www.jard.edu.pl http://dx.doi.org/10.17306/J.JARD.2017.00277

Journal of Agribusiness and Rural Development

pISSN 1899-5241
eISSN 1899-5772

1(43) 2017, 143–156

EFFECT OF AGRICULTURAL COMMERCIALIZATION ON FOOD SECURITY AMONG SMALLHOLDER FARMERS IN POLOKWANE MUNICIPALITY, CAPRICORN DISTRICT OF LIMPOPO PROVINCE, SOUTH AFRICA

Isaac Busayo Oluwatayo✉, Matshidisho Annah Rachoene

University of Limpopo

Abstract. Agricultural commercialization refers to agricultural transformation in which farmers shift from mainly consumption oriented subsistence production towards market and profit oriented production systems. This study examined the effect of agricultural commercialization on food security among smallholder farmers in Polokwane municipality of Capricorn District in South Africa. Primary data were collected using a structured questionnaire. A multistage sampling technique was employed to collect data from 56 respondents in the study area. Analytical tools employed descriptive statistics, ordinary least square regression, and logistic regression. The results showed the majority (87.5 percent) of the farmers were market oriented. The study also revealed that the number of hired labourers, farm size, government subsidies, type of mechanization, and monthly expenses had influence on commercialization in the study area. Again, age of respondents, their marital status, level of education, farm size, number of labourers employed, mechanization type, and the level of commercialization were the determinants of food security in the study area. The study therefore, recommended that smallholder farmers in Polokwane municipality should be provided with productive inputs such as land, irrigation facilities and other incentives, market information, credit facilities, and extension services to enhance commercialization. Investment in capacity building through education should also be intensified to enhance commercialization because of its positive influence.

Keywords: agricultural commercialization, food security, Polokwane municipality, smallholder farmers, South Africa

INTRODUCTION

Agriculture is an important livelihood activity to South Africans, especially to those residing in rural areas, as is the case in many of the countries in sub-Saharan Africa. Notably, among many other types, crop husbandry, nurturing of animals including fisheries, marketing, and value addition (processing) are a means to providing employment opportunity and nutritious food for an active and healthy life.

According to Campbell (1991), food insecurity exists whenever food security is limited or uncertain. Food security is a situation where a given household is able to access the required food or quantities at all times to live a healthy and active life (World Bank, 1986). While there are four different dimensions (availability, accessibility, affordability, and adequacy) of food security, it can also be defined in terms of whether it is nationwide (national) or at household level (Anderson, 1990). Food security at national level refers to the condition whereby the nation is able to manufacture, import, retain, and sustain food needed to support its population with minimum per capita nutritional standards. However, at a household level food security refers to the availability and accessibility to food in one's home (Anderson, 1990). Thus when the members of the family do not live in hunger or fear of starvation, the household is said to be food secure.

✉Ph.D. Isaac Busayo Oluwatayo, Department of Agricultural Economics and Animal Production, University of Limpopo, Private Bag X1106, Sovenga 0727, South Africa, e-mail: isaac.oluwatayo@ul.ac.za

FAO (2008) described South Africa as a food secure nation, producing enough staple foods or has the capacity to import food, if needed, in order to meet the basic nutritional requirements of its population. Although Aliber and Hart (2009) supported the argument that South Africa seems to be food secure at the national level, but the same cannot be said about households in rural areas. This is attributed to the fact many of these households are constrained by limited farm income realised from their small farms and inability to commercialize their farm operations. However, commercialization has been indicated as a catalyst to agricultural development as it enhances productivity which often leads to increased income and widens their accessibility to dietary needs. Jaleta et al. (2009) and Juma (2010) indicated that commercialization has a significant impact on improving farmers' income which is supposed to increase food consumption budget share. Studies on commercialization focusing on sub-Saharan Africa advocates market oriented smallholder commercialization as an engine in achieving sustainable poverty reduction and food security.

Agricultural commercialization is a process that is accompanied by economic growth, urbanization and withdrawal of labour from the agricultural sector (Pingali and Rosegrant, 1995). Agricultural commercialization and increased food production are the cornerstone for increasing food security. Smallholder farmers are often good at allocating resources efficiently, therefore those commercializing will contribute largely to South Africa's economic growth and food security. This will create employment opportunity which eventually enables people to afford nutritious food for a healthy life.

Zhou et al. (2013) stated that smallholder farmers, of which are dominant in most of rural areas have not fully benefited from agriculture's multiple functions because they produce at a small-scale, which excludes them from the formal market system and the related income mediated benefits because they are unable to meet increasing demand (Diao and Hazell, 2004; IFPRI, 2005). As a result, smallholders have remained subsistence oriented causing their economic contribution to be unaccounted for properly (World Bank, 2008). This is due to the fact that they face various challenges such as unfavourable historical policies and restrictive institutional factors; high transaction costs and lack of access to productive resources, finance, technology, markets, market information, technology, infrastructure and skills development services (Barrett, 2008; World Bank, 2008; Pingali, 2010; Kirsten et al., 2012).

Meanwhile, there are quite a number of problems facing smallholder farmers which often leads to declining food production and heavy post-harvest losses. Also, a sizeable number of these farmers suffer from weak connections to the market and fail to add value to their produce. They are most times dependent on the erratic rainfall, insufficient support facilities such as mechanization, transportation, and information to market their produce resulting in production losses. When these farmers depend on rainfall for increased production, they are unable to respond to increased demand because they lack assets, credit, and capital. According to Muriithi and Matz (2014), imperfections in the market, high transaction costs, climate change, pest and diseases are hindering smallholder farmers from enjoying the benefits of commercialization. Conflict of interest resulting from multiplicity of agencies hinders the overall objectives to be achieved as the priorities and objectives of the agencies are sometimes conflicting. Smallholder farmers in South Africa face quite a number of challenges that impede their growth and ability to effectively contribute to food security relative to the commercial farmers (DAFF, 2012). Some of the constraints they face relate to lack of access to land, poor physical and institutional infrastructure as well as inadequate value addition initiatives.

From the foregoing, this study attempted to provide answers to the following questions:

- What are the socioeconomic characteristics of smallholder farmers in Polokwane municipality of Capricorn District?
- What is the level of commercialization of these farmers?
- What are the determinants of commercialization among smallholder farmers in Polokwane municipality of Capricorn District?
- Does commercialization have any effect on the food security status of these smallholder farmers?

The main objective of this study is to examine the effect of agricultural commercialization on food security among smallholder farmers in Polokwane municipality of Capricorn District. The specific objectives of the study are to:

- Identify socioeconomic characteristics of the smallholder farmers in Polokwane municipality of Capricorn District.

- Assess the level of commercialization of smallholder farmers in the study area.
- Examine the determinants of commercialization of smallholder farmers in Polokwane municipality of Capricorn District.
- Analyse the effect of commercialization on food security status of smallholder farmers in Polokwane municipality of Capricorn District

LITERATURE REVIEW

The Nexus between Commercialization and Food Security

Agricultural commercialization is a cornerstone of rural development and poverty reduction and an indispensable pathway to economic growth (von Braun and Kennedy, 1994). The implication is that commercialization aims to alleviate poverty, develop the economy and maintain food security through income growth (Pender and Alemu, 2007). Govereh et al. (1999) and Okezie et al. (2008) have viewed commercialization as increasing the proportion of marketed output while Kennedy et al. (1987) view it as increasing cash crop production. Other authors view it broadly as a transition from subsistence towards market-oriented production (Brush and Turner, 1987; von Braun and Kennedy, 1994; Pingali and Rosegrant, 1995).

According to a study done by Jaleta et al. (2009) and Mathenge et al. (2010), commercialization of agriculture among smallholder farmers is assumed to lead towards more specialized production systems which are based on comparative advantages in resource use. Consecutively, specialization leads to higher productivity through economies of scale, greater learning by doing, regular interaction and exposure to new ideas through trade, and better incentives in the form of higher income, which can achieve welfare gains for smallholder farmers. Hence, commercialization is expected to affect various aspects of households that in turn influence their welfare, such as production and productivity, incomes, and food and nutrition security. Also, Kirsten et al. (1998) indicated that smallholder farmers in South Africa are often viewed in a negative light. They further emphasised that it is often equated with a backward, non-productive, non-commercial, subsistence agriculture that we find in parts of the former homeland areas. Commercialization is also viewed as an avenue to improve household food security due to its comparative advantages over subsistence production (Kirimi et al., 2013). Malumfashi and Kwara (2013) on the other hand examined the impact of agricultural commercialization on food security in Nigeria using the Ordinary Least Square regression method. The study findings showed that food security was influenced by domestic food production, food import, and agricultural commercialization. In other words, there was a positive relationship between agricultural commercialization and food security.

Food Security Situation in South Africa

FAO (2008) revealed that about 20% of South African households have inadequate or severely inadequate food access and Limpopo province was one of the provinces that had the least food security problems in 2008, constituting about 11.9%. It was reported that high unemployment rate, inadequate social welfare systems, and a high HIV/AIDS infection rate are the contributory factors to food insecurity in the country.

Various food security indicators have been used to assess the food security status of the households in Limpopo province such as the Household Food Insecurity Access Scale (HFIAS) and the Household Dietary Diversity Score (HDDS) (De Cock et al., 2013). The HFIAS score is a continuous measure of the degree of food (access) insecurity (Coates et al., 2007). Food insecurity occurs if the means are insufficient and is, therefore, closely related to wide-spread poverty. The households may lack the means (e.g. land, manpower, access to water, knowledge, technology) to produce enough food on their own, and/or the purchasing power to buy the food they need in the market. The HDDS reflects the number of different food items or food groups consumed by the household over a given reference period (Ruel, 2003). These include consumption of the food items at home, or home prepared but consumed outside the home.

METHODOLOGY

The study was conducted in Polokwane local municipality of Capricorn district in the Limpopo province. According to SACN (2011), Polokwane municipality accounts for 3% of the total surface area of Limpopo, however, over 10% of the population of Limpopo resides within its boundaries. The municipality has the highest population density in the Capricorn District and serves as the economic hub. Polokwane municipality is

23% urbanised and 71% rural and the largest sector of the community within the municipality resides in rural tribal villages, followed by urban settlements. According to Census… (2011), Polokwane municipality covers a surface area of 37696 km^2 and has a population of 628 999.

Primary data were obtained through the use of structured questionnaires administered through personal interviews with 56 farmers. A multistage sampling technique was employed to collect data in Polokwane Municipality because the total number of people (population) living in the study area is unknown.

The following analytical tools were used to analyse the data: descriptive statistics, ordinary least squares (OLS), household dietary diversity scores (HDDS), and the logistic regression model.

Descriptive statistics was used to analyse the information collected on the socioeconomic characteristics of smallholder farmers in Polokwane municipality of Capricorn district and it was also used to assess the level of commercialization of these smallholder farmers. The household commercialization index (HCI) was used to determine the specific level of commercialization per household. The index measures the ratio of the value of output sold in the market by a household in a year to the total estimated value of farm production by the same household in the same year expressed as a percentage. According to Govereh et al. (1999) and Strasberg et al. (1999), the index measures the extent to which a household is oriented towards the market. Therefore, the value of zero represents a totally subsistence oriented household and the closer the index is to 100, the higher the degree of commercialization. The index is specified as:

$$HCI = \frac{\text{value of sold in the market by household in a year}}{\text{value of the total estimated farm production by household in a year}} \times 100$$

The ordinary least squares (OLS) was used to examine the determinants of commercialization of smallholder farmers in Polokwane municipality of Capricorn district, represented by the function $Y = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_8, X_{10}, X_{11}, X_{12}, X_{13}, X_{14}, X_{15} .... \varepsilon i)$.

Using the variables in Table 1 below the specific model is written as:

Table 1. Description of variables
Tabela 1. Opis zmiennych

Variable – Zmienna	Description – Opis	Measurement – Pomiar
1	2	3
Dependent variable – Zmienna zależna		
Level of commercialization Poziom komercjalizacji	Share of output sold in the market to total output Stosunek produkcji sprzedanej na rynku do produkcji całkowitej	Continuous variable Zmienna ciągła
Independent variables – Zmienne niezależne		
AGE Age (X_1) – Wiek (X_1)	Age of respondent in years Wiek respondentów w latach	Years Lata
GNDR Gender (X_2) – Płeć (X_2)	1= if male, 0= otherwise 1 = mężczyzna, 0 w przeciwnym razie	Dummy variable Zmienna zerojedynkowa
MS Marital status (X_3) Stan cywilny (X_3)	1 = if respondent is married, 0 = otherwise 1 = respondent w związku małżeńskim, 0 = w przeciwnym razie	Dummy variable Zmienna zerojedynkowa
YOE Years of formal education (X_4) Liczba lat edukacji formalnej (X_4)	Years of formal education Liczba lat edukacji formalnej	Continuous variable Zmienna ciągła

Table 1 cont. – Tabela 1 cd.

1	2	3
HHS Household size (X_5) Wielkość gospodarstwa (X_5)	The number of people living together in the same house Liczba osób wspólnie zamieszkujących gospodarstwo	Numbers Liczba
NHL Number of hired labourers (X_6) Liczba zatrudnionych robotników (X_6)	The number of people employed on the farm Liczba osób zatrudnionych w gospodarstwie	Numbers Liczba
FS Farm size (X_7) Wielkość gospodarstwa (X_7)	Size of area used for agricultural purposes Obszar wykorzystywany do celów rolniczych	Hectares Hektary
WA Water access (X_8) Dostęp do wody (X_8)	1 = if respondent has access to water, 0 = otherwise 1 = respondent ma dostęp do wody, 0 = w przeciwnym razie	Dummy variable Zmienna zerojedynkowa
CA Credit access (X_9) Dostęp do kredytu (X_9)	1 = if respondent has access to credit,0 = otherwise 1 = respondent ma dostęp do kredytu, 0 = w przeciwnym razie	Dummy variable Zmienna zerojedynkowa
MEMOFCO Member of cooperative (X_{10}) Członkostwo w spółdzielni (X_{10})	1 = if respondent is a member of cooperative, 0 = otherwise 1 = respondent jest członkiem spółdzielni, 0 = w przeciwnym razie	Dummy variable Zmienna zerojedynkowa
LRI Land renting involvement (X_{11}) Dzierżawa gruntów (X_{11})	1 = if respondent is involved in land renting, 0 = otherwise 1 = respondent dzierżawi grunty, 0 = w przeciwnym razie	Dummy variable Zmienna zerojedynkowa
ESA Extension service access (X_{12}) Dostęp do usług upowszechniania wiedzy (X_{12})	1 = if respondent has access to extension service, 0 = otherwise 1 = respondent ma dostęp do usług upowszechniania wiedzy, 0 = w przeciwnym razie	Dummy variable Zmienna zerojedynkowa
GOVSUB Government subsidies (X_{13}) Dotacje rządowe (X_{13})	1 = if respondent receives government subsidies, 0 = otherwise 1 = respondent otrzymuje dotacje rządowe, 0 = w przeciwnym razie	Dummy variable Zmienna zerojedynkowa
MECNTYP Mechanization type (X_{14}) Rodzaj mechanizacji (X_{14})	1 = human power, 2 = draught animal power, 3 = mechanical power 1 = praca ludzka, 2 = praca zwierząt pociągowych, 3 = praca urządzeń mechanicznych	Categorical Kategorie
MONEXP Monthly expenditure (X_{15}) Wydatki miesięczne (X_{15})	Amount of money spent monthly on the farm Kwota wydawana co miesiąc przez gospodarstwo	Rand (ZAR)

$$\text{LEVEL OF COMMERCIALIZATION} = \beta_0 + \beta_1 \text{AGE} + \beta_2 \text{GNDR} + \beta_3 \text{MS} + \beta_4 \text{YOE} + \beta_5 \text{HHS} + \beta_6 \text{NHL} + \beta_7 \text{FS} + \beta_8 \text{WA} + \beta_9 \text{CA} + \beta_{10} \text{MEMOFCO} + \beta_{11} \text{LRI} + \beta_{12} \text{ESA} + \beta_{13} \text{GOVSUB} + \beta_{14} \text{MECNTYP} + \beta_{15} \text{MONEXP} + \varepsilon i$$

The Logistic regression model was used to analyse the effects of agricultural commercialization on food security status of smallholder farmers in Polokwane municipality of Capricorn district. The general theoretical logistic regression model is given as

$$Y = \text{In} \left(\frac{P_a}{1 - P_a}\right)$$

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \ldots + \beta_K X_K + U_i$$

$$\text{In} \left(\frac{P_a}{1 - P_a}\right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \ldots + \beta_K X_K + U_i$$

Where:

Y – the dependent variable (food security status of respondent)

P_a – the probability that there agricultural commercialization of smallholder farmers has no significant impact on food security.

In the natural logarithm function:

$\beta_0 – x_2$ the intercept of the model

$\beta_1 – B_K$ regression coefficients

$X_1 – X_k$ the independent variables

U_i– the error term.

Estimation of food security status

Dietary diversity score was employed to measure food security status of respondents over a reference period of three days. According to Ruel (2003), dietary diversity is defined as the number of individual food items or food groups consumed over a given reference period. HDDS was calculated by summing the number of selected food items in the food groups consumed by a household over the summation of the total number of food items in the food groups over a reference period of three days. The study focused on four food groups, namely carbohydrates, vitamins, proteins, and fats. Each food group consist of 12 food items. A household must consume a minimum of 6 food items in each food group for it to be food secured. Therefore, a household that has consumed a minimum of 24 food items out of 48 is assumed to be food secured. This HDDS is an indication of economic access to food because the financial capability of an individual determines how varied his/her diet would be.

Food security as a dependent variable is regressed on commercialization and other instrumental variables. In its implicit form, the model is given as:

$$\text{FOOD SECURITY} = f(\text{AGE, GNDR, MS, YOE, HHS, NHL, FS, WA, CA, MEMOFCO, LRI, ESA, GOVSUB, MECNTYP, MONEXP, LOC})$$

In stochastic form, it is given as:

$$\text{FOOD SECURITY} = \beta_0 + \beta_1\text{AGE} + \beta_2\text{GNDR} + \beta_3\text{MS} + \beta_4\text{YOE} + \beta_5\text{HHS} + \beta_6\text{NHL} + \beta_7\text{FS} + \beta_8\text{WA} + \beta_9\text{CA} + \beta_{10}\text{MEMOFCO} + \beta_{11}\text{LRI} + \beta_{12}\text{ESA} + \beta_{13}\text{GOVSUB} + \beta_{14}\text{MECNTYP} + \beta_{15}\text{MONEXP} + \beta_{16}\text{LOC} + U_i$$

Table 2. Description of variables
Tabela 2. Opis zmiennych

Variable Zmienna	Description Opis	Measurement Pomiar
1	2	3
Dependent variable – Zmienna zależna		
Food security (Y) Bezpieczeństwo żywnościowe (Y)	Food security status will be measured using dietary diversity index Stan bezpieczeństwa żywnościowego jest mierzony za pomocą wskaźnika urozmaicenia spożycia żywności	Dummy variable, where: 1 = if respondents are food secure 0 = otherwise Zmienna zerojedynkowa, 1 = respondent ma zapewnione bezpieczeństwo żywnościowe, 0 = w przeciwnym razie
Independent variables – Zmienne niezależne		
AGE Age (X_1) – Wiek (X_1)	Age of respondent in years Wiek respondentów w latach	Years Lata
GNDR Gender (X_2) – Płeć (X_2)	1 = if male, 0 = otherwise 1 = mężczyzna, 0 = w przeciwnym razie	Dummy variable Zmienna zerojedynkowa

Table 2 cont. – Tabela 2 cd.

1	2	3
MS Marital status (X_3) Stan cywilny (X_3)	1 = if respondent is married, 0 = otherwise 1 = respondent w związku małżeńskim, 0 = w przeciwnym razie	Dummy variable Zmienna zerojedynkowa
YOE Years of formal education (X_4) Liczba lat edukacji formalnej (X_4)	Years of formal education Liczba lat edukacji formalnej	Continuous variable Zmienna ciągła
HHS Household size (X_5) Wielkość gospodarstwa (X_5)	The number of people living together in the same house Liczba osób wspólnie zamieszkujących gospodarstwo	Numbers Liczba
NHL Number of hired labourers (X_6) Liczba zatrudnionych robotników (X_6)	The number of people employed on the farm Liczba osób zatrudnionych w gospodarstwie	Numbers Liczba
FS Farm size (X_7) Wielkość gospodarstwa (X_7)	Size of area used for agricultural purposes Obszar wykorzystywany do celów rolniczych	Hectares Hektary
WA Water access (X_8) Dostęp do wody (X_8)	1 = if respondent has access to water, 0 = otherwise 1 = respondent ma dostęp do wody, 0 = w przeciwnym razie	Dummy variable Zmienna zerojedynkowa
CA Credit access (X_9) Dostęp do kredytu (X_9)	1 = if respondent has access to credit, 0 = otherwise 1 = respondent ma dostęp do kredytu, 0 = w przeciwnym razie	Dummy variable Zmienna zerojedynkowa
MEMOFCO Member of cooperative (X_{10}) Członkostwo w spółdzielni (X_{10})	1 = if respondent is a member of cooperative, 0 = otherwise 1 = respondent jest członkiem spółdzielni, 0 = w przeciwnym razie	Dummy variable Zmienna zerojedynkowa
LRI Land renting involvement (X_{11}) Dzierżawa gruntów (X_{11})	1 = if respondent is involved in land renting, 0 = otherwise 1 = respondent dzierżawi grunty, 0 = w przeciwnym razie	Dummy variable Zmienna zerojedynkowa
ESA Extension service access (X_{12}) Dostęp do usług upowszechniania wiedzy (X_{12})	1 = if respondent has access to extension service, 0 = otherwise 1 = respondent ma dostęp do usług upowszechniania wiedzy, 0 = w przeciwnym razie	Dummy variable Zmienna zerojedynkowa
GOVSUB Government subsidies (X_{13}) Dotacje rządowe (X_{13})	1 = if respondent receives government subsidies, 0 = otherwise 1 = respondent otrzymuje dotacje rządowe, 0 = w przeciwnym razie	Dummy variable Zmienna zerojedynkowa
MECNTYP Mechanization type (X_{14}) Rodzaj mechanizacji (X_{14})	1 = Human power 2 = Draught animal power 3 = Mechanical power 1 = praca ludzka 2 = praca zwierząt pociągowych 3 = praca urządzeń mechanicznych	Categorical Kategorie
MONEXP Monthly expenditure (X_{15}) Wydatki miesięczne (X_{15})	Amount of money spent monthly on the farm Kwota wydawana co miesiąc przez gospodarstwo	Rand (ZAR)
LOC Level of commercialization (X_{16}) Poziom komercjalizacji (X_{16})	Share of output sold Udział produkcji sprzedanej	Continuous variable Zmienna ciągła

RESULTS AND DISCUSSION

Socioeconomic Characteristics of Respondents

Analysis of the age categories of sampled smallholder farmers (respondents) show 17.9% of smallholder farmers in Polokwane Local Municipality were below 31 years of age. Those that fell within the age range of 31–40 years accounted for 8.9%, about 26.8% of the respondents were of the age range of 41–50 years while about 19.6% of the respondents were of the age range of 51–60 and the remaining 26.8% of the respondents were above 60 years of age. The implication of these findings is that the majority of the respondents belong to the middle aged group and old age group. This is an advantage because the middle aged group are usually very active and productive with more energy to channel into agricultural production activities. Also, the older group is likely to have more experience in farm activities which may also enhance productivity.

Participation of males (62.5 percent) in agricultural production in the study area was greater than that of the females (37.5 percent). This shows that more males are involved in agricultural practices than females. This might be due to the fact that females do more of the marketing than the males, or that the females do engage more in the house chore works. A further analysis of data showed that 41.1 percent of the respondents were married, 17.9% were single, 25% were widowed, 3.6% were divorced while12.5% were separated. The implication of this finding was that most of the farmers were married and they make use of family members as labour. This act will increase their productivity to favour high marketable surplus (agricultural commercialization) and to reduce their labour costs. Being married determines the capability of the farm households to allocate all their resources efficiently on both farm and non-farm activities to boost the household income. Also, the results revealed that 8.9% of the farmers attended primary school and about 50% of the respondents attended secondary school while the remaining 41.1% had tertiary education. This had a great effect on the level of diversification of farmers to minimize risk, generate more income, and increase their production volume to favour agricultural commercialization.

Data analysis shows that those who had between zero and four people in the family consisted 60.7% of the respondents. About 25% of the respondents had between five and eight people in the family, while about 14.3% had over eight people in the family. The relatively small household size of the farmers is an advantage, since it's likely to enable the farmers to have a higher level of commercialization. Larger households with many dependents are likely to have a lower level of commercialization because more of the farm produce is likely to be allocated for home consumption rather than the market (Lapar et al., 2003).

The result from data analysis indicate that 60.7% belonged to a farmer cooperative while 39.3% did not belong to any famer cooperative. This implies there is an advantage for the members of the cooperative to access information about available market opportunities and extension services as well as information important to production (Peterson, 1997).

Moreover, it was revealed that 42.9 percent of the respondents operate on a farm size that is greater than five hectares. About 21.4% of farmers operate on farm size range of 0–1 hectares, 19.6 percent on a farm size range of 1.1–2 hectares, 7.1 percent on a farm size range of 2.1–3 hectares, 5.4 percent on a farm size range between 3.1–4 hectares whilst 3.6 percent of farmers operate on a farm size ranging between 4.1–5 hectares. Therefore, the farmers with a larger farm size are like to enjoy the benefits of commercialization.

Level of commercialization among respondents

When measuring a specific level of commercialization of a household, household commercialization index (HCI) is used, this is a ratio of the value of the output sold per household per year to the total estimated value of farm production. This index has been used in the past by Agwu et al. (2012). The results showed that 12.5 percent of the households had a ratio below 50 implying that there is a low level of orientation towards agricultural commercialization and 87.5 percent of them had a ratio above 49 implying that there is a high level of orientation towards agricultural commercialization in the study area. According to Govereh et al. (1999) and Strasberg et al. (1999), the closer the index is to 100, the higher the level of commercialization.

Determinants of Commercialization

The ordinary least squares (OLS) model was used to estimate the factors that determine the commercialization of the smallholder farmers. In this study, the adjusted R^2

was 27%, the F-test was 4.40 and the overall model was significant in the explanation of the dependent variable (yield on commercializing) at 10%. The result for the OLS model is summarized in Table 3. The coefficient of number of hired labourers was significant at 10% with a positive sign indicating that the higher the number of the labourers employed, the higher level of commercialization. The coefficient of farm size was also seen to be significant at 1% with a negative sign. This implies that commercialization decreases as farm size increases.

Table 3. Determinants of commercialization (OLS Regression Result)
Tabela 3. Uwarunkowania komercjalizacji (wynik regresji opartej na zwykłej metodzie najmniejszych kwadratów)

Explanatory variables Zmienne objaśniające	Coefficient Współczynnik	Standard error Błąd standardowy	t-ratio Wskaźnik t
Age (X_1) – Wiek (X_1)	–1.482	2.694	–0.550
Gender (X_2) – Płeć (X_2)	5.739	7.256	0.791
Marital status (X_3) – Stan cywilny (X_3)	0.978	3.212	0.304
Years of formal education (X_4) Liczba lat edukacji formalnej (X_4)	–0.471	6.551	0.072
Household size (X_5) Liczba osób w gospodarstwie (X_5)	–10.00	6.100	1.639
Number of hired labourers (X_6) Liczba zatrudnionych robotników (X_6)	7.980*	4.087	1.953
Farm size (X_7) – Wielkość gospodarstwa (X_7)	–5.401***	1.773	3.046
Water access (X_8) – Dostęp do wody (X_8)	5.863	9.309	0.630
Credit access (X_9) – Dostęp do kredytu (X_9)	–16.085	9.407	–1.710
Membership of cooperative (X_{10}) Członkostwo w spółdzielni (X_{10})	–11.273	8.949	–1.260
Land renting involvement (X_{11}) Dzierżawa gruntów (X_{11})	–9.460	11.604	–0.815
Extension service access (X_{12}) Dostęp do usług upowszechniania wiedzy (X_{12})	5.464	3.696	1.478
Government subsidies (X_{13}) Dotacje rządowe (X_{13})	14.969*	7.635	1.961
Mechanization type (X_{14}) Rodzaj mechanizacji (X_{14})	8.233*	4.326	1.903
Monthly expense (X_{15}) Wydatki miesięczne (X_{15})	6.214***	2.255	2.756
Constant – Stała	98.982	24.374	4.061
No of observations – Liczba obserwacji = 56			
Adjusted R^2 – Skorygowany współczynnik R^2 = 27%			
F-test – Wynik testu F = 4.397			

*** and * are significant levels at 1% and 10%, respectively.
Source: own calculations from survey data.
*** i * oznaczają zmienne istotne odpowiednio na poziomach prawdopodobieństwa 1% i 10%.
Źródło: obliczenia własne na podstawie danych ankietowych.

This is due to the low level of mechanization among the farmers.

Meanwhile, the coefficient of government subsidies was seen to be significant at 10% with a positive sign. The implication is that an increase in government subsidy encourages farmers to increase production which invariably enhances commercialisation. There exists a positive and statistically significant relationship between type of mechanization and commercialization. Most of the farmers who had access to mechanization had the advantage of ploughing larger areas in a short period of time, e.g. for dry land farmers, access to mechanization made it possible for them to catch-up with the rainy season. Mechanization improves the ease of cultivation of larger areas which in turn increased the yields and consequently the commercialization. The coefficient farmer's monthly expenditure was also seen to be significant at 10%. The farmer's monthly expenditure on agricultural activities was positively associated with the likelihood for a farmer to commercialize his or her produce.

Relationship between Commercialization and Food Security

The LR test shows whether the model as a whole predicts the percentage contribution of the explanatory variables to the dependent variable or not. Several independent variables had a significant influence on the probability of being food secured. The log likelihood is –28.41 indicating that 28% of the variables were not predicted correctly. The LR chi-square is 16.17 which means that the model is of good fit since the rule of the thumb says the chi-square has to be <30.

The coefficients which measured the strength and the direction of the relationship between the dependent and independent variable are outlined. The following seven out of the sixteen hypothesized variables had an impact on the food security status of the smallholder farmers: age, marital status, level of education, farm size and the number of labourers employed, mechanization type, and the level of commercialization.

Age was seen to be significant at 10% with a negative sign. This implies that there is a negative relationship between age and the probability that the farmer could be food insecure. The marital status had an influence on the effect of commercializing agriculture on food security status of the farmers. Being married determines the capability of the farm households to allocate all their resources efficiently on both farm and non-farm activities to boost the household income. The coefficient of marital status was significant at 5% with a negative sign. This implies that there is a negative relationship between marital status and the probability of the farmer to be food secure.

Education is one of the fundamental factors that can enable a farmer to easily understand basic farm and financial management, agricultural marketing principles, and the ability to create business networks. In other words, education level has the ability to improve the competitiveness of the farmer in order to generate farm income. A higher level of education is associated with more knowledge, and access to information increases, hence commercialization. With commercialization, food can be available at all times. In most instances, farmers with secondary education can easily understand the dynamics of farming for business purposes and can be easily trained, unlike those with primary education only. Low levels of education hinder smallholder farmers' ability to respond to new business opportunities or improved methods of doing farm business and production. As a result, this negatively affects participation in the formal markets.

The Level of education of the head of the household is positively and significantly associated with the participation of a farmer in commercialization at 10%. This is supported by previous studies. Several studies have found a direct relationship between the level of education and successful performance in farming (Mintzberg, 1989; Montshwe et al., 2005; Bizimana et al., 2004 and Mohammed and Ortmann, 2005). Human capital, represented by the household head's formal education (at least secondary level) is known to increase a household's understanding of market dynamics and therefore improve decisions about the amount of output sold (Makhura et al., 2001). These results are consistent with findings by Suri et al. (2009) that having more than a primary education is a key driver in reducing the probability of a household ever being poor. Therefore, the highest level of education of the head of the household influences smallholder farmers' participation in commercialization positively thus increasing the probability of the farmer to be food secure.

The coefficient of farm size was also seen to be significant at 10% with a positive sign. This implies that the probability of commercialization is likely to increase as the size of the farm increases. Thus, farmers with large

Table 4. Commercialisation as Determinants of Food Security (Logistic regression results)
Tabela 4. Komercjalizacja jako czynnik warunkujący bezpieczeństwo żywnościowe (wyniki regresji logistycznej)

Explanatory variables Zmienne objaśniające	Coefficient Współczynnik	Standard error Błąd standardowy	t-ratio Wskaźnik t
Age (X_1) – Wiek (X_1)	–0.411*	0.218	–1.885
Gender (X_2) – Płeć (X_2)	–0.268	0.659	–0.407
Marital status (X_3) Stan cywilny (X_3)	–0.555**	0.268	–2.071
Years of formal education (X_4) Liczba lat edukacji formalnej (X_4)	0.884*	0.485	1.823
Household size (X_5) Liczba osób w gospodarstwie (X_5)	–0.407	0.428	–0.951
Number of hired labourers (X_6) Liczba zatrudnionych robotników (X_6)	0.706*	0.354	1.994
Farm size (X_7) Wielkość gospodarstwa (X_7)	0.254*	0.145	1.752
Water access (X_8) Dostęp do wody (X_8)	–1.028	1.021	–1.007
Credit access (X_9) Dostęp do kredytu (X_9)	1.368	1.088	1.257
Membership of cooperative (X_{10}) Członkostwo w spółdzielni (X_{10})	–0.414	0.618	–0.670
Land renting involvement (X_{11}) Dzierżawa gruntów (X_{11})	0.061	0.809	0.075
Extension service access (X_{12}) Dostęp do usług upowszechniania wiedzy (X_{12})	–0.005	0.245	–0.020
Government subsidies (X_{13}) Dotacje rządowe (X_{13})	–1.023	0.908	–1.127
Mechanization type (X_{14}) Rodzaj mechanizacji (X_{14})	1.040**	0.471	2.208
Monthly expense (X_{15}) Wydatki miesięczne (X_{15})	–0.234	0.193	–1.212
Level of commercialization (X_{16}) Poziom komercjalizacji (X_{16})	–0.255*	0.115	–2.217
Constant – Stała	–2.550	1.277	–1.997
No of observations – Liczba obserwacji = 56			
Log likelihood – Logarytm naturalny wiarygodności = –28.414526			
LR chi^2 (3) – Wskaźnik wiarygodności testu chi^2 (3) = 16.17			
Pseudo R^2 = 0.2215			

** and * are significant levels at 5% and 10%, respectively.
Source: own computation from survey data.
** i * oznaczają zmienne istotne odpowiednio na poziomach prawdopodobieństwa 5% i 10%.
Źródło: obliczenia własne na podstawie danych ankietowych.

farm sizes are likely to be food secure. The coefficient higher number of hired labourers is significant at 10% with a positive sign. A higher number of the labourers employed have the ability to attain higher levels of commercialization. Thus, they will be able to respond to consumption needs and food will be available. There is a positive relationship between type of mechanization used and the level of commercialization. The type of mechanization used has the capability of increasing the level of commercialization, thus increasing the probability of the farmer to be food secured.

The results show a negative relationship between agricultural commercialization and food security. The coefficient agricultural commercialization is significant at 10%. This implies that a low degree of commercialization brought about low revenue to farmers, which makes it difficult for them to purchase the required inputs for increased food production. In addition, generated revenue will not provide a means to increased access to a variety of food stuffs in the market.

CONCLUSIONS AND RECOMMENDATIONS

The study examined the effects of agricultural commercialization on food security of smallholder farmers in Polokwane municipality of Capricorn District. The results of the descriptive statistics revealed that agricultural production in the study area is dominated by men, 62.5% of the respondents being male. The majority of the farmers belonged to the middle as well as the old aged group and most of the farmers were married. It was revealed that half of the respondents have secondary education, while 41.1% had tertiary education. The findings indicate that 60.7% belonged to a farmer cooperative. The majority (87.5 percent) of the respondents have a high orientation towards agricultural commercialization.

The results of OLS regression model revealed that the number of hired labourers, farm size, government subsidies, type of mechanization, and monthly expense had an impact on commercialization of smallholder farmers and was found to be significant. Meanwhile, the results of logistic regression model showed age, marital status, level of education, farm size and the number of labourers employed, mechanization type, and the level of commercialization were the determinants of food security status of the smallholder farmers.

Based on the findings of this study, it is therefore recommended that:

1. Increased and unhindered access to land should be priotized so that the much needed increase in production scale becomes achievable. The more the production, the more the likelihood of commercialization among the farmers.

2. Government should provide production inputs and subsidies especially mechanization so as to enhance production and commercialisation.

3. Increased investment in education to boost the capacity of farmers is important since this will enhance better adoption of innovations which will translate to higher productivity and eventually enhanced commercialization.

REFERENCES

Agwu, N. M., Anyanwu, C. I., Mendie, E. I. (2012). Socioeconomic Determinants of Commercialization among Small Holder Farmers in Abia State, Nigeria. Green. J. Agric. Sci., 2(8), 392–397.

Aliber, M., Hart, T. G. B. (2009). Should subsistence agriculture be supported as a Strategy to Address Rural Food Insecurity? Agrekon, 48(4), 434–458.

Anderson, S. A. (1990). Core Indicators of Nutritional State for Difficult-to-sample Populations. J. Nutr., 120, 1559–1600.

Barrett, C. (2008). Smallholder Market Participation: Concepts and Evidence from Eastern and Southern Africa. Food Polic., 33, 299–317.

Bizimana, C., Nieuwoudt, W. L., Ferrer, S. R. D. (2004). Farm Size, Land Fragmentation and Economic Efficiency in Southern Rwanda. Agrekon, 43(2), 244–262.

Brush, S. B., Turner, B. L. (1987). The Nature of Farming Systems and Views of their Change. In: S. B. Brush, B. L. Turner (Eds.), Comparative farming systems. New York: Guilford Press.

Campbell, C. C. (1991). Division of Nutritional Sciences. J. Nutr., 121(3), 408–415.

Census by district council, gender, age in 5 year groups and population group (2011). Statistics South Africa. Retrieved Aug 6th 2014 from: https://unstats.un.org/unsd/demographic/sources/census/wphc/Uganda/UGA-2016-05-23.pdf

Coates, J., Swindale, A., Bilinsky, P. (2007). Household Food Insecurity Access Scale (HFIAS) for Measurement of Household Food Access: Indicator Guide (v3). Washington, DC.

DAFF (2012). A Framework for the Development of Smallholder Farmers through Cooperative Development. Directorate of Co-operative and Enterprise Development,

Department of Agriculture, Forestry and Fisheries, Pretoria, South Africa, July 2012.

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.

Diao, X., Hazell, P. (2004). Exploring Market Opportunities for African Smallholders. 2020 Africa Conference Brief No. 6. Washington, DC: IFPRI.

FAO (2008). Food Security Report, South Africa.

Govereh, J., Jayne, T. S., Nyoro, J. (1999). Smallholder commercialization, interlinked markets and food crop productivity: Cross-country evidence in eastern and southern Africa. Published by the Department of Agricultural Economics and the Department of Economics. USA: Michigan State University (MSU).

IFPRI (2005). The Future of Small Farms: Proceedings of a research workshop. Wye, UK, Washington, DC: International Food Policy Research Institute.

Jaleta, M., Gebremedhin, B., Hoekstra, D. (2009). Smallholder Commercialization: Processes, Determinants and Impact. Discussion Paper No. 18. Improving Productivity and Market Success (IPMS) of Ethiopian Farmers Project. ILRI: Nairobi, Kenya.

Juma, C. (2010). The New Harvest: Agricultural Innovation in Africa: Oxford University Press.

Kennedy, E., Eileen, T., Cogill, B. (1987). Income and Nutritional Effects of Commercialization of Agriculture in South-western Kenya. Research Report 63. Washington: International Food Policy Research Institute.

Kirimi, L., Gitau, R., Olunga, M. (2013). Household Food Security and Commercialization among Smallholder Farmers in Kenya. Paper prepared for the 4th International Conference of the African Association of Agricultural Economics.

Kirsten, J., Mapila, M., Okello, J. (2012). Managing agricultural commercialization for inclusive growth in Sub-Saharan Africa. Policy research paper 1. New Delhi, India: The Global Development Network.

Kirsten, J., van Zyl, J., Vink, N. (Eds.). (1998). Agricultural democratisation in South Africa. Cape Town: Africa Institute for Policy Analysis and Economic Integration.

Lapar, M. L., Holloway, G., Ehui, S. (2003). Policy options promoting market participation among smallholder livestock producers: A case study from the Philippines. Food Polic., 28, 187–211.

Makhura, M. T., Kirsten, J., Delgado, C. (2001). Transaction costs and smallholder participation in the maize market in the Northern Province of South Africa. Paper presented at the Seventh Eastern and Southern Africa Regional Maize Conference, 11–15 February 2002. Department of Agricultural Economics. Pretoria: University of Pretoria.

Malumfashi, A. H., Kwara, M. A. (2013). Agricultural Commercialization and Food Security in Nigeria. Int. Jour. Adv. Res. Mgt. Soc. Sci., 2(7), 111–120.

Mathenge, M., Place, F., Olwande, J., Mithoefer, D. (2010). Participation in Agricultural Markets among the Poor and Marginalized: Analysis of Factors Influencing Participation and Impacts on Income and Poverty in Kenya, a study report. Nairobi: Tegemeo Institute of Agricultural Policy and Development.

Mintzberg, H. (1989). Mintzberg on Management: Inside our Strange World of Organisations. Canada: Collier Maclimann, Inc.

Mohammed, M. A., Ortmann, G. F. (2005). Factors Influencing Adoption of Livestock Insurance by Commercial Dairy Farmers in Three Zobatat of Eritrea. Agrekon, 44(2).

Montshwe, B. D., Jooste, A., Alemu, Z. G. (2005). An Econometric Analysis of Determinants of Market Participation within the South African Small-Scale Cattle Sub Sector. A paper presented at the 43rd AEASA conference, Limpopo Polokwane, September 21–23, 2005.

Muriithi, B. W., Matz, J. A. (2014). Smallholder Participation in the Commercialisation of Vegetables: Evidence from Kenyan Panel Data. Quart. J. Int. Agric., 53(2), 141–168.

Okezie, C. A., Nwonsu, A. C., Okezie, C. R. (2008). An assessment of the extent of Commercialization of Agriculture in Abia State. Niger. Agric. J., 3(2), 129–133.

Pender, J., Alemu, D. (2007). Determinants of smallholder commercialization of food crops: Theory and evidence from Ethiopia. IFPRI Discussion Papers, No. 75. Washington DC, USA: International Food Policy Research Institute.

Peterson, W. (1997). The context of extension in agricultural and rural development. In: B. E. Swanson, R. P. Bentz, A. J. Sofranko (Eds.), Improving Agricultural Extension: A Reference Manual (p. 21–26). Rome: Food and Agriculture Organisation of the United Nations.

Pingali, P. L. (2010). Agriculture Renaissance: Making "Agriculture for Development" Work in the 21st Century. Elsevier.

Pingali, P. L., Rosegrant, M. W. (1995). Agricultural commercialization and diversification: Processes and Policies. Food Polic., 20 (3), 171–185.

Ruel, M. T. (2003). Operationalizing dietary diversity: A review of measurement issues and research priorities. J. Nutr., 133, 3911S–3926S.

SACN (2011). Polokwane: City of Resilience and Middle Class Bling? South African Cities Network (SACN) Publication, 50pp, www.sacities.net.

Strasberg, P. J., Jayne, T. S., Yamano, T., Nyoro, J., Karanja, D., Strauss, J. (1999). Effects of agricultural commercialization on food crop input use and productivity in Kenya.

Michigan State University International Development Working Papers No. 71. Michigan, USA.

Suri, T., Dave, T., Irungu, C., Gitau, R., Kariuki, D. (2009). Rural Incomes, Inequality and Poverty Dynamics in Kenya, Tegemeo Institute of Agricultural Policy and Development, Working Paper No. 30/2008, Nairobi.

Von Braun, J., Kennedy, E. (Eds.) (1994). Agricultural commercialization, economic development and nutrition. Baltimore Maryland: IFPRI, Johns Hopkins University Press.

World Bank (1986). Poverty and hunger: Issues and options for food security in developing countries. A World Bank Policy study, World Bank, Washington DC, USA.

World Bank (2008). World Development Report 2008: Agriculture for development. 1818 H Street, NW, Washington, DC 20433, USA.

Zhou, S., Minde, I. J., Mtigwe, B. (2013). Smallholder agricultural commercialization for income growth and poverty alleviation in southern Africa. Afr. J. Agric. Res., 8(22), 2599–2608.

WPŁYW KOMERCJALIZACJI ROLNICTWA NA BEZPIECZEŃSTWO ŻYWNOŚCIOWE MAŁYCH GOSPODARSTW ROLNYCH W GMINIE POLOKWANE Z OKRĘGU CAPRICORN W POŁUDNIOWOAFRYKAŃSKIEJ PROWINCJI LIMPOPO

Streszczenie. Pojęcie komercjalizacji rolnictwa oznacza transformację branży rolnej, w ramach której rolnicy przechodzą od produkcji ukierunkowanej głównie na konsumpcję i własne potrzeby do systemów rynkowych zorientowanych na zysk. Niniejsze badanie dotyczy wpływu komercjalizacji rolnictwa na bezpieczeństwo żywnościowe małych gospodarstw rolnych w gminie Polokwane z okręgu Capricorn w RPA. Dane podstawowe zostały zebrane za pomocą ustrukturyzowanego kwestionariusza. Zastosowano technikę wieloetapowego pobierania próbek w celu zgromadzenia informacji od 56 respondentów z obszaru objętego badaniem. W ramach narzędzi analitycznych wykorzystano metody statystyki opisowej, regresję opartą na zwykłej metodzie najmniejszych kwadratów i regresję logistyczną. Jak pokazują wyniki, większość (87,5%) rolników prowadziła działalność ukierunkowaną na rynek. W badaniu wykazano również, że wpływ na komercjalizację w badanym obszarze miały następujące czynniki: liczba zatrudnionych robotników, wielkość gospodarstwa, dotacje rządowe, rodzaj mechanizacji oraz wydatki miesięczne. Natomiast czynnikami decydującymi o bezpieczeństwie żywnościowym w tym obszarze były wiek, stan cywilny i poziom wykształcenia respondentów, wielkość gospodarstwa, liczba zatrudnionych robotników, rodzaj mechanizacji oraz stopień komercjalizacji. W ramach niniejszego badania zaleca się zatem, aby rolnikom z małych gospodarstw rolnych z gminy Polokwane zapewnić środki produkcji, takie jak ziemia i urządzenia do nawadniania, jak również inne bodźce zachęcające, informacje rynkowe, narzędzia kredytowe oraz usługi upowszechniania wiedzy. Dzięki temu możliwe będzie poszerzanie zakresu komercjalizacji. Ponadto ze względu na korzystny wpływ komercjalizacji należy poszerzać jej zakres, zwiększając inwestycje w rozwój potencjału oparty na edukacji.

Słowa kluczowe: komercjalizacja rolnictwa, bezpieczeństwo żywnościowe, gmina Polokwane, rolnicy małorolni, RPA

Accepted for print – Zaakceptowano do druku: 04.11.2016