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Demography of smallholder agricultural enterprise led by women and youth, and their association with the cultivation of the Okra (*Abelmoschus esculentus* L. Moench) vegetable crop

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Abstract

Okra (*Abelmoschus esculentus* (L.) Moench) is a yearly multi-use crop propagated through seed with the potential to contribute to smallholder livelihood. The purpose of the study was to characterize women and youth smallholder irrigation scheme entrepreneurs (SHAW-YEr) to develop and facilitate policy instruments for sustainable agricultural businesses. A structured household questionnaire together with facilitation was used to survey a sample, purposively focusing on Smallholder Agricultural Women and Youth Enterprises (SHAW-YEs). The total sample was comprised of 294 respondents (N=294) selected through the general category, gender category, and gender by age category. The Statistical Package for the Social Sciences (SPSS) version 22 was used to analyse quantitative data. Descriptive statistics included frequency tables and measures of central tendency. The study revealed that gender, age, education, and income seem to have an influence on the production of Okra in the Madimbo Corridor in Musina and Upper Mutale Valley in Thulamela Local Municipality. But is characterized by small land areas under cultivation. However, the poor level of education at 90.8% re-emphasizes the need for the Government to enhance skills training on-farm to SHAW-YE to complement the farmer's experience with the cultivation of Okra.

Keywords: Okra, entrepreneur, enterprise, association, cultivation

Introduction

Okra (*Abelmoschus esculentus* (L.) Moench) is a yearly fruit vegetable crop propagated. Through seed and normally grown commercially in tropical and sub-tropical regions of the world (Abe, 2018) [1]. It is also grown in warmer temperate regions of the Mediterranean region (Dhankhar, 2009) [8].

According to the writings of Kochhar (1986) [14] and Thakur (1986) [28] Okra is currently found in most countries of the African continent and Asia. Sathish (2013) [26] did a review on the work done on the crop and reported that it originated in Ethiopia and was cultivated by the ancient Egyptians. Several authors (Kochhar, 1986; Thakur, 1986; Gemede et. al., 2015 and Gemede *et. al.*, 2016) [11, 12, 14, 28] reported that okra is a multi-use crop due to its numerous usages of the pods, fresh leaves, buds, flowers, stems, and seeds. The young fruits can be consumed as vegetables, in the form of salads, soups and stews, fresh or dried, fried or boiled. Woolfe *et al*, (1977) [31] in his studies done on mucilage's extracted from Okra found that the plant contains gum like substances in various plant parts, which is associated with other important substances including tannins.

The main purposes of mucilage within the plant includes helping in water storage, decreasing diffusion in plants, assistance in seed dispersal and germination, and acting as a membrane thickener and food reserve. Okra mucilage is used for manufacturing in glace paper production and medicinal applications as a plasma replacement or blood volume expander (Akinyele *et al.*, 2007) [3] in different parts of the world. Nutritionally, Okra contains proteins, carbohydrates, and vitamins that plays a vital role in food security, human health, and nutritional security (Lamont, 1999) [16].

The young and green fruits are consumed as fresh fruits, in boiled, fried, or cooked variety of forms. Tindall (1983) [27] indicated that the seeds of Okra contain about 20% protein and 20% oil. Moekchantuk (2004) [19] in his work to export Okra reported that the seeds of the crop can be dried, and the dried seeds are a nutritious material that can be used to prepare vegetable curds or roasted and ground to be used as coffee additive or substitute. Doijode, (2001) [9] also reported that okra leaves can also be used as animal feed, whilst the green leaf buds and flowers are also edible (Akinyele *et al.*, 2007) [3]. A study by Kumar *et al.* (2009) [15] in China suggested that an alcohol extract of okra leaves can eliminate oxygen free radicals, alleviate renal tubular-

interstitial diseases, reduce proteinuria, and improve renal function.

Okra as a vegetable crop has become traditional with comparatively low agricultural input needed. Historically, the intercropping of crops by smallholder farmers has been a common exercise throughout the years. The advantage of the practice may allow balancing interactions in crops that have greater system resilience, in some instances reduce insect pest incidence and deliver environmental benefits such as greater soil and water conservation potential. Over 75% of maize and 60% of okra grown in Nigeria are produced under intercropping system. On average SHAW-YE produce okra on an average plots of 2.13 ha per entrepreneur under irrigation which is the second out of all the vegetable crops. In the context that 89% of the population of Limpopo Province is classified as rural, the smallholder sector producing Okra has a potential to play a major role in the economic development of rural areas of the Province (Nesamvuni *et al*., 2003) [21].

However, socio-economic factors continue to play a critical role in determining the levels of production undertaken and the sort of crops planted. This was corroborated by von Braun and Mirzabaev (2015) [30] who stated that the production levels are not the only areas affected but also the way business enterprises are managed which put the socio-economic characteristics of the smallholder farmers and entrepreneurs into focus. Previous studies (Mwaniki, 2006; Abdulai *et al.,* 2013; Asante *et al.,* 2013; Onumah *et al.,* 2013) [2, 5, 20, 24] have resolved that if assistance is to be extended to crop producers their demography is worth investigating to fully comprehend their needs.

The relationship between demography and socio-economic factors will be described in this study to produce appropriate policy information to agricultural stakeholders and government. In developing women and youth agricultural entrepreneurs producing Okra there is lack of knowledge on its contribution to women and youth livelihood and incomes in SHAW-YEs in rural South Africa. The main objective of this study was therefore to assess the demography of SHAW-YEr and the associated cultivation of Okra under irrigation.

Methodology

Study Area

The study was carried out in Vhembe District Municipality of Limpopo Province, South Africa. The specific areas were Madimbo Corridor in Musina and Mutale Valley in Thulamela Local Municipality. The two areas were categorized as independent SHAW-YE each with a private water supply in the case of Madimbo and as irrigated enterprises which are served by communal water supply infrastructure in the case of Mutale. The two areas of Madimbo Corridor and upper Mutale Valley irrigation schemes constitute a total of more than 2270 ha of production area.

Sampling Procedure

Stratified random sampling was used to obtain a representative sample of villages and households for interview (Leedy *et al*, 2010) [17] with target population being SHAW-YEs. A two-stage random sampling process was conducted using SURVEYSELECT procedure of SAS. The PROC SUREVEYSELECT allowed for probability-based random sampling where sampling in a category or class depended on the number of units within that class. The sampling was regarded appropriate for handling selection bias.

Data Collection

A semi structured household questionnaire was used to carry out a survey with an emphasis on SHAW-YE. Total number of SHAW-YE interviewed were two hundred and ninety-four (N=294) with a response rate of 75 percent. The sample was comprised of 71 youths aged 18 to 35 years old (56 females and 15 males) and 223 women of whom 153 were adults (36-59 years) and 70 pensioners (≥ 60 years old).

Data analysis

Statistical Package for the Social Sciences (SPSS) version 22 was used to analyse quantitative data. Descriptive statistics included frequency tables and measures of central tendency. Inferential statistics were in the form of chi square analyses, which assessed the association between major demographic variables (gender, age, education, and income) and vegetable/ field crop production, water resources and governance. Fischer Exact tests were interpreted in cases where the assumptions for chi square analysis had been violated. A Bonferroni adjustment was made to prevent a type I error; therefore, significance was considered when $p < 0.013$. Qualitative data was analysed using MS Excel, themes for each question were created according to participant's responses and each response was coded accordingly. (In some cases, these themes were further broken down into one or more relevant sub-themes.)

Results and Discussion

The production potential

The average production area under irrigated for Okra was 1.64 ha per farmer. The production area was 0.49 ha more in winter than in summer. It was reported that winter had production potential of up to 5000 bags in summer as compared to 200 bags at the most in winter. The price for Okra was on average the same at R50 / bag.

The association between cultivating Okra and gender

A chi-square test for association was conducted between cultivating Okra and gender (Table 1). It is necessary to establish the differences in the roles played by males and females in farm households since this gender differences are likely to influence their capacity to adapt to climate change as well as their choices of climate change adaptation strategies (Gerald, 2009) [13].

The test of association in the winter season showed that all the expected cell frequencies were greater than five, which means that the assumption for the test was not violated. However, there was not a statistically significant association between cultivating okra and gender, $\chi 2 = 0{,}028$, $p = 0.866$. It was determined that 46.7% of males cultivated okra compared to 44.4% females. In line with the result not being statistically significant, the effect size showed a weak association (Cohen, 1988) [7], as measured by the Phi measure of effect size, $\varphi = 0.010$, $p = 0.866$. The test for association in the summer season indicated that all the

expected cell frequencies were greater than five, the test's assumption was not violated. The results also showed that there was not a statistically significant association between cultivating okra and gender, $\chi 2 = 0{,}524$, $p = 0.56$. It was determined that 26.7% males cultivated okra compared to 35.8% females. In line with the result not being statistically significant, the effect size showed a weak association (Cohen, 1988) [7], as measured by the Phi measure of effect size, $\varphi = 0.042$, $p = 0.469$.

Table 1: Association between gender of Smallholder Agricultural Women and Youth Entrepreneur and seasonal cultivation of Okra crop in Vhembe District of Limpopo Province, South Africa

Gender	Variable	Winter		Summer	
		No	Yes	No	Yes
Male	Count	8	7	11	4
	Expected Count	8.3	6.7	9.7	5.3
	% within gender of the respondent	53.3%	46.7%	73.3%	26.7%
	% within season crop: Okra	4.9%	5.3%	5.8%	3.8%
	% of Total	2.7%	2.4%	3.7%	1.4%
Female	Count	155	124	179	100
	Expected Count	154.7	124.3	180.3	98.7
	% within gender of the respondent	55.6%	44.4%	64.2%	35.8%
	% within season crop: Okra	95.1%	94.7%	94.2%	96.2%
	% of Total	52.7%	42.2%	60.9%	34.0%
Total	Count	163	131	190	104
	Expected Count	163.0	131.0	190.0	104.0
	% within gender of the respondent	55.4%	44.6%	64.6%	35.4%
	% within season crop: Okra	100.0%	100.0%	100.0%	100.0%
	% of Total	55.4%	44.6%	64.6%	35.4%
		$\chi 2 = 0{,}028$, $p = 0.866$		$\chi 2 = 0{,}524$, $p = 0.56$.	

Though there were seasonal differences found in this study, males were still participating more in producing Okra. Similar observations were made in a study of youth agricultural projects in Limpopo Province, Maele *et al*. (2015) [18] revealed that majority of farmers (74%) were male. The finding that men were majority owners of agricultural projects was also affirmed by Bembridge and Tshikolomo (1998) [6] who revealed that 90% of fruit growers in the Phaswana area of the Limpopo Province were males.

The association between cultivating Okra and age

The Chi-square test of association between age of the respondent and the cultivation of Okra crop in winter and summer is reflected in Table 2.

Table 2: Association between age of Smallholder Agricultural Women and Youth Entrepreneur and seasonal cultivation of Okra crop in Vhembe District of Limpopo Province, South Africa

Age (Years	Variable	Winter		Summer	
		No	Yes	No	Yes
18 -35	Count	38	33	41	30
	Expected Count	39.4	31.6	45.9	25.1
	% within age of the respondent	53.5%	46.5%	57.7%	42.3%
	% within Winter crop: Okra	23.3%	25.2%	21.6%	28.8%
	% of Total	12.9%	11.2%	13.9%	10.2%
36 - 59	Count	83	72	100	55
	Expected Count	85.9	69.1	100.2	54.8
	% within age of the respondent	53.5%	46.5%	64.5%	35.5%
	% within season crop: Okra	50.9%	55.0%	52.6%	52.9%
	% of Total	28.2%	24.5%	34.0%	18.7%
>60	Count	42	26	49	19
	Expected Count	37.7	30.3	43.9	24.1
	% within age of the respondent	61.8%	38.2%	72.1%	27.9%
	% within season crop: Okra	25.8%	19.8%	25.8%	18.3%
	% of Total	14.3%	8.8%	16.7%	6.5%
Total	Count	163	131	190	104
	Expected Count	163.0	131.0	190.0	104.0
	% within age of the respondent	55.4%	44.6%	64.6%	35.4%
	% within season crop: Okra	100.0%	100.0%	100.0%	100.0%
	% of Total	55.4%	44.6%	64.6%	35.4%
		$\chi 2 = 1{,}431$, $p = 0.489$		$\chi 2 = 3{,}114$, $p = 0.211$	

For winter season the results showed that all the expected cell frequencies were greater than five, for the Chi-square test assumption not to be violated. There was not a statistically significant association between cultivating okra and age, $\chi 2 = 1{,}431$, $p = 0.489$. It was determined that 46,5% of 18-35-year participants cultivate okra compared to 46,5% and 38,2% of 36-59-year and those >60 years respectively. In line with the result not being statistically

significant, the effect size showed a weak association (Cohen, 1988) [7], as measured by the Phi measure of effect size, φ = 0.070, p = 0.489.

A chi-square test for association was conducted between cultivating okra and age in summer (Table 2). All the expected cell frequencies of the table were greater than five, therefore the test assumption was not violated.

There was not a statistically significant association between cultivating okra and age, $\chi 2 = 3{,}114$, p = 0.211. It was determined that 42.3% of 18-35-year participants cultivated okra compared to 35.5% of 36-59-year participants and 27.9% of those >60-years. In line with the result not being statistically significant, the effect of size showed a weak association (Cohen, 1988) [7], as measured by the Phi measure of effect size, φ = 0.103, p = 0.211.

Okra seems to be a youth-oriented crop judged by the trends showing higher participation of youth between the ages of 18-35-yer both in winter and summer. More participation seems to be in winter (44.6%) than in summer (35%). The results showed how youth tend to take new challenges in the name of a new crop for the area and adopt it for the market. This was corroborated by Fussel and Klein (2006) who reported that older farmers could be resistant to change and thus may not see the need of employing new technologies and would prefer the traditional models of farming that they are familiar with other than adopting new methods. Farm productivity has been shown to deteriorate with the farmers' age, especially among the smallholders who largely rely on their own physical labour to execute many farming responsibilities (Uddin *et al.*, 2014) [29]. The advantage with youth farmers was they may have a longer planning horizon and to take up long term measures that will influence their decision to increase production levels.

The association between cultivating Okra and education

A chi-square test for association was conducted between cultivating okra and household head education (Table 3). The importance of education in successful developmental activities such as farming cannot be overemphasized. The level of education has a strong influence on the extent to which a farmer can access new information and technology, not only through improved literacy that enables the farmers to access written information, but also through the increased ability to search for information using modern information technologies. Citing Appleton and Balihuta (1996) [4], Oduro-Ofori *et al.* (2014) [23] described the effect of education on agricultural productivity as cognitive and non-cognitive.

Cognitive effects reportedly emphasize basic literacy and numeracy that farmers achieve from education while non-cognitive effects emphasize the change in the attitude of farmers who attended school due to improved discipline introduced by formal schooling. Better education may therefore be associated with the improved adaptive capacity to adverse effects of climate change and variability. The results showed no statistically significant association between cultivating okra and household head education in winter, $\chi 2 = 3.545$, p = 0.315. It was determined that 52.5% of participants whose household head's had no/ primary school cultivated okra, while 47.4% and 39.4% of participants with household head education levels of secondary and tertiary level cultivated okra respectively. Also, 38.3% of participants with household head education of ABET planted the crop. In line with the result not being statistically significant, the effect size showed a weak association (Cohen, 1988) [7], as measured by the Phi measure of effect size, φ = 0.110, p = 0.315. The level of education for SHAW-YE producing Okra seems to be poor as 90.8% of respondents either had no primary schooling or had Adult Basic Education & Training (ABET).

Table 3: Association between Education of Smallholder Agricultural Women and Youth Entrepreneur and seasonal cultivation of Okra crop in Vhembe District of Limpopo Province, South Africa

Education	Variable	Winter		Summer	
		No	Yes	No	Yes
Primary	Count	29	32	46	15
	Expected Count	33.5	27.5	39.2	21.8
	% within education of the respondent	47.5%	52.5%	75.4%	24.6%
	% within season crop: Okra	18.1%	24.4%	24.6%	14.4%
	% of Total	10.0%	11.0%	15.8%	5.2%
Secondary	Count	61	55	66	50
	Expected Count	63.8	52.2	74.5	41.5
	% within education of the respondent	52.6%	47.4%	56.9%	43.1%
	% within season crop: Okra	38.1%	42.0%	35.3%	48.1%
	% of Total	21.0%	18.9%	22.7%	17.2%
Tertiary	Count	20	13	21	12
	Expected Count	18.1	14.9	21.2	11.8
	% within education of the respondent	60.6%	39.4%	63.6%	36.4%
	% within season crop: Okra	12.5%	9.9%	11.2%	11.5%
	% of Total	6.9%	4.5%	7.2%	4.1%
Abet	Count	50	31	54	27
	Expected Count	44.5	36.5	52.1	28.9
	% within education of the respondent	61.7%	38.3%	66.7%	33.3%
	% within season, crop: Okra	31.3%	23.7%	28.9%	26.0%
	% of Total	17.2%	10.7%	18.6%	9.3%
Total	Count	160	131	187	104
	Expected Count	160.0	131.0	187.0	104.0
	% within education of the respondent	55.0%	45.0%	64.3%	35.7%
	% within season crop: Okra	100.0%	100.0%	100.0%	100.0%
	% of Total	55.0%	45.0%	64.3%	35.7%
		$\chi 2 = 3{,}545$, p = 0.315		$\chi 2 = 6{,}250$, p = 0.100	

A chi-square test for association was conducted between cultivating okra and household head education for the summer season. There was not a statistically significant association between cultivating okra and household head education, $\chi2 = 6,250, p = 0.100$. It was determined that 24,6% of participants with no/ primary household head education cultivated okra while 43,1% of participants with household head with secondary education cultivated okra and 36,4% and 33,3% of participants with household heads with tertiary education and ABET respectively cultivated okra. In line with the result not being statistically significant, the effect size showed a weak association (Cohen, 1988) [7], as measured by the Phi measure of effect size, $\varphi = 0.147$, $p = 0.100$.

The association between cultivating Okra and income

A chi-square test for association was conducted between cultivating okra and monthly income (Table 8.8). According to Nouman *et al.* (2013) [22], household income is also one of the determinants of the amount of credit that can be borrowed by the farmers. High income farming households can therefore not only better afford needs such as production inputs and other production factors but would also easily qualify for credit to procure the assets that would otherwise not be affordable. The results revealed that there was not a statistically significant association between cultivating okra and monthly income, $\chi2 = 0.121, p = 0.728$. It was determined that 44.0% of participants earning < R5000 a month cultivated okra, compared to 46.4% of those earning > R5000 a month. In line with the result not being statistically significant, the effect size showed a weak association (Cohen, 1988) [7], as measured by the Phi measure of effect size, $\varphi = 0.020$, $p = 0.728$. Similarly, for the summer season there was not a statistically significant association between cultivating okra and monthly income, $\chi2= 0.210$, $p = 0.647$.

It was determined that 34.7% of participants earning < R5000 a month cultivated okra, compared to 37.7% of those earning > R5000 a month. In line with the result not being statistically significant, the effect size showed a weak association (Cohen, 1988) [7], as measured by the Phi measure of effect size, $\varphi = 0.027$, $p = 0.647$.

Table 4: Association between monthly income of Smallholder Agricultural Women and Youth Entrepreneur and seasonal cultivation of Okra crop

Income	Variable	Winter		Summer	
		No	Yes	No	Yes
< 5000	Count	126	99	147	78
	Expected Count	124.7	100.3	145.4	79.6
	% within income of the respondent	56.0%	44.0%	65.3%	34.7%
	% within season crop: Okra	77.3%	75.6%	77.4%	75.0%
	% of Total	42.9%	33.7%	50.0%	26.5%
>5000	Count	37	32	43	26
	Expected Count	38.3	30.7	44.6	24.4
	% within income of the respondent	53.6%	46.4%	62.3%	37.7%
	% within season crop: Okra	22.7%	24.4%	22.6%	25.0%
	% of Total	12.6%	10.9%	14.6%	8.8%
Total	Count	163	131	190	104
	Expected Count	163.0	131.0	190.0	104.0
	% within income of the respondent	55.4%	44.6%	64.6%	35.4%
	% within season crop: Okra	100.0%	100.0%	100.0%	100.0%
	% of Total	55.4%	44.6%	64.6%	35.4%
		$\chi2 = 0.121$, $p = 0.728$		$\chi2= 0,210$, $p = 0.647$	

Conclusion

The results of the study indicate some imperative conclusions about the demographic profile of the Smallholder Agricultural Enterprises and their association with the production of Okra. The study revealed that gender, age, education, and income seem to have an influence, but we had statistically not significant results on the production of Okra in the Madimbo Corridor in Musina and Mutale Valley in Thulamela Local Municipality. However, there was no statistical significance and weak association between the demography and production of Okra. The study revealed that the SHAW-YE producing Okra are characterized by small land areas under cultivation. The increased participation of SHAW-YE around the ages of 18-35-year gave a trend suggesting that youth were the dominant participants in the production of this crop.

However, the poor level of education for 90.8% of participants re-emphasizes the need for Government to enhance skills training on-farm to SHAW-YE to complement the farmers experience with cultivation of Okra. About 44.0% of the SHAW-YE earned less than R5000.00 compared with 46.4% earning more than R5000.00. Markets channels and access should be promoted for SHAW-YE to enable throughput of Okra to not only informal but also fresh produce and retail markets.

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