www.jard.edu.pl http://dx.doi.org/10.17306/J.JARD.2021.01412

Journal of Agribusiness and Rural Development

pISSN 1899-5241
eISSN 1899-5772

3(61) 2021, 323–336
Accepted for print: 9.09.2021

ANALYSIS OF FOOD SECURITY STATUS AMONG AGRICULTURAL HOUSEHOLDS IN THE NKOMAZI LOCAL MUNICIPALITY, SOUTH AFRICA

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Abstract. The study analysed the food security status of agricultural households in Nkomazi Local Municipality, South Africa. Descriptive statistics, the food security index and multivariate analysis were used to realise the objectives of the study. The majority of respondents were females. Furthermore, respondents aged between 61 and 70 years and those who had only completed primary school education were also in the majority. Just under half of the respondents had a farming experience of more than 21 years and had large households (6-10 household members). Although most agricultural households in the study area were food secure, overall food insecurity among the respondents was very high. The marital status, education level and annual farm income of the respondents were positively and significantly associated with food security. Farming is practised mainly by older people with low levels of education. The level of food insecurity among agricultural households was approximately twice the South African national household food insecurity index. The findings of this study provide a basis for the formulation of a policy framework to help tackle the high food insecurity observed in the study area.

Keywords: agricultural households, household food security, Phezukomkhono Mlimi Programme

INTRODUCTION

Among the countries of the Southern African Developing Community (SADC) region, South Africa has a considerably high gross domestic product (WEF, 2017). It is a net exporter of cereals (FAO, 2020) and, concurrently, is the largest importer of agricultural products (Viljoen, 2017). While South Africa is considered food secure at the national level (EIU, 2019), there are households and individuals in South Africa who experience high levels of food insecurity (Masuku et al., 2017). For example, in 2016, approximately 19.9% of households at the national level in South Africa and 22.2% in the Mpumalanga province ran out of money to buy food (SSA, 2016a). In addition, access to food in South Africa was moderately insufficient in about 15% of households, while in 5.2% of households access to food was severely inadequate.

However, in the available literature, there have been contradicory reports on food insecurity statistics. For example, according to the SSA (2019a), food insecurity was at 28.4% in the Mpumalanga province and 34.3% in the North West province. Yet, in a study by Alemuet al. (2015), the food insecurity statistics in these two provinces were at 76% and 76%, respectively. While it can be argued that this difference can be attributed to the time difference, it is noteworthy that Statistics South Africa used the household food insecurity access scale (HFIAS), while Alem et al. (2014) used the income and expenditure survey and Wooldridge's (WCLM) estimator to determine food security. In fact, in a food security study conducted by Ijatuyi et al. (2018), using the food security index, the authors observed that 56.58% of agricultural households were food secure in the North

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West province. Therefore, the authors of this study are of the view that these discrepancies result from different methodologies and seasonality.

Households with severely inadequate access to food and suffering hunger in South Africa are estimated to be at 13.4 and 1.6 million, respectively (SSA, 2019b). With reference to the demographics, Africans and female-headed households tended to be more severely affected by food insecurity. In addition, high levels of food insecurity are mostly observed in households with more than eight family members (SSA, 2019b). Literature attributes this to the fact that larger numbers of members in a household put more pressure on food consumption in the household (Dula & Berhanu, 2019; Jeyarajah, 2018; SSA, 2019b). Food insecurity is also predominant among elderly people (IOA, 2017; Steiner et al., 2018) and within households whose members have low education levels (Mutisya et al., 2016; Steiner et al., 2018).

The food insecurity figures in South Africa are expected to increase due to the outbreak of the COVID-19 pandemic. This is because the COVID-19 pandemic has put pressure on and disrupted the South African food system. This has consequently affected the availability and access to food among households (Troskie, 2020). In addition, the COVID19-associated lockdown restrictions resulted in a significant contraction in the South African economy (SSA, 2020b). This contraction has directly impacted food supply and demand, and indirectly the food supply by reducing the purchasing power, production capacity and distribution of food (Devereux et al., 2020; HLPE, 2020; Pu and Zhong, 2020). It is the poor and vulnerable households (HLPE, 2020), characterised by low levels of education and low salary incomes (Arndt et al., 2020), whose food security status is mostly affected in the event of outbreaks such as the COVID-19 pandemic (SSA, 2020b).

Agriculture plays a key role in improving food security (Jain and Bathla, 2016) by contributing to food availability (Wegren and Elvestad, 2018), access, stability and dietary diversity (HLPE, 2016). Therefore, household food production is regarded as one of sustainable strategies for fighting food insecurity, especially by under-resourced households. It is not only a source of food but also contributes to the generation of income and employment (Khanna and Solanki, 2014; Vasylieva, 2018; World Bank, 2018). In a study conducted in central Malawi by Mango et al. (2018), agricultural production significantly increased access to food. In South Africa, particularly in Cape Town, urban agriculture is reported to have significantly contributed to improved access to food (Philander and Karriem, 2016) and income for households that participated in agricultural projects (Swanepoel et al., 2017). This was also confirmed by Khumalo and Sibanda (2019), in a study conducted in Tongaat, KwaZulu-Natal, where the majority (66%) of households involved in agricultural activities were food secure. Moreover, these households had a higher dietary diversity score, compared to the households that did not engage in agriculture.

In view of the above-mentioned benefits of being engaged in agriculture, the Phezukomkhono Mlimi (PKM), a food security programme, formerly known as the Masibuyele Emasimini programme, was initiated in 2005 by the Mpumalanga Provincial government to help to improve the accessibility and availability of food among the residents of the study area. The overall objective of the programme is to fight poverty and household food insecurity in rural areas by assisting peasant farmers and poor households in the cultivation of under-utilised pieces of land, to produce sufficient food and thus achieve household food security (DALA, 2007). The PKM programme is intended to provide the beneficiaries with production inputs, that is, seeds, fertilisers and chemicals; mechanisation support for tilling the land; support with basic infrastructure for farming, such as fencing, boreholes and irrigation pipes; and agricultural advisors for extension and advisory assistance.

However, there is no evidence of studies that have investigated how the PKM programme contributes to household food security in the Nkomazi Local Municipality. Studies that have been conducted in other areas show that the programme has been unsuccessful in meeting the intended objectives and the needs of small-scale farmers (Grobler, 2016; Nyathi, 2014). According to these studies, production inputs are delivered late in the season (Shabangu, 2015), the programme fails to meet the set targets, with a considerable number of tractors broken and malfunctioning (Grobler, 2016). Additionally, it is reported that tractors are inadequate for the mechanisation service required (Shabangu, 2015). In addition to the fact that these past studies were conducted five or more years ago, and in other areas (Masoka, 2014; Shabangu, 2015), their findings could not be generalised, due to the methodology used (Kothari, 2004; Kumar, 2011). For example, in the study by Shabangu (2015), non-standardised food security measurement

tools were employed, while in the study by Grobler (2016), the contribution of the programme to food security was not assessed.

This paper aims to assess the status of food security among households benefiting from the PKM programme and to identify factors that are associated with food security among the agricultural households benefitting from the PKM programme in the Nkomazi Local Municipality, South Africa.

METHODOLOGY

Study area

The study was conducted in the Nkomazi Local Municipality (NKLM). The NKLM is located in the eastern part of the Ehlanzeni District Municipality (EDM) of Mpumalanga, South Africa. The municipality borders with Mozambique (in the east) and the Kingdom of Eswatini (in the south). It has an estimated population of 410,900 people (SSA, 2016b). Its climate is subtropical, with a rainfall of 755 mm and an annual temperature of 28°C, on average (Adeola et al., 2016). The NKLM is mainly rural, with agriculture as one of the main economic activities (NKLM, 2016). The main agriculture activities in the study area include vegetable, sugar cane, banana, citrus and sub-tropical fruit farming under irrigation as well maize and cotton under dry land conditions (van Niekerk, 2015). The NKLM was selected because it has a high number of households involved in agricultural activities (SSA, 2011) and a high poverty rate (MPT, 2015).

Study population

The study population included agricultural households in the NKLM that were beneficiaries of the PKM programme in the 2018/19 production season. All the 543 agricultural households supported by the PKM programme in the study area during the 2018/19 production season were targeted to participate in the study.

Data collection

Face-to-face interviews, using a pretested structured questionnaire were conducted with agricultural households by trained enumerators. The questionnaire consisted of three sections which captured information on socio-economic characteristics, food security status and factors connected to the food security of the respondents. Each interview took 30 to 60 minutes. The data was collected from 1 February to 24 March 2020. Out of the 543 agricultural households supported by the Phezukomkhono Mlimi Programme in the study area during the 2018/19 production season, only 355 (65% response rate) assented to be part of the study and signed the consent form and completed the questionnaire.

Data analysis

The Statistical Package for the Social Science programme (SPSS version 25) was utilised to analyse the data. Descriptive statistics, the food security index (FSI) and multivariate analysis were used to realise the objectives of the study. Households were classified into two groups: food secure and food insecure households, using the FSI as described by Omotayo and Ganiyu (2017). The equation for the food security index (Fi) is specified as:

$$\text{Fi} = \frac{\text{Per capita food expenditure for each household}}{\text{2/3 Mean per capita food expenditure of all households}} \quad (1)$$

A household with monthly per capita food expenditure exceeding or equivalent to two-thirds of the mean per capita food expenditure was regarded as food secure. Conversely, if a household had a per capita food expenditure that was less than two-thirds of the mean per capita monthly food expenditure, it was regarded as food insecure (Omonona and Agoi, 2007).

The FSI was used to classify households in the study sample as either food secure (coded = 1) or food insecure (coded = 0). This led to the formulation of a binary outcome variable (food security status). A probit regression model was employed to identify factors associated with food security status among agricultural households. The equation for the probit regression model is specified as:

$$Y^* = W_0 + W_1 X_1 + W_2 X_2 + W_3 X_3 + \ldots. + W_{14} X_{14} + \varepsilon \quad (2)$$

where:

Yi – household food security status (food secure households = 1, food insecure households = 0). From the FSI measured above, households with scores equal to or higher than 1 will be classified as food secure (1); while those with scores of less than 1 will be classified as food insecure (0).

W_0 – the intercept

W_1 – W_{14} – parameters to be estimated

X – sets of independent variables

ε – an independent distributed error term.

In the probit regression analysis, the independent variables are as follows:

X_1 – age of household head (in years)
X_2 – gender (dummy; male = 1, female = 0)
X_3 – Marital status (dummy; married = 1, otherwise = 0)
X_4 – mariage (dummy; polygamous marriage = 1, otherwise = 0)
X_5 – size of the household (number of people in the household)
X_6 – dependency ratio (number, continuous)
X_7 – level of education (years of formal education)
X_8 – access to extension services (dummy; yes = 1, otherwise = 0)
X_9 – received mechanisation assistance (dummy; yes = 1, otherwise = 0)
X_{10} – received support with production inputs (dummy; yes = 1, otherwise = 0)
X_{11} – received infrastructure support (dummy; yes = 1, otherwise = 0)
X_{12} – annual farm income (income in rands)
X_{13} – received training (dummy; yes = 1, otherwise = 0)
X_{14} – engagement in non-farm activities (dummy; yes = 1, otherwise = 0)

RESULTS AND DISCUSSION

Socio-economic characteristics of respondents

Socio-economic details of the respondents are presented in Table 1. Most (27.9%; n = 99) of the respondents in this study were between 61 and 70 years of age. These results concur with the results obtained by Ijatuyi et al. (2018), who noted a high proportion of ageing farmers in a study that was conducted in the North West province, South Africa. The significantly low numbers of the younger generation involved in farming are worrying, as it could have a negative implication on the future of agriculture in the area. The low numbers of youth participating in agriculture could be put down to the difficulty in accessing credit (Rakgwale and Oguttu, 2020) and negative perceptions of the youth on farming (Swarts and Aliber, 2013). Omotayo (2018) is of the view that programmes to attract the youth into the agricultural sector are needed so that the younger generation can take over from aged farmers.

With regard to gender (Table 1), 40.6% (n = 144) of the respondents were males, while 59.4% (n = 211) were females. The results of the study support the findings reported by Khumalo and Sibanda (2019), who also observed that there were more females (54.8%) in a study that assessed the impact of urban and peri-urban agriculture on household food security status in Tongaat, eThekwini Municipality, South Africa. The high number of females in this study was an expected situation because females are usually the main custodians of food production, procurement and processing at the household level (Botreau and Cohen, 2019). However, this finding contradicts the findings by Olayiwola et al. (2017), who discovered that the majority (79.3%) of the respondents in the study conducted in the Oluyole Local Government area of Oyo State, Nigeria, were males. Apart from differences in geographical areas, the discrepancies observed between these two studies could be attributed to the existence of the vulnerable household producer subcategory of subsistence farmers under the PKM programme. This subcategory caters for women, persons with disabilities, child-headed households and farmworkers who have an interest in improving their food security levels through food crop production (DARDLEA, 2019).

The present study also discovered that most (49.9%; n = 177) of the respondents were married. The results reported here are also consistent with findings by Sani and Kemaw (2019), who observed that most farmers in their study were married. Marital status is postulated to influence the extent of involvement in farming and non-farm activities (Gordon and Craig, 2001). Available evidence shows that household food security status increases when the head of the household is married (Agboola et al., 2017; Mustapha et al., 2018).

With regard to household size, households that had six to ten persons were in the majority (52.4%; n = 186). This finding contradicts the finding by Olayiwola et al. (2017), who found that just less than half (48.7%) of households had a family size of one to five persons. This contradiction might be due low levels of income and education of the respondents in this study. According to Debebe (2014), households with lower levels of income and education are less probable to access family planning services. As a result, females with low levels of education use less protection against unwanted pregnancy and have many children, compared to females with higher levels of education. Household size

Table 1. Socio-economic profile of participants (n = 355)

Variable	Frequency	Percentage
1	2	3
Age		
22–30	10	2.8
31–40	15	4.2
41–50	43	12.1
51–60	88	24.8
61–70	99	27.9
71–79	71	20.0
> 80	29	8.2
Gender		
Male	144	40.6
Female	211	59.4
Marital status		
Single	44	12.4
Married	177	49.9
Divorced	20	5.6
Widowed	114	32.1
Household size		
1–5 members	123	34.6
6–10 members	186	52.4
11–15 members	40	11.3
16–20 members	06	1.7
Education level		
No formal education	149	42.0
Less than Grade 12 education	155	43.7
Grade 12/matric certificate	35	9.9
Tertiary education	16	4.5
Farming experience		
1–5 years	56	15.8
6–10 years	62	17.5
11–15 years	28	7.9
16–20 years	39	11.0
> 21 years	170	47.9
Farm size		
< 3 hectare	214	60.3
3–5 hectares	99	27.9
5–10 hectares	30	8.5
> 10 hectares	12	3.5
Annual farm income		
< R40 000	342	96.2
R40001–R80000	10	2.8
R80001–R120000	01	0.3
> R120000	02	0.7
Engaged in non-farm activities		
Yes	131	36.9
No	224	63.1
Received mechanisation assistance		
Yes	249	70.1
No	106	29.9
Total	355	100

Source: field survey, 2020.

and food security tend to be negatively correlated (SSA, 2019b; Tiwasing et al., 2018), which means that as the number of members of a household increases, the food security status of that household declines (Sambo et al., 2017; Yousaf et al., 2018). A national study conducted in South Africa by SSA (2019b), revealed that inadequate food access was more prevalent among households that have more than eight members.

Most respondents (43.7%; n = 155) had primary school education and this was followed by 42% (n = 149) who had no formal education. Meanwhile, 9.9% (n = 35) had secondary education and 4.5% (n = 16) had attained tertiary education level. The results of the study indicate that, generally, the education level among farmers in the NKLM was low and that low education level was biased towards the aged respondents. This concurs with the findings of Alam et al. (2020), who reported that 44.6% of respondents had no formal education, in their study conducted in the coastal area of Noakhali, Bangladesh. The low education levels of the farmers in this

study could be attributed to the inequalities of the past apartheid government which prevented black people from getting formal education in South Africa (Antwi and Nxumalo, 2014; De Cock et al., 2013). The results are worrisome, as the literature indicates that high education levels are highly positively correlated with household food security status (Omonona and Agoi, 2007; Yahaya and Danmaigoro, 2020). Education has been shown to empower farmers, as it helps them to acquire skills and knowledge needed to improve their productivity and food security status (Antwi and Nxumalo, 2014).

Nearly half (47.9%; n = 170) of the farmers had a farming experience of more than 21 years. This was followed by 15.8% (n = 56) of the farmers that had a farming experience of less than 5 years. The proportion of farmers with farming experience between 6 and 10 years accounted for 17.5% (n = 62), while those with 11-15 years of farming made up 7.9% (n = 28) of the study population. Farmers with between 16 and 20 years of farming experience accounted for 11.0% (n = 39). The findings of this study concur with the results of Sambo et al. (2017), who found that the majority (40.1%) of farmers had between 16-20 years of farming experience. The high number of farmers having many years of experience in this study is good news for the food security level in the study area. Available evidence suggests that households headed by individuals that have been in farming for many years are likely to be food secure (Mohammed et al., 2014).

The findings also revealed that a high proportion (60.3%; n = 214) of households in this study had less than three hectares (ha) of land, and only 3.5% (n = 12) of households had more than 10 hectares (Table 1). The results are in agreement with those of the study conducted among urban farmers in Kaduna State, Nigeria, by Saleh and Mustafa (2018), who also found that most farmers cultivate a land area smaller than three hectares. However, according to Khumalo and Sibanda (2019), small plots are associated with low yields that negatively affect household food security. Jeminiwa et al. (2018), are of a similar view and were able to conclude that the level of productivity is influenced by farm size.

The majority of households in this study (96.2%; n = 342) had an annual farm income that was below R40,000.00. Only 0.7% (n = 2) of the households had an annual farm income higher than R120,000.00, followed by 0.3% (n = 1), who had an income of R80,001-R120,000.00 (Table 1). The results reported here suggest that the households in the study area generally had a low income, with an average of R6,490.99 per annum. The low income among households in the study area could be attributed to the smaller sizes of plots under cultivation, as explained above. The area of agricultural land under production is positively associated with farm income (Ryś-Jurek, 2019). However, the findings reported here do not concur with the findings of the study carried out in the North West province, South Africa, by Ijatuyi et al. (2018), who reported that 44.9% of the households had an annual income from the farm ranging from R40,000.01 to R80,000.00 per annum. The low-income levels observed in this study are worrisome, because household income significantly contributes to food security status (Cheteni et al., 2020; Sambo et al., 2017).

The majority (63.1%; n = 224) of respondents in this study stated that they were not involved in non-farm activities. The results are inconsistent with those reported by Bila et al. (2015), in a study conducted in Hawul Local Government Area, Borno State, Nigeria, which found that the majority (95.6%) of farming households were involved in non-farm activities. The inconsistencies observed between the present study and that by Bila et al. (2015) can be attributed to the difference in the age of the two study populations and the low educational levels of respondents in the current study. Almost all (98.5%) of the households in the study by Bila et al. (2015) were below 45 years of age. Therefore, they are likely to partake in off-farm activities to earn extra income, because they belong to the active labour force. On the contrary, slightly more than half (55.6%) of the households in this study were above 61 years of age and mostly dependent on the old age grant for extra income. Involvement in non-farm activities offers households extra income that enables them to access basic essentials such as clothing, schooling and healthcare services in addition to food (Adem et al., 2018). Moreover, off-farm income is positively correlated with food security (Apanovich and Mazur, 2018).

Most (70.1%, n = 249) of the households received support from the PKM programme in the form of mechanisation service. Masoka (2014) had earlier observed a similar phenomenon in a study conducted in the Nkangala District of the Mpumalanga province, South Africa. The study by Masoka (2014) observed that 68% of the beneficiaries of the PKM programme received assistance in the form of mechanisation. Bastian et al. (2019) argue that the mechanisation programme is effective in

developing smallholder farmers and boosts production and household food security status. This is because, as Hemming et al. (2018) suggest, agricultural subsidy schemes provide agricultural inputs and services to farmers at lower rates, and further contribute to rising productivity and economic growth, as well as reducing food insecurity and poverty.

Food security status of agricultural households

The FSI, which is computed as per capita food expenditure for a given household, divided by two-third (2/3) mean per capita food expenditure of all households, was used to determine the food security status of agricultural households. A household with a food security index (F1) higher than or equal to one (≥ 1) was considered food secure. Conversely, a household with food security (F1) lower than one (< 1) was considered food insecure.

The monthly mean per capita food expenditure (MPCHHFE) (Table 2) for all the households was R1 581.07, while the two-third mean per capita food expenditure for all the households was R 1,054.05. Slightly more than half (52.4%; n = 186) of the investigated agricultural households had a food security index of ≥ 1, while just under half (47.6%; n = 169) of households had a food security index of < 1. The results are similar to those reported by Olayiwola et al. (2017), in a study conducted in the Oluyole Local Government Area of Oyo State, Nigeria, where 58.7% of rural households were food secure. However, the number of food insecure households in this study was slightly lower than what was reported by Ijatuyi et al. (2018) in what is known as the 'Platinum Province' of South Africa. Although this result is appreciated, the number of food insecure households in the current study is still high, as it is double that of the national average of 20.2%.

Given the low involvement of the respondents in non-farm activities and the small farm areas for the farmers, it was not surprising that just under half of the respondents were food insecure. In addition, according to the literature, the study area has a high poverty level (MPT, 2015), which could also explain the high food insecurity in the study area. This is because poverty and food insecurity are positively correlated (Sati and Vangchhia, 2017).

Households' food expenditure approach measures the food accessibility dimension of food security (i.e. economic access to food), which is influenced by households' purchasing power (affordability) and spending on food. Findings reported here show that 52.4% (n = 186) of the households in the study area were food secure and could afford the price of food relative to their income. Thus, just over half of the households in the study area had economic access to food (i.e. could afford food) at the household level, by buying from the market.

Factors associated with food security among the households

The results of the probit regression of the factors associated with food security among agricultural households in the study area are presented in Table 3. Among 14 variables fitted into the probit model, only the marital status, level of education and annual farm income were found to be significantly associated with food security of agricultural households in the study area.

The marital status variable was statistically significant (p < 0.05) and positively associated (coefficient = 0.385) with the food security status of households in this model. This is in line with the a priori expectation of this study. This result is corroborated by findings by Agboola et al. (2017), as well as Mustapha et al. (2018), who concluded that household food security status improved if the head of the household was married. According to Aboaba et al. (2020), if the head of a household is married, they are mature and take the responsibility for providing for their families.

Table 2. Food security status of the respondents based on food security index (n = 355)

Food security status	F	%	MPCHHFE	Two-Third MPCHHFE
Food secure	186	52.4		
Food insecure	169	47.6		
Total	355	100	R 1 581.07	R 1 054.05

Source: field survey, 2020.

Table 3. Probit regression results of the factors associated with food security among agricultural households (n = 355)

Food security	Coefficient	Std error	Z	P > z
Age	0.007	0.0071	0.986	0.303
Gender	–0.056	0.1609	–0.348	0.726
Marital status	0.385	0.1652	2.331	0.020*
Marriage Type	0.216	0.2591	0.834	0.405
Level of education attained	0.052	0.00188	27.660	0.006*
Household size	0.030	0.0224	1.339	0.183
Dependency ratio	–0.030	0.0750	–0.400	0.626
Annual farm income	1.78	7.70	0.231	0.020*
Mechanisation assistance	0.064	0.1609	0.398	0.690
Production inputs support	0.039	0.2929	0.133	0.894
Access to extension services	–0.210	0.1641	–1.280	0.201
Infrastructure support	0.117	0.2345	0.499	0.618
Training received	–0.116	0.1636	–0.709	0.479
Engaged in non-farm activities	–0.050	0.1493	–0.335	0.740
Constant	–1.023	–1.536	0.124	0.6660
Prob > chi^2				0.000

* 5% significant level.
Source: field survey, 2020.

The coefficient of the level of education level was likewise positive (0.052) and significantly ($p < 0.05$) associated with food security among agricultural households in the study area. This is consistent with previous studies (Ibok et al., 2014; Masahudu, 2019; Mohammed et al., 2014) that have reported that households of educated farmers have a high probability of being food secure. These findings suggest that the higher level of education attained by the household head, the more likely the household is to be food secure. Secondly, according to Antwi and Nxumalo (2014), education is social capital and increases the responsiveness of farmers to up-to-date agricultural practices, which results in higher yields and farm incomes, thus ensuring food security. Thirdly, SSA (2020) is of the view that education is an essential and powerful tool for economic and social development, and has a significant effect of reducing poverty and food insecurity.

Annual farm income revealed a positive (coefficient = 0.020) and significant ($p < 0.05$) association with food security. This indicates that a rise in income from selling agricultural produce boosts the households' purchasing power and so the possibility of households becoming food secure also increases. This is corroborated by the results of Ibok et al. (2014) and Ijatuyi et al. (2018), who reported that annual farm income was positively associated with food security. This is also supported by other authors, who have reported that low income is a significant risk associated with food insecurity (Alam et al., 2020).

Although the age of household head receiving mechanisation assistance and production input support, as well as infrastructure support had a positive coefficient, they were not significantly associated with food security ($p > 0.05$). In line with a study by Aragie and Genanu (2017), these findings suggest that although production inputs such as seeds and fertilisers contribute positively to household food security, their contribution is insignificant ($p > 0.05$).

Variables such as gender of household head, dependency ratio, access to extension services, training received

Table 4. Probit regression results of the factors associated with food security among agricultural households (n = 355)

Food security	Coefficient	Std error	Z	P > z
Age	0.007	0.0071	0.986	0.303
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Constant	–1.023	–1.536	0.124	0.6660
Prob > chi^2				0.000

* 5% significant level.
Source: field survey, 2020.

and engagement in non-farm activities were found to be negatively associated with the food security status of the respondents, albeit not significant ($p > 0.05$). What is more, Aragie and Genanu (2017) observed a significant negative association between household size and food security. Although the study is unable to explain why the association in this study failed to reach significance, it is known that an increase in the size of the household, especially by members that are unable to work, puts more pressure on food consumption in the household (Dula and Berhanu, 2019; Jeyarajah, 2018). Furthermore, it has been reported that an increase in dependency ratio by one member in a household, is likely to decrease household food security status by almost 50% (Aboaba et al., 2020).

According to Aragie and Genanu (2017), households partaking in non-farm activities, in addition to farming activities, have a higher probability to be food secure than those that do not partake in non-farm activities. This is because households that are involved in non-farm activities have an opportunity to earn additional income from non-farm activities and are thus able to boost their purchasing power, which, in turn, improves the food security status of a household. Therefore, negative coefficients for the engagement in non-farm activities observed in this study that did not reach significance ($p > 0.05$) were not expected. This could be due to the low proportion of respondents involved in non-farming activities.

Although the coefficients for the gender of household head and access to extension services were negative, thus suggesting a negative association with food security, they failed to reach significance ($p > 0.05$). This is contrary to what the authors had anticipated. According to Botreau and Cohen (2019), due to gender inequalities, men have more access to livelihood assets than women. Eneyew and Bekele (2012) are of the view that households headed by females are more vulnerable to food insecurity, due to restricted access to resources. According to Mustapha et al. (2018), access to extension

services has a positive contribution to household food security. Fisher and Lewin (2013) further suggested that a single visit by an agricultural extension advisor during each production season would lower food insecurity by at least 5.2%.

CONCLUSION AND RECOMMENDATIONS

To the best of our knowledge, the food security status of households benefitting from the PKM programme and associated factors have not been studied at NKLM. Therefore, this study adds to the body of literature and sheds light on the food security status of PKM beneficiaries and associated factors. Generally, farmers in the study area were elderly people, mostly female, with low educational levels, had limited access to arable land and had low levels of farm income. Despite participation in the programme, the level of food insecurity among agricultural households in the study area was very high; double the national and provincial household food insecurity levels. However, considering that the food security levels in the study area are low compared to other areas, these findings support the use of agriculture as one of affordable sustainable strategies to reduce food insecurity. The authors are of the view that farmers should use other non-farm activities to help boost the food security status of their households. Given that a large proportion of the farming community in this study was over 60 years of age, it is recommended that programmes be implemented to make agriculture more appealing to the youth, to safeguard the future of agriculture in the study area. The findings of the study provide a basis for the formulation of a policy framework to help tackle the high food insecurity observed in the study area. Based on the findings of this study, the following policy measures, aimed at improving the food security status of households in the study area, should be considered: i) the government, together with farmers, should focus on increasing the farm size for each participating household—a rural land reform programme can play an important role in increasing the farm size of participating households; ii) taking into consideration the age of the farmers in this study, alternative means, such as adult-based education, should be investigated and encouraged, so that farmers can acquire skills and information to help them to improve their productivity and food security status.

ACKNOWLEDGEMENTS

The authors would like to acknowledge the University of South Africa for funding the project.

SOURCE OF FINANCING

The project was funded by the University of South Africa's postgraduate research funding.

REFERENCES

Aboaba, K., Fadiji, D.M., Hussayn, J.A. (2020). Determinants of food security among rural households in Nigeria: USDA food insecurity experience based measurement (forms) approach. J. Agribus. Rural Dev., 56(2), 113–124. https://doi.org/10.17306/J.JARD.2020.01295

Adem, M., Tadele, E., Mossie, H., Ayenalem, M. (2018). Income diversification and food security situation in Ethiopia: A review study. Cogent Food Agric., 4(1). https://doi.org/10.1080/23311932.2018.1513354

Adeola, A.M., Botai, O.J., Olwoch, J.M. (2016). Environmental factors and population at risk of malaria in Nkomazi municipality, South Africa. Tropic. Med. Int. Health, 21(5), 675–686.

Agboola, W.L.,Yusuf, S.A., Oloyinniyi, M.T. (2014). Determinants of Access to Micro- Credit Among Arable Crop Farmers in Kwara State, Nigeria. J. Appl. Agric. Res., 6(1), 11–23.

Agboola, P.T., Oyekale, A.S., Samuel, O.O. (2017). Assessment of Welfare Shocks and Food Insecurity in Ephraim Mogale and Greater Tubatse Municipality Of Sekhukhune Districts, Limpopo Province, South Africa. IOSR J. Agric. Vet. Sci., 10(04), 23–32. https://doi.org/10.9790/2380-1004022332

Alam, M.R., Shahadat, H.M., Hasan, S.A., Bashir, A.M., Reza, S., Chowdhury, P. (2020). Assessment of Food Security Status and the Determinants of Food Security in Selected Households from Coastal Area of. Indian J. Public Health Res. Dev., 11(9), 210–217.

Alemu, Z.G. (2015). Developing a Food. In: Security Map for South Africa, Working Paper Series 220. African Development Bank, Tunis, Tunisia. https://www.afdb.org/fileadmin/uploads/afdb/Documents/Publications/WPS_No_220_Developing_a_food_in_security_map_for_South_Africa_BB.pdf

Antwi, M., Nxumalo, K.K.S. (2014). Impact of Proactive Land Acquisition Strategy (PLAS) Projects on Human Capital Livelihood of Beneficiaries in the Dr. Kenneth

Kaunda District in South Africa. J. Agric. Sci., 6(12), 1–13. https://doi.org/10.5539/jas.v6n12pxx

Apanovich, N., Mazur, R.E. (2018). Determinants of seasonal food security among smallholder farmers in south-central Uganda. Agric. Food Sec., 7(1). https://doi.org/10.1186/s40066-018-0237-6

Aragie, T., Genanu, S. (2017). Level and Determinants of Food Security in North Wollo Zone (Amhara Region – Ethiopia). J. Food Sec., 5(6), 232–247. https://doi.org/10.12691/jfs-5-6-4

Arndt, C., Gabriel, S., Robinson, S. (2020). Assessing the toll of COVID-19 lockdown measures on the South African economy. Retrieved Oct 11th 2020 from https://www.ifpri.org/blog/assessing-toll-covid-19-lockdown-measures-south-african-economy

Bastian, R.M., Swanepoel, J.W., Van Niekerk, J.A. (2019). Effectivenes of the implementation of the mechanisation programme for emerging farmers in the Oberberg and Enden Districts of the Western Cape. South Afr. J. Agric. Exten., 47(2), 58–71. https://doi.org/http://dx.doi.org/10.17159/2413-3221/2019/v47n2a503

Bila, Y., Mshelia, B.S., Landi, J.H. (2015). Off Farm Activities and Its Contribution to Household Income in Hawul Local Government Area, Borno State, Nigeria. IOSR J. Agric. Vet. Sci., 8(10), 9–13. https://doi.org/10.9790/2380-081010913

Botreau, H., Cohen, M.J. (2019). Gender Inequalities and Food Insecurity: Ten years after the food price crisis, why are women farmers still food-insecure? https://doi.org/10.21201/2019.4375

Cheteni, P., Khamfula, Y., Mah, G. (2020). Exploring Food Security and Household Dietary Diversity in the Eastern Cape Province, South Africa. Sustainability, 12(5), 1851. https://doi.org/10.3390/su12051851

DALA (Department of Agriculture and Land Administration). (2007). Strategic Plan 2007/2008- 2009/2010. Nelspruit: Department of Agriculture and land Administration.

DARDLEA (Department of Agriculture Rural Development Land and Environmental Affairs). (2019). Phezukomkhono Mlimi Programme (Food Secuirty Policy). Mbombela: Department of Agriculture,Rural Development, Land and Environmental Affairs.

De Cock, N., D'Haese, M., Vink, N., van Rooyen, C.J., Staelens, L., Schönfeldt, H.C., D'Haese, L. (2013). Food security in rural areas of Limpopo province, South Africa. Food Sec., 5(2), 269–282. https://doi.org/10.1007/s12571-013-0247-y

Debebe, D. (2014). Population Education, Fertility and Family Planning in Ethiopia. Int. J. Pharm. Med. Res., 2(4), 4–13. Retrieved Oct 10th 2020 from: https://www.woarjournals.org/IJPMR

Devereux, S., Béné, C., Hoddinott, J. (2020). Conceptualising COVID-19's impacts on household food security. Food Sec., 12, 769–772. https://doi.org/10.1007/s12571-020-01085-0

Dula, T., Berhanu, W. (2019). Determinants of Rural Household Food Security and Coping Up Mechanisms in the Case of Woliso Woreda Western Ethiopia. World J. Agric. Soil Sci., 1(2), 1–10. https://doi.org/10.33552/WJASS.2019.01.000507

EIU (The Economists Intelligence Unit). Global Food Security Index 2019: Global Exploring challenges & developing solutions. Washington, DC: Economists Intelligence Unit.

Eneyew, A., Bekele, W. (2012). Causes of household food insecurity in Wolayta. J. Stored Prod. Postharv. Res., 3(3), 35–48.

FAO (Food and Agriculture Organisation of the United Nations). (2020). Cereal supply and demand balances for sub-Saharan African countries: Situation as of June 2020. Food and Agriculture Organisation of the United Nations. Rome: FAO.

Fisher, M., Lewin, P.A. (2013). Household, community, and policy determinants of food insecurity in rural Malawi. Dev. South. Afr., 30(4), 451–467.

FSIN (Food Security Information Network). (2020). 2020 Global Report on Food Crises: Joint Analysis for Better Decisions. Rome: World Food Programme.

Gordon, A., Craig, C. (2001). Rural non-farm activities and poverty alleviation in Sub-Saharan Africa. Natural Resources Institute, University of Greenwich: Chatham, UK.

Grobler, B. (2016). Masibuyele Emasimini reaches only 22% of targets in Bushbuckridge. Retrieved July 9th 2019 from: https://www.da-mpu.co.za/2016/02/masibuyele-emasimini-reaches-only-22-of-targets-in-bushbuckridge/

Hemming, D.J., Chirwa, E.W., Dorward, A., Ruffhead, H.J., Hill, R., Osborn, J., Langer, L., Harman, L., Asaoka, H., Coffey, C., Phillips, D. (2018). Agricultural input subsidies for improving productivity, farm income, consumer welfare and wider growth in low- and middle-income countries: a systematic review. International Initiative for Impact Evaluation: London.

Hendriks, S.L., Olivier, N.J.J. (2015). Review of the South African Agricultural Legislative Framework: Food security implications. Dev. South. Afr., 32(5), 555–576.

HLPE (High Level Panel of Experts). (2016). Sustainable agricultural development for food security and nutrition: A report by The High Level Panel of Experts on Food Security and Nutrition HLPE High Level Panel of Experts what roles for livestock? Committee on World Food Security: Rome.

HLPE (High-Level Panel of Experts). (2020). Interim Issues Paper on the Impact of COVID-19 on Food Security and

Nutrition (FSN) by the High-Level Panel of Experts on Food Security and nutrition (HLPE). Retrieved Nov 6th 2020 from: https://www.fao.org/cfs/cfs-hlpe

Ibok, O.W., Idiong, I.C., Brown, I.N., Okon, I.E., Okon, U.E. (2014). Analysis of Food Insecurity Status of Urban Food Crop Farming Households in Cross River State, Nigeria: A USDA Approach. Journal of Agricultural Science, 6(2). Retrieved July 9, 2019, from https://doi.org/10.5539/jas.v6n2p132

Ijatuyi, E.J., Omotayo, A.O., Nkonki-Mandleni, B. (2018). Empirical analysis of food security status of agricultural households in the platinum province of South Africa. Journal of Agribusiness and Rural Development, 47(1), 29–38. Retrieved June 5, 2020, from https://doi.org/10.17306/j.jard.2018.00397

IOA (Institute on Aging). (2017). Why Are Older Adults at Risk for Food Insecurity? Raising Awareness on World Food Day. Retrieved October 20, 2020, from https://blog.ioaging.org/activities-wellness/why-are-older-adults-at-risk-for-food-insecurity-raising-awareness-on-world-food-day/

Jain, T., Bathla, S. (2016). Role of Agriculture in Enhancing Food Security. International Journal of Science and Nature, 7(1), 34–38.

Jeminiwa, O.R., Okanlawon, T.F., Taiwo, D.M., Olaoti-Laaro, S.O., Jeminiwa, M.S. (2018). Constraints to Agricultural Productivity in Kainji Lake National Park, Nigeria. Asian Journal of Research in Agriculture and Forestry, 2(1), 1–9. Retrieved July 7, 2020, from https://doi.org/10.9734/ajraf/2018/42853

Jeyarajah, S. (2018). Food Security Status of Marine Fisheries Households in Batticaloa District of Sri Lanka. International Journal of Current Research, 10(1), 64737–64741.

Khanna, H., Solanki, P. (2014). Role of agriculture in the global economy. 2nd International Conference on Agricultural and Horticultural Sciences, s1(01). Retrieved July 9, 2019, from https://doi.org/10.4172/2168-9881.s1.008

Khumalo, N.Z., Sibanda, M. (2019). Does urban and peri-urban agriculture contribute to household food security? An assessment of the food security status of households in Tongaat, eThekwini Municipality. Sustainability, 11(4), 1–24. Retrieved July 7, 2020, from https://doi.org/10.3390/su11041082

Kothari, C.R. (2004). Research Methodology: Methods and Techniques (2nd Revised). New Delhi: New Age International Publishers.

Kumar, R. (2011). Research Methodology: A Step-By-tep Guide for Beginners (3rd ed.). Los Angels: Sage Publications.

Mango, N., Makate, C., Mapemba, L., Sopo, M. (2018). The role of crop diversification in improving household food security in central Malawi. Agriculture and Food Security, 7(1). Retrieved May 1, 2020, from https://doi.org/10.1186/s40066-018-0160-x

Masahudu, M. (2019). Food insecurity and coping strategies of farm families in the Savelugu-Nanton Municipal of Northern region. International Journal of Advance Research, 5(3), 2268-2272. Retrieved August 9, 2020, from https://www.ijariit.com

Masoka, N. (2014). Post-settlement land reform challenges: The case of the Department of Agriculture, Rural Development and Land Administration, Mpumalanga Province. North West University.

Masuku, M., Selepe, M., Ngcobo, N. (2017). Small Scale Agriculture in Enhancing Household Food Security in Rural Areas. Journal of Human Ecology, 58(3), 153–161. Retrieved May 1, 2020, from https://doi.org/10.1080/09709274.2017.1317504

Mohammed, D., Bukar, U., Umar, J., Adulsalam, B., Dahir, B. (2014). Analysis of food security among smallholder households in arid areas of Borno State, Nigeria. Continental Journal of Agricultural Economics, 8(1), 1–8. Retrieved July 3, 2017, from https://doi.org/doi:10.5707/cjae.2014.8.1.1.8

Moselakgomo, A. (2011). Farming programme on brink of collapse. Retrieved July 8, 2019, from https://www.sowetanlive.co.za/news/2011-01-12-farming-programme-on-brink-of-collapse/

MPT (Mpumalanga Provincial Treasury). (2015). Ehlanzeni Soico-Economic Profiles March 2015. Nelspruit: Mpumalanga Provincial Treasury.

Mustapha, M., Kamaruddin, R.B., Dewi, S. (2018). Factors affecting rural households food security status in Kano, Nigeria. International Journal of Management Research & Review, 8(9), 1–19.

Mutisya, M., Ngware, M.W., Kabiru, C.W., Kandala, N.-B. (2016). The effect of education on household food security in two informal urban settlements in Kenya: a longitudinal analysis. Food Security, 8(4), 743–756. Retrieved July 2, 2019, from https://doi.org/10.1007/s12571-016-0589-3

NKLM (Nkomazi Local Municipality). (2016). Integrated Development Plan 2016/17. Malelane: Nkomazi Local Municipality.

Nyathi, S. (2014). Mpumalanga farming programme under fire. Retrieved July 8, 2019, from https://www.fin24.com/Companies/Agribusiness/Mpuma-farming-programme-under-fire-20141116

Olayiwola, S.A., Tashikalma, A.K., Giroh, D.Y. (2017). Analysis of food security status and coping strategies among rural households in Oluyole Local Government area of Oyo State, Nigeria. FUW Trends in Science & Technology

Journal, 2(1A), 28–32. Retrieved September 12, 2020, from https://www.ftstjournal.com

Omonona, B.T., Agoi, A.G. (2007). An analysis of food security situation among Nigerian urban households: evidence from Lagos State, Nigeria. Journal of Central European Agriculture, 8(3), 397–406.

Omotayo, A.O. (2018). Economics of food intake, nutrition and farm households' health in Southwest Nigeria. North West University.

Omotayo, O.A., Ganiyu, M.O. (2017). Effects of Livelihood Activities on the Households' Food Security in the Ogbomoso South Local Government Area of Oyo State, Nigeria. Journal of Human Ecology, 1(2), 107–113.

Philander, F.R., Karriem, A. (2016). Assessment of Urban Agriculture as a Livelihood Strategy for Household Food Security: An Appraisal of Urban Gardens in Langa, Cape Town. International Journal of Arts & Sciences, 9(1), 327–338.

Pu, M., Zhong, Y. (2020). Rising concerns over agricultural production as COVID-19 spreads: Lessons from China. Global Food Security, 26. Retrieved October 10, 2020, from https://doi.org/10.1016/j.gfs.2020.100409

Rakgwale, T.J., Oguttu, J. W. (2020). The impact of the 2014–2016 drought in Greater Letaba Local Municipality: How the farmers coped and factors that were significantly associated with loss of animals. International Journal of Disaster Risk Reduction, 50. Retrieved October 10, 2020, from https://doi.org/10.1016/j.ijdrr.2020.101869

Ryś-Jurek, R. (2019). Determinants of Family Farm Income Depending on Farm Size. Annals of the Polish Association of Agricultural and Agribusiness Economists, XXI(3), 401–411. Retrieved September 15, 2020, from https://doi.org/10.5604/01.3001.0013.4097

Saleh, M.K., Mustafa, A.S. (2018). Food security and productivity among urban farmers in Kaduna State, Nigeria. Journal of Agricultural Extension, 22(1), 171–180. Retrieved March 11, 2020, from https://doi.org/https://dx.doi.org/10.4314/jae.v22i1.15

Sambo, A.S., Mustapha, A., Abdulaziz, K., Bada, M.M. (2017). Socio-Economic Analysis of Food Security Status Among Rural Farming Households in Kaduna State, Nigeria. CARD International Journal of Agricultural Research and Food Production, 1(2), 1–23. Retrieved August 01, 2020 from http://www.casirmediapublishing.com

Sani, S., Kemaw, B. (2019). Analysis of households food insecurity and its coping mechanisms in Western Ethiopia. Agricultural and Food Economics, 7(1). Retrieved March 11, 2020, from https://doi.org/10.1186/s40100-019-0124-x

Sati, V.P., Vangchhia, L. (2017). A Sustainable Livelihood Approach to Poverty Reduction. An Empirical Analysis of Mizoram , the Eastern Extension of the Himalaya. Retrieved March 11, 2020, from https://doi.org/10.1007/978-3-319-45623-2

Shabangu, R.R. (2015). Effect of Masibuyele Emasimini Programme on food security at New Forestry Irrigation Scheme at Bushbuckridge Municipality of Ehlanzeni District of Mpumalanga Province. Univerisity of Limpopo.

SSA (Statistics South Africa). (2011). South Africa's population census. Retrieved Sep 8th 2020 from: http://www.statssa.gov.za/?page_id=993&id=nkomazi-municipality

SSA (Statistics South Africa). (2016a). Community Survey 2016: Statistical release. Pretoria: Statistics South Africa.

SSA (Statistics South Africa). (2016b). Provincial profile: Mpumalanga: Community Survey 2016. Pretoria: Statistics South Africa.

SSA (Statistics South Africa). (2019a). General Household Survey 2018. In Statistics South Africa. Retrieved October 20, 2020 from https://www.statssa.gov.zainfo@statssa.gov.za

SSA (Statistics South Africa). (2019b). Towards measuring food security in South Africa: An examination of hunger and food inadequacy. Pretoria: Statistics South Africa.

SSA (Statistics South Africa). (2020a). Gender Series Volume VI: Education and Gender, 2009-2018. Statistics South Africa. Retrieved October 20, 2020 from https://www.statssa.gov.za

SSA (Statistics South Africa). (2020b). Quarterly Labour Force Survey - Quarter 2: 2020. Statistics South Africa. Pretoria: Statistics South Africa.

SSA (Statistics South Africa). (2020c). Steep slump in GDP as COVID-19 takes its toll on the economy. Retrieved October 5, 2020, from https://www.statssa.gov.za/?p=13601

Steiner, J.F., Stenmark, S.H., Sterrett, A.T., Paolino, A.R., Stiefel, M., Gozansky, W.S., Zeng, C. (2018). Food Insecurity in Older Adults in an Integrated Health Care System. Journal of the American Geriatrics Society, 66(5), 1017–1024. Retrieved March 11, 2020, from https://doi.org/10.1111/jgs.15285

Swanepoel, J.W., Van Niekerk, J.A., D'Haese, L. (2017). The socio-economic profile of urban farming and non-farming households in the informal settlement area of the Cape Town Metropole in South Africa. South African Journal of Agricultural Extension (SAJAE), 45(1), 131–140. Retrieved October 20, 2020 from https://doi.org/10.17159/2413-3221/2017/v45n1a447

Swarts, M.B., Aliber, M. (2013). The "youth and agriculture" problem: implications for rangeland development. African Journal Range Forage Science, 30, 23–27. Retrieved June 17, 2019, from https://doi.org/10.2989/10220119.2013.778902.

Tiwasing, P., Dawson, P., Garrod, G. (2018). Food Security of Rice-Farming Households in Thailand: A Logit Analysis.

The Journal of Developing Areas, 52(1), 85–98. Retrieved June 17, 2019, from https://doi.org/10.1353/jda.2018.0006

Troskie, D.P. (2020). Impact of COVID-19 on agriculture and food in the Western Cape. Cape Town: Western Cape Department of Agriculture.

van Niekerk, G. (2015). Farms in Mpumalanga achieving high investment. Retrieved June 17, 2019, from https://www.pamgolding.co.za/property-news/2015/3/13/farms-in-mpumalanga-achieving-high-return-on-investment

Vasylieva, N. (2018). Ukrainian Agricultural Contribution to the World Food Security: Economic Problems and Prospects. Montenegrin Journal of Economics, 14(4), 215–224. Retrieved June 17, 2020, from https://doi.org/10.14254/1800-5845/2018.14-4.15

Viljoen, W. (2017). The face of African agriculture trade. Retrieved October 7, 2020, from https://www.tralac.org/discussions/article/11629-the-face-of-african-agriculture-trade.html

WEF (World Economic Forum). (2017). The Africa Competitiveness Report 2017. Retrieved October 15, 2020, from http://www3.weforum.org/docs/WEF_ACR_2017.pdf

Wegren, S.K., Elvestad, C. (2018). Russia's food self-sufficiency and food security: an assessment. Post-Communist Economies, 30(5), 565–587. Retrieved October 7, 2020, from https://doi.org/10.1080/14631377.2018.1470854

WFP (World Food Programme). (2020). Risk of hunger pandemic as coronavirus set to almost double acute hunger by end of 2020. Retrieved October 20, 2020, from https://insight.wfp.org/covid-19-will-almost-double-people-in-acute-hunger-by-end-of-2020-59df0c4a8072

World Bank (2018). Agriculture as an Engine of Growth and Jobs Creation Africa Region. Geneva: World Bank.

Yahaya, K., Danmaigoro, A. (2020). Analysis of Food Security Status among Farming Households in Zuru Agricultural Zone of Kebbi State, Nigeria. IOSR Journal of Economics and Finance, 11(2), 48–55. Retrieved November 2, 2020, from https://doi.org/10.9790/5933-1102044855

Yousaf, H., Zafar, M.I., Anjum, F., Adil, S.A. (2018). Food security status and its determinants: A case of farmer and non-farmer rural households of the Punjab, Pakistan. Pakistan Journal of Agricultural Sciences, 55(1), 217–225. Retrieved November 2, 2020, from https://doi.org/10.21162/PAKJAS/18.6766