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IN THE FIELD

# Monetary valuation of livelihoods for understanding the composition and complexity of rural households

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**Abstract.** There is, at present, little precise understanding of the relative contributions of the various income streams used by impoverished rural households in southern Africa. The impact of household profiles on overall income is also not well understood. There is, therefore, little consideration of these factors in national economic accounting. This paper is an attempt to reduce this gap in knowledge by reflecting on the relative contribution of agro-pastoralism, secondary woodland resources, and formal and informal cash income streams to households in the semi-arid rural village of Thorndale, Limpopo Province, South Africa. In the absence of jobs and confronted with high migrant labor, households with open access to natural resources derived more benefits from land-based livelihoods than cash income streams (i.e., 57.5% vs. 42.5%). Total livelihood income was valued at US$2887 per household per annum. A significant correlation between monetary values derived from crops and formal wages was established, and it was found that households with high cash incomes tended to invest more in crop production. Over 80% of households were male-headed. Of these heads of household, more than 60% were long-term migrants to urban areas, leaving household decision-making to the women. The low literacy rates of women have deprived them of paid jobs outside the area and, therefore, have increased their dependence on crops (62%) and secondary woodlands resources (60%). This was further reflected in the proportion of households in which females were the main contributors of cash income (9.7%), or joint contributors with men (24.4%). Various positive correlations were established between the number of women per household and the three land-based livelihoods. This implied that women's total control over such activities was mostly a result of the absence of men and not a typical phenomenon. In spite of this control, it was not positively reflected in the lives of the majority of the women. Households differed in their participation in livelihood activities. Household size influenced the level of production and was positively correlated with the value of secondary woodland resources and crops. The study shows the interdependence of land-based livelihood sources and the impact of household features on production and consumption. Policies that focus on livelihood options need to recognize and accommodate associated household dynamics.

**Key words**: Direct-use value, Gender, Household composition, Land-based resources, Livelihood options, Multiple resource use, Rural poor, South Africa, Woodland resources

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## Introduction

### *The dynamism of rural livelihoods*

Livelihood entails various means of supporting life and meeting individual and community needs (Forsyth et al., 1998). It can be expressed in cash, kind, or both, in addition to human, social, and natural capital (Bryceson, 1996; Lipton, 1996; Ellis, 1998; Carney et al., 1999). Household characteristics, composition, decision-making, and social networks tend to influence livelihood strategies (David, 1998). Diversifying livelihood options[1] remains one of the central tenets of sustainable livelihoods.[2] Livelihood options are, however, not synonymous with cash income diversification (Reardon et al., 1992; Sandangi and Singh, 1993; Unni, 1996; Lipton et al., 1996). Secondary woodland resources[3] (e.g., fuel wood, construction poles, edible herbs) and small-scale agriculture have been reported as part of livelihood diversity (Crow, 1992; Cunningham, 1997; Campbell et al., 1997, 2000a; Luoga et al., 2000a, b; May et al., 2000; Shackleton et al., 2001; Dovie et al., 2002, 2003). Hence, livelihood diversification provides new perspectives in developing sustainable healthy societies with secure and satisfying sources of living, as prescribed by Agenda 21.[4]

Diversification strategies are often a response to food insecurity, serving as a safety net in a changing environment (Guijt et al., 1995; Melnyk and Bell, 1996). Some communities embark on shared activities for making their own livelihoods, through out-grower schemes or contract production of commercial crops and small-scale farming (Beinart, 1992; Vaughan, 1992; Matanyaire, 1996; McAllister, 2000). The direct-use benefits of goods and services from cattle and goats are other forms of livelihood diversification (Barrett, 1992; Scoones et al., 1992; Duvel and Afful, 1996; Campbell et al., 2000b).[5] There are households that derive their livelihoods from formal cash income streams, most especially non-agricultural sources or in combination with other livelihood sources (Ellis, 1998; May et al., 2000; Bryceson, 2002). Livelihoods theory has developed through various stages and now attends to more than the means for making a living. Livelihoods may also embrace endowments of, and entitlements to, natural resources (Kepe, 1997; Forsyth et al., 1998). It further comprises the institutional arrangements, such as communal, collective, or cooperative production for allocating assets, labor, and resources (Davison, 1992; Mohasi and Turner, 1999).[6]

The precise value of livelihood options in impoverished rural households is given little consideration in national economic assessments (e.g., measures of GDP) in southern Africa (DWAF, 1997; Hassan, 2002). This appears largely to be due to the marginalization and meager allocation of resources to the rural subsistence sector. Generally, only cash income sources have been considered, but much valuable economic activity does not require the exchange of money. Attempts have been made to determine the contribution of crops towards rural household livelihoods (McAllister, 1992, 2000; Hatch, 1996). Other studies have examined the contribution of secondary woodland resources (Campbell et al., 1997; Luoga et al., 2000a, b; Shackleton and Shackleton, 2000; Letsela et al., 2002; Shackleton et al., 2002). Many of these studies have not determined the precise incomes in monetary terms of each livelihood sector within the same household (Cavendish, 2000; Campbell et al., 2002).[7] This paper, therefore, examines the contribution of all livelihood options to the total household income.

The household is the most important unit of production and consumption in these communities, involving control of and access to assets, labor, and income as well as impacting agrarian change and consumption (Crehan, 1992). Because household activities revolve around the role of each household member and his/her various attributes (e.g., education, skills, social status), it will be instructive to determine how these, in turn, affect overall incomes. The precise linkages between household characteristics in relation to resource use are complex (David, 1998; Francis, 1998; Valdivia and Gilles, 2001). However, these linkages have important implications for policy and the livelihood system adopted by poor households. This paper examines the precise contribution of each livelihood sector and details the specific relationships that exist between resource use and household profiles based on characteristics such as gender, division of labor, and household composition.

### *Relative contribution of livelihood sources*

Several studies have analyzed the relative contributions of, and the household's participation in, various livelihood options (Vaughan, 1992; Lipton, 1996; Hatch, 1996; Ellis, 1998; Mohasi and Turner, 1999; May et al., 2000; McAllister, 2000; Shackleton et al., 2001; Bryceson, 2002). The relative contribution of each livelihood option has been used to characterize rural livelihoods in southern Africa. Ellis (1998), in a review of recent literature on livelihood diversification as a rural household strategy in sub-Saharan Africa, found that 30%–50% of households relied on non-farm income. In Malawi, subsistence farming is a priority livelihood activity regardless of peoples' earnings from non-agricultural sources, and 93% of rural dwellers interviewed were involved in this activity. Their returns (all benefits whether tangible or not), by contrast, were only 40% of that obtained from non-agricultural sources (Tellegen,

1997). However, much subsistence production (particularly when consumed in the household) was unaccounted for and, hence, under-valued. Mohasi and Turner (1999) showed in a Lesotho study that 55.5% of households embarked on peasant agriculture as their main livelihood activity compared to the remaining 44.5% that were dependent on other sources (i.e., wages and remittances from migrant labor and informal activities). In a similar study, also in Lesotho, 14.8% of households were involved in migrant labor and 29.7% in other non-farm activities (Lawry, 1986). In Zimbabwe, Berkvens (1997) recorded a value of 42% for non-agricultural earnings, mainly in the form of remittances to households. The study of Barhoorn and Riezebos (1990) revealed that 50% of households were involved in peasant livestock and 70% in crop production in parts of rural Botswana. Secondary woodland resources from Miombo woodlands in Zimbabwe provided 23% of household's non-cash income compared with only 8% of the household's cash return from the same woodlands (Cavendish, 2000).

Monetary contribution to rural livelihoods from formal cash income streams (e.g., wages, remittances, government grants, pensions, and seasonal labor on commercial farms) and non-farm activities have been reported in a number of studies and account for more than 70% of total livelihoods in South Africa (Beinart, 1992; Francis, 1999; May et al., 2000). Beinart (1992) reported that 78% of household cash income came from migrant remittances and 22% from crop production, but did not consider livestock and secondary woodland resources. In Nkandla in the Kwazulu–Natal province, Ardignton and Lund (1996) reported the value of crop production alone to be 24%, and attributed the rest to wages and remittances, but again omitted livestock and secondary woodland resources. Dercon (1998) provided a relative breakdown of rural livelihoods in Tanzania as crop income (i.e., subsistence 22%, cash 4%), livestock income (i.e., subsistence 23%, cash 30%), and non-agricultural income (i.e., 21%), but also omitted forest products. In post-apartheid South Africa, land claims have helped to re-establish the importance of small-scale or peasant agriculture, making them a vital part of household incomes (Berkvens, 1997; Manona, 1999). The major gaps have been the exclusion of non-marketed outputs and latent products of crops and livestock as well as the secondary woodland resources, which are often considered to be "free commodities."

## Description of study area

The village of Thorndale, which covers an area of 15 $km^2$ in the Bushbuckridge region of Limpopo Province (31°28′ E; 24°39′ S), South Africa, was chosen for this study (Figure 1). The study area reflects the characteristics of the majority of communal lands

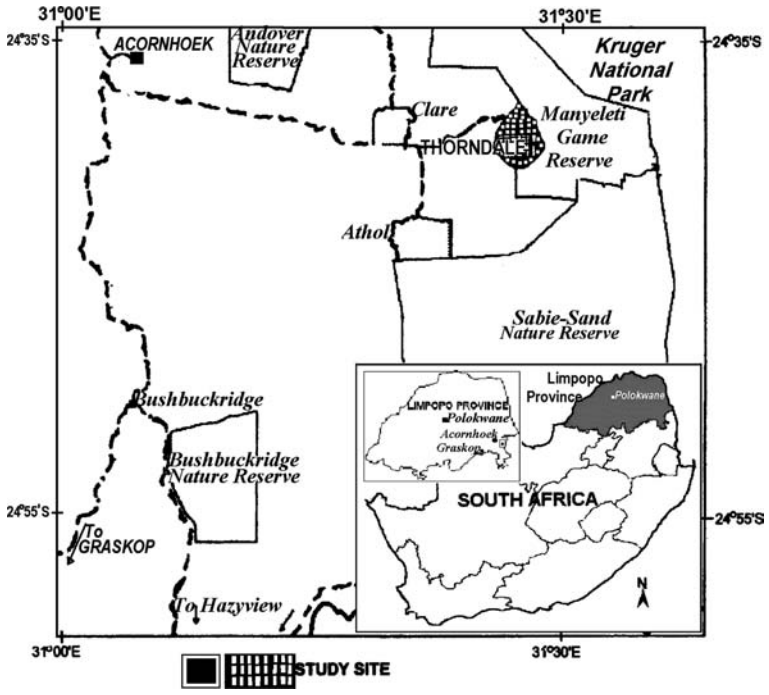


**Figure 1.** Study site.

because it was created for relocated families during the apartheid regime. It has strictly zoned land-use types and resource use is similar to that of other areas in communal lands. In general, the harvesting of natural resources in the communal lands in the Bushbuckridge region suggests over-utilization and degradation (Shackleton and Shackleton, 2000). However, Thorndale has a relatively pristine woodland and grazing area, bordering the Manyeleti Game Reserve, and natural resources were relatively plentiful at the time of the study in 1999. Regionally, land use is largely communal rangelands, followed by nature conservation, plantation forestry, dry-land arable agriculture, irrigated arable agriculture, and residential use in that order. There are high human population densities, more than 300 people/km$^2$ in the west and approximately 160 people/km$^2$ in the east (Shackleton and Shackleton, 2000). Mean annual rainfall at Thorndale is approximately 550–600 mm, mostly falling between October and April and usually in the form of convectional thunderstorms. Mean annual temperature is approximately 22 °C.

The people of Thorndale are part of one of the marginalized and minority ethnic groups in South Africa – the "Shangaans" – and have some ancestral descendents in neighboring Mozambique. Land is categorized into both arable and residential plots, and residents are allowed free access for grazing livestock in the remaining area. There are no individual title deeds and anyone is allowed free access in consultation with the headman of the village. Therefore, there is no institutional control over resource use, a situation that could be exploited by people from outside the community who feel they owe no allegiance to the headman. The communal rangeland is a common property resource, which raises questions about who benefits most, who manages it, and with what authority and logistics. Additionally, harvesting natural and secondary resources such as thatch grass, construction materials, fruits, medicinal plants, bushmeat, and reeds from the woodland is allowed and widespread (Dovie et al., 2002). Local agriculture does not attract any government support apart from a cattle-dipping facility erected in the nearby community of Seville B. There is no access to the national electricity grid or orthodox health facilities apart from weekly visits by health personnel for maternity and child health care. There is intermittent access to potable water, which is pumped from a borehole and distributed to public taps. The roads are unsealed and rarely graded and, hence, in poor shape. Few households are involved in off-farm income generation activities. Apart from teachers of the village primary school and a few working in the Manyeleti Game Reserve, there is no formal employment within several kilometers of the village.

**Data collection and analysis**

Information on secondary woodland resources and agricultural products used and traded (i.e., their quantities, the extent of their use, and their availability) was collected at the household level. In addition, data on informal and formal cash income streams via pensions, wages, and remittances were collected, and came from both the informal and formal employment sectors.[8] Remittances from the formal employment sector were built into formal wages, while remittances from informal employment were covered in the informal cash income. The relationships between society, in this case an individual household's behavior and the role of household members in resource partitioning and use, as well as their development attributes, were documented largely through structured and semi-structured interviews (Bernard, 1994; Aumeeruddy-Thomas et al., 1999). Interviews were carried out on a per household basis and uniformly conducted to give all respondents equal exposure to the questions posed (Bernard, 1994). Household heads were the main sources of information, but when they were themselves not confident, they often delegated another member of the household to provide the information. Anyone who played a key role in settling the household/family in Thorndale was regarded as the household head whether or not he or she made significant contributions to the household. In households where it was difficult to isolate a respondent, a collective household interview was conducted. Interviews were combined with simple participatory rural appraisal tools, including matrix ranking, seasonal calendars, and product flow diagrams to ease the acquisition of information. The emphasis was placed on household approaches rather than community level enumeration because the ability of people to develop socio-economic networks in resource use takes place at the household level (von Bach and Nuppenau, 1996; Dercon, 1998). A combination of data collection methods including interviews and household level participatory rural appraisals resulted in a hierarchy of tools, herein referred to as the "hierarchical valuation scheme" (HVS). A sample of 45 households representing 63.4% of the total number of households was randomly selected using an aerial photograph of Thorndale, and interviews carried out in 1999. The mean number of permanent residents was 6.28 ± 0.8 persons per household, which was used in this study to compute the value of livelihood incomes per capita. All individuals 18 years and older were considered to be adults; those under 18 years were considered to be children.

The quantitative data is characterized by descriptive statistics, showing means and standard errors, supported with univariate statistics (i.e., *t*-test, correlation analysis, and chi-square test). Multivariate statistics (i.e., principal component analysis (PCA)) were used to examine

the broad-scale correlation between all livelihood sectors using CANOCO Version 4.5 program (ter Braak and Šmilauer, 2002).[9] In addition, Spearman's rank correlation (Zar, 1999) was used to establish the fine-scale correlation between livelihood activities and household composition variables. Student *t*-tests were used to determine differences between the means of the values of the various livelihood sectors, household profiles such as demography and gender, and activities undertaken in the homestead. Products and inputs from crops and livestock were measured by weight, volume and/or by absolute numbers where appropriate. Villagers would normally take measurements using unorthodox means (e.g., polythene bags and plastic bowls), which were thoroughly evaluated. In cases where no local prices were apparent for some products because of the absence of trade in the village, prices from the closest local market were used. From these, quantities and direct-use values of secondary woodland resources, and goods and services from livestock and crops were calculated on a per household basis and extrapolated across the whole village. The diversity of crops cultivated was determined using a standard measure (i.e., the Shannon Diversity Index) (Zar, 1999) and was based on the number of crops and their relative proportions. The present monetary or annual values and costs associated with fixed and capital assets of high longevity (e.g., infrastructure such as fences and roofs made of thatch) were estimated based on linear depreciation (Equation (1)), with the value of the asset determined by its value in year 1. The 1999 values of the assets were discounted in terms of their useful lives and their monetary values allocated using Equation (2). The average foreign exchange rate used was US$1.00 = 6.14 Rand.

$$Y_{yr=1} = \frac{V_{\text{asset}}}{Y_{\text{life}}},$$

$Y_{yr=1}$ = the value of asset in first year;

$V_{\text{asset}}$ = the value of asset;

$Y_{\text{life}}$ = useful life. (1)

Actual value in present year,

$$y = y_1 \prod_{j=2}^{k} \left(r_{(j-1)/100} + 1\right) \quad (2)$$

$r_{(j-1)/100}$ = annualized inflation rate in the $r_{j-1\text{th}}$ year; $y_1$ = first year value; $y_k$ = value in year $k$; $j$ = 2, 3, 4, . . . , $k$; $k$ = current year of estimate.

## Results

### *Household composition and labor*

The population of Thorndale was estimated at 450 persons in 71 households, ranging from 1 to 32 persons/household. Fifty-two percent were children, 30% female adults, and 18% male adults. Within the sampled households, 283 persons were permanent residents. A Spearman's rank correlation showed that the numbers of children and adults were highly correlated (i.e., $r_s = 0.82$, $P < 0.0001$). Both males and females participated in the livelihood activities of the household either separately or jointly depending on the prevailing value system of the household. Though eleven activities were studied, seven major ones were analyzed to determine the participation of household members based on gender (Table 1). Generally, there was an association between gender and livelihood activities of the household (i.e., $\chi^2 = 114.64$, df = 6, $P < 0.0001$). This means that there was generally a division of labor based on gender.

Spearman's rank correlation was used to determine whether the differences in role performance by gender were statistically significant at $P < 0.05$. A negative correlation was observed between the numbers of males and females (i.e., $r_s = -0.65$, $P < 0.0001$). Females do the cooking in most households (82.9%), compared to 4.9% for males and 12.2% for men and women jointly. Men did the construction in the majority of the 41 households (80.5%) and responded to questions about the construction of the household shelter. Females participated in the harvesting of woodland resources in 60% of households, and males in the remaining households. Males provided the majority of the cash income in 65.8% of households. Females maintained the cropping fields or farms in 61.5% of households. There were four major activities (i.e., harvesting of secondary woodland resources, provision of cash income,

**Table 1.** Livelihood tasks performed according to gender and by number of households at Thorndale.

| Livelihood activity/role | Females (*n*) | Males (*n*) | Both (*n*) |
|---|---|---|---|
| *Major roles* | | | |
| Livestock maintenance | 3 | 22 | 1 |
| Harvesting woodland resources [a] | 24 | 5 | 11 |
| Provision of cash income [a] | 4 | 27 | 10 |
| Farm maintenance (crops) [a] | 24 | 8 | 7 |
| Harvesting farm produce[a] | 24 | 3 | 11 |
| Cooking for household | 34 | 2 | 5 |
| Provision of shelter | 6 | 33 | 2 |
| *Minor roles* | | | |
| Selling farm produce | 1 | 1 | 2 |
| Selling woodland resources | 0 | 3 | 0 |
| Selling livestock products | 0 | 2 | 0 |
| Record keeping | 2 | 0 | 1 |

[a] Major livelihood activities with greater joint participation of males and females/less division of labor.

maintenance of farms, and harvesting of farm produce) where males and females jointly participated.

*Relationship between household composition and value of livelihood options*

The relationships between household demography and associated gender composition were examined for their link with household production (Table 2). There was a positive correlation between the number of people/household and the monetary values of direct-uses of (a) secondary woodland resources (i.e., $r_s = 0.62$, $P < 0.0001$) and (b) crops (i.e., $r_s = 0.44$, $P < 0.0025$). The number of adult males was positively correlated with the value of informal cash income (i.e., $r_s = 0.48$, $P < 0.0008$). The number of adult females/household correlated with the monetary values of (a) secondary woodland resources (i.e., $r_s = 0.57$, $P < 0.0001$), (b) crops (i.e., $r_s = 0.37$, $P < 0.0136$), and (c) livestock (i.e., $r_s = 0.47$, $P < 0.0010$). Finally, the number of children/household correlated with both monetary values of secondary woodland resources (i.e., $r_s = 0.43$, $P < 0.0034$) and crops (i.e., $r_s = 0.34$, $P < 0.0226$).

**Table 2.** Correlations between household composition and monetary value of livelihood sectors ($n = 45$). Significant correlations are in bold face type ($P < 0.05$).

| Population category | Livelihood activity | $r$[a] | $P$[b] |
|---|---|---|---|
| Total household size | Formal cash income | 0.07 | 0.6199 |
| Total household size | Informal cash income | 0.03 | 0.8207 |
| Total household size | Total cash income | 0.02 | 0.8872 |
| Total household size | Secondary woodland resources | 0.61 | **0.0001** |
| Total household size | Crops | 0.43 | **0.0025** |
| Total household size | Livestock | 0.27 | 0.0652 |
| No. of male adults | Formal cash income | −0.26 | 0.0800 |
| No. of male adults | Informal cash income | 0.48 | **0.0007** |
| No. of male adults | Total cash income | 0.05 | 0.7262 |
| No. of male adults | Secondary woodland resources | 0.23 | 0.1259 |
| No. of male adults | Crops | 0.22 | 0.1313 |
| No. of male adults | Livestock | 0.21 | 0.1555 |
| No. of female adults | Formal cash income | 0.19 | 0.1924 |
| No. of female adults | Informal cash income | −0.05 | 0.7134 |
| No. of female adults | Total cash income | 0.16 | 0.2709 |
| No. of female adults | Secondary woodland resources | 0.56 | **0.0001** |
| No. of female adults | Crops | 0.36 | 0.0136 |
| No. of female adults | Livestock | 0.47 | **0.0010** |
| No. of children | Formal cash income | 0.03 | 0.8313 |
| No. of children | Informal cash income | −0.11 | 0.4646 |
| No. of children | Total cash income | −0.10 | 0.5102 |
| No. of children | Secondary woodland resources | 0.42 | **0.0033** |
| No. of children | Crops | 0.33 | **0.0226** |
| No. of children | Livestock | 0.01 | 0.9159 |

[a] Spearman's rank correlation coefficient for establishing the general relationship between two variables, and when variables cannot be designated as independent or dependant and could either be positive or negative. The variables vary together and as one variable goes up, the other goes up as well, or goes down, and *vice-versa*.

[b] This is a probability that gives an indication of the confidence of the mean values of the sample. It is often used to represent an error measurement. The value $P = 0.05$ suggests a 95% confidence interval, implying that calculated $P$-values of less than 0.05 show a high probability that the correlation is significant.

*Cash incomes*

Sixty-seven percent of the households had at least one member employed for wages. Forty-nine percent held permanent employment, while 18% were casually employed. The mean wages and remittances from formal income only were US$1073 ± 160 per household per annum ($n = 27$), or US$644 ± 124 across all households. Government grants and pensions provided US$865 ± 141 per household for seven households. The rest did not have that particular livelihood source. Income from government grants, remittances, and pensions was US$1094 ± 143 per beneficiary household or US$777 per household across all households. Remittances to households were mostly contributed by men (78.8%) in the formal employment sector. The difference in the number of male and female contributors of remittances to households ($n = 45$) was significant as determined using a paired $t$-test (i.e., $t = -3.01$, $df = 44$, $P < 0.0043$). Income from the informal sector was estimated at US$452 per household across all households. Formal cash incomes ranged from US$197 to $3322 per annum. Informal cash incomes were from US$97 to $3322 per household per annum.

*Household heads and production*

Eighty-four percent of the household heads were male. Of the 16% of female heads, 2.2% were traders and 13.4% were peasant farmers. None of the female household heads had educational qualifications beyond grade 12 of high school. Male household heads were peasant farmers (21%), artisans (18.4%), wildlife rangers (15.8%), factory workers (13.2%), traders (10.5%), commercial transport drivers (5.3%), commercial farm workers (5.3%), a sentry (2.6%), and a bartender (2.6%). Most of the employed male heads of households involved migrant labor, while 5.3% were jobless. Nearly 16% of the male-heads had attained the matriculation level qualification upon successful completion of grade 12 of high school. Another 36.8% had no education. The mean age of household heads was

48.3 ± 2.1 years, with a range of 25–79 years. Thirty-four percent of household heads were between 40 and 49 years old, 22% between 30 and 39 years, 7% between 20 and 29 years, 13% between 50 and 59 years, 9% between 60 and 69 years and 11% between 70 and 79 years. The ages of 4% of household heads were unknown.

*Settlement history*

The majority of the households came to Thorndale as a result of the apartheid government's forced relocation scheme, with almost half of them arriving in 1979 and the rest trickling in between 1979 and 1998. No statistical association was observed between a household's settlement history and its major livelihood activities (Figure 2).

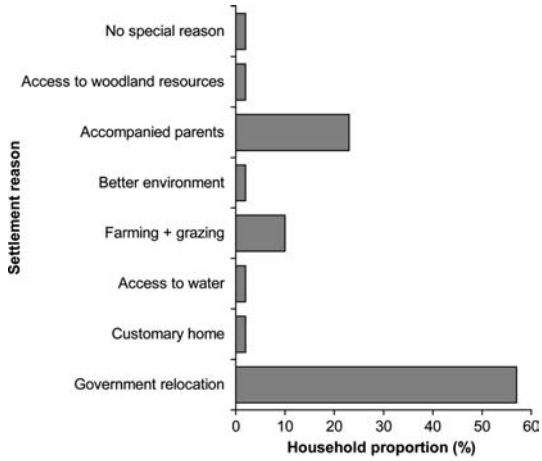


**Figure 2.** Reasons for the settlement of households in Thorndale.

*Crop production*

Crop production was mainly the task of women and children. Of the household heads who farmed, the majority were elderly, ranging from 47 to 80 years (78.6%). The remaining 21.4% were ≤46 years-old. Ten different major crops were cultivated and/or harvested by the people of Thorndale during the 1999 cropping season (Table 3). These were grown around homesteads (i.e., home gardens) and in fields. The four most cultivated crops were maize, peanuts, watermelon, and common beans. Maize, peanuts, common beans, and pumpkins were planted both around homesteads and in fields. Cassava and guava grew in the home gardens only. Bambarra beans, butternut, sugar cane, and watermelon were grown in fields only. Ninety-six percent of households cultivated and harvested at least one of the crops. The annual net direct-use value of crops harvested was estimated at US$443.4 per household per annum, representing 15.4% of total livelihood income. Plowing typically involved the use of both cattle and hoe. Most households (87%) harvested crops from home gardens while 38% harvested them concurrently from fields and home gardens. The majority practiced mixed cropping either in home gardens or fields. Dovie et al. (2003) provide a comprehensive analysis of crop production in Thorndale and implications for policy and agrarian reform in South Africa.

*Livestock production*

There was a net direct-use value of US$656 per household per annum from livestock goods and services (excluding the option values of holding cattle as savings), more than 90% of which came from cattle, and amounted to US$607 per cattle-owning household per

**Table 3.** Direct-use and traded values of crops at Thorndale (adapted from Dovie et al., 2003).

| | Annual values/household | | | | |
|---|---|---|---|---|---|
| | User households ($) | All households ($) | Relative contribution (%) | Value traded ($) | Value/ha ($) |
| Maize *(Zea mays)* | 434.4 | 416.3 | 39.9 | 77.4 | 651.6 |
| Watermelon (*Citrullus vulgaris*) | 221.7 | 29.5 | 20.3 | 0 | 103.3 |
| Peanuts (*Arachis hypogaea*) | 54.2 | 19.2 | 5.0 | 21.4 | 62.1 |
| Common beans (*Phaseolus vulgaris*) | 49.2 | 15.3 | 4.5 | 0 | 76.4 |
| Pumpkin (*Cucurbita pepo*) | 118.9 | 13.2 | 10.9 | 0 | 70.0 |
| Bambarra beans (*Voandzeia subteranea*) | 30.6 | 2.8 | 2.8 | 0 | 8.7 |
| Cassava (*Manihot esculenta*) | 122.1 | 2.8 | 11.2 | 0 | 1508 |
| Guava (*Psidium guajava*) | 49.3 | 1.1 | 4.5 | 0 | 609.3 |
| Sugar cane (*Saccharum officinarum*) | 5.7 | 0.2 | 0.5 | 0 | 2.0 |
| Butternut (*Juglans cinerea*) | 4.8 | 0.2 | 0.4 | 0 | 1.6 |
| Gross value | 1091.2 | 500.6 | 100 | 98.8 | |

annum. The other benefits came from non-livestock owning households and goat owners, estimated at US$33 and US$16 per household, respectively. The value of livestock goods sold by households amounted to US$181 per household and was primarily from sales of live animals. These sales represent 27.7% of the total value of direct livestock benefits (Dovie et al., forthcoming).

*Livestock owning households*

Plowing, milking, and meat from both cattle and goats were ranked as the most important benefits of livestock ownership. Sixty-four percent of households owned livestock (i.e., cattle and goats) while 36% did not own any. Of the livestock owning households, 34% owned cattle only, 49% goats only, and another 17% owned both. Cattle-owning households increased from six in 1995 to fifteen in 1999, representing a 150% increase. Sixty-seven percent of cattle-owning households had milking cows and the value of the milk produced was estimated at US$694.79 ± 181.76 per household per annum. Dung was used by 33% of cattle-owning households as manure and 60% of cattle-owning households used their animals to plow their land (Dovie et al., forthcoming). Twenty percent of cattle owners used their animals for transporting water and carting fuel wood from the grazing areas. Cattle were sold to pay school fees, purchase household items, and provide capital for trading and housing projects. Goat owners sold goats primarily to raise money for housing projects and to buy other meat (e.g., beef). Some households would not sell their goats because: (a) they were meant for the household meat supply only; (b) the number of animals was small and they were left to reproduce; (c) there was sufficient surplus and the household could use them to accumulate wealth.

*Non-livestock owning households*

Households not owning livestock still enjoyed benefits in the form of gifts or cheaper goods and services. They benefited mostly from using animals for plowing (Dovie et al., forthcoming). This was reflected in a direct-use value of US$19 per household, which represented 59% of the total direct-use value to non-owning households. The monetary value of milk consumed contributed over 28% of the direct-use value. This was followed by meat, which provided 12.7% of the total value for non-livestock owning households. The most important reason for not owning livestock was lack of money (56% of households), followed by the absence of herders and loss of animals through drought. Of the non-livestock owning households, the majority (81%) wanted to own livestock. Of those desiring to own livestock, 68% preferred cattle, 13% goats, and the rest were undecided. Households without livestock used dung collected from the kraals of livestock owners as manure and for making the floors of buildings. Reasons for wanting to own livestock were to provision: (a) draught power; (b) milk; (c) meat; (d) future savings; (e) sales for cash income; or (f) transportation. Half the number of non-livestock owning households felt they needed to find a means of raising money to acquire livestock, while the other half had no idea how they might acquire animals.

**Table 4.** The direct-use and traded values of secondary woodland resources in Thorndale.

| Resource | Number of user households | | All households | Annual values/household | | | |
|---|---|---|---|---|---|---|---|
| | Percent (%) | Absolute number(n) | Total values($) | User households($) | All households($) | Relative value(%) | Value traded($) |
| Fuel wood | 95.6 | 43 | 13382.74 | 311.24 | 297.40 | 44 | 15.79 |
| Edible herbs | 91.1 | 41 | 7497.07 | 182.90 | 166.64 | 25.9 | 0.16 |
| Thatch grass | 37.8 | 17 | 1280.62 | 75.41 | 28.49 | 10.7 | 0 |
| Weaving reed + mats | 46.7 | 21 | 1260.91 | 59.93 | 27.97 | 8.5 | 3.88 |
| Medicinal plants | 33.3 | 15 | 604.40 | 40.88 | 13.61 | 5.8 | 0 |
| Edible fruits | 46.7 | 21 | 213.68 | 10.10 | 4.71 | 1.4 | 0 |
| Wooden utensils | 97.8 | 44 | 296.42 | 6.68 | 6.53 | 0.9 | 94.30 |
| Edible insects | 75.6 | 34 | 166.78 | 5.05 | 3.81 | 0.7 | 0 |
| Kraal/fencing poles | 33.3 | 15 | 49.35 | 3.26 | 1.09 | 0.5 | 1.47 |
| Housing poles | 55.6 | 25 | 46.42 | 1.68 | 0.93 | 0.2 | 9.77 |
| Grass hand brushes | 82.2 | 37 | 59.93 | 1.63 | 1.34 | 0.2 | 0 |
| Twig hand brushes | 95.6 | 43 | 62.21 | 1.45 | 1.39 | 0.2 | 0 |
| 1% of above values for other uses | | | 243.16 | 7.00 | 5.55 | 1.0 | 1.25 |
| Total value | | | | 707.21 | 559.46 | 100 | 126.62 |

*Source*: Dovie et al., 2002.

*Secondary woodland resources*

Twelve secondary woodland resources that were continually used and others with miscellaneous uses were studied (Table 4). The proportion of households that used various secondary woodland resources was 97.8%. The total direct-use value of resources consumed was US$707.21 per user household per annum, and $559.46 per household for all households across the village. These figures excluded the amount traded. Four woodland resources were important to over 90% of the households; (a) wood for utensils; (b) fuel wood; (c) twig brushes; (d) edible herbs. The least used resources were thatch grass, weaving reeds, edible wild fruits, and kraal poles. Fuelwood was a key resource, providing the energy required for cooking and heating (Dovie et al., 2004). Thirty-three percent of the households (i.e., fifteen households) utilized medicinal plants at various times of the year. Other resources utilized by the Thorndale residents included wild honey, mushrooms, construction reeds, indigenous wood for furniture, and bush meat (i.e., wild animal meat). Most resources were harvested from the grazing areas (i.e., the woodlands). Edible insects and herbs came mostly from farmers' fields and around the homestead (Dovie et al., 2002). Weaving reeds were harvested from local wetlands and the Manyeleti Game Reserve bordering the communal woodlands.

*Relationship between values from all livelihood sectors*

A PCA biplot showed the broad-scale relationship between the monetary values from the livelihood sectors. There were two PCA runs of the values from all livelihoods, one with education as a covariate because educated households were expected to least influence the extent of resource use and hence the monetary values, and the other without. Education had little effect on the overall pattern. In order to ascertain the precise empirical values of the correlations, Spearman's rank correlations were used (Table 5). There were positive correlations between monetary values of secondary woodland resources and (a) crops (i.e., $r_s = 0.36$, $P = 0.0144$) and (b) livestock (i.e., $r_s = 0.31$, $P = 0.0344$) as well as between crops and livestock (i.e., $r_s = 0.32$, $P = 0.0287$). A positive correlation between crops and formal cash income was also evident (i.e., $r_s = 0.36$, $P = 0.0144$). Finally, a significant negative correlation existed between formal and informal cash income (i.e., $r_s = -0.60$, $P = 0.0001$). The total cash income contribution was 42.5%, less than the 57.5% value contribution from land-based livelihood sectors of which crops and livestock contributed 38.1%, and secondary woodland resources contributed 19.4%.

## Discussion

*Land-based livelihoods and households*

The importance of land-based livelihoods to rural households is influenced by the characteristics of households and the community at large. The contribution of the land-based livelihoods of the rural poor to the South African national economy is underestimated and is hardly reflected in aggregate statistics such as Gross National Product (GNP) or Gross Domestic Product (GDP) (DWAF, 1997). National accounting tools mainly capture benefits from the commercial sector, with the contribution of peasant agriculture to rural

**Table 5.** Spearman's rank correlations between monetary values from the various livelihood sectors (secondary resources, crops, livestock, formal and informal cash income), $n = 45$ households. Significant correlations are in boldface type ($P < 0.05$).

| First variable | Second variable | $r$ | $P$ |
|---|---|---|---|
| Secondary woodland resources | Crops | 0.36 | **0.0144** |
| Secondary woodland resources | Livestock | 0.31 | **0.0344** |
| Secondary woodland resources | Informal cash income | −0.01 | 0.9400 |
| Secondary woodland resources | Formal cash income | 0.02 | 0.8696 |
| Secondary woodland resources | Total cash income | 0.04 | 0.7679 |
| Crops | Livestock | 0.32 | **0.0287** |
| Crops | Informal cash income | −0.13 | 0.3869 |
| Crops | Formal cash income | 0.36 | **0.0144** |
| Crops | Total cash income | 0.27 | 0.0627 |
| Livestock | Informal cash income | −0.03 | 0.8017 |
| Livestock | Formal cash income | 0.15 | 0.2978 |
| Livestock | Total cash income | 0.18 | 0.2153 |
| Informal cash income | Formal cash income | −0.60 | **<0.0001** |

livelihoods receiving little attention (GCIS, 1999). Hence, the contribution of non-marketed outputs and products, such as consumption during production before final harvests, gifts of livestock and crop products, and harvesting of woodland resources are undervalued. Secondary woodland resources, the least conspicuous but most important of the land-based livelihood sectors, are often totally neglected. By contrast, incomes from wages are emphasized (Kirsten et al., 1998; May et al., 2000).

Gender plays an important role in the contribution of different livelihood sectors to households, but needs to be negotiated for the success of family survival and the sustainable use of natural resources (Francis, 1998; Valdivia and Gilles, 2001). A general division of labor based on gender was observed in Thorndale. Males participated more frequently in the formal employment sector through migrant labor (mostly as factory workers) in the cities. The predominance of men in formal employment is partly due to their level of education, with some men holding diplomas.

None of the women had the same opportunity for education. No relationship between household size and formal cash income was established. Although the value of crops (15.4%) did not match that of formal cash income, the aggregate value of peasant agro-pastoralism (38.1%) far outweighed contributions from formal cash income. More women than men were involved in crop production, but more men than women were engaged in livestock production. This gendered division of labor may have raised the value of agro-pastoralism.

Women were the great majority of those involved in secondary woodland resource extraction. The ownership and herding of cattle were demanding endeavors in terms of time and the cash injections involved. Because economic returns were not in physical cash, the ability to own cattle was more constrained for women heads of households than for their male counterparts. Cash income from both formal and informal employment sectors combined was important, although it was lower than the value from land-based livelihoods. In terms of livelihood sources, returns from the extraction of secondary woodland resources, for non-skilled labor in South Africa, were better than wage earnings in local agriculture on commercial farms. This formal wage translated into US$1.01 per capita per day compared to a net direct-use value from secondary woodland resources of US$3.5 per capita per day, at the time of the study.

The difference in relative values of livelihood activities could be due to several factors, the most important of which are the characteristics of households, their composition, and assets. In addition, the impacts of geographical location, proximity to commercial and urban centers, and the interdependences of these different factors cannot be ruled out. Livelihood systems, therefore, can be likened to a web of relationships and interconnections.

Pensions and grants contributed only US$133 per household per annum across all households in Thorndale. In comparison, a study in the Ezingolweni and Nkandla tribal wards in Kwazulu-Natal reported pension income of US$244 per annum in 1993 (i.e., US$425 in 1999, adjusting for inflation) (Kirsten et al., 1998). In the same study, US$489 (i.e., US$850 in 1999 adjusting for inflation) was recorded as formal income per household per annum vs. US$644 in Thorndale. In Zimbabwe, Bradley and Dewees (1993) reported that agriculture accounted for up to 50% of the total income of rural households in communal areas. Differences in the extent of livelihood activities across various regions in South Africa have been reported, and compared with this study (Table 6). There appeared to be higher land-based livelihood incomes in Thorndale relative to records from former homelands and from South African Development Trust (SADT)[10] areas. With the history of good governance in the SADT areas, there is the possibility that resource use and access to land through supply and demand were more fairly controlled than in Thorndale. Crown lands had group title deeds with traditional managers in the

**Table 6.** The monetary value ($) of land-based livelihoods in South African Development Trust[a] (SADT) areas (Adams et al., 2000) and in Thorndale.

| Land-based livelihoods | Value per household ($) | | Relative contribution per household (%) | |
|---|---|---|---|---|
| | Former homelands + SADT areas | Thorndale | Former homelands + SADT areas | Thorndale |
| Cropping | 251.0 | 443.4 | 27.9 | 26.7 |
| Livestock | 195.0 | 656.0 | 21.6 | 39.6 |
| Natural resources | 455.0 | 559.0 | 50.5 | 33.7 |
| Total | 901.0 | 1658.4 | 100.0 | 100.0 |

[a] The SADT areas were the native administered Crown lands. They included the commonage of Mgwali under a tribal authority system transferred in the 1970s to the ''independent state'' of Ciskei, now in the Eastern Cape Province.

independent former homelands, compared to Thorndale, where communal land ownership was not vested in the hands of the settlers. In the former homelands and SADT areas, there were consistently more diversified livelihoods compared to Thorndale where residents had to reorganize their livelihood options in this new and unfamiliar environment. Land-based livelihoods, as a result, provide the immediate solution to livelihood problems in communal lands, hence the higher monetary values of these options compared to the former homelands (Table 6).

*Analyses of the land-based livelihood sectors*

Characteristics of the household were a major factor in determining the fate of farm produce. Crops were harvested at various stages depending on household requirements at that time and used for home consumption, gifts, ceremonies, or held for the next growing season. Such decisions were more likely to be made by the women who did the majority of the farm work. The mean net value of crops estimated for home gardens was US$177 per household, compared to a similar study in the Bushbuckridge region of US$233 per household per annum, corrected for inflation (High and Shackleton, 2000). Cash incomes of US$99 per household per annum from the sale of agricultural produce were similar to a previous study that recorded US$70 and US$211 per household per annum, adjusted for inflation, for two Kwazulu–Natal villages (Fenwick and Lyne, 1999). Most households retained some or all of their harvests for home consumption as a means of food security. This is especially important in households that received no remittances.

Households in Thorndale accrued significant value through the multiple goods and services provided by livestock. Although one-third of the households did not own livestock, they still shared the benefits through gifts and access to cheap milk, meat, dung, and plowing services. The ownership of livestock, was not linked to cash income from employment. More households owned goats than cattle because most people could not afford large stock (i.e., cattle). Males participated mostly in the maintenance of livestock. Few female-headed households owned any livestock, and none owned cattle. Livestock products were given as gifts, and services were exchanged especially for labor, providing a vital coping strategy in marginalized rural communities. This was of benefit to the giver in terms of improving status and as insurance against difficult times. It helped to strengthen the relationship between neighbors, families, and friends.

The higher the number of female adults and children in the household, the greater the value of the products gained from secondary woodland resources. The poorest members of society (which tended to be women) relied more on natural resources. For example, in times of drought (and hence crop failure), children and women often sought out lesser-known plant species for fruits, bulbs, leaves, and fiber to keep the household alive. A large proportion of households (i.e., greater than 33% and up to 97.8% for specific resources) extracted woodland resources in 1999 (not a drought year), an indication of the relevance of local resource access and use (Table 4). A similar study in the Bushbuckridge region revealed the gross direct-use value of secondary woodland resources for home use to be US$414.17 (adjusted for inflation to 1999 values) per household per annum (Shackleton and Shackleton, 2000). This is 26% less than the total value of US$559.46 obtained in this study for Thorndale and might be due to the fact that the reliance of women and children on woodland resources raised demand and monetary value. The reliance of women on woodland resources was partly due to a lack of formal work opportunities for them in this region.

Although people generally perceived the extraction of secondary woodland resources as an activity practiced more by the poorer households, most households often had little option but to use them. In contrast, others with higher cash income still used large amounts of woodland resources, and had the means to obtain ''more than a fair share'' (e.g., by using pick-up vehicles). This competition for resources between poor and wealthy households complicates the understanding and analysis of livelihoods. After 1999, and more precisely from 2001 onward, the extraction of resources from the woodlands has become much more extensive and intensive. This is largely the result of ''outsiders'' (i.e., non-villagers) harvesting large amounts of resources, particularly wood-based resources (Dovie, 2001, personal observation).

The history of apartheid-forced removals and the underdevelopment of infrastructure in the area have probably increased dependency on natural resources for livelihood security, and limited the capabilities and assets of households. Though this holds true in most communal areas, there was no correlation between the numbers of apartheid-forced relocated households and their involvement in both cash income and land-based livelihood activities. Does this imply that the forced relocation scheme has not influenced population growth, and for that matter, the high usage of natural resources in Thorndale? The answer would be ''yes'' and ''no'' – ''yes'' because of the lack of any sign of impact and ''no'' because it has been ascertained by Dovie et al. (2002) that most resources were in short supply (Figure 3), but could still sustain the present resident population of Thorndale. Without a doubt, the apartheid-forced relocation and the associated migrant

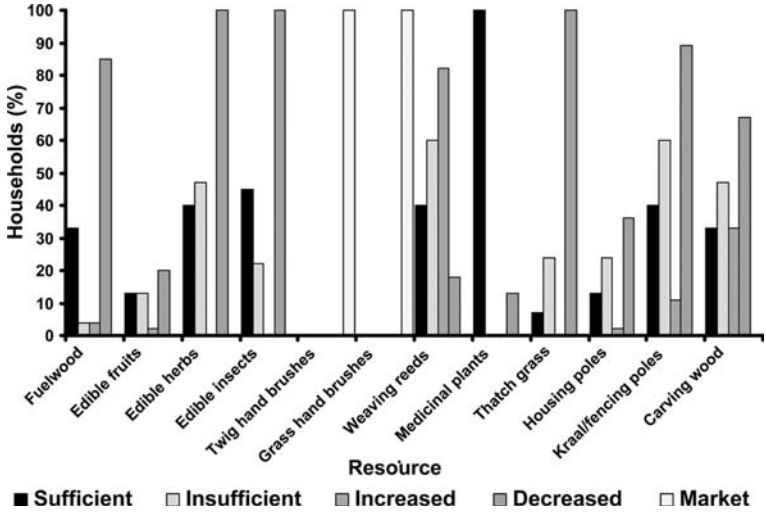


**Figure 3.** By household, perceptions of change in resource availability and perceptions of resource adequacy for harvesting in Thorndale, 1990–1999.

labor system among the male population have altered gender roles in household livelihoods, limiting women's formal work potential and increasing their dependence on land-based livelihoods.

*Interrelationships between land-based livelihoods and cash income streams*

The correlation between secondary woodland resources and crops (Table 5) indicates that households that rely more on secondary resources tend to produce a greater value of crops. The observed correlation between the monetary values of crops and livestock can be attributed to livestock owners, in this case cattle owners, who tend to hold onto their stock, which provide them with agricultural-related services. For example, draught power adds value to livestock and reduces the input cost required for cropping. However, in order to sustain the levels of production, households will have to engage in additional livelihood activities and/or maximize yield per unit area for direct consumption. Non-cattle owning households, therefore, can cultivate more crops (by borrowing cattle), buffering to some extent the limited benefits they enjoy from livestock and increasing the value of the crop sector (Dovie, 2004).

The correlation between monetary values from crops and formal cash income (Table 5) can be seen in terms of a household's access to money to invest in cattle, which consequently can be used for plowing and manuring. Beinart (1992) reported that money from formal employment was invested in farming, which markedly increased access to land for higher income households. However, this link has been diminishing over time, as people increasingly invest surplus cash in consumer goods and housing. Still, crops, together with secondary woodland resources and livestock, play a consistent role in maintaining balanced consumption in over 90% of the surveyed households. Similar observations were reported by Kirsten et al. (1998). Alternatively in Thorndale, wages from formal income can be used for consumer goods and for building human capital through formal education. The negative correlation between values from formal and informal cash income is logical because as more rural people aspire to join the formal employment sector in cities and urban centers, there is a resulting decline in the informal sector.

*Household composition, characteristics, and livelihoods*

The ratio of children to adults, both male and female, is likely to affect the productivity of the household (Dovie et al., 2004). This is because the potential of children to participate in a productive economy may fall below their participation in consumptive activities, creating an economic deficit. Clearly this also depends on the ages of the children. In this study, there was a positive correlation between the number of children per household and the value of crops and secondary woodland resources. It is obvious that children provided labor for farming, and harvesting resources from the woodlands. The majority of households in Thorndale are headed by men, although the majority of the male heads of households have left for employment opportunities elsewhere. As a result, most women have taken on male responsibilities, gaining greater household control and reduced dependency. However, the separation of parents is likely to affect family cohesion and the upbringing of children. The association between gender and the livelihood activities of households re-emphasizes the role of

gender in household provisioning and the division of labor, with females involved in the village-based activities and males in activities more closely linked to cash incomes. The majority of household heads (63%) in the active working age group (i.e., 20–49 years) did not see cropping as a source of livelihood, but more as the social responsibility of the elderly. This also was observed by Berkvens (1997). The level of education, which is closely related to gender, influenced the overall division of labor, as education is crucial in obtaining formal employment.

Religion played a major role in the use of medicinal plants by the villagers. The most prominent religious group in the Limpopo Province is the Zion Christian Church, which prohibits the use of traditional medicinal (*muthi*) plants. Most respondents who did not use medicinal plants indicated that their religious doctrines did not allow it. Only 33% of the households used plants for medication, similar to the 15% in Ha-Gondo, Limpopo Province (Shackleton et al., 2002), an area where the presence of missionaries is even higher. In Kwajobe in the KwaZulu-Natal Province, 93.5% of households used traditional medicinal plants (Shackleton et al., 2002).

Furthermore, few households participated in any formal trade in Thorndale. This is because there are no functional markets within a radius of several kilometers of Thorndale. Money from cash income streams, therefore, was not channeled into trade. However, this does not imply that all rural households do not participate in formal markets. In KwaZulu-Natal, 68% of households in Mkhwanazi village held savings in commercial banks, with incomes possibly earned from wages (Fenwick and Lyne, 1999). The rates of resource use and choice of livelihood activities were probably dependent on how the households settled in the village, though the statistics showed no such relationship. The majority of households were relocated from their various tribal homes and lands. This was a strong factor in changing livelihoods because it also transformed social and human capital and neighborhood networks (McAllister, 1992). Forced removals and relocations during the apartheid regime are felt to have had significant negative impacts on food security, land use, and most importantly on biodiversity.[11] Additionally, lack of secure land tenure has been noted to affect on-farm investment, constraining agricultural productivity, and sustainable production (Moor and Nieuwoudt, 1998).

*Emerging policy and development issues*

A combination of factors tends to affect the micro-economic issues of rural households, identified in this study as household assets, livelihood activities, and capabilities. It is possible that households may have assets that will help build their livelihoods, but may lack the capability of harnessing them, and *vice versa*. The extensive participation of females in land-based activities rather than paid work raises important considerations about power in the household and gender inequality in the control of key resources. The absence of rural women in the paid work force may reinforce the diversification of livelihoods. This is because women tend to prioritize the provision of food and basic household requirements, which more often than not, do not require significant cash expenditures (Van Esterik, 1999). Further, it has been argued that the intersection of women's rights and the right to food is not a natural division of labor, but one based on individual ability and negotiation (Van Esterik, 1999; Valdivia and Gilles, 2001). The study also showed that fewer men are involved in traditional agriculture, with the majority engaged in migrant labor. This tends to promote "de-agrarianization" in the rural sector. The resource-poor females (elderly women especially) must overcome their vulnerable situations by producing for their households in the absence of the men. In doing so, they are forced to increase their dependence on natural resources, in this case secondary woodland resources or non-timber forest products (NTFP). This may be an important reason why cash injections into crop and/or livestock production are insufficient for assisting the rural poor. Greater attention to policy may be required to sustain the key role of women in providing for the household. Societal values need to change and women's roles and land tenure rights need to be redefined. Women need opportunities to become more involved in secondary level production rather than only basic production.

The existence of traditional markets and the proximity of factors influencing production (e.g., inputs, outputs, credit, and capital assets) have positive roles to play in the sustainable management of natural resources. The current open access system, for instance, could lead to the misuse of the land, as there are no individual title deeds. The absence of formal markets in Thorndale serves as a barrier to the judicious use of available resources, because people do not recognize the importance placed on what is otherwise referred to as "free commodities." This is why the monetary valuation of such non-marketed goods and services is highly relevant, and must be accounted for in macro-economic policy, in food security, and in livelihood strategies of rural people. Functioning markets and indisputable rights of resource ownership are inevitable for sound productive and consumptive activities and strategies. Hence, the current improvement in the land tenure system of South Africa needs to take into account, all factors of production and their accessibility, especially to those most vulnerable to poverty and food

insecurity (e.g., women). Gender issues, feminization of production, and control of resources need to be accommodated in policy.

## Conclusions

The extraction of non-timber forest products, traditional small-scale cropping and livestock production are important in sustaining rural livelihood by supplementing other livelihood sectors such as formal jobs. However, these sectors are heavily dependent on household capacity and attributes. Women are the most important players in land-based livelihoods. Due to the lack of marketing opportunities, most households directly consume their land-based production, rather than selling it for cash. The correlation between the land-based livelihood sectors, suggests that in the absence of stable cash incomes, these sectors provide a buffer for household consumption. Policies to improve rural livelihoods, therefore, have to be analyzed within a total livelihood context and have to consider the role of the household and the importance of gender in relation to the division of labor. Limited agro-ecological potential, the growing human population, and scarce employment opportunities are a threat to sustainable livelihoods. The interdependence of livelihoods, ranging from household structures and profiles, to production and consumption offers opportunities to alleviate the adverse effects of economic and environmental hardships. In view of this, monetary valuation exercises should not be isolated from economic estimates of resource supply, demand, and sustainability, or from the primary determinants of household activities. The different elements of household power, capabilities, assets, and a changing external environment in a dynamic society are important for understanding the vulnerability of rural households to adverse conditions. Ultimately, this understanding will inform appropriate policy actions and interventions.

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## Notes

1. Livelihood option is used in this context to refer to land-based activities such as agro-pastoralism and the extraction of secondary woodland resources. It also refers to jobs in the formal and informal employment sectors. Livelihood option, livelihood sources, and livelihood activities are used interchangeably to refer to the livelihoods that were considered in this paper.
2. The major determinants of sustainable livelihoods are social equity, benefit sharing, environmental stability, resilience to poverty, appropriate technology, and economic efficiency that ought to be fully understood at the household level (Crehan, 1992; Makhura et al., 1998).
3. Secondary woodland resources are natural resources from a given land, coincidental to the primary management objectives (Shackleton, 1996), and mainly in the form of non-timber forest products (NTFP).
4. Agenda 21 is the blueprint for sustainable development, crafted at the Rio Summit in Brazil, 1992. The document provides the framework for the long-term objective of enabling all people to achieve sustainable livelihoods. It emphasizes the integration of factors that allow policies to simultaneously address development, sustainable resource management, and poverty eradication with suggestions for the management of natural resources in a sustainable livelihoods context (Robinson, 1993; Forsyth et al., 1998).
5. There are a multitude of woodland products that have both direct and indirect benefits. The direct-use benefits are defined as all the tangible uses (e.g., livestock grazing and extraction of forest products), while excluding ecological services, bequest, etc.
6. Entitlements are the rights of access to a resource. They can be referred to as the alternative sets of benefits of cash income activities available to people from the environment, and enabling people to achieve their well being. Many actors (e.g., resource managers) and institutions (e.g., kinship ties, rules and regulations) shape these entitlements (Leach et al., 1997; Forsyth et al., 1998).
7. Incomes in this context refer to the cash earnings of households, payments, and benefits in kind that can be converted to a monetary value (Lipton and Maxwell, 1992).
8. As used here, informal employment is defined as all cash income-earning activities other than those of government and the private sector. Informal employment tends to be irregular. Wages from artisanal work and village shops as well as other trades (i.e., self-employment), but excluding peasant land-based activities, constitute the informal income sector. Formal earnings include jobs with regular wages, government grants, and pensions.
9. CANOCO is a statistical program for performing an ordination analysis of large data sets and establishing the broad relationships between the variables (ter Braak and Šmilauer, 2002).
10. The SADT areas were the native administered Crown lands, which did not involve relocation. They included the commonage of Mgwali under a tribal authority system transferred to the "independent state" of the Ciskei

in the apartheid era in the 1970s, now in the Eastern Cape Province of the new South Africa.

11. Biodiversity refers to the variety within and variability among living organisms and the ecological complexes in which they occur. It encompasses genes, species, ecosystems, and their relative abundance (OTA, 1987; Noss, 1990; Wilson, 1992; Johnson, 1993).

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