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Rural households' livelihoods diversification through termite utilization in depressed region of Zimbabwe

Josiah Taru^{a*} and Bernard Chazovachii^b

^aDepartment of Sociology and Social Anthropology, Great Zimbabwe University, Masvingo, Zimbabwe; ^bDepartment of Rural and Urban Development, Great Zimbabwe University, Masvingo, Zimbabwe

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This study sought to examine the utility of termites to rural households in depressed regions of Bikita, Zimbabwe. Colonialism and its spread of European culture had viewed entomophagy with contempt resulting in reduced utilization and consumption of termites in most colonies. In our quest to understand how people in depressed regions utilized termites, both quantitative and qualitative methodologies were employed. Questionnaires and in-depth interviews were used to gather data during field work. Purposive and snowball sampling techniques were used in recruiting respondents. Excel and content analysis were used in data presentation and analysis. Results revealed that dampwood and drywood termites are climatic indicators for the rural communal farmers, a low-cost technology in weather forecasting. Subterranean and mold builders provide manure, relish, and are medicinal in nature. They are traded for income generation, and as for the poor, harvesting, processing, storage, and marketing is cost effective. Though considered nostalgic foods, most respondents highlighted that selling termites complimented other off-farm livelihood activities. Termite consumption and utilization provide a sustainable way for livelihood diversification in depressed regions and has partly addressed problems of food insecurity.

Keywords: termites consumption and utilization; livelihoods; food security; NTFP

1. Introduction and background

Forests have long been identified as instrumental in sustaining and maintaining livelihoods in most rural and communal areas across the world (Dovie et al. 2001; Basure et al. 2012; Chazovachii et al. 2012). Forest products are divided into two categories: timber products and non-timber forest products (NTFP). The utility of the former to both individual households and corporations has been overemphasized. This article's analysis is focused on the latter. An increase in the study of NTFP came to prominence after changing from the previous term that was used to describe these resources. Previously, the term "minor forest products" (MFP) was used to refer to products other than timber that could be harvested in forests. MFP was a dismissive term that failed to acknowledge the importance and the value that these resources had to both livelihoods of humans and in conserving the environment (Pfund & Robinson 2005). A politically correct term "NTFP" was developed in 1989 to replace MFP. The paradox of the concept NTFP is that it identifies products by what they are not rather than what they are (Pfund & Robinson 2005); resultantly, most definitions have been constructed inversely, for example, Belcher (2003) defines NTFPs as non-timber goods that are tangible and physical objects of biological origin. The conceptualization used in this article is adopted from Dovie et al.

(2001, 2–3) who use the term "NTFP" to "describe all harvested secondary forest-resources with biological origin for purposes other than the primary management objectives of the ecosystem in which they occur" (Dovie et al. 2001, 2–3). This conceptualization is utilized because it defines what NTFP positively by setting parameter of what they constitute rather than what they are not.

NTFP in the form of food, fodder, and medicine greatly contributes to the survival of people in most developing countries. Ndoye (2005) gives a comparative analysis of the cost of herbal medicine and modern medicine, illustrating that herbal medicine is thrice cheaper and easy to acquire than modern medicines. This gives a form of NTFP an edge over modern medicines as they are easily accessed and affordable for most poor households in Cameroon. In Kyrgyzstan, Schmidt (2005) notes that in rural villages, most families depend on fodder gathered from walnut forests. The fodder is fed to animals such as donkeys and horses that are used for draught power by most households. Walnuts harvested in forests are important as they constitute a large proportion of most rural household's commissariat. Trading in NTFP has enabled most households to generate income needed in meeting daily requirements and supplementing other livelihood activities, especially farm-based activities (Sunderland et al. 2004; Ndoye 2005; Chazovachii et al.

*Corresponding author. Email: jtaru@gzu.ac.zw

2012). NTFP enable poor households to alleviate themselves from poverty, the weak, the landless and women have found a “safety net” to fall upon (Pfund & Robinson 2005).

2. Entomophagy and other uses of insects and termites by humans

While much researches have concentrated on broader NTFP’s contribution to household’s livelihoods and food security, in-depth analysis into understanding a specific component of NTFP such as edible and other insects that play important role in livelihoods activities has remained minimal. Durst et al. (2010) lament that of all the fauna, research on insects is by far less as compared to other types. The practice of consuming insects is as old as mankind itself (Johnson 2010); for Meyer-Rochow (2010), insect eating was common in pre-Christian Europe but factors that led to its death are unknown, while Durst et al. (2010) note that earliest reference of insect eating can be found in the Bible, for example, Leviticus 11 verse 22 or Matthew 3 verse 4. Notwithstanding that in many societies across the world, from Shoshoni in America to African and Asian societies, insects have been traditionally consumed in many societies; contemporary societies have reduced insect consumption. This can be attributed to a number of factors. Colonialism and its spread of European culture that viewed entomophagy with contempt have greatly led to the reduction in the consumption of insects in most former colonies. Furthermore, globalization has universalized European eating habits and food stuffs; this has concomitantly also reduced the popularity of insect traditionally consumed. Western food such as pizza, French fries, sushi, and hot dogs have become popular in most of non-western societies. Rapid urbanization, “modernization”, and the increase of many people into middle class partly explain the disappearance of entomophagy. The urban set-up and its political economy based on the market reduce the availability and urbanites’ accessibility to forests that provide these edible insects. In sub-Saharan Africa, Jongema (2012) notes that most societies have at least 200 identified different types of edible insects but urbanization has acted as a barrier between the forests and the urbanites. Edible insects have been considered as “nostalgia foods” by urbanites and the middle class. Such food stuff reminds them of their early days in rural areas (Durst et al. 2010). The consumption of insects is thus associated with nostalgia, rurality, primitiveness, and poverty.

A study in Thailand by Durst et al. (2010) revealed that most people preferred to consume insects because their price is relatively cheaper as compared to beef and chicken. Van Huis et al. (2013) cite various benefits derived from eating insects, insects are nutritious, containing fats, proteins, and calcium, and furthermore, processing of insects is associated with less emission of

greenhouse gasses. Rearing of these mini livestock creates livelihood opportunities for most households both in rural and in urban settings. In Southern Zimbabwe, Mopani worms processing and trade is dominated by women and children; trading in these NTFP has allowed women to earn independent income (Kozanayi & Frost 2002).

Bodenheimer (1951) notes different insect activities that benefit humans:

- (a) insects producing silk,
- (b) insects producing honey and wax,
- (c) insects as sources of dyes,
- (d) insects producing sap,
- (e) edible insects,
- (f) insects as sources of medicine, and
- (g) insects as ornaments.

In addition, insects are also important in facilitating plant pollination, some insects are predators by nature, such insects control harmful pests in cultivated crops (Van Huis et al. 2013).

There is need to increase the intensity of studies that elucidate the contribution of termites to human livelihoods and the extent to which termites address concerns of food insecurity. Such studies must incorporate a comparative assessment, juxtaposing termites with other livestock. Issues of sustainability and environmental conservation must also be explored in order to determine the feasibility and the resilience of adopting termites as an integral part of our commissariat.

3. Research objectives

The study sought to

- (a) assess the contribution of termites to household livelihoods,
- (b) examine the contribution of termites to household food security, and
- (c) assess the linkage between NTFP and poverty alleviation.

4. Methodology

The study adopted methodological triangulation to add rigor; both qualitative and quantitative research methodology were used. Quantitative methodology was utilized to obtain statistical data and descriptive data on the demography, earning, and prevalence of households that rely on NTFP. Qualitative methodology was used to its ability to capture subjectivities and narratives from the respondents themselves. Questionnaires and in-depth unstructured interviews were used to gather data during fieldwork. Respondents for the study were recruited using purposive sampling and snowballing. A total of 89 individuals constituted the study population.

Presentation and analysis was done using excel and content analysis to establish emerging themes from the qualitative data.

5. Study area

Bikita district is located 80 km east of Masvingo town. Bikita is located in agro-ecological region 4 which receives an average rainfall of 400 mm and the region is prone to dry spells. Dry cropping is common in the region and most farmers grow drought-resistant crops. Gukurume (2013) notes farmers in the areas are facing ever decreasing agricultural productivity. Most farmers, whose livelihoods are based on agriculture, are vulnerable to food insecurity and their livelihoods are in a precarious position.

6. Rationale for termite utilization

It has been realized that termites utilization is important on health, environmental, and for livelihoods purposes. Termites are viewed as highly nutritious and have been taken as an alternative to other domestic livestock, like pork, beef, and chicken. Van Huis et al. (2013) revealed that termites are rich in proteins, fatty acids, and other micronutrients. Whether fried or dried, termites contain 32–38% protein. Of all the termites, it has been discovered that above-ground hill termite species have fatty acids, and their nutritious value is so high that in Uganda and Zambia they are fed to undernourished children.

Unlike most livestock, termites emit considerably fewer greenhouse gases and ammonia. Termites utilization is not necessarily a land-based livelihood activity and does not need destruction of forests for production. Termites have high food conversion efficiency than other domestic livestock and they do not give unnecessary costs on their feeds since they feed on organic waste streams (Van Huis et al. 2013).

As a livelihood activity in depressed regions, termites harvesting has no costs. It does not need sophisticated technologies and has low capital investment option in the processing since it is sun-dried, smoked or fried and killed by roasting (Silow 1983; Van Huis et al. 2013). In harvesting syntermes, they introduce a palm leaf rib into the gallery of the nest, and the soldiers biting it are then fished out. For macrotermes, which emerged after the first rains fall at the end of the dry season, from holes near termites nests, locals beat the ground around termites hill simulating heavy rain to provoke the termites to emerge (Van Huis et al. 2013). In other areas, they just wait 2–3 days after the rains to see their flight and then they would throw light on an open space in the midst of their homestead. This light would attract them and harvest would begin.

7. Presentation and discussion

7.1. Types of termites useful to the rural poor

In rural areas, there are four distinct groups of termites which are dampwood, drywood, subterranean, and mound builders. Dampwood termites live and feed in very moist wood-like stumps and fallen trees in the forest. Drywood termites are opposed to the former in that they do not require contact with moisture or soil. Subterranean termites live and breed in soil. Mound builders are those that build earthen towers approximately 8 m or more in height.

7.2. Termites and household livelihoods

After harvesting and processing, termites, apart from consuming as ready relish, can be dried and crushed into powder form with a pestle and mortar and eaten with honey (Ogotu 1986; Van Huis et al. 2013). This implies different kinds of relish are obtained from termites giving poor households a plethora of alternatives foods from locally available resources. In DRC, the Azande tribe and pygmies fry meat in the fat residue of these termites. The oils from termites are used to treat body and hair of the pygmies. The abundance of fat and oils from termites is gives the rural poor the opportunity to save the little remittance from relatives since they no longer go for cooking oils in rural service centers. Termites are traded for income generation at local markets, as barter trade with traditional beer, and other crop produce. The income generated would give rural household capital to purchase clothes, school fees, and other household utensils to sustain their livelihoods. Sun-dried termites are grounded into powder and mixed with other food ingredients to form livestock feeds like chicks, pigs, etc. The product is free from additive that may be expensive for the poor. Van Huis et al. (2013) acknowledged that the powder from sun dried termites can be mixed with other ingredients by baking, boiling, steaming, or processing into crackers, muffins, or meat loaves which can trade at both local and regional markets. This has created rural industrialization; the unemployed youth would engage themselves into harvesting and commercialization of termites in consolidated villages, rural service centers, and growth points to supplement other sources of livelihoods. It has been observed that where households used to harvest termites, during the rain season, they would harvest a lot of mushroom. These mushrooms species found growing on termites nests are consumed regularly in many rural tropical areas and constitute an important food supplement for rural people. This type of mushroom is traded for income generation amongst rural households. Hence, the existence of termites has multiplier effects to the livelihoods of the local inhabitants.

7.3. *Other uses of termites*

Termites act as climatic indicators for the rural communal farmers. The abundance of termites, particularly subterranean termites, determines severe drought to come. This would inform local farmers on the type of seed varieties to grow that particular season. Therefore, the presence of termites in sub-Saharan Africa brings sanity and sustainability since depressed regions are using low-cost technology in weather forecasting, an issue that could be very difficult and expensive if they are to hire expertise from outside. It is worth noting that anthills or earth mounds created by termites are used by the majority of household who have no livestock and other sources of manure and fertilizer to apply in the crop fields. Earth mounds provide 'organic fertilizers' used by poor households in enriching their crop fields. These earth mounds are also applied in backyard gardens to add fertility in the soils for productivity.

8. **Why termites are ideal for poverty alleviation in the depressed regions**

8.1. *Issues of availability and accessibility*

Termites utilization if fully harnessed and integrated into livelihoods activities in regions that have less rainfall can bear meaningful returns. Termites' availability is not governed or regulated by the availability or lack of rainfall. Termites' availability and accessibility is easy for almost all people in the region. Anthills and earthen towers fall both on individual owned pieces of land and also on communal controlled land. This enables easy accessibility to termites to those who are well-of and those vulnerable and susceptible to food insecurity. Termites that are found on dead trees and those that depend on tree moist pose little or no challenge for vulnerable people in rural areas under study. While rainfall quantities are continuously dwindling in these areas, harnessing termites may be one of the adopting or coping strategies employed to fill the ever widening gap between food required by the household and the quantity obtained from farming. Rainfall is not a factor that in the long run determines termites' availability. Termites freely fly and roam these communities giving all community members an equal chance of trapping and harvesting them. Furthermore, there are few taboos that regulate the harvesting and consumption of these termites, making them free for all. Despite the fact that these termites are not controlled or owned by an individual, their utilization is not affected by Hardin's classical tragedy of the common phenomena. People cannot carelessly harvest these termites that they can become extinct, they are infinite resource.

8.2. *Processing and storage of termites*

Processing of termites require simple technologies and indigenous knowledge that most people already have. Due to this, all members of the community are best equipped with utensils and cultural knowledge to process and preserve the termites. Most termites are boiled, dried, and fried using their own fats. This is done using fire and basic utensils such as pots and pans. These utensils are common in every household; thus, there is less need for capital to acquire and process the termites. Once dried, termites may remain edible for more than a year. This allows households to save and termites for use towards the end of winter seasons when relish is scarce. Most households bank on termites due to their durability, they can substitute beef or goat meat since they have high protein content. Termites do not require expensive storage facilities; most respondents noted that they store termites in containers away from moisture. A 1-liter container can store enough termites to feed a family of seven for 10 days. As noted above, termites may last for more than a year without getting spoiled. Salt is the only additive used; this enables termites to dry and last long. Respondents who sell termites at the local markets and busy terminus depend on the durability of dried terminus; they can store and trade them longer than most relishes and snacks.

8.3. *Household benefits from termites*

Most households acknowledged the benefits they derived from termites that are found in their area. These benefits are categorized into three: food security, dietary variety, livelihoods and income generating. Termites harvested, stored, and consumed by household were instrumental for most households during times of drought and periods immediately before rain seasons. In these communities, termites are not reduced to snacks but are some of the few options available for households. Termites add variety to food consumed by people in this area. Dried vegetables and jerked meat are the common relishes available to people; the consumption of termites adds variety and new nutrition. Termites lack artificial preservatives such as sulfur dioxide that have negative effects to human especially people with asthma.

For households that sell termites, they have managed to sustain and boost household income. Termites are mostly retailed during winter and dry seasons by those households that preserve and properly store them. Flying termites, for example, are rare after rain seasons, and few people will have them. It is a common for most people in Bikita to sell flying termites at bus termini and along major highways to travelers and urbanites buying termites as nostalgic foods.

9. Gender aspects in harnessing termites

Traditionally, the trapping and selling of termites has been dominated by women and children. Males have shunned from termites business. Responses from the study have also revealed that females and children continue to dominate the process of trapping and selling termites. Men have not joined because termites vending was considered feminine and produced little profit. Through interviews and probing, respondents have noted that proceeds from selling termites at beer halls, bus terminus, and along major roads are decent and adequate to meet basic household requirements. Termites cost US\$1 per standard mug, with most respondents claiming that on a good day they sell close to 10 cups per day. On a dull day, one may sell two cups. Averaging the figures obtained from the field, respondents who sold termites got US\$ 133 per month. Such an amount earned independently and controlled by women goes a long way improving the lifestyle of households in depressed region. For women whose households consumed termites, a number of women highlighted that termites were cheaper, easy to prepare, and delicious. As they present relatively a cheaper alternative to beef and chicken, at the same time providing proteins, termites were a better option. Through reducing money spent of relish, money could be channeled to other needs of the household. There is need to encourage women to fully harness termite utilization and consumption as they derive more benefits— independent income and nutritional value.

10. Conclusions

The study revealed that termites are vital NFTP that assist many households in Bikita in meeting their nutritional and income demands. Different types of termites are utilized as source of food, especially relished by most families and households. During winter and dry seasons when relish is scarce and more expensive to purchase, most households afford termites. For those that sell termites, they earn income that goes a long way in meeting financial needs of the household. Termites are easy to acquire, store, and preserve even for vulnerable households. There is need to encourage the utilization and consumption of termites especially among the poor as there are accessible and their availability is not mediated by a number of hindering factors. The processing of termites is not expensive or complex, thus making them vital in distressed regions. Furthermore, respondents noted that termites are utilized in weather forecasting. Farmers' preparedness and knowledge of the possible weather can be predicted basing on termites behavior. Termites play an important role in creation of mulch by aiding the decomposition of wood and grass. The mature and mulch produced is cheap to acquire and

readily absorbed by plants. Organic fertilizers are less harmful to the soil as compared to artificial and inorganic fertilizers. Termites are important for planning for farmers as termites assist in predicting the weather.

Disclosure statement

No potential conflict of interest was reported by the authors.

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