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DO SOCIO-ECONOMIC CHARACTERISTICS OF RURAL BACKYARD FARMERS' HOUSEHOLDS DRIVE INCOME GENERATION FROM BACKYARD FARMING? EVIDENCE FROM NORTH WEST PROVINCE, SOUTH AFRICA

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Abstract. People in most developing countries' rural areas around the world face food insecurity and malnutrition due to many factors, including low purchasing power. There is renewed interest in backyard or home gardens as a source of income and a pathway out of poverty and food insecurity among rural households. This paper identifies and analyzes the factors that influence income generation from backyard farming among backyard farmers in the rural communities of Bojanala district municipality in the North West province. Using a structured questionnaire, cross-sectional data was collected from 220 backyard farmers. Multiple linear regression was used to analyze the data; the findings reveal that gender of household head, formal employment, farm ownership, farming experience and annual income from livestock had a positive and significant influence on income generation from backyard farming. To maximize the potential of backyard gardens as a source of income generation and livelihood, policymakers and relevant government departments must pay close attention to these variables.

Keywords: backyard gardens, economic contribution, poverty alleviation, rural communities, North West, South Africa

INTRODUCTION

Backyard gardens are an integral part of livelihoods among the rural poor where they grow different kinds of edible and medicinal plants for all-year round household consumption and income generation. The concept of having gardens near homes started thousands of years ago (Landon-Lane, 2004). Kumar and Nair (2004) defined backyard garden as an intensively worked land-use system involving deliberate management of multipurpose plants in association with agricultural crops, and invariably livestock, within the compounds of individual households.

Most rural households in developing countries, particularly in Sub-Saharan Africa, are faced with severe food insecurity. Especially as regards the rural poor, food insecurity continues to become increasingly severe as a result of many issues, such as population expansion, increasing prevalence of HIV/AIDS pandemic, climate change and drought. Moreover, the increase in food prices undermines food security and threatens the livelihoods of the most vulnerable by eroding their already limited purchasing power (Nawrotzki et al., 2013). Alleviation of food shortages can be attained through the use of home gardens to obtain income. As noted by Nzabakenga et al. (2013), agricultural income determines the purchasing power of rural people.

Backyard gardens possess unique features that make them a potential source of livelihood among the rural poor. According to Shrestha et al. (2002) home garden

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crops, vegetables and fruits are largely grown organically and therefore provide safe and healthy food for household consumption. According to Weinberger (2013), this may instill good eating habits leading to a healthier consumption behavior among children and young adults. Backyard gardens are deemed traditional sources of nutrient-dense food and hence they are crucial in improving food and nutrition security and livelihoods of rural farming communities in most developing countries. According to Maroyi (2009), home gardens also strengthen social ties in the communities through trade and exchange of home garden products amongst neighbors and relatives. The home garden food and vegetable species also have multiple uses and multiple harvest times, and this year-round availability helps diversify sources and types of micronutrients in the daily diet (Shrestha et al., 2002). Home gardens are important sources for food supply and are also important for their economic, social and cultural use values (Sunwar et al., 2006).

Households continue to rely on home gardening as a strategy to stabilize household food security and income against the risks and uncertainties of monocropping (Maroyi, 2009). Most previous studies (Agergaard and Birch-Thomsen, 2006; Fay, 2013; Manona, 2005) have reported a noticeable shift from field cultivation to home gardens as a source of livelihood in the rural areas as they are regarded as easier to manage than the fields. A number of socio-economic variables have an important influence on the income generated from backyard gardens. A substantial number of previous studies suggest that the farmers' income is influenced by a set of socio-economic attributes such as age, education level, gender, etc. of farmers and other external factors such as technology use etc. However, very little research has been done to identify such factors focusing on backyard or home garden farming. Therefore, this study aims to bridge that gap. Moreover, the potential of backyard gardens as a pathway out of poverty has been largely neglected in development policy discussions. Therefore, the findings of this study can assist in drawing more attention to the importance of home gardens in improving household income, food and nutrition security.

MATERIALS AND METHODS

Study area
The Bojanala district municipality, situated in the North West province of South Africa, was selected for this study. This municipality is one of the four district municipalities in the North West province. The district experiences severe cold and frost during winter months and hot weather during the summer months, and suffers from regular droughts. Thus, based on the United Nations Human Development Index (HDI), the North West Province is among the bottom ranked in terms of quality of life (Tladi et al., 2002).

Data
Data for this study was collected from 220 purposively selected backyard farmers, using a structured questionnaire. The purposive sampling technique enabled the researcher to select a sample of respondents who had the experience and knowledge about the variables of the study. The questionnaire was pre-tested and validated. It was administered by trained university students.

Model specification
The multiple linear regression model specification was employed to examine the effects of demographic and socio-economic factors (predictors) that influence the generation of income from backyard gardens. The dependent variable (income) is continuous, hence the use of the multiple linear regression. In this respect, the LS estimates are: linear, unbiased, with minimum variance, consistent and normally distributed (Gujarati, 2003). The multiple linear regression model may be expressed as (Gujarati, 2003):

$$Y_i = \beta_0 + \beta_1 X_i + \varepsilon_i \qquad (1)$$

Where Y_i is the amount of annual income of growers, β_i are the parameters to be estimated, β_0 is a constant and X_i are the demographic and socio-economic factors which influence the income of the backyard farmer as shown in Table 1.

$$Y_j = a + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \ldots\ldots + \beta_m X_{mj} + \varepsilon_j$$

The sample regression equation containing the statistics used to estimate the population parameters when there are m independent variables, would be:

$$Y_j = a + b_1 X_1 + b_2 X_2 + b_3 X_3 + \ldots\ldots + b_m X_{mjj}$$

All the endogenous variables were removed. The assumptions of linearity, normality, homoscedasticity and independence of error terms were considered to ensure validity of the model. Autocorrelation and multicollinearity were checked with the Durbin–Watson statistic and VIF values, respectively. The Statistical Package

for Social Sciences (version 23.0) was used to analyze the OLS model; the parameter estimates provided included the following: regression coefficient β, constant, standard error, R^2, adjusted R^2, VIF, residual analysis, Durbin–Watson, t-values and the F-test.

Variable selection and theoretical assumptions

Table 1 below shows the variables that were selected and included in the regression model. The choice of these variables was motivated by previous literature. Hence, a number of previous studies were reviewed and relevant variables were sorted. The explanation of some selected variables is given under Table 1.

In this study, the farmer's gender is expected to have a positive influence on income. Men are most likely to focus more on selling greater quantities of backyard garden products whereas women may use a higher proportion of products in the household. This thesis is supported by Shrestha et al. (2002) who highlighted that

Table 1. Variable labels and their expected effects

Independent variables	Variable description	Expected effect
X_1	Gender. Male = 1, Female = 0	+
X_2	Age (years)	−
X_3	Number of household dependents	+
X_4	Level of education (ordered)	+
X_5	Do you have other formal employment? Yes = 1, No = 0	+
X_6	Do you own a farm? Yes = 1, No = 0	+
X_7	Years of farming experience	+
X_8	Do you engage in non-farm activities? Yes = 1, No = 0	+
X_9	Is your household food secure? Yes = 1, No = 0	+
X_{10}	Contribution of BYG to food security	+
X_{11}	Proportion of BYG to household income	+
X_{12}	Size of BYG	+
X_{13}	Do you farm the whole area of backyard? Yes = 1, No = 0	+
X_{14}	Product quality	+
X_{15}	Annual income from livestock sales	−
X_{16}	Proportion of output consumed	−
X_{17}	Proportion of farm inputs purchased	+
X_{18}	Do you have access to reliable market? Yes = 1, No = 0	+
X_{19}	Do you have vegetable production skills? Yes = 1, No = 0	+
X_{20}	Do your BYG problems get solved by extension officer? Yes = 1, No = 0	+
X_{21}	Do extension officers visit the garden? Yes = 1, No = 0	+
X_{22}	Number of permanent jobs created on the BYG	+
X_{23}	Do you hire seasonal labor for the BYG? Yes = 1, No = 0	+
X_{24}	Do you have access to credit? Yes = 1, No = 0	+
X_{25}	Do you keep farm records? Yes = 1, No = 0	+
Y (dependent variable)	Continuous variable: amount of annual income of households from backyard gardens	

Source: own elaboration.

men tend to grow commercial fruit trees as a way of generating higher income.

The farmer's age is expected to have a negative effect on income generated from backyard farming. Especially in rural areas where resources are limited, farming is a labor-intensive activity and thus requires strength which can be challenging to older people. Hence, Fadipe et al. (2014) indicate that as people get older, they have less and less energy to work.

The number of household dependents and the level of education are both expected to have a positive influence on income generated from backyard farming. As regards education, it is usually expected that educated people comprehend information pertaining to farming better than less educated farmers. As far as the number of household dependents is concerned, more family members mean that the household has considerably larger labor resources to carry out the farming and product marketing activities. Hence, more income is expected to be generated from the backyards of farmers with larger households. Hassan (2015) found that larger households were generating more income in Sudan. Non-farm income and formal employment are expected to have a positive influence on income generation. Such activities are most likely to generate income that can be invested in backyard farming. Authors such as Lema (2014) emphasized the importance of off-farm income for the rural poor since it constitutes a significant share of household income.

Furthermore, farm ownership and farming experience are both expected to have a positive influence on income from backyard farming. Farm ownership is critical for rural people since it is the basic source of livelihood. When farmers own land, it is highly likely that they invest more in it to generate income. The importance of land for rural people is accentuated by Ibekwe (2010). Annual livestock income is hypothesized to have a negative effect on the income generated from backyard farming. The income from livestock sales can be sufficient for the family so that they might not dedicate more time to work on their backyard farming. However, findings in Yemen by Safa (2005) revealed a positive influence of livestock ownership on income from small-scale agroforestry.

RESULTS

This section presents the study findings. The descriptive statistics that summarize the respondents' demographic characteristics are presented first, followed by inferential results.

Descriptive results

A total of 220 households engaging in backyard gardening were interviewed, and the demographic characteristics of the respondents are presented in Table 2. Out

Table 2. Demographic and socio-economic characteristics of respondents ($n = 220$)

Variables	Frequency	Percentage
1	2	3
Gender		
female	150	68.2
male	70	31.8
	220	100.00
Age of respondents		
≤ 20	1	0.5
21–30	21	9.5
31–40	39	17.7
41–50	41	18.6
51–60	46	20.9
61–70	46	20.9
≥ 70	26	11.8
	220	100.00
Household size		
1–4	103	46.8
5–8	99	45.0
9–12	17	7.7
	220	100.00
Number of dependents		
1–5	99	45.0
6–10	87	39.5
11–15	27	12.2
≥ 16	7	3.2
	220	100.00

Table 2 – cont.

	1	2	3
Level of education			
below the national senior certificate		8	3.6
national senior certificate		153	69.5
tertiary education		46	20.9
no formal education		13	5.9
		220	100.00
Farming the whole area of backyard garden			
no		88	40.0
yes		132	60.0
		220	100.00
Number of years in farming			
0		1	0.5
1–9		136	61.8
10–18		38	17.2
19–30		31	14.0
31–40		13	5.9
≥ 41		1	0.5
		220	100.00
Vegetable production skills			
no		1	0.5
yes		219	99.5
		220	100.00

Source: own elaboration based on study findings.

of the 220 household heads interviewed, approximately 68.2% were female while 31.8% were male. The results further reveal that 27.7% of the youth (that is those aged 40 years or younger) are involved in backyard gardening. However, the majority (60.4%) of respondents fall within the 41–70 years age bracket. Respondents aged 71 years and above constituted 11.8%. About 46.8% of the respondents had a household size ranging from 1 to 4 members, and 45% of the respondents had 5 to 8 family members. With regard to dependents, 45% of the respondents indicated that they had between 1 and 5 dependents while 39.5% had 6 to 10 dependents.

Most respondents (69.5%) were holders of the National Senior Certificate (NSC), 20.9% had tertiary education, 3.6% had an education level below the National Senior Certificate while 5.9% had no formal education. The findings further show that 40% of respondents could not manage to farm the whole garden area, while 60% were able to farm the entire area reserved for gardening. With regard to farming experience, 61.8% of the respondents had between 1 to 9 years of experience while only 0.5% of respondents indicated that they started farming more than 41 years ago. Furthermore, the results reveal that only 0.5% of respondents do not have vegetable production skills while 99.5% of respondents do.

Factors influencing the annual income of BYG of respondents in the study area

The results of the linear multiple regression analysis of the effect of selected socio-economic variables on the respondents' annual income from backyard gardens are presented in Table 3. The co-efficient of determination, R-Square, is 0.600 which implies that independent variables account for 60% of the variation in the dependent variable (income from backyard garden). The Adjusted R-Square of 0.538 is reasonably close to the value of the R-Square (0.600), implying that the correlation between independent variables included in the regression and the dependent variable Y was quite good. The Durbin-Watson statistic of the analysis is 1.938 which indicates the absence of autocorrelation. The F-Value is 10.690, and is statistically significant (sig. 0.000). This is an indication that the combined effect of independent variables on the dependent variable is very significant. All the respective Variable Inflationary Factors (VIF) of the Collinearity statistics are between 1.049 and 2.704; an indication that there was no multicollinearity among variables.

The results of the regression analysis in Table 3 show that 5 variables had a significant influence on the income generated from backyard garden farming. These variables were gender of household head, formal employment, farm ownership, farming experience and annual income from livestock. The findings revealed that *gender of respondents* had a positive and statistically significant influence (sig 0.001, β = 0.187) on the annual income from BYG with all other factors held constant. The implication is that male BYG producers earn 0.187 units more than females.

Table 3. Results of the linear multiple regression analysis

Model	Unstandardized coefficients		Standardized coefficients	t	Sig.	Collinearity statistics	
	β	Std. error	β			tolerance	VIF
Constant	–1 947.426	2 341.111		–0.832	0.407		
Gender	949.843	271.144	0.187	3.503	0.001***	0.752	1.330
Age	–10.236	10.427	–0.068	–0.982	0.328	0.441	2.265
Household dependents	–43.684	28.726	–0.074	–1.521	0.130	0.894	1.119
Level of education	237.898	218.520	0.062	1.089	0.278	0.662	1.511
Formal employment	1 230.402	343.653	0.195	3.580	0.000***	0.722	1.386
Own farm	4 701.738	967.011	0.269	4.862	0.000***	0.697	1.435
Years of farming experience	224.044	101.165	0.149	2.215	0.028**	0.472	2.117
Engaging in non-farm activities	223.780	269.386	0.044	0.831	0.407	0.759	1.318
Household food secure	–28.631	735.678	–0.002	–0.039	0.969	0.954	1.049
Proportion of BYG to food security	64.566	153.485	0.022	0.421	0.674	0.813	1.230
Proportion of BYG income	133.930	147.640	0.052	0.907	0.365	0.644	1.552
Size of BYG	–134.707	145.533	–0.055	–0.926	0.356	0.605	1.652
Do you manage to farm the whole area of your backyard?	–116.858	346.298	–0.026	–0.337	0.736	0.370	2.704
Product quality	10.164	183.341	0.003	0.055	0.956	0.819	1.221
Annual income from livestock sales	0.030	0.004	0.495	7.834	0.000***	0.535	1.870
Proportion of output consumed	1.075	5.456	0.012	0.197	0.844	0.563	1.777
Proportion of farm inputs purchased	103.296	111.435	0.051	0.927	0.355	0.708	1.413
Access to a reliable market?	–679.020	388.407	–0.118	–1.748	0.082	0.468	2.137
Skills in vegetable production	676.999	1 853.317	0.020	0.365	0.715	0.749	1.336
Do your BYG problems get solved by extension officers?	693.191	412.444	0.085	1.681	0.094	0.829	1.207
Do extension officers visit the garden?	210.938	229.083	0.057	0.921	0.358	0.566	1.768
Number of permanent jobs created	–139.945	191.647	–0.046	–0.730	0.466	0.541	1.848
Do you hire seasonal labor?	508.939	281.458	0.102	1.808	0.072	0.667	1.499
Credit access	1 202.083	804.733	0.084	1.494	0.137	0.677	1.476
Do you keep farm records?	–472.208	302.512	–0.094	–1.561	0.120	0.590	1.696

Dependent variable: Annual income from BYG, $R = 0.771$, $R^2 = 0.600$, Adj. $R^2 = 0.538$, $D = 1.938$, Std. error of the estimate = 1599.76, $F = 10.690$, VIF = 1.049–2.704
***Significant at 1%. **Significant at 5%. *Significant at 10%.
Source: own elaboration based on study findings.

Formal employment in addition to BYG had a positive and statistically significant effect on the annual income from BYG (sig 0.000, β = 0.195) with all other factors held constant. This implies that a unit increase in the employment variable would result in a 0.195 units increase in the annual income from BYG, all other factors held constant. *Ownership of a farm*, besides the BYG (by respondent), also had a positive and statistically significant effect on the annual income from BYG (sig 0.000, β = 0.269) with all other factors held constant. Therefore, respondents who own farms in addition to BYG earn 0.269 units more than those who only have a BYG, with all other factors held constant.

Years of experience in farming had a positive and statistically significant effect on the annual income from BYGs (sig 0.028, β = 0.148) with all other factors held constant. The results show that a unit increase in the number of years of farming will increase annual income from BYGs by 0.148 units with all other factors held constant. The results further revealed that *annual income from livestock sales* by respondents also had a positive and statistically significant effect on the annual income from BYGs (sig 0.000, β = 0.495) with all other factors held constant. The results show that a unit increase in the income from the sale of livestock will increase annual income from BYGs by 0.495 units with all other factors held constant.

DISCUSSION AND POLICY RECOMMENDATIONS

Factors influencing income generation from backyard garden farming were identified and analyzed using multiple linear regression analysis. This section serves to present a discussion on the relevant descriptive and inferential findings that emerged from this study and to provide policy recommendations based on the study findings. The descriptive results show that there were more women engaging in backyard gardening as compared to men. This correlates with the findings of Jacobi et al. (2000) that women tend to dominate in certain forms of cultivation (backyard gardens and small-scale animal husbandry) while men dominate in commercial food production.

It also emerged from the descriptive results that quite a significant percentage of youth were engaged in backyard farming in the study area. This suggests that the provision of services and social development initiatives targeted at the youth should be a significant consideration in rural communities of Bojanala Platinum District Municipality (BPDM). Only a small percentage of farmers were 71 years and above. This may be a result of poor physical health and the demanding nature of some of the gardening activities since most of the work is done manually. Fadipe et al. (2014) are of the opinion that as people get older, they have less and less energy to work.

It was found that most respondents had at least an entry level qualification to the employment sector, while the minority of respondents had an education level below the National Senior Certificate. "Education is a key asset that determines household ability to access higher return activities (whether in agriculture or other sector) and escape poverty" (FAO 2007). Alene and Manyong (2007) suggest that educated farmers would be expected to respond more quickly than uneducated ones to technological change in agriculture, which requires the collection and processing of new information. There is a serious need for rural communities to receive education and hands-on training in order to develop their capacities in increasing production, thereby contributing to the local economy and development of the community.

The regression results further revealed that male backyard farmers were earning a greater annual income from backyard farming than their female counterparts. A possible explanation for this could be that unlike men, women are usually responsible for feeding the household and it is imperative for them to use backyard garden products to prepare meals for the family rather than selling them. It is also commonly observed that men tend to introduce exotic commercial fruit trees into the home garden whereas women prefer to maintain traditional vegetables and other plant species that are required in the kitchen on a regular basis (Shrestha et al., 2002). Contrastingly, Mabe et al. (2010) discovered that the greater the number of female farmers involved in livestock enterprises, the higher the farm income in North West province of South Africa.

Having formal employment apart from backyard farming was found to have a positive and significant influence on the annual income obtained from backyard gardens. The reason for this effect may be the fact that income from formal employment may be used by the farmer to acquire sufficient and appropriate BYG equipment and other relevant inputs/resources for expansion and improved productivity on BYG. As Diakalia (2007)

points out, overdependence on subsistence farming with limited access to gainful off-farm employment is one key determinant of poverty in Sub-Saharan Africa. According to Lema (2014), off-farm employment is critical to the rural poor since it provides a considerable share of the total rural household income while also increasing the fraction of the labor force in rural areas.

The results further show that owning a farm besides the backyard garden significantly increases annual income from backyard farming. This may be due to the fact that such farmers might have acquired relevant farming experience and skills from their farms which are then applied in BYG, hence increased output and income. Income from farming activities may also be used to improve BYGs through acquisition of the right inputs/resources for BYGs. Land ownership is vital particularly for the rural poor since their livelihood is almost dependent on it. Ibekwe (2010) suggest that land is a single most important resource in rural farm production. Having more farming experience is associated with increased annual income from backyard farming. This may be attributed to the fact that farmers might have acquired substantial knowledge and skills in farming which are used in BYGs for increased output and income.

Annual income from livestock sales positively and significantly influenced income from backyard farming. This may be due to the fact that such farmers might have used some of the income from the sale of livestock to improve BYGs through the acquisition of the right inputs/resources for BYGs. Access to the right inputs translates into higher outputs. This shows the importance of livestock as a source of income and as a way to improve the livelihoods of rural farmers. Likewise, Safa (2005) found that livestock holding had a significant effect on the income of small-scale agroforestry in Yemen.

The results have highlighted the importance of gender of household head, formal employment, farm ownership, farming experience and annual income from livestock in influencing the income generation from backyard farming. It is therefore recommended that farmers engage in some form of formal employment to generate more additional income that can be used to invest in backyard gardens. As well, such formal employment can be a safety net for rural poor given the risks of agriculture due to the heightened impact of climate change and related disasters. The farmers may be trained as a way of opening up more income-generating opportunities. The study also revealed the importance of livestock in promoting income from backyard income in the study area. It is therefore imperative to encourage farmers to engage in livestock farming. As well, women should be encouraged to be more commercially oriented in order to generate income but at the same time maintain their important role of feeding their households. With regard to land ownership, the government should work towards improving land ownership among farmers.

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