THE CONTRIBUTION OF NON-TIMBER FOREST PRODUCTS TO RURAL LIVELIHOODS AND THEIR PRICE DETERMINATION IN DIFFERENT AGRO-ECOLOGICAL ZONES OF SOUTH AFRICA

Worship Mugido

A thesis submitted in fulfilment of the requirements for the degree of
DOCTOR OF PHILOSOPHY (Environmental Science)
at Rhodes University

JUNE 2016

Declaration

I**, Worship Mugido** hereby declare that this thesis is my own original work, has not been submitted for any degree or examination at any other university, and that the sources I have used have been fully acknowledged by complete references. This thesis is submitted in fulfilment of a PhD in Environmental Science in the Faculty of Science at Rhodes University, South Africa.

Signature: _____ Date: _____

Table of contents

List of tables

List of figures

Abstract

A large number of studies have been conducted on the contribution of different types of non-timber forest products (NTFPs) to rural livelihoods. However, not many of these have considered the context in which these contributions are made, especially agro-ecological potential. Similarly, there are few studies that focus on the price setting of NTFPs in different settings as most are based on a single or relatively few sites. Thus, there is no indication of the prevalence of the different factors within a uniform macro context, nor how they might vary between different types of NTFPs. Therefore, the aim of this thesis was to establish the contribution of NTFPs to rural livelihoods and their price determination in areas of varying agro-ecological potential of South Africa. The study used data from 1 200 randomly selected households across four agro-ecological zones of South Africa to quantify the contribution of NTFP income to total household income, the proportion of households selling at least a single NTFP and the nature and extent of use of NTFPs as safety nets in areas of varying agro-ecological potential. In addition, 300 sellers of NTFPs in 15 towns across South Africa were interviewed to assess the factors they take into account when setting prices.

The findings of this study support the argument that the level of dependence on NFTPs varies with agro-ecological conditions. This was supported by the significant difference between the NTFP incomes of the following pairs of agro-ecological classes: very low and low, medium and high. About 6.4 % households reported selling one or more NTFPs for various reasons, with many (39 %) citing the need to earn cash income and limited employment opportunities (16.9 %). Income from trading NTFPs is undoubtedly an important source of cash income for many rural households. Thus, 300 sellers, selling either at home or in town, were interviewed and the majority (79.3 %) of the sellers reported that selling NTFPs was their main source of cash household income, with only 8 % and 5.7 % receiving their main cash household income from state child grants and state pension grants, respectively. The pricing factors considered by sellers when setting the prices of NTFPs tended to vary with the type of NTFP being sold, type of market (home markets or urban markets) and the method used by the seller to procure the stock. However, overall, transport costs (29 %), stock price (18.4 %), profit margin (12.7 %), time taken to collect or produce the product (7.3 %) and the market price (6.4 %) were the widely used factors to

determine prices for NTFPs. The reported various pricing factors showed that there was no formal or certain price mechanism that was used by the sellers of NTFPs to establish the market prices of NTFPs. The study found that about 79 % of the total households interviewed experienced at least one shock of some magnitude in the previous 12 months. The most common shocks were illness (43 %), death (42 %), crop failure (29 %) and hunger (22 %). The households employed various coping strategies (21) in response to different types of shocks, with the three widely used strategies being assistance from friends and relatives (60.1 %), using cash savings (37.9%) and using NTFPs (35.6 %). Shocks, hunger or food shortage and crop failure were significantly and positively related to the usage of NTFPs as safety nets. Therefore, households who experienced hunger or food shortage and crop failure were likely to use NTFPs to cope with these shocks. The study concluded that NTFPs are an integral part of the rural livelihoods, especially for the households living close to the survival line.

Acknowledgements

This work was funded by the South African Research Chairs Initiative of the Dept of Science and Technology and the National Research Foundation of South Africa. Any opinion, finding, conclusion or recommendation expressed in this material is that of the authors and the NRF does not accept any liability in this regard.

This study could not have been successful without the support, assistance and participation of various persons and institutions. I would like to express my sincere gratitude and thanks to the following persons and institutions:

- My supervisor, Prof Charlie Shackleton, for sharing his extensive knowledge, guidance, support, and motivation and for being patient with me throughout this study.
- Ms Kate Benyon for all the financial and logistical support throughout the course of this study.
- Ms Kathy Cassidy for your help with GIS.
- The Oppenheimer Memorial Trust for financial assistance.
- Dr Tony Palmer for providing me with data and maps of agro-ecological zones of South Africa.
- All the households that participated in this study.
- To my friends, colleagues and mentors, especially Prof Theo Kleynhans, Prof James Blignaut, Dr Daan Louw, Dr Sheunesu Ruwanza, Dr Gladman Thondhlana, Mr Zukile Madlebe, Mr Emmanuel Vellemu, Mrs Gamucharai Chakona, Ms Mwazvita Sachikonye, Ms Nosi Mtati, Mr Apollo Philip, Ms Nontlantla Busakwe, Ms Nozibele Magidiwana, Ms Nozibele Holoholo, Ms Fhatuwani Masindi, Ms Mukondeleli Mphephu and Ms Hulisani Netshivhulana, thank you for your support and inspiring me to go this far.
- Ms Nonkuselo Madlakana for your regular prayers, encouragement and unrelenting belief in me.
- My family, especially Rose and Vhumani, for your encouragement, invaluable moral support and your wise words that always come at the right time.

"You are my God, and I will praise you; you are my God, and I will exalt you. Give thanks to the Lord, for he is good; his love endures forever." Psalm 118:28-29

CHAPTER 1: INTRODUCTION

1.1 Non-timber forest products (NTFPs) and rural livelihoods

Rural households in developing countries pursue multiple livelihood strategies. Thus, rural livelihood strategies are diverse, with most households relying on several activities while others specialise in one or a few activities (Babulo et al., 2008). Most rural livelihood strategies in developing countries are either directly or indirectly connected to the natural resource base (Babulo et al., 2009). This is because most households are involved in agriculture and other primary sector activities such as collection of NTFPs. Some of the diversified sources of income for rural households in developing countries include crop production, livestock farming, off-farm activities (e.g. off-farm employment), collection of NTFPs, remittances and petty trade (Illukpitiya and Yanagida, 2008).

There is a wide range of NTFPs and they have many functions (Agustino et al., 2011) such as food, energy for cooking and heating, house construction materials, health, security, household and agricultural implements (Melaku et al., 2014; Piya et al., 2011). The contribution of NTFPs to the wellbeing of most rural households is significant. For instance, in developing countries, the majority (75 %) of the poor live in rural areas (Chen and Ravallion, 2007) and are highly dependent on the natural resources for their subsistence needs and cash generation (Barbier, 2010; Schaafsma et al., 2014). The relative contribution of NTFP income to total household income generally varies from 15 to 65 % (Angelsen et al., 2014; Babulo et al., 2008, 2009; Cavendish, 2000; Kamanga et al., 2009; L'Roe, and Naughton-Treves, 2014; Mamo et al., 2007; McElwee, 2008; Thondhlana and Muchapondwa, 2014 and Uberhuaga et al., 2012; Worku et al., 2014; Yemiru et al., 2010). Furthermore, there is a growing number of studies showing that NTFPs are vital to rural households in preventing them from sinking deeper into poverty and in some cases reducing poverty (Babulo et al., 2009; Fisher, 2004; Shackleton et al., 2007a; Yemiru et al., 2010). In most cases the poorer households are relatively more dependent on NTFPs than the better-off, although the latter often have bigger absolute NTFP incomes (Angelsen et al., 2014; Meilby et al., 2014; Vedeld et al., 2007). Thus, poor people with few assets, staying in areas of marginal production and also rich areas for agriculture, are usually heavily reliant on the

natural environments surrounding them (Banerjee and Duflo, 2007; Kamanga et al., 2009; López-Feldman, 2014). Many poor rural households will not be able to meet their basic needs without directly extracting resources from the local environment. López-Feldman (2014) reported that the participation in resource extraction by Mexican rural households follows an inverted U-shaped relationship in which income and the dependence on environment decreases with increasing income, and then increases again. However, the participation rates of the better-off households were not negligible, with about 52 % of the households in the highest income quintile participating in the extraction of NTFPs (López-Feldman, 2014). Even though dependence on NTFPs decreases with income, it is still considerable for the relatively rich households that harvest NTFPs. Thus, on average income from NTFPs accounted for 12 % of the total income for households in the highest income quintile that extracted NTFPs (López-Feldman, 2014). This can be attributed to the diverse livelihood strategies and the varying size of farmland owned by the poorest rural households and well-off rural households (Heubach et al., 2011).

1.1.1 NTFPs and rural livelihoods – South African context

Mirroring the international situation, South African rural livelihoods are diverse and most rural households depend on various livelihood strategies (Shackleton et al., 2007a). NTFPs harvested in rural areas (and also in urban areas) are critical in the rural livelihoods of many South African households since they supply households with both subsistence and cash income (Dovie et al., 2002; Hunter et al., 2011; Makhado et al., 2009; Paumgarten, 2007; Pereira et al., 2006; Shackleton et al., 2001; Shackleton et al., 2008; Twine et al., 2003). Approximately 85 % of the South African rural households use NTFPs on a daily basis and the commonly used products include fuelwood, wooden utensils, edible fruits, grasses, fodder, bushmeat and wild vegetables (Makhado et al., 2009; Shackleton and Shackleton, 2004; Tewari, 2012). Shackleton and Shackleton (2004) reported that on average a household consumes about "5.3 tonnes of fuelwood, 58 kg of wild spinach, 104 kg of edible fruits and 185 large poles for fencing kraals and houses per annum". However, the use of NTFPs is not the only livelihood strategy for rural people (Paumgarten, 2005; Shackleton, 2004; Shackleton et al., 2007a). Some of the livelihood strategies such as migrant labour, agriculture and state grants, predominates the use of NTFPs (Paumgarten and Shackleton,

2011). However, in some cases the income from NTFPs is supplemented with cash from other livelihood activities such as agriculture, wage labour and self-employment (Shackleton et al., 2008). The availability of NTFPs makes it possible for rural households to further diversify their livelihoods and cushion against hardships and to spread risk (Hunter et al., 2011; Paumgarten, 2005; Paumgarten and Shackleton, 2011; Shackleton et al., 2008). In the savanna regions of southern Africa, it is estimated that, on average, the direct-use value of the NTFP income accounts for about one fifth of the total household income (Shackleton et al., 2007a).

1.2 Contribution of NTFPs to rural livelihoods

1.2.1 The subsistence use of NTFPs

About 250 million people in Sub-Saharan Africa live around dry forests (CIFOR, 2008) and the majority of them rely on the forests for products such as food, firewood and building materials (Damte and Kotche, 2011). Furthermore, NTFPs contribute to the livelihoods of about 1.4 – 1.6 billion people around the globe (FAO, 2001). Various studies have shown that NTFPs are important in meeting the subsistence needs of many households. For instance, Mulenga et al. (2012) noted that the average share of NTFP income to total household income was 33 % in parts of Zambia. Similarly, Melaku et al. (2014) recorded that NTFP income constituted about 47 % of the total household income in parts of Ethiopia. In both studies, the poorer households were more dependent on NTFPs than the better off households. The same pattern where NTFP income contributes significantly to total household, with poorer households being more reliant on NTFPs than the well-off households, has been observed by many studies (Heubach et al. 2011; Kar and Jacobson, 2012; López-Feldman, 2014; El Tahir and Gebauer, 2004; Thondhlana and Muchapondwa, 2014; Vedeld et al., 2007).

Some studies question the potential of NTFPs to alleviate poverty (Angelsen and Wunder, 2003; Belcher et al., 2005; Gubbi and MacMillan, 2008; Neumann and Hirsch, 2000; Wunder et al., 2014a). Furthermore, they suggested that earlier studies could have been overly optimistic about the role of NTFPs in poverty alleviation and NTFPs could be actually responsible for perpetuating poverty (Neumann and Hirsch 2000; Sheil and Wunder 2002;

Ros-Tonen and Wiersum 2005). For instance, Lawrence (2003) noted that "early hopes that NTFPs would underpin rural livelihoods, and rescue rural populations from poverty while providing them with a reason to protect and manage forests, led to exaggerated claims of economic potential. They also tended to overlook the great diversity of products referred to, in terms of biological characteristics, and social and economic value, whilst simultaneously ascribing unreasonably lofty and altruistic goals to some of the world's poorest people". Nonetheless, there is a growing number of studies suggesting that NTFPs have the potential to contribute significantly towards poverty alleviation or preventing households from sinking deeper into poverty (Babulo et al., 2009; Fisher, 2004; Shackleton et al., 2007a; Yemiru et al., 2010). For instance, Yemiru et al. (2010) noted that in the Bale Highlands, southern Ethiopia, NTFP income is helping about 20 % of the households to stay above the poverty line and therefore, reducing inequality by 15.5 %. Similarly, Babulo et al. (2009) reported that the inclusion of NTFP income in household income accounting would result in the reduction of headcount poverty by 20.9 % in Tigray, northern Ethiopia.

Interestingly, much of the literature suggesting that the contribution of NTFPs to household income is insufficient to be a viable vehicle for alleviating poverty (Angelsen and Wunder, 2003; Belcher et al., 2005; Gubbi and MacMillan, 2008; Neumann and Hirsch, 2000; Wunder et al., 2014a) comes from Southeast Asia, which is characterised by generally more productive environments than the dry savannas of Sub-Saharan Africa (see for example FAOSTAT, 2014; World Bank, 2014a). So, at a national scale, agriculture is far more viable in such regions than in South Africa (see introduction of chapter 2). Consequently, rural communities are engaging or have potential to engage more in agriculture, which might mean reduced dependency on NTFPs in such settings. In contrast, South and southern African environments are characterised by dry and variable climates and small land holdings, which limit the potential for agriculture (Feynes and Meyer, 2003; Shackleton et al., 2007a; Tregurtha and Vink, 2008). Indeed, many rural households farm at subsistence level and in most cases their produce barely covers their consumption needs. This is characteristic of many rural farmers in dry agro-ecological zones of Sub-Saharan Africa (see for example Babulo et al., 2008; Barrett et al., 2001). This weakens agriculture as a viable rural livelihood strategy. Moreover, Sub-Saharan Africa is characterised by high unemployment rates, as high as 30 % in some countries, compared to other regions such as

Southeast Asia and the Pacific (ILO, 2015). Therefore, the potential relative contribution of NTFPs to household income is likely to be greater (Dovie et al., 2002; Makhado et al., 2009; Shackleton et al., 2007a; 2007b). Following on the argument by Shackleton et al. (2007a) that dependence on NTFPs is likely to be higher in dry, relatively unproductive environments than in the moister ones, the second chapter of this thesis sought to investigate if there was any significant difference in the contribution of NTFPs to rural livelihoods in areas of varying agro-ecological potential.

1.2.2 Role of NTFP trade in rural livelihoods

The importance of NTFP trade to rural livelihoods has been documented by many authors (Lyndon, 2005; Shackleton et al., 2008; Yemiru et al., 2010). However, given that the optimism about the potential of NTFPs to alleviate poverty waned following the failure of some NTFP commercialisation projects (Sills et al., 2011); there are some studies that point out why trading NTFPs cannot lift households out of poverty. For instance, some studies argue that NTFPs are inferior products, implying that the demand of NTFPs decrease as household income increases (Arnold, 2002; Ruiz-Pérez et al., 2004). In addition, some argue that NTFPs are inherently substitutable (Sills et al., 2011). For example, "some NTFPs (e.g. *Hevea brasiliensis* and *Paullinia cupana*) have been substituted by either cultivated crops or synthetic products like plastic buttons rather than vegetable ivory (*Phytelephas macrocarpa*) and industrially produced repellents instead of plant-based pesticides like barbasco (*Lonchocar- pus nicou*)" (Sills et al., 2011). Even though, this is true for certain NTFPs, there are some NTFPs that are consumed for preferential and cultural purposes; therefore, some NTFPs are not inferior products or easily substitutable. For example, bushmeat in central Africa (Van Vliet et al., 2011); medicinal plants in southern Africa (Shackleton et al., 2007a); and traditional brooms in South Africa (Cocks et al., 2011).

Trading NTFPs has been regarded by some as a poverty trap, thus NTFPs are inferior products with low market prices with high collection costs, which are difficult to reduce (Angelsen and Wunder, 2003; Belcher and Schreckenberg, 2007; Sheil and Wunder, 2002). In addition, some argue that NTFP trade tends to follow a 'boom-bust' cycle, where the returns from NTFPs trade reaches a ceiling before falling sharply as the NTFPs are

substituted by non-NTFPs (Homma, 1992). In contrast, a review of CIFOR's 61 case studies showed that only 12 % followed a boom-bust cycle (Sills et al., 2011). Similarly, a survey of 10 products in 18 poor communities in Bolivia and Mexico revealed that not any of the NTFP activities were regarded as 'poverty traps' (Schreckenberg et al., 2006). In many developing countries, households sell NTFPs and in some cases, they seem to be promising in alleviating poverty (Yemiru et al., 2010). Moreover, returns to labour typically exceed those to agriculture or local wage labour (Shackleton et al., 2007a)

Selling of NTFPs is often associated with resource-poor households, especially women, because the collection of NTFPs requires low technical skills and the NTFPs are often freely available to households (Neumann and Hirsch, 2000). Thus, the selling of NTFPs is often due to lack of alternatives instead of the attraction of the NTFP trade (Angelsen and Wunder, 2003; Cavendish, 2000). However, there is no doubt that in some cases NTFPs provide an opportunity for cash-constrained rural households to earn cash, especially in those communities where other income earning sources are limited (Agustino et al., 2011; Melaku et al., 2014; Mujawamariya and Karimov, 2014; Shackleton and Pandey, 2014). In some cases the cash income from selling NTFPs often compares well with the available alternatives, that is, if there are any (Shackleton et al., 2008). Furthermore, many parts of Sub-Saharan Africa are characterised by low land productivity, small landholdings and high unemployment rates, making selling of NTFPs an important livelihood activity and source of cash income since agriculture production is limited in such areas (Lemenih et al., 2003; Adam and Pretzsch, 2010, Shackleton et al., 2007a).

In South Africa, there is extensive NTFP trade within communities and via external markets. Even though there is a lack of national or regional statistics of the total number of sellers or households taking part in the trade of NTFPs, on either an ad hoc or semi-permanent basis, it is speculated that millions of people are involved (Shackleton et al., 2007a). There are many South African studies (Botha et al., 2004; Dovie et al., 2002; Pereira et al., 2006; Shackleton, 2005; Shackleton et al., 2008) showing that rural households trade in certain NTFPs but these studies are sectorial, that is, per individual NTFP market chain. There is a limited indication of the proportion of all households or a random sample of households

trading one or more NTFPs, and how it varies in relation to local context. Therefore, the third chapter of this study sought to establish the proportion of households trading in NTFPs in sites of different distances to urban markets and agro-ecological zones of South Africa.

1.3.3 Safety net role of NTFPs

Many studies have documented the importance of NTFPs as safety nets (López-Feldman, 2014; Paumgarten and Shackleton, 2011; Takasaki, 2011; Wunder et al., 2014b). For instance, Debela et al. (2012) noted that the reliance on NTFPs increased in parts of Uganda in the wake of shocks and this increased dependence on NTFPs was for direct needs instead of cash. Similarly, in south-eastern Zimbabwe, rural households responded to HIV/AIDS-related economic shocks by harvesting more NTFPs to smooth both consumption and income (Mutenje et al., 2011). Thus, approximately 48 % of the total household income shortfall caused by HIV/AIDS was offset by harvesting more NTFPs. On the other hand, Wunder et al. (2014b) recorded marginal (7.8 %) use of NTFPs as safety nets as a first response (5.2 % and 4.4 % as second and third responses, respectively) to a shock in their global sample over a one year recall period. Therefore, they concluded that NTFPs could be actually "options of last resort" which households turn to when they experience severe shocks and they have limited coping strategies. Furthermore, rather than assuming that NTFPs play an important role as a safety net, careful "case-by-case" analysis should be done to understand the local context and extent of use of NTFPs as safety nets.

A large number of studies underscore the importance of the safety net function of NTFPs to rural households, but there seem to be no studies that explicitly show the extent of use of NTFPs as safety nets across a range of sites and contexts (Mutenje, 2010). For example, in low agro-ecological zones, livelihoods are likely to be more prone to many shocks such as crop failure, major livestock loss and seasonal flooding (Babulo et al., 2008; Barrett et al., 2001; Delacote, 2007). In their global sample, Wunder et al. (2014b) reported high shock intensity in Africa as compared to Asia and Latin America, with about 76 % of the shocks being moderate and 39 % severe shocks. They attributed this to dry climatic conditions and the poor asset base that exposes many households to shocks. Similarly, Kezaala and Bataringaya (1998) suggested that households in east Africa were less likely to be prone to

droughts than households in southern Africa due to different agro-ecological zones. Likewise, Mason et al. (2007) noted that low agro-ecological zones of Zambia had highest shocks such as droughts, HIV prevalence, AIDS-related deaths and low rainfall. The poorest agro-ecological zones of Zimbabwe have the highest occurrences of droughts, crop pests and food shortages (Manjengwa et al., 2012).

Based on the above studies, the question that arises is what is the nature and extent of the usage of NTFPs as safety nets in areas of varying agro-ecological potential? There are several South African studies (Hunter et al., 2011; Paumgarten and Shackleton, 2011; Shackleton and Shackleton, 2004) showing that rural households use NTFPs as safety nets in times of misfortune. However, being focussed on one or two sites, they do not show the prevalence of NTFP use as safety nets across different contexts and multiple sites such as different agro-ecological zones. Therefore, it was hypothesised in the fifth chapter that households in low agro-ecological zones are in a more precarious setting and are likely to experience more shocks and of greater severity. Consequently, these households are likely to use NTFPs as safety nets more than households in high agro-ecological zones. In addition, households with a high contribution of NTFPs to total household income are more likely to use NTFPs as safety nets since they already have the aptitude to harvest NTFPs. Therefore, the aim of the fifth chapter was to establish the nature and extent of the use of NTFPs as safety nets in multiple sites of varying agro-ecological potential.

1.3 Pricing of NTFPs

A large number of studies have been conducted on the contribution of different types of NTFPs to household incomes and livelihoods, but not much knowledge is available (especially in South Africa) on how prices are set for NTFPs (Famuyide et al., 2012). The limited available information on price determination of NTFPs shows that there are no certain or formal mechanisms (pricing based on demand, pricing based on the total cost incurred or pricing based on competition) used by the sellers of NTFPs when of setting prices (Agea et al., 2013; Ham et al., 2008; Tchoundjeu et al., 2008).

A number of studies indicate the wide variety of factors that can influence the price determination of NTFPs (Agea et al., 2013; Botha et al., 2004; Famuyide et al., 2012; Ham et al., 2008; Mahapatra and Tewari, 2005; Ndoye et al., 1997; Pereira et al., 2006; Tchoundjeu et al., 2008). However, since most are based on single or relatively few sites, there is no indication of the prevalence of the different factors within a uniform macro context, nor how they might vary between different types of NTFPs. The determination of prices of NTFPs is important so as to avoid either over or under-valuing them in markets and in poverty studies. Therefore, the fourth chapter of this thesis sought to determine the factors and the rationale behind the setting of prices for selected NTFPs in different areas of South Africa. South Africa is a particularly useful setting for such a study because of its marked dual first and third world economies, strong market integration and yet extensive use of NTFPs. Based on previous work and this macro context, it was hypothesised that there are no certain mechanisms used by the sellers of NTFPs to set the prices of the NTFPs. In addition, the pricing factors taken into account by the sellers of NTFPs are likely to vary with the type of NTFP being sold, type of market (home market or urban market), socio-economic characteristics of the seller and the method used by the seller to procure the NTFPs.

1.4 Definitions and conceptual frameworks

1.4.1 Defining non-timber forest products (NTFPs) and their uses

The definition of non-timber forest products (NTFPs) has been a subject of debate ever since Beer and McDermott (1989) coined the term 'NTFP' (Belcher, 2003; Neumann and Hirsch, 2000). Beer and McDermott (1989) defined NTFPs as "all biological materials other than timber, which are extracted from forests for human use" (Ahenkan and Boon, 2011). Ever since then, many definitions of NTFPs have been proposed depending on the purpose of the study. Therefore, there hasn't been a universal definition of NTFPs (Ahenkan and Boon, 2011; Belcher, 2003). However, what can be noted from the various definitions is that they do not include commercial timber and the products are extracted from forests and non-forest wildlands (Belcher and Schreckenberg, 2007). Some definitions of NTFPs tend to characterise them by what they are 'not', thus indicating that NTFPs include a wide range of products and in some instances this leads to inconsistencies in the results from empirical

studies (Ahenkan and Boon, 2011; Belcher and Schreckenberg, 2007). Thus, the debate about NTFPs tends to be centred on the scale of extraction or production, the nature of the product, the ownership and distribution of benefits, and the source of the product (collected from either the wild or from domesticated sources) (Ahenkan and Boon, 2011; Belcher, 2003).

Despite many studies documenting the socio-economic importance of NTFPs to rural livelihoods, there is still no universal terminology and definition of NTFPs (Ahenkan and Boon, 2011). There are many terminologies that have been used interchangeably by different authors including "non-wood forest products", "minor forest products", "forest biological resources", "special forest products", "non-wood forest benefits", "non-wood goods and services", "wild products", "natural products" and "minor forest products" (Ahenkan and Boon, 2011, Belcher, 2003; Chandrasekharan 1995; Wunder and Angelsen 2003). It seems that some of these terms do not encompass the wide array of ideas that are covered in the NTFP concept. For the purposes of this study, an inclusive definition of NTFPs by Shackleton (2004) was adopted. Thus, NTFP was taken to refer to "any biological resource (animal or plant) harvested from forested lands by rural households for domestic consumption or small-scale trade, with no, or limited capital investment".

Many studies have documented various functions performed by NTFPs in supporting rural livelihoods (Angelson et al., 2014; Babulo et al., 2009; Shackleton et al., 2007; Tewari, 2012; Wunder et al., 2014b). Thus, NTFPs support the livelihoods of rural households broadly in five ways (Shackleton and Pandey, 2014). Firstly, households directly consume NTFPs in the form of food, fibre, medicines, shelter, etc. For example, Makhado et al. (2009) recorded extensive use of NTFPs such as medicinal plants, edible insects, mushrooms, thatching grass, broom grasses, wild fruits, firewood and fencing poles in Limpopo Province, South Africa. For instance, they noted that about 80 % of the interviewed households used firewood as the main source of energy for cooking and heating. Likewise, Velded et al. (2007) recorded significant reliance on NTFPs, especially by poor households, in their analysis of case studies from Africa, Asia and South America. Thus, income from NTFPs such as fuelwood, foods, and fodder accounted for more than 20 % of the total household income. Similarly, many studies have shown that many rural households across the globe depend heavily on NTFPs to meet

their subsistence needs such as food and energy (Angelson et al., 2014; Kiplagat et al. 2008; Melaku et al., 2014; Piya et al., 2011).

Secondly, NTFPs offer households an opportunity to earn cash income either to supplement other sources of income or as the main source of income (Shackleton and Pandey, 2014; Shackleton et al., 2008). For instance, Sadashivappa et al. (2006) reported that about 50 % of the cash for some households in Western Ghats region of Karnataka in India comes from NTFP sales. On the other hand, Piya et al. (2011) noted that the average contribution of NTFP trade to total household income was 13.2 % for Chepang Community in Nepal. Even though, the cash income from selling NTFPs might be relatively low due to small quantities in which NTFPs are sold and the poorly developed markets, it is still important to many rural households, especially to those in areas where cash income earning opportunities are limited (Shackleton et al., 2008; Sunderlin et al., 2005).

Thirdly, it is well documented that many rural households use NTFPs as a 'safety net' in times of hardships (Shackleton and Pandey, 2014). Thus, the 'safety net' function of NTFPs refers to a situation where NTFPs are used by households in times of emergency income shortfalls and also as a way of avoiding getting worse off in times of hardships (Belcher, 2005). In times of hardships households use NTFPs as safety nets either through direct consumption or cash income generation (Paumgarten and Shackleton, 2011). For instance, Mutenje et al. (2011) reported that approximately 48 % of the total household income shortfall caused by HIV/AIDS was offset by harvesting more NTFPs in south-eastern Zimbabwe.

Fourthly, some NTFPs are used in the cultural and spiritual functions performed by households (Shackleton and Pandey, 2014). For instance, Lemenih et al. (2003) noted that oleo-gum resins were widely used for cultural and religious rituals in Liban, south-east Ethiopia. Lastly, NTFPs are used by some rural households as 'cash saving' (Shackleton and Pandey, 2014). Therefore, cash saving is a benefit from direction consumption of NTFPs. Thus, use of NTFPs products allows households to use cash income for their living expenses or invest in other livelihood activities such as farming and small business operations (Paumgarten and Shackleton, 2011; Shackleton et al., 2008).

1.4.2 Conceptualising rural livelihoods

Consistent with the livelihood strategy literature (Babulo et al., 2008; Kusters et al., 2005; Martinez, 2004; Van Gevelt, 2013) a sustainable livelihoods approach was used to in this study to understand the activities of rural households and the factors influencing households to engage in certain activities. The sustainable livelihood framework shows various elements that shape the livelihoods of households, the factors affecting them, and the connections between these different factors (Babulo et al., 2008; DFID, 1999) (Figure 1). Thus, it focuses on the assets of the households, their capacity to weather shocks, and institutions and policies that reflect the priorities of households (Babulo et al., 2008). Therefore, the framework shows how sustainable livelihoods are attained based on the ability of households to access various types of capital (natural, social, physical, financial and human), which are put together in the undertaking of various livelihood activities (Martinez, 2004). One of the notable features of the livelihoods framework is that rather than focusing on the economic poverty line and what people lack, it focusses on assets; hence what households can achieve with the assets they have (Adato and Mainzen-Dick 2002). Therefore, the expected outcomes are not only tangible goods (cash income, fuelwood, food security, etc.), but also intangible goods such as well-being.

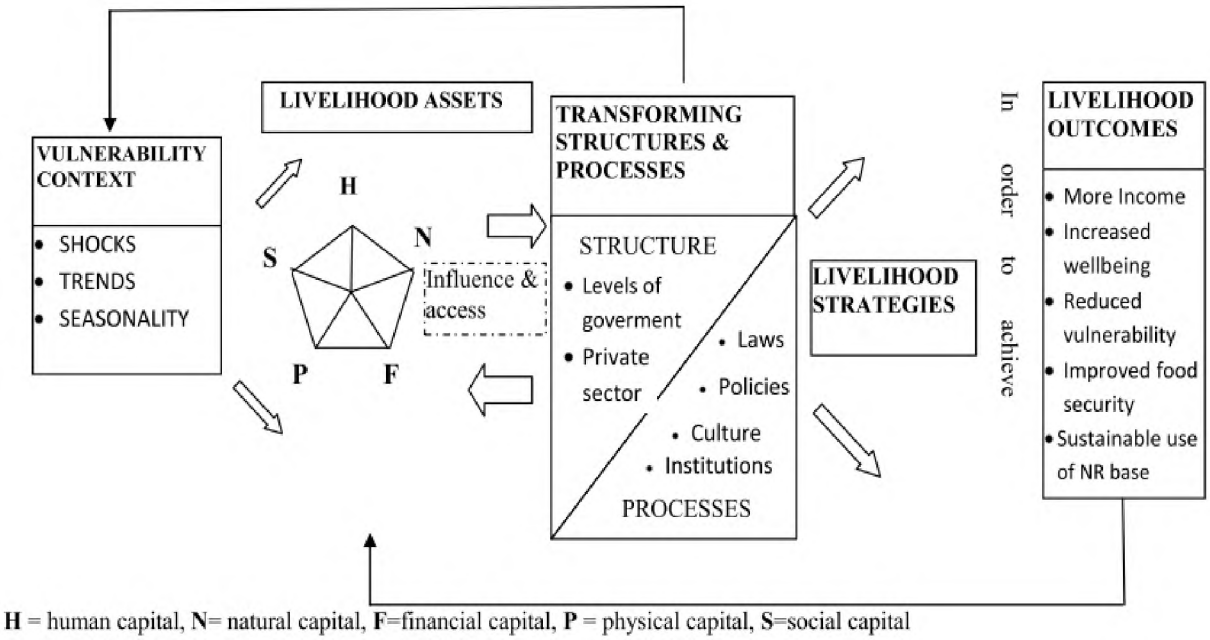

Figure 1: The sustainable livelihoods framework

(Source: DFID, 1999)

Poverty has generally been assessed based on income or consumption criteria (Farrington et al., 1999). Thus, a person was regarded poor if their income levels were below a certain poverty line, or if their consumption was lower than a specified level (Farrington et al., 1999). However, the concept has widened by including intangible and non-material features of welfare such as nutrition, education, security and empowerment (Ingram and Bongers, 2009). Whilst acknowledging that there are many definitions of poverty, a comprehensive definition of poverty was used in this study. Thus, poverty was defined as "the absence of basic capabilities to meet physical needs, but also to achieve goals of participating in the life of the community and influencing decision-taking" (Farrington et al., 1999). The sustainable livelihoods approach examines the factors that are important to poor households and the ways of attaining these things. This makes it an essential tool in understanding rural poverty, especially in developing countries where rural areas are normally characterised by poverty and imperfect markets (Sjaastand et al., 2005). Poverty reduction is a term that refers to households being lifted above a predetermined poverty line (Angelson and Wunder, 2003). Thus, households become evidently better off, either in absolute or relative terms (Angelson and Wunder, 2003). On the other hand, poverty prevention refers "to the role of forests in helping people to survive and maintain a minimum standard of living – the insurance and gap filling functions of forests in cushioning poverty, without lifting people above a poverty line" (Ingram and Bongers, 2009). As noted by Angelson and Wunder (2003), poverty alleviation is an "inclusive term that encompasses both poverty reduction and poverty prevention".

The definition of the term 'livelihood' has been widely discussed in the literature (Ellis, 1998, Chambers and Conway, 1992; Scoones, 2009), with debates being centred on what should be included (Kusters et al., 2005). The commonly used definition and the one followed in this study is that a livelihood comprises "the capabilities, assets (including both material and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks, maintain or enhance its capabilities and assets, while not undermining the natural resource base" (Chambers and Conway, 1992). A household's ability to engage in various livelihood strategies is influenced by the assets it has access to (Martinez, 2004). As noted by Ellis (1999), "in pursuing

livelihood strategies composed of a range of activities, both the access to assets and the use to which they can be put are mediated by social factors (social relations, institutions, organisations) and by exogenous trends (e.g. economic trends) and shocks (drought, disease, floods, pests)". Livelihood strategies or activities can be defined as the various combinations of choices that households pursue to attain their livelihood goals (e.g. income, wellbeing and safety) (Adato and Mainzen-Dick, 2002; DFID, 1999). For instance, many studies have noted that rural households tend to engage in multiple livelihood strategies such as migrant labour, collection of NTFPs, agriculture and state grants (Babulo et al., 2008; Paumgarten and Shackleton, 2011; Shackleton et al., 2001). Diversification of rural livelihoods was defined as (Ellis, 1999) "the process by which households construct a diverse portfolio of activities and social support capabilities for survival and in order to improve their standard of living". The sustainable livelihoods framework can be used as checklist by which limitations to successful livelihoods can be identified and eliminated (Ellis, 1999).

Many studies emphasise the importance of using the total income (consisting of both cash and non-cash incomes) approach in understanding rural livelihoods (Babulo et al., 2008; Babulo et al., 2009; Cavendish, 2000; Heubach et al., 2011). Therefore, for the purposes of this study income consisted of both cash and non-cash incomes.

1.4.3 A conceptual framework for pricing decisions

Many studies have shown that NTFP trade is widespread (Cunningham, 2011; Phounvisouk and Ting, 2014; Sunderlin et al., 2005). However, many studies tend to focus on the contribution of NTFP cash income to total household income (Famuyide et al., 2012). Yet, cash income from trading NTFPs depends on volume traded and unit price. In South Africa, there are no studies (a very few internationally) that sought to examine the pricing criteria of NTFPs.

Making sound pricing decisions is usually challenging due to the complex interaction of internal and external factors that need to be considered (Figure 2) and the interrelationships among them (Monroe and Mazumdar, 1988; Rogers, 1990; Singh, 2013). The concept of the pricing decisions framework is the selection of a suitable pricing method in line with the

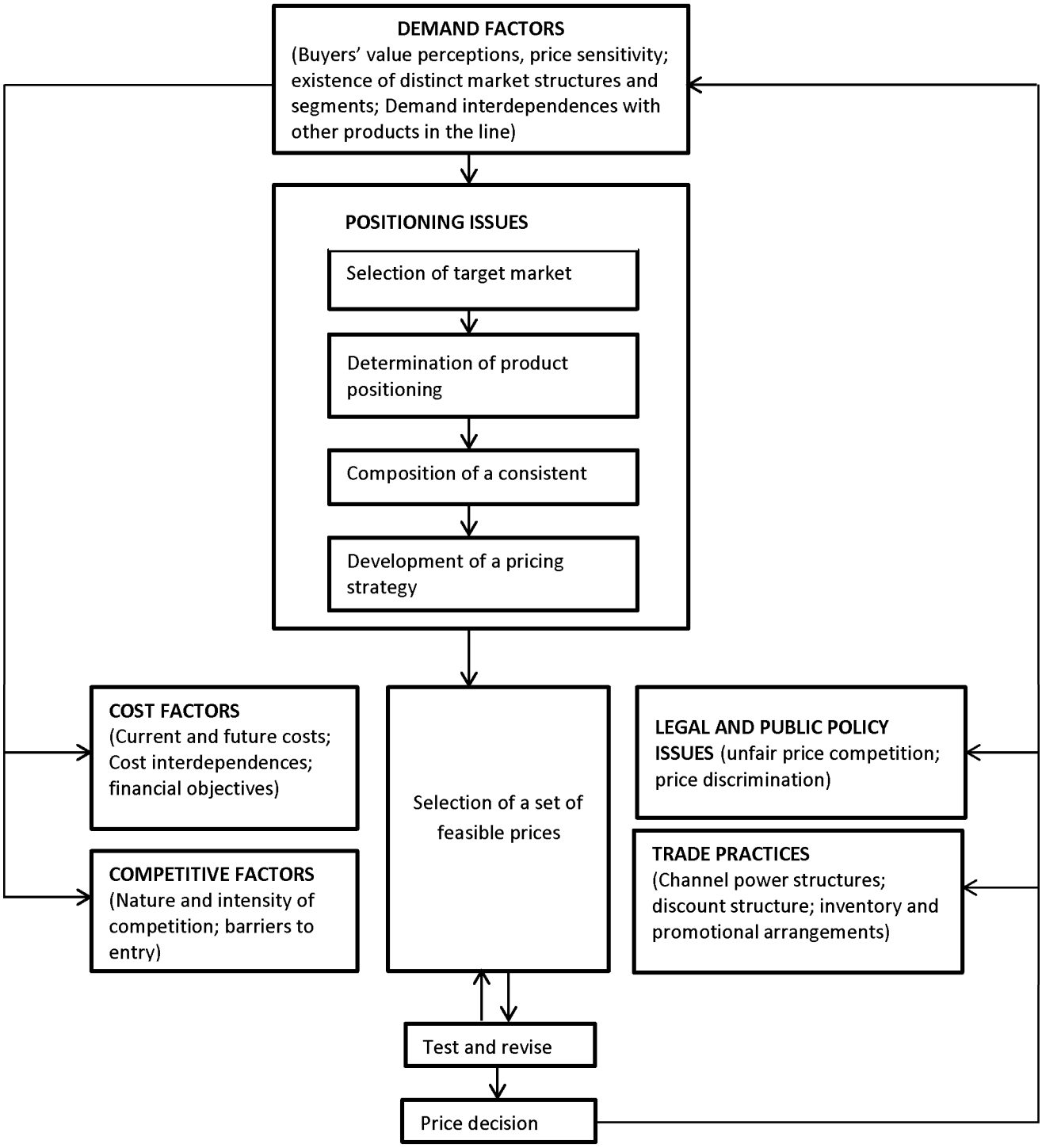

Figure 2: Determination of the pricing strategy

(Source: Monroe and Mazumdar, 1988)

overall positioning of the NTFP (Figure 2) (Shapiro and Jackson, 1978). For instance, if a seller puts the importance of customers' views first, then the NTFP positioning and, therefore, choice of the pricing strategy should take into account the demand factors like customer's perceptions of value and existence of distinct price market segments based on

buyers' preferences (Monroe and Mazumdar, 1988). Following on a sound marketing and pricing strategy, an NTFP seller can formulate a set of feasible pricing alternatives by considering the cost related factors, expected competitive reactions, prevalent trade practices in the distribution channel, and seller's objectives within a legal and public-policy framework (Monroe and Mazumdar, 1988).

1.4.4 Pricing models

The pricing models can be broadly classified into six groups (Monroe and Mazumdar, 1988): (1) single-period pricing models, (2) dynamic pricing models, (3) price promotion and discount models, (4) product line pricing, (5) price and other marketing-mix variables and (6) price and individual choices. Which of these apply to most NTFPs is unknown.

In general, single-period pricing models aim to solve certain marketing problems by selecting a price that maximises single-period profits (Monroe and Mazumdar, 1988). Even though there are numerous diverse models in this class, the common feature about them is that they assume that the variables of interest remain the same over time (Monroe and Mazumdar, 1988). Thus, changes in demand, cost, and competitive reactions over time are not explicitly taken into account. On the contrary, the dynamic pricing models explicitly examine the change in cost and demand functions over time (Monroe and Mazumdar, 1988). Thus, changing costs and demand functions are put together to develop a pricing strategy that maximises the profit of the firm (Bertsimas and Perakis, 2001; Keskin and Zeevi, 2014). Within this class of models, different models have been developed that take into account the impacts of competitive entry, product obsolescence, and cases where the product's value changes with increased adoption (Bitran and Caldentey, 2003).

Generally, with the price promotion and discount models, sellers are concerned about disposing inventory by using price inducements and in some cases attract more customers using price discounts (Jiang and Liu, 2012; Monroe and Mazumdar, 1988). Furthermore, it is assumed that the buyer's aim is to balance the savings of purchasing on promotion against the additional time and storage costs (Monroe and Mazumdar, 1988). On the other hand, the product line pricing models aim to maximise the seller's total profits by assessing the

cost and demand interdependences of products in the line (Draganska and Jain, 2006). Therefore, the main variables of interest include the own-price and cross price elasticities among the products on the demand side and the sharing patterns of input resources on the cost side (Draganska and Jain, 2006; Reibstein and Gatignon, 1984). In this class of models, various models take into account nonlinear price-volume schedules and the impacts of price differentials (Reibstein and Gatignon, 1984; Kannan et al., 2009). However, typically, these models do not take into account competitive and buyers' behavioural responses (Monroe and Mazumdar, 1988).

Price and other marketing-mix variables models assess the interrelationships between price and different non-price variables such as advertising, product warranty, channel competition and structure, and the pricing authority for sales force (Monroe and Mazumdar, 1988). Thus, these models seek to capture the interaction between price and other marketing mix variables (Gatignon and Hanssens, 1987). On the other hand, price and individual choice models assess how price and price range enters buyers' product assessments, utility formation, and the ultimate choice (MacDonald et al., 2012; Monroe and Mazumdar, 1988). In addition, they assess the effects of buyers' perceptions of price change (MacDonald et al., 2012).

1.4.5 Methods for pricing

The pricing methods reflect the decisions taken by a seller about the price at which certain products will be made available to customers in a given market (Singh, 2013). Generally, the pricing methods change as the marketing conditions and environmental factors change (Rogers, 1990; Singh, 2013). Some of the crucial factors in pricing include cost of production, marketing strategy, distribution costs, advertising costs and any type of price variation in the market. Pricing methods are used by sellers to achieve certain goals or objectives such as increasing market share, maximising profit, attaining competitive advantage and to attain set returns (Rogers, 1990; Singh, 2013). Therefore, each pricing method can be used as an effective strategy of achieving certain objectives. There are broadly four methods for determining prices (Singh, 2013): (1) cost based pricing, (2) break-even concept (3) demand based pricing and (4) pricing related to market.

Under cost based pricing, the seller can either use mark-up pricing (cost plus pricing), full cost pricing (absorption cost pricing) or marginal cost pricing. With mark-up pricing, the price is derived simply by adding a mark-up to the cost of the product (Cannon and Morgan, 1990; Rogers, 1990). This method is normally used by sellers who do not manufacture products (Singh, 2013). On the other hand, full cost pricing is normally used by manufacturers (Singh, 2013). Full cost pricing entails estimating the unit cost of a product and adding a profit margin to this unit cost (Ray and Gramlich, 2016). Thus, the method employs the standard costing techniques by calculating both fixed and variable costs incurred from the manufacturing to the selling of the product (Ray and Gramlich, 2016; Singh, 2013). Marginal cost pricing aims to maximise the contribution towards fixed costs (Singh, 2013). Thus, the direct variable costs are fully realised as well as a fraction of the fixed costs.

Break-even analysis as a pricing method is based on the break-even concept. The break-even point is where the total costs are exactly the same as the total revenues (Singh, 2013). Therefore, at this level, both profit and loss will be equal to zero. At a level where revenues are greater than the costs, profits are realised (Singh, 2013). Many sellers use this pricing method to set prices and also to calculate the level of production that gives the desired profits (Rogers, 1990).

Under demand based pricing, firms make use of pricing methods such as skimming, penetration and charging what the 'traffic will bear'. Skimming pricing entails the seller skimming the market by setting a high premium price for a certain product and then lowers the price over time (Rogers, 1990; Spann et al., 2015). This method is appropriate for sellers introducing new products of luxury in the market (Singh, 2013). Thus, it enables the seller to have an idea of the product's demand and then make necessary adjustments to the pricing strategy. In contrast, penetration pricing strategy is normally employed by sellers aiming to achieve a foothold in competitive markets (Singh, 2013; Spann et al., 2015). Thus, the major goal is to achieve a certain market share or market penetration. The "charging what the traffic will bear" pricing strategy points out the demand price (Rogers, 1990). For instance, professionals such as doctors, lawyers, accountants charge their fees based on "the ability to pay and the cost factor comes secondary in their charges" (Singh, 2013).

Pricing as per competition strategy entails using approaches such as discount pricing, premium pricing and going rate pricing (parity pricing) to set the price of a given product (Singh, 2013). Discounts and allowances are price concessions offered to customers in the form of reductions of the originally set price (Singh, 2013). Thus, they are forms of indirect price competition. The popular discounts include trade, cash, quantity and seasonal discounts (Rogers). The going rate pricing entails a seller setting prices that are in line with the competitors' prices (Cannon and Morgan, 1990; Singh, 2013).

1.5 Aim and research questions of the study

Based on the preceding background and motivation, the main aim of this study was to determine the contribution of NTFPs to rural livelihoods and their price setting in areas of varying agro-ecological potential and distance to urban markets. The study sought to explore the following questions:

1. What is the income contribution of NTFPs to rural livelihoods in areas of varying agro-ecological potential?
2. What is the nature and extent of households trading in particular NTFPs in different agro-ecological areas and distance to urban markets?
3. What determines the price of NTFPs in different parts of South Africa?
4. What is the nature and extent of households' use of certain NTFPs as safety nets in different agro-ecological areas?

1.6 Structure of the thesis

This thesis is presented in six chapters. The second, third, fourth and fifth chapters are written as stand-alone papers. Therefore, some of the arguments made in chapter one are elaborated more in the second, third, fourth and fifth chapters. A broad overview of NTFPs and rural livelihoods and the South African context of NTFPs and rural livelihoods were presented in this first chapter. Furthermore, the pricing models and pricing methods were described in chapter one. The rationale of the study, aim of the study and research questions was also provided in the first chapter.

The second chapter deals with the contribution of NTFPs to rural households in areas of varying agro-ecological potential. Thus, how does the contribution of income from NTFPs to total household income vary with changing agro-ecological potential of an area?

Chapter three provides the proportion of rural households trading in certain NTFPs at different distances to urban markets and in varying agro-ecological areas. In addition, the level of contribution of the NTFP trade income to the total household income in different distances to urban market and varying agro-ecological areas is also presented in the third chapter.

Chapter four presents the rationale behind the pricing of certain NTFPs in different parts of South Africa. Thus, it provides the factors taken into account by traders of NTFPs when they set the prices of NTFPs.

The nature and frequency of use of NTFPs as safety nets by rural households in areas of varying agro-ecological potential is presented in Chapter five. Chapter six presents the summary, conclusions and recommendations of this thesis.

References

Adato, M and Meinzen-Dick, R., 2002. Assessing the impact of agricultural research on poverty using the sustainable livelihoods framework. EPTD Discussion Paper 89/FCND Discussion Paper 128. Washington, DC: International Food Policy Research Institute (IFPRI).

Adam, Y.O. and Pretzsch, J., 2010. Contribution of local trade in *Ziziphus spina-christi L.* fruits to rural household's economy in Rashad locality, Sudan. *Forestry Ideas*, 16(39), 19-27.

Agea, J.G., Okia, C.A., Obaa, B.B., Munga, J., Isubikalu, P., Woiso, D.A., Obua, J. and Teklehaimanot, Z., 2013. Market conduct and performance of wild and semi-wild food plants traded in Bunyoro-Kitara Kingdom, Uganda. *African Journal of Environmental Science and Technology,* 7(6), 457–471.

Agustino, S., Mataya, B., Senelwa, K and Achigan-Dako E.G., 2011. Non-wood forest products and services for socio-economic development. A compendium for technical and professional forestry education. The African Forest Forum, Nairobi.

Ahenkan, A. and Boon, E., 2011. Non-timber forest products (NTFPs): clearing the confusion in semantics. *Journal of Human Ecology*, 33(1), 1–9.

Angelsen, A. and Wunder S., 2003. Exploring the forest — poverty link: key concepts, issues and research implications. Centre for International Forestry Research. Jakarta.

Angelsen, A., Jagger, P., Babigumira, R., Belcher, B., Hogarth, N.J., Bauch, S., Börner, J., Smith-Hall, C. and Wunder, S., 2014a. Environmental income and rural livelihoods: a global-comparative analysis. *World Development*, 64 (S1), S12-S28.

Arnold, M., 2002. Clarifying the links between forests and poverty reduction. *International Forestry Review*, 4(3), 231–233.

Babulo, B., Muys, B., Nega, F., Tollens, E., Nyssen, J., Deckers, J. and Mathijs, E., 2008. Household livelihood strategies and forest dependence in the highlands of Tigray, northern Ethiopia. *Agricultural Systems*, 98(2), 147–155.

Babulo, B., Muys, B., Nega, F., Tollens, E., Nyssen, J., Deckers, J. and Mathijs, E., 2009. The economic contribution of forest resource use to rural livelihoods in Tigray, northern Ethiopia. *Forest Policy and Economics*, 11(2), 109–117.

Banerjee, A.V. and Duflo, E., 2007. The economic lives of the poor. *Journal of Economic Perspectives*, 21(1), 141–167.

Barbier, E.B., 2010. Poverty, development, and environment. *Environment and Development Economics*, 15(06), 635–660.

Barrett, C.B., Bezuneh, M., Clay, D.C. and Reardon, T., 2001. *Income diversification strategies in rural Africa*. *New York*. *Working Paper 2001-25.* Cornell University, Ithaca, New York, USA.

Belcher, B.M., 2003. What isn't an NTFP? *International Forestry Review*, 5(2), 161–168.

Belcher, B.M., 2005. Forest product markets, forests and poverty reduction. *International Forestry Review*, 7(2), 82–89.

Belcher, B. and Schreckenberg, K., 2007. Commercialisation of non-timber forest products: a reality check. *Development Policy Review*, 25(3), 355–377.

Belcher, B., Ruíz-Pérez, M. and Achdiawan, R., 2005. Global patterns and trends in the use and management of commercial NTFPs: implications for livelihoods and conservation. *World Development*, 33(9), 1435–1452.

Bertsimas, D. and Perakis, G., 2001. Dynamic pricing: a learning approach. Massachusetts Institute of Technology. Assessed 20 May 2016, http://www.mit.edu/~dbertsim/papers/Revenue%20Management/Dynamic%20Pricing-%20A%20Learning%20Approach.pdf

Bitran, G. and Caldentey, R., 2003. An overview of pricing models for revenue management. *Manufacturing and Service Operations Management*, 5(3), 203–229.

Botha, J., Witkowski, E.T.F. and Shackleton, C.M., 2004. Market profiles and trade in medicinal plants in the Lowveld, South Africa. *Environmental Conservation*, 31(1), 38–46.

Cannon, H.M., and Morgan, F.W., 1990. A strategic pricing framework. *The Journal of Services Marketing*, 4(2), 19–30.

Cavendish, W., 2000. Empirical regularities in the poverty-environment relationship of rural households: evidence from Zimbabwe. *World Development*, 28(11), 1979–2003.

Chambers, R. and Conway, G., 1992. Sustainable rural livelihood: practical concepts for the 21st century. Institute for Development Studies, Discussion Paper 296, Brighton, UK.

Chandrasekharan, C., 1995. Terminology, definition and classification of forest products other than wood. FAO. Accessed 23 May 2014, http://www.fao.org/docrep/v7540e/V7540e28.htm

Chen, S. and Ravallion, M., 2007. Absolute poverty measures for the developing world, 1981-2004. *Proceedings of the National Academy of Sciences of the United States of America*, 104(43), 16757–62.

CIFOR., 2008. *Thinking beyond the canopy*. Annual Report. Accessed 14 June 2014, http://www.cifor.org/publications/pdf_files/AReports/AR2008.pdf

Cocks, M., Lopez, C. and Dold, T., 2011. Cultural importance of non-timber forest products: opportunities they pose for bio-cultural diversity in dynamic societies. In Shackleton, S., Shackleton, C. and Shanley P., ed. Non-timber forest products in the global context. Springer-Verlag, Berlin, Heidelberg, 2011, 107-128.

Cunningham, A.B. 2011. Non-timber products and markets: lessons for export-oriented enterprise development from Africa. In Shackleton, S., Shackleton, C. and Shanley P., ed. Non-timber forest products in the global context. Springer-Verlag, Berlin, Heidelberg, 2011, 83-106.

Damte, A. and Koch, S.F., 2008. Forest dependency, property rights and local level institutions: empirical evidence from Ethiopia. University of Pretoria, Department of Economics Working Paper Series, Working Paper: 2011-11.

Debela, B., Shively, G., Angelsen, A. and Wik, M., 2012. Economic shocks, diversification, and forest use in Uganda. *Land Economics,* 88(1), 139–154.

Delacote, P., 2007. Agricultural expansion, forest products as safety nets, and deforestation. *Environment and Development Economics*, 12(02), 235-249.

DFID. 1999. Sustainable livelihoods guidance sheets. Accessed 14 June 2014, http://www.eldis.org/vfile/upload/1/document/0901/section2.pdf

Dovie, D.B.K., Shackleton, C.M. and Witkowski, E.T.F., 2002. Direct-use values of woodland resources consumed and traded in a South African village. *International Journal of Sustainable Development and World Ecology*, 9(3), 269–283.

Draganska, M. and Jain, D.C., 2006. Consumer preferences and product-Line pricing strategies: an empirical analysis. *Marketing Science*, 25(2), 164–174.

Ellis, F., 1998. Household strategies and rural livelihood diversification. *Journal of Development Studies* 35(1), 1-38.

Ellis, F. 1999. Rural livelihood diversity in developing countries: evidence and policy implications. Overseas Development Institute. Natural Resource Perspectives, Number 40. Assessed 11 November 2016, http://dlc.dlib.indiana.edu/dlc/bitstream/handle/10535/4486/40-rural-livelihood-diversity.pdf?sequence=1

El Tahir, B.A. and Gebauer, J., 2004. Non-timber forest products: opportunities and constrains for poverty reduction in Nuba Mountains, South Kordofan, Sudan. *A paper presented in the Conference on International Agricultural Research for Development, Deutscher Tropentag 2004, Berlin, October 5-7, 2004.*

Famuyide, O., Adebayo, O., Adeniran, O. and Owese, T., 2012. Price determination of *Garcinia kola* (Bitter Kola) and *Aframomum melegueta elegueta* (Alligator Pepper) in Ibadan, Oyo State. *Journal of Biology, Agriculture and Healthcare,* 2(7), 52–60.

FAO. 2014. *FAOSTAT*. Accessed 14 June 2014, http://faostat3.fao.org/faostatgateway/go/to/download/Q/QI/E

FAO. 2001. Trees outside forests – towards rural and urban integrated resource management. FAO. Rome. Accessed 23 May 2016, http://www.fao.org/3/a-y1785e.pdf

Farrington, J., Carney, D., Ashley, C. and Turton, C., 1999. Sustainable livelihoods in practice: early applications of concepts in rural areas. ODI Natural Resource Perspectives, No. 42.

Feynes, T. and Meyer, N., 2003. Structure and production in South African agriculture. Cited in Hart, T. 2008. Reviewing 15 years of resource poor small-scale agriculture in South Africa: is there any way forward? Accessed 02 June 2014, http://www.tips.org.za/files/Hart_Paper_24_Oct_2008__tmp52aa50cf.pdf

Fisher, M., 2004. Household welfare and forest dependence in southern Malawi. *Environment and Development Economics*, 9(2), 135–154.

Gatignon, H. and Hanssens, D.M., 1987. Modeling marketing interactions with application to salesforce effectiveness. *Journal of Marketing Research,* 24, 247-257.

Gubbi, S. and MacMillan, D.C., 2008. Can non-timber forest products solve livelihood problems? A case study from Periyar Tiger Reserve, India. *Oryx*, 42(02), 222–228.

Ham, C., Akinnifesi, F.K., Franzel, S., Du, P.S., Jordaan, D., Hansmann, C., Ajayi, O.C. and De Kock, C., 2008. Opportunities for commercialization and enterprise development of indigenous fruits in southern Africa. Cited in Agea, J.G., Okia, C.A., Obaa, B.B., Munga, J., Isubikalu, P., Woiso, D.A., Obua, J. and Teklehaimanot, Z., 2013. Market conduct and performance of wild and semi-wild food plants traded in Bunyoro-Kitara Kingdom, Uganda. *African Journal of Environmental Science and Technology,* 7(6), 457–471.

Heubach, K., Wittig, R., Nuppenau, E.A. and Hahn, K., 2011. The economic importance of non-timber forest products (NTFPs) for livelihood maintenance of rural west African communities: a case study from northern Benin. *Ecological Economics*, 70(11), 1991–2001.

Homma, A.K.O., 1992. The dynamics of extraction in Amazonia: a historical perspective. In Nepstad, D.C. and Chwartzman, S. (eds) Non-timber products from tropical forests: evaluation of a conservation and development. New York Botanical Garden, New York, 23–31.

Hunter, L.M., Twine, W. and Johnson, A., 2011. Adult mortality and natural resource use in rural South Africa: evidence from the Agincourt health and demographic surveillance site. *Society and Natural Resources*, 24(3), 256–275.

Illukpitiya, P. and Yanagida, J.F., 2008. Role of income diversification in protecting natural forests: evidence from rural households in forest margins of Sri Lanka. *Agroforestry Systems*, 74(1), 51–62.

ILO., 2015. World employment and social outlook. International Labour Office. Geneva. Accessed, 28 May 2015 http://www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/---publ/documents/publication/wcms_337069.pdf

Ingram, V. and Bongers, G., 2009. Valuation of non-timber forest product chains in the Congo basin: a methodology for valuation. CIFOR. Yaounde.

Jiang, Y. and Liu, Y., 2012. Optimization of online promotion: a profit-maximizing model integrating price discount and product recommendation. *International Journal of Information Technology and Decision Making*, 11(5), 961–982.

Kamanga, P., Vedeld, P. and Sjaastad, E., 2009. Forest incomes and rural livelihoods in Chiradzulu district, Malawi. *Ecological Economics*, 68(3), 613–624.

Kannan, P.K., Pope, B.K. and Jain, S., 2009. Pricing digital content product lines: a model and application for the national academies press. *Marketing Science*, 28(4), 620–636.

Kar, S.P. and Jacobson, M.G., 2012. NTFP income contribution to household economy and related socio-economic factors: lessons from Bangladesh. *Forest Policy and Economics*, 14(1), 136–142.

Keskin, N.B. and Zeevi, A., 2014. Dynamic pricing with an unknown demand model: asymptotically optimal semi-myopic policies. *Operations Research*, 62(5), 1142–1167.

Kezaala, R. and Bataringaya, J., 1998. The practicalities of orphan support in east and southern Africa: planning and implementation of multi-sectoral social services for children and child carers". *Paper presented at the Conference on Raising the Orphan Generation, Pietermaritzburg, June 9–12.*

Kiplagat, A.K., Mburu, J. and Mugendi, D.N., 2008. Consumption of non-timber forest products (NTFPs) in Kakamega forest, western Kenya: accessibility, role and value. *IASC Biennial International Conference 14-19 July 2008, University of Gloucestershire, Cheltenham, England.*

Kusters, K., Ruiz-Pérez, M. and Achdiawan, R., 2005. A method to assess the outcomes of forest product trade on livelihoods and the environment. CIFOR Working Paper No. 32

Lacuna-Richman, A.C., 2014. Subsistence strategies of an indigenous minority in the Philippines: nonwood forest product use by the Tagbanua of Narra, Palawan. *Economic Botany*, 58(2), 266–285.

Lawrence, A., 2003. No forestry without timber? *International Forestry Review*, 5(2), 87–96.

Lemenih, M., Abebe, T. and Olsson, M., 2003. Gum and resin resources from some Acacia, Boswellia and Commiphora species and their economic contributions in Liban, Southeast Ethiopia. *Journal of Arid Environments*, 56(1), 149–166.

López-Feldman, A., 2014. Shocks, income and wealth: do they affect the extraction of natural resources by rural households? *World Development*, 64(S1), S91-S100.

L'Roe, J. and Naughton-Treves, L., 2014. Effects of a policy-induced income shock on forest-dependent households in the Peruvian Amazon. *Ecological Economics*, 97, 1–9.

Lyndon, J., 2005. The potential of non-timber forest products to contribute to rural livelihoods in the Windward Islands of the Caribbean. CANARI Technical Report No. 334.

MacDonald, L., Anderson, C.K. and Verma, R., 2012. Using revealed- and stated-preference customer choice models for making pricing decisions in services: an illustration from the hospitality industry. *Journal of Revenue and Pricing Management*, 11(2), 160–174.

Mahapatra, A.K., Albers, H.J. and Robinson, E.J.Z., 2005. The impact of NTFP sales on rural households' cash income in India's dry deciduous forest. *Environmental Management*, 35(3), 258–265.

Mahapatra, A.K. and Tewari, D.D., 2005. Importance of non-timber forest products in the economic valuation of dry deciduous forests of India. *Forest Policy and Economics*, 7(3), 455–467.

Maharjan, K.L. and Khatri-Chhetri, A., 2006. Role of forest in household food security: evidence from rural areas in Nepal. Annual Report of Research Centre for Regional Geography, 15, 41–67.

Makhado, R.A., Von Maltitz, G.P., Potgieter, M.J. and Wessels, D.C.J., 2009. Contribution of woodland products to rural livelihoods in the northeast of Limpopo province, South Africa. *South African Geographical Journal,* 91(1), 46–53.

Mamo, G., Sjaastad, E. and Vedeld, P., 2007. Economic dependence on forest resources: a case from Dendi district, Ethiopia. *Forest Policy and Economics*, 9(8), 916–927.

Manjengwa, J., Kasirye, I. and Matema, C., 2012. Understanding poverty in Zimbabwe: a sample survey in 16 districts. *Paper prepared for presentation at the Centre for the Study of African Economies Conference 2012 "Economic Development in Africa", Oxford, United Kingdom, March 18-20, 2012.*

Martinez, F.R., 2004. Non timber forest products in Colombia: review of constraints for effective commercialisation. MSc thesis. The University of Queensland, Brisbane.

Mason, N.M., Chapoto, A., Jayne, T.S. and Myers, R.J., 2007. HIV /AIDS and agrarian livelihoods in Zambia: a test of the new variant famine hypothesis. Policy synthesis, food security research project Number 23. Lusaka. Accessed 07 April 2016, http://fsg.afre.msu.edu/zambia/ps23.pdf

McElwee, P.D., 2008. Forest environmental income in Vietnam: household socioeconomic factors influencing forest use. *Environmental Conservation*, 35(02), 147–159.

Meilby, H., Smith-Hall, C., Byg, A., Larsen, H.O., Nielsen, Ø.J., Puri, L. and Rayamajhi, S., 2014. Are forest incomes sustainable? Firewood and timber extraction and productivity in community managed forests in Nepal. *World* Development, 64(S1), S113–S124.

Melaku, E., Ewnetu, Z. and Teketay, D., 2014. Non-timber forest products and household incomes in Bonga forest area, southwestern Ethiopia. *Journal of Forestry Research*, 25(1), 215–223.

Monroe, K.B. and Mazumdar, T., 1988. Pricing decision models: recent developments and research opportunities. In Devinney, T.M., (ed.), Issues in pricing: theory and research, New York. Lexington Books, 361-388.

Mujawamariya, G. and Karimov, A., 2014. Importance of socio-economic factors in the collection of NTFPs: the case of gum arabic in Kenya. *Forest Policy and Economics*, 42, 24-29.

Mulenga, B.P., Richardson, R.B. and Tembo, G., 2012. Non-timber forest products and rural poverty alleviation in Zambia. Working paper number 62. Indaba Agricultural Policy Research Institute (IAPRI). Accessed 30 March 2014, http://www.aec.msu.edu/fs2/zambia/index.htm

Mutenje, M.J., 2010. Rural livelihoods in south-eastern Zimbabwe: the impact of HIV/AIDS on the use and management of non-timber forestry products. PhD thesis. University of KwaZulu-Natal. Pietermaritzburg.

Mutenje, M.J., Ortmann, G.F. and Ferrer, S.R., 2011. Extraction of non-timber forest products as a coping strategy for HIV/AIDS-afflicted rural households in south-eastern Zimbabwe. *African Journal of AIDS Research*, 10(3), 195–206.

Ndoye, O., Ruiz Pérez, M. and Eyebe, A., 1997. *The markets of non-timber forest products in the humid forest zone of Cameroon.* ODI Rural Development Forestry Network, Paper No. 22c. London, ODI.

Neumann, R.P. and Hirsch, E., 2000. *Commercialisation of non-timber forest products: review and analysis of research*. CIFOR. Jakarta.

Paumgarten, B.F., 2007. The significance of the safety-net role of NTFPs in rural livelihoods, South Africa. MSc thesis. Rhodes University. Grahamstown.

Paumgarten, F., 2005. The role of non-timber forest products as safety-nets: a review of evidence with a focus on South Africa. *GeoJournal*, 64(3), 189–197.

Paumgarten, F. and Shackleton, C.M., 2011. The role of non-timber forest products in household coping strategies in South Africa: the influence of household wealth and gender. *Population and Environment,* 33(1), 108-131.

Pereira, T., Shackleton, C. and Shackleton, S., 2006. Trade in reed-based craft products in rural villages in the Eastern Cape, South Africa. *Development Southern Africa*, 23(4), 477–495.

Phounvisouk, L. and Ting, Z., 2014. Economics of NTFPs for the ethnic minority livelihood: the case of "peuak meuak " in northern Laos. *International Journal of Agricultural Sciences and Natural Resources*, 1(1), 13–23.

Piya, L., Maharjan, K.L., Joshi, N.P. and Dangol, D.R., 2011. Collection and marketing of nontimber forest products by Chepang community in Nepal. *The Journal of Agriculture and Environment,* 12, 10–21.

Ray, K. and Gramlich, J., 2016. Reconciling full-cost and marginal-cost pricing. *Journal of Management Accounting Research*, 28(1), 27–37.

Reibstein, D.J. and Gatignon, H., 1984. Optimal product line pricing: the influence of elasticities and cross-elasticities. *Journal of Marketing Research*, 21(3), 259-267.

Rogers, L., 1990. *Pricing for profit*. Basil Blackwell Ltd, Oxford.

Ros-tonen, M.A.F. and Wiersum, K.F., 2003. The importance of non-timber forest products for forest-based rural livelihoods : an evolving research agenda. *Paper presented at The International Conference on Rural Livelihoods, Forests and Biodiversity 19-23 May 2003, Bonn, Germany.*

Ruiz-Pérez, M., Belcher, B., Achdiawan, R., Alexiades, M., Aubertin, C., Campbell, B., Clement, C., Cunningham, T., Fantini, A., Foresta, H., Fernández, C.G., Gautam, K.H.,

Martínez, P.H., De Jong, W., Kusters, K., Kutty, G., López, C., Fu, M., Angel, M., Alfaro, M., Nair, T.K.R., Ndoye,O., Ocampo, R., Rai, N., Ricker, M., Schreckenberg, K., Shackleton, S., Shanley, P., Sunderland, Y. and Youn, Y., 2004. Markets drive the specialization strategies of forest peoples. *Economic and Society*, 9(2), 4.

Sadashivappa, P., Suryaprakash, S. and Krishna, V.V., 2006. Participation behaviour of indigenous people in non-timber forest products extraction and marketing in the dry deciduous forests of South India. *Conference on International Agricultural Research for Development. University of Bonn, October 11-13, 2006.*

Schaafsma, M., Morse-Jones, S., Posen, P., Swetnam, R.D., Balmford, A., Bateman, I.J., Burgess, N.D., Chamshama, S.A.O., Fisher, B., Freeman, T., Geofrey, V., Green, R.E., Hepelwa, S., Hernández-Sirvent, A., Hess, S., Kajembe, G.C., Kayharara, G., Kilonzo, M., Kulindwa, K., Lund, J.F., Madoffe, S.S., Mbwambo, L., Meilby, H., Ngaga, Y.M., Theilade, I., Treue, T., Van Beukering, P., Vyamana, V.G. and Turner, R.K., 2014. The importance of local forest benefits: economic valuation of non-timber forest products in the eastern Arc mountains in Tanzania. *Global Environmental Change*, 24, 295–305.

Schreckenberg, K., Marshall, E., Newton, A., Te Velde, D.W., Rushton, J. and Edouard, F., 2006. Commercialisation of non-timber forest products: what determines success? ODI Forestry Briefing, Number 10.

Scoones, I., 2009. Livelihoods perspectives and rural development. *Journal of Peasant Studies*, 36(1), 171–196.

Shackleton, C.M., 2004. Assessment of the livelihoods importance of forestry, forests and forest products in South Africa. Rhodes University. Accessed 21 May 2016, http://www.daff.gov.za/doaDev/sideMenu/ForestryWeb/dwaf/cmsdocs/Elsa/Docs/Forests/Assessment%20of%20the%20Livelihoods%20Importance%20of%20Forestry,%20Forests%20and%20Forest%20Products%20in%20SA.%202004.pdf

Shackleton, C.M. and Pandey, A.K., 2014. Positioning non-timber forest products on the development agenda. *Forest Policy and Economics*, 38, 1–7.

Shackleton, C. and Shackleton, S., 2004. The importance of non-timber forest products in rural livelihood security and as safety nets: a review of evidence from South Africa. *South African Journal of Science,* 100, 658–664.

Shackleton, C.M., Shackleton, S.E., Buiten, E. and Bird, N., 2007a. The importance of dry woodlands and forests in rural livelihoods and poverty alleviation in South Africa. *Forest Policy and Economics*, 9(5), 558–577.

Shackleton, C.M., Shackleton, S.E. and Cousins, B., 2001. The role of land-based strategies in rural livelihoods: the contribution of arable production, animal husbandry and natural resource South Africa. *Development Southern Africa*, 18(5), 581-604.

Shackleton, C.M., Shackleton, S.E., Ntshudu, M. and Ntzebeza, J., 2002a. The role and value of savannah non-timber forest products to rural households in the Kat River Valley, South Africa. *Journal of Tropical Forest Products*, 8(1), 45-65.

Shackleton, C.M., Timmermans, H.G., Nongwe, N., Hamer, N. and Palmer, N.R., 2007b. Direct-use values of non-timber forest products from two areas on the Transkei Wild Coast. *Agrekon*, 46(1), 113–134.

Shackleton, S., 2004. Livelihood benefits from the local level commercialization of savanna resources: a case study of the new and expanding trade in marula (*Sclerocarya birrea*) beer in Bushbuckridge, South Africa. *South African Journal of Science*, 100, 651–657.

Shackleton, S.E., 2005. The significance of the local trade in natural resource products for livelihoods and poverty alleviation in South Africa. PhD thesis. Rhodes University. Grahamstown.

Shackleton, S., Campbell, B., Lotz-Sisitka, H. and Shackleton, C., 2008. Links between the local trade in natural products, livelihoods and poverty alleviation in a semi-arid region of South Africa. *World Development*, 36(3), 505–526.

Shapiro, B.P. and Jackson, B.B., 1978. Industrial pricing to meet customer needs. *Harvard Business Review*, 54, 119-127.

Sheil, D. and Wunder, S., 2002. The value of tropical forest to local communities: complication caveats, and cautions. *Conservation Ecology*, 6(2), 1–14.

Sills, E. O., Lele, S., Holmes, T. P. and Pattanayak, S.K., 2003. Nontimber forest products in the rural household economy. In Viet Quang, D. and Nam Anh, T., 2006. Commercial collection of NTFPs and households living in or near the forests. *Ecological Economics*, 60(1), 65–74.

Sills, E., Shanley, P., Paumgarten, F., de Beer, J. and Pierce, A.R. 2011. Evolving perspectives on non-timber forest products. In Shackleton, S., Shackleton, C and Shanley, P (eds.) Non-timber forest products in the global context. Springer.

Singh, M., 2013. Important Pricing Methods in 4P's. *International Journal of Management and Business Studies*, 3(2), 147–150.

Sjaastad, E., Angelsen, A., Vedeld, P. and Bojö, J. 2005. What is environmental income? *Ecological Economics*, 55(1), 37–46.

Spann, M., Fischer, M. and Tellis, G.J., 2014. Skimming or penetration? strategic dynamic pricing for new products. *Marketing Science*, 34(2), 235–249.

Sunderlin, W.D., Angelsen, A., Belcher, B., Burgers, P., Nasi, R., Santoso, L. and Wunder, S., 2005. Livelihoods, forests, and conservation in developing countries: An Overview. *World Development*, 33(9), 1383–1402.

Takasaki, Y., Barham, B.L. and Coomes, O.T., 2004. Risk coping strategies in tropical forests: floods, illnesses, and resource extraction. *Environment and Development Economics*, 9(2), 203–224.

Tchoundjeu, Z., Atangana, A., Asaah, E., Tsobeng, A., Facheux, C., Foudjem, D., Mbosso, C., Degrande, A., Sado, T., Kanmegne, J., Mbile, P., Tabuna, H., Anegbeh, P. and Useni, M., 2008. Domestication, utilisation and marketing of indigenous fruit trees in west and central Africa. Cited in Agea, J.G., Okia, C.A., Obaa, B.B., Munga, J., Isubikalu, P., Woiso, D.A. and Teklehaimanot, Z., 2013. Market conduct and performance of wild and semi-wild food plants traded in Bunyoro-Kitara Kingdom, Uganda. *African Journal of Environmental Science and Technology*, 7(6), 457–471.

Tewari, D.D., 2012. Promoting non-timber forest products (NTFPs) to alleviate poverty and hunger in rural South Africa: a reflection on management and policy challenges. *African Journal of Business Management*, 6(47), 11635–11647.

Thondhlana, G. and Muchapondwa, E., 2014. Dependence on environmental resources and implications for household welfare: Evidence from the Kalahari drylands, South Africa. *Ecological Economics*, 108, 59–67.

Tregurtha, N. and Vink, N., 2008. Presidency fifteen year review project: review of agricultural policies and support instruments. Accessed 24 March 2014, http://www.thepresidency.gov.za/docs/reports/15year_review/economic/agricultural_policy.pdf

Twine, W., Moshe, D., Netshiluvhi, T. and Siphugu, V., 2003. Consumption and direct-use values of savanna bio-resources used by rural households in Mametja, a semi-arid area of Limpopo province, South Africa. *South African Journal of Science,* 99, 467–473.

Uberhuaga, P., Smith-Hall, C. and Helles, F., 2011. Forest income and dependency in lowland Bolivia. *Environment, Development and Sustainability*, 14(1), 3–23.

Van Gevelt, T., 2013. The economic contribution of non-timber forest products to South Korean mountain villager livelihoods. *Forests, Trees and Livelihoods*, 22(3), 156-169.

Van Vliet, N., Nasi, R. and Taber, A., 2011. From the forest to the stomach: bushmeat consumption from rural to urban settings in central Africa. In Shackleton, S., Shackleton, C. and Shanley P., ed. Non-timber forest products in the global context. Springer-Verlag, Berlin, Heidelberg, 2011, 129-148.

Vedeld, P., Angelsen, A., Bojö, J., Sjaastad, E. and Kobugabe Berg, G., 2007. Forest environmental incomes and the rural poor. *Forest Policy and Economics*, 9(7), 869–879.

World Bank. 2014. World Development Indicators: agricultural output and productivity. Accessed 20 May 2014, http://wdi.worldbank.org/table/3.3

Worku, A., Pretzsch, J., Kassa, H. and Auch, E., 2014. The significance of dry forest income for livelihood resilience: the case of the pastoralists and agro-pastoralists in the drylands of south eastern Ethiopia. *Forest Policy and Economics*, 41, 51–59.

Wunder, S., Börner, J., Shively, G. and Wyman, M., 2014b. Safety nets, gap filling and forests: a global-comparative perspective. *World Development*, 64(S1), S29-S42.

Wunder, S., Angelsen, A. and Belcher, B., 2014a. Forests, Livelihoods, and Conservation: Broadening the Empirical Base. *World Development*, 64(S1), S1-S11.

Yemiru, T., Roos, A., Campbell, B. and Bohlin, F., 2010. Forest incomes and poverty alleviation under participatory forest management in the Bale Highlands, southern Ethiopia. *International Forestry Review*, 12(1), 66–77.

CHAPTER 2: THE CONTRIBUTION OF NTFPS TO RURAL LIVELIHOODS IN DIFFERENT AGRO-ECOLOGICAL ZONES OF SOUTH AFRICA

1 Introduction

Non-timber forest products (NTFPs) provide rural communities with their subsistence needs such as food, health (medicines), building materials and energy (Piya et al., 2011). In addition, they are also essential for generating income through trading products such as firewood, wild fruits, honey, medicines, wood carvings, wild vegetables, wild edible insects and mushrooms (Tewari, 2012).

Many studies of NTFP use tend to focus on a single area within a country (Albers and Robinson, 2013), partly due to limited availability of resources required to carry out multi-site studies. On the contrary, Vedeld et al. (2007) undertook a meta-analysis of 51 case studies from Africa, Asia and South America to investigate the level of reliance of rural people on NTFPs. They established that fuelwood, foods, and fodder make up the greater part of the value drawn from the environment and provide households with over 20 % of their total income. Furthermore, NTFPs contribute considerably to rural livelihoods and the poorest households tend to be more dependent on the harvesting of NTFPs for a portion of their income (Heubach et al., 2011; Vedeld et al., 2007). On the other hand, well-off rural households are less dependent on NTFPs but may use larger amounts of NTFPs (Albers and Robinson, 2013). This can be attributed to the diverse livelihood strategies and the size of farmland owned by both poorest rural households and well-off rural households (Heubach et al., 2011). For instance, Vedeld et al. (2007) found that the relative forest environmental income for the poorest quintile was on average, double the share for richest quintile, but the absolute value of the richest quintile was ten times the absolute value of the poorest quintile. These findings are in line with Angelsen et al. (2014), who found that the natural environment contributes an average of 27.5 % of total household income across 35 sites globally, which was close to the income share of agricultural crops (28.7 %). However, there are many cases in which NTFPs provide more than 20 % of the total household income (Babulo et al., 2009; Fisher, 2004; Mamo et al., 2007; Yemiru et al., 2010). As noted by Ruiz-Pérez et al. (2004), in Africa NTFPs generally contribute up to 50 % of total annual household income.

Much of the literature from the tropics suggests that the contribution of NTFPs is insufficient to be a viable vehicle for alleviating poverty (Angelsen and Wunder, 2003; Belcher et al., 2005; Gubbi and MacMillan, 2008; Neumann and Hirsch, 2000; Wunder et al., 2014a). For example, Angelsen et al. (2014) summarised several studies from Asia and showed contributions from NTFP income to average 20.1 %. In comparison, crop and livestock production contributed 29.1 % and 13.2 %, respectively. Furthermore, they also summarised several studies from Africa and showed contributions from NTFP income, crop income and livestock to average 21.4 %, 32.2 %, and 11.7 %, respectively. Many of these studies come from Southeast Asia and mostly humid tropics of Africa, which are characterised by generally more productive environments than the dry savannas of Sub-Saharan Africa (see for example FAOSTAT, 2014; World Bank, 2014a statistics). So, at a national scale, agriculture is far more viable in such regions than in South Africa (Figure 1). Consequently, rural communities are engaging or have the potential to engage more in agriculture, which might mean reduced dependency on NTFPs.

There are limits on land size in highly populous countries in Southeast Asia. For instance, agricultural area per capita in Sub-Saharan Africa is 1.51 ha, compared with 1.12 ha in North Africa and the Middle East, and 0.32 ha in Asia and the Pacific (FAO, 2006). However, the land in Southeast Asia is more productive (Figure 3) and also because of the use of irrigation and inputs, such as quality seed and fertiliser, agriculture is a considerably more viable livelihood option (FAO, 2006). About 33.2 % of land in Asia and Pacific is under irrigation compared to 3.7 % in Sub-Saharan Africa (FAO, 2006). Furthermore, fertiliser use in Asia and the Pacific is 163.2 kg/ha while it is 12.6 kg/ha in Sub-Saharan Africa (FAO, 2006). Despite Asia, having a lower agricultural area per capita than Sub-Saharan Africa, it has a higher agricultural productivity than Sub-Saharan Africa. For instance, cereal yield per hectare in Sub-Saharan Africa is about a third of what it is in Asia (FAO, 2006).

In South Africa there are also limits on the size of land because of high populations in rural areas resulting from racial zoning of land occupancy during the colonial and apartheid periods (Hart, 2008; Tregurtha and Vink, 2008); therefore agriculture on a small piece of land does not meet households' needs. For example, in South Africa, there are about 3.4 to 4.8 million households mostly settled in the former apartheid era homelands and produce

on about 17 million hectares (Feynes and Meyer, 2003). In addition, the majority of small-scale farmers are semi-subsistence; therefore they do not produce enough from agriculture to meet all their household needs, even in terms of food (Hart, 2008; Tregurtha and Vink, 2008). It is estimated that the contribution of subsistence agriculture to household incomes varies from 6 to 12 % in dry rural areas and from 24 to 30 % for areas under irrigation (Van Averbeke and Mohamed, 2006).

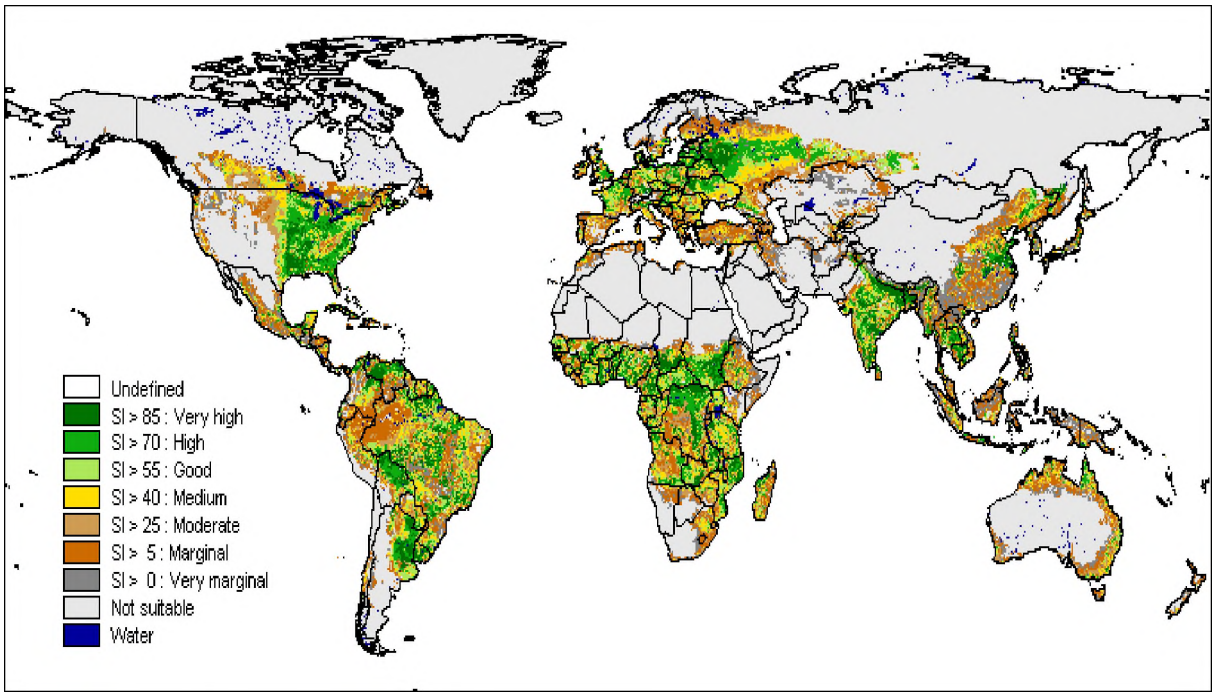

Figure 3: Suitability of land for rain-fed crop production

(Source: Fischer et al., 2002.)

As indicated in Figure 3, the majority of South African land is classified as unsuitable for rain-fed crop production, whereas countries such as India, Bangladesh and Thailand have larger proportions of land classified as suitable for rain-fed crop production. Therefore, climate and soil conditions leave only about 12 % of South Africa suitable for farming rain-fed crops (World Bank, 2014b), with only 3 % regarded as high potential land (WWF, n.d). On the contrary, the percentage of land that is arable for India, Bangladesh and Nepal is 53 %, 59 % and 30 %, respectively (World Bank, 2014b).

Given that South African environments are characterised by dry and variable climates and small land holdings, the potential for agriculture is weakened. Therefore, the potential relative contribution of NTFPs to livelihoods is likely to be greater (Dovie et al., 2002; Makhado et al., 2009; Shackleton et al., 2007a; Shackleton et al., 2007b; Thondhlana and Muchapondwa, 2014).

Following on the argument by Shackleton et al. (2007a) that dependence on NTFPs is likely to be high in dry, relatively unproductive environments, this study investigated if the findings in the humid tropics (Angelsen and Wunder, 2003; Belcher et al., 2005; Gubbi and MacMillan, 2008; Neumann and Hirsch, 2000; Wunder et al., 2014a) can also apply in the dry parts of Sub-Saharan Africa where environments are characterised by dry forests and variable climates. Therefore, South Africa was used as a case example to test if there is any significant difference in the contribution of NTFPs to rural livelihoods in areas of varying agro-ecological potential.

There are already many South African studies (Dovie et al., 2002; Makhado et al., 2009; Pereira et al., 2006; Shackleton and Shackleton, 2004; Shackleton et al., 2001; Shackleton et al., 2007b; Thondhlana and Muchapondwa, 2014; Twine et al., 2003) that have shown the contribution of NTFPs to rural livelihoods. However, there are no South African studies that have examined multiple sites (using the same methods) on the contribution of NTFPs to household income in different agro-ecological areas. Therefore, such studies cannot be used to achieve the aim of this chapter, which was to determine the contribution of NTFPs to rural livelihoods in areas of varying agro-ecological potential. This chapter examined multiple sites of varying agro-ecological potential to determine the proportion of the contribution of NTFPs to household income.

2 Methods

2.1 Site selection

The sites were selected based on their agro-ecological potential. Agro-ecological potential was indexed using net primary productivity (NPP). Net primary productivity is the net production of organic matter by plants (Sivakumar and Valentin, 1997). Therefore, NPP can

be used to characterise the production potential or agro-ecological potential of an area (Sivakumar and Valentin, 1997).

South Africa was divided into four agro-ecological classes based on NPP (Figure 4) provided by the Agricultural Research Council (ARC) of South Africa. The four agro-ecological classes in the order of increasing NPP were, very low (< 500 g C $m^{-2}yr^{-1}$), low (501 - 1 000 g C $m^{-2}yr^{-1}$), medium (1 001 – 1 500 g C $m^{-2}yr^{-1}$) and high (> 1 500 g C $m^{-2}yr^{-1}$). Six sites were selected where there was a stark change of at least one agro-ecological potential class over short distances (< 150 km), thereby limiting other macro contextual differences (Figure 4).

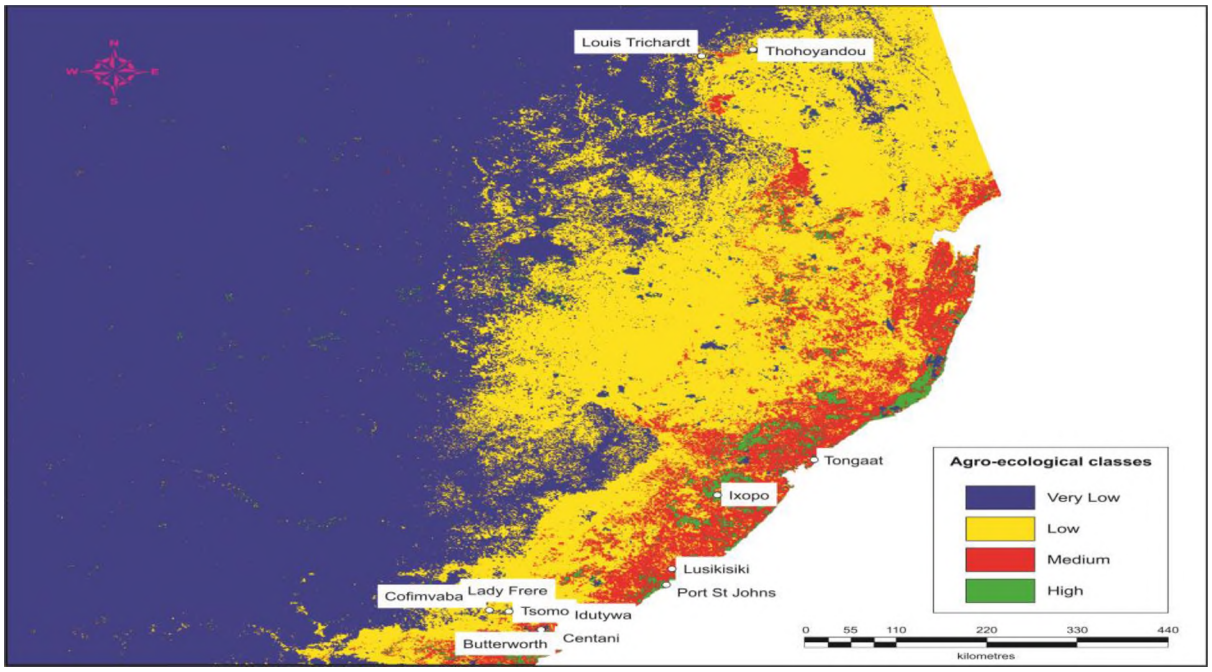

Figure 4: Study sites across four agro-ecological classes

At each site, two towns were selected across the two different agro-ecological classes (Table 1). In each agro-ecological class two villages neighbouring each town were selected, with one village being closer to urban markets than the other. The distance between the far and near urban market villages was at least 10 km.

Table 1: Study sites and their agro-ecological class and distance to urban market

Site	Agro-ecological class	Town	Village	Distance to the urban market
1	Very low	Lady Frere	Ecacadu	Near
			Mtsheko	Far
	Low	Tsomo	Tsomo Mission	Near
			East Bank	Far
2	Very low	Louis Trichardt	Tshikuwi	Near
			Manyii	Far
	Low	Thohoyandou	Khumbe	Near
			Mulangaphuma	Far
3	Low	Idutywa	Lencane	Near
			eMamfeneni	Far
	Medium	Butterworth	Jekete	Near
			Zagwiti	Far
4	Low	Cofimvaba	Luxhomo	Near
			Lomani	Far
	Medium	Centani	Mnyameni	Near
			Ejojweni	Far
5	Medium	Lusikisiki	Ngobozana	Near
			Luqoqweni	Far
	High	Port St Johns	Noqekwana	Near
			Gqubeni	Far
6	Medium	Tongaat	Sunduzi	Near
			Matholamnyama	Far
	High	Ixopo	Echibini	Near
			Ematolweni	Far

2.2 Data collection

2.2.1 Household interviews

ARCVIEW's random selection function was used to randomly select 50 households per village. Therefore, a total of 1 200 households were interviewed in areas of varying agro-ecological potential. The interviews were conducted from September 2014 to June 2015. A structured questionnaire was used to collect data. The questionnaire included sections on NTFPs use and trade, wage income, crop production costs, crop income, livestock production costs, livestock income, other sources of income over a one year period and household characteristics (see Annexure 1). Each interview was about 45 minutes long. The

household head or an adult member of the household with good knowledge of the household's sources of income and consumption patterns was interviewed. Local field assistants with good knowledge of the study area and experience in collecting data were recruited to help with translating the English questionnaires. The author was responsible for the daily supervision of the field assistants. Data cleaning, coding and data entry into STATISTICA 13 software was done by the author.

Whilst it is recognised that a single once-off questionnaire is likely to under-estimate certain sources of income (Babulo et al., 2009; Heubach et al., 2011), the main interest of this study was in relative difference in different settings. Therefore, absolute amounts are less important and the error is likely to be consistent in all sites.

2.2.2 Measuring income and definitions

The aim of the household interviews was to gather detailed data on all household sources of income. In this study, income was defined as "the value added of labour and capital (including land)" (Angelsen et al., 2014). The total net income (consisting of both cash and non-cash incomes) approach was broadly used to determine the income of households (Babulo et al., 2008; Babulo et al., 2009; Cavendish, 2002; Heubach et al., 2011). Total household income was divided into six major categories: NTFP income, crop income, livestock income, wage income, social grants income and other income. Based on the approaches used in similar studies (Babulo et al., 2008; Babulo et al., 2009; Cavendish, 2000; Fisher, 2004; Heubach et al., 2011; Kamanga et al., 2009; Narain et al., 2008; Twine et al., 2003), the following two assumptions were made in the calculation of the household income.

Gross values for NTFPs were used. In rural areas, the collection of most NTFPs doesn't need skilled labour (Babulo et al., 2008), thus many NTFPs can be harvested with very low capital investment. Given that many rural areas are characterised by the absence of labour markets or thin labour markets and limited opportunities, it is difficult to impute the opportunity cost of labour (Babulo et al., 2009; Campbell and Luckert, 2002; Heubach et al., 2011). Consequently, the costs of labour and costs of capital consumption are insignificant.

Therefore, capital costs (depreciation), input costs, transport costs and labour costs were not subtracted from the value of NTFPs.

Only the actual values of collected NTFPs were calculated. Some previous studies that estimated the values of forest products were criticised for basing their values on potential harvest or potential markets (Wollenberg, 2000). On the contrary, recent studies use the actual harvested products and either reported values or market prices to estimate the real contribution of NTFPs to rural livelihoods (Babulo et al., 2008; Babulo et al., 2009; Cavendish, 2002; Fisher, 2004; Narain et al., 2008). Based on these assumptions each income category (NTFP income, crop income, livestock income, wage income, social grants income and other income) was quantified as described below.

NTFP income includes income from both commercial and subsistence uses of NTFPs. Interviewed households provided physical amounts and the current local market prices of the NTFPs. Furthermore, households provided the quantity of each collected NTFP on a weekly or monthly or yearly basis, the quantity consumed, the amount exchanged, quantity donated, and quantity sold and cash amount obtained from selling the product. If any NTFP was bartered instead of being sold, then the market value of the exchanged product was noted as cash income. Therefore, value estimates were obtained from actual household consumption rather than from potential use of NTFPs (Babulo et al., 2009). In addition, the data provided by the households was used to calculate the annual NTFP income in order to avoid the seasonality nature of NTFPs distorting data across all the sites. Relative NTFP income was taken to be the percentage contribution of NTFP income to total household income.

For traded NTFPs, local market values were taken as their market prices. There were also some NTFPs such as wild plants used for rituals, which were not traded in the local markets, but their value estimates are generally well-known by the households. For such NTFPs, the household reported the quantity used and their value estimates. Thus, values reported by the household can be used to value these products (Babulo et al., 2009). However, there were some NTFPs such as wild vegetables and traditional medicine, which households

couldn't estimate their value. In such a situation, the market price of a close substitute was used (Babulo et al., 2009).

Net crop income was calculated as the gross crop value (quantity produced multiplied by price) produced in a given season minus the total crop input costs (seed, fertiliser, hired labour, hired equipment, etc.) accrued in the corresponding cropping season (Angelsen et al., 2014). Given that most of the households use hired equipment for cropping purposes, the capital and depreciation costs were not included in the calculation of crop income.

Livestock income was defined as the value of products obtained from livestock (including live animals sales) and services such as rented-out draft power (Angelsen et al., 2014). In line with other studies (Angelsen et al., 2014; Uberhuaga et al., 2012), livestock income excluded incremental stock value changes. Annual gross livestock income for each household was derived by summing the values of livestock products (e.g. milk, meat, and eggs), livestock sales and livestock services such as draft power. Annual livestock cost for each household was obtained by summing all the costs (hired labour, veterinary services, feed, etc.) incurred in the production of livestock. Then, the net livestock income for each household was obtained by subtracting annual livestock total costs from annual gross livestock income.

Wage income was defined as "wages earned from skilled and unskilled labour" (e.g. taxi driver, cleaner and teacher) (Heubach et al., 2011). Thus, income generated from non-farming and non-forest extraction activities. Annual wage income was derived from the actual values given by the households from these activities for a given year.

Social grants income includes all the social security grants given to qualifying South African citizens by the government. The social grants income includes state old age pension, war veterans grant, child support grant, foster child grant, disability grant, social relief of distress grant and the care dependency grant.

Besides the sources of income mentioned above, some households also obtained income from other sources such as remittances, private pensions, gifts, selling of non-NTFPs and rent. Income from such sources was summed up and referred to as 'other income'.

2.3 Data analysis

Descriptive statistics were used to describe the various sources of income in different agro-ecological areas. A Mann-Whitney U paired test was done to determine if there is any significant difference between the NTFP incomes for the following pairs of agro-ecological classes: very low and low, very low and medium, low and medium, medium and high. Kruskal-Wallis ANOVA by Ranks test was conducted to establish if there are any significant differences between the means of NTFP income in different agro-ecological areas. To understand the relationship between NTFP income and various sources of income, a Spearman Rank Order Correlations analysis was performed. Both principal component analysis and general linear model (GLM) regression analysis were applied to identify the factors affecting both absolute and relative NTFP incomes. The independent variables used included household characteristics such as education, age, sex, household size, employment status of the household head and geographical factors such as agro-ecological class.

3 Results

3.1 The average absolute and relative incomes across sites

The average contribution of income from NTFPs to total annual household income across all sites was 15.1 % (Table 2). The average absolute value of annual NTFP income was R 3 660 ± 4 687 for all the sites. The average contributions of crop income and livestock income to total household income were 4.9 % and 2.8 %, respectively. The share of livestock income across all sites ranged from 1.1 – 5.4 %. On the other hand, the share of crop income across all sites ranged from 1.1 – 7.8 %. It should be noted that the share of crop income of 4.9 % consisted of the shares of fruit income (1 %), vegetables income (2 %) and cereals income (1.9 %). Therefore, without fruit and vegetable incomes, the share of crop income drops to 1.9 %. At every site, the income from NTPFs was much higher than both crops and livestock combined.

Table 2: Households' absolute and relative annual incomes by major income source

		Absolute income (Rands)						**Relative income** (%)					
Site		NTFP income	Crop income	Livestock income	Wage income	Social grants income	Other income	NFTP income	Crop income	Livestock income	Wage income	Social grants income	Other income
1	Mean	2 778	262	1 326	6 718	19 558	711	11.7	1.1	2.4	19.2	63.3	2.5
	Std dev	4 006	556	3 726	16 718	14 570	3 574						
2	Mean	4 703	899	696	23 186	11 894	22	18.2	4.2	1.2	38.6	38.6	0.1
	Std dev	4 477	1 303	3 002	42 143	10 747	115						
3	Mean	2 322	1 055	2 482	11 973	18 186	832	11.2	4.8	5.3	18.2	58.5	1.9
	Std dev	2 078	1 913	6 834	26 733	12 626	4 484						
4	Mean	3 045	1 133	2 609	5 974	19 468	322	15.4	4.2	4.7	12.6	62.3	0.9
	Std dev	5 165	4 278	8 052	18 790	13 543	2 611						
5	Mean	5 308	2 462	765	7 396	19 617	535	19.7	7.8	1.7	13.8	56.3	0.7
	Std dev	7 157	3 848	2 844	19 571	15 290	5 494						
6	Mean	3 801	2 523	1 013	12 197	19 340	349	14.8	7.5	1.8	19.8	55.1	1.0
	Std dev	2 749	4 530	4 250	23 498	12 998	1 948						
Entire sample	Mean	3 658	1 389	1483	11241	18011	462	15.2	4.9	2.9	20.2	55.7	1.2
	Std dev	135	94	151	768	393	101						

(N = 200 households per site)

The average share of wage income across all sites was 20.4 %. There was a noticeable variation in terms of the share of wage income across sites, with a lowest of 12.6 % (Site 4) and a highest of 38.6 % (Site 2). The sites with high shares of wage income were generally located close to big towns. On the other hand, the sites with low shares of wage income were generally located close to small towns. For instance, site 2 consisted of relatively two big towns, that is, more than 50 000 people, (Thohoyandou and Louis Trichardt) and the average share of wage income was 38.6 %. Conversely, site 1 consisted of two small towns, that is, less than 15 000 people, (Lady Frere and Tsomo) and the average share of wage income was 19.2 %. The same pattern was observed for the other four sites (Table 2). Thus, households close to big towns had better employment opportunities than households further from the big towns. Given the limited employment opportunities in rural areas and rural labour market imperfections, the recorded 20.4 % wage income is remarkable. Wage income was mostly derived from semi-skilled labour, casual labour and informal business activities.

The average annual absolute and relative values of social grants income across all sites were R 18 010 ± 3 043 and 55.7 %, respectively. The income from social grants was the biggest contributor to total annual household income across all sites. The average share of other income across all sites was 1.2 %, with an absolute average annual value of R 462 ± 2 93. The share of other income was relatively homogenous ranging from 0.1 % to 2.5 %. 'Other income' was mainly made up of remittances and income from selling items other than NTFPs.

3.2 The differences in incomes across paired agro-ecological sites

The annual absolute and relative NTFP and non-NTFP incomes differences across paired sites are presented in Table 3 and Table 4. Both absolute and relative NTFP incomes were significantly different for site 1 ($p = 0.001$ and 0.009, respectively), which was made up of paired very low and low agro-ecological classes. The very low agro-ecological class had a higher rank of mean NTFP income than the low agro-ecological class. Similarly, both absolute and relative crop incomes were significantly different for the two classes of site 1, with, the very low agro-ecological class being a lower than the low agro-ecological class.

The absolute NTFP income was significantly different between the very low and low agro-ecological classes making up site 2. However, the relative NTFP income for the two classes of site 2 was not significantly different. Similar to site 1, the very low agro-ecological class had a higher rank of mean NTFP income than the neighbouring low agro-ecological class. Both absolute and relative crop, livestock, and social grants incomes were significantly different. The very low agro-ecological class had higher ranks of mean livestock and social grants incomes than the low agro-ecological class. On the contrary, the very low agro-ecological class had a lower rank of mean crop income than the low agro-ecological class.

Site 3 which consisted of low and medium agro-ecological classes demonstrated no significant difference regarding both absolute and relative NTFP incomes for the two classes. Similarly, all other sources of income were not significantly different for the two classes.

Site 4 was made up of low and medium agro-ecological classes and both absolute and relative NTFP incomes for the two classes were not significantly different. Only absolute crop income and relative crop income were significantly different for the two classes. As expected, the medium agro-ecological class had a higher rank of mean crop income than the low agro-ecological class.

The medium and high agro-ecological classes making up site 5 had significantly different absolute and relative NTFP incomes. Interestingly, the medium agro-ecological class had a lower rank of mean NTFP income than the high agro-ecological class. Other sources of income for the two classes were not significantly different.

Site 6 consisted of medium and high agro-ecological classes and the relative NTFP incomes for the two agro-ecological classes were significantly different. Similar to site 5, the medium agro-ecological class had a lower rank of mean NTFP income than the high agro-ecological class. Both absolute and relative crop income were significantly different for the two classes with the medium agro-ecological class having a higher rank of mean crop income than the high agro-ecological class.

Table 3: Ranks of mean absolute and relative annual incomes by major income source for six paired sites across agro-ecological zones

			Absolute income (Rands)						**Relative income** (%)					
Site	Agro-ecological class	N	NTFP income	Crop income	Livestock income	Wage income	Social grants income	Other income	NFTP income	Crop income	Livestock income	Wage income	Social grants income	Other income
1	Very low	100	116.4	87.5	99.0	93.5	112.1	97.3	111.1	84.7	98.1	91.3	108.6	96.8
	Low	100	84.6	113.5	102.1	107.5	88.9	103.8	89.9	116.4	102.9	109.7	92.4	104.2
2	Very low	100	114.4	52.4	110.3	92.6	120.0	100.5	103.0	53.7	108.9	91.1	118.2	101.0
	Low	100	86.6	148.6	90.7	108.4	81.0	100.5	98.1	147.4	92.1	109.9	82.8	100.0
3	Low	100	99.8	102.8	95.8	97.8	106.0	103.3	101.0	101.1	94.9	98.0	105.7	103.2
	Medium	100	102.3	99.2	106.3	104.3	96.0	98.7	101.0	100.9	107.1	104.0	96.3	98.8
4	Low	100	102.5	86.5	92.7	107.6	101.6	104.6	96.3	85.0	92.1	107.6	100.4	104.1
	Medium	100	98.5	114.5	108.3	93.4	99.4	96.4	104.7	116.0	108.9	93.5	100.6	96.9
5	Medium	100	80.1	105.7	100.2	105.0	102.9	104.0	83.2	102.8	100.4	105.2	106.4	103.5
	High	100	121.0	95.3	100.8	96.0	98.1	97.0	117.8	98.2	100.6	95.8	94.7	97.5
6	Medium	100	93.9	119.2	95.3	98.9	96.9	101.0	91.6	116.4	95.3	98.3	96.5	101.0
	High	100	107.1	81.8	105.7	102.1	104.1	100.0	109.4	84.7	105.7	102.7	104.5	100.0

Table 4: The differences in absolute and relative incomes by major income source for six paired sites across agro-ecological zones

Site		**Absolute income** (Rands)						**Relative income** (%)					
		NTFP income	Crop income	Livestock income	Wage income	Social grants income	Other income	NFTP income	Crop income	Livestock income	Wage income	Social grants income	Other income
1	Mann-Whitney U	3 413	3 698	4 846	4 297	3 841	4 676	3 938	3 415	4 759	4 082	4 193	4 628
	Wilcoxon W	8463	8 748	9 896	9 347	8 891	9 726	8 988	8 465	9 809	9 132	9 243	9 678
	Z	-3.879	-3.408	-0.385	-1.954	-2.841	-1.158	-2.597	-4.375	-0.608	-2.553	-1.973	-1.342
	Asymp. Sig. (2-tailed)	0.000	0.001	0.700	0.051	0.005	0.247	0.009	0.000	0.543	0.011	0.048	0.180
2	Mann-Whitney U	3 608	194	4 021	4 213	3 050	5 000	4 756	316	4 162	4 063	3 227	4 952
	Wilcoxon W	8 658	5 244	9 071	9 263	8 100	1 005	9 806	5 366	9 212	9 113	8 277	10 002
	Z	-3.402	-11.897	-3.082	-1.963	-4.838	-0.004	-0.598	-11.857	-2.963	-2.337	-4.364	-0.372
	Asymp. Sig. (2-tailed)	0.001	0.000	0.002	0.050	0.000	0.997	0.55	0.000	0.003	0.019	0.000	0.710
3	Mann-Whitney U	4925	4 866	4 524	4 724	4 547	4 818	5 047	5 042.5	4 438	4 748	4 580	4 825
	Wilcoxon W	10 076	9 916	9 675	9 875	9 597	9 868	10 198	10 093	9 589	9 899	9 630	9 875
	Z	-0.303	-0.449	-1.285	-0.952	-1.226	-0.817	-0.009	-0.018	-1.508	-0.882	-1.141	-0.792
	Asymp. Sig. (2-tailed)	0.762	0.654	0.199	0.341	0.22	0.414	0.993	0.985	0.131	0.378	0.254	0.428
4	Mann-Whitney U	4 801	3 600	4 221	4 289	4 889	4 590	4 578	3 452	4 160	4 296	4 993	4 644
	Wilcoxon W	9 851	8 650	9271	9 339	9 939	9 640	9 628	8 502	9 210	9 346	10 043	9 694
	Z	-0.486	-3.556	-1.920	-2.239	-0.273	-1.927	-1.033	-3.971	-2.082	-2.217	-0.017	-1.710
	Asymp. Sig. (2-tailed)	0.627	0.000	0.055	0.025	0.785	0.054	0.302	0.000	0.037	0.027	0.986	0.087
5	Mann-Whitney U	2 955	4 479	4 972	4 551	4 760	4 649	3 271	4 767	4 992	4 528	4 416	4 701
	Wilcoxon W	8 005	9 529	10 022	9 601	9 810	9 699	8 321	9 817	10 042	9 578	9 466	9 751
	Z	-4.998	-1.282	-0.07	-1.320	-0.589	-2.007	-4.227	-0.575	-0.020	-1.387	-1.429	-1.775
	Asymp. Sig. (2-tailed)	0.000	0.200	0.944	0.187	0.556	0.045	0.000	0.565	0.984	0.165	0.153	0.076
6	Mann-Whitney U	4 339	3 127	4 479	4 843	4 638	4 951	4 111	3 416	4 479	4 778	4 604	4 952
	Wilcoxon W	9 389	8 177	9 529	9 893	9 688	10 001	9 161	8 466	9 529	9 828	9 654	10 002
	Z	-1.615	-4.614	-1.318	-0.426	-0.889	-0.202	-2.175	-3.967	-1.392	-0.601	-0.969	-0.197
	Asymp. Sig. (2-tailed)	0.106	0.000	0.188	0.67	0.374	0.84	0.030	0.000	0.164	0.548	0.332	0.843

3.3 The relationship between NTFP income and other sources of income

Rural households in developing countries pursue multiple livelihood strategies. Thus, rural livelihood strategies are diverse, with most households relying on several activities while others specialise in one or a few activities. This section sought to investigate the relationship among various sources of income reported by the households.

Relative livestock income had a weak negative relationship with relative NTFP income (Table 5). Thus, as livestock income increased, households become less dependent on NTFPs. There was a significant positive correlation (p = 0.0001) between both absolute and relative NTFP and crop incomes. This seems to suggest that households with high crop income depended more on NTFPs or vice versa. Thus, high crop income does not necessarily diminish the need for NTFP income. Therefore, farmers may extract more NTFPs so that they can mitigate risks and also diversify their sources of income. Similarly, there was a significant positive (p = 0.0001) relationship between absolute total household income and absolute NTFP income. As expected, there was a significant negative relationship between relative wage income and relative NTFP income. Similarly, both relative social grants and other incomes were significantly related (negatively) to relative NTFP income. All correlations with relative income were significant, negatively for all, except crop. Conversely, only absolute crop and total incomes were positively and significant related to absolute NTFP income.

Table 5: The relationship between NTFP income and other sources of income

Pair of variables		Spearman R	t(N-2)	p < 0.05
Relative NTFP income	- relative crop income	0.1181	4.1192	**0.0001**
	- relative livestock income	-0.0585	-2.0274	**0.0428**
	- relative wage income	-0.2522	-9.0245	**0.0001**
	- relative social grants income	-0.2533	-9.0666	**0.0001**
	- relative other income	-0.0855	-2.9800	**0.0029**
Absolute NTFP income	- absolute crop income	0.1299	4.5379	**0.0001**
	- absolute livestock income	0.0441	1.5292	0.1265
	- absolute social grants income	-0.0188	-0.6505	0.5155
	- absolute wage income	0.0543	1.8847	0.0597
	- absolute other Income	-0.0400	-1.3865	0.1658
	- absolute total income	0.2119	7.5063	**0.0001**

N = 1 200

3.4 Factors affecting household absolute and relative NTFP income

A principal component analysis (PCA) and GLM analysis were conducted to establish the principal components of the socio-economic factors that influenced households to rely on NTFPs. A PCA on the independent variables showed that about 70.3 % of total variance was explained by a total of four components (Table 6). Age and employment status of the household head had huge positive loadings on the first factor (Table 6). On the other hand, education level of the household head had a huge negative loading on the first factor. Agro-ecological class and household size had big positive loadings on the second factor, whereas employment status, education level and age of the household head had small loadings on the second factor, with the latter two being negative. Sex of the household head and household size had big positive loadings on the third factor. On the other hand, distance to urban market had a huge positive loading on the fourth factor.

Table 6: Principal component (PC) loadings for the independent variables for dependency of households on NTFPs

Variable	Component			
	PC1	PC2	PC3	PC4
Initial eigenvalues	1.659	1.115	1.111	1.000
Percentage of variance	23.702	16.393	15.868	14.292
Age of the household head	**0.824**	-0.153		
Education level of the household head	**-0.706**	-0.119	0.119	
Employment status of the household head	**0.626**	0.141	0.412	
Agro-ecological class		**0.795**	0.308	
Household size	0.190	**0.691**	**-0.402**	
Sex of the household head			**0.830**	
Distance to urban market				**0.995**

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

[a]Rotation converged in 5 iterations.

The results of the GLM regressions analysing absolute NTFP income and relative NTFP income against household characteristics and geographical factors are shown in Table 7.

Even though the R-squared values seem low, the significant coefficients still provide important information on how changes in the predictor values are associated with changes in the response value.

It can be noted that, if the household head was a male then there was a significant likelihood that the absolute NTFP income will be high. This could therefore suggest that men tended to engage more in high return forest extraction activities. There was a significant positive relationship for household heads with low formal education and relative NTFP income. The higher the education level of household head, the smaller were both the absolute and relative NTFP income. Therefore, high level education implies that households tended to engage less in relatively low remunerative NTFPs extraction activities. This was confirmed by the negative relationship between household heads with a university qualification and both absolute NTFP income and relative NTFP income.

Household size was significantly and positively related to absolute NTFP income, thus the bigger the household size, the more labour available to collect labour intensive NTFPs. The older the household head, the smaller were both the absolute NTFP income and relative NTFP income (the latter finding is significant). Generally, young household heads tended to engage more in physically demanding NTFPs extraction activities. On the other hand, older household heads tended to engage more in less strenuous NTFPs extraction activities. Thus, older household heads might not have enough time and physical strength to engage in the extraction of NTFPs. Both absolute NTFP income and relative NTFP income were negatively related to both low and medium agro-ecological classes. This is surprising, since I hypothesised that in the low agro-ecological class, households would depend more on NTFPs due to the low land productivity. Therefore, low land productivity does not necessarily mean that households will engage more in the extraction of NTFPs.

Table 7: GLM regressions of absolute and relative NTFP income against household characteristics and geographical factors

		Absolute NTFP income (Rands)				**Relative NTFP income** (%)			
	Level of effect	Coefficient	SE	t-value	p	Coefficient	SE	t-value	p
Intercept		3271	781	4.1889	**0.0001**	23.922	2.529	9.461	**0.0001**
Age of household head		-20	10	-1.945	0.0515	-0.252	0.034	-7.479	**0.0001**
Household size		275	47	5.805	**0.0001**	-0.230	0.153	-1.498	0.1344
AE class	Low	-791	223	-3.551	**0.0001**	-1.749	0.721	-2.425	**0.0155**
AE class	Medium	-713	218	-3.265	**0.0011**	-3.010	0.707	-4.257	**0.0001**
Distance to urban market	Far	241	131	1.839	0.0662	0.498	0.425	1.172	0.2415
Education level of household head	Primary	661	550	1.203	0.2292	5.205	1.779	2.925	**0.0035**
Education level of household head	No formal education	794	579	1.372	0.1703	4.911	1.873	2.621	**0.0089**
Sex of household head	Male	354	138	2.567	**0.0103**	0.274	0.446	0.614	0.5392
Employment status of household head	Employed	107	175	0.615	0.5390	-1.961	0.565	-3.470	**0.0005**
		$R = 0.2791$; $R^2 = 0.0778$; $R_{adj}^2 = 0.0686$; $F = 8.3505$; $p = 0.0001$				$R = 0.2921$; $R^2 = 0.0853$; $R_{adj}^2 = 0.0761$; $F = 9.2197$; $p = 0.0001$			

4 Discussion

The share of social grants was the largest share of the total household income. This demonstrates the heavy dependence on social grants by many South African rural households (see for example Neves et al., 2009; Phaahla, 2015). Without income from social grants many rural households will sink deeper into poverty and other sources of income such NTFP income will become very important for many rural households. The average share of wage income across all sites was 20.4 % which is in line with other studies. For example, Angelsen et al. (2014) in their summary of 35 sites globally reported average wage share of 15.2 %. Similarly, Davis et al. (2010) reported total wage share of 25.3 % in the summary of 16 country-level rural income surveys.

Most of the households (more than 75 %) collected NTFPs from open access or communal areas, with the exception of some traders who reported paying fees to collect NTFPs (mainly edible insects). Therefore, it was assumed that the collection of NTFPs by households was done legally. In addition, the households provided credible data as there was no incentive for them to underreport the collected NTFPs as is usually the case with NTFPs collected illegally. The share of NTFP income of 15.1 % across all sites is similar to the findings by Kamanga et al. (2009) who found that NTFP income accounts for 15.3 % of total household income in certain villages of Malawi. The contribution of livestock income (2.8 %) to the total household income echoed the 3 % recorded by Heubach et al. (2011) in northern Benin. The overall average income shares of 4.9 % and 2.8 % for crops and livestock, respectively, across all sites are significantly lower than the shares reported by Davies et al. (2010) and Angelsen et al. (2014) possibly due to the differences in climatic conditions, land productivity, etc. Davies et al. (2010) used a sample consisting of 16 country-level rural income surveys across Asia, Africa, Eastern Europe, and Latin America and reported average shares of 30 % for crop income and 10.3 % for livestock income. The PEN sample used by Angelsen et al. (2014) consisted of 35 sites across the globe and they recorded average shares of 28.7 % for crop income and 12.3 % for livestock income.

The average contribution of NTFPs income to the total household income across all sites of 15.1 % is much higher than the shares of both crop income (4.9 %) and livestock income (2.8

%). This underlines the significance of forests and non-forest wildlands to rural livelihoods in South Africa. Furthermore, this supports the argument made by Shackleton et al. (2001) and Shackleton et al. (2007) that agriculture is not necessarily the main source of income in most rural areas of South Africa, which are characterised by dry and variable weather conditions and high social security as compared to the humid tropics. Indeed, only about 12 % of South Africa is suitable for farming rain-fed crops (World Bank, 2014b), therefore crop production is not viable for many rural households which do not have irrigation facilities. Many rural households in South Africa lack enough farming land due to high population densities resulting from racial zoning of land during the colonial and apartheid periods (Hart, 2008; Tregurtha and Vink, 2008). Inadequate farming land constrains household crop production, thereby making other options such as NTFPs extraction or off-farm incomes more viable. Therefore, it's not surprising that the share of NTPF income is significantly greater than the share of crop income. There was a clear pattern when comparing the share of NTFP income with that of crop and livestock shares, the former contributes at least twice as the latter. This finding underscores the importance of NTFPs in rural areas and it is consistent with findings by Shackleton et al. (2001) who reported that in many cases, whilst NTFP income is not the main livelihood activity, irrespective of agro-ecological potential, it is usually greater than one or both crop income and livestock income. Yet development planners and interventions rarely focus on NTFPs, but still favour crops or livestock.

The contribution of both social grant income and wage income was significantly higher than the income from NTFPs except at Site 4 where the share of wage income was less than the share of NTFP income. An important finding is that the share of NTFP income for the pairing of medium and high agro-ecological class was significantly different. Interestingly, the high agro-ecological class had a higher mean rank of NTFP income than the medium agro-ecological class. This is in contrast with other studies which have suggested that NTFP income decreases with increasing land productivity or increasing agricultural income (Babulo et al., 2008; Heubach et al., 2011; Kar and Jacobson, 2012; Mamo et al. 2007; McElwee, 2008; Vedeld et al., 2007). Similar to this finding, Kamanga et al. (2009) reported that households with lower income from agriculture engaged less in the extraction of NTFPs. They noted that the positive relationship between NTFP income and agriculture income could be because households without non-farm employment have to rely on both NTFP and

agriculture incomes. As noted by Angelson et al. (2014) agricultural production and NTFPs extraction activities tend to complement each other at household level. Therefore, farmers may extract more NTFPs so that they can mitigate risks and also diversify their sources of income also some NTFPs are used directly in agricultural production, such as timber for fencing, handles for tools, medicinal plants to treat sick animals, etc. This, however, appears to contradict the argument that high agricultural income (generally due to access to good farming land) diminishes the need for NTFP income. As noted during fieldwork some villages in the high agro-ecological zones were characterised by rich biodiversity and NTFPs, and the locals engaged more in the collection and selling of NTFPs than households from other areas. Thus, rich agro-ecological conditions if maintaining sufficient biodiversity improve NTFP income opportunities (Angelsen and Kaimowitz, 1999; Woittiez et al., 2013).

The GLM regression analyses revealed insights about the factors affecting reliance on NTFPs. There was generally more reliance on NTFPs by households headed by males, less educated household heads and big households. This is in line with findings by other authors (see for example, Angelson et al., 2014; Babulo et al., 2008; Kamanga et al., 2009; Mamo et al., 2007; McSweeney, 2003; Uberhuaga et al., 2012). On the other hand, there was generally less reliance on NTFPs by older household heads, probably, therefore, recipients of state pensions. About 47.6 % of the households reported receiving state pensions. Interestingly, both absolute and relative NTFP incomes were significantly and negatively related to both low and medium agricultural classes. This suggests that households in the low and medium agro-ecological classes tended to rely less on NTFPs. Therefore, low land productivity does not necessarily mean that households will engage more in the extraction of NTFPs. However, it is not completely surprising given that it was noted during fieldwork that some households in certain villages (e.g. Ecacadu, Luxhomo, Tsomo Mission) stated that they used less NTFPs because they aren't available in their immediate surroundings. Therefore, some of the NTFPs they used came from neighbouring towns. In some cases, the households would simply substitute the NTFPs with other products. For such households, most of their income was derived from non-forest resources. Consequently, some of these villages had the lowest share of NTFP income suggesting that such households had to rely more on other sources of income, such as wage income and social grants.

As expected, relative NTFP income was negatively related to relative wage, social grants and other incomes. Interestingly, there was a positive significant relationship between relative NTFP income and relative crop income showing that the two were complimentary. This seems to support the findings by Angelson et al. (2014) that at household level NTFP and crop incomes tend to complement each other. Moreover, the villages in the high agro-ecological classes tended to be characterised by high crop income (due to the abundance of fruit and relatively conducive environments for agriculture) and abundance of NTFPs. For instance, some of the NTFPs used by households in other agro-ecological classes came from the towns in or close to the high agro-ecological classes.

The findings of this study partially support the argument by Shackleton et al. (2007) that the level of dependence on NFTPs is likely to vary with agro-ecological conditions. This is supported by the significant difference between the NTFP incomes of the following pairs of agro-ecological classes: very low and low, medium and high. However, the significant difference between the NTFP income for the pair, medium and high, was opposite to what was suggested by Shackleton et al. (2007). Conversely, there was no significant difference between the NTFP incomes for the following pair of agro-ecological class: low and medium. This reflects a U-shaped pattern where the significance differences in NTFP incomes of the paired classes are only noted in the paired classes at the extreme ends of the agro-ecological class spectrum. At the very low agro-ecological end of the gradient I speculate that NTFP contributions are higher than the low and medium classes, therefore agricultural production is severely constrained. In contrast, at the upper end, the agro-ecological potential improves prospects for both agriculture and NTFPs. The high agro-ecological potential supports a greater diversity of NTFPs, which fostered greater engagement in NTFP trade. As noted by Shackleton et al. (2007) there are some similarities (such the heavy dependence on NTFPs by poor households) between the findings obtained in the humid tropics and the dry environments of the Sub-Saharan Africa. However, there are some differences (such as climatic conditions and land productivity) between the regions that make some findings in the two regions different. Therefore, given that most South African environments are characterised by dry and variable climates as compared to the tropical

environments, the findings from the tropics might not necessarily apply in the dry forests and savannas of South Africa.

Given that the findings of this study showed that NTFP incomes vary by agro-ecological zones and this variation tends to follow a U-shaped relationship, future research work could include NTFP income, agro-ecological zones and resource abundance simultaneously. Thus, such work could include a three-dimensional analysis of NTFP income, agro-ecological class and resource abundance. This could yield interesting findings given that agro-ecological zones are mainly defined from an agricultural point of view rather than NTFP productivity. On the other hand, resource abundance can be defined from a NTFP viewpoint.

5 Conclusions

Even though NTFPs are not necessarily the vehicle of poverty alleviation for millions of households in Sub-Saharan Africa, the analysis confirmed that they are an integral part of the rural livelihoods. Given that many rural households in South Africa are faced with many farming constraints (poor soil quality, inadequate inputs, land shortages, dry and variable weather conditions, etc.), it is not surprising that the share of income from NTFPs was greater than the shares of income from crop and livestock. Indeed, many rural households farm at subsistence level and in most cases their produce rarely covers their consumption needs. This is characteristic of many rural farmers in dry agro-ecological zones of Sub-Saharan Africa (see for example Babulo et al., 2008; Barrett et al., 2001). This weakens agriculture as a viable rural livelihood strategy.

My analysis supports the argument that the contribution of NTFPs to rural livelihoods varies across different agro-ecological zones. Therefore, some of the literature from the tropics might not necessarily apply to the dry Sub-Saharan African environments. Even though, there are some similarities between Sub-Saharan African countries and developing countries in the tropics, there are important differences that affect the use of NTFPs in rural livelihoods.

References

Albers, H.J. and Robinson, E.J.Z., 2013. A review of the spatial economics of non-timber forest product extraction: implications for policy. *Ecological Economics*, 92, 87–95.

Angelsen, A., Jagger, P., Babigumira, R., Belcher, B., Hogarth, N.J., Bauch, S., Börner, J., Smith-Hall, C. and Wunder, S., 2014. Environmental income and rural livelihoods: a global-comparative analysis. *World Development*, 64 (S1), S12-S28.

Angelsen, A. and Kaimowitz, D., 1999. Rethinking the causes of deforestation: lessons from economic models. *The World Bank Research Observer*, 14(1), 73–98.

Angelsen, A. and Wunder S., 2003. Exploring the forest — poverty link: key concepts, issues and research implications. Centre for International Forestry Research. Jakarta.

Babulo, B., Muys, B., Nega, F., Tollens, E., Nyssen, J., Deckers, J. and Mathijs, E., 2008. Household livelihood strategies and forest dependence in the highlands of Tigray, northern Ethiopia. *Agricultural Systems*, 98(2), 147–155.

Babulo, B., Muys, B., Nega, F., Tollens, E., Nyssen, J., Deckers, J. and Mathijs, E., 2009. The economic contribution of forest resource use to rural livelihoods in Tigray, northern Ethiopia. *Forest Policy and Economics*, 11(2), 109–117.

Barrett, C.B., Bezuneh, M., Clay, D.C. and Reardon, T., 2001. Income diversification strategies in rural Africa. New York. Working Paper 2001-25. Cornell University, Ithaca, New York, USA.

Belcher, B., Ruíz-Pérez, M. and Achdiawan, R., 2005. Global patterns and trends in the use and management of commercial NTFPs: implications for livelihoods and conservation. *World Development*, 33(9), 1435–1452.

Campbell, M.B. and Luckert, K.M.E., 2002. *Uncovering the hidden harvest: valuation methods for woodland and forest resources*. Earthscan Publications Ltd. London.

Cavendish, W., 2000. Empirical regularities in the poverty-environment relationship of rural households: evidence from Zimbabwe. *World Development*, 28(11), 1979–2003.

Davis, B., Winters, P., Carletto, G., Covarrubias, K., Quin˜ones, E. J., Zezza, A., Stamoulis, K., Azzarri, C. and Digiuseppe, S., 2010. A cross-country comparison of rural income generating activities. *World Development*, 38(1), 48–63.

Dovie, D.B.K., Shackleton, C.M. and Witkowski, E.T.F., 2002. Direct-use values of woodland resources consumed and traded in a South African village. *International Journal of Sustainable Development and World Ecology*, 9(3), 269–283.

FAO. 2006. Assessment of land use pressure, state and response in Sub-Saharan Africa. Accessed 14 June 2014,

http://knowledgebase.terrafrica.org/fileadmin/user_upload/terrafrica/docs/PDF-B%20Activity%201-1%20WIP%20v8.doc.

FAO. 2014. *FAOSTAT*. Accessed 14 June 2014, http://faostat3.fao.org/faostatgateway/go/to/download/Q/QI/E

Feynes, T. and Meyer, N., 2003. Structure and production in South African agriculture. Cited in Hart, T. 2008. Reviewing 15 years of resource poor small-scale agriculture in South Africa: is there any way forward? Accessed 02 June 2014, http://www.tips.org.za/files/Hart_Paper_24_Oct_2008__tmp52aa50cf.pdf

Fisher, M., 2004. Household welfare and forest dependence in southern Malawi. *Environment and Development Economics*, 9(2), 135–154.

Gubbi, S. and MacMillan, D.C., 2008. Can non-timber forest products solve livelihood problems? A case study from Periyar Tiger Reserve, India. *Oryx*, 42(02), 222–228.

Hart, T. 2008. Reviewing 15 years of resource poor small-scale agriculture in South Africa: is there any way forward? Accessed 02 June 2014, http://www.tips.org.za/files/Hart_Paper_24_Oct_2008__tmp52aa50cf.pdf

Heubach, K., Wittig, R., Nuppenau, E.A. and Hahn, K., 2011. The economic importance of non-timber forest products (NTFPs) for livelihood maintenance of rural west African communities: a case study from northern Benin. *Ecological Economics*, 70(11), 1991–2001.

Kamanga, P., Vedeld, P. and Sjaastad, E., 2009. Forest incomes and rural livelihoods in Chiradzulu district, Malawi. *Ecological Economics*, 68(3), 613–624.

Kar, S.P. and Jacobson, M.G., 2012. NTFP income contribution to household economy and related socio-economic factors: lessons from Bangladesh. *Forest Policy and Economics*, 14(1), 136–142.

López-Feldman, A., 2014. Shocks, income and wealth: do they affect the extraction of natural resources by rural households? *World Development*, 64(S1), S91-S100.

Makhado, R.A., Maltitz, G.P. Von, Potgieter, M.J. and Wessels, D.C.J., 2009. Contribution of woodland products to rural livelihoods in the northeast of Limpopo province, South Africa. *South African Geographical Journal,* 91(1), 46–53.

Mamo, G., Sjaastad, E. and Vedeld, P., 2007. Economic dependence on forest resources: a case from Dendi district, Ethiopia. *Forest Policy and Economics*, 9(8), 916–927.

Mcelwee, P.D., 2008. Forest environmental income in Vietnam: household socioeconomic factors influencing forest use. *Environmental Conservation*, 35(02), 147–159.

Mcsweeney, K., 2005. Forest product sale as financial insurance: evidence from Honduran smallholders. ODI Wildlife Policy Briefing, Number 10.

McSweeney, K., 2003. Tropical forests as safety nets? The relative importance of forest product sale as smallholder insurance, Eastern Honduras. *The International Conference on Rural Livelihoods, Forests and Biodiversity. 19-23 May 2003, Bonn, Germany*.

Narain, U., Gupta, S. and Veld, K.V., 2005. Poverty and the environment: exploring the relationship between household incomes, private assets, and natural assets. *Land Economics*, 1–39.

Neves, D., Samson, M., Van Niekerk, I., Hlatshwayo, S. and Du Toit, A., 2009. *The use and effectiveness of social grants in South Africa*. *Institute for Poverty, Land and Agrarian Studies (PLAAS)*.

Neumann, R.P. and Hirsch, E., 2000. *Commercialisation of non-timber forest products: review and analysis of research*. CIFOR. Jakarta.

Phaahla, E., 2015. What the South African state does for the poor: 1 – social grants. Helen Suzman Foundation. Accessed 02 June 2015, http://hsf.org.za/resource-centre/hsf-briefs/what-the-south-african-state-does-for-the-poor-i-social-grants

Pereira, T., Shackleton, C. and Shackleton, S., 2006. Trade in reed-based craft products in rural villages in the Eastern Cape, South Africa. *Development Southern Africa*, 23(4), 477–495.

Piya, L., Maharjan, K.L., Joshi, N.P. and Dangol, D.R., 2011. Collection and marketing of nontimber forest products by Chepang community in Nepal. *The Journal of Agriculture and Environment,* 12, 10–21.

Quang, D. and Anh, T., 2006. Commercial collection of NTFPs and households living in or near the forests. *Ecological Economics*, 60(1), 65–74.

Ruiz-Pérez, M., Belcher, B., Achdiawan, R., Alexiades, M., Aubertin, C., Campbell, B., Clement, C., Cunningham, T., Fantini, A., Foresta, H., Fernández, C.G., Gautam, K.H., Martínez, P.H., De Jong, W., Kusters, K., Kutty, G., López, C., Fu, M., Angel, M., Alfaro, M., Nair, T.K.R., Ndoye,O., Ocampo, R., Rai, N., Ricker, M., Schreckenberg, K., Shackleton, S., Shanley, P., Sunderland, Y. and Youn, Y., 2004. Markets drive the specialization strategies of forest peoples. *Economic and Society*, 9(2), 4.

Shackleton, S., 2004. Livelihood benefits from the local level commercialization of savanna resources: a case study of the new and expanding trade in marula (*Sclerocarya birrea*) beer in Bushbuckridge, South Africa. *South African Journal of Science*, 100, 651–657.

Shackleton, C.M., Shackleton, S.E., Buiten, E. and Bird, N., 2007a. The importance of dry woodlands and forests in rural livelihoods and poverty alleviation in South Africa. *Forest Policy and Economics*, 9(5), 558–577.

Shackleton, C.M., Shackleton, S.E. and Cousins, B., 2001. The role of land-based strategies in rural livelihoods: the contribution of arable production, animal husbandry and natural resource South Africa. *Development Southern Africa*, 18(5), 581-604.

Shackleton, C.M., Timmermans, H.G., Nongwe, N., Hamer, N. and Palmer, N.R., 2007b. Direct-use values of non-timber forest products from two areas on the Transkei Wild Coast. *Agrekon*, 46(1), 113–134.

Sivakumar, M.V.K. and Valentin, C., 1997. Agroecological zones and the assessment of crop production potential. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 352, 907-916.

Tewari, D.D., 2012. Promoting non-timber forest products (NTFPs) to alleviate poverty and hunger in rural South Africa: a reflection on management and policy challenges. *African Journal of Business Management*, 6(47), 11635–11647.

Thondhlana, G. and Muchapondwa, E., 2014. Dependence on environmental resources and implications for household welfare: Evidence from the Kalahari drylands, South Africa. *Ecological Economics*, 108, 59–67.

Tregurtha, N. and Vink, N., 2008. Presidency fifteen year review project: review of agricultural policies and support instruments. Accessed 24 March 2014, http://www.thepresidency.gov.za/docs/reports/15year_review/economic/agricultural_policy.pdf

Twine, W., Moshe, D., Netshiluvhi, T. and Siphugu, V., 2003. Consumption and direct-use values of savanna bio-resources used by rural households in Mametja , a semi-arid area of Limpopo province, South Africa. *South African Journal of Science,* 99, 467–473.

Uberhuaga, P., Smith-Hall, C. and Helles, F., 2012. Forest income and dependency in lowland Bolivia. *Environment, Development and Sustainability*, 14(1), 3–23.

Van Averbeke, W. and Mohamed, S.S., 2006. Smallholder farming styles and development policy in South Africa: the case of Dzindi Irrigation Scheme. *Agrekon*, 45(2), 136–157.

Vedeld, P., Angelsen, A., Bojö, J., Sjaastad, E. and Kobugabe Berg, G., 2007. Forest environmental incomes and the rural poor. *Forest Policy and Economics*, 9(7), 869–879.

Vedeld, P., Angelsen, A., Sjaastad, E. and Berg, G.K., 2004. Counting on the environment. forest incomes and the rural poor. Environment Department Papers, Paper No. 98. Environmental Economics Series. The World Bank Group, Washington D.C.

Woittiez, L.S., Rufino, M.C., Giller, K.E. and Mapfumo, P., 2013. The use of woodland products to cope with climate variability in communal areas in Zimbabwe. *Ecology and Society*, 18(4), 1-24.

Wollenberg, E., 2000. Methods for estimating forest Income and their challenges. *Society and Natural Resources*, 13(8), 777–795.

WWF. n.d. Agriculture: facts and trends. South Africa. Accessed 12 June 2014, http://awsassets.wwf.org.za/downloads/facts_brochure_mockup_04_b.pdf

World Bank. 2014a. World development indicators: agricultural output and productivity. Accessed 20 May 2014, http://wdi.worldbank.org/table/3.3

World Bank. 2014b. Agricultural land (% of land area). Accessed 12 June 2014, http://data.worldbank.org/indicator/AG.LND.AGRI.ZS

Wunder, S., Angelsen, A. and Belcher, B., 2014a. Forests, livelihoods, and conservation: broadening the empirical base. *World Development*, 64(S1), S1-S11.

CHAPTER 3: THE CONTRIBUTION OF NTFP TRADE TO RURAL LIVELIHOODS IN DIFFERENT AGRO-ECOLOGICAL ZONES OF SOUTH AFRICA

1 Introduction

Many NTFPs are harvested for commercial purposes (sale or barter trade). The introduction of markets in remote areas and growing local markets, even though they are poorly developed, has led to an increase in the demand and opportunity for generation of cash incomes, and an increase in international interest in many types of NTFPs, such as herbal medicines, hand-crafted utensils, food additives and decorative items (Cunningham, 2011; Phounvisouk and Ting, 2014; Sunderlin et al., 2005). However, most of these products are sold in relatively small quantities per producer at relatively low prices (Neumann and Hirsch, 2000; Shackleton et al., 2007b; Sunderlin et al., 2005). Poor market access in remote areas often makes it difficult for producers to bargain for better prices with traders who normally provide transport, market connections and sometimes credit to the producers (Sunderlin et al., 2005).

Trade in NTFPs provides a prospect for cash-constrained rural households to earn cash, especially in those communities where other cash income earning sources are limited (Agustino et al., 2011; Melaku et al., 2014; Mujawamariya and Karimov, 2014; Shackleton and Pandey, 2014). For instance, Sadashivappa et al. (2006) reported that about 50 % of the cash for some households in the Western Ghats region of Karnataka in India comes from NTFP sales. Similarly, for the Tagbanua tribe in the Palawan Island of the Phillipines, NTFP gathering is the most significant source of both subsistence and cash incomes (Lacuna-Richman, 2004). In some parts of Cameroon, collection and selling of NTFPs is the main source of cash income for many rural households (Fuashi, 2005). The same pattern has been noted in numerous African countries (Adam and Pretzsch, 2010; Chupezi et al., 2009; Lemenih et al., 2003; Shackleton et al., 2007a; Yemiru et al., 2010). A review of many PEN cases showed that woodfuel accounts for a large fraction of NTFP cash income. For example, in the Democratic Republic of Congo (DRC), commercial production and selling of woodfuel (firewood and charcoal) accounts for about 75 % of the total cash income of charcoal producers in Kinshasa (Schure et al., 2014).

Neumann and Hirsch (2000) conducted a comprehensive analysis of NTFP trade and showed that it tends to offer low returns to the poorest households instead of offering a viable means of socioeconomic development. Some authors even suggest that trading in NTFPs might actually represent a poverty trap instead of alleviating poverty (Adam et al., 2013). They further point out that many NTFPs have "very low to zero market value" and they are available to poor households because "no one else wants them" (Belcher, 2005). Some of the NTFPs are inferior products, thus superior products replace them as household income increases (Arnold, 2002; Ruiz-Pérez et al., 2004). However, in some instances cultural preferences underlie many markets, therefore, some NTFPs are not inferior products. For example, bushmeat in central Africa (Van Vliet et al., 2011); medicinal plants in southern Africa (Shackleton et al., 2007a); and traditional brooms in South Africa (Cocks et al., 2011). Nonetheless, in many developing countries households use NTFPs and in some cases they seem to be promising in alleviating poverty (Yemiru et al., 2010).

Despite many studies (Fisher, 2004; Heubach et al., 2011; Kar and Jacobson, 2012; Melaku et al., 2014; Mulenga et al., 2012; Schaafsma et al., 2014) reporting that NTFPs are important to the livelihoods of many rural and some urban communities in developing countries, there are some studies that show that some people do not prefer harvesting NTFPs as a livelihood strategy. Gubbi and MacMillan (2008) conducted a case study in the Periyar Tiger Reserve, India, to investigate the contribution of NTFPs to livelihoods by analysing incomes obtained from various NTFP species, assessing the economic returns to harvesters from different social backgrounds, and establishing the attitudes of harvesters towards their profession. Their results showed that the majority of the collectors (82 %) did not wish to continue harvesting NTFPs if other livelihood options from agriculture were available, and all of them didn't want their children to be NTFP collectors. They concluded that the role of NTFPs collection in poverty alleviation is questionable, regarding social justice and environmental sustainability. In Nepal, Piya et al. (2011) reported that selling NTFPs is an unattractive livelihood, particularly for those comparatively affluent Chepang households who own huge areas of land, who are food secure, and have diversified livelihood options. This is due to the low prices of NTFPs paid to the collectors which barely cover the labour costs.

In contrast, Shackleton et al. (2008) point out that in the South African context, even though the earnings from trading in natural products are usually low, they often compare well with: (1) the locally available wage labour alternatives, that is if they are there, (2) earnings from other sources such as agriculture, and (3) other self-employment, which normally requires capital investment which people might not have. Therefore, even though trade might not always boost households' incomes considerably, it plays important roles in (Shackleton et al., 2008): (1) offering extra income generation options in the context of limited opportunities, (2) allowing income diversification, (3) providing a "safety net" for households in times of shocks and adversities, (4) decreasing the reliance of households on other safety nets such as inter-household transfers and government social grants, (5) skills development and (6) flexible working hours to suit the household demand.

In South Africa, there is extensive NTFP trade within communities and via external markets. Even though there are no national or regional estimates of the total number of people or households involved, on either an ad hoc or semi-permanent basis, it is speculated that millions of people are involved (Shackleton et al., 2007a). For example, Shackleton and Shackleton (2004) reported that more than 4 % of rural households are involved in trading at least a single NTFP and it's even higher for poorer households, than the better-off ones. For example, Shackleton and Shackleton (2002) showed that at least 30 % of the poor households were involved in selling NTFPs as a way of generating cash in the Kat River area of the Eastern Cape. Furthermore, poor households sold a greater range of kinds of NTFPs, and the income earned accounted for a greater portion of the total household income than it did for the few (less than 10 %) well-off households which sold NTFPs.

There are some South African studies (Botha et al., 2004; Dovie et al., 2002; Pereira et al., 2006; Shackleton, 2005; Shackleton et al., 2008) showing that rural households trade in certain NTFPs but these are sectorial, i.e. per individual NTFP market chain. There is limited indication of the proportion of all households or a random sample of households trading one or more NTFPs, how it varies in relation to local context. Therefore, the aim of this chapter was to establish the proportion of households trading in NTFPs in sites of different distances to urban markets and agro-ecological areas of South Africa.

2 Methods

2.1 Site selection

See section 2.1 in chapter 2.

2.2 Data collection

2.2.1 Household interviews

See section 2.2.1 in chapter 2.

2.2.2 Measuring income and definitions

See section 2.2.2 in chapter 2.

2.3 Data analysis

Descriptive statistics was used to describe the socioeconomic characteristics and proportion of the households trading in NTFPs in different agro-ecological areas and distance to urban market. A Kruskal-Wallis ANOVA by Ranks test was conducted to establish if there are any significant differences between the means of NTFP trade income in different agro-ecological areas and distance to urban market. Spearman Rank Order Correlations analysis between relative NTFP trade income and various sources of income was performed in order to establish the relationship between various sources of income. A general linear model (GLM) regression analysis was applied to identify the factors affecting both household absolute and relative NTFP trade incomes. The independent variables used included household characteristics such as age, education, sex, size of the household and geographical factors such as agro-ecological class and distance to urban market.

3 Results

3.1 Characteristics of households involved in NTFP trade

The mean household size across all sites was 6.1 ± 3.5 members. On average, household heads had attained 4.9 ± 4.2 years of schooling, and the average age was 56.8 ± 14.2 years. About 45 % of the households were headed by a man whilst the remainder were female-headed households. The majority (77.9 %) of household heads were not employed. Only 9.1 % stated that they were full-time traders of NTFPs, whilst 13 % were employed in non-NTFPs

and non-agricultural activities. Therefore, 77.9 % were part-time NTFP traders. Each household sold an average of 9 ± 15.1 units of NTFPs per month.

Interestingly, when comparing the female-headed households against male-headed households, a t-test showed that there were no significant differences in the means of the following variables: crop income (p = 0.0882), livestock income (p = 0.1536), NTFP income (p = 0.4074), age of household head (p = 0.3025) education level of household head (p = 0.1425) and household size (0.3315). Conversely, there was a significant (p= 0.0148) difference between the mean absolute wage income of the female-headed household (R 5 429 ± 14 558) and male-headed households (R24 357 ± 4 6543). Similarly, male headed households had a significantly (p = 0.0010) bigger mean total household income than the female-headed households (R 70 503 ± 62 204 versus R 43 685 ± 25 093). On the other hand, female-headed households had a significantly (p = 0.0303) higher mean relative social grants income than the male-headed households (53.8 ± 24.9 % versus 40.2 ± 29.2 %). This suggests that male-headed households are likely to be employed and less reliant on other sources of income (e.g. remittances and social grants) as compared to female-headed households.

The households stated various reasons for selling NTFPs (Figure 5). About 39 % reported selling NTFPs because they wanted to generate household cash income, whilst 16.9 % stated they were "unemployed" and about 15.6 % cited hunger as the reason for selling NTFPs.

3.2 The proportion of households trading NTFPs

Of the 1 200 households interviewed, only 77 reported selling NTFPs (Table 8). Therefore, 6.4 % of the interviewed households were engaged in trading NTFPs. There was no difference in the number of households trading NTFPs for the two classes of distance to the urban market. Thus, 49.4 % of the household traders were found in the class "near" urban market, whereas 50.6 % where found in the class "far" from urban markets. Conversely, there was a wide variation in the number of households trading NTFPs across the agro-ecological classes (Table 8), with increasing trade with increasing agro-ecological potential; 15.6 % in very low agro-ecological class through to 36.4 % in high agro-ecological class. Thus,

the proportion of households trading in NTFPs tended to increase with increasing agro-ecological potential However, a Kruskal-Wallis test showed that there was no significant difference in the number of trading households across agro-ecological classes..

Table 8: The proportion of households trading NTFPs across agro-ecological classes and distance to urban market

Agro-ecological class	Number of trading households	Percent of household trading per class (%)	Percent of household trading (%)	Distance to urban market	Number of trading households	Percent (%)
Very low	12	4.0	28.6	Near	38	49.4
Low	19	6.3	24.7	Far	39	50.6
Medium	18	6.0	23.4			
High	28	9.3	36.4			
Total	**77**	**6.4**	**100.0**		**77**	**100.0**

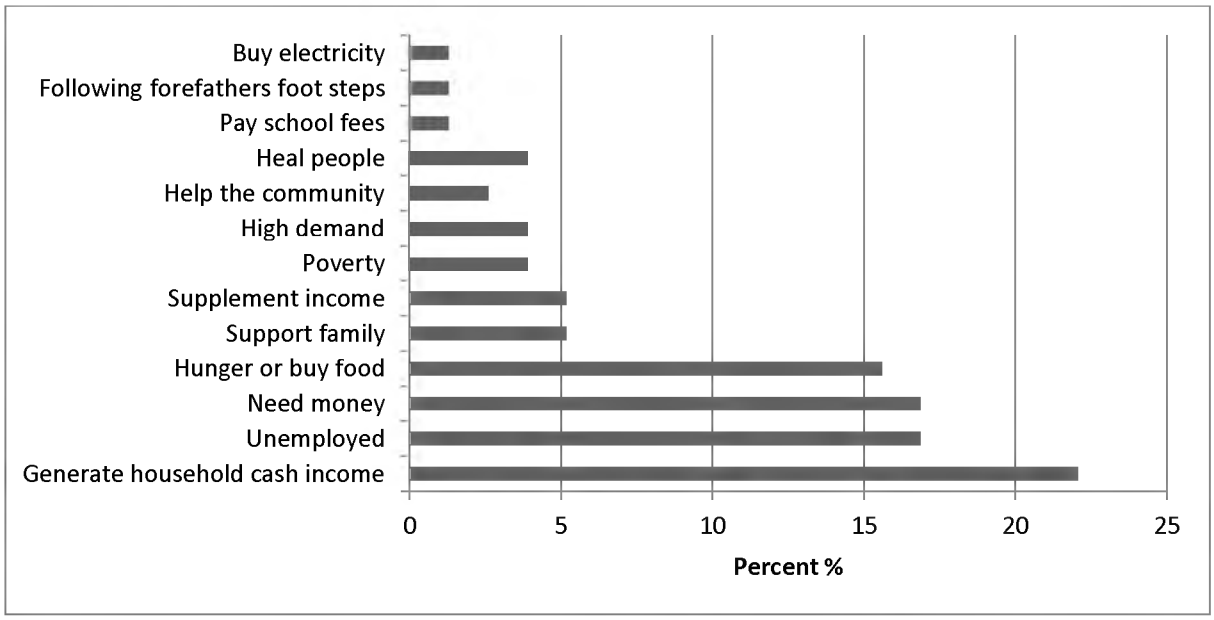

Figure 5: Respondents' reasons for selling NTFPs (n =1 200)

3.3 Types of NTFPs traded

The most commonly traded NTFPs were firewood, with 28 % or 25 households selling the product, followed by weaving material (17 %) and wild fish (11 %) (Table 9). The NTFPs with

the highest return were hand brushes, crafts, weaving material and firewood, generating average annual values of R 6 998, R 6 764, R 6 120 and R 5 610 per selling household, respectively. Thus, NTFPs such as firewood, weaving material, hand brushes, crafts, edible insects and wild fish constituted the bulk of the NTFP trade income generated by households. Even though a few households were selling NTFPs such as kraal poles, kraal branches, traditional sticks and wild honey, their sale value was substantial. Approximately, 61.7 % of the total NTFP income (both non-cash and cash) of households across all sites was for subsistence use, whilst about 38.3 % was cash income. On average, each trading household sold 1.1 ± 0.3 type of NTFP. Thus, the trading households tended to focus on selling a single type of NTFP.

Table 9: NTFPs traded across all sites and their average annual absolute value

NTFP	Number of households selling	Percent of trading households	Average annual trade income per household selling the product (Rands)
Firewood	25	28	5 610 ± 6 225
Weaving material	15	17	6 120 ± 5 821
Wild fish	10	11	4 056 ± 3 024
Edible insects	9	10	2 953 ± 2 706
Medicinal plants	7	8	2 840 ± 1 570
Hand brushes	6	7	6 998 ± 8 174
Crafts	5	6	6 764 ± 7 547
Kraal poles	3	3	5 320 ± 3 450
Wooden utensils	3	3	4 080 ± 1 812
Kraal branches	1	1	2 160*
Traditional sticks	1	1	3 600*
Wild meat	1	1	800*
Wild vegetables	1	1	1 280*
Wild honey	1	1	1 920*

*No standard deviation since only one seller was selling the product (N= 77)

3.4 The contribution of income from NTFP trade to rural livelihoods

The average contribution of income from NTFP trade to the total household income across all sites was 12 % (Table 10). The average absolute value of annual NTFP trade income was R 5 621 ± 5 635 for all the sites. NTFP trade income was the fourth largest contributor towards

total household income after social grants income (47.4 %), non-cash NTFP income (21 %) and wage income (12 %).

Table 10: Households' absolute and relative incomes by major income source

		Absolute income		Relative income	
Income category	N	(Rands)	Std.Dev.	(%)	Std.Dev.
Non-cash NTFP income	77	915	6 160	21.0	13.3
Trade NTFP income	77	5 621	5 635	12.0	10.4
Total NTFP income	77	14 773	11 525	33.0	22.3
Crop income	77	2 344	6 992	4.0	7.8
Livestock income	77	1 996	6 641	2.2	6.6
Wage income	77	12 686	33 113	13.2	24.2
Social grants income	77	21 549	16 735	47.4	27.6
Other income	77	87	352	0.2	0.8

There was a wide variation in relative NTFP trade income across the agro-ecological classes (Table 11). For instance, the average share of NTFP trade income for the sites in very low agro-ecological class was 8.2 %. Whereas the average contribution of NTFP trade income to total household income in agro-ecological classes low, medium and high was 14.8 %, 9.9 % and 13.1 %, respectively. There was a small but noteworthy difference in the contribution of NTFP trade income to total household income in both classes of distance to the urban market. Thus, NTFP trade income accounted for about 10.2 % of average household income in areas classified as “far” from urban markets, whereas in areas grouped as “near” urban markets, NTFP trade income constituted 13.9 % of the average household income.

The share of livestock income across all agro-ecological classes ranged from 0.7 – 4.2 %. On the other hand, share of crop income across all agro-ecological classes ranged from 0.2 – 6.5 %. The share of crop income across all two classes of distance to urban market was 3.9 % and 4 % for the classes near and far, respectively (Table 11). On the other hand, the share of livestock income was 1 % and 3.3 %, for near and far classes, respectively.

Table 11: Relative annual incomes (%) across agro-ecological classes and distance to urban market

	Agro-ecological class				Distance to urban market	
Average relative income (%)	Very low	Low	Medium	High	Near	Far
Total NTFP income	31.5	37.8	25.9	35.0	36.1	30.0
Non-cash NTFP income	23.3	23.0	16.0	21.9	22.2	19.8
NTFP trade income	8.2	14.8	9.9	13.1	13.9	10.2
Crop income	0.2	4.5	2.0	6.5	3.9	4.0
Livestock income	4.2	3.0	2.4	0.7	1.0	3.3
Wage income	17.5	24.2	12.6	4.3	11.9	14.5
Social grants income	46.5	30.0	57.0	53.5	46.8	48.0
Other income	0.0	0.6	0.2	0.1	0.3	0.1

(N=77)

The average share of wage income across all sites was 13.2 %. The recorded average share of wage income of 13.2 % is characteristic of limited employment opportunities and labour market imperfections in many rural areas. The average annual absolute and relative values of social grants income across all sites were R 21 549 ± 16 735 and 47.4 %, respectively. The income from social grants was the biggest contributor to the total annual household income across all sites.

The means of NTFP trade income for four agro-ecological classes were not significantly different (Table 12) (H = 6.66; p = 0.08). Similarly, the means of NTFP trade income for two classes of distance to urban market were not significantly different (H = 1.30; p = 0.25).

Table 12: Comparison of NTFP trade income means across agro-ecological classes and distance to urban market

NTFP trade income	Valid N	Sum of Ranks	Mean Rank	NTFP trade income	Valid N	Sum of Ranks	Mean Rank
Very low	12	307	25.58	Far	39	1 409	36.13
Low	19	862	45.37	Near	38	1 594	41.95
Medium	18	781	43.39				
High	28	1 053	37.61				
H (3, N= 77) =6.66 p =.0835				H (1, N= 77) =1.3031 p =0.2536			

When the households who reported selling NTFPs were compared with the households that reported not selling NTFPs using a t-test analysis, it was evident that there were significant differences (p = 0.0001) in both relative and absolute NTFP incomes for the two groups (Table 13). Thus, the selling households were more reliant on NTFPs than the non-selling households. Interestingly, the selling households had a bigger mean absolute social grants income than the non-selling households and this finding is significant (p = 0.0223). On the other hand, the share of social grants income to total household income was significantly different between the two groups, being 56 % for the non-selling households and 47 % for the selling households. Likewise, the non-selling households had a significantly (p = 0.0498) higher relative wage income than the selling households. The selling households tended to have significantly (p = 0.0066) smaller household size than the non-selling households.

Table 13: Comparison of households selling NTFPs and not selling NTFPs

	Selling households		Non-selling households				
	Mean	**Std. Dev.**	**Mean**	**Std. Dev.**	**t-value**	**df**	**p**
NTFP income	14 772	11 525	3 658	4 691	17.68	1 200	**0.0001**
Crop income	2 344	6 992	1 363	3 219	2.35	1200	**0.0188**
Wage Income	12 686	33 113	11 030	26 404	0.53	1 200	0.5997
Social grants	21 549	16 735	17 795	13 773	2.29	1 200	**0.0223**
Other Income	87	352	453	3 476	-0.92	1 200	0.3554
Total household income	53 435	42 984	35 686	30 727	4.78	1 200	**0.0001**
Relative NTFP income	33	22	15	19	7.96	1 200	**0.0001**
Relative livestock income	2	7	3	17	-0.34	1 200	0.7310
Relative wage income	13	24	20	31	-1.96	1 200	**0.0498**
Relative social grants income	47	28	56	32	-2.19	1 200	**0.0289**
Relative other income	0	1	1	7	-1.29	1 200	0.1985
Age of household head	57	15	57	15	-0.32	1 200	0.7461
Household size	6	3	5	3	2.72	1 200	**0.0066**

N = 77 for selling households and 1 123 for non-selling households

3.5 The relationship between relative NTFP trade income and other sources of income

Rural households in developing countries pursue multiple livelihood strategies. Thus, rural livelihood strategies are diverse, with most households relying on several activities while others specialise in one or a few activities. Therefore, Spearman Rank Order Correlations analysis between relative NTFP trade income and various sources of income was performed in order to establish the relationship between various sources of income. As expected,

relative NTFP trade income had a positive and significant relationship with both relative non-cash NTFP income and relative total NTFP income (Table 14). It is worth noting that there was a significant negative relationship between relative NTFP trade income and relative wage income. Similarly, relative NTFP trade income was significantly and negatively related to social grants income. Therefore, as households get more income from other sources such as wages and social grants, they tend to engage less in the trade of NTPFs.

Table 14: The relationship between relative NTFP trade income and other sources of income

Trade NTFP income and:	Valid N	Spearman R	t(N-2)	p < 0.05
Total NTFP income	77	0.8432	13.5823	**0.0001**
Non-cash NTFP income	77	0.6698	7.8114	**0.0001**
Crop income	77	0.1520	1.3319	0.1869
Livestock income	77	0.0311	0.2697	0.7882
Wage income	77	-0.2877	-2.6016	**0.0112**
Social grant income	77	-0.4756	-4.6818	**0.0001**
Other Income	77	0.0010	0.0088	0.9930

3.6 Factors affecting income from NTFP trade

Even though the R-squared values seem low, the significant coefficients still provide important information on how changes in the predictor values are associated with changes in the response value (Table 15). Household size was significantly and positively related to absolute NTFP trade income (Table 15). Thus, the bigger the household size, the more labour available to collect labour intensive NTFPs. The older the household head, the smaller were both the absolute NTFP trade income and relative NTFP trade income (the latter finding was significant). Generally, young household heads tended to engage more in physically demanding NTFPs extraction activities. On the other hand, older household heads tended to engage more in less strenuous NTFPs extraction activities. Thus, older household heads might not have enough time and physical strength to take part in the extraction and selling of NTFPs.

Table 15: GLM regressions of absolute and relative NTFP income against household characteristics and geographical factors

		Absolute NTFP income (Rands)				**Relative NTFP income** (%)			
	Level of effect	Coefficient	SE	t-value	p	Coefficient	SE	t-value	p
Intercept		7406	3146	2.354	**0.0210**	23.307	5.687	4.098	**0.0001**
Household size		485	201	2.409	**0.0188**	0.494	0.364	1.356	0.1787
Age of household head		-84	52	-1.610	0.1122	-0.258	0.095	-2.725	**0.0082**
AE class	High	-1303	1092	-1.193	0.2373	-1.235	1.974	-0.625	0.5338
AE class	Low	2094	1219	1.719	0.0903	3.721	2.203	1.689	0.0958
AE class	Medium	1047	1284	0.815	0.4180	-0.289	2.322	-0.125	0.9013
Distance to urban market	Far	64	643	0.100	0.9209	-1.758	1.164	-1.511	0.1355
Education level of household head	Secondary	-688	1049	-0.656	0.5145	-2.673	1.897	-1.409	0.1634
Education level of household head	Primary	777	892	0.871	0.3870	2.798	1.613	1.735	0.0873
Household head sex	Female	101	668	0.151	0.8804	1.765	1.208	1.461	0.1488
	$R = 0.4133$; $R^2 = 0.1709$; $R_{adj}^2 = 0.0595$; $F = 1.5340$; $p = 0.1541$					$R = 0.4654$; $R^2 = 0.2166$; $R_{adj}^2 = 0.1114$; $F = 2.0587$; $p = 0.0459$			

(N=77)

4 Discussion

About 6.4 % of the households interviewed reported selling at least one NTFP. This is line with findings by Shackleton and Shackleton (2004) who reported that more than 4 % of rural households were involved in the trading of NTFPs. Many households were engaged in the selling of NTFPs due to limited employment opportunities in the rural areas and they saw selling NTFPs as a means of generating cash income. Indeed, as noted by other authors, NTFPs provide an opportunity for the cash-constrained rural households to earn cash, especially in those communities where other income earning sources are limited (Agustino et al., 2011; Melaku et al., 2014; Mujawamariya and Karimov, 2014; Shackleton and Pandey, 2014). Some of the reasons why households sell NTFPs (e.g. hunger or buy food, poverty, and unemployment, buy electricity) demonstrate the importance of NTFPs in sustaining rural households especially for those living close to the survival line. The income from trading products such as wild meat and wild vegetables seems very low but the cash income from trading such products is an integral part of the source of cash income for the households. For many cash-strapped rural households, low NTFP trade income is of huge value since it helps them to meet other subsistence needs (Shackleton et al., 2008; Sunderlin et al., 2005).

Even though the proportion of households trading in NTFPs tended to increase with increasing agro-ecological potential, a Kruskal-Wallis test showed that there was no significant difference in the number of trading households across agro-ecological classes. However, it was observed during field work that markets (Ixopo, Port St Johns, etc.) in or close to high agro-ecological classes tended to have a wide variety of NTFPs. Thus, the locals engaged more in the collection and selling of NTFPs than households from other agro-ecological classes. Therefore, rich agro-ecological conditions improve NTFP income opportunities (Angelsen and Kaimowitz, 1999; Woittiez et al., 2013).

The most commonly traded NTFPs were firewood (28 % or 25 households), followed by weaving material (17 %) and wild fish (11 %). On the other hand, the NTFPs with the highest annual return were hand brushes, crafts, weaving material and firewood, generating on average annual income of R 6 998, R 6 764, R 6 120 and R 5 610, respectively. The average

contribution of income from NTFP trade to total household income across all sites was 12 %. This finding is in conformity with the findings by Piya et al. (2011) who noted that the average contribution of NTFP trade to total household income was 13.2 % for Chepang Community in Nepal. Similarly, Mahaptra et al. (2005) reported that the average contribution of NTFP cash income to total household cash income was 14 % in certain regions of India. The average absolute value of annual NTFP trade income was R 5 621 ± 5 635 for all the sites. This is line with findings by Gyan and Shackleton (2005) who found that the average annual gross income from brush selling was R 5 688 in King Williams Town, South Africa. This is however, significantly higher than the average income (R 1 246) from trading crafts reported by Pereira et al. (2006) in Mpozolo and Ntubeni, Eastern Cape province of South Africa. Similarly, Shackleton (2005) reported an average income of R 998 from trading woven mates in Bushbuckridge, South Africa. Likewise, Shackleton et al. (2008) reported average absolute incomes of R 7 000, R 2 000, R 1 000 and R 520 for sellers of carvings, brooms, mats and brooms and Marula beer, respectively in Bushbuckridge, South Africa.

The average share of wage income across all sites was 13.2 % which is in line with findings by Angelsen et al. (2014). In their summary of 35 sites globally reported average wage share of 15.2 %. Conversely, Davis et al. (2010) reported total wage share of 25.3 % in the summary of 16 country-level rural income surveys. The average share of NTFP trade income (12 %) compares favourably with average share of wage income (13.2 %) across all sites. This is line with the argument by Shackleton et al. (2008) who noted that in the South African context, NTFP trade income normally compares well with income from other sources such as wages, agriculture and self-employment. The income from social grants was the biggest contributor to the total annual household income across all sites. This demonstrates the heavy dependence on social grants by many South African rural households (see for example Neves et al., 2009; Phaahla, 2015).

There is a clear pattern when comparing the share of NTFP trade income with that of crop and livestock shares, the former contributes at least as twice as the latter. Obviously, the same can be said about the relative total NFTP income. Thus, the average contribution of

income from NTFP trade to total household income across all sites was 12 %, which is significantly higher than the shares of both crop income (4 %) and livestock income (2.2 %). The shares of both crop income (4 %) and livestock income (2.2 %) were even significantly smaller than the share of total NTFP income (33 %). This finding underscores the importance of NTFPs in rural areas and it is consistent with findings by Shackleton et al. (2001) who reported that in many cases, whilst NTFP income is not the main livelihood activity, irrespective of agro-ecological potential it is usually greater than one or both crop income and livestock income. This is not surprising given that many rural households in South Africa are characterised by small land holdings, absence of irrigation facilities and low land productivity (Hart, 2008; Tregurtha and Vink, 2008). Therefore, they tend to produce crops for home consumption and in many cases this does not cover their daily food requirements (Hart, 2008; Tregurtha and Vink, 2008). This finding is similar to findings by Adam and Pretzsch (2010) who noted that due to low land productivity and small landholdings, the share of income from trading wild fruit (54 %) was significantly larger than the shares of income from both crop (19 %) and livestock (6 %) production in Rashad, Sudan. The same pattern was noted by Mahapatra et al. (2005), who reported that the contribution of agriculture to household cash income was relatively low due to small land holdings and low land productivity, in Orissa and Jharkhand, India. Thus, the contribution of agriculture to total cash income ranged from 2 – 6 % in Orissa and 12 – 25 % in Jharkhand, India. Conversely, the average contribution of NTFP trade income to total cash income for the two regions, Orissa and Jharkhand, was 19 % and 29 %, respectively. Similarly, Lemenih et al. (2003) found that the share of NTFP trade income was almost three times the share of income from crop production in Liban, Ethiopia. In Bale Highlands, southern Ethiopia, Yemiru et al. (2010) noted that cash income from selling NTFPs was the most important source of cash income (53 %) almost throughout the year, followed by cash income from livestock sales. These findings underscore the importance of cash from trading NTFPs for many cash-constrained rural households.

For the households distant to the urban market, the share of NTFP trade income (10.2 %) was the fourth largest contributor to total household income after social grants (48 %) income, non-cash NTFP income (19.8 %) and wage income (14.5 %), respectively. For households proximal to the urban market, NTFP trade income (13.9 %) was the third largest

contributor to the total household income after social grants income (46.8 %) and non-cash NTFP income (22.2 %), respectively. Thus, the average share of NTFP trade income for households far away from urban market (10.2 %) was smaller than the average share of NTFP trade income for households close to urban market (13.9 %). Similarly, Hegde and Enters (2000) observed a similar pattern where the relative NTFP trade income decreased with increasing distance from urban centres. Being close to urban markets offers better market opportunities for sellers of NTFPs. This highlights the critical role markets, lower transport costs and time play for rural households' participation in the selling of NTFPs. Furthermore, households proximal to the urban market have a higher (22.2 %) average share of non-cash NTFP income than households distant to the urban market (19.8 %). This seems to contradict studies (Ghate et al., 2009; Kamanga et al., 2009; Kar and Jacobson, 2012; Lo´pez-Feldman, 2014; Mamo et al., 2007; Sills et al., 2003; El Tahir and Gebauer, 2004; Vedeld et al., 2004) that have shown that reliance on NTFPs tends to increase with the distance to market. However, it is generally recognised that high levels of NTFP extraction are associated with high levels of NTFP trade income (Dovie et al., 2002; Vedeld et al., 2004). Therefore, since the share of non-cash NTFP income for households proximal to the urban market is higher than that of households distant to the urban market, it is not surprising that the share of NTFP trade income for households proximal to the urban market was higher than that of the households distant to urban market.

Interestingly, the share of wage income was slightly higher for the distant to urban market households (14.5 %) than for the proximal to urban market households (11.9 %). This seems to contradict the argument or the general perception that villages close to town have better employment opportunities than households further from town (El Tahir and Gebauer, 2004). However, this is not completely surprising as it was noted during fieldwork that there were various projects (building of toilets, installation of water taps, road maintenance as part of the government's Expanded Public Works Programme (EPWP)) going on in villages further from town. Therefore, these government projects were providing villagers with temporary employment opportunities.

In line with other studies, it was noted that household size was significantly and positively related to absolute NTFP trade income (Adam and Pretzsch, 2010; Babulo et al., 2008; Hegde and Enters, 2000; Mamo et al., 2007; Viet Quang and Nam Anh, 2006). There was no significant relationship between gender of the household head and both absolute and relative NTFP trade income. This is contrary to studies (El Tahir and Gebauer, 2004; Sadashivappa et al., 2006) that reported a positive and significant relationship between female population and NTFP trade income. The GLM analysis revealed that there was no any significant relationship between level of education of household head and absolute and relative NTFP trade incomes. Conversely, some studies (Adam and Pretzsch, 2010; Adhikari et al., 2004; Hegde and Enters, 2000; Piya et al., 2011) reported that there is a tendency of a significant negative relationship between level of education of household head and NTFP trade income. Thus, high levels of education imply that households tend to engage less in relatively low remunerative NTFP trade activities. Generally, it is expected for NTFP trade income to be negatively related to distance to urban market (see for example Ghate et al., 2009). Households further from urban centres are normally devoid of formal markets. Furthermore, the roads connecting them with the urban markets are generally poor, resulting in high transaction costs. Therefore, this diminishes the NTFP trade income or makes trading in NTFPs less attractive. However, the results of the GLM analysis did not establish any significant relationship between NTFP trade income and distance to urban market. There is not any significant relationship between agro-ecological classes and NTFP trade income. This is further supported by the recorded relative NTFP trade incomes which did not show any particular pattern or systematic trend across agro-ecological classes. Indeed, an ANOVA test showed that there was no significant difference in the means of relative NTFP trade income for the four agro-ecological classes.

5 Conclusions

NTFP income is undoubtedly a very important source of income for many rural households. However, the findings of this study showed that NTFP trade income only accounted for about 12 % of the total household income across all sites. About 6.4 % households reported selling NTFPs for various reasons, with many (39 %) citing the need to earn cash income and limited employment opportunities (16.9 %). Even though the returns from trading NTFPs are relatively low, every earning is very important to many cash-strapped rural households. This

was demonstrated through many sellers of NTFPs using their earnings to augment household income and cover their living expenses.

Many rural areas are characterised by limited employment opportunities, therefore the share of NTFP trade income (12 %) compared favourably well with the share of wage income (13.2 %). However, the total NTFP income was the second largest contributor to total household income after social grants income. Thus, the share of total NTFP income (33 %) was significantly higher the share of wage income (13.2 %) across all sites. Whilst, NTFP income is not the main livelihood activity, irrespective of agro-ecological potential it was greater than one or both crop income and livestock income. Yet development planners and interventions rarely focus on NTFPs, but still favour crops or livestock. Any future development plans in South African rural livelihoods should take into consideration that NTFPs contribute significantly to the livelihoods of many rural households rather than just focusing on agriculture alone.

Many rural households in South Africa are faced with many farming constraints (poor soil quality, inadequate inputs, land shortages, dry and variable weather conditions, etc.). Therefore, they do not earn much cash income from agriculture and this limits cash income earning alternatives for many rural households. This presents an opportunity for households to earn cash income by selling NTFPs and diversify their income earning sources against risks such as drought and limited employment opportunities. Interestingly, there was no significant difference between the means of the of relative NTFP trade income for the four agro-ecological classes. Therefore, agro-ecological zones didn't seem to have an influence on the relative NTFP trade income. This suggest that sellers could be engaging in the selling of NTFPs, not necessarily due to the level of land productivity, but to other reasons such as complimenting other sources of income and high levels of unemployment.

References

Adam, Y.O. and Pretzsch, J., 2010. Contribution of local trade in *Ziziphus spina-christi L.* fruits to rural household's economy in Rashad locality, Sudan. *Forestry Ideas*, 16(39), 19-27.

Adam, Y.O., Pretzsch, J. and Pettenella, D., 2013. An analytical framework for assessing the effect of income from non-timber forest products on poverty alleviation in Savannah region, Sudan. *Journal of Agricultural* Science, 21(1), 1–25.

Adhikari, B., Di Falco, S. and Lovett, J.C., 2004. Household characteristics and forest dependency: evidence from common property forest management in Nepal. *Ecological Economics*, 48(2), 245–257.

Agustino, S., Mataya, B., Senelwa, K. and Achigan-Dako, E.G., 2011. Non-wood forest products and services for socio-economic development. A compendium for technical and professional forestry education. The African Forest Forum, Nairobi.

Angelsen, A. and Kaimowitz, D., 1999. Rethinking the causes of deforestation: lessons from economic models. *The World Bank Research Observer*, 14(1), 73–98.

Angelsen, A., Jagger, P., Babigumira, R., Belcher, B., Hogarth, N.J., Bauch, S., Börner, J., Smith-Hall, C. and Wunder, S., 2014. Environmental income and rural livelihoods: a global-comparative analysis. *World Development*, 64 (S1), S12-S28.

Arnold, M., 2002. Clarifying the links between forests and poverty reduction. *International Forestry Review*, 4(3), 231–233.

Babulo, B., Muys, B., Nega, F., Tollens, E., Nyssen, J., Deckers, J. and Mathijs, E., 2008. Household livelihood strategies and forest dependence in the highlands of Tigray, northern Ethiopia. *Agricultural Systems*, 98(2), 147–155.

Babulo, B., Muys, B., Nega, F., Tollens, E., Nyssen, J., Deckers, J. and Mathijs, E., 2009. The economic contribution of forest resource use to rural livelihoods in Tigray, northern Ethiopia. *Forest Policy and Economics*, 11(2), 109–117.

Belcher, B.M., 2005. Forest product markets, forests and poverty reduction. *International Forestry Review*, 7(2), 82–89.

Botha, J., Witkowski, E.T.F. and Shackleton, C.M., 2004. Market profiles and trade in medicinal plants in the Lowveld, South Africa. *Environmental Conservation*, 31(1), 38–46.

Cavendish, W., 2000. Empirical regularities in the poverty-environment relationship of rural households: evidence from Zimbabwe. *World Development*, 28(11), 1979–2003.

Cocks, M., Lopez, C. and Dold, T., 2011. Cultural importance of non-timber forest products: opportunities they pose for bio-cultural diversity in dynamic societies. In Shackleton, S., Shackleton, C. and Shanley P., ed. Non-timber forest products in the global context. Springer-Verlag, Berlin, Heidelberg, 107-128.

Chupezi, T.J., Ndoye, O., Tchatat, M. and Chikamai, B., 2009. Processing and marketing of non-wood forest products: potential impacts and challenges in Africa. *Discovery and Innovation,* 21(1), S60-S65.

Cunningham, A.B. 2011. Non-timber products and markets: lessons for export-oriented enterprise development from Africa. In Shackleton, S., Shackleton, C. and Shanley P., ed. Non-timber forest products in the global context. Springer-Verlag, Berlin, Heidelberg, 83-106.

Davis, B., Winters, P., Carletto, G., Covarrubias, K., Quin˜ones, E. J., Zezza, A., Stamoulis, K., Azzarri, C. and Digiuseppe, S., 2010. A cross-country comparison of rural income generating activities. *World Development*, 38(1), 48–63.

Dovie, D.B.K., Shackleton, C.M. and Witkowski, E.T.F., 2002. Direct-use values of woodland resources consumed and traded in a South African village. *International Journal of Sustainable Development and World Ecology*, 9(3), 269–283.

El Tahir, B.A. and Gebauer, J., 2004. Non-timber forest products: opportunities and constrains for poverty reduction in Nuba Mountains, South Kordofan, Sudan. *A paper presented in the Conference on International Agricultural Research for Development, Deutscher Tropentag 2004, Berlin, October 5-7, 2004.*

Fisher, M., 2004. Household welfare and forest dependence in southern Malawi. *Environment and Development Economics*, 9(2), 135–154.

Fuashi, A.N., 2005. Production and marketing of non-timber forest products NTFPs, a major source of rural and national income in the south west province of Cameroon. Cited in Piya, K.L. Maharjan, N.P. and Joshi, D.R.D., 2011. Collection and marketing of non-timber forest products by Chepang community in Nepal. *The Journal of Agriculture and Environment*, 12, 10–21.

Ghate, R., Mehra, D. and Nagendra, H., 2009. Local institutions as mediators of the impact of markets on non-timber forest product extraction in central India. *Environmental Conservation*, 36(01), 51-61.

Gubbi, S. and MacMillan, D.C., 2008. Can non-timber forest products solve livelihood problems? A case study from Periyar Tiger Reserve, India. *Oryx*, 42(02), 222–228.

Gyan, C.A. and Shackleton, C.M., 2005. Abundance and commercialization of *Phoenix reclinata* in the King Williams Town area, South Africa. *Journal of Tropical Forest Science*, 17(3), 334–345.

Hart, T., 2008. Reviewing 15 years of resource poor small-scale agriculture in South Africa: is there any way forward? Accessed 02 June 2014, http://www.tips.org.za/files/Hart_Paper_24_Oct_2008__tmp52aa50cf.pdf

Hegde, R. and Enters, T., 2000. Forest products and household economy: a case study from Mudumalai Wildlife Sanctuary, Southern India. *Environmental Conservation*, 27(3), 250–259.

Heubach, K., Wittig, R., Nuppenau, E.A. and Hahn, K., 2011. The economic importance of non-timber forest products (NTFPs) for livelihood maintenance of rural West African communities: a case study from northern Benin. *Ecological Economics*, 70(11), 1991–2001.

Kamanga, P., Vedeld, P. and Sjaastad, E., 2009. Forest incomes and rural livelihoods in Chiradzulu district, Malawi. *Ecological Economics*, 68(3), 613–624.

Kar, S.P. and Jacobson, M.G., 2012. NTFP income contribution to household economy and related socio-economic factors: lessons from Bangladesh. *Forest Policy and Economics*, 14(1), 136–142.

Lacuna-Richman, A.C., 2014. Subsistence strategies of an indigenous minority in the Philippines: nonwood forest product use by the Tagbanua of Narra, Palawan. *Economic Botany*, 58(2), 266–285.

Lemenih, M., Abebe, T. and Olsson, M., 2003. Gum and resin resources from some Acacia, Boswellia and Commiphora species and their economic contributions in Liban, Southeast Ethiopia. *Journal of Arid Environments*, 56(1), 149–166.

López-Feldman, A., 2014. Shocks, income and wealth: do they affect the extraction of natural resources by rural households? *World Development*, 64(S1), S91-S100.

Mahapatra, A.K., Albers, H.J. and Robinson, E.J.Z., 2005. The impact of NTFP sales on rural households' cash income in India's dry deciduous forest. *Environmental Management*, 35(3), 258–265.

Mamo, G., Sjaastad, E. and Vedeld, P., 2007. Economic dependence on forest resources: a case from Dendi district, Ethiopia. *Forest Policy and Economics*, 9(8), 916–927.

Mcelwee, P.D., 2008. Forest environmental income in Vietnam: household socioeconomic factors influencing forest use. *Environmental Conservation*, 35(02), 147–159.

Melaku, E., Ewnetu, Z. and Teketay, D., 2014. Non-timber forest products and household incomes in Bonga forest area, southwestern Ethiopia. *Journal of Forestry Research*, 25(1), 215–223.

Mujawamariya, G. and Karimov, A., 2014. Importance of socio-economic factors in the collection of NTFPs: the case of gum arabic in Kenya. *Forest Policy and Economics*, 42, 24-29.

Mulenga, B.P., Richardson, R.B. and Tembo, G., 2012. Non-timber forest products and rural poverty alleviation in Zambia. Working paper number 62. Indaba Agricultural Policy Research Institute (IAPRI). Accessed 30 March 2014, http://www.aec.msu.edu/fs2/zambia/index.htm

Neumann, R.P. and Hirsch, E., 2000. *Commercialisation of non-timber forest products: review and analysis of research*. CIFOR. Jakarta.

Neves, D., Samson, M., Van Niekerk, I., Hlatshwayo, S. and Du Toit, A., 2009. The use and effectiveness of social grants in South Africa. Institute for Poverty, Land and Agrarian Studies (PLAAS), Cape Town.

Pereira, T., Shackleton, C. and Shackleton, S., 2006. Trade in reed-based craft products in rural villages in the Eastern Cape, South Africa. *Development Southern Africa*, 23(4), 477–495.

Phaahla, E., 2015. What the South African state does for the poor: 1 – social grants. Helen Suzman Foundation. Accessed 02 June 2015, http://hsf.org.za/resource-centre/hsf-briefs/what-the-south-african-state-does-for-the-poor-i-social-grants

Phounvisouk, L. and Ting, Z., 2014. Economics of NTFPs for the ethnic minority livelihood: The case of "peuak meuak" in northern Laos. *International Journal of Agricultural Sciences and Natural Resources*, 1(1), 13–23.

Piya, K.L. Maharjan, N.P. Joshi, D.R.D., 2011. Collection and marketing of non-timber forest products by Chepang community in Nepal. *The Journal of Agriculture and Environment*, 12, 10–21.

Ruiz-Pérez, M., Belcher, B., Achdiawan, R., Alexiades, M., Aubertin, C., Campbell, B., Clement, C., Cunningham, T., Fantini, A., Foresta, H., Fernández, C.G., Gautam, K.H., Martínez, P.H., De Jong, W., Kusters, K., Kutty, G., López, C., Fu, M., Angel, M., Alfaro, M., Nair, T.K.R., Ndoye,O., Ocampo, R., Rai, N., Ricker, M., Schreckenberg, K., Shackleton, S., Shanley, P., Sunderland, Y. and Youn, Y., 2004. Markets drive the specialization strategies of forest peoples. *Economic and Society*, 9(2), 4.

Sadashivappa, P., Suryaprakash, S. and Krishna, V.V., 2006. Participation behaviour of indigenous people in non-timber forest products extraction and marketing in the dry deciduous forests of South India. *Conference on International Agricultural Research for Development. University of Bonn, October 11-13, 2006.*

Schaafsma, M., Morse-Jones, S., Posen, P., Swetnam, R.D., Balmford, A., Bateman, I.J., Burgess, N.D., Chamshama, S.A.O., Fisher, B., Freeman, T., Geofrey, V., Green, R.E., Hepelwa, S., Hernández-Sirvent, A., Hess, S., Kajembe, G.C., Kayharara, G., Kilonzo, M., Kulindwa, K., Lund, J.F., Madoffe, S.S., Mbwambo, L., Meilby, H., Ngaga, Y.M., Theilade, I., Treue, T., Van Beukering, P., Vyamana, V.G. and Turner, R.K., 2014. The importance of local forest benefits: economic valuation of non-timber forest products in the eastern Arc mountains in Tanzania. *Global Environmental Change*, 24, 295–305.

Schure, J., Levang, P. and Wiersum, K.F., 2014. Producing woodfuel for urban centers in the Democratic Republic of Congo: a path out of poverty for rural households? *World Development*, 64(S1), S80-S90.

Shackleton, C.M. and Pandey, A.K., 2014. Positioning non-timber forest products on the development agenda. *Forest Policy and Economics*, 38, 1–7.

Shackleton, C.M. and Shackleton, S.E., 2004. The use of woodland resources for direct household provisioning. In: Lawes, M.J., Eeley, H.C., Shackleton, C.M. and Geach, B.S. (Eds.), Indigenous Forests and Woodland in South Africa: Policy, People and Practice. University of KwaZulu-Natal Press, Pietermaritzburg, 195–226.

Shackleton, C.M., Shackleton, S.E., Buiten, E. and Bird, N., 2007a. The importance of dry woodlands and forests in rural livelihoods and poverty alleviation in South Africa. *Forest Policy and Economics*, 9(5), 558–577.

Shackleton, C.M., Shackleton, S.E. and Cousins, B., 2001. The role of land-based strategies in rural livelihoods: the contribution of arable production, animal husbandry and natural resource harvesting in communal areas in South Africa. *Development Southern Africa*, 18(5) 581–604.

Shackleton, C.M., Shackleton, S.E., Ntshudu, M. and Ntzebeza, J., 2002. The role and value of savannah non-timber forest products to rural households in the Kat River Valley, South Africa. *Journal of Tropical Forest Products*, 8(1) 45-65.

Shackleton, S.E., 2005. The significance of the local trade in natural resource products for livelihoods and poverty alleviation in South Africa. PhD thesis. Rhodes University, Grahamstown.

Shackleton, S., Campbell, B., Lotz-Sisitka, H. and Shackleton, C., 2008. Links between the local trade in natural products, livelihoods and poverty alleviation in a semi-arid region of South Africa. *World Development*, 36(3), 505–526.

Shackleton, S.E., Shanley, P. and Ndoye, O., 2007b. Invisible but viable: recognising local markets for non-timber forest products. *International Forestry Review*, 9, 697-712.

Sills, E.O., Sharachchandra L., Holmes, T.P. and Pattanayak, S.K., 2003. Nontimber forest products in the rural household economy. In Sills, E.O., Abt, K.L., ed. *Forests in a Market Economy*. Springer, 259–281.

Sivakumar, M.V.K. and Valentin, C., 1997. Agroecological zones and the assessment of crop production potential. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 352, 907-916.

Sunderlin, W.D., Angelsen, A., Belcher, B., Burgers, P., Nasi, R., Santoso, L. and Wunder, S., 2005. Livelihoods, forests, and conservation in developing countries: An Overview. *World Development*, 33(9), 1383–1402.

Tregurtha, N. and Vink, N., 2008. Presidency fifteen year review project: review of agricultural policies and support instruments. Accessed 24 March 2014, http://www.thepresidency.gov.za/docs/reports/15year_review/economic/agricultural_policy.pdf

Uberhuaga, P., Smith-Hall, C. and Helles, F., 2011. Forest income and dependency in lowland Bolivia. *Environment, Development and Sustainability*, 14(1), 3–23.

Van Vliet, N., Nasi, R. and Taber, A., 2011. From the forest to the stomach: bushmeat consumption from rural to urban settings in central Africa. In Shackleton, S., Shackleton, C. and Shanley P., ed. Non-timber forest products in the global context. Springer-Verlag, Berlin, Heidelberg, 129-148.

Vedeld, P., Angelsen, A., Sjaastad, E. and Berg, G.K., 2004. Counting on the environment: forest incomes and the rural poor. World Bank Environment Department Working Paper, vol. 98. Washington, D.C.

Viet Quang, D., and Nam Anh, T., 2006. Commercial collection of NTFPs and households living in or near the forests: case study in Que, Con Cuong and Ma, Tuong Duong, Nghe An, Vietnam. *Ecological Economics*, 60(1), 65–74.

Yemiru, T., Roos, A., Campbell, B. and Bohlin, F., 2010. Forest incomes and poverty alleviation under participatory forest management in the Bale Highlands, southern Ethiopia. *International Forestry Review*, 12(1), 66–77.

CHAPTER 4: PRICE DETERMINATION OF NTFPS IN DIFFERENT AREAS OF SOUTH AFRICA

1 Introduction

Ward and Schroeder (2002) note that there are two overall concepts that help to describe how prices are derived in a given area or for any particular transaction. These two concepts are price determination and price discovery.

Price determination is when the price of a product is determined by the laws of supply and demand (Martinez, 2004; Peterson, 2014; Ward and Schroeder, 2002). In such a situation factors like quality, certainty of the supply, speculation and availability of substitutes play an important function in the mechanism of determining prices. These factors, particularly the quality of NTFPs, are potentially vital in price determination of NTFPs (Martinez, 2004; Ndoye et al., 1997). Generally, a customer is inclined to pay a higher price to the seller if they can be guaranteed a consistent supply of a specific quality (Martinez, 2004).

Price discovery is a process where buyers and sellers through negotiation arrive at a certain price for quantity and quality of a particular product at a given time and place (Peterson, 2014; Ward and Schroeder, 2002). This is not the same as price determination where the price of a product is set by the broad forces of supply and demand, thus these forces generally set an equilibrium price of a product (Martinez, 2004; Peterson, 2014).

The limited previous literature suggests that the prices of NTFPs are probably determined through price discovery due to the nature of the poorly developed or imperfect NTFP markets in rural areas (Agea et al., 2013; Martinez, 2004; Ndoye et al., 1997). Whether the price of NTFPs has been determined through price discovery or price determination, there are several factors that affect both processes partly due to poor development of the NTFP markets or imperfect markets and the socio-economic characteristics of the market participants. For example, some collectors of NTFPs set their prices on the basis of cost of food and labour incurred during harvesting the products (FPRDI-ITTO, 2012). Some of the markets are imperfect hence the prices are set by a few buyers. For instance, middlemen colluded in setting the price of Palmyra Palm (*Borassus flabellifer*) products in north-eastern Nigeria (Tee et al., 2009). Therefore, the collectors were reduced to being price takers.

Famuyide et al. (2012) found that the markets for Bitter Kola (*Garcinia kola)* and Alligator Pepper (*Aframomum melegueta elegueta)* in Ibadan, Nigeria, tend towards oligopoly, as the market for these two products are characterised by few sellers and price discrimination. Additionally, age, level of education, experience in the trade by the seller, transport cost and cost price of the products had significant positive effects in price determination of the two products. This suggests that older, educated, experienced sellers were likely to set higher prices for the products. In Labo, Philippines, the prices of NTFPs (handicraft products) are dictated by a big exporter (FPRDI-ITTO, 2012) and the other actors in the supply chain, including the sellers of NTFPs, just accept the price set by the exporter (FPRDI-ITTO, 2012).

Agea et al. (2013) found that in Bunyoro-Kitara Kingdom, Uganda, the majority (73 %) of the sellers based their prices for wild and semi-wild food plants (WSWFPs) on the daily market demand of each product and on the time and risks involved in harvesting the products (56 %). Some sellers (40 %) based their prices on the market price of substitute food plants on sale in the market and on price information from other places. Furthermore, some sellers (35 %) considered the previous or past seasons' prices and for those sellers (22 %) who were supplied by the collectors only depended on costs incurred from suppliers to set the prices of their products. Therefore, there are no certain or formal mechanisms (pricing based on demand, pricing based on the total cost incurred or pricing based on competition) of setting prices of WSWFPs traded by the sellers. Agea et al. (2013) also observed that in all cases, price setting followed a kind of "action-reaction sequence". Thus, the process of setting prices for NTFPs between the seller and the buyer entails bargaining until an equilibrium price is reached somewhere between the minimum price the seller is willing to take and the maximum price the customer is willing to pay (Ndoye et al., 1997). There is always negotiation of prices between the buyer and seller even if the seller has offered the buyer a reasonable market price.

These findings are in line with those in various countries in southern African, where available knowledge (Ham et al., 2008) shows that the establishment of market prices of wild edible plants, particularly indigenous fruit, is not based on a definite mechanism. Likewise, in west and central Africa, there is no a clear system (Tchoundjeu et al., 2008) used by sellers to set prices for wild food plants. In some cases the sellers consider the buyer's

ability to buy the product. Therefore, the price is determined based on the seller's appraisal of the buying power of different buyers. A simple look at the potential buyer by the seller would sometimes help the seller to determine the price to charge the potential buyer (Agea et al., 2013; Botha et al., 2004).

In the Mpumalanga Lowveld, South Africa, Botha et al. (2004) noted that sellers of medicinal plants were largely price takers. Similarly, Pereira et al. (2006) highlighted that sellers of reed craft products in certain rural villages of the Eastern Cape, South Africa, were mostly price takers as many buyers always haggle for lower prices. In addition, some crafters cannot stand firm on fixed prices as they wish to maintain a good reputation and relationships in the community. Shackleton (2005) found that in Bushbuckridge, South Africa, wood carvers were largely price takers as most buyers were willing to pay only about a third of the originally set price.

Mahapatra and Tewari (2005) noted that in India some collectors were poor, not familiar with the money exchange system and owe local money lenders and sellers which compelled them to trade high value NTFPs for low value food products. They also observed that the primary harvesters were ignorant about storage methods and were not sure of future market forecasts. Consequently, they preferred selling their products soon after harvesting at the risk of lower prices to the sellers who earned better margins by selling the same products when the demand is high.

There are also other factors which sellers consider when setting prices. These include; perishability of the product as many sellers don't have storage facilities; their own financial requirements (depending on their real disposable incomes); and also the presence of many sellers in the village can, for example, give a signal to sellers about the relative scarcity of NTFPs in nearby markets or urban areas (Ndoye et al., 1997).

Shackleton et al. (2002a) considered three South African villages in the Eastern Cape radiating out from a town. They found out that for the village close to the urban market, the prices of NTFPs were higher than in the other two villages, possibly due to high pressure on the land resulting in higher scarcity or greater demand. The households in villages close to

the urban market consumed fewer NTFPs than the households in the villages further away from urban markets, but the total use value of the NTFPs was higher for the village close to the urban market because of the higher price of NTFPs. In a separate study (Shackleton et al., 2002b) in three rural villages of South Africa, the same pattern was noticed. Shackleton et al.'s (2002a; 2002b) findings show the critical role price plays in determining the total value of NTFPs to rural households. Households further away from urban centres tend to be more dependent on NTFPs for subsistence than households close to urban centres. This is because households further away from urban centres are usually distanced from formal markets, thus there is less opportunity for them to sell either agricultural products or NTFPs (other than low value local markets), and there are very limited employment opportunities.

The above studies indicate the wide variety of factors that can influence the price determination of NTFPs. However, since most are based on single or relatively few sites, there is no indication of the prevalence of the different factors within a uniform macro context, nor how they might vary between different types of NTFPs. The determination of prices of NTFPs is important so as to avoid either over or under-valuing them in markets and in poverty studies. Therefore, this study sought to determine the factors and rationale behind the setting of prices for selected NTFPs in different areas of South Africa. South Africa is a particularly useful setting for such a study because of its marked dual first and third world economies, strong market integration and yet extensive use of NTFPs. Based on previous work and this macro context it was hypothesised that there are no certain mechanisms used by the sellers of NTFPs to set the prices of the NTFPs. In addition, the pricing factors taken into account by the sellers of NTFPs are likely to vary with the type of NTFP being sold, type of market (home market or urban market), socio-economic characteristics of the seller and method used by the seller to procure the NTFPs.

2 Methods

2.1 Site selection and data collection

Purposive sampling was used to select the study sites, with 12 towns being selected on the basis that there were part of the study sites of the previous two chapters (see section 2.1 in chapter 2). The other three were selected on the basis that they were relatively close to the

other study sites. Moreover, these three study sites had fairly large numbers of NTFP sellers. Therefore, a total of 15 towns were selected across South Africa (Table 16). Most of the sellers of NTFPs were found in formal markets, whereas those selling at home were found in villages adjacent to or further away from town. A formal market was assumed to be a market where "sellers can publicly advertise their prices and locations, whereas in informal markets, sellers need to trade through bilateral bargaining so as to remain anonymous from the taxing authority" (Anbarci et al., 2012). Therefore, a structured questionnaire was administered to 223 sellers selling NTFPs in the urban markets and 77 sellers who were selling NFTPs at home across all sites. Because there are generally small numbers of NTFP sellers, all NTFP sellers who were willing to participate were interviewed. The interviews were conducted from September 2014 to June 2015. The questionnaire included sections on types of NTFPs sold, reasons for selling NTFPs, trading years, connections with other NTFP sellers, source of the traded NTFPs, frequency of offering discounts, credit and lowering prices to customers, factors taken into account when setting prices and socio-economic characteristics of the seller (see Annexure 2). Local field assistants with good knowledge of the study area and experience in collecting data were recruited to help with translation. The author was responsible for the daily supervision of the field assistants. Data cleaning, coding and data entry into SPSS version 21 software was done by the author.

Table 16: Study sites across South Africa

Site	Town	Province
1	Lady Frere	Eastern Cape
2	Queenstown	Eastern Cape
3	Cofimvaba	Eastern Cape
4	Idutywa	Eastern Cape
5	Mthatha	Eastern Cape
6	Tsomo	Eastern Cape
7	Butterworth	Eastern Cape
8	Centani	Eastern Cape
9	Lusikisiki	Eastern Cape
10	Port St Johns	Eastern Cape
11	Tongaat	KwaZulu Natal
12	Ixopo	KwaZulu Natal
13	Pietermaritzburg	KwaZulu Natal
14	Louis Trichardt	Limpopo
15	Thohoyandou	Limpopo

2.2 Data analysis

Descriptive statistics were used to describe the socio-economic characteristics of the sellers of NTFPs across all sites, as well as to describe the traded NTFPs, sources of traded NTFPs, their reasons for selling NTFPs, and changes in the number of NTFPs sellers. Frequency tables were used to show the various factors taken into account by NTFP sellers when setting prices of NTFPs. A general linear model (GLM) regression analysis was applied to identify factors influencing sellers to lower prices or sell on credit. Similarly, a GLM regression analysis was conducted to identify the significant pricing factors taken into account by the sellers of certain NTFPs. The GLM is a generalization of the linear regression model, such that effects can be tested (1) for categorical predictor variables, as well as for effects for continuous predictor variables and (2) in designs with multiple dependent variables as well as in designs with a single dependent variable. Thus, the GLM used in this study makes use of the least square methods of the general linear model to estimate and test hypotheses about effects. The GLM was run in Statistica 13 software.

3 Results

This results section presents the factors taken into account by sellers when setting the prices of NTFPs. The socio-economic characteristics of the sellers and the traded NTFPs are also presented in this chapter. The sellers were asked questions about the nature of NTFP trade in terms of lowering of prices, reasons for selling NTFPs, frequency and reasons of selling on credit, the turnover of sellers and connections of sellers. Their responses are presented in this chapter.

3.1 Price determination of NTFPs

3.1.1 Factors taken into account by NTFP sellers when setting prices

Sellers of NTFPs consider various reasons when setting NTFP prices (Table 17). The most reported were transport costs (29 %), stock price (18.4 %), profit margin (12.7 %), time taken to collect or produce the product (7.3 %) and market price (6.4 %).

The pricing factors tended to vary between urban markets and home markets ($X^2 = 41.27$; $p < 0.0001$). For instance, the main pricing factors taken into account by sellers in urban

markets were transport costs (30.3 %), stock price (20.4 %), profit margin (14.2 %), market price (6 %), time taken to collect or produce the product (5.5 %) and food costs incurred procuring the product (5.1 %). On the other hand, the main pricing factors considered by sellers who sold from home were time taken to collect or produce the product (18.9 %), transport costs (16.2 %), market price (9 %), distance to site (8.1 %), amount of physical energy used to collect or produce the product (5.4 %) and entrance fees to access the forests (5.4 %).

Table 17: Pricing factors taken into account by 300 sellers of NTFPs

Pricing factors*	**Frequency**	**Relative frequency** (%)
Transport costs	246	29.0
Stock price	156	18.4
Profit margin	108	12.7
Time taken to collect or produce the product	62	7.3
Market price	54	6.4
Food costs incurred procuring the product	42	4.9
Discuss with other sellers of NTFPs	41	4.8
Amount of physical energy used to collect/ produce NTFPs	20	2.4
Labour costs	15	1.8
Distance to site	17	1.9
Entrance fees to access the forests	14	1.6
Rent incurred when collecting NTFPs	13	1.5
Costs of raw materials	11	1.3
Affordability of the customers	9	1.1
People's health first – profit is a bonus	9	1.1
Size of the product	6	0.7
Difficulty in collecting or producing the NTFP	6	0.7
Storage costs	5	0.6
Burial society premium	3	0.4
Availability of the NTFPs	2	0.2
Guided by ancestors	2	0.2
Price of substitutes	2	0.2
Air time costs	2	0.2
Design of the product	2	0.2
Cost of living	1	0.1
Degree of sickness of the customer	1	0.1
Risk involved in collecting the NTFPs	1	0.1

*It should be noted that many sellers provided more than a single pricing factor

When the pricing factors were grouped according to the method used by the seller to procure the stock, those sellers who reported buying their stock considered the following as the main ones: transport costs (32.2 %), stock price (25.8 %), profit margin (15 %), food costs incurred procuring the product (5.7 %), market price (5.7 %) and discuss with other sellers of NTFPs (5.2 %). As for those sellers who reported collecting or producing their stock ($X^2 = 46.83$; $p < 0.0001$), their main pricing factors were transport costs (20.6 %), time taken to collect or produce the product (16.3 %), amount of physical energy used to collect or produce the product (7.9 %), market price (7.9 %), profit margin (6.7 %) and distance to site (5.2 %). Those sellers who both bought and collected or produced their stock reported their main pricing factors as transport costs (24.4 %), stock price (19.5 %), profit margin (17.1 %), discuss with other sellers of NTFPs (9.8 %) and the market price (4.9 %).

Even though there was variation in the factors that sellers take into account across different NTFPs, there are some factors that were dominant across all products (Table 18). For instance, the most mentioned factors were transport costs (33.5 %), stock price (20.1 %) and profit margin (11.9 %). Similarly, the factors considered by sellers of traditional brooms and brushes when setting prices were transport costs (30.3 %), stock price (20.1 %), and profit margin (13.6 %). Likewise, the highly reported price setting factors taken into account by sellers of wooden utensils were transport costs (34.3 %), stock price (19.6 %) and profit margin (19.6 %). The same pattern was observed for products such as wild fish, crafts, traditional sticks, wild meat and weaving material and wild vegetables.

It can be noted in Table 18 that some pricing factors are specific to certain NTFPs. For example, distance to site (river) (10.5 %) was mentioned only by the sellers of wild fish. Similarly, the burial society premium was taken into account by the sellers of kraal branches (50 %) and kraal poles (20 %) only. The design of the product (11.1 %) was mentioned by the sellers of traditional sticks only.

Table 18: Relative percentage frequencies of pricing factors considered by NTFP sellers when setting prices for each NTFP (N=300)

Pricing factors	Firewood (%)	Brooms & brushes (%)	Mats (%)	Medicinal plants (%)	Edible insects (%)	Wild vegetables (%)	Wild Fish (%)	Crafts (%)	Wooden utensils (%)	Wild meat (%)	Weaving material (%)	Kraal poles (%)	Kraal branches (%)	Traditional sticks (%)	Wild honey (%)
Transport costs	10.2	30.3	33.5	29.0	15.3	27.3	21.1	33.3	34.8	33.3	32.6	0.0	0.0	22.2	0.0
Stock price	0.0	20.1	20.1	4.3	20.0	18.2	10.5	33.3	19.6	33.3	20.9	0.0	0.0	0.0	0.0
Profit margin	0.0	13.6	11.9	10.1	16.5	9.1	15.8	0.0	19.6	0.0	11.6	0.0	0.0	33.3	0.0
Market price	20.4	7.6	3.6	2.9	8.2	27.3	0.0	0.0	4.3	0.0	4.7	20.0	50.0	0.0	0.0
Food costs incurred procuring NTFPs	2.0	6.4	9.3	0.0	5.9	0.0	0.0	0.0	0.0	0.0	10.5	0.0	0.0	11.1	0.0
Discuss with other sellers of NTFPs	0.0	6.4	3.6	0.0	15.3	18.2	0.0	16.7	6.5	0.0	2.3	0.0	0.0	0.0	0.0
Time taken to collect/produce NTFPs	18.4	4.5	5.2	4.3	1.2	0.0	10.5	0.0	10.9	0.0	4.7	0.0	0.0	0.0	100.0
Amount of physical energy used	10.2	0.8	1.5	7.2	0.0	0.0	5.3	16.7	2.2	0.0	1.2	20.0	0.0	0.0	0.0
Entrance fees to access the forests	0.0	0.8	1.0	0.0	10.6	0.0	0.0	0.0	0.0	0.0	2.3	0.0	0.0	0.0	0.0
Distance to site	14.3	0.0	0.0	2.9	1.2	0.0	10.5	0.0	0.0	0.0	0.0	20.0	0.0	0.0	0.0
Affordability of customers	4.1	0.0	0.5	7.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.0	0.0	0.0	0.0
Size of the product	0.0	0.0	0.5	1.4	0.0	0.0	15.8	0.0	0.0	0.0	0.0	0.0	0.0	11.1	0.0
People's health first – profit is a bonus	0.0	0.0	0.0	13.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Price of substitutes	0.0	0.0	0.0	0.0	1.2	0.0	0.0	0.0	0.0	33.3	0.0	0.0	0.0	0.0	0.0
Burial society premium	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.0	50.0	0.0	0.0
Design of the product	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.1	0.0

There are some pricing factors that are taken into account by sellers of NTFPs that reflect that the sellers extract or produce the NTFPs themselves. For instance, pricing factors such as the physical energy used to collect or produce a product, distance to site and time taken to collect or produce the product. Conversely, there are pricing factors such as stock price, and transport costs that suggest that the sellers buy the NTFPs.

There are some pricing factors that are taken into account by the sellers of NTFPs that are very difficult to quantify or turn into monetary terms. For instance, sellers of medicinal plants tended to consider the health of their customers (13.4 %) when charging them. Similarly, some sellers of firewood (10.2 %), crafts (16.7 %) and kraal poles (20 %) took into account the amount of physical energy that is used to collect or produce the product.

3.1.2 Factors influencing the pricing of certain NTFPs

The results of the GLM regression analysis show that market price and transport costs were the significant pricing factors taken into account by the sellers of firewood (Table 19). Some sellers of firewood, especially in Idutywa and Cofimvaba, reported that they collect firewood from distant forests due to relative scarcity of the product in their immediate vicinity. Therefore, it is not surprising that sellers of firewood consider transport costs as a significant pricing factor. Conversely, the significant pricing factors taken into account by the sellers of medicinal plants were people's health and degree of sickness of the customer. This suggests that some sellers of medicinal plants were more interested in the wellbeing of their customers than money. In fact, sellers of medicinal plants who reported taking into account people's health as a pricing factor remarked that profit is a bonus to them.

The significant pricing factors taken into account by the sellers of traditional brooms and brushes were the time taken to produce or collect the product, affordability to the customers, the amount of physical energy used to collect or produce the product and stock price. The pricing factors, time taken to collect or produce the product and the amount of physical energy used to collect or produce the product, suggest that such sellers produce their stock. Contrarily, the pricing factor, stock price, suggests that such sellers buy their stock.

Table 19: Pricing factors for various NTFPs (significant results only)

Source		Coefficient	SE	t-value	Sig.
Firewood	Market price	0.213	0.050	4.238	0.000
	Transport costs	0.131	0.040	3.310	0.001
Brooms and brushes	Time taken to collect or produce the product	0.143	.083	1.719	0.001
	Affordability of the customers	0.317	0.176	1.803	0.037
	Amount of physical energy used to collect or produce NTFPs	0.208	0.127	1.631	0.024
	Stock price	0.019	0.066	0.293	0.036
Medicinal plants	People's health first – profit is a bonus	0.468	0.133	3.526	0.005
	Degree of the sickness of the customer	1.017	0.364	2.795	0.047
Edible insects	Time taken to collect or produce the product	0.022	0.052	0.421	0.010
	Stock price	0.137	0.041	3.313	0.000
Wild vegetables	Time taken to collect or produce the product	0.015	0.029	0.527	0.025
	Stock price	0.054	0.023	2.397	0.001
Wild fish	Time taken to collect or produce the product	0.049	.032	1.541	0.047
	Transport costs	0.043	0.025	1.728	0.003
	Cost of living	0.845	0.176	4.801	0.000
	Discuss with other sellers of NTFPs	0.098	0.033	2.940	0.016
	Distance to site	0.232	0.103	2.245	0.014
Wooden utensils	Time taken to collect or produce the product	0.466	0.188	2.477	0.018
	Design of the product	0.827	0.293	2.823	0.033
Weaving material	Airtime costs	0.846	0.355	2.383	0.047
	Transport costs	0.064	0.048	1.340	0.008
Kraal poles	Transport costs	0.012	0.025	0.496	0.043
	Affordability of the customers	0.042	0.030	1.391	0.000
	Burial society premium	0.648	0.047	13.749	0.000
Kraal branches	Affordability of the customers	0.012	0.009	1.284	0.003
	Burial society premium	0.001	0.036	0.021	0.000
Sex	Transport costs	0.122	0.122	4.226	0.000
	Entrance fees to access the forests	0.245	0.245	5.877	0.016
	Availability of the NTFPs	0.027	0.027	4.038	0.045

R Squared = 0.470 (Adjusted R Squared =0 .404) N = 300

Time taken to collect or produce the product and stock price were the significant pricing factors taken into account by the sellers of edible insects and wild vegetables. Edible insects

and wild vegetables were only sold in two towns, Louis Trichardt and Thohoyandou. Some sellers of edible insects and wild vegetables in Louis Trichardt collected edible insects and wild vegetables themselves; therefore, the time taken to collect the edible insects and wild vegetables was an important pricing factor for them. Similarly, some sellers of edible insects and wild vegetables reported buying their stock mainly from Thohoyandou; hence stock price was a significant pricing factor to them.

Sellers of wild fish consider time taken to catch the fish, transport costs, cost of living, discuss with other sellers of NTFPs and distance to site as significant pricing factors. Pricing factors, time taken to catch the fish and distance to site show that such sellers collect their stock. This is consistent with many sellers of wild fish in Port St Johns who reported catching the wild fish themselves. Contrarily, many sellers of wild fish in Thohoyandou reported buying the stock from the villages in the outskirts of the town, hence transport costs was one of the significant pricing factors.

Many sellers of wooden utensils reported that producing wooden utensils is time consuming. Therefore, it's not surprising that the time taken to produce the wooden utensils and the designs of the wooden utensils were the significant pricing factors taken into account by the sellers of wooden utensils. Some weaving material sellers reported that they buy their stock from distant towns. Consequently, they incur costs such as transport costs and airtime costs, hence their significant pricing factors were airtime costs and transport costs.

Interestingly, sellers of kraal poles and kraal branches considered the affordability of the customers and burial society premium as significant pricing factors. It was noted during fieldwork that some of the sellers who reported basing their pricing on burial society premium use money obtained from selling kraal poles and kraal branches specifically for paying burial society premium.

The sex of the seller had a significant relationship with the pricing factors, transport costs, entrance fees to access forests and the availability of the NTFPs. Given that the selling of

NTFPs was dominated by women who reported travelling to distant towns or having to pay for entrance fees to access forests (especially female collectors of edible insects in Louis Trichardt) it is not surprising that such pricing factors were seen as very important by female sellers.

3.2 Nature of NTFP trade

3.2.1 Socio-economic characteristics of NTFP sellers

The NTFP trade was dominated by women, with 75.3 % being women and 24.7 % men. The age of sellers ranged from 19 to 85 years, with a mean age of 48 ± 11.8 years (Table 20). About 45 % of the sellers were at least 50 years old, whilst only 27.3 % were less than 40 years old. Similarly, the number of years trading NTFPs showed a significant range, from 1 to 40 years, with a mean of 9.5 ± 8.1 years. About 55.3 % of the sellers had less than 10 years of trading. The highest school grade attained ranged from 0 (no formal education) to 12 (highest secondary school grade), with an average of 6.3 ± 3.8 years. About 15.3 % of the sellers had no formal education, whilst about 42.3 % had attained school grades ranging from 1 -7. The remaining sellers (42.3 %) attained school grades ranging from 8 – 12.

Table 20: The socio-economic characteristics of NTFP sellers across all sites (n = 300)

	Age of seller (years)	Trading years	Trading days per week	Trading hours per day	Highest school grade attained
Mean	47.6	9.5	5.8	8.2	6.3
Standard Deviation	11.8	8.1	1.2	1.9	3.8
Minimum	19.0	1.0	1.0	1.0	0.0
Maximum	85.0	40.0	7.0	13.0	12.0

On average, the sellers were engaged in NTFP selling activities for 5.8 ± 1.2 days per week and about 8.2 ± 1.9 hours per day. The majority (79.3 %) of the sellers reported that selling NTFPs was their main source of cash household income, with only 8 % and 5.7 % receiving their main cash household income from state child grants and state pension grants, respectively. Some sellers mentioned other main sources of cash household income, such as wage income (4.3 %), selling clothes (1.3 %), farming (0.7 %), remittances (0.3 %), and state disability grant (0.3 %). For those sellers, who reported that selling NTFPs is not their main

source of cash income, their average share of NTFP trade income to total household income was 28 ± 11.5 %.

When the average share of NTFP trade income to the total household income was divided into four quartiles, about 49.3 % of the sellers stated that the average share of NTFP trade income ranges from 50 to 75 % and their average years of trading was 9.9 ± 8.1 years (Table 21). On the other hand, about 30.3 % reported that the share of NTFP trade income was 76 to 100 % and their average years of trading were 9.5 ± 7.7 years. Only, 12.7 % of the sellers, with average years of trading 7.9 ± 8.8, reported that the contribution of income from NTFP trade to total household income ranged from 25 – 50 %, with remaining sellers (7.7 %) noting that the share of NTFP trade income to total household income was less than 25 % and their average years of trading was 11.5 ± 10.5 years. These responses were significantly different when classified according to gender of the seller, with the exception of those who reported that the share of NTFP trade income was between 25 and 50 % ($p = 0.8008$) and less than 25 % ($p = 0.7351$). On the other hand, the other two categories of the shares of NTFP income were as follows: 50 to 75 % ($p = 0.0443$) and 76 to 100 % ($\chi^2 = 4.8$; $p = 0.0278$).

Table 21: The contribution of NTFP trade income to total household cash income

Share of NTFP trade income (%)	Percentage of Sellers (%)	Average years trading
< 25	7.7	11.5 ± 10.5
25 – 50	12.7	7.9 ± 8.8
50 -75	49.3	9.9 ± 8.1
76 - 100	30.3	9.5 ± 7.7

N = 300

3.2.2 Traded NTFPs

The NTFP trade across all sites was dominated by the trade of traditional brooms and hand brushes, traditional mats, raw weaving material and medicinal plants (Table 22). It should be noted that many sellers traded more than a single NTFP. Traditional brooms and hand brushes were being traded by 116 sellers (38.7 %), followed by traditional mats being sold by 94 sellers (31.3 %). About 54.3 % of the sellers across all sites purchased their stock,

whilst about 41 % of the sellers collected or produced their stock themselves. Only, 4.7 % of the sellers both purchased and collected or produced their stock. When grouped according to the sex of the seller, there was significant difference for those who reported buying their stock (χ^2 = 42.2; p = 0.0001) and producing or collecting their stock (χ^2 = 39.5; p= 0.0001).

Table 22: The types of NTFPs sold and the number of sellers across all sites

NTFP	Number of sellers	Sellers (%)
Traditional brooms and brushes	116	38.7
Traditional mats	94	31.3
Weaving material	40	13.3
Medicinal plants	40	13.3
Firewood	28	9.3
Wooden utensils	25	8.3
Edible insects	25	8.3
Wild fish	14	4.7
Wild vegetables	6	2.0
Traditional sticks	6	2.0
Kraal poles	3	1.0
Crafts	2	0.7
Wild meat	1	0.3
Wild honey	1	0.3
Kraal branches	1	0.3
Total	**402**	**100**

3.2.3 Reasons for trading NTFPs and selection of trading places

About 46 % of the sellers stated that they started selling NTFPs because they wanted to generate household cash income, whilst about 21.3 % of the sellers stated that there were no jobs. Other reasons included: poverty (6 %), high demand for NFTPs (4.7 %), boosting business income (5 %), supplementing household income (4.7 %), help sick people (4 %), instructed by ancestors (3.3 %), easy way to make money (2 %), following in their forefathers' footsteps (1 %), retrenched at work (0.3 %), and uneducated (0.3 %).

The majority (74.3 %) of the sellers were selling NTFPs in urban markets, with only 25.7 % of the sellers selling NFTPs from home. To understand the nature of the relationship between method of procuring the stock, sex of the seller and selling place, a GLM regression analysis was conducted (Table 23). There was a positive and significant relationship (t= 8.9; p =

0.0001) between procurement method, buy, and selling place, urban market, suggesting that those who bought their stock were likely to sell in urban markets. On the contrary, sex of seller, male, was negatively and significantly (t = -6.9; p = 0.0001) related to procurement method, buy. Therefore, male sellers were not likely to sell in urban markets. Similarly, procurement method, collect or produce, was negatively and significantly (t = -8.8; p = 0.0001) related to selling place, urban market. This suggests that sellers who either produced or collected their stock were not likely to sell their products in urban markets. On the other hand, there was a positive and significant relationship (t = 6.7; p = 0.0001) between sex of seller, male, and procurement method, collect or produce. Thus, male sellers were inclined to producing or collecting their stock.

Table 23: The factors influencing method of procuring stock

		Buy				Collect or produce			
Factor	**Level of effect**	**Coefficient**	**SE**	**t**	**p**	**Coefficient**	**SE**	**t**	**p**
Intercept		0.272	0.331	0.823	0.4110	0.860	0.325	2.646	**0.0086**
Selling place	Urban market	0.277	0.031	8.938	**0.0001**	-0.267	0.030	-8.767	**0.0001**
Sex of seller	Male	-0.187	0.027	-6.890	**0.0001**	0.178	0.027	6.673	**0.0001**
$R = 0.6624$; $R^2 = 0.4388$; $R_{adj}^2 = 0.4172$; $F = 20.4$; $p = 0.0001$						$R = 0.6664$; $R^2 = 0.4440$; $R_{adj}^2 = 0.4227$; $F = 20.8$; $p = 0.0001$			

The sellers reported various reasons why they either sell in the urban markets or from home. For instance, about 63 % sold NTFPs in urban markets because they felt that there is high demand in the town, while 13 % of the sellers were selling at home because they live close to their customers. Thus, most of their customers were their fellow village dwellers. This made it unnecessary for them to sell in town. Other reasons stated by sellers for selling in town included: people in the village buy on credit while in town people buy cash (7.3 %), do not have anywhere else to sell from (3 %), live close to town (2.7 %), get robbed if one sells in the village (0.7 %) and works in town (0.3 %). Whereas for those selling from home, the reasons included: lack of transport (6 %), demand is high in the village (1.7 %), too old to

travel (1 %), health problems (0.3 %), help fellow villagers (0.3 %), have a shop at home (0.3 %), and instructed by ancestors to sell at home (0.3 %).

3.2.4 Changes in the number of NTFP sellers in the recent past

About 91.1 % of the sellers (i.e. 273 sellers) reported that there were other NTFP sellers selling similar products in the immediate vicinity. The majority (73.3 %) of the sellers reported that the number of NTFP sellers selling in the immediate vicinity has increased in the previous five years, whilst 20.7 % noted that the number of sellers has remained the same for the past five years. Only 6 % of the sellers stated that the number of sellers in the immediate vicinity has decreased in the past five years.

About 56.8 % of the sellers who reported an increase in the number of sellers attributed this to limited employment opportunities. Other reasons included: perceived high income from trading (11.4 %), high demand of NTFPs (9.5 %), people need money to survive (6.4 %), poverty (6.4 %), hunger (2.3 %), selling NTFPs is profitable (1.8 %), influx of foreign sellers (1.4 %), help sick people (1.4 %), high cost of living (1.4 %), and instructed by ancestors to sell medicinal plants (1 %).

Of the sellers who reported a decrease in the number of sellers (27.8 %) attributed this to the low demand of NTFPs. Other reasons for the perceived decrease were: it's difficult to collect or produce NTFPs (22.2 %), few people know medicinal plants (16.7 %), people are too lazy to sell NTFPs (11.1 %), many people are now relying on social grants (5.6 %), many firewood sellers passed away (5.6 %), lack of business skills (5.6 %), and demand is seasonal (5.6 %).

Approximately 22.6 % of the sellers who reported no change in the number of sellers attributed this to the fact that "many people are too lazy" to start selling NTFPs. Other reasons stated by the sellers included: low demand (12.9 %), hunger (12.9 %), it's difficult to collect or produce NTFPs (12.9 %), few people know medicinal plants (11.3 %), demand is seasonal (8.1%), high cost of living (4.8 %), lack of selling place – existing sellers don't welcome new sellers (3.2 %), people prefer selling non-NTFPs (3.2 %), people don't have

transport (3.2 %), many people are now relying on social grants (1.6 %), no jobs (1.6 %) and people don't have capital to start the business (1.6 %). Thus, factors such high cost of living, hunger and lack of employment opportunities encourage the sellers to stay in the business of selling NTFPs, therefore the number of sellers remain the same.

3.2.5 Connections between sellers and willingness to lower prices, offer discount and credit

About 70.7 % of the sellers stated that they were connected with other sellers, whilst 23 % stated that they were not connected with other sellers. The remaining 6.3 % of the sellers were not connected with other sellers since there were no other sellers in the immediate vicinity. There was no difference in the average age of the sellers who either stated that they were connected with other sellers (47.5 ± 11.1 years) and those who stated that they were not connected with other sellers (47.9 ± 13.3 years) ($t = 0.4253$; $p = 0.6715$). Similarly, there was no difference in the average highest school grade attained by sellers who were connected with other sellers (6.5 ± 3.7) and sellers who were not connected with other sellers (5.9 ± 4.0) ($t = 0.1797$; $p = 0.8577$). About 81.1 % of the sellers who were connected to other sellers were women, whilst about 18.9 % were men. Likewise, about 61.4 % of the sellers who were not connected to other sellers were women and 38.6 % were men ($X^2 = 9.71$; $p < 0.005$). The average years in the trade were not different for sellers who were either connected with other sellers or unconnected with other sellers. About 88.2 % of the sellers who were connected with other sellers were selling from urban markets, whereas 11.8 % were selling from home. On the other hand, 53.4 % of the sellers who were unconnected with other sellers were selling from home, whilst 46.6 % were selling from urban markets ($X^2 = 29.45$; $p < 0.0001$). The most sold NTFPs by sellers who were connected with other sellers were traditional brooms and brushes (32 %), traditional mats (24.9 %), weaving material (11.8 %), edible insects (7.7 %), wooden utensils (6.1 %) and medicinal plants (6.4 %). On the other hand, the most frequently sold NTFPs by sellers who were not connected with other sellers were traditional brooms and brushes (20 %), medicinal plants (20 %), firewood (19 %), traditional mats (19 %), wooden utensils (6.7 %) and weaving material (4.8 %) ($X^2 = 48.54$; $p < 0.0001$).

There were no differences in the prices of the same NTFPs sold by 71 % of the sellers in the same vicinity. On the other hand, there were differences in the prices of the same NTFPs sold by about 18.3 % of the sellers. For other sellers, there were no other sellers in the immediate vicinity to compare their prices with (9 %) and some didn't know how their prices compare with the prices of other sellers (1.7 %).

The majority (58.7 %) of the sellers were unwilling to lower their prices. On the other hand, about 41.3 % of the sellers reported lowering prices for various reasons. For instance, many sellers (36.2 %) were prepared to lower their prices because they felt empathy for the customers, to increase sales (27.4 %) and to build relationships with customers (25.8 %) (Table 24).

Table 24: The reasons NTFP sellers lower their prices or sell on credit

Reasons for lowering prices	Number of sellers	% of sellers	Reasons for selling on credit	Number of sellers	% of sellers
Empathy	45	36.2	Trustworthy customers	60	34.9
Increase sales	34	27.4	Build relationships with customers	28	16.3
Build relationships with customers	32	25.8	To customers with a stable source of income	24	14.0
Financial needs of the seller	11	8.8	Empathy	23	13.4
Perishability	2	1.6	To regular customers	23	13.3
Empathy	45	36.2	Increase sales	14	8.2

There were no differences in the attributes of the sellers (sex, age, trading years and level of education) who were willing to lower prices and those who were not willing to lower prices. Approximately, 87.1 % of the sellers who were willing to lower prices were selling in urban markets, whilst 12.9 % were selling from home ($X^2 = 5.38$; $p < 0.05$). In contrast, 68.6 % of the sellers who were unwilling to lower their prices were selling in urban markets, whilst 31.4 % were selling from home. The most frequently sold NTFPs by sellers who were willing to lower prices were traditional brooms and brushes (27.7 %), traditional mats (25.1 %), weaving material (14.1 %), medicinal plants (11 %) and firewood (7.3 %). On the other hand,

the most frequently sold NTFPs by sellers who were unwilling to lower prices were traditional brooms and brushes (29.9 %), traditional mats (21.8 %), medicinal plants (9 %), edible insects (9 %) and wooden utensils (7.1 %).

About 53.7 % of the sellers reported that they offer discount to customers who buy in bulk, but 46.3 % do not. For those sellers who offered discount, they did so about three times per month. There were no differences in the attributes of the sellers (sex, age, trading years and level of education), who were offering discount and those who were not offering discount. The most frequently sold NTFPs by sellers who were offering discount were traditional mats (32.5 %), traditional brooms and brushes (26.8 %), weaving material (14.6 %), medicinal plants (7.3 %) and firewood (6.5 %). Conversely, the most frequently sold NTFPs by sellers who were not offering discount were traditional brooms and brushes (32.1 %), medicinal plants (14.1 %), wooden utensils (11.5 %), edible insects (10.3 %) and traditional mates (9 %).

The majority (57.3%) of the sellers did sometimes sell NTFPs on credit, whilst about 42.7% of the sellers did not sell on credit. For those sellers who sell on credit, they do so at least five times per month. Many sellers (34.9 %) sold on credit because they trusted their customers and they wanted to build good relationships with customers (16.3 %) (Table 24).

There were no differences in the mean average trading years (9 ± 7.8 and 10.2 ± 8.5 years) and level of education (6.4 ± 3.6 and 6.2 ± 4.2) of the sellers who were willing to sell on credit and those who were not willing to sell on credit. The mean average age of the traders who were willing to sell on credit was 49.2 ± 11.2 years, whilst it was 45.4 ± 12.1 years for the sellers who were not selling on credit. About 82.6 % of the sellers who were selling on credit were women, with only 17.4 % being men. On the other hand, 65.6 % of the sellers who were not selling on credit were women, whilst 34.4 % were men ($X^2 = 7.61$; $p < 0.01$). There was a difference in the most frequently sold NTFPs by sellers who were selling on credit and those who were not selling on credit. For instance, the most frequently sold NTFPs by sellers who were selling on credit were traditional mats (29.1 %), traditional brooms and brushes (28.6 %), weaving material (11.9 %), firewood (6.6 %) and edible insects

(6.6 %). In contrast, the most frequently sold NTFPs by sellers who were not selling on credit were traditional brooms and brushes (29.1 %), traditional mats (16 %), medicinal plants (16 %), firewood (7.4 %) and weaving material (7.4 %).

3.2.6 Factors influencing sellers to lower prices or sell on credit

When the top five reasons for sellers lowering their prices were analysed via GLM, the factors that influence sellers to lower their prices, were number of years trading, number of trading days per week, number of trading hours per day, medicinal plants, traditional sticks and edible insects (Table 25). Even though the R-squared values seem low, the significant coefficients still provide important information on how changes in the predictor values are associated with changes in the response value. There was a significant and positive relationship between number of trading years of the seller and the price lowering factor, increase sales. This suggests that experienced sellers were willing to lower prices so that they can sell many products.

The number of trading days per week was significantly and negatively related to the price lowering factor, increase sales. The number of trading hours per day was significantly and negatively related to the price lowering factor, build relationships with customers. Conversely, number of trading hours per day was significantly and positively related to price lowering factor, empathy. Thus, sellers who traded for long hours per day were likely to show empathy towards their customers, whereas sellers who sold for a few hours per day were likely not to lower prices to customers for the sake of building relationships with customers.

There was a significant and positive relationship between sellers of medicinal plants and edible insects and the price lowering factor, empathy. Similarly, the price lowering factor, build relationships with customers, was significantly and positively related to sellers of traditional sticks. Therefore, sellers of medicinal plants and edible insects were likely to lower prices because they feel empathy for the customer. On the other hand, sellers of traditional sticks were likely to lower prices to build relationships with customers.

Table 25: Factors influencing sellers to lower prices of NTFPs

	Build relationships with customers				Empathy				Increase sales			
Effect	Coefficient	SE	t-value	p	Coefficient	SE	t-value	p	Coefficient	SE	t-value	p
Intercept	1.3516	0.6942	1.9469	**0.0561**	-0.3270	0.6023	-0.5429	0.5891	0.8904	0.8329	1.0691	0.2892
Trading years	0.0001	0.0064	0.0156	0.9876	-0.0024	0.0055	-0.4298	0.6688	0.0202	0.0077	2.6445	**0.0104**
Trading days/week	0.0518	0.0525	0.9864	0.3278	-0.0118	0.0456	-0.2587	0.7967	-0.1349	0.0630	-2.1406	**0.0362**
Trading hours/day	-0.0633	0.0313	-2.0216	**0.0475**	0.0555	0.0272	2.0435	**0.0453**	0.0622	0.0376	1.6566	0.1027
Medicinal plants	0.0337	0.0739	0.4554	0.6504	0.1372	0.0641	2.1389	**0.0364**	0.0177	0.0887	0.1995	0.8426
Traditional sticks	0.5577	0.1900	2.9349	**0.0047**	0.1418	0.1649	0.8603	0.3930	0.0253	0.2280	0.1111	0.9119
Edible insects	-0.1935	0.1478	-1.3098	0.1951	-0.2198	0.0886	2.4807	**0.0158**	0.0519	0.1773	0.2928	0.7707
	$R = 0.6901$; $R^2 = 0.4763$; $R_{adj}^2 = 0.3495$				$R = 0.5597$; $R^2 = 0.3132$; $R_{adj}^2 = 0.1471$				$R = 0.5597$; $R^2 = 0.3132$; $R_{adj}^2 = 0.1471$			
	$F = 1.4354$; $p = 0.1596$				$F = 3.7585$; $p = 0.0001$				$F = 1.8852$; $p = 0.423$			

The GLM regression analysis results show that highest school grade attained by the seller was significantly and positively related to the credit factor, to trusted customers only (Table 26). On the other hand, there was a significant and negative relationship between highest grade attained by the seller and the credit factor, to customers with a stable source of income. Thus, sellers who attained high school grades were likely to sell on credit to customers they trust, whereas sellers with low school grades were inclined to sell on credit to customers with a stable source of income.

Age of the seller was significantly and positively related to the credit factor, empathy towards a customer. Conversely, there was a significant and negative relationship between the age of the seller and the credit factor, to customers with a stable source of income. This suggests that old sellers were likely to sell on credit to customers they feel empathy for. On the other hand, young sellers were inclined to sell on credit to customers with a stable source of income. The number of trading years of the seller was significantly and positively related the to the credit factor, to customers with a stable source of income, suggesting that experienced sellers were inclined to sell on credit to customers with a stable source of income. There was a significant and negative relationship between the number of trading days per week and credit factor, build relationships with customers. Thus, sellers who sold for few days per week were unlikely to sell on credit for the sake of building relationships with customers.

The significant and positive relationship between credit factor, to trusted customers only and sellers of crafts and wild vegetables suggests that sellers of crafts and wild vegetables were inclined to sell on credit to trustworthy customers. Similarly, credit factor, build relationships with customers, was significantly and positively related to sellers of firewood, suggesting that sellers of firewood were likely to sell on credit to build relationships with customers. There was a significant and positive relationship between credit factor, to regular customers only and sellers of weaving material and edible insects. Similarly, credit factor, to customers with a stable source of income, was significantly and positively related to sellers of weaving material. Therefore, sellers of weaving materials were likely to sell on

Table 26: Factors influencing sellers to sell NTFPs on credit

Effect	To trusted customers only				Build relationships with customers				To regular customers only				Empathy				To customers with a stable source of income			
	Coef	SE	t	p	Coef	SE	t	p	Coef	SE	t	p	Coef	SE	t	p	Coef	SE	t	p
Intercept	1.166	0.712	1.638	0.104	0.670	0.376	1.780	0.078	-0.796	0.441	-1.806	0.074	0.526	0.340	1.545	0.125	-0.031	0.391	-0.079	0.937
Trading years	-0.003	0.007	-0.467	0.642	-0.003	0.004	-0.871	0.386	0.003	0.004	0.727	0.469	-0.004	0.003	-1.288	0.200	0.011	0.004	2.880	**0.005**
Trading days/week	0.037	0.047	0.783	0.435	-0.072	0.025	-2.927	**0.004**	0.009	0.029	0.304	0.761	-0.002	0.022	-0.110	0.912	0.019	0.026	0.751	0.454
Age of seller	0.009	0.005	1.731	0.086	-0.002	0.003	-0.644	0.521	-0.006	0.003	-1.856	0.066	0.005	0.002	2.161	0.033	-0.009	0.003	-3.392	**0.001**
Highest grade attained	0.036	0.014	2.559	**0.012**	-0.008	0.007	-1.085	0.280	-0.009	0.009	-1.005	0.317	0.000	0.007	0.034	0.973	-0.024	0.008	-3.068	**0.003**
Firewood	-0.018	0.097	-0.181	0.857	0.117	0.051	2.269	**0.025**	0.114	0.060	1.889	0.061	-0.005	0.047	-0.109	0.913	0.061	0.053	1.145	0.255
Weaving material	-0.081	0.064	-1.258	0.211	0.005	0.034	0.141	0.888	0.095	0.040	2.382	**0.019**	-0.030	0.031	-0.984	0.327	0.077	0.035	2.177	**0.032**
Medicinal plants	-0.015	0.107	-0.139	0.890	0.039	0.057	0.684	0.495	-0.023	0.066	-0.351	0.727	0.181	0.051	3.523	**0.001**	0.029	0.059	0.490	0.625
Traditional sticks	-0.101	0.191	-0.531	0.597	0.042	0.101	0.415	0.679	0.126	0.118	1.066	0.289	0.240	0.091	2.624	**0.010**	0.026	0.105	0.247	0.805
Crafts	0.547	0.271	2.022	**0.046**	0.024	0.143	0.167	0.868	0.249	0.167	1.488	0.139	-0.058	0.129	-0.451	0.653	0.202	0.148	1.364	0.175
Wild vegetables	0.329	0.161	2.044	**0.043**	-0.008	0.085	-0.089	0.929	0.132	0.100	1.326	0.188	-0.010	0.077	-0.132	0.895	0.089	0.088	1.012	0.314
Edible insects	-0.028	0.099	-0.282	0.778	0.015	0.053	0.284	0.777	0.138	0.061	2.249	**0.026**	0.102	0.047	2.156	**0.033**	0.079	0.054	1.454	0.149
	$R = 0.3832$; $R^2 = 0.147$; $R_{adj}^2 = 0.017$				$R = 0.494$; $R^2 = 0.244$; $R_{adj}^2 = 0.130$				$R = 0.408$; $R^2 = 0.166$; $R_{adj}^2 = 0.040$				$R = 0.508$; $R^2 = 0.258$; $R_{adj}^2 = 0.145$				$R = 0.548$; $R^2 = 0.300$; $R_{adj}^2 = 0.194$			
	$F = 1.134$; $p = 0.331$				$F = 2.132$; $p = 0.010$				$F = 1.314$; $p = 0.197$				$F = 2.287$; $p = 0.005$				$F = 2.829$; $p = 0.001$			

credit to both regular and customers with a stable source of income. On the other hand, sellers of medicinal plants, traditional sticks and edible insects were inclined to sell on credit to customers they have empathy for. This is demonstrated by the significant and positive relationship between credit factor, empathy towards a customer, and sellers of medicinal plants, traditional sticks and edible insects.

4 Discussion

The NTFP trade was dominated by women, with 75.3 % being women and 24.7 % men. This is line with other studies that have shown that the NTFP trade is usually dominated by women (Adam and Pretzsch, 2010; Agea et al., 2013; Famuyide et al., 2012; Pereira et al., 2006; Shackleton et al., 2008). The number of years trading showed a wide range, from 1 to 40 years, with a mean of 10 ± 8.1 years. About 55.3 % of the sellers had less than 10 years of trading. This is line with findings by Shackleton et al. (2008) who noted that about 50 % of the sellers of traditional brooms had a maximum of 10 years of trading in Bushbuckridge, South Africa. This suggests that there is a high turnover of sellers in the NTFP trade, especially in light of 73 % saying that the number of traders had increased in last five years. The majority (79.3 %) of the sellers reported that selling NTFPs was their main source of income, with only 8 % and 5.7 % receiving their main income from state child grants and state pension grants, respectively. This is in contrast with many South African studies (see for example, Daniels et al., 2013; Mtati, 2014; Perret et al., 2005; Thondhlana and Muchapondwa, 2014; Tshuma and Monde, 2012) that have shown higher percentages of households relying on state grants as their main source of income.

The NTFP trade across all sites was dominated by traditional brooms and hand brushes, traditional mats, weaving material and medicinal plants. Most of these NTFPs are largely cultural items rather than utilitarian or consumptive. This is in line with many studies that recorded widespread usage of such NTFPs mainly for cultural purposes (Cocks et al., 2011; Pereira et al., 2006; Shackleton et al., 2007). Undoubtedly, NTFP trade is an important source of income for many sellers, with about 79.3 % of the sellers indicating that the share of NTFP trade income to total household cash income is more than 50 %. Similar to this finding, Yemiru et al. (2010) noted that in Bale Highlands, southern Ethiopia, cash income from NTFPs was the most important source of cash income (53 %) almost throughout the

year. Likewise, Adam and Pretzsch (2010) noted that the share of income from trading wild fruit (54 %) was significantly bigger than the other shares of sources of income, such as crop (19 %) and livestock (6 %) production in Rashad, Sudan. In Bushbuckridge, South Africa, Shackleton et al. (2008) noted that about 77 % of the sellers of crafts reported that more than 50 % of their total household cash income came from selling crafts. Pereira et al. (2006) reported that about 25 % of the crafters ranked selling crafts as their most important source of cash income, with about 70 % ranking selling crafts as their second most important source of cash income in certain villages in the Eastern Cape province of South Africa.

Given that many rural towns in South Africa are characterised by limited employment opportunities (Neves et al., 2009; Posel et al., 2013), it is not surprising that about 46 % of the sellers stated that they started selling NTFPs because they wanted to generate cash income, whilst about 21.3 % of the sellers stated that there were no jobs. This echoes much other work in the region, for instance, Shackleton et al. (2008) found that in Bushbuckridge, South Africa, there was a general growth in the trade of certain NTFPs mainly due to lack of employment opportunities, job losses, HIV/AIDs and high living costs. Similarly, Pereira et al. (2006) reported that about 55 % of the respondents started selling crafts due to the lack of alternative cash income earning sources. Therefore, selling of NTFPs provides an opportunity for cash-constrained households to earn cash, especially in those communities where other income earning sources are limited (see for example, Adam and Pretzsch, 2010; Pereira et al., 2006; Shacketon et al., 2008; Yemiru et al., 2010). Indeed, as noted in this study the majority (73.3 %) of the sellers reported that the number of sellers has increased in the previous five years, with about 56.8 % of the sellers attributing this to limited employment opportunities and perceived high income from trading (11.4 %).

The pricing factors tended to vary with the type of NTFP being sold, type of market (home markets or urban markets), and the method used by the seller to procure the stock. Overall, the widely reported pricing factors were transport costs (29 %), stock price (18.4 %), profit margin (12.7 %), time taken to collect or produce the product (7.3 %) and the market price (6.4 %). This finding is contrary to the findings by Agea et al. (2013) who reported that

sellers of wild and semi-wild food plants in Bunyoro-Kitara Kingdom, Uganda, based their prices on daily market demand (73 %), time and risks involved in harvesting the plants (56 %), prices of substitutes (40 %), previous or past season's prices (35 %) and costs incurred from suppliers (22 %). However, what was similar between the findings of this study and the findings by Agea et al. (2013) is that there is no a formal mechanism (pricing based on total costs incurred, pricing based on competition or pricing based on demand) that is used by the sellers to set the prices of NTFPs. Similarly, Ham et al. (2008) noted that in some southern African countries, there are no certain mechanisms that are used to set prices of wild edible plants, particularly the indigenous fruit. Likewise, in west and central Africa, there is no a clear system used by sellers to set prices for wild food plants (Tchoundjeu et al., 2008).

Under cost based pricing, the seller can either use mark-up pricing (cost plus pricing), full cost pricing (absorption cost pricing) or marginal cost pricing. With mark-up pricing, the price is derived simply by adding a mark-up to the cost of the product (Cannon and Morgan, 1990; Rogers, 1990). Even though some of the sellers mentioned that they take into account costs incurred when setting prices of NTFPs, they sometimes fail to take into account all costs incurred. Therefore, even though this pricing strategy is akin to 'cost based pricing', sellers do not seem to know how to fully implement it. For instance, many sellers of traditional mates reported that they take into account transport costs, airtime costs and food costs when setting prices. However, they did not mention other important pricing factors such as stock price (given that many buy their stock), storage costs and rent. Therefore, they run a risk of selling some of their products at a loss. Moreover, some sellers mentioned some pricing factors (amount of physical energy used to collect or produce the products, guided by ancestors and difficulty in gathering or producing the product) that are difficult to turn into monetary terms.

It was observed during interviews that there is some subjectivity or sentimentalism underlying the setting of prices. For example, some sellers lower their prices because they want to build relationships with customers (12.9 %), they feel empathy towards the seller (10.5 %) or to customers who complain about the price (3.2 %). This concurs with findings by Pereira et al. (2006), who noted that sellers of reed crafts products in certain rural villages of

Eastern Cape, South Africa, were mostly price takers as many buyers always haggle for lower prices. In addition, some crafters cannot stand firm on fixed prices as they wish to maintain a good reputation and relationships in the community. Shackleton (2005) reported a similar pattern in Bushbuckridge, South Africa, where wood carvers were largely price takers as most buyers were willing to pay about one-third of the original set price. This kind of pricing behaviour is similar to discount pricing, where discounts and allowances are price concessions offered to customers in the form of reductions of the originally set price (Singh, 2013). Thus, they are forms of indirect price competition.

Interestingly, seller attributes such as the age, sex, highest grade education, years trading, number of trading days per week and the number of trading hours per day had some influence on whether the seller will lower prices or sell on credit. In addition, the type of NTFP being sold by the seller also had a bearing on either the seller will lower prices or sell on credit.

Some sellers bought their stock in bulk as a group and they in turn discuss the maximum prices they should charge for each product. Thus, it was noted that the prices of NTFPs sold by 71 % of the sellers were the same. However, individual sellers were free to lower the prices as they see fit. It was noted that some NTFP sellers have learnt that customers often ask for a discount or a lower price, therefore the sellers tended to put a mark-up on the prices to cushion themselves against selling the products at a loss. Therefore, price discrimination was noted in many markets. Furthermore, this pricing method is akin to skimming pricing, where the seller skims the market by setting a high premium price for a certain product and then lowers the price over time (Rogers, 1990; Spann et al., 2015).

Even though, the sellers stated various reasons for lowering prices, it was noted during interviews that the percentage reduction in the price is mainly determined by the seller's assessment of the buying power of the customer, the loyalty of the customer and the ability of the customer to negotiate for a lower price. This behaviour was reported by Agea et al. (2013) in Bunyoro-Kitara Kingdom, Uganda, where they noted that a mere look at the potential buyer by the seller would sometimes help the seller to determine the price to

charge the potential buyer. Botha et al. (2004) reported the same amongst medicinal plant sellers in the Lowveld, South Africa.

The GLM regression analysis did not find any significant relationship between factors such as the age of the seller, highest grade attained by the seller, trading years of the seller, number of trading days per week and the number of trading hours per day and the pricing factors. Conversely, Famuyide et al. (2012) noted in two markets of Bitter Kola (*Garcinia kol)* and Alligator Pepper (*Aframomum melegueta elegueta)* in Ibadan, Nigeria, that age of the seller, level of education of the seller and experience in the trade by the seller had significant positive effects in price determination of the two products. However, the sex of the seller had significant relationship with pricing factors such as transport costs, entrance fees to access forests and the availability of the NTFPs. Furthermore, the significant pricing factors varied with the type of the NTFP being sold.

5 Conclusions

The results of this study showed that NTFP trading is the main source of income for 79 % of the sellers, with the same percentage of NTFP sellers reporting that the share of NTFP trade income to total household cash income is more than 50 %. For those sellers, who reported that trading NTFPs is not their main source of income, their average share of NTFP trade income to total household income was 28 %. Therefore, even if NTFP trade income is not the main source of income, it still contributes significantly to the total household income.

Pricing of NTFPs is very important if the sellers of NTFPs are to run profitable businesses in markets characterised by many buyers who usually seek to negotiate for low prices and some sellers who cannot stand firm on the original set price. There are various factors that sellers of NTFPs take into account when selling prices of NTFPs. The pricing factors considered by sellers when setting the prices of NTFP tended to vary with the type of NTFP being sold, type of market (home markets or urban markets) and the method used by the seller to procure the stock. However, overall, transport costs, stock price, profit margin, time taken to collect or produce the product and market price are the widely used factors to determine prices for NTFPs. The reported various pricing factors show that there is no a formal or certain price mechanism that is used by the sellers of NTFPs to establish the

market prices of NTFPs. In some cases, the pricing factors used by sellers of NTFPs are difficult to quantify or turn into monetary terms. Even though in some cases, sellers seemed to be following discount pricing, skimming pricing and mark-up pricing, these pricing strategies are not clearly used or adhered to by the sellers. In most cases, the prices seemed to be set through price discovery, rather than through price determination. This could be due to the nature of the poorly developed or imperfect NTFP markets in rural areas.

References

Adam, Y.O. and Pretzsch, J., 2010. Contribution of local trade in *Ziziphus spina-christi L.* fruits to rural household's economy in Rashad locality, Sudan. *Forestry Ideas*, 16(39), 19-27.

Agea, J.G., Okia, C.A., Obaa, B.B., Munga, J., Isubikalu, P., Woiso, D.A., Obua, J. and Teklehaimanot, Z., 2013. Market conduct and performance of wild and semi-wild food plants traded in Bunyoro-Kitara Kingdom, Uganda. *African Journal of Environmental Science and Technology,* 7(6), 457–471.

Anbarci, N., Gomis-Porqueras, P. and Pivato, M., 2012. Formal and informal markets: a strategic and evolutionary perspective. MPRA Paper No. 42513. Accessed 7 March 2015, https://mpra.ub.uni-muenchen.de/42513/1/MPRA_paper_42513.pdf

Botha, J., Witkowski, E.T.F. and Shackleton, C.M., 2004. Market profiles and trade in medicinal plants in the Lowveld, South Africa. *Environmental Conservation*, 31(1), 38–46.

Cannon, H.M., and Morgan, F.W., 1990. A strategic pricing framework. *The Journal of Services Marketing*, 4(2), 19–30.

Cocks, M., Lopez, C. and Dold, T., 2011. Cultural importance of non-timber forest products: opportunities they pose for bio-cultural diversity in dynamic societies. In Shackleton, S., Shackleton, C. and Shanley P., ed. Non-timber forest products in the global context. Springer-Verlag, Berlin, Heidelberg, 107-128.

Daniels, R.C., Partridge, A., Kekana, D. and Musundwa, S., 2013. Rural Livelihoods in South Africa. Cape Town: SALDRU, University of Cape Town. SALDRU Working Paper Number 122/ NIDS Discussion Paper 2013/4.

Famuyide, O., Adebayo, O., Adeniran, O. and Owese, T., 2012. Price determination of *Garcinia kola* (Bitter Kola) and *Aframomum melegueta elegueta* (Alligator Pepper) in Ibadan, Oyo State. *Journal of Biology, Agriculture and Healthcare,* 2(7), 52–60.

FPRDI-ITTO. 2012. Assessment of marketing of non-timber forest products. Project Technical Report. Los Baños, Laguna Philippines. Assessed 2 April 2014, http://www.itto.int/files/user/pdf/PROJECT_REPORTS/Assessment%20of%20Marketing%20

NTFPs%20-%20PD%20448-07%20R2%20(I).pdf

Ham, C., Akinnifesi, F.K., Franzel, S., Du, P.S., Jordaan, D., Hansmann, C., Ajayi, O.C. and De Kock, C., 2008. Opportunities for commercialization and enterprise development of indigenous fruits in southern Africa. Cited in Agea, J.G., Okia, C.A., Obaa, B.B., Munga, J., Isubikalu, P., Woiso, D.A., Obua, J. and Teklehaimanot, Z., 2013. Market conduct and performance of wild and semi-wild food plants traded in Bunyoro-Kitara Kingdom, Uganda. *African Journal of Environmental Science and Technology,* 7(6), 457–471.

Mahapatra, A.K. and Tewari, D.D., 2005. Importance of non-timber forest products in the economic valuation of dry deciduous forests of India. *Forest Policy and Economics*, 7(3), 455–467.

Martinez, F.R., 2004. Non timber forest products in Colombia: review of constraints for effective commercialisation. MSc thesis. The University of Queensland, Brisbane.

Mtati, N., 2014. The relative contribution of non-timber forest products, agriculture and off-farm sources of income to rural households in Koloni and Guquka, Eastern Cape. MSc thesis. Rhodes University, Grahamstown.

Ndoye, O., Ruiz Pérez, M. and Eyebe, A., 1997. *The markets of non-timber forest products in the humid forest zone of Cameroon.* ODI Rural Development Forestry Network, Paper No. 22c. London, ODI.

Neves, D., Samson, M., Van Niekerk, I., Hlatshwayo, S. and Du Toit, A., 2009. The use and effectiveness of social grants in South Africa. Institute for Poverty, Land and Agrarian Studies (PLAAS).

Pereira, T., Shackleton, C. and Shackleton, S., 2006. Trade in reed-based craft products in rural villages in the Eastern Cape, South Africa. *Development Southern Africa*, 23(4), 477–495.

Perret, S., Anseeuw, W. and Mathebula, N., 2005. *Poverty and livelihoods in rural South Africa. Investigating diversity and dynamics of livelihoods. Case studies in Limpopo*. Unpublished Project report num.05/01, Kellogg's Foundation. University of Pretoria, 65p. Accessed 7 March 2014, http://ageconsearch.umn.edu/bitstream/60885/2/2005-01.pdf

Peterson, P., 2014. Fixing prices and fixing markets. *Farmdoc Daily,* 4:118, Department of Agricultural and Consumer Economics, University of Illinois at Urbana-Champaign, June 25, 2014. Accessed 24 March 2014, http://farmdocdaily.illinois.edu/2014/06/fixing-prices-and-fixing-markets.html

Posel, D., Casale, D. and Vermaak, C., 2013. The unemployed in South Africa: why are so many not counted? Accessed 18 July 2014, http://www.econ3x3.org/sites/default/files/articles/Posel%20et%20al%20Feb%202013%20Measuring%20unemployment%20FINAL_0.pdf

Rogers, L., 1990. *Pricing for profit*. Basil Blackwell Ltd, Oxford.

Shackleton, C.M., Shackleton, S.E., Buiten, E. and Bird, N., 2007a. The importance of dry woodlands and forests in rural livelihoods and poverty alleviation in South Africa. *Forest Policy and Economics*, 9(5), 558–577.

Shackleton, C.M., Shackleton, S.E., Ntshudu, M. and Ntzebeza, J., 2002a. The role and value of savannah non-timber forest products to rural households in the Kat River Valley, South Africa. *Journal of Tropical Forest Products*, 8(1) 45-65.

Shackleton, S.E., 2005. The significance of the local trade in natural resource products for livelihoods and poverty alleviation in South Africa. PhD thesis. Rhodes University, Grahamstown.

Shackleton, S.E., Shackleton, C.M., Netshiluvhi, T.R., Geach, B.S., Ballance, A. and Fairbanks, D.H.K., 2002b. Use patterns and value of savanna resources in three rural villages in South Africa. *Economic Botany*, 56(2), 130–146.

Singh, M., 2013. Important Pricing Methods in 4P's. *International Journal of Management and Business Studies*, 3(2), 147–150.

Spann, M., Fischer, M. and Tellis, G.J., 2014. Skimming or penetration? strategic dynamic pricing for new products. *Marketing Science*, 34(2), 235–249.

Tchoundjeu, Z., Atangana, A., Asaah, E., Tsobeng, A., Facheux, C., Foudjem, D., Mbosso, C., Degrande, A., Sado, T., Kanmegne, J., Mbile, P., Tabuna, H., Anegbeh, P. and Useni, M., 2008. Domestication, utilisation and marketing of indigenous fruit trees in west and central Africa. Cited in Agea, J.G., Okia, C.A., Obaa, B.B., Munga, J., Isubikalu, P., Woiso, D.A. and Teklehaimanot, Z., 2013. Market conduct and performance of wild and semi-wild food plants traded in Bunyoro-Kitara Kingdom, Uganda. *African Journal of Environmental Science and Technology*, 7(6), 457–471.

Tee, N.T., Jimoh, S.O. and Popoola, L., 2009. Marketing system of non-timber forest products: the case of Palmyra Palm in north-eastern Nigeria. *Journal of Research in Forestry, Wildlife and Environment*, 1(1), 36-45.

Thondhlana, G. and Muchapondwa, E., 2014. Dependence on environmental resources and implications for household welfare: Evidence from the Kalahari drylands, South Africa. *Ecological Economics*, 108, 59–67.

Tshuma, M.C. and Monde, N., 2012. A socio-economic impact assessment of a project to identify and implement best management practices at the Zanyokwe Irrigation Scheme at farm level. *Water SA*, 38(5), 783-792.

Ward, C.E. and Schroeder, C.T., 2002. Price determination versus price discovery. Managing for today's cattle market and beyond. Accessed 24 March 2014, http://cattlemarketanalysis.org/class/PriceDeterminationvsDiscov.pdf

Yemiru, T., Roos, A., Campbell, B. and Bohlin, F., 2010. Forest incomes and poverty alleviation under participatory forest management in the Bale Highlands, southern Ethiopia. *International Forestry Review*, 12(1), 66–77.

CHAPTER 5: THE SAFETY NET FUNCTION OF NTFPS IN DIFFERENT AGRO-ECOLOGICAL ZONES OF SOUTH AFRICA

1 Introduction

NTFPs play important roles in the livelihoods of many households. A key use is as 'safety nets' when rural households or communities rely on them to bridge periods of hardship (Hunter et al., 2011; Liswanti et al., 2011; López-Feldman, 2014; Paumgarten and Shackleton, 2011; Takasaki, 2011; Wunder et al., 2014). Shackleton and Shackleton (2004) note that NTFPs act as safety nets when they are used as a coping strategy in assisting households to cope with hardships such as droughts, death of breadwinners, floods, etc. Furthermore, NTFPs are used as a 'daily net', therefore functioning as a 'cost saving' for poor households and the government (Shackleton and Shackleton, 2004; Shackleton et al., 2007). This makes it possible for these households to invest the saved money in other important livelihood strategies like education, agriculture or small businesses (Paumgarten, 2005; Shackleton et al., 2007).

The use of NTPFs as a coping strategy during times of misfortune includes substituting previously purchased goods with NTFPs, and temporary selling of NTFPs to augment household income or increased use of NTFPs already used (Shackleton and Shackleton, 2004). Even though the absolute cash income obtained from selling NTFPs might not be high, it might be crucial in coping with the misfortune (Belcher and Schreckenberg, 2007; Shackleton, 2005). The safety net function of NTFPs is particularly essential to poor and vulnerable households (Shackleton and Shackleton, 2004), especially in rural areas where livelihoods are prone to crop failure or seasonal flooding, and price shocks (Delacote, 2007). However, being driven into NTFP trade as a coping response, such trade often becomes a stable livelihood activity (McSweeney, 2005a; Paumgarten and Shackleton, 2011; Shackleton et al., 2008).

The dependence on NTFPs by rural households normally increases after an unexpected misfortune. For instance, McSweeney (2005b) reported that in Honduras, selling of NTFPs was an important coping strategy for young households during financial crises. Debela et al. (2012) found that in Uganda the harvesting of NTFPs for both cash and subsistence needs,

particularly by the asset-poor households, increased following large negative shocks. Takasaki et al. (2004) showed that in Peru households responded to flooding by increasing cropping land and gathering of NTFPs. Similarly, Liswanti et al. (2011) found that in Indonesia households responded to flooding by increasing their dependence on NTFPs, particularly those most heavily affected by floods and the poorest. Moreover, households providing help to affected households may, in turn, use NTFPs to cope (Takasaki, 2011).

Paumgarten and Shackleton (2011) showed that in two South African villages over a two year period that 70 % of households used NTFPs as a safety net in times of shocks. In addition, the households used NTFPs to cope with anticipated times of vulnerability such as seasonal low crop yields and payment of school fees. In south-eastern Zimbabwe, rural households responded to HIV/AIDS-related economic shocks by harvesting more NTFPs to smooth both consumption and income (Mutenje et al., 2011). Thus, approximately 48 % of the total household income shortfall caused by HIV/AIDS was offset by harvesting more NTFPs.

Wunder et al. (2014) used the global Poverty and Environment Network (PEN) data to examine the role played by forests and wildlands as safety nets. They reported that about 44.3 % of the households who experienced a shock in the preceding year reported environmental and forest use as their response. Their findings are in line with other studies (Fisher et al., 2010; Mutenje et al., 2011; Paumgarten and Shackleton, 2011; Völker and Waibel, 2010) that recorded that rural households turn to NTFPs in times of unanticipated misfortune amongst other strategies (e.g. relying on kinship, reducing the amount of food consumed) to smooth the crisis.

The type of shock experienced by the household shapes the forest responses (DFID, 1999; Mcsweeney, 2005a; Paumgarten and Shackleton, 2011; Wunder et al., 2014). For instance, Wunder et al. (2014) reported that shocks in their PEN sample were mainly either covariate crop failure or idiosyncratic illnesses and deaths. Households that experienced idiosyncratic shocks turned to different coping strategies, with marginal use of NTPFs (6-8 %). As for the covariate shocks, households responded by reducing consumption and harvesting more NTFPs (14 %). The households' response to idiosyncratic shocks in the PEN sample is

different from the responses recorded by Hunter et al. (2011), Mutenje et al. (2011) and Paumgarten and Shackleton (2011) where the use of NTFPs was significant.

Various South African studies (Hunter et al., 2011; Paumgarten and Shackleton, 2011; Shackleton and Shackleton, 2004) have shown that rural households use NTFPs as safety nets in times of misfortune. However being focussed on one or two sites, they do not provide a comprehensive picture of the prevalence of NTFP use. In addition, they do not show the use of NTFPs as safety nets by rural households in different agro-ecological zones. In low agro-ecological zones, livelihoods are likely to be prone to many shocks such as crop failure, major livestock loss, seasonal flooding, and price shocks (Babulo et al., 2008; Barrett et al., 2001; Delacote, 2007). In their PEN sample, Wunder et al. (2014) reported high shock intensity in Africa as compared to Asia and Latin America, with about 76 % of the shocks being moderate and 39 % severe shocks. They attributed this to dry climatic conditions and the poor asset base that exposes many households to shocks. Therefore, I hypothesised that households in low agro-ecological zones are in a precarious setting and are likely to experience more shocks and of greater severity. Consequently, these households are likely to use NTFPs as safety nets more than households in high agro-ecological zones. In addition, households with a high contribution of NTFPs to total household income are more likely to use NTFPs as safety nets since they already have the aptitude to harvest NTFPs. Therefore, the aim of this chapter was to establish the nature and extent of the use of NTFPs as safety nets in multiple sites of varying agro-ecological potential.

2 Methods

2.1 Site selection

See section 2.1 in chapter 2.

2.2 Data collection

2.2.1 Household interviews

ARCVIEW's random selection function was used to randomly select 50 households per village. Therefore, a total of 1 200 households were interviewed across all sites. The interviews were conducted from September 2014 to June 2015. A structured questionnaire

was used to collect data. The questionnaire included sections on shocks experienced, responses to shocks and socio-economic characteristics of the household. The household head or an adult member of the household with good knowledge of the shocks experienced by the household and the response strategies of the household was interviewed. Local field assistants with good knowledge of the study area and experience in collecting data were recruited to help with translating the English questionnaires. The author was responsible for the daily supervision of the field assistants. Data cleaning, coding and data entry into STATISTICA 13 software was done by the author.

This study was based on a one year recall period for shocks. To ensure that the data collected from households were of good quality, the households were given a list of possible shocks to help them understand what we meant by shocks. The categorisation of the shocks was based on the recommendations by PEN (2007). These categories include (1) illness, (2) death, (3) serious crop failure, (4) hunger or food shortage, (5) land loss, (6) major livestock loss, (7) other major asset loss, (8) lost wage employment and (9) wedding or other costly social events.

Households were asked if they had experienced a given shock and if so how did they respond to that particular shock. Following on the recommendations by PEN (2007) and the approach by Wunder et al. (2014), the households were also asked to state the severity of the shock, that is, either moderate or severe. Based on the approach used by Paumgarten (2007) and PEN (2007) the responses were classified into 22 categories (see Annexure 1). In addition to other response strategies, households were asked more specific research questions about the use of NTFPs during times of hardships. Thus, they were asked (Paumgarten, 2007) (1) if they used more NTFPs than they normally use, (2) consumed NTFPs they don't usually use under normal circumstances, (3) sold more NTFPs than they normally do and (4) sold NTFPs they do not usually sell. The data was analysed using STATISTICA 13 software.

2.3 Data analysis

Frequency distributions were used to represent shocks faced by rural households, coping strategies used by rural households to cope with hardships and the use of NTFPs as safety nets. A general linear model (GLM) regression analysis was applied to identify the factors affecting the usage of NTFPs as safety nets by rural households. The independent variables used included household characteristics such as sex, education and age of the household head, size of the household, total annual household income, relative NTFP income, agro-ecological class, number of shocks and types of shocks experienced by households.

3 Results

3.1 Number of shocks experienced by households

About 79 % of the total households interviewed reported experiencing at least one shock of some magnitude in the previous 12 months. Thus, a total of 948 out of the 1 200 interviewed households experienced at least one shock in the period under study. About, 16.5 % of these households were located in the very low and high agro-ecological classes, respectively, increasing to 31.6 % in the low agro-ecological class and 35.4 % in the medium agro-ecological class. A Kruskal-Wallis test revealed that there was significant difference (p = 0002) in the number of households that reported experiencing at least one shock across all the agro-ecological classes. Therefore, this significant difference was for the following pair of agro-ecological classes; very low and medium (p = 0.0086); medium and high (0.0018).

About 75 % of those households who reported having experienced shocks, had suffered at least two in the last year. The modal and average number of shocks reported was two and 4 ± 2.2, respectively (Figure 6). There was little difference in the modal number of shocks reported in low, medium and high agro-ecological classes. Thus, the modal number of shocks reported in low, medium and high agro-ecological classes was one. On the other hand, the modal number of shocks reported in the very low agro-ecological class was two. The average number of shocks reported tended to decrease with increasing agro-ecological potential. Thus, the average number of shocks reported in very low agro-ecological class was 2.2 ± 1.2, whereas it was 2 ± 1, 1.9 ± 1 and 1.7 ± 0.9 for low, medium and high agro-ecological classes, respectively.

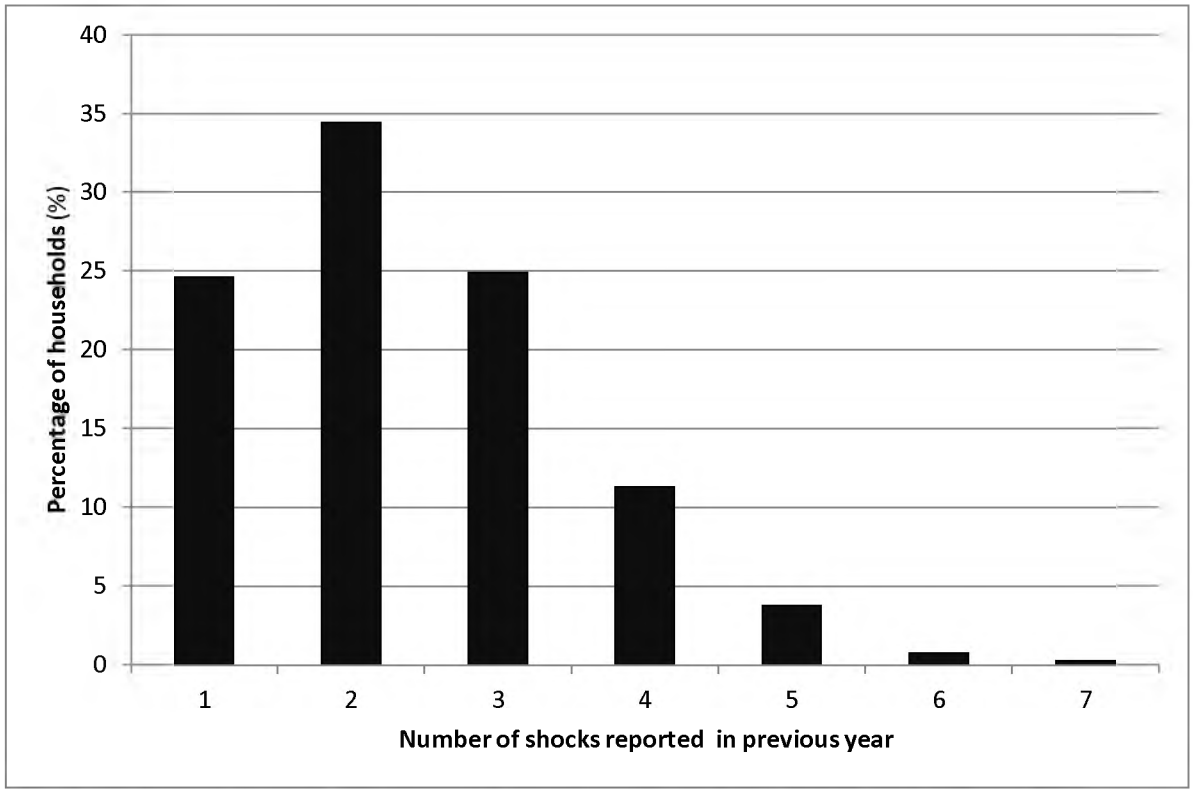

Figure 6: The number of shocks experienced per household in the last 12 months

Approximately, 88.4 % of the shocks experienced were classified as moderate and 36.3 % as severe shocks. There was no difference in the number of households that experienced moderate shocks in the different agro-ecological classes. Thus, the reported percentages of households that experienced moderate shocks were 86.9 %, 88.3 %, 89.7 % and 90.4 % for high, medium, low and very low agro-ecological classes, respectively. Conversely, there was a variation in the percentages of households that experienced severe shocks, with the frequency of shocks decreasing with agro-ecological potential. Thus, the reported percentages of households that experienced severe shocks were 22.4 %, 34.7 %, 40.8 % and 43.6 % for high, medium, low and very low agro-ecological classes, respectively.

The most frequently experienced shocks were illness (43 %), hunger or food shortage (42 %), serious crop failure (29 %), major livestock loss (22 %) and death (19 %) (Table 27). The least reported shocks included wedding or other costly social events (15 %), lost wage employment (13 %) and land loss (3 %). The same pattern was observed for medium and high agro-ecological classes, where the most frequently reported shocks were illness and hunger or food shortage (Figure 7). Thus, the most frequently experienced shocks in

medium agro-ecological class were illness (47.3 %) and hunger or food shortage (35.4 %) and in the high agro-ecological class were illness (46.8 %) and hunger or food shortage (39.1 %). Conversely, the most frequently experienced shocks in very low agro-ecological class were hunger or food shortage (51.9 %) and illness (30.8 %). Likewise, the most frequently experienced shocks in low agro-ecological class were hunger or food shortage (40.3 %) and illness (39 %).

Table 27: Types and the frequency of the shocks experienced by households

Shock	Frequency	Percent of shocks (%)	Households (%)
Illness	398	21	43
Hunger/food shortage	384	21	42
Serious crop failure	269	14	29
Major livestock loss	203	11	22
Death	177	9	19
Other major asset loss	157	8	17
Wedding or other costly social events	140	7	15
Lost wage employment	118	6	13
Land loss	24	1	3

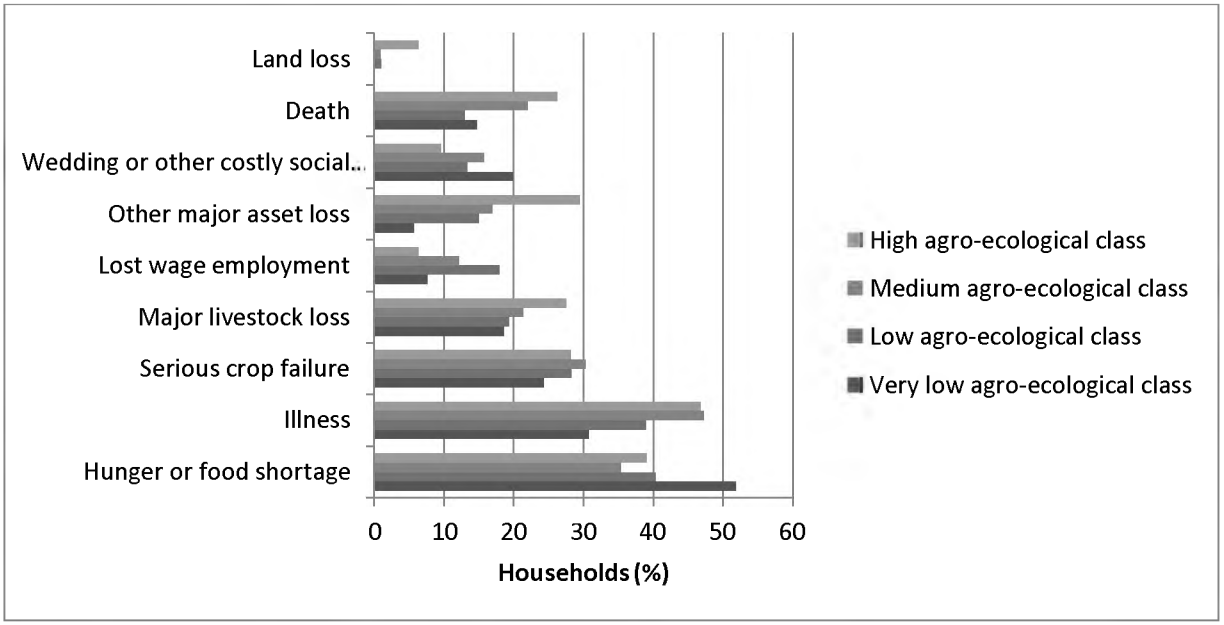

Figure 7: Types of shocks experienced by households in different agro-ecological classes

3.2 Coping strategies employed by households

The most (60.1 %) reported response to a shock is assistance from friends and relatives (Table 28). More than a third (37.9%) of the households used cash savings to cope with shocks. Usage of NTFPs was reported as the third most important coping strategy (35.6 %). This increased reliance on NFTPs in the wake of shocks was for both direct consumption and selling. However, the increased dependence on NTFP products in the wake of shocks was mainly for direct consumption (32.1 %) instead of cash generation (3.5 %). Nonetheless, NTFPs provided households through the periods of hardships with food, goods and in some instances with an opportunity to earn cash income. Other coping strategies used by households include assistance from NGOs, community organisations, religious organisations, etc. (10.4 %), reducing the number of meals taken (8.7 %) and getting a loan (5.2 %). A Kruskal-Wallis test revealed significant differences in the following pairs of response strategies across all different types of shocks: used NTFPs and did nothing in particular ($p = 0.0001$); used NTFPs and reduced the number of meals ($p = 0.0001$); used NTFPs and changed cropping patterns ($p = 0.0001$); reduced number of meals taken and changed cropping patterns ($p = 0.0001$).

The same pattern was observed for medium and high agro-ecological classes, were the most reported response to a shock were assistance from friends and relatives, followed by using cash savings, using NTFPs and getting assistance from NGOs, community organisations, religious organisations, etc. However, the very low agro-ecological class showed a different pattern, with the most reported response to a shock being assistance from friends and relatives (62.2 %), using NTFPs (36.5 %), reducing number of meals taken (24.4 %) and spending cash savings (20.5 %). Similarly, the most frequently reported responses to shocks in low agro-ecological zones were assistance from friends and relatives (58 %), using NTFPs (37 %) and spending cash savings (37 %). The increased reliance on NTFPs in the wake of shocks was mainly for direct consumption instead of cash generation across all agro-ecological classes. There was a marginal difference in the use of cash income from selling NTFPs as a safety net, with the low agro-ecological class having the lowest (1.7 %) and the high agro-ecological class having the highest (8.3 %).

Table 28: Coping strategies used by households to cope with shocks

Response	Percentage of households (%)
Assisted by friends and relatives	60.1
Spent cash savings	37.9
Used more NTFPs	31.7
Assisted by NGOs	10.4
Reduced number of meals taken	8.7
Got loan	5.2
Spent savings / retirement money	4.5
Sold more NTFPs	3.4
Did extra casual labour work	2.7
Changed cropping patterns	2.7
Borrowed against future earnings	2.6
Did nothing in particular	2.3
Sold assets	1.8
Started new business	0.9
Reduced household spending	0.6
Harvested premature crops	0.5
Changed to different type of livestock	0.5
Consumed NTFPs they don't usually use	0.4
Sold NTFPs they do not usually sell	0.1
Rented out land	0.1
Harvested more agricultural products	0.1

3.3 Coping strategies employed by households for each type of shock

Whilst acknowledging that there is no one universal definition of safety nets, safety nets was taken to refer to assets or resources households use to cope with adversity. Therefore, frequency tables and Kruskal-Wallis test were used to quantify and test for significance for the different coping strategies used by households to cope with various types of shocks.

Households employed various coping strategies for different types of shocks (Figure 8). For instance, the most reported strategies for coping with illness were spending cash savings (58 %) ($p = 0.0001$) and getting assistance from friends and relatives (28.1 %). Households that experienced death responded mostly by spending cash savings (34 %) ($p = 0.0001$), getting assistance from NGOs, community organisations, religious organisations, etc. (27.9 %) and getting assistance from friends and relatives (19.7 %). Many households reported facing serious crop failure and many of them did nothing in particular (33.9 %)($p = 0.0001$) in

coping with crop failure, whilst some changed cropping patterns or types of crops planted (22.9 %) and others got assistance from friends and relatives (15.6 %). Those households that experienced hunger or food shortages coped by getting assistance from friends and relatives (43.3 %) (p = 0.0001), by using more NTFPs than they normally use (36.9 %) (p = 0.0001) and by reducing the number of meals taken (10.1 %).

Interestingly, for the households that suffered land loss, the most (86.4 %) (p = 0.0001) reported response strategy by the households was doing nothing in particular, followed by assistance from friends and relatives (4.5 %) and spending savings or retirement money (4.5 %). The households that experienced major livestock loss reported coping by mostly getting assistance from friends and relatives (41.7 %) (p = 0.0001), by doing nothing in particular (32.1 %) and by spending cash savings (9.6 %). As for those households that lost major assets they responded mainly by getting assistance from friends and relatives (59.9 %) (p = 0.0001), spending cash savings (12.1 %) and getting assistance from NGOs, community organisations, religious organisations, etc. (11.1 %).

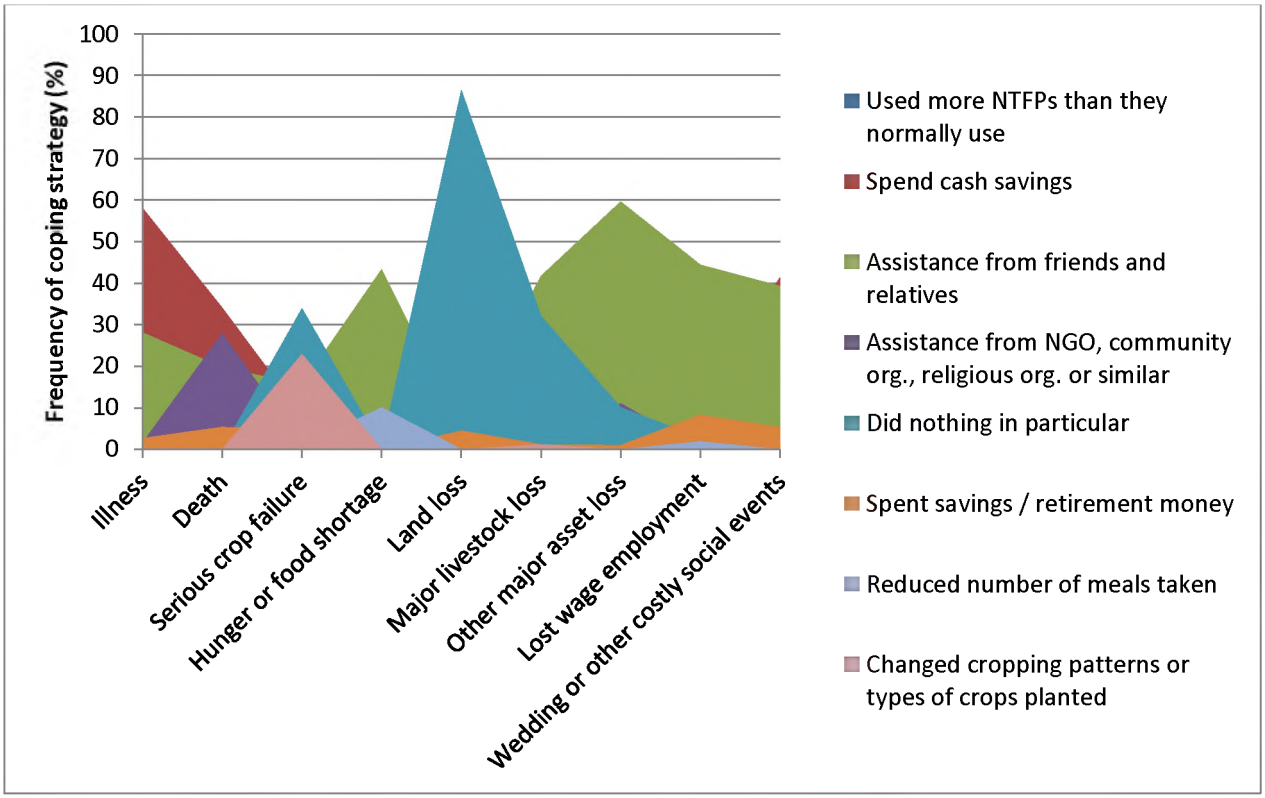

Figure 8: The frequencies of coping strategies per type of shock

Households who lost wage employment responded by employing different coping strategies. The most reported coping strategies were getting assistance from friends and relatives (44.4 %) (p = 0.0001), spending cash savings (13 %) and doing extra casual labour work (12 %). Households which had weddings and other costly social events coped mainly by spending cash savings (41.3 %) (p =0.001) and getting assistance from friends and relatives (39.3 %) (p = 0.0001).

When comparing the responses for moderate and severe shocks, a pattern was noticed were as the intensity of the shocks increased, fewer households employed the response strategy, "doing nothing in particular". For instance, the households that experienced moderate asset losses responded by doing nothing in particular (46.5 %) (p = 0.0001) and getting assistance from friends and relatives (14.8 %). On the other hand, the most frequently reported response strategies for households that experienced severe asset loss were getting assistance from friends and relatives (51.9 %) (p = 0.0001), getting assistance from NGOs, community organisations, religious or similar, etc. (18.5 %) and doing nothing in particular (14.8 %). The same pattern applies for major livestock loss, crop failure and lost wage employment shocks. Thus, as the shocks became severe, the households responded by moving away from the strategy of doing nothing to depending more on the assistance from friends, relatives, NGOs and in some instances the households increased their reliance on NTFPs.

As illness, lost wage employment and wedding or other costly social events shocks became severe households depended less on spending their cash savings and they relied more on other strategies such as getting a loan from money lenders, credit association, bank, etc., spending savings or retirement money, increasing reliance on NTFPs, assistance from friends and relatives and assistance from NGOs, community organisations, religious or similar, etc. This suggests that as the intensity of the shocks increases, households exhaust their cash savings hence they will have to rely on other strategies.

3.4 Factors affecting use of NTFPs as safety nets by households

The use of NTFPs as safety nets by households was significantly and positively related to the number of shocks experienced by the household (Table 29) as well as household size Therefore, big households who experienced multiple shocks were most likely to use NTFPs as safety nets. The level of education of household head was significantly and negatively related to the usage of NTFPs as safety nets. This may be therefore, suggest that harvesting certain NTFPs might be considered backward and not for educated people.

Table 29: The factors affecting the usage of NTFPs as safety nets by households

Factor	Level of effect	Coefficient	SE	t	p
Intercept		0.085	0.067	1.266	0.2057
Relative NTFP income		0.004	0.001	5.061	**0.0001**
Annual household income		0.000	0.000	-1.543	0.1230
Highest grade of household head		-0.009	0.003	-2.967	**0.0031**
Household size		0.013	0.004	3.297	**0.0010**
Age of household head		-0.002	0.001	-2.005	**0.0452**
Number of shocks		0.125	0.011	11.612	**0.0001**
Illness		-0.099	0.024	-4.167	**0.0001**
Hunger or food shortage		0.346	0.024	14.527	**0.0001**
Crop failure		0.153	0.029	5.341	**0.0001**
AE class	Very low	0.023	0.022	1.064	**0.0143**
AE class	Low	0.058	0.018	3.257	**0.0012**
AE class	Medium	-0.006	0.018	-0.344	0.7312
Sex of HH	Male	0.001	0.011	0.118	0.9062
Employment status of household head	Employed	0.003	0.014	0.238	0.8118

$R = 0.5892$; $R^2 = 0.3472$; $R_{adj}^2 = 0.3393$; $F = 44.668$; $p = 0.0001$

Interestingly, the relationship between usage of NTFPs safety nets and age of the household head was significant and negative. This suggests that young headed households are likely to turn to NTFPs in times of hardships as compared old headed households. As hypothesised, the relative NTFP income was significant and positively related to the usage of NTFPs as safety nets. Therefore, as the share of NTFP income to total household income increased, so did the likelihood of households using NTFPs as safety nets.

The very low and low agro-ecological classes were significantly and positively related to the usage of NTFPs as safety nets. Thus, households in very low and low agro-ecological classes were likely to use NTFPs in the wake of hardships. The significant and negative relationship between the type of shock, illness, and usage of NTFPs as safety nets suggested that households who experienced illness were not likely to turn to NTFPs as safety nets. Conversely, hunger or food shortage and crop failure were significantly and positively related to the usage of NTFPs as safety nets. Therefore, households who experienced hunger or food shortage and crop failure were likely to use NTFPs to cope with these shocks.

4 Discussion

About 79 % of the households interviewed reported experiencing at least one shock of some magnitude in the past 12 months. This is higher than the findings by Wunder et al. (2014) who reported that in their PEN sample, about 64 % of the households reported experiencing a shock during their one year study period. Approximately, 88.4 % of the households reported experiencing moderate shocks and 36.3 % experiencing severe shocks. This ratio is similar to findings by Wunder et al. (2014) who noted that in their PEN sample, 76 % and 39 % of the African households reported moderate and severe shocks, respectively. As expected, the frequency of the shocks (particularly, severe shocks) experienced by the households tended to increase with decreasing agro-ecological potential. Therefore, households in very low and low agro-ecological zones are generally more exposed to severe shocks as compared to households in high agro-ecological zones. This is line with findings by Mason et al. (2007) who reported that low agro-ecological zones in Zambia had the highest occurrence of severe droughts, HIV prevalence rates and AIDS related deaths. Similarly, Manjengwa et al. (2012) noted that the low agro-ecological zones in Zimbabwe had the highest occurrences of droughts, crop pests and food shortages.

The most frequently experienced shocks were illness (43 %), hunger or food shortage (42 %), serious crop failure (29 %), major livestock loss (22 %) and death (19 %). Conversely, Wunder et al. (2014) reported that about 80 % of the reported shocks were either mostly covariate crop failure or idiosyncratic labour shocks in their PEN sample. These results are not surprising given that many rural areas in South Africa are characterised by dry and

variable climates and high HIV/AIDS prevalence (Shisana et al., 2014). In addition, many rural households in South Africa are characterised by small land holdings, absence of irrigation facilities and low land productivity (Hart, 2008; Tregurtha and Vink, 2008). Therefore, households tend to produce crops for home consumption and in many cases this does not cover their daily food requirements (Hart, 2008; Tregurtha and Vink, 2008). Consequently, such households are vulnerable to food shortages, adverse weather, local diseases, price shocks and pest infestations, and this is exacerbated by many rural households already living close to the survival line (Shackleton and Shackleton, 2012; Shisana et al., 2014; Tibesigwa et al., 2014). In addition, many South African rural areas are characterised by limited employment opportunities (Neves et al., 2009; Posel et al., 2013) hence limiting the strategies which households can employ in times of hardships. Therefore, NTFPs play an essential role in helping rural households cope with hardships, particularly taking into consideration that agricultural production is marginal in all but the high agro-ecological zone, partly due to the fact that low agro-ecological zones are characterised by pests, diseases, severe or unpredictable weather conditions and unfertile soils (Blignaut et al., 2009; Delacote, 2007). Indeed, the results of the results of GLM regression analysis revealed that hunger or food shortage and crop failure were significantly and positively related to the usage of NTFPs as safety nets. Therefore, households who experienced hunger or food shortage and crop failure were likely to use NTFPs to cope with these shocks.

The results showed that households employed various coping strategies in the wake of shocks. These responses revealed different options that were available to households in coping with hardships. The most (60.1 %) reported response to a shock is assistance from friends and relatives. Paumgarten (2007) also noted that in two rural villages of South Africa, the most used coping strategy in response to shocks were kinship and community-support network. About 35.6 % of the households reported increasing their reliance on NFTPs (either by direct consumption or selling) in the wake of shocks. This percentage of households using NTFPs as safety nets is low as compared to the findings of Paumgarten and Shackleton (2011) who reported that about 70 % of the households used NTFPs as safety nets in times of food shortages in two villages of South Africa over a 24 months period. This maybe a reflection of the two year period compared to the 12 months in my

study. Even higher, Liswanti et al. (2011) reported that about 90 % of the respondents increased their dependence on forests in the wake of large covariate shocks as represented by floods in East Kalimantan (Borneo), Indonesia.

Some of the least reported coping strategies included reducing number of meals taken (8.7 %), got a loan (5.2 %), sold assets (1.8 %) and reduced household spending (0.6 %). Contrarily, Paumgarten (2007) noted that in two rural villages of South Africa, 74 % of the respondents reduced household spending as a way of coping with shocks, with 72 % changing their diet and 41 % selling livestock. This difference could be due to the different types of shocks experienced by households in these two studies. For instance, the most frequently experienced shocks in this study were illness (43 %), hunger or food shortage (42 %) and serious crop failure (29 %). On the contrary, the most frequently experienced unexpected shocks in the study by Paumgarten (2007) were increasing living costs (78 %), illness or injury to household members (66 %) and loss or damage to property (50 %). Thus, the type of shock experienced by the household shapes the responses (DFID, 1999; Mcsweeney, 2005a; Paumgarten and Shackleton, 2011; Wunder et al., 2014).

Households employed various coping strategies for each type of shock. The use of NTFPs as safety nets ranged from 0 – 36.5 %, depending on the type of the shock experienced by the household. Interestingly, households who experienced land loss or weddings or other costly social events did not use NTFPs as safety nets. Conversely, Wunder et al. (2014) noted that in their PEN sample, households that experienced shocks turned to different coping strategies, with 10.4 %, 9 % and 7.5 % reporting use of NTPFs as their first, second and third response, respectively. Furthermore, when they classified shocks into idiosyncratic and covariate shocks, the overall use of NTFPs as a response strategy was 6 – 8 % and 14 %, respectively. The households' response to idiosyncratic shocks in the PEN sample is different from the responses recorded by Mutenje et al. (2011) who reported that approximately 48 % of the total household income shortfall caused by HIV/AIDS was offset by harvesting more NTFPs in south-eastern Zimbabwe. Similarly, Hunter et al. (2011) reported significant use of NTFPs as a coping strategy against idiosyncratic shocks in Agincourt, South Africa.

The increased dependence on NTFPs products in the wake of shocks was for direct consumption (32.1 %) instead of cash generation (3.5 %). This is in accord with findings by Debela et al. (2012) who noted that the reliance on NTFPs increased in the wake of shocks and this increase on the dependence on NTFPs was for direct needs instead of cash in parts of Uganda. Given that rural areas in South Africa frequently encounter shocks such as crop failure and seasonal flooding, NTFPs play a critical role in helping many households to weather such shocks. As noted by other studies (Debela et al. 2012; Liswanti et al. 2011; Paumgarten and Shackleton, 2011; Wunder et al., 2014) many households used multiple coping strategies either at the same time or in sequence. For instance, Wunder et al. (2014) reported that in their global sample, only 10.4 % of the households that experienced a shock ranked the use of NTFPs as their primary response, with 9 % and 7.5 % ranking the use of NTFPs as their second and third responses, respectively. Interestingly, the response strategies changed in relation to the severity of the shocks, with households increasing their dependence on social capital, NTFPs and loans as the severity of the shock increased. The infrequently used coping strategies included harvesting premature crops, reducing household spending, selling assets, etc.

The use of NTFPs as safety nets by households was significantly and positively related to the number of shocks experienced by the household. This suggests that the use of NTFPs of safety nets increases as other strategies wear down. Interestingly, Wunder et al. (2014) reported that in their global sample, usage of NTFPs as a response strategy ranked fifth for idiosyncratic shocks (6 – 8 %) and fourth for covariate shocks (14 %). In addition, they noted that households tend to respond to idiosyncratic shocks by seeking assistance from friends, relatives and local informal money lenders. However, households were likely to respond to widespread covariate shocks by reducing consumption and increasing reliance on NTFPs. Contrarily, Völker and Waibel (2010) reported that there was no significant relationship between the number of shocks suffered by household and the usage of NTFPs as safety nets in parts of Vietnam. However, they noted that when they disaggregated the types of shocks, households used NTFPs in the wake of severe weather shocks. On the other hand, there was no a significant relationship between health shocks and usage of NTFPs as safety nets.

The use of NTFPs as safety nets by households was positively and significantly related to the size of the household. Therefore, big households who experienced multiple shocks were most likely to use NTFPs as safety nets. Similarly, Debela et al. (2012) noted that in some parts of Uganda, large households were likely to use NTFPs as safety nets. Mutenje et al. (2011) reported a significant and positive relationship between household size and reliance on NTFPs as safety nets in rural households in south-eastern Zimbabwe. Conversely, Wunder et al. (2014) did not find any significant relationship between household size and the usage of NTFPs as safety nets. Similarly, Völker and Waibel (2010) noted that the relationship between household size and usage of NTFPs as safety nets was not significant in Vietnam.

The level of education of household head was significantly and negatively related to the usage of NTFPs as safety nets. The higher the education level of household head, the less the household used NTFPs as safety nets. This mirrors general use of NTFPs (Babulo et al., 2008; Kamanga et al., 2009; Mamo et al., 2007; Thondhlana and Muchapondwa, 2014; Uberhuaga et al., 2012). In addition, harvesting certain NTFPs might be considered backward and not for educated people. This is in line with findings by Wunder et al. (2014) who noted that the level of education of the household head was significantly and negatively related to the usage of NTFPs as safety nets in their global sample. Similarly, Debela et al. (2012) noted that in parts of Uganda, usage of NTFPs as safety nets declined with the level of education of the household head. This same pattern was noted by Liswanti et al. (2011) in East Kalimantan (Borneo), Indonesia, where educated and wealthier households tended not to use NTFPs as safety nets. Likewise, Völker and Waibel (2010) reported a negative and significant relationship between level of education of the household head and the probability of the household turning to NTFPs in times of crisis in Vietnam. Thus, households with educated heads were likely to have other coping strategies other than extraction and selling of NTFPs.

Interestingly, the relationship between use of NTFPs as safety nets and age of the household head was significant and negative. This suggests that young headed households were likely to turn to NTFPs in times of hardships as compared to old headed households. This is probably a reflection of young headed households having limited or no other assets and also

probably less social capital. This is in line with findings by Mutenje et al. (2011) who noted a significant and negative relationship between the age of the household head and usage of NTFPs as safety nets for rural households affected by HIV/AIDS in south-eastern Zimbabwe. Thus, NTFPs were an important safety net for poor and young headed rural households with limited choices to cope with crisis.

As expected, the relative NTFP income was significant and positively related to the usage of NTFPs as safety nets. Therefore, as the share of NTFP income to total household income increased, so did the likelihood of households using NTFPs as safety nets. This suggests that households with high contribution of NTFPs to total household income were more likely to use NTFPs as safety nets since they already have the aptitude to harvest NTFPs.

Interestingly, the very low and low agro-ecological sites were significantly and positively related to the usage of NTFPs as safety nets. Thus, households in very low and low agro-ecological locations were likely to use NTFPs in the wake of hardships. This is supported by the usage of NTFPs as safety nets being the second (36.5 %) and joint-second (37 %) most frequently used coping strategy by households in very low and low agro-ecological classes, respectively. This is not surprising given that some studies suggested heavy use of NTFPs as safety nets by households in low agro-ecological zones due to unproductive land (rendering agriculture unviable) and limited employment opportunities (see for example Manjengwa et al., 2012; Mason et al., 2007; Mutenje, 2010; Woittiez et al., 2013). In addition, rural areas in low agro-ecological zones of Sub-Saharan Africa tend to be characterised by high poverty rates, frequent occurrence of shocks and underdevelopment hence NTFPs are critical in assisting rural households cope with hardships (Livingston et al., 2011; Manjengwa et al., 2012; Oni, 2014; Siegel, 2008).

In medium and high agro-ecological classes, the total annual household income and employment status of the household head were not significantly related to the usage of NTFPs as safety nets. Likewise, sex of household head was not related to the usage of NTFPs as safety nets. Similar to this finding, Wunder et al. (2014) noted that there was no any significant relationship between female headed households and usage of NTFPs in their global sample.

5 Conclusions

Many rural households in South Africa are vulnerable to shocks such as illness, death, crop failure and hunger. This was revealed in this study, with about 79 % of the total households interviewed experiencing at least one shock of some magnitude in the previous 12 months. The households employed various coping strategies in response to different types of shocks. However, many South African rural areas are characterised by limited employment opportunities, variable weather and poor agricultural output due to various factors such as poor soils, lack of quality inputs, and inadequate farming land. This limits the coping strategies that are available to many rural households when faced with shocks hence making many households vulnerable to shocks. Therefore, it is not surprising that were only three widely used strategies to coping with shocks. These three coping strategies were assistance from friends and relatives (60.1 %), using cash savings (37.9 %) and using NTFPs (35.6 %).

The findings of this study show that even though NTFPs are always important, they become even more important, particularly to rural households, in the wake of hardships such as crop failure, hunger or food shortage and major livestock loss. Many households reported increasing their dependence on NTFPs as a way of coping with various hardships. Thus, not only did the NTFPs provide the rural households with food and goods in times of crisis, but they also provided households with marketable products which in turn provided cash income for the households.

My analysis supports the argument that households in low agro-ecological zones are in a precarious setting and are likely to experience more shocks and of greater severity. Consequently, these households are likely to use NTFPs as safety nets more than households in high agro-ecological zones. In addition, households with high contribution of NTFPs to total household income are more likely to use NTFPs as safety nets since they already have the aptitude to harvest NTFPs.

References

Angelsen, A. and Wunder S., 2003. Exploring the forest — poverty link: key concepts, issues and research implications. Centre for International Forestry Research. Jakarta.

Babulo, B., Muys, B., Nega, F., Tollens, E., Nyssen, J., Deckers, J. and Mathijs, E., 2008. Household livelihood strategies and forest dependence in the highlands of Tigray, northern Ethiopia. *Agricultural Systems*, 98(2), 147–155.

Barrett, C.B., Bezuneh, M., Clay, D.C. and Reardon, T., 2001. *Income diversification strategies in rural Africa*. *New York*. *Working Paper 2001-25.* Cornell University, Ithaca, New York, USA.

Belcher, B. and Schreckenberg, K., 2007. Commercialisation of non-timber forest products: a reality check. *Development Policy Review*, 25(3), 355–377.

Belcher, B.M., 2005. Forest product markets, forests and poverty reduction. *International Forestry Review*, 7(2), 82–89.

Blignaut, J., Ueckermann, L. and Aronson, J., 2009. Agriculture production's sensitivity to changes in climate in South Africa. *South African Journal of Science*, 105, 61–68.

Debela, B., Shively, G., Angelsen, A. and Wik, M., 2012. Economic shocks, diversification, and forest use in Uganda. *Land Economics,* 88(1), 139–154.

Delacote, P., 2007. Agricultural expansion, forest products as safety nets, and deforestation. *Environment and Development Economics*, 12(02), 235-249.

Department for international development (DFID)., 1999. DFID's sustainable livelihoods approach and its framework. Accessed 08 March 2016, http://www.gloch/B7/en/multimedia/B7_1_pdf2.pdf

Fisher, M., Chaudhury, M. and McCusker, B., 2010. Do forests help rural households adapt to climate variability? Evidence from southern Malawi. *World Development*, 38(9), 1241–1250.

Hart, T., 2008. Reviewing 15 years of resource poor small-scale agriculture in South Africa: is there any way forward? Accessed 02 June 2014, http://www.tips.org.za/files/Hart_Paper_24_Oct_2008__tmp52aa50cf.pdf

Hunter, L.M., Twine, W. and Johnson, A., 2011. Adult mortality and natural resource use in rural South Africa: evidence from the Agincourt health and demographic surveillance site. *Society and Natural Resources*, 24(3), 256–275.

Kamanga, P., Vedeld, P. and Sjaastad, E., 2009. Forest incomes and rural livelihoods in Chiradzulu district, Malawi. *Ecological Economics*, 68(3), 613–624.

López-Feldman, A., 2014. Shocks, income and wealth: do they affect the extraction of natural resources by rural households? *World Development*, 64(S1), S91-S100.

Liswanti, N., Sheil, D., Basuki, I., Padmanaba, M. and Mulcahy, G., 2011. Falling back on forests: how forest-dwelling people cope with catastrophe in a changing landscape. *International Forestry Review*, 13(4), 442–455.

Livingston, G., Schonberger, S. and Delaney, S., 2011. Sub-Saharan Africa: the state of smallholders in agriculture. *Paper presented at the IFAD conference on new directions for smallholder agriculture, 24-25 January, 2011. Rome.*

Maharjan, K.L. and Khatri-Chhetri, A., 2006. Role of forest in household food security: evidence from rural areas in Nepal. Annual Report of Research Centre for Regional Geography, 15, 41–67.

Mamo, G., Sjaastad, E. and Vedeld, P., 2007. Economic dependence on forest resources: a case from Dendi district, Ethiopia. *Forest Policy and Economics*, 9(8), 916–927.

Manjengwa, J., Kasirye, I. and Matema, C., 2012. Understanding poverty in Zimbabwe: a sample survey in 16 districts. *Paper prepared for presentation at the Centre for the Study of African Economies Conference 2012 "Economic Development in Africa", Oxford, United Kingdom, March 18-20, 2012.*

Mason, N.M., Chapoto, A., Jayne, T.S. and Myers, R.J., 2007. HIV /AIDS and agrarian livelihoods in Zambia: a test of the new variant famine hypothesis. Policy synthesis, food security research project Number 23. Lusaka. Accessed 07 April 2016, http://fsg.afre.msu.edu/zambia/ps23.pdf

McSweeney, K., 2005a. Natural insurance, forest access, and compounded misfortune: Forest resources in smallholder coping strategies before and after Hurricane Mitch, north eastern Honduras. *World Development*, 33(9), 1453–1471.

Mcsweeney, K., 2005b. Forest product sale as financial insurance: evidence from Honduran smallholders. ODI Wildlife Policy Briefing, Number 10. Ohio.

Mutenje, M.J., 2010. Rural livelihoods in south-eastern Zimbabwe: the impact of HIV/AIDS on the use and management of non-timber forestry products. PhD thesis. University of KwaZulu-Natal. Pietermaritzburg.

Mutenje, M.J., Ortmann, G.F. and Ferrer, S.R., 2011. Extraction of non-timber forest products as a coping strategy for HIV/AIDS-afflicted rural households in south-eastern Zimbabwe. *African Journal of AIDS Research*, 10(3), 195–206.

Neves, D., Samson, M., Van Niekerk, I., Hlatshwayo, S. and Du Toit, A., 2009. The use and effectiveness of social grants in South Africa. Institute for Poverty, Land and Agrarian Studies (PLAAS).

Neumann, R.P. and Hirsch, E., 2000. *Commercialisation of non-timber forest products: review and analysis of research*. CIFOR. Jakarta.

Oni, O.A., 2014. Livelihood, agro ecological zones and poverty in rural Nigeria. *Journal of Agricultural Science*, 6(2), 103-113.

Paumgarten, F., 2005. The role of non-timber forest products as safety-nets: a review of evidence with a focus on South Africa. *GeoJournal*, 64(3), 189–197.

Paumgarten, F., 2007. The significance of the safety-net role of NTFPs in rural livelihoods, South Africa. MSc thesis. Rhodes University. Grahamstown.

Paumgarten, F. and Shackleton, C. M., 2011. The role of non-timber forest products in household coping strategies in South Africa: the influence of household wealth and gender. *Population and Environment,* 33(1), 108-131.

Posel, D., Casale, D. and Vermaak, C., 2013. The unemployed in South Africa: why are so many not counted? Accessed 18 July 2014, http://www.econ3x3.org/sites/default/files/articles/Posel%20et%20al%20Feb%202013%20Measuring%20unemployment%20FINAL_0.pdf

Poverty and Environment Network (PEN). 2007. PEN technical guidelines, version 4. Accessed 18 July 2014, http://www1.cifor.org/fileadmin/fileupload/PEN/pubs/PEN%20Technical%20Guidelines%20-%20version%204%20-%20May%202007.zip

Shackleton, C. and Shackleton, S., 2004. The importance of non-timber forest products in rural livelihood security and as safety nets: a review of evidence from South Africa. *South African Journal of Science,* 100, 658–664.

Shackleton, S.E., 2005. The significance of the local trade in natural resource products for livelihoods and poverty alleviation in South Africa. PhD thesis. Rhodes University. Grahamstown.

Shackleton, S., Campbell, B., Lotz-Sisitka, H. and Shackleton, C., 2008. Links between the local trade in natural products, livelihoods and poverty alleviation in a semi-arid region of South Africa. *World Development*, 36(3), 505–526.

Shackleton, S.E. and Shackleton, C.M., 2012. Linking poverty, HIV/AIDS and climate change to human and ecosystem vulnerability in southern Africa: consequences for livelihoods and sustainable ecosystem management. *International Journal of Sustainable Development and World Ecology*, 19(3), 275–286.

Shisana, O., Rehle, T., Simbayi L.C., Zuma, K., Jooste, S., Zungu N., Labadarios, D., Onoya, D., Wabiri., N., Davids, A., Ramlagan, R., Mbelle, N. and Van Zyl, J., 2014. *South African National HIV Prevalence, Incidence and Behaviour Survey, 2012.* Cape Town, HSRC Press.

Siegel, B.P., 2008. Profile of Zambia's smallholders: where and who are the potential beneficiaries of agricultural commercialization? World Bank. *Africa Region Working Paper*

Series, (113). Accessed 08 April 2016, http://www.worldbank.org/afr/wps/WPS113_Zambia_Smallholder.pdf

Sills, E. O., Lele, S., Holmes, T. P. and Pattanayak, S.K., 2003. Nontimber forest products in the rural household economy. In Viet Quang, D. and Nam Anh, T., 2006. Commercial collection of NTFPs and households living in or near the forests. *Ecological Economics*, 60(1), 65–74.

Sivakumar, M.V.K. and Valentin, C., 1997. Agroecological zones and the assessment of crop production potential. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 352, 907-916.

Takasaki, Y., 2011. Do the Commons help augment mutual insurance among the poor? *World Development*, 39(3), 429–438.

Takasaki, Y., Barham, B.L. and Coomes, O.T., 2004. Risk coping strategies in tropical forests: floods, illnesses, and resource extraction. *Environment and Development Economics*, 9(2), 203–224.

Thondhlana, G. and Muchapondwa, E., 2014. Dependence on environmental resources and implications for household welfare: Evidence from the Kalahari drylands, South Africa. *Ecological Economics*, 108, 59–67.

Tibesigwa, B., Visser, M. and Twine, W., 2014. Investigating the sensitivity of household food security to agricultural-related shock and the implication of informal social capital: the case of rural small-scale farming households in the Mpumalanga region of South Africa. ERSA working paper 470. Accessed 06 April 2016, http://www.econrsa.org/system/files/publications/working_papers/working_paper_470.pdf

Tregurtha, N. and Vink, N., 2008. Presidency fifteen year review project: review of agricultural policies and support instruments. Accessed 24 March 2014, http://www.thepresidency.gov.za/docs/reports/15year_review/economic/agricultural_policy.pdf

Uberhuaga, P., Smith-Hall, C. and Helles, F., 2011. Forest income and dependency in lowland Bolivia. *Environment, Development and Sustainability*, 14(1), 3–23.

Völker, M. and Waibel, H., 2010. Do rural households extract more forest products in times of crisis? Evidence from the mountainous uplands of Vietnam. *Forest Policy and Economics*, 12(6), 407–414.

Woittiez, L.S., Rufino, M.C., Giller, K.E. and Mapfumo, P., 2013. The use of woodland products to cope with climate variability in communal areas in Zimbabwe. *Ecology and Society*, 18(4), 1-24.

Wunder, S., Börner, J., Shively, G. and Wyman, M., 2014. Safety nets, gap filling and forests: a global-comparative perspective. *World Development*, 64(S1), S29-S42.

CHAPTER 6: SYNTHESIS AND RECOMMENDATIONS

6.1 Introduction

A large number of studies have been conducted on the contribution of different types of NTFPs to rural livelihoods (Angelsen et al., 2014; Babulo et al., 2008; Babulo et al., 2009; Dovie et al., 2002; Hunter et al., 2011; López-Feldman, 2014; Makhado et al., 2009; Paumgarten, 2007; Paumgarten and Shackleton, 2011; Pereira et al., 2006; Piya et al., 2011; Shackleton et al., 2001; Shackleton et al., 2007a; Shackleton et al., 2008; Tewari, 2012; Twine et al., 2003). However, few have examined the contributions in relation to local context such as agro-ecological potential. Similarly, there are few studies that focus on the price setting of NTFPs in different settings. Therefore, the aim of this thesis was to establish the contribution of NTFPs to rural livelihoods and their price determination in areas of varying agro-ecological potential of South Africa. The new insights and knowledge coming from this thesis are hoped to provide policy makers with relevant information and also contribute new knowledge towards the nature and extent of NTFPs use and price setting in different contexts.

A common theme emerging from all the chapters presented in this thesis is that NTFPs are an integral part of the rural livelihoods, especially for the households living close to the survival line. Given that many rural households in South Africa are faced with many farming constraints (poor soil quality, inadequate inputs, land shortages, dry and variable weather conditions, etc.) and limited employment opportunities, it is not surprising that NTFPs contribute significantly to rural livelihoods. Moreover, some NTFPs are not consumed by households due to lack of resources but because of cultural preferences.

The new knowledge emerging from this thesis broadly contributes towards establishing the nature and extent of the contribution of NTFPs to rural livelihoods in the dry savannah regions of Africa in relation to local context such as agro-ecological potential. In addition, this thesis contributed towards understanding the factors taken into account by the sellers of NTFPs when setting prices in various towns of South Africa.

6.2 Synthesis of key findings

6.2.1 Contribution of NTFPs to total household income

When comparing the contribution of NTFP income to total household income, a pattern was noted where NTFP income contributed twice as much as crop income and livestock income. Similarly, the same pattern was also observed for the households that reported selling at least one NTFP. Thus, the share of NTFP trade income was at least twice the shares of both crop and livestock incomes. This underlines the significance of forests and other wildlands to rural livelihoods in South Africa. Furthermore, this supports the argument made by Shackleton et al. (2001) and Shackleton et al. (2007) that agriculture is not necessarily the main source of income in most rural areas of South Africa, which are characterised by dry and variable weather conditions and high social security as compared to the humid tropics. Whilst NTFP income is not the main livelihood activity, irrespective of agro-ecological potential it is usually greater than one or both crop income and livestock income (Shackleton et al., 2001). Yet development planners and interventions rarely focus on NTFPs, but still favour crops or livestock. Indeed, only about 12 % of South Africa is suitable for farming rain-fed crops (World Bank, 2014b), therefore crop production is not viable for many rural households which do not have irrigation facilities. Many rural households in South Africa lack enough farming land due to high population densities resulting from racial zoning of land during the colonial and apartheid periods (Hart, 2008; Tregurtha and Vink, 2008). Inadequate farming land constrains household crop production, thereby making other options such as NTFPs extraction more viable. Therefore, it's not surprising that the share of NTPF income is significantly greater than the share of crop income.

Interestingly, the average share of NTFP income to total household income for the interviewed 1 200 rural households was 15.1 %. On the other hand, NTFP income accounted for about 33 % of the total household income for the 77 rural households who reported selling at least a single NTFP. Thus, the rural households that reported selling NTFPs tended to consume more NTFPs. It is, however, generally recognised that high levels of NTFP extraction are associated with high levels of NTFP trade income (Dovie et al., 2002; Vedeld et al., 2004).

The income from social grants accounted for about 55.7 % of the total household income across all the interviewed 1 200 rural households. Similarly, the share of social grants income was the largest contributor to total household income for those 77 rural households that reported selling at least a single NTFP. Thus, the average share of social grants income was 47.4 %. This demonstrates the heavy dependence on social grants by many South African rural households (see for example Neves et al., 2009; Phaahla, 2015). Without income from social grants many rural households will sink deeper into poverty and other sources of income such NTFP income will become very important for many rural households. Interestingly, there was generally less reliance on NTFPs by older household heads, probably therefore they are recipients of state pensions. About 47.6 % of the interviewed households reported receiving state pensions.

The level of reliance on social grants seemed to change from the households that mainly use NTFPs for subsistence purposes to households who use them to generate cash income. For instance, about 300 sellers, selling either at home or in town, were interviewed and the majority (79.3 %) of the sellers reported that selling NTFPs was their main source of cash household income, with only 8 % and 5.7 % receiving their main cash household income from state child grants and state pension grants, respectively. This is in contrast with many South African studies (see for example, Daniels et al., 2013; Mtati, 2014; Perret et al., 2005; Thondhlana and Muchapondwa, 2014; Tshuma and Monde, 2012) that have shown higher percentages of households relying on state grants as their main source of income. For those sellers, who reported that selling NTFPs is not their main source of cash income, their average share of NTFP trade income to total household income was 28 ± 11.5 %. Therefore, even in the case where NTFP trade is not the main source of income for the sellers, it still contributes significantly to the total household income. This strongly suggests that NTFP trade has potential to wean rural households off heavy reliance on state social grants or at least provide households with cash income earning opportunities. In addition, this will help households to diversify their income earning sources hence shielding themselves against shocks such as droughts, job losses, floods and volatile prices.

NTFP trade income is an important source of cash income for many rural households. About 6.4 % of the interviewed rural households reported selling NTFPs for various reasons, with many (39 %) citing the need to earn cash income and limited employment opportunities (16.9 %). Even though the returns from trading NTFPs are relatively low (12 %), every earning is very important to many cash-strapped rural households. This was demonstrated by the fact that many sellers of NTFPs use their earnings to augment household income and cover their living expenses. Moreover, many rural areas are characterised by limited employment opportunities, therefore the share of NTFP trade income (12 %) compared favourably well with the share of wage income (13.2 %). This is line with the argument by Shackleton et al. (2008) who noted that in the South African context, NTFP trade income normally compares well with income from other sources such as wages, agriculture and self-employment. Many rural households in South Africa are faced with many farming constraints (poor soil quality, inadequate inputs, land shortages, dry and variable weather conditions, etc.). Therefore, they do not earn much cash income from agriculture and this limits cash income earning alternatives for many rural households. This presents an opportunity for households to earn cash income by selling NTFPs and diversify their income earning sources against risks such as drought and limited employment opportunities.

Even though NTFPs are not necessarily the vehicle of poverty alleviation for millions of households in Sub-Saharan Africa, my analysis confirmed that they are an integral part of the rural livelihoods, especially for the households living close to the survival line. Many studies acknowledge that NTFP income usually supplements other sources of income (Paumgarten and Shackleton, 2011; Shackleton et al., 2001). However, it was noted that for many of the 300 sellers interviewed, they reported that other sources of income such as state grants and remittances were supplementing income from selling from NTFPs. Thus, about 49.3 % of the sellers stated that the average share of NTFP trade income ranges from 50 to 75 % and their average years of trading was 9.9 ± 8.1 years. On the other hand, about 30.3 % reported that the share of NTFP trade income was 76 to 100 % and their average years of trading were 9.5 ± 7.7 years. Only, 12.7 % of the sellers, with average years of trading 7.9 ± 8.8, reported that the contribution of income from selling NTFPs to total household income ranged from 25 – 50 %, with remaining sellers (7.7 %) noting that the

share of NTFP trade income to total household income was less than 25 % and their average years of trading was 11.5 ± 10.5 years.

Given that many rural towns in South Africa are characterised by limited employment opportunities (Neves et al., 2009; Posel et al., 2013), it is not surprising that about 46 % of the sellers stated that they started selling NTFPs because they wanted to generate cash income, whilst about 21.3 % of the sellers stated that there were no jobs. Therefore, selling of NTFPs provides an opportunity for cash-constrained households to earn cash, especially in those communities where other income earning sources are limited (see for example, Adam and Pretzsch, 2010; Pereira et al., 2006; Shacketon et al., 2008; Yemiru et al., 2010). Indeed, as noted in this study the majority (73.3 %) of the sellers reported that the number of sellers has increased in the previous five years, with about 56.8 % of the sellers attributing this to limited employment opportunities and perceived high income from trading (11.4 %).

The findings of this study partially support the argument by Shackleton et al. (2007) that the level of dependence on NFTPs is likely to vary with agro-ecological conditions. This is supported by the significant difference between the NTFP incomes of the following pairs of agro-ecological classes: very low and low, medium and high. However, the significant difference between the NTFP income for the pair, medium and high, was opposite what was suggested by Shackleton et al. (2007). Thus, the medium agro-ecological class had a lower rank of mean NTFP income than the high agro-ecological class. Conversely, there was no significant difference between the NTFP incomes for the following pair of agro-ecological class: low and medium. This reflects a U-shaped pattern where the significance differences in NTFP incomes of the paired classes are only noted in the paired classes at the extreme ends of the agro-ecological class spectrum. At the very low agro-ecological end of the gradient I speculate that NTFP contributions are higher than the low and medium classes, therefore agricultural production is severely constrained. In contrast, at the upper end, the agro-ecological potential improves prospects for both agriculture and NTFPs. The high agro-ecological potential supports a greater diversity of NTFPs, which fostered greater engagement in NTFP trade.

An important finding is that the share of NTFP income for the pair medium and high agro-ecological class was significantly different. Interestingly, the high agro-ecological class had a higher mean rank of NTFP income than the medium agro-ecological class. In addition, there was a positive significant relationship between relative NTFP income and relative crop income showing that the two were complementary. This is in contrast with other studies which have suggested that NTFP income decreases with increasing land productivity or increasing agriculture income (Babulo et al., 2008; Heubach et al., 2011; Kar and Jacobson, 2012; Mamo et al. 2007; McElwee, 2008; Vedeld et al., 2007). Similar to this finding, Kamanga et al. (2009) and Angelsen et al. (2014) reported that a positive relationship between NTFP income and agriculture income because households without non-farm employment might have to rely on both NTFP and agriculture incomes. Thus, agricultural production and NTFPs extraction activities tend to complement each other at household level. Therefore, farmers may extract more NTFPs so that they can mitigate risks and also diversify their sources of income. This, however, appears to contradict the argument that high agricultural income (generally due to access to good farming land) diminishes the need for NTFP income. As noted during fieldwork some villages in the high agro-ecological classes were characterised by rich biodiversity, therefore NTFPs, the locals remarkably engaged more in the collection and selling of NTFPs than households from other areas. In addition, the proportion of households trading in NTFPs tended to increase with increasing agro-ecological potential. Thus, rich agro-ecological conditions improve NTFP income opportunities (Angelsen and Kaimowitz, 1999; Woittiez et al., 2013).

6.2.2 The use of NTFPs as safety nets

Many rural households in South Africa are vulnerable to shocks such as illness, death, crop failure and hunger. This was substantiated in this study, with about 79 % of the total households interviewed experiencing at least one shock of some magnitude in the previous 12 months. As expected, the frequency of the shocks (particularly, severe shocks) experienced by the households tended to increase with decreasing agro-ecological potential. Therefore, households in very low and low agro-ecological zones are generally more exposed to severe shocks as compared to households in high agro-ecological zones. This is line with findings by other studies that noted that low agro-ecological zones are

generally characterised by high occurrence of severe shocks such as droughts, HIV prevalence rates, AIDS related deaths, crop pests and food shortages (Manjengwa et al., 2012; Mason et al., 2007). Therefore, the role of NTFPs as a safety net becomes important for households in the low agro-ecological zones. Indeed, the findings of the study revealed that the very low and low agro-ecological sites were significantly and positively related to the usage of NTFPs as safety nets. Thus, households in very low and low agro-ecological locations were likely to use NTFPs in the wake of hardships. This was supported by the usage of NTFPs as safety nets was the second (36.5 %) and joint-second (37 %) most frequently used coping strategy by households in very low and low agro-ecological classes, respectively.

The findings of this study show that the use of NTFPs as safety nets by households was significantly and positively related to the number of shocks experienced by the household. This suggests that the use of NTFPs of safety nets increases as other strategies wear down. Similarly, large households and those headed by younger people were likely to turn to NTFPs in times of hardships as compared to old headed households. Therefore, young headed households have limited or no other assets and also probably less social capital.

The households employed various coping strategies in response to different types of shocks. However, many South African rural areas are characterised by limited employment opportunities, variable weather and poor agricultural output due to various factors such as poor soils, lack of quality inputs, and inadequate farming land. This limits the coping strategies that are available to many rural households when faced with shocks hence making many households vulnerable to shocks. Therefore, it is not surprising that there were only three widely used strategies to coping with shocks. These three coping strategies were assistance from friends and relatives (60.1 %), using cash savings (37.9 %) and using NTFPs (35.6 %).

The findings of this study show that even though NTFPs are always important, they become even more important, particularly to rural households, in the wake of hardships such as crop failure, hunger or food shortage and major livestock loss. Many households reported

increasing their dependence on NTFPs as a way of coping with various hardships. Thus, not only did the NTFPs provide the rural households with food and goods in times of crisis, but they also provided households with marketable products which in turn provided cash income for the households. Indeed, the results of the results of GLM regression analysis revealed that hunger or food shortage and crop failure were significantly and positively related to the usage of NTFPs as safety nets. Therefore, households who experienced hunger or food shortage and crop failure were likely to use NTFPs to cope with these shocks. My analysis supports the argument that households in low agro-ecological zones are in a precarious setting and are likely to experience more shocks and of greater severity. Consequently, these households are likely to use NTFPs as safety nets more than households in high agro-ecological zones. In addition, households with high contribution of NTFPs to total household income are more likely to use NTFPs as safety nets since they already have the aptitude to harvest NTFPs. Indeed, the very low and low agro-ecological sites were significantly and positively related to the usage of NTFPs as safety nets. This is not surprising given that some studies suggested heavy use of NTFPs as safety nets by households in low agro-ecological zones due to unproductive land (rendering agriculture unviable) and limited employment opportunities (see for example Manjengwa et al., 2012; Mason et al., 2007; Mutenje, 2010; Woittiez et al., 2013). In addition, rural areas in low agro-ecological zones of Sub-Saharan Africa tend to be characterised by high poverty rates, frequent occurrence of shocks and underdevelopment hence NTFPs are critical in assisting rural households to cope with hardships (Livingston et al., 2011; Manjengwa et al., 2012; Oni, 2014; Siegel, 2008).

6.2.3 Factors affecting pricing of NTFPs

Pricing of NTFPs is very important if the sellers of NTFPs are to run profitable businesses in markets characterised by many buyers who usually seek to negotiate for low prices and some sellers who cannot stand firm on the original set price. For example, some sellers lower their prices because they want to build relationships with customers (12.9 %), they feel empathy towards the seller (10.5 %) or to customers who complain about the price (3.2 %). This concurs with findings by Pereira et al. (2006) and Mjoli and Shackleton (2015), who noted that sellers of reed crafts products in certain rural villages of Eastern Cape, South

Africa, were mostly price takers as many buyers always haggle for lower prices. In addition, some crafters cannot stand firm on fixed prices as they wish to maintain a good reputation and relationships in the community. Shackleton (2005) reported a similar pattern in Bushbuckridge, South Africa, where wood carvers were largely price takers as most buyers were willing to pay about one third of the original set price.

There are various factors that sellers of NTFPs take into account when setting prices of NTFPs, including the type of NTFP being sold, type of market (home markets or urban markets) and the method used by the seller to procure the stock. However, overall, transport costs, stock price, profit margin, time taken to collect or produce the product and market price were the widely used factors to determine prices for NTFPs. Therefore, as hypothesised in this study, the reported various pricing factors show that there was no a formal or certain pricing mechanism used by the sellers of NTFPs to establish the market prices of NTFPs. In some cases, the pricing factors used by sellers of NTFPs are difficult to quantify or turn into monetary terms. In addition, even though some of the sellers mentioned that they take into account costs incurred when setting prices of NTFPs, they sometimes do not take into account all costs incurred. For instance, many sellers of traditional mats reported that they take into account transport costs, airtime costs and food costs when setting prices. However, they did not mention other important pricing factors such as stock price (given that many buy their stock), storage costs and rent. Therefore, they run a risk of selling some of their products at a loss. However, this is not completely surprising given that the highest school grade attained ranged from 0 (no formal education) to 12 (highest secondary school grade), with an average of 6.3 ± 3.8 years. Furthermore, about 15.3 % of the sellers had no formal education, whilst about 42.3 % had attained school grades ranging from 1 -7.

Interestingly, the GLM regression analysis did not find any significant relationship between factors such as the age of the seller, highest grade attained by the seller, trading years of the seller, number of trading days per week and the number of trading hours per day and the pricing factors. However, the sex of the seller had significant relationship with pricing factors such as transport costs, entrance fees to access forests and the availability of the

NTFPs. Furthermore, the significant pricing factors varied with the type of the NTFP being sold.

6.3 Recommendations

The findings of the study revealed that the contribution of NTFPs to rural livelihoods varies across different agro-ecological zones. Therefore, some of the literature from the tropics might not necessarily apply to the dry Sub-Saharan African environments. Even though, there are some similarities between Sub-Saharan African countries and developing countries in the tropics, there are still some differences that affect the use of NTFPs in rural livelihoods. For instance, Wunder et al. (2014) reported marginal use of NTFPs as a safety net in their PEN sample, leading to them concluding that NTFPs could be "options of last resort". Conversely, results of this study showed that more than 35 % of the households reported using NTFPs as safety nets. Therefore, any policies relating to the use of NTFPs in South Africa should not be necessarily based on information from the studies carried out in humid tropics.

The study showed that agriculture is not the main source of income in most rural areas of South Africa, which are characterised by dry and variable weather conditions and high social security as compared to the humid tropics. Whilst, NTFP income is not the main livelihood activity, irrespective of agro-ecological potential it was greater than one or both crop income and livestock income. Yet development planners and interventions rarely focus on NTFPs, but still favour crops or livestock. Any future development plans in South African rural livelihoods should take into consideration that NTFPs contribute significantly to the livelihoods of many rural households rather than just focusing on agriculture alone. Indeed, not only a single livelihood activity (NTFP consumption, agriculture, social grants etc.) would solve rural poverty, but a combination of different livelihood activities is likely to have a positive impact on the welfare of rural households (Shackleton et al., 2008).

NTFP trade income is an important source of cash income for many rural households. About 6.4 % rural households reported selling NTFPs for various reasons, with many (39 %) citing the need to earn cash income and limited employment opportunities (16.9 %). Most also

noted that the number of participants was increasing. Therefore, NTFPs presents an opportunity for households to earn cash income by selling NTFPs and diversify their income earning sources against risks such as drought and limited employment opportunities. Development practitioners or policy makers should implement policies that promote or support NTFP sellers by providing environments that are conducive for trading NTFPs. For instance, many sellers of NTFPs (e.g. in Queenstown, Thohoyandou, Port St Johns and Idutywa) remarked that they could have been making more profits if they had covered markets to protect their products against extreme weather conditions. However, work is needed to ensure that increasing trade is ecologically sustainable for most types of NTFPs.

References

Adam, Y.O. and Pretzsch, J., 2010. Contribution of local trade in *Ziziphus spina-christi L.* fruits to rural household's economy in Rashad locality, Sudan. *Forestry Ideas*, 16(39), 19-27.

Angelsen, A., Jagger, P., Babigumira, R., Belcher, B., Hogarth, N.J., Bauch, S., Börner, J., Smith-Hall, C. and Wunder, S., 2014. Environmental income and rural livelihoods: a global-comparative analysis. *World Development*, 64 (S1), S12-S28.

Angelsen, A. and Kaimowitz, D., 1999. Rethinking the causes of deforestation: lessons from economic models. *The World Bank Research Observer*, 14(1), 73–98.

Babulo, B., Muys, B., Nega, F., Tollens, E., Nyssen, J., Deckers, J. and Mathijs, E., 2008. Household livelihood strategies and forest dependence in the highlands of Tigray, northern Ethiopia. *Agricultural Systems*, 98(2), 147–155.

Babulo, B., Muys, B., Nega, F., Tollens, E., Nyssen, J., Deckers, J. and Mathijs, E., 2009. The economic contribution of forest resource use to rural livelihoods in Tigray, northern Ethiopia. *Forest Policy and Economics*, 11(2), 109–117.

Daniels, R.C., Partridge, A., Kekana, D. and Musundwa, S., 2013. Rural Livelihoods in South Africa. Cape Town: SALDRU, University of Cape Town. SALDRU Working Paper Number 122/ NIDS Discussion Paper 2013/4.

Dovie, D.B.K., Shackleton, C.M. and Witkowski, E.T.F., 2002. Direct-use values of woodland resources consumed and traded in a South African village. *International Journal of Sustainable Development and World Ecology*, 9(3), 269–283.

Hart, T. 2008. Reviewing 15 years of resource poor small-scale agriculture in South Africa: is there any way forward? Accessed 02 June 2014, http://www.tips.org.za/files/Hart_Paper_24_Oct_2008__tmp52aa50cf.pdf

Heubach, K., Wittig, R., Nuppenau, E.A. and Hahn, K., 2011. The economic importance of non-timber forest products (NTFPs) for livelihood maintenance of rural West African communities: a case study from northern Benin. *Ecological Economics*, 70(11), 1991–2001.

Hunter, L.M., Twine, W. and Johnson, A., 2011. Adult mortality and natural resource use in rural South Africa: evidence from the Agincourt health and demographic surveillance site. *Society and Natural Resources*, 24(3), 256–275.

Kar, S.P. and Jacobson, M.G., 2012. NTFP income contribution to household economy and related socio-economic factors: lessons from Bangladesh. *Forest Policy and Economics*, 14(1), 136–142.

Livingston, G., Schonberger, S. and Delaney, S., 2011. Sub-Saharan Africa: the state of smallholders in agriculture. *Paper presented at the IFAD conference on new directions for smallholder agriculture, 24-25 January, 2011. Rome.*

López-Feldman, A., 2014. Shocks, income and wealth: do they affect the extraction of natural resources by rural households? *World Development*, 64(S1), S91-S100.

Makhado, R.A., Von Maltitz, G.P., Potgieter, M.J. and Wessels, D.C.J., 2009. Contribution of woodland products to rural livelihoods in the northeast of Limpopo province, South Africa. *South African Geographical Journal,* 91(1), 46–53.

Mamo, G., Sjaastad, E. and Vedeld, P., 2007. Economic dependence on forest resources: a case from Dendi district, Ethiopia. *Forest Policy and Economics*, 9(8), 916–927.

Manjengwa, J., Kasirye, I. and Matema, C., 2012. Understanding poverty in Zimbabwe: a sample survey in 16 districts. *Paper prepared for presentation at the Centre for the Study of African Economies Conference 2012 "Economic Development in Africa", Oxford, United Kingdom, March 18-20, 2012.*

Mason, N.M., Chapoto, A., Jayne, T.S. and Myers, R.J., 2007. HIV /AIDS and agrarian livelihoods in Zambia: a test of the new variant famine hypothesis. Policy synthesis, food security research project Number 23. Lusaka. Accessed 07 April 2016, http://fsg.afre.msu.edu/zambia/ps23.pdf

Mtati, N., 2014. The relative contribution of non-timber forest products, agriculture and off-farm sources of income to rural households in Koloni and Guquka, Eastern Cape. MSc thesis. Rhodes University, Grahamstown.

Mutenje, M.J., 2010. Rural livelihoods in south-eastern Zimbabwe: the impact of HIV/AIDS on the use and management of non-timber forestry products. PhD thesis. University of KwaZulu-Natal. Pietermaritzburg.

Mcelwee, P.D., 2008. Forest environmental income in Vietnam: household socioeconomic factors influencing forest use. *Environmental Conservation*, 35(02), 147–159.

Mjoli, N. and Shackleton, C.M., 2015. The trade in and household use of *Phoenix Reclinata* palm from hand brushes on the wild coast, South Africa. *Economic Botany*, 69, 218–229.

Neves, D., Samson, M., Van Niekerk, I., Hlatshwayo, S. and Du Toit, A., 2009. *The use and effectiveness of social grants in South Africa*. *Institute for Poverty, Land and Agrarian Studies (PLAAS)*.

Oni, O.A., 2014. Livelihood, agro ecological zones and poverty in rural Nigeria. *Journal of Agricultural Science*, 6(2), 103-113.

Paumgarten, B.F., 2007. The significance of the safety-net role of NTFPs in rural livelihoods, South Africa. MSc thesis. Rhodes University. Grahamstown.

Paumgarten, F. and Shackleton, C.M., 2011. The role of non-timber forest products in household coping strategies in South Africa: the influence of household wealth and gender. *Population and Environment,* 33(1), 108-131.

Pereira, T., Shackleton, C. and Shackleton, S., 2006. Trade in reed-based craft products in rural villages in the Eastern Cape, South Africa. *Development Southern Africa*, 23(4), 477–495.

Perret, S., Anseeuw, W. and Mathebula, N., 2005. *Poverty and livelihoods in rural South Africa. Investigating diversity and dynamics of livelihoods. Case studies in Limpopo*. Unpublished Project report num.05/01, Kellogg's Foundation. University of Pretoria, 65p. Accessed 7 March 2014, http://ageconsearch.umn.edu/bitstream/60885/2/2005-01.pdf

Phaahla, E., 2015. What the South African state does for the poor: 1 – social grants. Helen Suzman Foundation. Accessed 02 June 2015, http://hsf.org.za/resource-centre/hsf-briefs/what-the-south-african-state-does-for-the-poor-i-social-grants

Piya, L., Maharjan, K.L., Joshi, N.P. and Dangol, D.R., 2011. Collection and marketing of nontimber forest products by Chepang community in Nepal. *The Journal of Agriculture and Environment,* 12, 10–21.

Posel, D., Casale, D. and Vermaak, C., 2013. The unemployed in South Africa: why are so many not counted? Accessed 18 July 2014, http://www.econ3x3.org/sites/default/files/articles/Posel%20et%20al%20Feb%202013%20Measuring%20unemployment%20FINAL_0.pdf

Shackleton, C.M., Shackleton, S.E., Buiten, E. and Bird, N., 2007. The importance of dry woodlands and forests in rural livelihoods and poverty alleviation in South Africa. *Forest Policy and Economics*, 9(5), 558–577.

Shackleton, C.M., Shackleton, S.E. and Cousins, B., 2001. The role of land-based strategies in rural livelihoods: the contribution of arable production, animal husbandry and natural resource South Africa. *Development Southern Africa*, 18(5), 581-604.

Shackleton, S.E., 2005. The significance of the local trade in natural resource products for livelihoods and poverty alleviation in South Africa. PhD thesis. Rhodes University, South Africa.

Shackleton, S., Campbell, B., Lotz-Sisitka, H. and Shackleton, C., 2008. Links between the local trade in natural products, livelihoods and poverty alleviation in a semi-arid region of South Africa. *World Development*, 36(3), 505–526.

Siegel, B.P., 2008. Profile of Zambia's smallholders: where and who are the potential beneficiaries of agricultural commercialization? World Bank. *Africa Region Working Paper Series*, (113). Accessed 08 April 2016, http://www.worldbank.org/afr/wps/WPS113_Zambia_Smallholder.pdf

Tewari, D.D., 2012. Promoting non-timber forest products (NTFPs) to alleviate poverty and hunger in rural South Africa: a reflection on management and policy challenges. *African Journal of Business Management*, 6(47), 11635–11647.

Thondhlana, G. and Muchapondwa, E., 2014. Dependence on environmental resources and implications for household welfare: Evidence from the Kalahari drylands, South Africa. *Ecological Economics*, 108, 59–67.

Tregurtha, N. and Vink, N., 2008. Presidency fifteen year review project: review of agricultural policies and support instruments. Accessed 24 March 2014, http://www.thepresidency.gov.za/docs/reports/15year_review/economic/agricultural_policy.pdf

Tshuma, M.C. and Monde, N., 2012. A socio-economic impact assessment of a project to identify and implement best management practices at the Zanyokwe Irrigation Scheme at farm level. *Water SA*, 38(5), 783-792.

Twine, W., Moshe, D., Netshiluvhi, T. and Siphugu, V., 2003. Consumption and direct-use values of savanna bio-resources used by rural households in Mametja, a semi-arid area of Limpopo province, South Africa. *South African Journal of Science,* 99, 467–473.

Vedeld, P., Angelsen, A., Bojö, J., Sjaastad, E. and Kobugabe Berg, G., 2007. Forest environmental incomes and the rural poor. *Forest Policy and Economics*, 9(7), 869–879.

Vedeld, P., Angelsen, A., Sjaastad, E. and Berg, G.K., 2004. Counting on the environment. forest incomes and the rural poor. Environment Department Papers, Paper No. 98. Environmental Economics Series. The World Bank Group, Washington D.C.

Woittiez, L.S., Rufino, M.C., Giller, K.E. and Mapfumo, P., 2013. The use of woodland products to cope with climate variability in communal areas in Zimbabwe. *Ecology and Society*, 18(4), 1-24.

World Bank. 2014. Agricultural land (% of land area). Accessed 12 June 2014, http://data.worldbank.org/indicator/AG.LND.AGRI.ZS

Wunder, S., Börner, J., Shively, G. and Wyman, M., 2014. Safety nets, gap filling and forests: a global-comparative perspective. *World Development*, 64(S1), S29-S42.

Yemiru, T., Roos, A., Campbell, B. and Bohlin, F., 2010. Forest incomes and poverty alleviation under participatory forest management in the Bale Highlands, southern Ethiopia. *International Forestry Review*, 12(1), 66–77.

Annexure 1: Household questionnaire

Date of interview……../……../……. Village ……House number…… GPS coordinates…… Interviewed by……

Firewood

Does your household use firewood? Yes◯ No◯

How often is it used?_____

A. Income from NTFPs

How does your household get firewood? Buy◯ Collect◯ Both◯

If you collect, how much do you collect?_____

How often do you go to collect firewood?_____

If bought, where is it bought?_____

How much is bought?_____

How often do you buy?_____

Generally, what is the local price?_____

Does your household ever sell firewood? Yes◯ No◯

If yes, how much is sold?_____

How often is it sold?_____

Why does your household sell?_____

Was this a typical year in terms of household use of firewood?_____

If not, why?_____

Hand brushes (includes palm, grass and twig hand brushes)

Does your household use hand brushes? Yes◯ No◯

How often are they replaced?_____

How does the household get hand brushes? Buy◯ Produce◯ Both◯

If you produce, how much do you collect?_____

How often do you go to collect?_____

If bought, where are they bought?_____

How many do you buy?_____

How often do you buy?_____

Generally, what is the local price?_____

Does your household ever sell hand brushes? Yes◯ No◯

If yes, how many are sold?_____

How often are they sold?_____

Why does your household sell?_____

Was this a typical year in terms of household use of hand brushes?_____

If not, why?_____

Thatch grass

Does your household use thatch grass? Yes◯ No◯

How often is it used?_____

How does the household get thatch grass? Buy◯ Collect◯ Both◯

If you collect, how much do you collect?_____

How often do you go to collect?_____

If bought, where is it bought?_____

How many do you buy?_____

How often do you buy?_____

Generally, what is the local price?_____

Does your household ever sell thatch grass? Yes◯ No◯

If yes, how much is sold?_____

How often is it sold?_____

Why does your household sell?_____

Was this a typical year in terms of household use of thatch grass?_____

If not, why?_____

Weaving material

Does your household use weaving material? Yes◯ No◯

How often is it used?_____

How does the household get weaving material? Buy◯ Collect◯ Both◯

If you collect, how much do you collect?_____

How often do you go to collect?_____

If bought, where is it bought?_____

How much do you buy?_____

How often do you buy?_____

Generally, what is the local price?_____

Does your household ever sell weaving material? Yes◯ No◯

If yes, how much is sold?_____

How often is it sold?_____

Why does your household sell?_____

Was this a typical year in terms of household use of weaving material?_____

If not, why?_____

Kraal poles

Does your household use kraal poles? Yes◯ No◯

How often are they replaced?_____

How does the household get kraal poles? Buy◯ Collect◯ Both◯

If you collect, how many do you collect?_____

How often do you go to collect?_____

If bought, where are they bought?_____

How many do you buy?_____

How often do you buy?_____

Generally, what is the local price?_____

Does your household ever sell kraal poles? Yes◯ No◯

If yes, how many are sold?_____

How often are they sold?_____

Why does your household sell?_____

Was this a typical year in terms of household use of kraal poles_____

If not, why?_____

Kraal branches

Does your household use kraal braches? Yes◯ No◯

How often are they replaced?_____

How does the household get kraal branches? Buy◯ Collect◯ Both◯

If you collect, how many do you collect?_____

How often do you go to collect?_____

If bought, where are they bought?_____

How many are bought?_____

How often do you buy?_____

Generally, what is the local price?_____

Does your household ever sell kraal braches? Yes◯ No◯

If yes, how many are sold?_____

How often are they sold?_____

Why does your household sell?_____

Was this a typical year in terms of household use of kraal brunches?_____

If not, why?_____

Fencing poles

Does your household use fencing poles? Yes◯ No◯

How often are they replaced?_____

How does the household get fencing poles? Buy◯ Collect◯ Both◯

If you collect, how many do you collect?_____

How often do you go to collect?_____

If bought, where are they bought?_____

How many are bought?_____

How often do you buy?_____

Generally, what is the local price?_____

Does your household ever sell fencing poles? Yes◯ No◯

If yes, how many are sold?_____

How often are they sold?_____

Why does your household sell?_____

Was this a typical year in terms of household use of fencing poles?_____

If not, why?_____

Wooden utensils

Does your household use wooden utensils? Yes◯ No◯

How often are they replaced?_____

How does the household get wooden utensils? Buy◯ Produce◯ Both◯

If you produce, how many do you produce?_____

How often do you produce them?_____

If bought, where are they bought?_____

How many are bought?_____

How often do you buy?_____

Generally, what is the local price?_____

Does your household ever sell wooden utensils? Yes◯ No◯

If yes, how many are sold?_____

How often are they sold?_____

Why does your household sell?_____

Was this a typical year in terms of household use of wooden utensils?_____

If not, why?_____

Medicinal plants

Does your household use medicinal plants? Yes◯ No◯

How often are they used?_____

How does your household get medicinal plants? Buy◯ Collect◯ Both◯

If you collect, how much do you collect?_____

How often do you go to collect?_____

If bought, where are they bought?_____

How much is bought?_____

How often do you buy?_____

Generally, what is the local price?_____

Does your household ever sell medicinal plants? Yes◯ No◯

If yes, how much is sold?_____

How often is it sold?_____

Why does your household sell?_____

Was this a typical year in terms of household use of medicinal plants?_____

If not, why?_____

Rituals

Does your household use plants for rituals? Yes◯ No◯

How often are they used?_____

How does your household get the plants used? Buy◯ Collect◯ Both◯

If you collect, how much do you collect?_____

How often do you go to collect?_____

If bought, where are they bought?_____

How much is bought?_____

How often do you buy?_____

Generally, what is the local price?_____

Does your household ever sell plants for rituals? Yes◯ No◯

If yes, how much is sold?_____

How often is it sold?_____

Why does your household sell?_____

Was this a typical year in terms of household use of plants for ritual?_____

If not, why?_____

Traditional sticks

Does your household use traditional sticks? Yes◯ No◯

How often are they replaced?_____

How does the household get traditional sticks? Buy◯ Collect◯ Both◯

If you collect, how much do you collect?_____

How often do you go to collect?_____

If bought, where are they bought?_____

How many are bought?_____

How often do you buy?_____

Generally, what is the local price?_____

Does your household ever sell traditional sticks? Yes◯ No◯

If yes, how many are sold?_____

How often are they sold?_____

Why does your household sell?_____

Was this a typical year in terms of household use of traditional sticks?_____

If not, why?_____

Crafts

Does your household use crafts? Yes◯ No◯

How often are they replaced?_____

How does the household get crafts? Buy◯ Produce◯ Both◯

If you produce, how many do you produce?_____

How often do you produce?_____

If bought, where are they bought?_____

How many are bought?_____

How often do you buy?_____

Generally, what is the local price?_____

Does your household ever sell crafts? Yes◯ No◯

If yes, how many are sold?_____

How often are they sold?_____

Why does your household sell?_____

Was this a typical year in terms of household use of crafts?_____

If not, why?_____

Wild meat

Does your household consume wild meat? Yes◯ No◯

How often is wild meat consumed?_____

How does your household get wild meat? Buy◯ Hunt◯ Both◯

If you hunt, how much do you generally catch in a single hunt?_____

How often do you hunt?_____

If bought, where is it bought?_____

How much is bought?_____

How often do you buy?_____

Generally, what is the local price?_____

Does your household ever sell wild meat? Yes◯ No◯

If yes, how much is sold?_____

How often is it sold?_____

Why does your household sell?_____

Was this a typical year in terms of household use of wild meat?_____

If not, why?_____

Edible wild fruits

Does your household use wild fruits? Yes◯ No◯

How often are they used?_____

How does your household get wild fruits? Buy◯ Collect◯ Both◯

If you collect, how much do you collect?_____

How often do you go to collect?_____

If bought, where are they bought?_____

How much is bought?_____

How often do you buy?_____

Generally, what is the local price?_____

Does your household ever sell wild fruits? Yes◯ No◯

If yes, how much is sold?_____

How often is it sold?_____

Why does your household sell?_____

Was this a typical year in terms of household use of edible fruits?_____

If not, why?_____

Wild vegetables

Does your household use wild vegetables? Yes◯ No◯

How often are they used?_____

How does your household get wild vegetables? Buy◯ Collect◯ Both◯

If you collect, how much do you collect?_____

How often do you collect?_____

If bought, where are they bought?_____

How much is bought?_____

How often do you buy?_____

Generally, what is the local price?_____

Does your household ever sell wild vegetables? Yes◯ No◯

If yes, how much is sold?_____

How often is it sold?_____

Why does your household sell?_____

Was this a typical year in terms of household use of wild vegetables?_____

If not, why?_____

Edible mushrooms

Does your household use mushrooms? Yes◯ No◯

How often are they used?_____

How does your household get mushrooms? Buy◯ Collect◯ Both◯

If you collect, how much do you collect?_____

How often do you collect?_____

If bought, where are they bought?_____

How much is bought?_____

How often do you buy?_____

Generally, what is the local price?_____

Does your household ever sell mushrooms? Yes◯ No◯

If yes, how much is sold?_____

How often is it sold?_____

Why does your household sell?_____

Was this a typical year?_____

If not, why?_____

Edible insects

Does your household use edible insects? Yes◯ No◯

How often are they used?_____

How does your household get edible insects? Buy◯ Collect◯ Both◯

If you collect, how much do you collect?_____

How often do you collect?_____

If bought, where are they bought?_____

How much is bought?_____

How often do you buy?_____

Generally, what is the local price?_____

Does your household ever sell edible insects? Yes◯ No◯

If yes, how much is sold?_____

How often is it sold?_____

Why does your household sell?_____

Was this a typical year in terms of household use of edible insects?_____

If not, why?_____

Wild honey

Does your household use wild honey? Yes◯ No◯

If yes, how often is it used?_____

How does your household get wild honey? Buy◯ Collect◯ Both◯

If you collect, how much do you collect?_____

How often do you collect?_____

If bought, where is it bought?_____

How much is bought?_____

How often do you buy?_____

Generally, what is the local price?_____

Does your household ever sell wild honey? Yes◯ No◯

If yes, how much is sold?_____

How often is it sold?_____

Why does your household sell?_____

Was this a typical year in terms of household use of wild honey?_____

If not, why?_____

Wild fish

Does your household use wild fish? Yes◯ No◯

If yes, how often is it used?_____

How does your household get wild fish? Buy◯ fish◯ Both◯

If you fish, how much do you catch?_____

How often do you fish?_____

If bought, where is it bought?_____

How much is bought?_____

How often do you buy?_____

Generally, what is the local price?_____

Does your household ever sell wild fish? Yes◯ No◯

If yes, how much is sold?_____

How often is it sold?_____

Why does your household sell?_____

Was this a typical year in terms of household use of wild fish?_____

If not, why?_____

B. Wage income

1. Does this household receive any wage income? Yes◯ No◯

2. If yes, please provide details:

Household member	**Type of work**			**How often is the income received**	**How much is received each time**
	Full-time	**Part-time**	**Casual**		

Note: One person can be listed more than once for different jobs.

3. Was this a typical year in terms employment?_____

4. If not, why?_____

C. Income from agriculture – crops and gardens

1. Does your household grow any cereal crops? Yes◯ No◯

2. If yes, please provide the quantities and values of crops that household has harvested during **the past cropping season**?

Crop	**Production area**	**Unit**	**Own use** (incl. gifts)	**Sold** (incl. barter)	**Price per unit**

3. Was this a typical agricultural season?_____

4. If not, why?_____

5. Would you like to grow more crops? Yes◯ No◯

6. If yes, why?_____

7. If no, why?_____

8. Do you regard this as a good agricultural area?_____

9. Why?_____

10. Do you irrigate your crops?_____

11. What are the main constraints to agriculture?_____

_____

_____

12. Does your household grow any fruits? Yes◯ No◯

13. If yes, please provide the quantities and values of fruit that household has harvested during **the past production season**.

Fruit	**Production area**	**Unit**	**Own use** (incl. gifts)	**Sold** (incl. barter)	**Price per unit**

14. Was this a typical production season?_____

15. If not, why?_____

16. Does your household grow any vegetables? Yes◯ No◯

17. If yes, please provide the following details:

Vegetable	Quantity produced per time	Unit	Own use	Sold	Price per unit

18. Was this a typical year in terms of vegetable production?_____

19. If not, why?_____

20. What are the quantities and values of inputs used in the past season in crop production?

Inputs	Used Yes/No	Where did it/they come from	Unit	If bought, what was the cost per unit or in total (specify)
Seeds				
Fertilizers				
Pesticides/herbicides				
Manure				
Draught power				
Hired labour				
Hired machinery				
Transport/marketing				
Payment for land rental				
Other, specify:				

D. Income from livestock

1. Does your household own any livestock? Yes◯ No◯

2. If yes, please provide the number of animals your household has now, and the frequency and value provided from livestock.

Livestock	Number	Frequency of slaughter to eat by household	Frequency live one or slaughtered is donated	Frequency live one or slaughtered is sold	Local price to buy or sell a whole one	No. of offspring last year
Cattle						
Goats						
Sheep						
Pigs						
Donkeys						
Horses						
Other,						

specify:						

3. Does your household own any poultry? Yes◯ No◯

4. If yes, please provide the number of birds your household has now, and the frequency and value provided from poultry.

Poultry	**No.**	**Frequency of slaughter to eat by household**	**Frequency live one or slaughtered is donated**	**Frequency live one or slaughtered is sold**	**Local selling or buying price**	**No. of offspring last year**	**No. of eggs collected per time (specify)**	**Local price of eggs**
Geese								
Chicken								
Ducks								
Other, specify:								

5. Besides meat what other tangible products do you obtain from your livestock?

Product/service	**Amount produced per time**	**Own use** (incl. gifts)	**Sold** (incl. barter)	**Price per unit**
Milk				
Hides and skin				
Wool				
Manure				
Draught power				
Honey				
Other, specify:				

6. Please provide the main costs associated with keeping livestock and poultry.

Inputs	**Frequency incurred**	**Amount**
Feed/fodder		
Rental of grazing land		
Medicines, vaccination and other veterinary services		
Dipping		
Costs of maintaining barns, enclosures, pens, etc.		
Hired labour		
Other, specify:		

7. Was this a typical year in terms of livestock production?_____

8. If not, why?_____

E. Other income sources

1. Please list any other income and receipts the household gets.

Type of income	**How often is it received**	**How much is received each time**	**Who receives it in the household**
Remittances			
Selling/trade			
Grants: Old age pension			
Disability grant			
Foster grant			
Child grant			
Support from NGOs			
Gifts from friends and relatives			
Payment for renting out land or accommodation			
Other, specify:			

2. Do kids receive food at school? Yes◯ No◯

3. If yes, please tick the following circles Breakfast◯ Lunch◯

4. How often do they receive the food?_____

F. Crisis and unexpected expenditures

Illness

Did the household experience any serious illness last year? Yes◯ No◯

If yes, please provide age in years and gender of the ill person_____

How did you cope with the illness? (**see codes below**)_____

Death

Did any immediate household member pass away last year? Yes◯ No◯

If yes, please provide age in years and gender_____

How did you cope with the passing? (**see codes below**)_____

How frequently has the household in the last year faced any major income shortfalls or unexpectedly large expenditures?

Event	Frequency	Severity[abc]	How did you cope with the income loss or costs? *Rank max. 3[d)]*		
			Rank1	Rank2	Rank3
Serious crop failure					
Hunger/Food shortage					
Land loss (expropriation, etc.)					
Major livestock loss (theft, drought, etc.)					
Other major asset loss (fire, theft, flood, etc.)					
Lost wage employment					
Wedding or other costly social events					
Other, specify:					

a) Codes severity: 0=no crisis; 1=yes, moderate crisis; 2=yes, severe crisis.

b) Moderate crisis refers to events such as moderate crop failure, illness for less than 3 months, losing only a small proportion of land, cattle or other assets, and losing a low-paid part time job.

*c) Severe crisis refers to events that lead to a **significant decline** in the household well-being. As a rule of thumb, a crisis of category 2 should be one the leads to a drop in the overall village income by more than 1/3.*

d) Codes coping:

1. Used more NTFPs than they normally use
2. Consumed NTFPs they don't usually use under normal circumstances
3. Sold more NTFPs than they normally do
4. Sold NTFPs they do not usually sell
5. Harvest more agricultural products
6. Spend cash savings
7. Sell assets (land, livestock, etc.)
8. Do extra casual labour work
9. Assistance from friends and relatives
10. Assistance from NGO, community org., religious org. or similar
11. Get loan from money lender, credit association, bank .
12. Tried to reduce household spending
13. Did nothing in particular
14. Spent savings / retirement money
15. Reduced number of meals taken
16. Borrowed against future earnings
17. Sold food that would otherwise be used for household consumption
18. Rented out land
19. Started new business
20. Changed to different type of livestock
21. Harvested premature crops.
22. Changed cropping patterns or types of crops planted
22. Other, specify:

F. Household characteristics

1. Please provide the details of your household **(start with respondent as the first person in the table):**

Name	Relation to head	Year born	Gender (M/F)	Highest grade/degree attained	Still studying (Y/N)*	Occupation(s)

Codes: * P = primary; S = secondary; C = college; U = University

Annexure 2: Sellers' questionnaire

Date of interview……../……../……. Village ……Market name……
GPS coordinates…… Interviewed by……

1. What do you trade?_____

A. Price setting of NTFPs

2. How long have you been trading this product (s)?_____

3. Why started?_____

4. What is the most important source of income to the household?_____

5. If not trading this product (s), how does the trade compare to the most important source?_____

6. What percentage of household income comes from trade? *Less than 25%*◯ *25% to less than 50%*◯ *50% to less than 75%*◯ *75 to 100%*◯

7. How many days a week do you usually trade?_____

8. How many hours per day do you trade?_____

9. How many units do you sell per _____day; _____week;_____month?

10. From where do you sell?_____

11. Why?_____

12. Are there others selling similar products in the immediate vicinity?_____

13. Are you well connected with other sellers?_____

14. How does your pricing compare to others?_____

15. Do you ever charge lower prices? Yes◯ No◯

16. If yes, how often and why?_____

17. Do you ever give "discount" for a large sale? Yes◯ No◯

18. If yes, how often?_____

19. Do you sometimes sell on credit?_____

20. If yes, why_____

21. If yes, how often?_____

22. Has the number of people selling here in last 5 years increased◯ decreased◯ or remained the same◯

23. Why?_____

24. Do you collect/produce or buy the products you sell? Buy◯ Collect/produce◯ Both◯

25. If you buy, where do you buy the products?_____

26. How do you decide what price to sell your goods?

NTFP	Reasons

B. Trader's characteristics

1. Sex of interviewee. Male ◯ b) Female ◯

2. Age of interviewee (in years)_____

3. Highest grade attained_____

4. Economic occupation(s) of the seller. Farmer ◯ Pensioner ◯ Student◯
Housewife◯ Unemployed ◯ Seller◯ other (specify)