



# The Real Jewels of the Kalahari

## Drylands Ecosystem Goods and Services in Kgalagadi South District, Botswana

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## **SUMMARY**

This study seeks to identify the contribution of drylands ecosystem goods and services to poverty reduction, livelihood security and the national economy, illustrated by a case study of two dryland communities in the Kgalagadi District of Botswana. We consider how a better understanding of the economic contribution of drylands could influence national and international decision making. The study seeks to answer the following questions:

- What are the ecosystem goods and services found in the study sites?
- Which of these services are key to the livelihood strategies of the local communities?
- What is the social and economic value of these ecosystem services?
- What are the implications of the case study findings to local and national development planning?

This valuation helps us answer practical questions of environmental policy such as: how much do our ecosystems contribute to our economic activities at national level?

empirical data from semi-arid northern Botswana and Namibia, adjusted to fit with the lower production conditions in the study area.

- Both private and economic values were measured in this study. Private values quantified the turnovers, net profits and returns to investment realised by households or enterprises, as expressed in transactions in money or in

**The asset value** of the study area represents the present value of the expected future contribution of the dryland ecosystem in terms of economic rent. The asset value of the study area was USD 984,200 (Pula 6.2 million), with the highest contribution – about half the value – coming from plant utilisation (Pula 3.8 million), followed by private sector tourism (Pula 2.3 million) and CBNRM trophy hunting (Pula 170,000). Although the main economic activity in Kgalagadi South sub district is livestock production, the valuation exercise revealed that livestock production contributed nothing to the asset value of the study area since it generated very minimal economic rent.

Among the **indirect use values or ecosystem regulating and supporting services** were carbon sequestration, protection from erosion, and value as a wildlife refuge. These values were roughly calculated using benefits transfer methods based on more detailed work that has been done elsewhere in semi-arid Botswana. The main indirect use value was the annual net change in carbon sequestration, at USD 111,300 (Pula 700,000). Protection from wind erosion, measured as annual production losses averted, was valued at USD 68,400 (Pula 430,000). The value of

## **PURPOSE OF THE STUDY**

This study assesses the contribution of drylands ecosystem goods and services to poverty reduction, livelihood security and the national economy through a case study of two communities in Botswana, southern Africa. The study's purpose is to show how such assessments can and should influence national and international decision-making processes.

There is increasing evidence concerning the economic importance of ecosystem services for local livelihoods. This evidence, however, has rarely been aggregated to make the case for investment in dryland management at the national level. Combined with the compartmentalization of dryland management issues into different sectors, this had led to a situation in which proponents of the Ecosystem Approach and other holistic frameworks have had to rely on special pleading rather than concrete evidence of the contribution to the national economy of dryland ecosystem services. As a consequence, the development of economic incentives for improved dryland management, contributing to local livelihood security and poverty alleviation, is still in its infancy.

It is thus important to quantify and document the value of these ecosystem goods and services in order to justify investment in the development of the dryland areas. Understanding the opportunity costs - at both local and national level - of *not* managing dryland ecosystems is central to influencing decision making on the need to invest in drylands and reduce the vulnerability of populations living in these areas.

There is a need for cost and benefit analysis of different land uses in Southern Africa's drylands. This is critical for changing the perceptions of development planners who view dryland areas as 'sinks' and areas for social welfare (Mortimore, 2006). Without an understanding of costs and benefits, practitioners and policy makers in the region and elsewhere will continue to design inappropriate interventions with perverse incentives. It is against this background that this study was carried out in Kgalagadi District of Botswana.

### **Background on dryland ecosystems**

Dryland ecosystems – including dry sub-humid, semi-arid, arid and hyper-arid areas – occupy approximately 50% of the Earth's terrestrial surface. More than 35% of the world's population lives in drylands, and many people depend directly for their livelihoods on goods and services provided by drylands ecosystems, such as food, fodder, fibre, medicine, provision of clean water and protection against erosion.

Due to the particular adaptations to extreme environmental conditions, dryland ecosystems harbour a distinctive biological diversity, with many endemic species and genetic variants that occur nowhere else in the world. Though species numbers tend to be moderate in semi-arid areas and decline to low levels in arid and hyper-arid zones, diversity in some animal and plant groups can in contrast to this general rule increase as aridity becomes more intense. An article in *Dryland Agrobio* (2003) shows that although the number of species is less in the drylands than the tropics or semi-tropics, drylands are characterised by high degree of endemism and also contain high value products for industrial and pharmaceutical uses. Dryland species have developed a wide range of adaptive traits to harsh environments, making them also important sources of genes for stress resistance in breeding for drought, cold, salinity, diseases and pests as well as other production constraints. Drylands also

provide habitats for wildlife and are critical to the survival of many migrating species (Christiansen and Vaughan 1997), Despite comparatively low species numbers, biodiversity is crucial to maintaining ecosystem functions in drylands. Losing species in dryland systems may result in the reduction of resilience, productivity and livelihood security far more quickly than in more humid environments.

A major concern in dryland ecosystems is degradation, as defined by the United Nations Convention to Combat Desertification (UNCCD). Degradation continues to impoverish farmers and pastoralists and has important consequences outside of the drylands, such as siltation of water bodies and the environmental impacts caused by displaced people. Human activity is expanding more and more into the very dry and hyper-arid areas; it has been estimated that approximately 70% of the worldwide dryland area is affected by some form of desertification and land degradation, resulting from a variety of factors including climatic variations and intensification of human activity. Global warming is likely to make drylands drier and increase even their size.

In Southern Africa the underlying causes of dryland degradation are a combination of lack of alternative economic opportunities and weak regulatory framework and institutional structures (Scholes and Biggs, 2004). The application of holistic frameworks such as the Ecosystem Approach and other natural resource management approaches that address environmental and socioeconomic factors in an integrated manner is an essential part of the solution. There is also considerable agreement that in many contexts there is a big gap between the social profitability of improved land management and the (limited) private benefits accruing to the land managers as a result of both market and policy failure. As a consequence, government policy and institutional reforms such as incentives are often needed.

Southern African countries have various initiatives for addressing issues of desertification through their National Action Plans and other programmes. Some of the emerging interventions are tackling the underlying causes of land degradation by focusing on both conservation and development challenges i.e geared towards poverty alleviation. Of relevance are the community-based natural resource management (CBNRM) programmes. A recent series of case studies in southern Africa by IUCN and USAID/FAME has shown that CBNRM has successfully increased the management authority and responsibility of local communities and promoted integrated approaches. Capacity building of communities undertaking measures to manage their resources and diversify their livelihoods has resulted in sustainable resource management (Von Malthias, 2007). Though CBNRM initiatives have yielded positive results, more is required to address the needs of local people in drylands. In particular, CBNRM in southern Africa remains mainly wildlife-based and there is more potential to develop veld products and tourism.

### **Objectives of the study**

This study seeks to identify the contribution of drylands ecosystem goods and services to poverty reduction, livelihood security and the national economy, illustrated by a case study of two dryland communities, Khawa and Struizendam, in the Kgalagadi District of Botswana. The aim is to consider how a better understanding of this contribution of drylands could influence national and international decision making. The study seeks to answer these questions:

- What are the ecosystem goods and services found in the study sites?
- Which of these services are key to the livelihood strategies of the local communities?



- What is the social and economic value of these ecosystem services?
- What are the implications of the case study findings to local and national development planning?

The economic value of dryland resources in the semi-arid area of Kgalagadi district is demonstrated through the application of valuation methods. These methods are complimented with other approaches, namely sustainable rural livelihoods and a gender perspective, which highlight the complexities around valuation of ecosystem

The productivity of Botswana's drylands and communal rangelands is often underestimated, stemming from a narrow focus on livestock, especially beef. Although beef production is the dominant type of land use in the drier parts of Botswana, this industry however only benefits a minority of the people, mainly because of the increasing privatisation of tribal land or communal land through acquisition of boreholes (de-facto privatisation) and leasehold areas. These changes were introduced under the Tribal Grazing Land Policy and the fencing component of the 1991 National Policy on Agriculture. A significant result of this privatisation has been the displacement of many dryland dwellers, particularly the San hunter-gathering ethnic group, and many rural poor who could not afford to sink boreholes or acquire ranches (Cullis and Watson 2005; Madzwamuse 2006). Due to loss of access to land and resources and increases in poverty, more dryland inhabitants have become dependent on government handouts and drought relief programmes.

In practice, communal rangelands are used for a mixture of purposes; livestock, wildlife and gathering wild products. The rangelands therefore produce a range of products in addition to beef (CAR 2004). There are efforts to support other land uses, as the country strives to diversify its rural economy in order to reduce poverty levels. The Revised National Policy for Rural Development calls for a more integrated and diversified approach to rural development, incorporating other sectors besides agriculture such as tourism and community-based natural resource management. (CBNRM). This approach promotes tourism, wildlife, forests and veld<sup>1</sup> products sectors that rely on a healthy environment. In 2005 the rural communities in Botswana earned USD 2.8 million from CBNRM activities, which include auctioning wildlife quota, basketry, land rentals etc. However CBNRM in some of Botswana's drylands remains underdeveloped due to relatively low wildlife populations. Diversifying CBNRM beyond wildlife, to cover other types of natural resources such as rangelands and veld products is a challenge, which Botswana shares with the rest of the region.

National development economic planning does not yet fully address how to diversify the rural drylands economy. Biodiversity and environmental issues in general have so far not been coherently incorporated into government planning, policies or legal frameworks in Botswana, although there is a trend to change this. While Botswana's biological resources of wildlife and agriculture have been addressed in planning, other natural resources have not and a long-term holistic approach is still missing. While this holds true for most of the biomes in the country, it is even truer for the drier parts of the country where the tourism industry, cultivation and other economic sectors are not that well developed. The NBSAP Stocktaking Report identified the following issues relevant to drylands, in terms of economic and development planning:

- Resource use charges and property rights are the most commonly used environmental –economic instruments in Botswana. Charges have however no common foundation, leading to distortions in resource use. Moreover, most charges are low and not regularly reviewed.
- Subsidies are common, but virtually

- Veld products and wood resources have long been neglected in policy development and implementation.
- Participation of the commercial private sector in biodiversity activities has so far been restricted to wildlife.

The NAP to combat desertification could facilitate the mainstreaming of these sectors with regards to drylands, but implementation has been slow according to Botswana's Country Report to the UNCCD for 2004. Botswana has also been slow in adopting the NAP, even though steps have been taken to incorporate the NAP into National Development Plan 9 under the agriculture, forestry, and wildlife and land administration sectors.

The implementation of pilot projects under the NAP has yielded mixed results. Although there are some successes in 'halting desertification' with community involvement, participation over time has dwindled due to a lack of incentive-based methods. The Government of Botswana recognises the role of communities in combating desertification, but interventions have been in the form of woodlots and similar environmental activities, with very limited focus on improving incomes and appropriate incentives. Part of the problem is because some of these interventions are not holistic and there is no direct link between ecosystem well-being and improved livelihoods.

## **DEFINITION OF CONCEPTS**

**Ecosystem goods and services** are generally defined as processes and products derived from ecosystems benefiting people and sustaining human life (MA 2003). Ecosystem goods are directly, or indirectly, utilised by humans and include food, water, construction material, medicines, fuel, utensils, waxes, handicraft materials, wild genes from plants and animals for agriculture etc.

Ecosystem services are conditions and processes through which natural ecosystems maintain biodiversity and the production of ecosystem goods to sustain and fulfil human life and are usually classified in the Millennium Ecosystem Assessment Framework as follows:

- **Provisioning services** are products and services harvested or passively provided by ecosystems, (e.g., wildlife and forest products for food, fibre and medicines; agricultural products, livestock pasturage; water, extracted minerals, and genetic resources).
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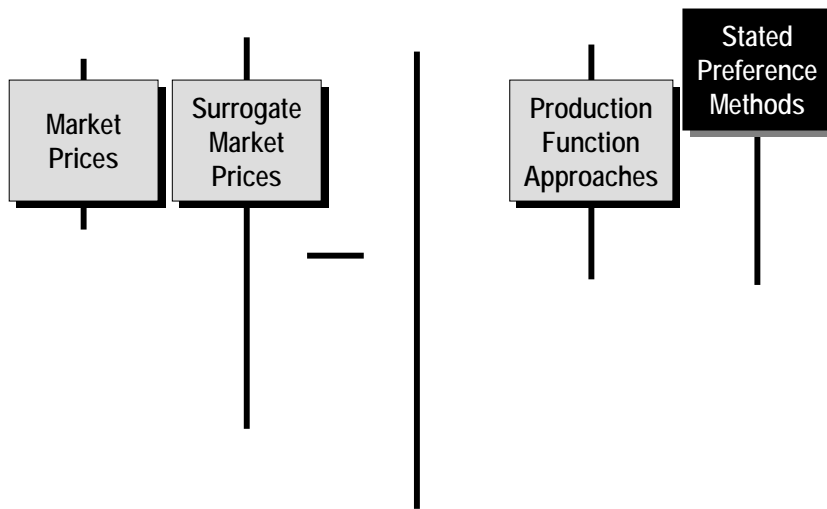


study presented here attempts to define some of the values obtained from drylands in Botswana and assesses both direct and indirect use values.

## **TOOLS AND METHODS USED FOR VALUING ECOSYSTEMS**

There are a number of generic tools that can be used for valuing ecosystems such as wetlands and also drylands. Each of the methods has different data and analytical requirements and has varying suitability in different contexts and situations. The methods can be categorised into i) Revealed preference methods (market prices, surrogate market prices, cost based approaches, production function approaches) and ii) Stated preference (Contingent valuation) as illustrated in figure 1, and iii) Benefits transfer.

**Figure 1: Methods for valuing ecosystem benefits/costs**











entrepreneurship. The economic values are measured as opportunity cost to the nation, and for this some adjustments need to be made to the private values. Thus, because some jobs reduce unemployment, the economic costs for unskilled labour are lower than the private ones. Also, excess demand for foreign exchange means that the economic prices for tradable items are higher than the private costs and benefits for these. Taxes and subsidies represent private costs and benefits, but they do not change the national income so are eliminated from the economic models.

At the national level, the social accounting matrix (SAM) model for Botswana was used to derive the income or value added multipliers for the different activities. The SAM is an input-output model of the whole economy, expanded to include income and expenditures at household level. The national level income multipliers used for this study were those derived by Turpie et al. (2006) for similar activities, using empirical data in a disaggregated SAM.

## **DRYLAND ECOSYSTEM GOODS AND SERVICES IN K GALAGADI SOUTH**

### **Livelihood Strategies in Kgalagadi**

Due to its ethnic composition (San, Bakgalagadi and Coloureds), livelihood strategies in Kgalagadi District traditionally combined pastoralism and hunting and gathering. Most settlements in the district are situated near pans or fossil river valleys, or on rock outcrops that serve as sources of water through ground water supplies.

Contemporary livelihood strategies combine Government drought relief projects, social welfare programmes, livestock rearing and collection of veld products especially in the case of female-headed households. Plant resources tend to contribute to the livelihoods of the local communities on a seasonal basis and also in times of good rains. In droughts, the communities in Kgalagadi stated that wildlife and livestock become even more important because there is diminished nutrition in plants as well as diminished availability. Access to wildlife resources is now at a collective community level through the quota allocation for the CBNRM programme. The community auctions this quota to private safari operators and uses only part of it for subsistence.

The main source of wealth in the district is commercial cattle rearing for meat production. Food, domestic supplies and production inputs to the district are supplied from Lobatse (500km), Jwaneng (360kms) and the capital Gaborone, 530km away from the Kgalagadi South district centre. The Meat C5(Food, domestic 0c(tl duction. )5(-6(Jabsorbc 0.

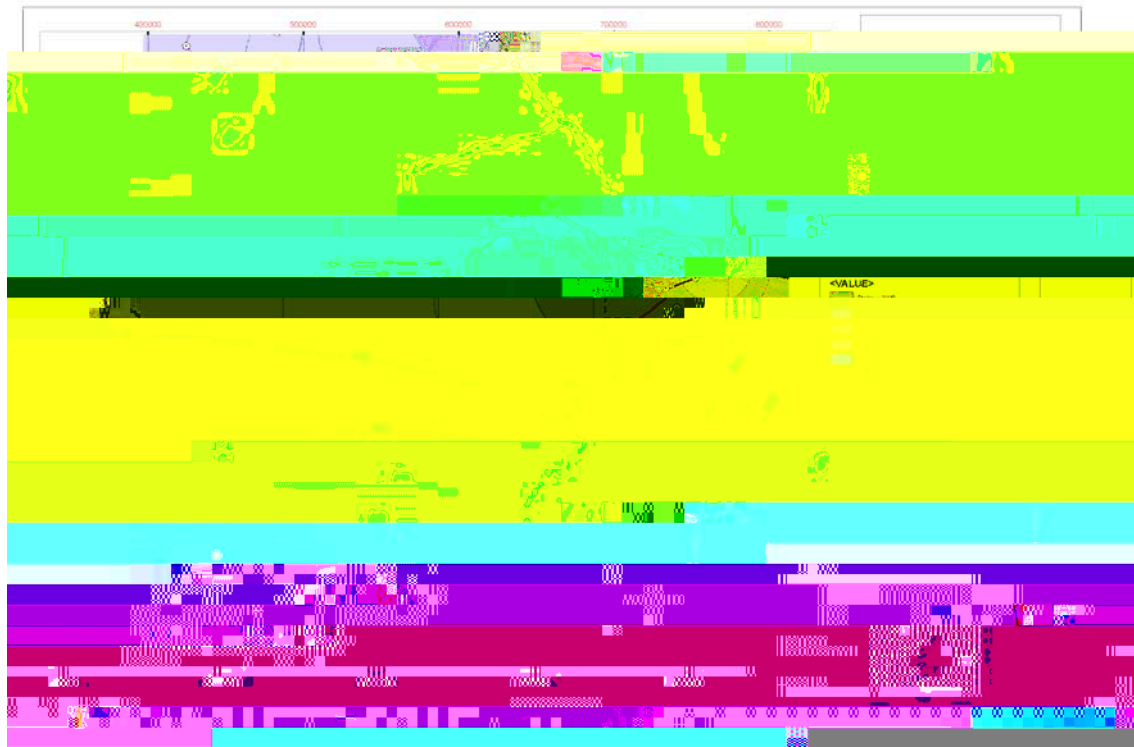
**Table 1: Distribution of Cattle at Household Level in Botswana**

Year	Rural households without cattle		Households with 1-20 cattle		Households with more than 20 cattle	
	'000s	%	'000s	%	'000s	%
1981	61.3	51.6	27.9	23.4	29.8	25.0
1991	104.7	67.6	26.9	17.4	23.5	15.2

Source: Cullis and Watson 2005, citing White 1998a

Tourism is emerging as a potential source of livelihood as a result of the establishment of the Kalahari Transfrontier Park that merged the Gemsbok National Park on the South African side and Kalahari Gemsbok Park in Botswana. Tourism is also been boosted by the introduction of community based natural resources management projects.

There are limited incentives for people to invest in sustainable natural resource uses other than those that are livestock-related. Grazing is currently the dominant landuse in the western portion of the Kgalagadi district while the areas surrounding the settlements are typically multiple use areas, for grazing of livestock, fuelwood and veld product harvesting (see Map 1 below).



**Map 1 Land use in Kgalagadi District**

## **DRYLAND GOODS AND SERVICES IN KGALAGADI**

The study identified a variety of goods and services key to the livelihoods of communities in the study area within Kgalagadi District. These comprise wild foods, timber, fuel, fibre, medicines, forage for livestock, wildlife refuge, soil fertility



Consumption and sale of meat are still the primary outputs from animal husbandry, representing a use value of USD 0.04/ha for cattle and USD 0.01/ha for goats, respectively (Amusa 2000). The importance of milk production mainly for subsistence is increasing and achieves high returns of USD 0.17/ha in the Kgalagadi District (Amusa 2000). Manure production and provision of draught power as other functions of livestock production are highly valued by people involved in arable agriculture and horticulture. Cattle are not only economically important but are also an important cultural marker for the Setswana ethnic identity, with strong cultural symbolism and value.

However, despite the high resilience of drylands, the productivity and value of rangelands appear to be gradually declining in Botswana as a consequence of land degradation and bush encroachment around boreholes and settlements; a process exacerbated by global climate change (CAR, 2006).

Furthermore, it is widely observed that government policies have made livestock

Almost all people in Kgalagadi District harvest different veld products for home consumption (Amusa 2000; Chanda and Totolo 2001; Velempini 2006). About one quarter of the people also generate income from harvesting veld products (Velempini, 2006). Veld product gathering accounted for USD 0.10/ha mainly due to the high use value of firewood (Amusa 2000). There is however a need to gain a better understanding of the commercial market for veld products and develop formal markets for these (IVP 2006).

Wild fruits and vegetables, particularly truffles (*Terfezia pseilii*), wild melons (*Citrullus lanatus*), bush raisins (*Grewia flava* fruits) as well as Mopane worms and honey, represent regular supplementary sources of food for rural people in Botswana's dryland areas. The variety and diversity of veld foods collected varies significantly from area to area and from district to district. Veld foods are mainly used for subsistence and when sold only earn very little money. They are not only an important part of people's diet, but livestock also forage on vegetation in the veld. Amongst veld foods, watermelons were rated as most important for livelihoods by rural communities in Kgalagadi South, followed by truffles and bush raisins, though only found occasionally (Velempini 2006).

### **Fuel wood**

Fuel wood is still a major energy source for the majority of rural households and for about 40% of urban households in Botswana (State of the Environment Report 2002). In rural areas, fuel wood is also used to scare wild animals away from the vicinity of villages (Velempini 2006). In Kgalagadi District, firewood represented the key resource for 89% of the households and contributed significantly to the high use value of veld products gathered in the area. However, overexploitation, overstocking and overgrazing continues to put pressure on available fuel wood resources and fuel wood shortages around villages in Kgalagadi have been reported (State of the Environment Report 2002).

### **Construction material**

Wooden poles usually taken from live trees are typically used for fencing, roofing timbers and structure frames. The State of the Environment Report (2002) estimated that nationally 180 tonnes/year were used in the fencing of kraals (livestock pens) and 35 tonnes/year in construction. There is no data available specifically for drylands. Furthermore, several types of thatching grasses, particularly *Eragrostis pallens* and *Stipagrostis uniplumis*, are harvested as construction material for roofs, hut walls, yards and mats, both for home consumption and sale. Thatching grass was reported to be the second most important veld product for rural people in Kgalagadi North after fire wood (Amusa 2000).

### **Medicinal plants**

The use of medicinal plants is still a common practice in Botswana's drylands, both for human and livestock health. Devil's Claw (*Harpagophytum procumbens*) is currently the most important commercially exploited medicinal plant in Botswana and endemic to drylands in southern Africa. This medicinal plant was rated as having the highest priority for the livelihoods of rural communities in Kgalagadi South (Velempini 2006). Nationally, approximately 20 tonnes of dried material with a value of USD 20,700 to USD 27,000 have been harvested and marketed in 2005 (DFRR 2006). Sales in Kgalagadi District have been estimated at between 5 and 10 tonnes with returns of USD 7,000 to 13,000. Likewise, *Hoodia goordonii*, a succulent plant with appetite suppressant qualities, growing only in the driest parts of the country (Kgalagadi South), provides a unique opportunity for livelihood diversification in rural communities. First cultivation trials in three communities in Kgalagadi South have been initiated by the DFRR in 2006. Besides these high value medicinal plants, a

large variety of other medicinal plants is consumed and marketed locally as various herbal teas. The Morula tree and the candle bush (*Sarcocaulon* sp) from semi-arid areas of Botswana contain ingredients interesting for the cosmetic industry such as valuable lipids and waxes.

### **Handicraft production**

Though the mokola palm and dyeing plants (*Berchemia* sp and *Euclea* sp) are nationally important as natural resources for basket production, this particular handicraft production is less common in drylands, where the palm hardly occurs. Nationally some 45 plants have been reported to have aesthetic value, typically pods, fruits, stems and dried inflorescences (State of the Environment Report 2002). However, unattractively low prices have hindered large-scale marketing of these resources. More commonly exploited in the drylands of Botswana are ostrich shells, often used in jewellery and craft production particularly in Gantsi District.

### **Subsistence hunting**

Vegetarian veld foods play a more important role in local people's diet than game meat, as hunting is strictly limited by current legislation and policies. Only around 10% of people in Kgalagadi District hunt animals such as gemsbok, eland, springbok, steenbok, hartebeest, duiker and ostrich (Amusa 2000; Velempini 2006). An annual raffle determines who receives a hunting permit for one animal in that particular year, but often the winners cannot afford to pay for the permits that range in cost between USD 16 (duiker) and USD 111 (eland and gemsbok). Birds that are not particularly protected can be hunted with an annual permit issued by the Department of Wildlife and National Parks (DWNP).

### **Tourism potential**

Though wildlife in Kgalagadi District is less abundant than in northern Botswana, the CBNRM programme in Botswana provides an excellent opportunity for communities to engage in wildlife-based tourism activities such as trophy hunting and photographic tourism. Dry areas outside Chobe and Ngamiland Districts in the north account for almost half of the country's lion population; these are however mainly restricted to protected areas under the Department of Wildlife and National Parks. Typical dryland inhabitants comprise species such as gemsbok, springbok and ostrich. While 90% of all CBNRM revenues are generated in Ngamiland District in the north (Status Report 2006), there is evidence that districts in the southern drier parts of the country also have potential to derive economic benefits from the wildlife-based tourism sector. In 2005 four communities in Kgalagadi District earned altogether USD 48,000 through auctioning of wildlife quota and land leases. These revenues significantly contributed to the direct use value of USD 0.08/ha for hunting activities in this district (Amusa 2000).

However, over the past decades the decline in wildlife numbers in Botswana's drylands, particularly in Kgalagadi District, together with bush encroachment, has reduced the scenic beauty and tourism potential of the savanna. This has limited economic diversification options, particularly in the tourism sector.

## **ECONOMIC VALUES OF DRYLAND GOODS AND SERVICES IN K GALAGADI**

There does not seem to be much evidence of dryland ecosystem valuation in Botswana. Attempts have been made to value rangelands, some of which are found in dry lands ecosystems, but most of this valuation shows that there is no inclusion of costs in the studies (Arntzen 1998). Economic valuation has also been carried out for

rangelands in a limited number of communities in Kgalagadi, the driest district in Botswana (Amusa 2000; Chanda and Totolo 2001). However, in all these studies values are mainly limited to direct use values, thus undervaluing drylands. Gathering of veld products (non timber) is the most undervalued activity, although it is of critical importance for low-income households.

**Figure 2: Private household and community direct use values, Kgalagadi case study**

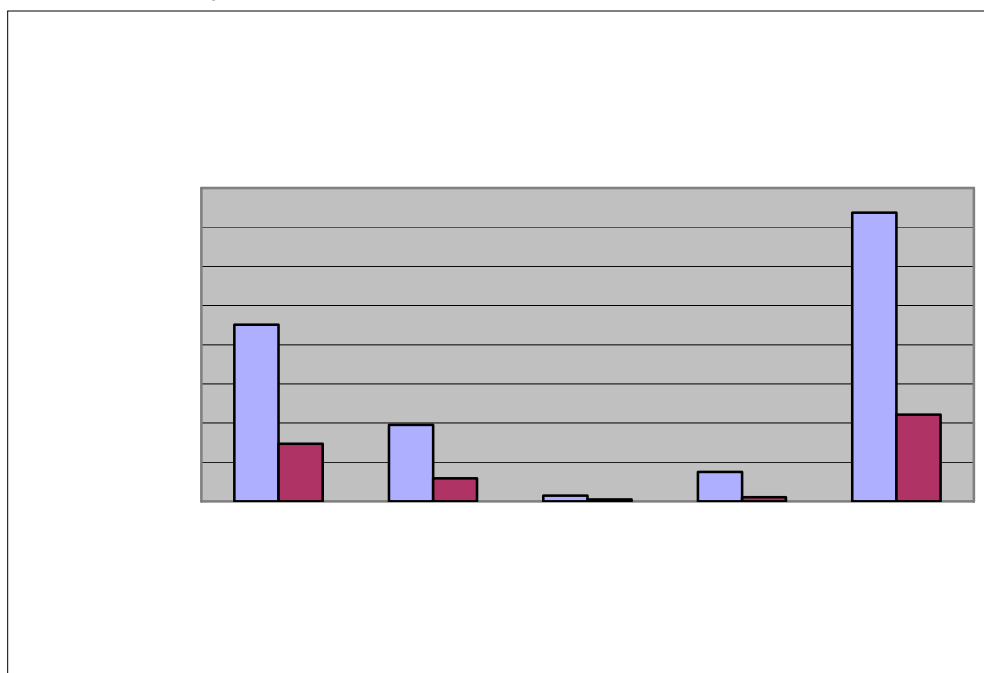
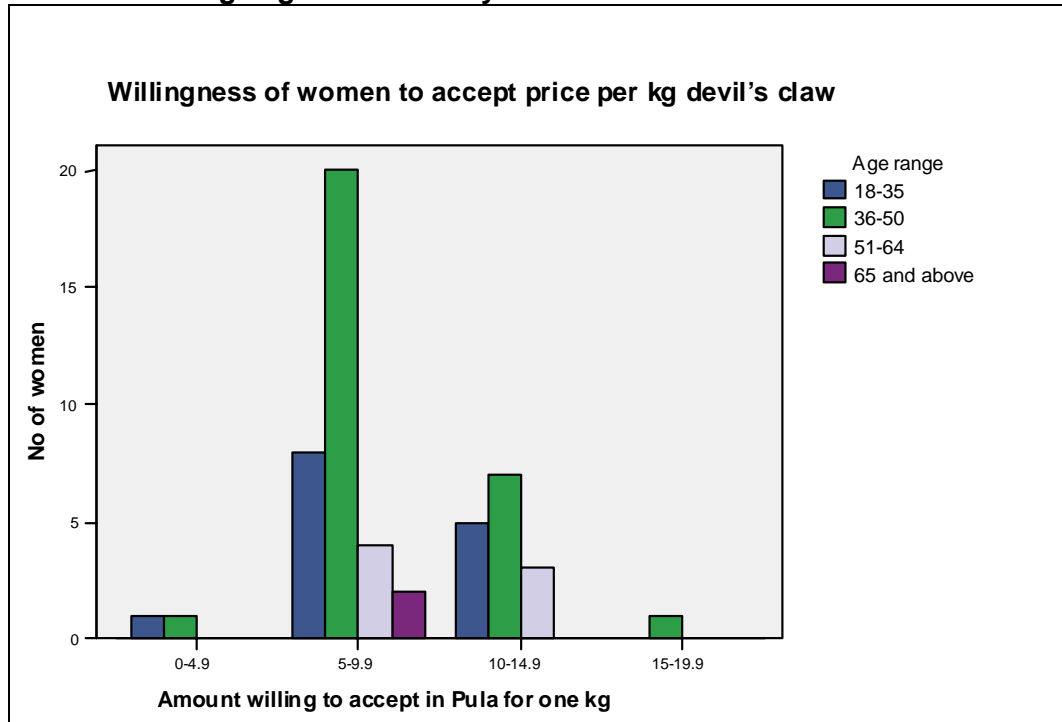




Figure 3: Willing to accept price for Devil's Claw, by women and men in Kgalagadi case study



**Economic - Direct Use Values**

Table 4 shows the economic values estimated for the ecosystem valuation in Kgalagadi South. Note that, as discussed above, the economic values are different

was discounted to present value to derive an asset value. Various discount rates between 2 and 10 percent were tested. But the base case discount used was 6%. Figure 4 shows that the asset value of the study area was USD 984,200 (Pula 6.2 million), with the highest contribution – about half the value - coming from plant utilisation (Pula 3.8 million), followed by private sector tourism (Pula 2.3 million) and CBNRM trophy hunting (Pula 170,000). Although the main economic activity in Kgalagadi South sub district is livestock production, the valuation exercise reveals that livestock production contributes nothing to the asset value of the study area since it generates very minimal economic rent. This result underlines the need for incentives to develop the sectors of plants and private sector tourism, considering that currently livestock seems to be overly subsidised. It is however important to regularly monitor the asset values.

**Figure 4: Asset Values of the Kgalagadi study area, in Pula**

**Indirect Use Values: Regulating and supporting services of drylands**

In addition to products and services that are directly harvested or provided by these ecosystems, drylands in Botswana, as is the case with other drylands, have a range

- *Ground-water storage (drought control)*: The water storage capacity of predominantly sandy soils in dry areas is poor and groundwater recharge low (below 1mm/year);
- *Habitat for species breeding and nursery*: This function is closely linked to biodiversity maintenance
- *Soil fertility regeneration*: The nutrient recycling process is determined by biochemical and physical processes and depends on biomass production and microorganisms.
- *Pollination services to crops and other plants*: This function is closely linked to maintenance of pollinator populations.

Among the indirect use values or ecosystem service values measured for the study area were carbon sequestration, protection from erosion, and value as a wildlife refuge. These values were roughly calculated using benefits transfer from more detailed work that has been done on them in semi-arid northern Botswana by Turpie et al. (2006). The calculations made in that study were adjusted to reflect the different productivity, cover values and species mixes in the Kgalagadi study area. The main indirect use value was the annual net change in carbon sequestration, at USD 111,300 (Pula 700,000). Protection from wind erosion, measured as annual production losses averted, was valued at USD 68,400 (Pula 430,000). The value of the study area in protecting wildlife which disperses and is used elsewhere, i.e. the wildlife refuge value, was estimated at Pula 15,000 per annum. The value for groundwater recharge was estimated to be negligible.

These environmental functions, often referred to as regulating and supporting services, have not been valued in dry areas of Botswana or the southern African region, though they are fundamental ecological and human well-being.

## **SOCIAL AND CULTURAL VALUES**

*“Thank you for having the courage to put a monetary value on our ancestral lands”* Statement made by the Chairman of Tomku Trust following a presentation on the economic value of the Kalahari

The statement above is a source of different perceptions of values. To develop interventions that support local livelihoods and increase the value of key sources, it is important to take note of local community values. These are embedded in the cultural practices and indigenous knowledge systems associated with the use of local natural sources. These cultural and spiritual values expressed in local practices, beliefs and norms are often referred to as social capital.

In some cases indigenous knowledge, which is part of a community's social capital, can be treated as a commodity where intellectual property rights are considered

Sharing and Intellectual Property Rights framework provides an opportunity for demonstrating the economic benefits associated with indigenous knowledge. For example in 2002, South Africa's Council for Scientific and Industrial Research signed a benefit-sharing agreement with the South African Council on the licensing and sale of the *Hoodia* appetite suppressant drugs. The agreement acknowledges the San peoples' prior intellectual property rights in the *Hoodia*<sup>2</sup> as an appetite suppressant.

<sup>2</sup> *Hoodia gordonii* is a plant found in the deserts of southern Africa, which is marketed internationally as an appetite suppressant.

There are other potential opportunities for similar benefit-sharing agreements. During the development of the Botswana National Biodiversity Strategy and Action Plan the local communities in Gantsi and Kgalagadi districts demonstrated a wealth of indigenous knowledge with regards to biodiversity, especially medicinal plants found in their locality.

This case study in the Kgalagadi district thus seeks to identify cultural values and norms as valuable assets that are worth protecting. These assets could be developed by the local communities for sustainable management of the dryland resources by tapping into the social and human capital that lies in the resource users themselves; the women that harvest plant resources and the men that work with livestock and wildlife.

These cultural practices could have a value in reducing dryland degradation and the consequent erosion of the ecosystem asset base. Where such cultural practices exist, it might be easier for people at a local community level to change their behaviour in order to address human-induced threats to biodiversity (McNeely 1998). Communities are likely to participate actively and effectively when they employ familiar methods of managing natural resources (Madzwamuse 2006). The cultural practices and norms illustrate the value that local people place on specific resources. Here we will focus on the practices relevant to the natural resources which are key to the livelihoods of the communities in Khawa and Struizendam in Kgalagadi District.

In Kgalagadi South sub district, examples of these values were found in taboos which have been noted by some conservationists as resulting in the protection of certain species and hence contributing to conservation. The taboos do not just relate to the environment: they cover all aspects of life in the village, the crop lands and the cattlepost. Management (including monitoring) of veld products has always been important in the lives of people of Kgalagadi, whether done consciously or not. Their adaptations, local beliefs and their taboos have always protected the environment within which they lived (Schapera, 1997). Such practices can even affect trade in products that are protected by local taboos, implying the seriousness with which development programmes need to consider local cultures and practices.

The community of Khawa spoke of certain rituals where plant resources were used, which shows the value of these resources to social and individual wellbeing. These included the use of plants for cleansing widows, pregnant women and new born babies.

- A woman who has had a miscarriage is smeared with a mixture of cow dung and a plant known as *Mogato* under her feet.
- *Sekanama* is used for cleansing a widow before she can remarry or be with another man.

Examples of other taboos and cultural practices related to ecosystem goods and services are listed in Figure 4:

**Figure 4: Taboos and other cultural practices related to ecosystem goods and services**

- People are prohibited from collecting firewood in the village “*motho ga a rwalele moteng ga motse*”
- During summer/ ploughing season people were not supposed to cut down thorny trees, e.g. *mongana* and *mokgalo*. This is believed to prevent harsh and stormy rains which could destroy crops
- Children are not allowed to go harvesting alone without the guidance of parents. Apart from the danger of wild animals, this was a way of making sure that they do not harvest unripe products thus causing unnecessary damage to the environment
- Trees were not cut during flowering times. This was to allow the trees to produce seeds and allow future germination.
- *Mokgalo* was a protected tree and to cut it one had to seek permission from the chief.
- Bulls were not slaughtered during ploughing season. They were only slaughtered during winter and this was done with the permission from the chief.
- *Makatane* were not to be thrown, as it was believed this action would attract lion and other predators to the settlement
- Thatching grass was only harvested during winter. This was to allow formation of the seeds.
- The cutting of primary tubers from Devil's Claw (*Harpogophytum procumbens*) when harvesting the plant is prohibited. Local residents believe that if the primary tube is cut in the harvesting process, the patient who uses it will not heal. The protection of the primary tuber has benefits for conservation as it promotes regeneration of the plant.
- It is against tradition to cut the base of thatch grass during harvesting; again this practice promotes re-growth and thus avoids the build up of sand dunes in the drier areas. When cutting thatch the communities scatter the seeds on their way back home so as to encourage growth, especially in areas with deep sands.

Source: Velempini 2006; Madzwamuse 2003.

### **Indigenous or traditional knowledge**

Using their indigenous knowledge, communities in Struizendam and Khawa have environmental markers for noting when to harvest various veld products, as well as the health of the ecosystem. Examples identified by Velempini (2006) for key livelihood resources of communities in the Kgalagadi South include;

- The winter season signals the harvesting period for Devil's Claw plants
- When plant species like umbrella thorn (*Acacia tortilis*) and silver leaf (*Terminalia sericea*) shed leaves it signals the harvesting season for Devil's Claw;
- Thatch grass is cut when *Acacia erioloba* (camel thorn) blossoms;
- Wild melons are ripe and ready for harvesting in the height of summer
- The communities in Kgalagadi also state that when trees produce a lot of wax (*borokhu*) it signals a drought.

The study carried out by Tlhalerwa (2006) further indicates that the difference in the traditional or indigenous knowledge held by men and women in Khawa influences access to natural resources. Women have more knowledge about plant resources key to subsistence livelihoods, whereas men are more knowledgeable about wildlife and cattle which have made it into the mainstream economic activities and are thus supported by strong national policies and economic incentives. The knowledge that women have and the resources that are central to their livelihoods are communally owned and subject to open access while the men's livelihood resources and knowledge they possess is subject to men's exclusive ownership of cattle and membership of a local wildlife trust.

## **IMPLICATIONS FOR NATIONAL ECONOMIC AND DEVELOPMENT PLANNING: SOME RECOMMENDATIONS**

The information from ecosystem valuation can be used to assist policy-makers and development planners to make informed decisions about what investments might yield optimum returns. Moreover, it is necessary to undertake valuation assessments regularly so as to monitor increases or declines in the assets and apply correctives in a timely manner.

This case study of a dryland region, Kgalagadi South sub district, provides evidence that some resources and economic activities at a local level remain undervalued; these may not therefore be well-reflected in national and local development plans. For instance the Kgalagadi District Landuse Plan, the overall framework for development, features cattle ranching as the main landuse, whereas this and several other studies have shown the economic value of non-livestock activities which may warrant investment, for example in development of veld products and ecotourism.

The community landuse plans being developed under the Indigenous Vegetation Project implemented by the Ministry of Agriculture and UNDP are making progress in this regard. But further information is still required for assessing costs and benefits of different land use options, each of which create value from local resources apart from pasture.

Some of the fundamental issues and challenges for policy and planning include;

- Veldt product markets are not formalised and remain underdeveloped. Hence these markets are not sufficiently visible in the formal landuse and investment plans at national and district levels
- Cultural values are not adequately rewarded; for example, no formal benefits for local knowledge and innovations through patents and royalties from the use of herbal teas or medicinal plants such as *hoodia* and Devil's Claw.
- There is a general lack of economic diversification at the local level i.e. livestock production concentrates only on beef production and not on the development of other by-products and small stock farming
- Failure to pay attention to gender roles means that village institutions generally support male-dominated livelihood strategies such as cattle farming and wildlife-based CBNR. This has left the livelihood strategies of female-headed households underdeveloped and vulnerable to poverty. Whereas there are a number of incentives and subsidies for boosting the cattle industry, there are no incentives for veld product based industries.
- Sectoral approaches to development planning have reduced opportunities to address dryland degradation and diversify livelihood supporting initiatives. For

example, agricultural policies fail to take into account other goods and services provided by dryland ecosystems.

Action is required at three distinct levels to change the delivery of ecosystem goods and services:

- Improving the governance of natural resources
- Increasing investment in biodiversity for livelihood security and
- Adopting appropriate technology

Next we offer recommendations on the first two items, but the development of appropriate technologies was not covered in this study.

### **Improving governance of natural resources in drylands**

It is evident that at the level of national economic planning, what are critical issues at a micro-economic level become negligible, though they are important for rural development and poverty reduction interventions. As the macro-economic issues tend to dominate national development planning, there will always be a risk that the ecosystem values highlighted in studies such as this for Kgalagadi sub-district are lost, unless these values are incorporated into the natural resource accounts.

While our recommendations target the national planning process, it is also essential to strengthen the ability of local and district level institutions to undertake ecosystem valuations. If this exercise is successful, the issues and lessons can be scaled up to influence national planning. It is after all at the district level that relevant policies such as the Rural Development Policy and the Poverty Reduction Strategy are being implemented in Botswana.

Generally the influence from rural village to national level planning is weak, compared to the other way round, except from rural districts that bring significant national economic returns such as from the tourism industry i.e Chobe and Ngamiland Districts. However, there are opportunities for district planners to influence the planning process through the Ministry of Local Government to the Ministry of Finance's Rural Development Division, responsible for coordinating the implementation of the National Rural Development Policy and its associated strategies.

A strong justification can be made for larger budgetary investments into drylands, through aggregating the economic values of drylands, as in the example of Kgalagadi



valuation. The application of these approaches will translate knowledge to local levels.

To further improve the governance of natural resources in drylands, local institutions need to be more equitable, strengthening the role of women in the local decision-making structures. This could be achieved by formally establishing resource user groups and linking these to the central Community Based Organisation committee. Women not only have a central role in sustaining livelihoods for households but they are also experts and custodians of indigenous knowledge about plant resources. (Tlhalerwa 2006; Velepini 2006)

### **Increasing investments in biodiversity for livelihoods security**

The ecosystem valuations outlined in this case study provide pointers for private sector investment. It is also indicative how private sector organisations could invest their corporate social responsibility funds in order to contribute to rural development and poverty reduction. The case study further shows where economic incentives need to be developed.

Some practical recommendations made during the valuation workshop in the case study Kgalagadi community location include:

- Establishing conducive regulatory mechanisms to provide incentives for investments in dryland ecosystems – this includes incentives for product development for veld products
- Package the drylands in order to attract private sector
- Improve access to markets for dryland community products
- Provide security of land and resource tenure
- Establish microfinance schemes to allow community investment for entrepreneurial activities
- Establish effective benefit sharing mechanisms at a community level
- Provision of enterprise development support
- Capacity building and training as well as strengthening extension services through NGOs
- Supporting product development and value addition at the local level

## **CONCLUSIONS**

Decisions regarding management of dryland ecosystems are made on the basis of economic, social, cultural and political considerations, but are often mainly based on economic calculations comparing the costs and the benefits of any planned initiative. Therefore it is important that comprehensive information is available on the total economic valuation of drylands.

Innovative conceptual frameworks must be designed for inclusive valuation of local social and ecological systems. Holistic and multidisciplinary approaches will enable more accurate valuation of dryland ecosystem goods and services. Resource economists need to work with ecologists and other social scientists to encourage practitioners in applying valuation tools.

Finally, improving the sustainability of dry lands depends on appropriate market incentives, product development in order to strengthen the economic base, and transferring knowledge on valuation to a local level.

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## **ANNEXES**

## **ANNEX A:**

### **Focus Group Discussion Veld Products Women**

*Number of participants: Youth\_\_\_\_\_ Elderly\_\_\_\_\_.*

#### **GENERAL QUESTIONS**

1. What is the predominant ethnic group/tribe of this community?
2. Of those in the formal or informal employment (i.e. paid by someone else), what is the proportion of those employed in employed in:
3. Tourism\_\_\_\_\_%. DWNP\_\_\_\_\_%. Trade in natural Products\_\_\_\_\_%. Government, Other\_\_\_\_\_%.
4. Could you provide a rough estimate of the total proportion of household source income last year from:  
Pensions \_\_\_\_\_%, Social welfare \_\_\_\_\_%; Drought subsidy \_\_\_\_\_%









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19. What proportion of your family diet do wild foods make up in the month when least collected? \_\_\_\_\_

20. What proportion of the harvest is typically sold? \_\_\_\_\_

**GRASSES/CRAFT MATERIAL/OILS AND WAXES**

We would like to find out about which types of grasses, craft materials, oils and waxes that are harvested by people in the village, and the products that are made from them.

27. What types of grasses and craft material are used by people in this village? How are they harvested e.g. what size bundle/other quantities, and how are they sold. How much are sold for? How plentiful or scarce are these resources

<b>grasses/ craft materials/oils and waxes</b>	<b>Local name</b>	<b>Use</b>	<b>Specify part of plant used (i.e. seed fruit, e.t.c)</b>	<b>Size of harvest bundle (cm diameter, weight)</b>	<b># selling bundles from a harvest</b>	<b>Size of selling bundle (cm diameter)</b>	<b>Price of selling bundle</b>	<b>Availability (Plenty/ enough/ scarce)</b>	<b>Trend (incr/ Decr)</b>

28. For each type of resource, please describe **who** is involved in a typical collecting trip, how are the bundles **transported**, **how long** does it take, and **how many** bundles are collected?

Type of Resources	Number & gender of people involved in a typical collecting trip	Length of a collecting trip	Number of bundles collected	Method of transportation

29. What proportion of the harvest is typically sold? \_\_\_\_\_

30. Which of these resources are purchased by traders who sell outside the village? \_\_\_\_\_

Who are the traders?

**Processing and selling**

31. What products are made from the above resources? How much is needed to make one? Prices, how long does this product last? How many of these would you expect to find in a typical household?

<b>Product</b>	<b>Made from</b>	<b>Quantity required (bundles/weight, give size)</b>	<b>Time to make (hours)</b>	<b>Price of product</b>	<b>Lifespan</b>	<b># in average hh</b>

32. What proportion of households produce the different products described? \_\_\_\_\_

33. Does anyone make these products for selling (which)? \_\_\_\_\_

34. What proportion of the production is typically sold? \_\_\_\_\_

35. Are they sold locally in this village? \_\_\_\_\_

36. How much is sold to outsiders or traders who sell outside the village? \_\_\_\_\_

37. What is the difference between the price paid to local producers and the price that traders get for the products elsewhere?

\_\_\_\_\_

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\_\_\_\_\_headloads (summer) \_\_\_\_\_headloads (winter)

44. How much firewood is used per week in a household that does have electricity?

\_\_\_\_\_headloads (summer) \_\_\_\_\_headloads (winter)

45. What is the distance travelled to collect firewood? \_\_\_\_\_kms

46. What proportion is collected from areas surrounding the village? \_\_\_\_\_.

47. How is firewood collected and sold (size of headload/bundles/cartload)\_\_\_\_\_

48. Selling price\_\_\_\_\_

49. How many people would go on a collecting trip for a household, how much time would they take, and how much would they get?

Number of people\_\_\_\_\_ Time\_\_\_\_\_hours Number of loads\_\_\_\_\_

50. How is the firewood transported back to the household?\_\_\_\_\_

**51. EQUIPMENT FOR HARVESTING AND PROCESSING PLANT RESOURCES**

Please describe the equipment used to harvest and process wild plant resources– we would like to know what equipment is used for which resources, how much it costs and how long it lasts.

Equipment	Cost	How long it lasts (years)	Food & Medicinal plants	Grass	Fuel-wood	Crafts	Other (specify)
