UNPACKING THE RELATIONSHIP AMONG RURAL LIVELIHOODS, INDIGENOUS PLANT'S CULTIVATION AND FOOD SECURITY: EVIDENCE FROM SOUTH AFRICA

Abiodun Olusola Omotayo[a] and Adeyemi Oladapo Aremu[a,b]

a Food Security and Safety Niche Area, Faculty of Natural and Agricultural Sciences, North-West-University, Private Bag X2046, Mmabatho, South Africa

b Indigenous Knowledge Systems (IKS) Centre, Faculty of Natural and Agricultural Sciences, North-West University, Private Bag X2046, Mmabatho, South Africa

Introduction

Africa is endowed with many plants with nutritional value for mitigating food insecurity but this diversity of plants is threatened by negligence, insufficient knowledge and population growth which affects the biodiversity (Hunter & Fanzo 2013; Bvenura & Sivakumar 2017)

Indigenous grain, fruit and vegetables are essential for healthy ecosystems which provide the conditions and processes that sustain all life. They form the basis for potential agricultural food production, following the global dependence on a relatively few major crops (Chivandi et al. 2015; Omotayo & Aremu 2020a)

In order to enhance the understanding of the potentials of indigenous plants in the face of food shortage and insecurity in South Africa

The current research applied a trans-disciplinary approach on the ethnobotanical and rural livelihoods in profiling information pertaining to the rural livelihoods, cultivation of indigenous plants and food security in South Africa.

Material and Methods

The study was conducted in the North West Province, South Africa. The data was collected using face-to-face interviews among rural households, across 12 communities within the four districts of the province

The study utilised descriptive and ethnobotanical indices (Figure 1) on 31 selected undervalued indigenous fruit, vegetable and grains, also the per capita food expenditure was used as an indicator of food security is well documented in the literature as well as the Foster-Greer-Thorbecke (FGT) index (Faridi & Wadood 2010, Omotayo et al. 2020). the FGT measures were mathematically derived as:

$$P_{\propto} = \frac{1}{N}\left(\frac{z - y_i}{z}\right)^{\propto} 1(y_i \leq z)$$



Figure 1. Pictures of some selected indigeneous fruits, grains and vegetables used in the study

To provide a detailed analysis of the factors influencing the cultivation of indigenous plants among households, the study applied a discrete choice probit model for binary choice (yes, no) responses to questions on the cultivation of indigenous plants (Omotayo 2018,Omotayo and Aremu 2020b).

$$P_I = \text{prob}[Y_i = 1] = \int_{-\infty}^{X_i\beta} (2\pi)^{-1/2} \exp\left(-\frac{t^2}{2}\right)) dt = \phi(X_i\beta)$$

Results and Discussion

Description of the rural participants

The average age (46.91 years) of these household heads reveals that, household head in the rural North West, South Africa are youths.

The gender distribution of the participants indicates that 53% of the households were headed by females with household size of 4 members and an average income (R11134.85) per annum.

Participants food security and land ownership

Table 1 shows that 59.40% of the farming households were food secure, while 40.60% were food insecure. While those that own land and utilizes their lands for indigenous plant cultivation were also 54.89%.

Table 1: Distribution of the households food security and land ownership

Variable	Frequency	Percentage
Food security status		
Food insecure	54	40.60
Food secure	79	59.40
Land ownership status		
Non land owner	60	45.11
Land owner	73	54.89
Total	**133**	**100**

The participants' Kernel density distributions of total income was disaggregated by their land ownership status (Figure 2).

The natural log (ln) of the average total income made from indigenuous plant cultivation was significantly higher among those who cultivate indigenous plants on their own land than the participants who cultivate indigenous plants on land through other land tenure patterns.

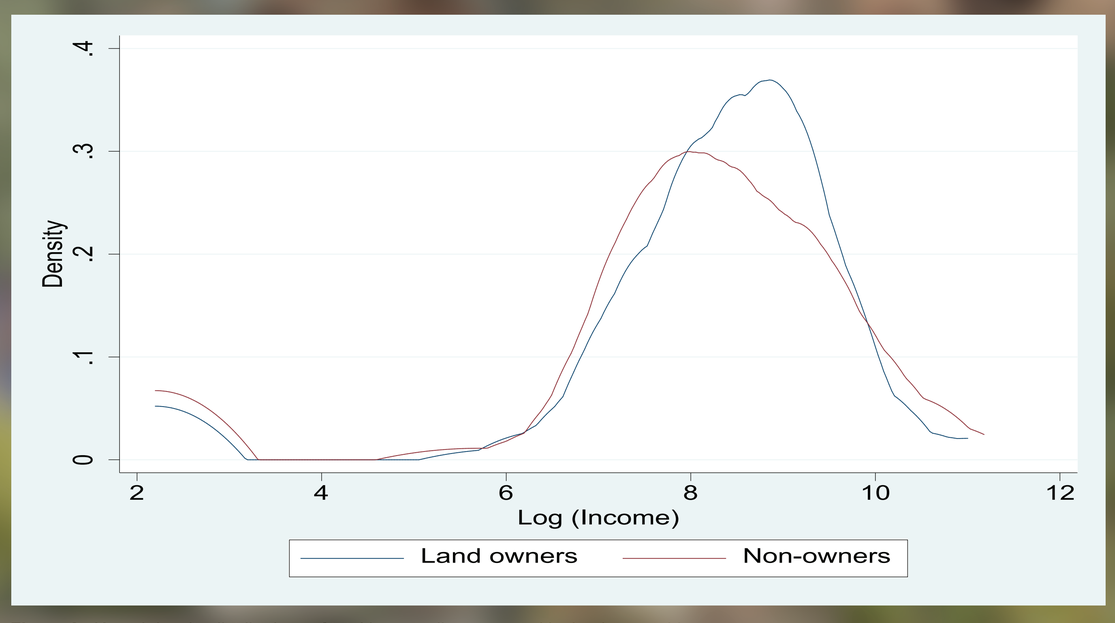

Figure 2. Kernel density distributions of total income disaggregated by land ownership

Probit regression estimates of the determinants of indigenous plants cultivation

Test for multicollinearity among the variables was carried out with the mean variance inflation factor (VIF) of 1.34.

The measures of goodness of fit for the model, including the Wald chi2, Pseudo R2 and Archer and Lemeshow (2006) were equally reported.

According to all the employed diagnostics measures, it was concluded that the Probit model is a good fit for the objective.

The results show that the human capital variables, financial capital asset, natural capital, social capital and physical assets were statistically significant to the probability of cultivating indigenous plants in the study area.

Table 2: Probit regression analysis of the determinants of indigenous plants cultivation in rural South Africa

Variable	Coefficients	Robust Std. Error	T	P>|z|	Marginal Effect	Robust Std. Error
Socio-economic and livelihood assets						
Households district	1.5631	0.4597	3.40	0.001***	0.5655	0.1353
Age of households head	-0.0038	0.0160	-0.24	0.808	-0.0014	0.0058
Gender of the household head	-0.1478	0.3513	-0.42	0.674	-0.0532	0.1267
Marital status of the head	0.4502	0.4055	1.11	0.267	0.1632	0.1463
Educational status of the household head	-0.1172	0.1091	-1.07	0.283	-0.0424	0.0397
Religion of the household head	1.1276	0.9939	1.13	0.257	0.2772	0.1370
Household size	0.683	0.1762	3.88	0.000***	0.2473	0.0624
Extension, advisory service and training	1.6743	0.4734	3.54	0.000***	0.5899	0.1213
Households average income	-0.0001	0.0000	-2.90	0.004***	-0.0000	0.0000
Membership of a cooperative society	0.2370	0.1268	1.87	0.061*	0.0546	0.2083
Knowledgeable about indigenous plants	-0.1641	0.6236	-0.26	0.792	-0.0611	0.2372
Aware of nutritional advantages of indigenous plants	0.1133	0.3543	0.32	0.749	0.0406	0.1254
Aware that indigenous plants drought resistant	-0.8661	1.0850	-0.80	0.425	-0.3348	0.4008
Low input requirement of indigenous plants	0.5491	0.7560	0.73	0.468	0.1708	0.1963
Land ownership	1.5146	0.5256	2.88	0.004***	0.5472	0.1487
Does indigenous plants have economic value	0.7086	0.5515	1.28	0.199	0.2266	0.1418
Households access to market	1.2135	0.4609	2.63	0.008***	0.4557	0.1548
Households willingness to pay for indigenous plants	0.6233	0.7332	0.85	0.395	0.1915	0.1831
Households total expenditure	-0.0037	0.0017	-2.16	0.031**	-0.0014	0.0006
Financial return from indigenous plants cultivation	1.6933	0.5439	3.11	0.002***	0.4450	0.0933
Contribution to households welfare	0.5559	0.3634	1.53	0.126	0.1961	0.1262
Access to seed and incentive	1.6117	0.6363	2.53	0.011**	0.5831	0.2268
Households physical assets	0.2370	0.1268	1.87	0.061*	0.0857	0.0461
Constant	-0.7783	1.6190	-0.48	0.631		
Number of observations	133					
Wald chi^2 (23)	81.70					
Prob > chi2	0.0000					
Pseudo R^2	0.5065					
Log Pseudo likelihood	-45.1266					
Goodness of fit measure- Hosmer-Lemeshow chi^2	2.97					
Prob > chi^2	0.9365					
Mean Variance Inflation Factor (VIF)	1.34					

Note: *** p<0.01, ** p<0.05, * p<0.1

Conclusions

The average total income made from indigenuous plant farming was significantly higher among those who cultivate indigenous plants on their own land than the participants who cultivate indigenous plants on land from other land tenure patterns.

Participants that utilizes indigenous plants have 58-59% probability of being food secured in the study area while 59.40 % of the households were food secure.

Indigenous plants cultivation contributes to the participants' livelihood assets in the rural areas. Therefore, indigenous plants cultivation was important for rural household's food security and livelihood.

Hence, the study advocates for the stimulation of indigenous plants cultivation for food supply, economic prosperity, improved livelihood and sustainability.

Based on the finding, policy interventions directed at the improvement of the present land tenure pattern and incentives for the cultivation of indigenous plants will increase their wider acceptance, improve the livelihoods and food security in South Africa.

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