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Factors Contributing to Rural Household Consumption Expenditure of Farmers Cultivating Legumes in the Limpopo Province of South Africa

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ABSTRACT This study was conducted to analyze factors affecting household consumption expenditures among small-scale legume farmers in selected areas of Limpopo Province, South Africa. A sample of 198 farmers was drawn from two small-scale farming communities using quota sampling. Farmers were beneficiaries of the two communities cultivating legumes during the 2014/2015 growing season. Poisson regression analysis was employed for the study. The results indicated that farmers with access to credit, high pay off farm income and cultivated only one type of legume variety were less likely to have high household consumption expenditure leading to decreased welfare. Again, married and old farmers were also less likely to have high household consumption expenditure. Comparatively, farmers with increased land tenure security and regular contacts with extension officers were likely to have increased household expenditure and welfare. The study recommended increase in the availability of land and contact with extension officers to enhance household welfare in the area.

INTRODUCTION

Household consumption expenditure is probably the most common indicator that can be used to measure the welfare of farmers (Moratti and Natali 2012). Its measurement has been indicated to be time consuming but at the same time, considered to have vast advantage over other measurements when considering short periods of time (Howe et al. 2010). Household consumption expenditure obtained from using short-term consumption modules have been observed to be consistent with ranking. Review of available literature points to the fact that studies to determine welfare of farmers have been limited and needs further research (Beegle et al. 2010). Different indicators of welfare exist; however consumption expenditure has long been selected by economists as an appropriate proxy for the determination of welfare (Moratti and Natali 2012). In order to obtain accurate measurement of welfare using consumption expenditure, it has been emphasized that questionnaires employed to collect information from respondents should cover all aspects of consumption as much as possible (Booysen et al. 2008). According to Howe et al. (2010), collecting information on a subset could result in bias results from the analysis. Beegle et al. (2010) indicate that information on consumption expenditure to be used as proxies for welfare should include expenditure on food items, non-food items (health, education plus other non-food items), housing and consumables. To give value to food consumption that does not go through the market, for example, consumption of own produce (from the farm), information on market prices could be used as good substitutes. Household consumption has been observed to be stable especially among farmers since it is smoothed over the seasons therefore reflecting real living standards (Azzarri et al. 2006).

Wealth index has recently been considered as an alternative measurement of wealth (Rutsein and Johnson 2004). It has been more appropriate than consumption expenditure in terms of its long-term reflections of welfare. However, it is considered suitable in studies in which multidimensional analysis is required (Sahn and Stifel 2000). Other studies have considered asset index as another proxy for measuring welfare. However, Filmer and Pritchett (2001) consider this method as poor estimation of welfare, whiles others consider it as suitable for long-term or permanent income estimation (Montgomery et al. 2000). In addition, several asset-based indices have been considered to a measure of welfare that does not consider other households'

current levels of poverty or welfare (Filmer and Pritchett 2001).

This study sets out as its main objective to determine factors that affect the welfare of farmers on smallholder farming setups in the Limpopo Province of South Africa. The study used household consumption expenditure as a proxy for welfare. The focus was on those farmers who cultivated legumes on small plots of land between 2 to 3 hectares.

METHODOLOGY

Quota sampling method was used to select 198 beneficiaries from two farming communities. Judgement was used to select 90 beneficiaries from one farming community and 108 from another based on a specified proportion. The farming community members were assumed to be mutually exclusive groups. A well-structured and field pre-test interviewing schedule was prepared for information collection on various socio-economics variables during the 2014/15 growing season. Descriptive statistics followed by Poisson Regression were used in the analysis. Poisson regression analysis was employed due to its appropriateness for the study and availability in the Statistical Package for Social Sciences (SPSS) version 22 software.

The Poisson Regression Model

The underlying assumption of the Poisson regression model is that the response variable, household consumption expenditure, is a count money variable and each legume farmer has the same length of observation time, crop production season. If the observations for the legume farmers had varied periods, and the differences in time were ignored, the Poisson regression estimate would be biased. Poisson model compared to other count models, for example, negative binomial or zero-inflated models, was assumed appropriate in this study. In this study, it was assumed that the response variable, household consumption expenditure, was not overdispersed and did not have excessive number of zeros.

Let Y_t denotes the observed amount of household expenditure in period *t,* the growing season; ω_t, the expected amount of household expenditure in period t ($\omega_t > 0$); and e= 2.71828 (the base for natural logarithms), the Poisson distribution model can be expressed as (Wooldridge 2005):

$$\Pr(Y_t = y_t; \omega_t) = \frac{e^{-\omega_t}\omega_t^{y_t}}{y_t}! \qquad \text{Equation (1)}$$

The hypothesis that the probability of household consumption expenditure occurs in period t, is the same as every other season for each farmer can be written as:

H_1: $\omega_1 = \omega_2 = \omega_3 = \ldots = \omega_n$ Equation (2)

The hypothesis indicates that the expected amount of household expenditure in period t, $\grave{u}_t$, is not correlated with others occurring in the same year or previous years. To allow, ω_t to vary as a function of the explanatory variables the following equation was postulated:

$$E(Yt) \equiv \omega_1 = \exp[\omega_0 + \omega_1 CRED + \omega_2 OFFIN + \omega_3 AGE + \omega_4 MST + \omega_5 CULT + \omega_6 LAND + \omega_7 EXT]. \qquad \text{Equation (3)}$$

The Deviance, defined as the log likelihood of the model, multiplied by (-2). For Poisson regression, SPSS calculated the deviance as:

$\sum_{i=1}^{n} 2(y_i \log \frac{y_i}{\hat{y}_i} - (y_i - \hat{y}_i))$ where $\hat{y}_i$ is the predicted value of y_i Equation (4)

The Pearson Chi-square which is the goodness of-fit measure that compares the predicted values of the outcome variable with actual values was calculated as:

$\sum_{i=1}^{n} \frac{(y_i - y_i)}{\hat{y}_i}$ where is the predicted value of y_i Equation (5)

The Alkaike Information Criterion (AIC), which also measures the goodness of fit was defined as: (-2 In L + 2k), Equation (6)

Where, k= number of parameters in the model and L = loglikelihood. Variables and their explanations are presented in Table 1.

RESULTS

Table 1 presents the definition of variables employed in the analysis with their hypothesized signs, whiles in Table 2, the descriptive statistics of the variables (dependent and independent) considered in the Poisson distribution model are provided. The statistical estimation of equation (3) is presented in Table 3. Not all the signs of the coefficients hypothesized are the in the correct direction. The variables 'AGE', 'LAND' and 'EXT' have the correct positive signs. An indication that old farmers operating on communal land tenure system with more than

Table 1: Definition of variables and their expected signs

Variable	*Measurement*	*Expected sign*
Consumption (HEXP)	[1]Consumption expenditure per growing season (Rand)	NA
Access to credit (CRED)	Dummy: 1 if farmer had access to credit and 0 otherwise	+
Off farm-income (OFFIN)	Dummy: 1 if farmer had off-farm income and 0 otherwise	+/-
Age (AGE)	Age of farmer in years	
Marital status (MST)	Dummy: 1 if farmer is married and 0 otherwise	+/-
Cultivation (CULT)	Dummy: 1 if farmer cultivated legumes only and 0 otherwise	+/-
Land tenure (LAND)	Dummy: 1 if farmer operated on communal land and 0 otherwise	+
Extension (EXT)	Dummy: 1 if contacts with extension officer 0 otherwise	+

[1]Consumption expenditure included: Own consumption, non-food items (health, education), housing, rent, utilities, and other durables

twice extension visits per growing season are more likely to have higher household consumption expenditure per growing season. Comparatively, farmers who have less credit, less off-farm income, not married and cultivate only legumes are less likely to have higher household expenditure per season.

In Poisson regression, the coefficients are interpreted as follows: for one unit change in the predictor variable, the difference in the logs of expected count is expected to change by the respective regression coefficient, given all other predictor variables in the model held constant (Wooldridge 2005). Considering the variable 'Access to credit (CRED)', the results indicate that the difference in the logs of expected count is 0.91 unit lower than for farmers with no access to credit. Thus, considering two legume farmers, one with access to credit and the other with no access to credit, it is expected that the farmer with access to credit will have less household expenditure than one with no access to credit.

'Off-farm income (OFFIN)' was the Poisson regression estimate for one unit increase in off-farm income score, all other variables held constant. The results indicate that if farmers were to increase their off-farm income by one point, the difference in the logs of expected counts would be expected to decrease by 0.79 unit, while holding all other variables constant. Thus, farmers with higher off-farm income are expected to have less household expenditure than those with lower off-farm-income.

The Poisson regression estimate for one unit increase in 'Age (AGE)' score, all other variables held constant was estimated to be -0.01. The result indicates that if farmers were to increase their age by one year, the difference in the logs of seasonal household expenditure count would be expected to decrease by 0.01 or one percent unit, while holding all other variables constant. Thus, older farmers are expected to have less household expenditure than the young ones. The estimated one unit increase in 'Marital Status (MST)' score, all other variables held constant was -0.37 or thirty-seven percent. The result indicates that if farmers were to increase their marital status by one, the difference in the logs of seasonal household expenditure count would be expected to decrease by thirty-seven percent, while holding all other variables constant. Thus, married farmers are expected to have less household expenditure than the unmarried ones.

For the variable 'Cultivation (CULT)', the results indicate that the difference in the logs of expected count is 0.36 or thirty-six percent lower than for farmers who cultivated one variety of legume only. Thus, considering two legume farmers, one cultivating one variety and the other cultivating different varieties, it is expected that farmers who cultivated only one variety of legume will have less household expenditure than one who cultivated different varieties. From Table 2, only thirty-six percent of farmers operated land with security of tenure. From Table 3, the result of the variable 'Land Tenure (LAND)', indicate that the difference in the logs of expected count is 0.28 unit higher than for farmers with no security of tenure. Thus, considering two legume farmers, one with tenure and the other with no security of tenure, it is expected that the farmer with security of tenure will have higher household expenditure than one with no security of tenure.

Only thirty-three percent of farmers indicated that they had at least two contacts with extension officers (Table 2). The results in Table 3

Table 2: Descriptive statistics of variables

Variable	*N*	*Minimum*	*Maximum*	*Mean*	*Std Dev*
Consumption (HEXP)	198	700	12000	3156.57	2175.436
Access to credit (CRED)	198	0	1	0.86	0.349
Off farm-income (OFFIN)	198	0	1	0.14	0.344
Age (AGE)	198	20	78	45.72	12.351
Marital status (MST)	198	0	1	0.48	0.501
Cultivation (CULT)	198	0	1	0.28	0.449
Land tenure (LAND)	198	0	1	0.36	0.482
Extension (EXT)	198	0	1	0.33	0.471

indicate that the variable 'Extension (EXT)', had the difference in the logs of expected count to be 0.24 unit higher than for farmers who had no contact with extension officers. Considering two legume farmers, one with contact and the other with no contact, it is expected that the farmer with contact will have higher household expenditure than one with no contact. All the standard errors of the coefficients are low and indicate precise results. Again, all the coefficients are significant at least at the one percent level. It can therefore be concluded that all the coefficients are greater than zero which rejects the first hypothesis. The Wald Confidence Interval of the regression coefficients are presented in Table 3. For a given predictor variable with ninety-five percent confidence interval, repeated trials of ninety-five percent would include the true population Poisson regression coefficient.

The Wald chi-square test indicates that all coefficients are zero. From the result of the chi-square test provides a strong support for the rejection of both the first and second hypotheses. The Pearson chi-square which is the goodness of-fit measure that compares the predicted values of the outcome variable with actual values was significant at one percent level of significance and estimated as 20 989.545 with df=190. The significance and high vale indicate a high measure of the goodness-of –fit of the model. The Alkaike Information Criterion (AIC) which also measures the goodness of fit (184 193.117) was relatively high and indicated high measure of the goodness-of–fit.

DISCUSSION

Considering two groups of legume farmers, one with access to credit and the other with no access to credit, the results indicated that farmers with access to credit to produce legumes will have ninety-one percent less household expenditure than those with no access to credit (Table 3). A plausible explanation of this strange result might be that those farmers with access to credit borrowed heavy sums of money which had to be paid on instalment thus leaving them with little to spend on household expenditure. According to Prinsloo (2002), consumer debt, which includes private and household debts, accounts for ninety-three percent of total household debt.

Table 3: Poisson regression parameter estimates

			95% Wald confidence interval		*Hypothesis test*		
Parameter	β	*Std error*	*Lower*	*Upper*	*Wald* χ^2	*df*	*Pr (β=0)*
(Intercept)	8.69	0.012	8.66	8.71	497 247.15	1	0.00
CRED	-0.91	0.011	-0.93	-0.89	6 836.10	1	0.00
OFFIN	-0.79	0.011	-0.81	-0.77	5 005.28	1	0.00
AGE	-0.01	0.000	0.01	0.01	4 338.48	1	0.00
MST	-0.37	0.003	-0.38	-0.36	14 368.49	1	0.00
CULT	-0.36	0.004	-0.36	-0.35	10 142.72	1	0.00
LAND	0.28	0.003	0.27	0.28	10 657.36	1	0.00
EXT	0.24	0.003	0.23	0.24	7 814.99	1	0.00

Statistics:

Pearson χ^2 = 209 89.545; df=190; P<0.00
Log likelihood = -92 088.558; P<0.00
AIC = 184 193.117

Farmers with higher off-farm income are expected to have seventy-nine percent less household consumption expenditure than those with lower off-farm-income (Table 3). The explanation for this unexpected result is that since the study considered household expenditure from legume farming it was expected that farmers who had high off-farm income concentrated less on legume production using less farm labour to receive more income. However, Babatunde (2015) has challenged the notion that off-farm income of farmers may lead to a decline in agricultural production as a result of competition for family labour between farm and off-farm work. The regression results presented in Table 3, indicate that if farmers were to increase their age by one year, the difference in the logs of seasonal household expenditure count would be expected to decrease by one percent while holding all other variables constant. Thus, older farmers are expected to have less household expenditure from legume production than the young ones. Evidence in the literature suggest that farmers' performance increases for the first few years of farming but tends to decrease as age increases (Babatunde 2005; Bongiwe and Masuku 2013).

The results indicated that if farmers were to increase their marital status by one, the difference in the logs of seasonal household expenditure count would be expected to decrease by thirty-seven percent, while holding all other variables constant. Thus, married farmers are expected to have less household expenditure than the unmarried ones. Youth, who are not married, and their participation in farming activities compared with married men has been found to be higher (Ugwoke et al. 2005). Considering two legume farmers, one cultivating one variety and the other cultivating different varieties, the results of the study indicated that farmers who cultivated only one variety of legume are expected to have thirty-six percent less household expenditure than one who cultivated different varieties. The result confirms the assertion by Bongiwe and Masuku (2013) who found out that the cultivation of varieties of vegetables results in an increase in productivity and profitability.

From the results, the difference in the logs of expected count for farmers with land tenure security was twenty-eight percent higher than for farmers with no security of tenure. Thus, it is expected that farmers with security of tenure will have higher household expenditure than those with no security of tenure. Security of land tenure has been found to enhance farm productivity, thus increasing household consumption expenditure (Mwijage et al. 2011). The results in Table 3 indicated that the difference in the logs of expected count for farmers who had contact with extension officers was twenty-four percent higher than for those who had no contact with extension officers. The inference is that farmers with contact will have higher household expenditure than one with no contact. Regular visits by extension officers to farmers have been considered to increase farm productivity resulting in high household consumption expenditure (Ugwoke et al. 2005).

CONCLUSION

The study noted the existence of lower household expenditure and thus reduced welfare for farmers that had accessed to credit to produce legume crops. This finding could be explained by the transfer or allocation of income towards high installment repayments. Farmers had higher off-farm income and the expectation were that much of this form of income was used to produce other crops rather than a focus on legume crops. Farmers were relatively aged. Literature has confirmed that older farmers are less productive; a factor that usually continues to lower income and thus less expenditure.

The study found out that farmers focused on one rather than a diversified variety of legumes. The productive ability of various varieties of legumes is desirable as it could result in some succeeding where others fail. This paper however noted increased household expenditure for farmers that had secure land tenure systems, however security was measured as having access to communal land rather than private land ownership or land rentals. In the context of communal smallholder farming, land tenure security is associated with land size rather than the form of tenure. Farmers had many contacts with extension officers, a factor that has also been attested by literature.

RECOMMENDATIONS

Strategies to increase household expenditure towards more family welfare need to be adopted. The observation that credit targeting production of legume crops was diverted to repay-

ment of high installments and the production of other crops needs to be re-dressed through proactive farmer training programmes, especially in understanding factors leading to misappropriation of funds. The role that can be played by private and public institutions in providing the necessary training cannot be sufficiently emphasized. Whereas crop diversification is necessary as a hedge for productive crop differences, there will be a need for partial budgeting targeting specific crops.

Maintenance and possible improvement in secure land tenure and contact with extension officers is a positive outcome that the paper has advanced. As communal land can be shifted for other uses with relative ease, and to the detriment of beneficiaries, farmers should be gradually exposed to take advantage of the government's land reform programmes, especially its Progressive Land Acquisition Strategy (PLAS) that advocates for land leases to aspirant farmers. The latter could be more attractive to younger farmers.

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