www.jard.edu.pl http://dx.doi.org/10.17306/J.JARD.2022.01542

Journal of Agribusiness and Rural Development

pISSN 1899-5241
eISSN 1899-5772

2(64) 2022, 153–160
Accepted for print: 11.05.2022

FACTORS AFFECTING LIVELIHOOD STRATEGIES OF SMALLHOLDER TOBACCO AND NON-TOBACCO FARMERS AND OFF-FARM HOUSEHOLDS BENEFITTING FROM LAND REFORM IN ZIMBABWE

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Abstract. The main objective of this paper was to determine the factors that affect the livelihood strategies of resettled smallholder farmers in Zimbabwe. The study was conducted in Manicaland Province in Zimbabwe, and the respondents were stratified into four groups. These were smallholder farmers resettled under the A1 and A2 models, as well as tobacco and non-tobacco smallholder farmers. The two models differ in how they were implemented and supported, which might lead to them having different livelihood strategies. A total of 300 respondents were surveyed, consisting of 114 tobacco and 149 non-tobacco farmers and 24 off-farm and 13 wage-earner households in Manicaland province. The study used a Multinomial Logit model to investigate the factors influencing a household's decision to choose different livelihood strategies. In the model, the dependent variables included four livelihood strategies, while the explanatory variables included various household social-economic and institutional factors. The results obtained from the multinomial logistic regression model established that gender and land size were significant at a level of 1%, and education, household size, access to credit and access to inputs were significant at 5% in the adoption of tobacco farming, access to credit and gender were significant at a 1% level in the adoption of non-tobacco farming, while education was significant at a 10% level in adopting off-farm were found to be significant in determining the adoption of the tobacco farming in the study area up to less than 10% probability level in adopting off-farm activities. Smallholder farmers who did not adopt tobacco farming indicated that limited land size, shortage of labour and access to tobacco inputs were the major impediments to adopting tobacco farming. The government should support the efforts of smallholder farmers to increase their livelihood strategies through unveiling credit lines for farming activities. Access to inputs for smallholder farmers should be made a priority by the government through the provision and fair distribution of adequate agricultural inputs.

Keywords: livelihood strategies, land reform, multinomial logit model, Manicaland, Zimbabwe

INTRODUCTION

The agricultural sector in Zimbabwe contributes a significant amount to the national economy, livelihood support and employment (Mango et al, 2020). It generates a large proportion of national income and foreign exchange earnings. According to Chingosho et al. (2021) the agricultural sector still plays a critical role in Zimbabwe, hence it is necessary to improve agricultural development strategies if the economy is to be revived in the future. The tobacco industry in Zimbabwe experienced a decline in production to as low of 48.8 million kg in 2008, down from a peak of well over

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200 million kg in 2000 (TIMB, 2009). The tobacco industry is, however, on the road to recovery following the adoption of multiple currencies in 2009, resulting in an increase in production to about 60 million kg being produced in 2009 (TIMB, 2009). The tobacco output continued to increase, doubling to 123 million kg in 2010 and to about 144 million kg in 2012 (TIMB, 2012). According to the annual statistical report by TIMB (2020), tobacco farming generated an average of $782 m from exports in the 2020 farming season, which reveals that it's an important source of income in the country. Tobacco farming has an integral role in Zimbabwe since it is the largest tobacco leaf producer in Africa and the sixth largest in the world, after China, Brazil, India, the USA and Indonesia (Chingosho et al., 2021).

It is important to understand the factors which have influenced the livelihood strategies used in Manicaland to attain different levels of food security status. These livelihood strategies refer to the combination of choices and activities that households undertake in order to achieve their own objectives (Scoones, 1998). Several studies have established that it is increasingly difficult to rely on farming activities alone as the core activity for rural households as a way of improving livelihood and reducing poverty (e.g., Stifel, 2010 and Yishak et al. 2014). One phenomenon that is of paramount importance in the rural development literature is the promotion and support of non-farm activities. Three major directions which households can undertake to choose the combination of strategies that best suit their proposed objectives given the available resources are whether to do tobacco farming or non-tobacco farming, or to undertake non-farming activities. Different livelihood strategies are influenced by several factors which also ultimately influence the food security status of smallholder farmers.

RELATED LITERATURE

Most studies broadly classify livelihood strategies into agricultural intensification and diversification and migration of livelihood sources at the household level (Barrett et al., 2001; Galab et al., 2002; Adugna, 2005; Berehanu, 2007). Little attention is, however, given to the specifics of what comprises non-farm activities and under which localities these are constituted (Lun et al., 2018). As a result, gaps still exist in the literature with regard to the specific activities that comprise on-farm and non-farm activities at various household localities and their relative contributions to food security.

Moreover, other studies also cite the general influence of household and institutional factors on the adaptation of livelihood strategies, ranging from gender and education to credit and extension (Bezemer and Lerman, 2002; Rao et al., 2004; Holden et al., 2004; Brown et al., 2006). However, more effort is focused on econometric modelling with regard to the direction and significance of influences at the expense of looking for the specific reasons reported by respondents. More often than not, policy insights based on such approaches have errors of commission and omission. The study by Chingosho et al. (2021) investigated the prevalence of tobacco-related indebtedness among smallholder farmers and the correlates of such indebtedness in Zimbabwe. The study established that most small-scale farmers are unhappy with the financial returns on tobacco farming and most are in tobacco-related debt. This study targets both on-farm and off-farm livelihood activities, as reported by smallholder tobacco and non-tobacco farmers, with the implicit goal of understanding locality-based livelihood adaptation strategies to improve food security in their communities.

MATERIALS AND METHODS

The study area

Th study focused on the province of Manicaland, which is one of the ten provinces in Zimbabwe. Manicaland province has an altitude of 1695m and a mean summer temperature of 26°C. Manicaland province stretches across Natural Regions I to V. However, most of the province lies in Natural Regions I and II, which have high rainfall and where temperatures range from 3°C to 28°C, though there is some probability of frost in winter along the mountain regions (Jerie and Ndabaningi, 2011).

This province was chosen because it contributes a significant amount (23 percent) of the country's tobacco production (third highest tobacco producing province, with Mashonaland West being the highest on 30 percent, and Mashonaland Central on 26 percent) and because its resettled smallholder farmers in the chosen districts of Mutasa, Mutare and Makoni survive mainly from income obtained from tobacco farming (Jerie and Ndabaningi, 2011). According to Jerie and Ndabaningi, tobacco, which is mainly produced in Manicaland province, is the most important cash crop and

potentially a major source of foreign currency in Zimbabwe. Manicaland province receives an average rainfall of between 600 mm and 800 mm per annum, which is enough to support tobacco cultivation, which requires about 50 mm to 60 mm of rainfall every month (Jerie and Ndabaningi, 2011).

The specific study areas within the province (Mutasa, Makoni and Mutare) were chosen based on two main criteria. These have almost the same type of agro-ecological zone (NR I and II) and tobacco and non-tobacco farming smallholder households. Moreover, these districts generally have the same type of soils, which are fersiallitic soils (Galang, 2002). This type of soil is derived from granite which originated from granite rocks. The soils are different colours, including dark grey and light colours. Furthermore, these soils are mostly sandy, which can easily be eroded and therefore possess poor nutrient levels. As a result, these soils require good conservation and the use of several inputs such as manure and fertilisers. This means that smallholder farmers resettled in Manicaland require several livelihood assets for them to successfully undertake their preferred livelihood strategies and obtain the desired livelihood outcomes.

Sampling procedure

This study employed a multi-stage sampling technique with stratified and random components. Samples were drawn from three districts, namely Mutare rural, Mutasa and Makoni. Stratification was carried out initially according to the A1 model of land reform or the A2 model for farmers, the latter according to whether smallholder farmers are tobacco or non-tobacco farmers. The reason for the former type of stratification is that land reform emerged from different models. According to Moyo (1998), the differences in the amount of land households obtain ultimately influences the livelihood strategies of those households.

Initially, a purposive sampling technique was applied to ensure tobacco growing districts such as Mutare, Mutasa and Makoni were included. The purposive sampling technique is particularly useful since this is an evaluation research method which involves identifying the smallholder tobacco and non-tobacco farmers who were resettled for evaluation. According to Lisa (2008), purposive sampling enables the researcher to understand the actual situation on the ground better and to identify and differentiate the needs of all relevant groups involved. Random sampling was applied in each stratum to obtain the respondents for the study. A total of three hundred respondents were interviewed using a researcher administered structured questionnaire to obtain information on factors affecting the livelihood strategies of smallholder tobacco and non-tobacco land reform beneficiaries in Manicaland province in Zimbabwe.

Mathematical representation of the multinomial logit regression model

A multinomial logit regression model highlights key household attributes such as age and gender of household head, family size, farming skills, access to credit, land size, income and constraints that differentiate households pursuing different livelihood strategies. The assumption is that, to identify the determinants behind a rural household's decision to pursue various livelihood strategies in a given period, a rational household head chooses among the four mutually exclusive livelihood strategy alternatives that will make the household derive maximum utility. Following Greene (2003), suppose for the i^{th} respondent faced with j choices, the utility choice j is specified as:

$$U_{ij} = Z_{ij}\beta + \varepsilon_{ij} \quad (1)$$

If the respondent makes choice j in particular, then we assume that U_{ij} is the maximum utility the i^{th} respondent could obtain among the j utilities. So, the statistical model is derived by the probability that choice $_j$ is made, which is:

$$\Pr(U_{ij} > U_{ik}) \text{ for all other } K \neq j \quad (2)$$

Where:

U_{ij} is the utility to the i^{th} respondent form livelihood strategy j

U_{ik} is the utility to the i^{th} respondent from livelihood strategy k

According to Brown et al. (2006), the household's choice is the optimal allocation of its asset endowment if the i^{th} respondent's utility is maximised as a result of the selected livelihood strategy. As a result, the i^{th} household's decision can ultimately be modelled as maximizing the expected utility by selecting the j^{th} livelihood strategy among J discrete livelihood strategies, i.e.,

$$\max_j = E(U_{ij}) = f_j(x_i) + \varepsilon_{ij}, j = 0 \ldots J \quad (3)$$

For an outcome variable with J categories, the j^{th} livelihood strategy that the i^{th} household chooses to maximize

its utility could take the value 1 if the i^{th} household chooses the j^{th} livelihood strategy and 0 otherwise. Consequently, the probability that a household with characteristic x chooses livelihood strategy j, P_{ij} can be modelled as:

$$P_{ij} = \frac{\exp(X_i^{'}\beta_j)}{\sum_{j=0}^{J}\exp(X_i^{'}\beta_j)}, J = 0...\ 3 \qquad (4)$$

Applying the requirement that $\sum_{j=0}^{J} P_{ij} = 1$ for any i where:

P_{ij} – probability representing the i^{th} respondent's chance of falling into category j

X – predictors of response probabilities

β_j – covariate effects specific to j^{th} response category with the first category as the reference.

To remove an indeterminacy in the model, when carrying out appropriate normalization, it should be assumed that $\beta_1 = 0$ (this arises because probabilities are equal to 1, so only J parameter vectors are needed to determine the $J + 1$ probabilities) so that $\exp(X_i\beta_j) = 1$, (Greene, 2003) implying that the generalized equation (4) above is equivalent to:

$$\Pr(y_i = j / X_i) = P_{ij} = \frac{\exp(X_i\beta_j)}{1 + \sum_{j=1}^{J}\exp(X_i^{'}\beta_j)}$$

for $j = 0, 2 \ldots J$ and

$$\Pr(Y_i = j) = \frac{e^{\beta_j x_i}}{\sum_{k=0}^{j} e^{\beta_k x_i}}, j = 0,\ 1 \ldots J \qquad (5)$$

where:

β_i – a vector of coefficients on each of the household attributes i,x

β_k – the vector of coefficients of the base alternative j denotes the specific one of the $j + 1$ possible livelihood choices.

RESULTS

Farmers' demographic and socio-economic profile

The demographic and socio-economic characteristics of the sampled households in Manicaland province were analysed using descriptive statistics. These statistics include gender of the household head, marital status, age of the household head, level of education, household size, farming activities and sources of income. Response variables that had an effect on the dependence of either tobacco or non-tobacco farming on all the other response variables were tested using the Chi-square test.

The average age of the majority of smallholder farmers of both tobacco and non-tobacco was generally high as it was in the range of 45–55 years. Furthermore, the average family size for both tobacco and non-tobacco farmers was at least about seven, which is an indication of high dependency ratios. The majority of the sampled households in the resettled areas, A1 (86%) and A2 (88%), were headed by men. Furthermore, the results of this study also revealed that 90.8 percent of tobacco farming households and 84.4 percent for non-tobacco farming households were headed by men. For the tobacco and non-tobacco resettled farmers, all the respondents had at least attained primary education, which reveals that all farmers are functionally literate. The results also established that A2 farmers have much greater land holdings on average (9.067 hectares) than A1 smallholder farmers (average 3.060 hectares). Moreover, A2 smallholder farmers have been found to produce more output of tobacco (6.584 tonnes) and maize on average (3.489 tonnes), whilst A1 smallholder farmers only managed an average of 2.657 tonnes of tobacco and 1.455 tonnes of maize on average.

Results of the multinomial logistic regression

The estimation of factors affecting livelihood generation was carried out using the multinomial logistic regression model. The results of the multinomial logistic regression model are shown in Table 1 below. In the multinomial logistic regression model, the dependent variable is ordered where: 1 – tobacco farming household; 2 – non-tobacco farming household (crops and livestock); 3 – household active in off-farm activities and 4 – wage-earner household (formal employment). Examination of the literature shows that the category which is redundant should be taken as the reference category, hence formal employment was considered to be the reference category in the model. Consequently, a positive sign for the variable in the multinomial model reflects a higher likelihood of participation in the main source of income (livelihood strategy) indicated. However, a negative sign for the variable in the multinomial model reflects a lower likelihood of participation in the main source of income indicated.

The chi-square value is significant at one percent, implying that the explanatory variables taken together influence the livelihood strategies adopted by smallholder

Table 1. Results of the multinomial logistic regression in the model (model included only significant variables at 0.1 level)

Variable	Tobacco farming			Non- tobacco farming			Off- farm activities		
	Estimate	SE	P(Sig)	Estimate	SE	P(Sig)	Estimate	SE	P(Sig)
Intercept	–25.797	3.673	.000	–27.692	3.669	.000	–25.352	3.984	.000
Gender	14.908	.653	.000***	15.014	.594	.000***	0.791	0.0230	0.200
Household size	.505	.208	.015**	.422	.205	.180	.344	.225	0.127
Education	0.376	.183	0.04**	.0800	.527	.129	1.114	.620	0.072*
Land size	2.271	.712	.001***	0.278	.712	.132	.881	.752	0.242
Access to credit	3.581	1.404	.011**	5.051	1.412	.000***	0.451	0.624	0.34
Access to inputs	2.010	.920	.029**	1.587	.906	0.080*	1.457	.990	.141

N = 300 (tobacco farming household – 114; non-tobacco farming household – 149; household active in off farm activities – 24 and wage-earner household – 13). Model chi-square = 149.994; $p < 0.0001$, –2 log likelihood = 402.994, Pseudo R^2 (Nagelkerke) = 0.887. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$. The reference category is: 4 (formal employment).
Source: field data.

farmers in Manicaland. The Pseudo-R^2 refers to the Nagelkerke's Pseudo-R^2. Verbeek (2008) suggests that the interpretation of the pseudo R^2 (Nagelkerke) be done with great caution since it does not have the same interpretation as the R^2 in the ordinary least square regression. A positive value means that the explanatory variable increases the chances of the livelihood strategy being pursued with an increase in its magnitude.

After including all variables which might influence household livelihood generation, the results indicated that there was an unexpected singularity in the Hessian matrix, and therefore, no meaningful conclusions could be drawn. To correct for unexpected singularities in the Hessian matrix, it was necessary to exclude some of the predictor variables which were not significant in the model such as age group, income, access to extension services, skills and several other constraints. As a result, variables which were significant at 0.1 levels were included, as shown in table 1 below.

Interpretation of econometric results

The multinomial logit regression model successfully estimated the significant variables which influenced the livelihood strategies used by resettled smallholder farmers in Manicaland. The results showed that the model had strong explanatory power since the p value obtained was less than 0.0001. Furthermore, the Pseudo R^2 (Nagelkerke) of 0.887 revealed that the explanatory variables managed to predict about 89 percent of variations in livelihood strategies for the respondents, indicating that the model was well specified. The following variables were found to be significant determinants for smallholder farmers in the study area to decide to adopt tobacco farming: gender, number of households, crop production land and challenges of access to markets and to credit. The results of the estimated equations of the final multinomial logistic regression model were discussed in terms of the significance and signs on the parameters. Table 1 shows that the set of significant explanatory variables varies across the groups in terms of the levels of significance for all livelihood choice categories.

Gender or sex of household head significantly affected the choice of livelihood strategies (both for tobacco and non-tobacco smallholder farmers) due to culturally defined roles and differential cultivation of crops, since cash crops such as tobacco farming are considered to be male crops, whilst grains and legumes are considered to be female crops in much of Africa, and particularly in Zimbabwe. This is in line with the findings of Adugna (2005) and was also stated by Zimstat (2013). Household characteristics like having a male head increased the probability of being a tobacco farmer, whilst having a female head increased the probability of the household being involved in the cultivation of non-tobacco farming for the respondents in Manicaland. This result is consistent with the results obtained by Demeke and Haji (2014), who established that male headed households

are more likely to be commercial farmers, as opposed to women, who are usually involved in subsistence farming. This is also in contrast to the findings established by Mango et al. (2020) which revealed that gender showed no significant difference in the conservation of miombo woodlands in tobacco farming regions of Mutasa in Zimbabwe. In this study, gender of household head was found to positively and significantly ($p < 0.01$) affect the livelihood strategy of the household, as expected.

Household size coefficient is positive and statistically significant at a 5% level of probability for tobacco farming. A larger family size is an important determinant for the adoption of tobacco farming, which is a labour-intensive farming practice. These results are in line with the findings of Hollaway et al. (2002), Takane (2007) and Kisaka-Lwayo (2012), who established that large family sizes are an indication of the availability of labour required for cash crops such as tobacco. Family labour is also of paramount importance in meeting the peak labour demands required for tobacco farming.

Educational level of household head (**Education**) proved to be one of the key factors which positively influences the likelihood of choosing the livelihood strategies of tobacco farming and off-farm activities. Educational attainment is crucial for understanding and adopting livelihood strategies that bring better returns, such as tobacco farming, and for understanding the need to diversify into other non-farm activities so as to reduce farming risks such as low output prices and bad weather conditions. These results are in line with the findings of Ayuya et al. (2012), which established that farmers who have attained higher education are able to analyse and respond to new and better livelihood strategies. Barret et al. (2001) also revealed that educational level is an important determinant of whether or not farmers adopt off-farm activities to diversify their earnings, which is also in line with the findings of this study. However, the results contradict the findings of Destaw (2003), who established that education has no effect on livelihood strategies. The results are also in contrast to the findings established by Mango et al. (2020), which revealed that educational level showed no significant differences in the conservation of miombo woodlands in tobacco farming regions of Manicaland in Zimbabwe.

The coefficient of **land size** was positive and statistically significant at a 1% level of probability for tobacco farming. The positive coefficient for tobacco farming households reflects the fact that larger farms appear to have a greater propensity to adopt tobacco farming, hence the necessity for more land to be given to smallholder farmers to be able to cultivate high returning cash crops such as tobacco. Smallholder farmers consider off-farm activities as an income source of last resort, hence the need for more land to be made available to them so that they can utilise it for production. These results are consistent with the studies of Balint (2005), Mahelet (2007), Takane (2007) and Demeke and Haji (2014), which showed that cultivated land size positively influenced the share of sale of cash crops and established a highly significant positive relationship between cultivated land and production of cash crops.

Access to inputs had a positive and statistically significant effect at 5% and 10% levels of probability for tobacco and non-tobacco smallholder farmers respectively. This shows that access to inputs is a key component for both tobacco and non-tobacco smallholder farmers in Manicaland. These results agreed with the findings of a survey carried out by ZimVac (2013), which established that the major reasons for reduction in the area planted by smallholder farmers were the late availability and unavailability of crop inputs. Moreover, these findings are also in line with the findings of a report by Poverty Reduction Forum Trust (2013), which reiterated that, generally, the downward trend in agricultural output by farmers in Zimbabwe is attributed to insufficient agricultural inputs.

As expected, **access to credit** for farming activities was found to have a positive and significant impact on the likelihood of choosing tobacco and non-tobacco farming. It also explains why most of the households were diversified since the majority of smallholder farmers in the study area lacked access to credit lines. These results also imply that both formal and informal credit facilities are a very important livelihood asset for rural farmers, not only for them to finance agricultural input activities, but also to acquire crucial livelihood assets such as cattle, trucks and barns. Furthermore, the results of the study consequently suggest that farmers' access to credit would play an important role in promoting smallholder farmers' agricultural output, leading to agricultural development. These results agree with the findings of Brown et al. (2006), Holden et al. (2004) and Berehanu (2007). This implies that making credit lines available to smallholder farmers will accelerate agricultural production and positively contribute to the

economic growth of a country like Zimbabwe. These findings were also supported by a report by the Poverty Reduction Forum Trust (2013) which noted that agricultural production in rural Zimbabwe is generally on the decline as a result of a lack of credit lines for farmers.

CONCLUSION

The study used a Multinomial Logit model to investigate the factors influencing a household's decision to choose different livelihood strategies. In the model, the dependent variables included four livelihood strategies, while the explanatory variables included various household socio-economic and institutional factors. The results obtained from the multinomial logistic regression model established that six variables (gender, household size, education, land size, access to inputs and access to credit) were found to be significant in determining the adoption of tobacco farming in the study area, up to less than a 10% probability level. Smallholder farmers who did not adopt tobacco farming indicated that limited land size, shortage of labour and access to tobacco inputs were the major impediments to adopting tobacco farming.

RECOMMENDATIONS

The results of the multinomial logistic regression model established that access to credit was a major challenge affecting the livelihood strategies undertaken by resettled smallholder farmers in the study area. The government should support the efforts of smallholder farmers to increase their livelihood strategies and improve the contribution of agriculture towards GDP through unveiling credit lines for farming activities. This will go a long way to enabling smallholder farmers to engage in better and higher returning livelihood strategies such as tobacco farming. Non-tobacco smallholder farmers reported that they failed to adopt tobacco farming (during data collection) due to a lack of access to credit, hence, mobilising and increasing rural credits to smallholder farmers in Zimbabwe should be prioritised during policy formulation. Consequently, Agribank needs to be enabled to effectively extend financial support to smallholder farmers in the country. Moreover, it is not entirely up to the government alone to fund agriculture, other players such as private companies and Non-Governmental Organisations (NGOs) should also chip in to help the cause, and systems should also be put in place for the bulk of agricultural production to be self-financing.

Access to inputs for smallholder farmers should be made a priority by the government through the provision and fair distribution of adequate agricultural inputs. This can be done through allocating adequate funds to the Ministry of Agriculture, as well as by supporting the Presidential Input Scheme. Private players should also play their role to ensure adequate supply of inputs to smallholder farmers. Tobacco contractors should also mobilise more funds in order to give enough inputs such as fertilizers and chemicals to contracted tobacco smallholder farmers and also to extend the facility to potential tobacco smallholder farmers. This will enable more resettled smallholder farmers to engage in tobacco farming, thereby improving their livelihood strategies.

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