: Socio-economic characteristics of households in the study area

No	Variable	Rain-fed frequency (*n = 96*)	Horticulture frequency (*n = 52*)
1	Gender		
	Male	33 (34.4%)	42 (80.8%)
	Female	63 (65.6%)	10 (19.2%)
2	Age		
	Youth	2 (2.1%)	18 (34.6%)
	Adults	94 (97.9%)	34 (65.4%)
3	Farming experience		
	Starters (1 – 5 years)	13 (13.5%)	24 (46.2%)
	Middle (6 – 15 years)	23 (24.0%)	23 (44.2%)
	Seasoned (> 16 years)	60 (62.5%)	5 (9.6%)
4	Household head		
	Yes	78 (81.3%)	47 (90.4%)
	No	18 (18.8%)	5 (9.6%)
5	Education		
	None	10 (10.4%)	0 (0%)
	Primary	50 (52.1%)	3 (5.8%)
	Junior secondary	19 (19.8%)	9 (17.3%)
	Senior secondary	9 (9.4%)	10 (19.2%)
	Tertiary	8 (8.3%)	30 (57.7%)
6	Hactrage (ha)		
	1 – 3 (small)	38 (39.6%)	36 (69.2%)
	4 – 6 (medium)	46 (47.9%)	9 (17.3%)
	> 7 (large)	12 (12.5%)	4 (7.7%)

According to Hall (2020), the nature of implications for food security and livelihood resilience will be defined by how the countries react to the challenges. When considering farming experience, rain-fed farming had more seasoned farmers (with more than 16 years in farming), probably they started farming at a young age with their parents. In horticulture, the majority of the respondents were starters (1 to 5 years in farming). This might be because horticulture has been introduced in Botswana post-independence and it is a business sub-sector by nature, which seems to be a challenge to many people. It was noted with concern that only a few farmers had large hectarage (> 7 ha). It was evident from the sample data that most of the horticulture farmers are retirees, as 65.4% of the respondents were adults. In horticultural farming, 53.8% of farmers attained tertiary education. The same observation was also noted by Bosekeng (2020) in his study on constraints of horticultural farmers in the northeast district of Botswana.

Although farming is the major source of living, the respondents highlighted that they have other sources of income (Figure 1).

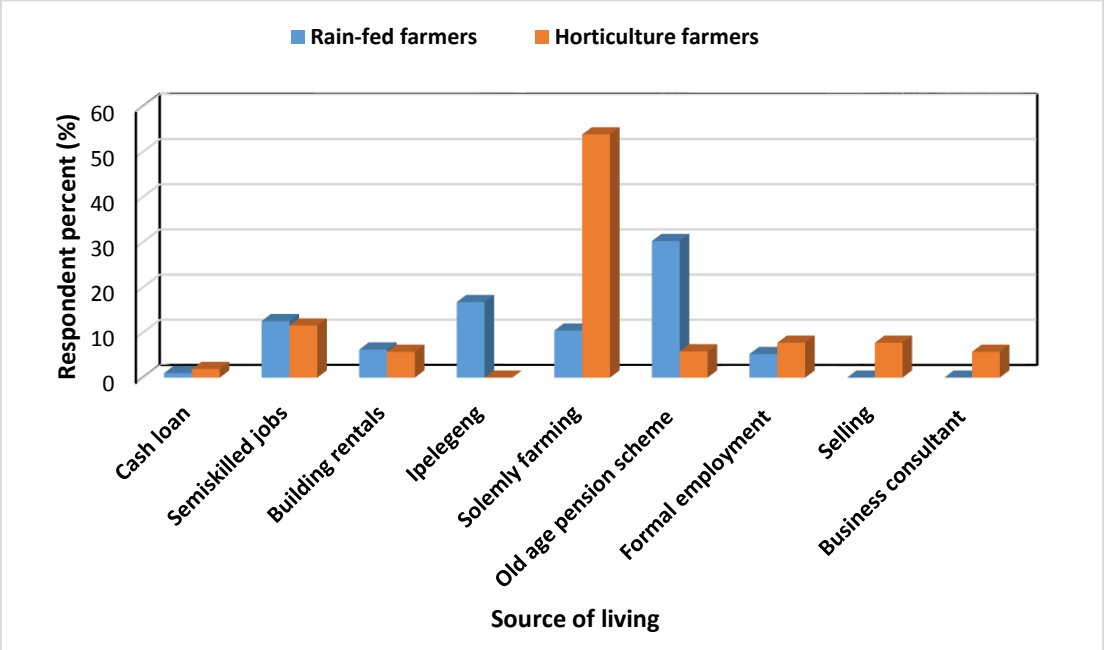

Figure 1: Source of living for the respondents

Table 2 below showed the top five crops in the fields when the national lockdown was declared. When the lockdown was declared, it was found out that 68.8% of the crops under rain-fed were at the fruiting stage, while in horticulture, most of the crops were at the harvesting stage (88.5%).

Table 2: The top five crops are grown during the declaration of the national lockdown

Rain-fed crops	%	Horticulture crops	%
Sorghum (*Sorghum bicolor* (L.) Moench)	83.3	Tomatoes (*Lycopersicon lycopersicum* Miller)	61.5
Cowpea (*Vigna unguiculata* (L.) Walp.)	78.1	Rape (*Brassica napus* L.)	57.7
Watermelon (*Citrullus lanatus* (Thunb.) Matsum.)	72.2	Green mealies (*Zea mays* L.)	51.9
Maize (*Zea mays* L.)	74.0	Cabbage (*Brassica oleracea* L.)	50.0
Millet (*Pennisetum glaucum* (L.) R. Br.)	74.0	Sweet pepper (*Capsicum annuum* L.)	44.2

Impact of COVID-19 on production activities

Movement restrictions had a significant impact ($p < 0.012$) on harvesting and pest or disease control as 70.8% of rain-fed respondents and 84.6% of horticulture farmers were expected to get a travel permit before going to their fields. Results revealed that there was a significant difference ($p < 0.001$, $value= 15.069^{a}$) in the way respondents perceived denied permits concerning crop loss, especially the rain-fed farmers, when subjecting the means to Chi-Square test. The protective measures imposed by countries to contain the spread of COVID-19, such as social distancing, travel ban and self-isolation upon contact with suspected persons have pronounced implications for perishable goods such as vegetables as they cannot be kept longer in houses (Nicola et al., 2020). The survey findings established that the national lockdown caused farming activities to be paused as 68.2% of the respondents paused production. This led to an average of 78.6% of the farmers losing their crops.

A country report by Agricultural Policy Research in Africa (2020a) indicated that in Zimbabwe, about 58.0% of the respondents reported that farming activities were negatively affected by the COVID-19 crisis. The absence of workers due to movement restrictions has significantly contributed to crop loss ($p<0.016$) as farmers depended mostly on casual/temporary workers for farm activities, hence these labourers were within their homes, causing field activities such as weeding, bird scaring, and harvesting to suffer, hence crop loss. The same findings were reported by Forsido et al. (2020), who noted that one of the effects of COVID-19 in agriculture is a shortage of labour due to restriction of movements to contain the pandemic, therefore impacting food production. Poudel et al. (2020) as well indicated in his findings that travel ban or movement restrictions have led to a shortage of seasonal or informal farmworkers. In addition, containment measures have affected labour mobility since workers stayed home (Hashem et al., 2020; International Labour Organization, 2020). For this study, when asked how activities were managed, the respondents indicated that they were visiting the fields regularly with a permit but would arrive at the areas late on some days due to delays in getting permits.

The process of issuing permits was prolonged as the farmers had to que in the same line with non-essential members of the public. The travel permits were issued on first-come, first serve basis with a daily limit of about 20 people per area (particularly the first two weeks). The delays in getting permits led to significant crop loss ($p<0.002$).

Impact of COVID-19 on distribution and market of agricultural produce

The restrictions on travel/movement permits which was a serious concern, affected distribution and marketing of agricultural produce significantly ($p<0.022$). Farmers highlighted that their usual market places (vendors and roadside stalls) were white elephants since people were not allowed to go out of their homes and as a result, they lost their customers. This agrees with Poudel et al. (2020), who highlighted that COVID-19 has affected the processes that connect farm production to the final consumer. Marketing opportunities such as local markets, schools, and restaurants have been minimized by the pandemic (Hashem et al., 2020). This study further indicates that market prices, particularly for horticultural produce during the pandemic, were escalated as the demand was high and the supply was restricted.

This supports Akter (2020) findings who reported an increase in food prices in European countries due to stay-at-home restrictions in combating COVID-19. Though the distribution of farm produce and market were affected during the pandemic, government's intervention in absorbing (buying) farm produce for use as a food relief package for the disadvantaged population cushioned 5.2% of the rain-fed farmers 67.3% of horticulture farmers on their sales. Probably most of the rain-fed farmers produce is usually absorbed by schools. Hence schools were shut down due to the lockdown, therefore affecting the sales. It was also noted that movement restrictions during COVID-19 affected monetary turnover for both rain-fed and horticulture farmers (Table 3 & 4). The decline of monitory turnover was observed on rain-fed farmers who normally get between $ 1911.83 (US dollars) and $ 5462.36 per annum as well as horticultural farmers who usually get income ranging between $ 3732.61 to $ 5462.36 and above $ 9103.94 per annum. This perhaps might be due to the absorption of farmers produced by the government (it should be noted that the government was buying at a standardized price and quantity) and the privilege of staying in the farms or not being affected by movement restrictions on some farmers. The findings agree with Meuwissen et al. (2019) who stated that farming systems face a wide range of challenges, including economic, environmental, and institutionally.

Table 3: Monetary turnover of rain-fed farmers during a normal year (before COVID-19) and during COVID-19 year

Monetary turnover ($)	Respondents number during a normal year (*n = 96)*	Respondents during a normal year (%)	Respondents number during Covid-19 (*n = 96*)	Respondents during Covid-19 (%)
0 (no sale)	3	3.1	15	15.6
9.10 – 1820.79	74	77.1	76	79.2
1911.83 – 3641.58	15	15.6	3	3.1
3732.61 – 5462.36	3	3.1	1	1.0
5553.40 – 7283.15	0	0.0	0	0.0
7374.19 – 9103.94	0	0.0	0	0.0
> 9103.94	1	1.0	1	1.0

Table 4: Monetary turnover of horticulture farmers during a normal year (before COVID-19) and during COVID-19 year

Monetary turnover ($)	Respondents number during a normal year (*n = 52*)	Respondents during a normal year (%)	Respondents number during Covid-19 (*n = 52*)	Respondents during Covid-19 year (%)
0 (No Sale)	5	9.6	5	9.6
0.91 – 1820.79	7	13.5	14	26.9
1911.83 – 3641.58	3	5.8	6	11.5
3732.61 – 5462.36	7	13.5	1	1.9
5553.40 – 7283.15	2	3.8	3	5.8
7374.19 – 9103.94	2	3.8	4	7.7
> 9103.94	26	50.0	19	36.5

Rain-fed farmers rated the response of agricultural experts to be excellent, very good, and good by 8.3%, 14.6%, and 26.0%, respectively, while horticultural farmers indicated that agricultural exports were 19.2% excellent, which was at par with a very good rating and 28.8% of them found the response to be good (Table 5). The scarcity of extension services was also reported by Agricultural Policy Research in Africa (2020b) in Malawi during the COVID-19 calamity. However, this study's ratings are lower than the 70.0% reported by Agricultural Policy Research in Africa (2020a) and 43.0 - 58.0% reported by Agricultural Policy Research in Africa (2020c). Rain-fed farmers (37.5%) and horticultural farmers (25.0%) are of the view that a dispensation of special movement could improve the rating permits to agricultural experts during lockdowns (more so than the first two weeks of the lockdown was very strict, with no action). The lower percentage of rain-fed farmers (7.3%) linked the lower ratings of experts with the lack of local specialists in their area compared with 50.0% of horticultural farmers.

Table 5: Rating on the response of agricultural experts during national lockdown by the respondents

Rating on agricultural experts by farmers	Rain-fed farmers (%)	Horticulture farmers (%)
Excellent	8.3	19.2
Very good	14.6	19.2
Good	26.0	28.8
Average	3.1	19.2
Poor	18.8	7.7
Extremely Poor	5.2	1.9
Unrated	24.0	3.8
Totals	100.0	100.0

The study further reveals that during the lockdown, farmers relied on the local radio stations, local television stations and other forms of media by 69.0%, 61.0%, and 9.0%, respectively for any information regarding the pandemic. Fewer numbers of rain-fed farmers (21.9%) were utilizing social media compared with horticultural farmers (63.5%). Moreover, fewer rain-fed farmers (2.1%) than horticultural farmers (60.0%) are in the WhatsApp group of farmers, which was beneficial for marketing their produce as 58.0% of horticultural farmers stated that the WhatsApp group was reliable during the lockdown. This is probably because most of the rain-fed farmers are adults who do not own mobile phones (smartphones) compared with the horticultural farmers whose number has gone up to tertiary education and are in use of smartphones. These findings agree with Chhachhar et al. (2014) who reported that the farmers whose education was high were interested in using their phones in search of information relating to agriculture. However, farmers have been urged to register their surplus produce with the local extension officer for it to be bought by the Local Government as part of the food hampers programme for the disadvantaged people during the pandemic as mentioned earlier on under distribution and market of agricultural produce. Rain-fed farmers (48.8%) preferred the use of a public announcement system (PA) compared with 15.4% of horticultural farmers. Most farmers (62.0%) suggested that local radio stations be the key sources of information if they could be a pandemic of this calibre in the future, while 60.9% of farmers preferred local television stations. More horticultural farmers (63.6%) recommended using social media in future pandemics

compared with 10.4% of rain-fed farmers. Regarding the utilization of PA systems in the future, 51.0% of rain-fed farmers were conversant with it, while it was only valued by 28.0% of horticultural farmers.

In assisting the government to combat the pandemic, 78.0% of respondents indicated that they were adhering to the COVID-19 protocols (wearing masks, washing hands, sanitizing, and keeping social distance). Furthermore, 16.6% of respondents played a role by educating the public within their communities on the precautions availed and 21.0% donated (farm produce and money) to the national COVID-19 relief fund. Subsequently, farmers indicated that the government's mitigation measure should begin with farmer's inventory which will promptly propel automatic free movements of farmers within zones during the lockdown. This was indicated by 9.0% of the respondents. Then 52.0% of the respondents suggested continued government subsidies. Khapayi and Celliers (2016) are of the view that government should remain paramount in investing support services as they offer critical interventions in agriculture. Notwithstanding that farmer's dedication is also an important factor in maintaining farm activities during unprecedented perilous times. Thus, apart from government backups, as their stake in mitigating the pandemic, 72.0% of farmers suggested that their utmost and continued commitment in farming during COVID-19 can result in sustainable products that will be enough to feed the nation in times of need. This was viewed by Van Passel et al. (2007), that the lower the farmer depends on support subsidies, the higher the sustainable farmer efficiency.

CONCLUSION AND RECOMMENDATIONS

Movement restrictions severely disrupted agricultural production since some farmers were denied permits due to the daily limited numbers, leading to the destruction of crops by pests and some crops being too ripe to be harvested. This also caused farming activities to be paused due to lack of workers who were like everyone else, needed a movement permit. Restrictions on movement also affected the distribution and market of agricultural produce since vendors and roadside stalls were not allowed. In addition, movement restrictions lowered the visibility of agricultural experts among the farming community. However, commitment, perseverance and adhering to COVID-19 protocols by farmers enabled a continued food supply during the pandemic.

Therefore, the study reveals that movement restrictions during a pandemic does not only reduce the spread of the disease but causes some negative impacts on food production, daily human activities and economically burdens the government.

Waving of movement restrictions on agricultural experts and farmers during lockdown should be considered. Alternatively, they should be agricultural townships/zones, whereby the fields, agricultural experts, input suppliers are in one location so that during pandemics, they are all enclosed in one place wherein movement restrictions can be waived. The country also needs to have some food reserves so that the population of vulnerable groups can be fed from them and to reduce the import bill during movement restrictions. The government need to continue with building the pandemic relief fund to cushion the farming communities.

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CONFLICT OF INTEREST

The authors declare no conflict of interest

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