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THE CONTRIBUTION OF APICULTURE TOWARDS RURAL INCOME IN HONDE VALLEY ZIMBABWE

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Livelihood strategies in developing countries typically depend on agricultural activities. Nonetheless, climate change, recurrent droughts and floods are contributing to crop failures in many developing countries yet beekeeping has proven to offer a valuable adaptive strategy. Against this background, the study sought to examine the role of apiculture as an alternative livelihood strategy in Honde Valley. Using the feasible generalised least squares (FGLS) technique and cross sectional data collected on 80 households selected through multistage sampling technique, gender of household head, access to credit, dependency ratio, level of education and size of land owned are found to be significant factors explaining rural income in Honde Valley. Turning to the variable of enquiry, the results of the analysis of covariance (ANCOVA) indicate that the mean per capita income for apiculture farmers is found to be significantly higher than that of non-apiculture farmers. Against this background, apiculture can be used as an alternative livelihood for the rural community. The study contributes in identifying alternative livelihood strategies in developing countries like Zimbabwe.

Key words: Apiculture, Beekeeping, rural income, poverty alleviation, Honde Valley

1.0 INTRODUCTION

Eradication of extreme poverty and hunger is currently one of the policy goals for every nation in Sub-Saharan Africa. From a policymaking realm, poverty alleviation is now considered as a critical cross-cutting developmental issue bearing far reaching implications for governments and non-governmental organizations. Within the arsenal of strategies used in developing countries particularly Zimbabwe to eradicate poverty, agricultural production plays a central role for many rural households as a livelihood strategy. Nonetheless, climate change, recurrent droughts and floods are having haemorrhaging effects on the perfomance of the sector thereby hurting rural households who depend on agricultural activities. Against this backdrop, responsible stakeholders are in the process of finding alternative livelihood strategies for rural households in the country. As it stands, attainment of the first millennium development goal of eradicating extreme poverty and hunger in Zimbabwe remains bleak and hence a sought to establish possible ways of coping with poverty becomes imperative.

Among the potential and most neglected sources of livelihood is apiculture which Nwali (1996) defines as the rearing of honey bees in order to get economic benefits. In a much similar way, Ikediobi and Achobi (1985) and Morse (1989) defines apiculture as an art of rearing, breeding and managing honeybee colonies in artificial hives for economic gains. It is one of the livelihood sources in most developing countries and its success can been noted in

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countries like Ethiopia. According to Azeez, Nosiru, Bello, Ojo, Clement and Amoo (2014), Ethiopia produces an estimated 44,000 tonnes of honey valued at US$76.6 million and is the largest producer and exporter of honey in Africa. According to Lietaer (2007), beekeeping can be practised as an additional source of income for farmers in rural areas and has been successfully implemented in poverty-alleviating projects. On the same note, beekeeping is a positive programme that not only contributes to uplifting the livelihoods of rural communities but protects the trees and ultimately contributes to protecting our planet earth. In fact, beekeeping is ecological friendly, requires few resources to start up production, can be quickly taken up again after a crisis period and the necessary skills are easily transmitted from one generation to the other making it a sustainable livelihood strategy.

Generally, honey production has been identified as one of the most lucrative enterprise in many parts of the world. For instance, more than 100 million kilogrammes of honey is produced each year in the United States of America. In Africa, beekeeping programmes are mainly dominant in countries like Tanzania, Kenya, Uganda, Zambia, Malawi and South Africa. In these countries, at least half of honey produced is consumed internally while some countries have surplus for export. In the Nigerian context, Ayansola (2012) observed that beekeeping helps eradicate poverty especially in the rural communities.

In Zimbabwe, apiculture is mainly dominant in the eastern forestry parts of the country covering Honde Valley in Mutasa District. The farmers currently boast of a well-established honey market and the honey sold at this market is approved by the Standard Association Zimbabwe (SAZ). The local farmers rely on clay pots and wood made hives with each beehive producing about 15kg of honey on average and approximately 12kg once processed. Decanted into bottles of 500g this equates to 24 bottles and sold at a market price of $4, a bottle produces an income of $96 from this one beehive (Kubari, 2014). The input costs are relatively low being less than 50% of the income generated, making beekeeping a thriving business that can contribute invaluably to a household income in the backdrop of low agricultural productivity that has exposed rural households to extreme poverty. According to the Zimbabwean Independent (2014), rural poverty in Zimbabwe increased to 76% in 2014 from the 63% recorded in 2013. At the same time, cropping practices have failed to exorcise the spectre of rural poverty that has troubled the nation for decades. Against this backdrop, can beekeeping be regarded as the answer to this problem?

Beekeeping has turned to be one of the most lucrative opportunities being derived from the utilization of woodlands. This has come at a time when rural communities have been conscious of the need for sustainable utilization of biodiversity as well as sustainable environmental management practices. The vast natural resources that the rural areas of Zimbabwe are endowed with suggest that quite a number of opportunities can be derived from their management and utilization (Chazovachii, Chuma, Mushuku, Chirenje, Chitongo and Mudyariwa, 2012). Beekeeping activities are integrated with conventional crop, livestock farming and agro-forestry. In a similar vein, beekeeping plays a significant role in contributing to food production through increased pollination of food crops and can also conserve forests and foster sustainable environmental management practices through the planting of bee forage and discouraging local communities from cutting down trees.

Through tree conservation and harnessing of honey, the households may also have access to fruits, medicines, poles, organic manure which can be of paramount importance in conservation farming and all these benefits play a critical role towards poverty alleviation as far as ecologically sustainable development is concerned in developing countries. As Joni (2004) notes, beekeeping plays a major role in the socio-economic development of rural

livelihoods. It provides an important ecosystem service via pollination which contributes to the improvement of biodiversity by maintaining the genetic diversity of plants and maintenance of ecological balance.

Furtherance to that, beekeeping is argued to be space efficient and a suitable intervention strategy towards poverty alleviation in countries with little land for agricultural activities. Rwanda for instance helps demonstrate this fact. The country commonly referred to as a country of thousand hills has little land suitable for agriculture and today the scarcity of land remains a source of tension in Rwanda against the backdrop of rising poverty levels. In response to this, access to research for development and innovation program (ARDI) supported a number of traditional beekeepers to adopt modern beekeeping techniques to increases honey production and household income.

However, despite the favourable natural environment existing in Zimbabwe, beekeeping often lacks the necessary capacitation at national level in form of financial and technical support that is required to fully exploit its great potential in conserving forests and natural ecosystems and in reducing poverty. Same is the case in Tanzania. According to Tanganyika (2014), Tanzania has over 2 million traditional artisanal beekeepers but they suffer from lack of modern equipment, training, finance and market. As a result, Tanzanian beekeeping is yet to meet its poverty alleviation potential.

On the same note, the potential of beekeeping in developing countries is far too often not exploited in development programmes because the benefits of bees and beekeeping are not well known to stakeholders. The purpose of this paper is therefore to provide farmers and stakeholders in the development sector with valuable evidence on how beekeeping, as an alternative livelihood strategy contributes towards rural income. The study will also provide useful information to forestry stakeholders with the necessary information and motivation to consider apiculture as a national and protective activity that should always be considered and integrated in national forest programmes and in other development programmes such as poverty reduction strategies. In a wider sense, the study helps in the formulation of policies that would go a long way to improve not only rural income but alleviate poverty in the economy at large. These policies would also facilitate a reduction in the import bill of honey in Zimbabwe as 60% of the honey consumed in this country is imported. With information from researches of this nature, Zimbabwe may also increase honey production and probably start exporting to other countries.

This paper closely follows the work of Aikaeli (2010) who examined drivers of rural income in Tanzania. The distinct feature however lies in the sense that the present analysis controls for apiculture as one of the explanatory variables in the income function. The paper is organised into five main parts: section 2 provides an overview of beekeeping and poverty alleviation in Zimbabwe and a review of related empirical literature, section 3 describes the methodology and section 4 provides empirical findings while the section 5 provides a conclusion, policy implications and limitations of the study.

2.0 BEEKEEPING AND POVERTY ALLEVIATION IN ZIMBABWE

Since independence in 1980, Zimbabwe has been battling to reduce poverty among the previously marginalised black majority. This has however proved to be a tall order as the number of people living under the poverty datum line has been rising over the years despite

the vast natural resources that the country has. During the 1980-1990 decade, the country of Zimbabwe boasted of an agricultural sector which provided more than 60% of formal employment and significantly contributed towards rural income. The idea of beekeeping as a means of alleviating poverty in Zimbabwe was conceived as way back as 1992 when the country implemented the Economic Structural Adjustment Programmes (ESAP) following a drought that hard hit the country in 1991. In response to the drought situation, the Zimbabwean ministry of Women Affairs, Gender and Community Development formed the Zimbabwe Farmers Development Trust (ZFDI) with the view to identify low cost projects of alleviating poverty. Against this background, beekeeping was considered as one of the projects that had minimum funding requirements and the potential to eradicate poverty.

The first beekeeping project was then introduced in Hurungwe district of Mashonaland West province. To date, the ZFDI beekeeping project has been launched in more than 20 districts (including Mutasa) in the country. Currently, while beekeeping is not well understood in Zimbabwe, the marketing and selling of locally produced honey is profitable and plays a significant role in creating employment and increasing rural income thus helping rural communities to break out of poverty. In Honde Valley, the honey is either gathered from wild honey bee colonies or is produced by local beekeepers and typically sold through local markets. The area has a higher demand for honey as households in this area not only require honey for food consumption but also for religious purposes. Apiculture in Zimbabwe at large is practiced by both men and women and is therefore a critical avenue towards poverty reduction and enhancing the quality of life. The sector has great potential for increasing incomes and supportive sustainable development. However, the huge deficit of honey in the country against the backdrop of a higher demand for honey has resulted in Zimbabwe becoming a net importer of honey despite being endowed in natural forests.

Given that apiculture forms part of people's livelihood strategies in rural areas of Zimbabwe, a number outcomes have been witnessed. Some of these outcomes include income and material goods and also non-material outcomes such as well-being and contentment. In terms of apiculture, the least visible livelihood outcome is the pollination of flowering plants, both wild and cultivated. Honey is also traditional medicine or food in nearly all societies. The beekeepers and other people in rural communities also use honey and beeswax to make secondary products such as candles. This is because selling a secondary product brings a far better return for the producer than selling the raw commodity. Bees also generate other products (pollen, propolis and royal jelly) that can in some situations be harvested, marketed and made into secondary products thereby strengthening people's livelihoods.

2.1 REVIEW OF RELATED EMPIRICAL LITERATURE

Few studies have managed to examine the contribution of apiculture towards rural income in developing countries. These few studies have demonstrated however that beekeeping is associated with several economic and social benefits which cannot be sparred. Others have shown that apicultural practices can be viewed as a means of eradicating poverty (Goldenberg, 2004., Mickels, 2006; Ogaba, 2007; Lalika, 2009). Other studies undertaken had to do with the analysis of the production of beekeeping and honey (Babatunde, Olorunsanya, Omotesho and Alao, 2007; Ebojei, Alamu, and Adeniji, 2008 and Chala, Taiye and Kebede, 2013). Using primary data collected through structured questionnaires, Chazovachii et al (2012) concluded that food, income in form of cash, employment and

scenery creation for tourism are major benefits derived from apicultural practices in Chitanga village of Mwenezi district of Zimbabwe.

Bradbear, (2009) on the other hand concluded that beekeeping does not require expensive equipment, as simple hives can be made from local materials by local artesian. Ajao and Oladimeji (2012) assessed the contribution of apicultural practices to household income and poverty alleviation in Kwara state of Nigeria. The study found that the average net return per litre of honey produced range from ₦1200 to ₦1500 while average income per season per colony ranges from ₦7500 to ₦10000. While the study provided valuable findings, it is surprising however that the contribution of apiculture towards household income was not explicitly addressed. Given that the study aimed to assess the contribution of apiculture towards household income, one would expect household income to be the dependent variable not apiculture income as done in Ajao and Oladimeji's (2012) study.

Qaiser, Ali, Taj and Akmal (2013) conducted an impact assessment of beekeeping in sustainable rural livelihood in Chakwal and Sargodha in Pakistan. Relying on descriptive statistics, apiculture was found to increase keepers' income although this ratio appeared low in the targeted study area. Saha (2002) conducted an exploratory study in Bangladesh and concluded that beekeeping is a proven technology as good profitable venture requiring small investment of capital and skilled labor and high yield enterprise in comparison to other poverty reduction activities.

From the reviewed studies, the main weakness that all studies, in exception of Ajao and Oladimeji (2012) inherited was to examine the role of apicultural practices in a purely descriptive manner. In this regards, the present analysis attempts to improve the existing literature by relying on econometric modelling. Unlike Ajao and Oladimeji (2012), the present analysis ensures that the dependent variable is household income such that the response of income to apiculture as a livelihood strategy can be addressed. Aikaeli (2010) on the other hand made a provocative analysis on the determinants of rural income in Tanzania but unfortunately failed to capture the contribution of apiculture in the model.

3.0 MATERIALS AND METHODS

3.1 Study Area

The study was carried out on the 14th and 15th of July 2014 in Honde Valley which is located in the eastern parts of Zimbabwe which receives the highest amount of rainfall in the country. Temperatures may reach 28 ˚C in summer (October-April) and this is the period where most of the rainfall is received. From May to the beginning of July, the temperatures may be as low as 2 ˚C. The average altitude of Honde Valley is around 900m above sea-level and since it is a low lying area, the most agricultural activities are tea and coffee production while some households are into apiculture production.

3.2 Sampling Technique and Data Collection

The sample consisted of 80 farmers out of 425 households and this constituted 18.8% of the total population along the valley. According to Best and Kahn (1993), a sample size of at least 10% is generally acceptable and hence 18.8% is reasonable in this particular case. From the 80 respondents, 40 of them were apiculture farmers while the other 40 were non-apiculture farmers selected through the multi-stage sampling technique. Data was collected

through structured questionnaires which were administered by the researcher with assistance from one agricultural extension officer and a colleague. The questionnaire which captured information on a set of socio-economic factors was pre-tested at Rupinda village in Mutasa district. Mindful of the potential limitation that farmers tend to understate their income levels, famers were clearly informed on the motive of the study. However, heavy rains were the major challenge faced during the data collection process and it took two working days to complete the data collection process.

3.2 Model Specification

Following Aikaeli (2010), the present analysis assumes a linear relationship between household income and a set of socio-economic characteristics. Relying on cross sectional data at household level, Aikaeli estimated the following linear model.

$$Y_i = \beta_0 + \beta_1 E_i + \beta_2 A_i + \beta_3 L_i + \beta_4 D_i + \beta_5 NA_i + \beta_6 G_i + \beta_7 MA_i + \mu_i \quad \text{for } i = 1, 2, 3, \ldots, 80 \quad (1)$$

Where:

Y = household per capita income (monthly income divided by the household size)
E = level of education of the household head (1=tertiary education, 0=otherwise)
L = household's labour force
A = acreage of land used
D = dependency ratio (ratio of household members who are wholly dependent)
NA = ownership of a rural non-farm activity (1=owner of a non-farm activity, 0=otherwise)
G = gender of the household head (0 if male, 1 if female);
MA =Market linkages

The linear model used by Aikaeli is modified in three ways. Firstly, labour is dropped from the model as it is more of a production than income determinant. Ownership of a non-farm activity is also dropped from the specification since apiculture itself is a non-farm activity. Secondly, the model is improved by including access to credit as an explanatory variable. By having access to credit, households are likely to obtain term loans which increase their earning capacities probably through engaging in income generating activities. Thirdly and most importantly, a dummy variable is introduced on the right hand side of the equation taking the value 1 for an apiculture farmer and 0 if otherwise. After taking into consideration al all these modifications, the final specification of the model takes the following form.

$$Y_i = \beta_0 + \beta_1 E_i + \beta_2 A_i + \beta_3 D_i + \beta_4 G_i + \beta_5 AC_i + \beta_6 MA_i + \beta_7 API_i + \mu_i \quad \text{for } i = 1, 2, 3, \ldots, 80 \quad (2)$$

Where:

API = Apiculture (1=apiculture farmers, 0=otherwise)
AC = Access to credit (1=access, 0= otherwise)

All other variables in equation 2 are as defined in equation 1. The income variable represents the sum of all incomes received by all household members during the last 30 days. It comprises monetary income as well as income received in the form of goods and services (their monetary evaluation was given by the respondents). According to Ashfaq (2006), beekeeping supplements the income of beekeepers and against this backdrop; a positive sign is expected on this dummy variable. According to conventional theory, educated households are likely to have more income, market linkages are expected to boost rural income and acreage by enabling the practice of agricultural activities is also expected to bear a positive sign while either sign is expected on gender and dependency ratio (Aikaeli, 2010).

3.3 Method of estimation

Due to prevalence of heteroscedasticity in the model (see appendix 1), the income function was estimated using the feasible generalised least squares technique. According to Gujarati (2004), the ordinary least squares technique produces inefficient estimates in the presence of heteroscedasticity and given too that the form of heteroscedasticity is not known this particular case, this necessitated the use of the feasible generalised least squares technique.

4.0 RESULTS AND DISCUSSION

Results of the analysis of covariance (ANCOVA) are reported in table 1. Given that income is measured in United States dollars, the results of the study indicate that the mean income of female households is relatively lower by $12.22 as compared to the income of their male counterparts. On the other hand, the mean income for those who have market linkages is relatively higher by $41.05 as compared to the income of the control group and this is tandem with the result obtained by Aikaeli (2010). Measured as possession of a telephone by the household head, the rationale behind this finding is that households who have efficient means of communications are better linked to the market and had higher per capita incomes than those who are constrained by information asymmetry. As theoretically expected, education, dependency ratio, acreage of land, market linkages and access to credit have positive signs as reported in Aikaeli (2010).

Table 1: the contribution of apiculture towards rural income

	Coefficient	**t-statistic**
Gender (1=female, 0 =male)	-12.22**	-2.38
	(5.11)	
Market Linkages (1=market linkage, 0=otherwise)	41.05***	5.41
	(7.58)	
Access to credit (1=access to credit,0=otherwise)	8.42**	2.01
	(4.17)	
Dependency ratio	16.75***	5.78
	(2.89)	
Education of Household head	8.51**	2.08
	(4.08)	
Acreage of land used by household head	12.11***	4.57
	(2.64)	
Apiculture (1=apiculture farmer,0=otherwise)	8.28***	2.69
	(3.07)	
Constant term	39.56***	3.73
	(10.58)	
Adj R-squared	0.60	
Prob(F-statistic)	0.000	
DW-Watson statistic	1.79	

Note: ****,**,* denotes significant at 1%, 5% & 10% respectively. Figures in parentheses are standard errors

Turning to the variable of interest, apiculture farmers are found to be better-off in terms of income. The mean income of apiculture farmers is on a relatively higher side. The empirical results are in line with the theoretical expectations and the major finding of the study manifests that income is disproportionally distributed in favour of apiculture farmers. The coefficient attached to the dummy variable indicates that a typical apiculture farmer is on average $8.28 richer than a non-apiculture farmer. The coefficient is significant indicating that apiculture and non-apiculture farmers are statistically different in terms of income. This empirical result draws theoretical support from Lietaer (2007) who postulated that beekeeping can be practised as a safety net that provides rural households with extra income from the sales of honey and other beehive products. The model explains 60% variation in rural income while 40% is captured by the error term which makes the model adopted from Aikaeli (2010) capable of explaining income variation in Honde Valley. Interesting is that all the coefficients were found to be significant drivers of rural income. The results were subjected to a battery of post estimation tests which include a test for normality of residuals, heteroscedasticity, model specification and the results indicated that the model passed all these tests (see appendix 1).

5.0 CONCLUSION

The study has examined the contribution of apiculture towards household income in Honde Valley. Relying on primary data collected on 80 households (40 apiculture and 40 non-apiculture farmers) through multi-stage sampling, the results of the analysis of covariance (ANCOVA) indicate that the mean income per capita of apiculture farmers is on a relatively higher side. The plausibility of this result is that beekeeping promotes economic self-reliance as it is less labour intensive and hence can be a source of income for the poor rural households. This implies that apiculture can be used as an alternative livelihood for the rural households along Honde Valley. Based on the findings of the study it is recommended that governments and non-governmental organisations should, through the existing structures promote beekeeping programmes through technical and financial capacitation to apiculture farmers. Instead of over relying on agricultural activities which are often exposed to drought stresses, the rural community can diversify their livelihoods by engaging in apiculture. Beekeeping helps rural households to alleviate poverty in a sustainable way and improve their livelihood. Given that apiculture fosters sustainable use of forests, it follows that apiculture should top the list in government policies and environmental and development organisations' programmes.

Biography

Brian Tavonga Mazorodze is an economist mergering in agriculture. He holds a bachelor of science honours degree in Agricultural Economics and Development Studies (2014) from Midlands State University in Zimbabwe. His research interests include fiscal, trade and exchange rate policy, commodity markets, economic growth and sustainable development.

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Appendix 1: Regression Results and Diagnostic tests

Heteroskedasticity Test: ARCH

F-statistic	8.117639	Prob. F(1,77)	0.0056
Obs*R-squared	7.534202	Prob. Chi-Square(1)	0.0061

Ramsey RESET Test:

F-statistic	1.522288	Prob. F(1,71)	0.2213
Log likelihood ratio	1.697125	Prob. Chi-Square(1)	0.1927