Indigenous Natural Products
Producer and Processor Organisations Sub-Activity

EIA for Devil's Claw

Report Reference Number 5a

11 March 2011

Commissioned by the Millennium Challenge Account Namibia with funding from the Millennium Challenge Corporation

MILLENNIUM CHALLENGE CORPORATION
UNITED STATES OF AMERICA

Natural Resources Institute

EIA for Devil's Claw

PROJECT DETAILS

Project Name:	Indigenous Natural Products Producer and Processor Organisations Sub-Activity
Project ID:	MCAN/COM/RFP/3C01001-A
Project Sponsor:	Commissioned by the Millennium Challenge Account Namibia with funding from the Millennium Challenge Corporation
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Report Submission Date:	11 March 2011
Cover photo:	Courtesy of Dave Cole

Contents

Acronyms and Abbreviations

ARD	Associates for Rural Development
CBNRM	Community-based natural resource management
CIF	Cost, insurance and freight
CITES	Convention on International Trade in Endangered Species
CMC	Conservancy Management Committee
CoP	Conference of Parties
CRIAA SA-DC	Centre for Research Information Action in Africa-Southern Africa Development and Consulting
DCEIA	Devil's Claw Environmental Impact Assessment
DCEMP	Devil's Claw Environmental Management Plan
DCRSWG	Devil's Claw Range State Working Group
DCWG	Devil's Claw Working Group
DEBS	Desktop Environmental Baseline Study
EC	European Community
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
ESCOP	European Scientific Cooperative on Phytotherapy
FOB	Free on board
GmbH	Gesellschaft mit beschränkter Haftung (limited liability company)
GSIP	Gender and Social Integration Plan
INP	Indigenous natural products
IRDNC	Integrated Rural Development and Nature Conservation
MCA-N	Millennium Challenge Account Namibia
MCC	Millennium Challenge Corporation
MET	Ministry of Environment and Tourism
MAWF	Ministry of Agriculture, Water and Forestry
NAB	Namibian Agronomic Board
NDCWG	National Devil's Claw Working Group
NNDCSA	Namibian National Devil's Claw Situation Analysis
NNF	Namibia Nature Foundation
NRI	Natural Resources Institute
PPO	Producer and processor organisations
SEA	Strategic Environmental Assessment
SHDC	Sustainably Harvested Devil's Claw
ToR	Terms of Reference
UK	United Kingdom
UoG	University of Greenwich
US	United States
VAT	Variable area transect
WIND	National Herbarium of Namibia Database

Executive Summary

Aim and purpose

The Environmental Impact Assessment for Devil's Claw, henceforth referred to as Devil's Claw Environmental Impact Assessment (DCEIA), aims to identify and assess environmental and social impacts (positive and negative) affecting the devil's claw resource base and its beneficiaries as a result of ongoing devil's claw harvesting and trade and the Indigenous Natural Products Producer and Processor Organisations Sub-Activity implemented under the Millennium Challenge Account Namibia (MCA-N INP PPO Sub-Activity). The DCEIA provides the basis for an Environmental Management Plan for Devil's Claw, referred to as Devil's Claw Environmental Management Plan (DCEMP) which is presented as a separate stand-alone companion document (Krugmann, 2010).

The main purpose of the DCEIA is to provide a comprehensive information baseline for:

- current environmental and social risks and benefits resulting from the commercialization of devil's claw in Namibia and prospects for ensuring plant resource use sustainability;
- the assessment of (positive and negative) environmental and social impacts resulting from ongoing commercial harvesting and trade in devil's claw and the INP PPO Sub-Activity;
- the application of the environmental screening tool during the inception and implementation phases of the INP PPO Sub-Activity, as it relates to devil's claw harvesting and trade; and
- the DCEMP.

Basic Features of the devil's claw resource

Devil's claw (*Harpagophytum* spp.) comprises two species, *H. procumbens* (with two subspecies) and *H. zeyheri* (with three subspecies). *H. procumbens* has been the preferred species for commercial purposes, but *H. zeyheri*, which is often admixed to *H. procumbens*, is now also commercially accepted in the pharmaceutical industry.

Devil's claw is a weedy, perennial plant with creeping annual stems, whose characteristic fruiting body, which is armed with two rows of recurved spines with sharp hooked horns, gives the plant its scientific and common names.

Devil's claw is a geophyte whose secondary tubers act as a strategic energy reserve on which the plant can draw for (stem) growth, reproduction (flower, fruit and seed production) and survival during times when there is little or no rainfall. Aside from constituting a store of energy that supplements the plant's energy budget, enabling plant growth, regeneration, and survival in times of "emergency", the secondary tubers also contain the highest concentrations of the biologically active compounds that give the plant its long-known valuable medicinal properties. It is the secondary tubers, therefore, that have been harvested traditionally, and more recently also commercially, with a view to preparing herbal medicines effective in curing or alleviating various human ailments.

The ability of devil's claw to store food and/or propagate by means of its secondary root tubers enables the plant to adapt to predictable seasonal change as experienced in the Kalahari. In addition, the ability of devil's claw to undergo "ad hoc" adaptive change in flowering and fruiting behaviour, and foliage growth, in response to unpredictable climatic and environmental change (i.e. its phenologic plasticity) allows the plant to adapt its development to unpredictable inter-annual variations in rainfall patterns that are common in the highly variable Kalahari climate and environment.

Given the critical role of the secondary tubers in the development and survival of devil's claw, harvesting these root components constitutes an intervention of high intrinsic destructiveness. However, building on traditional harvesting knowledge held by the San, a set of best-practice sustainable devil's claw harvesting techniques has been developed in recent years, with a view to minimizing the impact of commercial tuber harvesting on the devil's claw resource base.

Devil's claw is found in sandy Kalahari areas of Namibia, Botswana and South Africa and to a lesser extent Angola, Zambia, Zimbabwe and Mozambique. The plant is not uniformly distributed but tends to occur in irregular patches. Its clumped distribution is a reflection of its habitat preferences and seed dispersal mechanism. It reproduces relatively fast and accumulates relatively quickly in spots, often degraded, where the plant faces little competition from grass, herbs and brushes for scarce water and nutrients.

Field studies in Namibia and South Africa found that regular harvesting of devil's claw populations did not increase plant mortality if the primary tuber was not damaged during harvesting and the plant's normal growing cycle was not disturbed. The Namibian study found that harvesting reduced the growth of plants, while the South African study did not note any difference in plant growth and tuber regeneration between harvested and unharvested plants.

Traditional devil's claw plant uses and knowledge

The indigenous San and Khoi peoples of southern Africa have harvested and used devil's claw medicinally for centuries and developed systems of traditional knowledge about medicinal uses and harvesting methods on which modern medicinal uses and sustainable harvesting methods are based.

Commercial devil's claw harvesting and trade

Commercial harvesting and trade of devil's claw in Namibia started in 1962. Namibia has been the dominant producer and exporter of devil's claw, accounting for between 85% and 99% of total exports from the range states. Global annual market demand increased before and in the 1990s, peaking in 2002 (at 900,000 kg) and levelling off thereafter to between 360,000 and 670,000 kg. Devil's claw exports vary from year to year and within each annual season. Market demand has been highly variable and essentially unpredictable.

National income from devil's claw exports in 2009 has been estimated at approximately € 1.06 million, or N$ 12.16 million. This is only a small fraction (less than 5%) of the value of annual global retail sales of devil's claw products. Organised harvesters practicing sustainable harvesting and/or being certified organic) receive up to 2% of the retail market

value, close to half of what exporters receive, whereas at the lower end of the harvester spectrum informal unorganized harvesters may receive far less than 1%.

The global devil's claw market is highly concentrated, with power of price-setting and value capture lying in the hands of a very limited number of lead buyers overseas. Exporters and importers are unable and/or unwilling to maintain long-term trading relationships. These forms of market failure have been instrumental in keeping prices down at the level of the range state harvester and exporter and are responsible for the fundamental inequity in the distribution of benefits from the global devil's claw trade. This inequity, combined with the open-access nature of the resource and the extreme poverty of the harvesters, lies at the heart of the industry's problems, *inter alia* encouraging over-harvesting and use of unsustainable harvesting methods.

Environmental risks from ongoing devil's claw harvesting and trade

A number of intertwined environmental, social, economic and institutional risk factors combine in posing a potential threat to devil's claw populations in communal open-access areas prone to over-harvesting, especially during years of high market demand. These factors include: the intrinsic biological destructiveness of harvesting secondary root tubers; the informal and unorganized nature of (still much of) devil's claw harvesting and trade in Namibia; the open-access nature of many of the communal areas where harvesting takes place; extreme poverty among harvesters; persistently low prices received by most of the harvesters; lack of long-term relationships between (most of the) harvesters and exporters and between exporters and lead overseas buyers; and little or no upgrading and value addition of devil's claw tuber material within Namibia, prior to export.

Risks of over-harvesting and unsustainable harvesting of devil's claw may translate into adverse impacts on <u>local</u> plant resources -- as well as related negative impacts on the livelihoods of local harvesters and the sustainability of devil's claw supplies from Namibia. However, over-harvesting and unsustainable harvesting do not pose any significant threat to the overall national (and regional) devil's claw resource base, let alone the biological survival of the plant species.

Environmental benefits resulting from the INP PPO Sub-Activity

While it is unlikely that INP PPO Sub-Activity could cause, directly or indirectly, any adverse impacts on the devil's claw resource base, the INP PPO Sub-Activity is likely to have (indirect) positive impacts on the health and integrity of the devil's claw resource base and the sustainability of its commercial use as a result of helping to strengthen the technical, organizational and marketing capacities of eligible PPOs.

National and international responses to concerns over possible devil's claw over-harvesting in Namibia

There have been a number of national and international responses to concerns over devil's claw over-harvesting and unsustainable harvesting. Those responses involving tangible interventions have included:

- Organising devil's claw harvesting and trade within PPO structures practicing sustainable harvesting methods (based on resource surveys, management plans, harvester monitoring and post-harvest impact surveys), quality control and traceability (the proportion of Namibian exports coming from organised harvesting in recent years has increased to around 10%);
- Certification (organic or free trade);
- Developing and starting to implement a new Devil's Claw Policy;

A proposal from Germany to list devil's claw on Appendix 2 of CITES;

- Continuing efforts at devil's claw cultivation and enrichment planting; and
- Promoting coordinated strategy and collective action at national and regional levels.

Other responses have not yet gone beyond conceptualization, discussion or planning stages. These more 'intangible' responses include:

- Adding value to devil's claw production in Namibia;
- Declaring devil's claw a controlled product under the Agronomic Industry Act; and
- Attempting to capture a global niche market for devil's claw (possibly based on certification).

Each of these responses is described and examined in some depth in section 7 of this EIA.

Social and gender issues and impacts from ongoing devil's claw harvesting and trade and the INP PPO Sub-Activity

Commercial devil's claw harvesting and trade provides small but significant supplementary cash incomes to some of the poorest rural women and men. These cash incomes strengthen and diversify the livelihoods of those rural people and families who are too resource-poor to have many, if any, other livelihood options.

Both women and men are involved in devil's claw harvesting and trade. But gender equity is not always assured, and there are ways to strengthen the involvement of women and vulnerable groups.

The INP PPO Sub-Activity is expected to have indirect positive effect on the number of individuals trained and incomes from devil's claw earned, by helping to strengthen existing PPOs and enhance their capacities.

There is general lack of data and information on gender, the role and integration of women and vulnerable groups in devil's claw harvesting and sale, and the socio-economic conditions of the households and communities involved in commercial devil's claw harvesting and trade.

Key findings, conclusions and recommendations

Key findings, conclusions and recommendations are highlighted in section 9. Findings and conclusions are organised under the following headings:

- Adaptive behaviour of devil's claw in a variable climate and in the presence of plant competitors

- Intrinsic destructiveness of harvesting and sustainable harvesting methods
  Effects of environmental stressors other than irregular rainfall on impacts of tuber harvesting
- Population size, densities, dynamics, and secondary tuber re-generation and yields (with and without harvesting)
- Traditional plant uses and knowledge
- Commercial Harvesting and Trade: Producers, Markets, Prices, Supply and Demand, and Actors in the Value Chain
- Environmental risks from "traditional" informal devil's claw harvesting and trade
  Environmental impacts resulting from the INP PPO Sub-Activity
- Organising devil's claw harvesting and trade within rural institutional structures that practice sound resource management, sustainable harvesting techniques, traceability and quality control
- Certification
- Regulating devil's claw harvesting, trade and export on the basis of a national policy and permitting system for devil's claw
- Devil's claw cultivation and enrichment planting
- Coordinated strategy and collective action at national and regional levels
- Adding value to devil's claw production in Namibia
- Declaring devil's claw a controlled product under the Agronomic Industry Act
- Capturing a global niche market for devil's claw
- Social and gender issues and impacts from ongoing devil's claw harvesting and trade and the INP PPO Sub-Activity

Recommendations are organised under the following headings:

- Continuing and strengthening responses to concerns over local devil's claw over-harvesting
- Addressing socio-economic information gaps and monitoring the integration of women and vulnerable groups.

1. Introduction

The Environmental Impact Assessment for Devil's Claw, henceforth referred to as Devil's Claw Environmental Impact Assessment (DCEIA), aims to identify environmental and social impacts (positive and negative) affecting the devil's claw resource base and its beneficiaries as a result of ongoing devil's claw harvesting and trade and the Indigenous Natural Products Producer and Processor Organisations Sub-Activity (INP PPO Sub-Activity). The DCEIA provides the basis for an Environmental Management Plan for Devil's Claw, referred to as Devil's Claw Environmental Management Plan (DCEMP), which is presented as a separate stand-alone companion document (Krugmann, 2010). The INP PPO Sub-Activity is a major component of the INP Activity (contract MCAN/COM/RFP/3C01001-A) implemented under the Millennium Challenge Account Namibia (MCA-N), as part of the support given to the agriculture sector.

The overall objective of the MCA-N INP PPO Sub-Activity is to sustainably increase the number and income of households involved in the INP sector by broadening the number of products, increasing the volume, improving the quality and adding value. The envisaged timeframe of the INP PPO Sub-Activity is from July 2010 to August 2014. The current 6-month inception phase (July – December 2010) will be followed by an implementation phase which is scheduled to start in January 2011. The lead organization implementing the MCA-N INP PPO Sub-Activity is the Natural Resources Institute (NRI) of the University of Greenwich (UoG). Local partner organizations sub-contracted are Integrated Rural Development and Nature Conservation (IRDNC), Centre for Research Information Action in Africa-Southern Africa Development and Consulting (CRIAA SA-DC), and the Namibia Nature Foundation (NNF).

2. Purpose, Approach, Methods, and Structure

2.1 Purpose

The main purpose of the DCEIA is to provide a comprehensive information baseline for:

- current environmental and social risks and benefits resulting from the commercialization of devil's claw in Namibia and prospects for ensuring plant resource use sustainability;
- the assessment of (positive and negative) environmental and social impacts resulting from ongoing commercial harvesting and trade in devil's claw and the INP PPO Sub-Activity;
- the application of the environmental screening tool during the inception and implementation phases of the INP PPO Sub-Activity, as it relates to devil's claw harvesting and trade; and
- the DCEMP.

2.2 Approach and methods

2.2.1 Approach

The DCEIA has been modelled, in structure and content, after the species profiles that comprise the Desktop Environmental Baseline Study (DEBS). However, compared to the

species profiles covered by the DEBS, the DCEIA seeks to provide more comprehensive and in-depth baseline information and impact analysis.

2.2.2 Methods

A review of relevant and available literature and documentation as well as interviews, discussions and interactions with key informants provided the data and information on which the DCEIA is based. The range of documentation and literature reviewed comprises articles in scientific journals, reports of studies carried out by INP PPO Sub-Activity team members and other authors, relevant volumes and sections of the strategic environmental assessment conducted in preparation for the MCA-N Compact, and other written outputs from the inception phase of the INP PPO Sub-Activity. A full break-down of this literature and documentation is provided in the list of references at the end of the report. Key informants included team members from INP PPO Sub-Activity consortium partners (specifically Michel Mallet, Saskia den Adel, Klaus Fleissner and Mbazo from CRIAA, Karen Nott from IRDNC, and Ben Bennett from NRI) as well as staff from the National Botanical Research Institute (NBRI), the Chairperson of the Devil's Claw Working Group (DCWG) at MET, and the Manager of the MCA-N INP Activity.

2.3 Structure

The DCEIA is organized as follows:

- Basic features of the devil's claw resource
- Traditional plant uses and knowledge
- Commercial devil's claw harvesting and trade: applications, producers and markets, prices, supply and demand, and actors in the value chain
- Environmental risks and benefits from ongoing commercial devil's claw trade and the INP PPO Sub-Activity
- National and international responses to concerns over devil's claw over-harvesting in Namibia
- Gender issues and impacts on women and vulnerable groups associated with ongoing commercial harvesting and trade and with the INP PPO Sub-Activity
- Key findings, conclusions and recommendations

3. Basic Features of the Devil's Claw Resource

Devil's claw is the common English name for the genus *Harpagophytum* which belongs to the family Pedaliaceae. *Harpagophytum* is also referred to as grapple plant, wood spider, duiwelsklou (Afrikaans), Teufelskralle (German), griffe du diable (French), sengaparile (Tswana), and under various other common local names in Namibia and the Southern African region.

Harpagophytum comprises two species, *H. procumbens* and *H. zeyheri*. *H. procumbens* is composed of two subspecies (varieties[1]): *H. procumbens* subspecies *procumbens* and *H.*

[1] 'Variety' is another term commonly used to refer to a subspecies. The terms 'subspecies' and 'variety' are used interchangeably in this document to refer to taxa classified as morphologically and/or molecularly different, under the same species.

procumbens subspecies *transvaalense*. *H. zeyheri* subsumes three subspecies: *H. zeyheri* subspecies *zeyheri*, *H. zeyheri* subspecies *schijffii*, and *H. zeyheri* subspecies *sublobatum*. All these taxa are distinguished by flower and fruit characteristics (Stewart and Cole, 2005).

As far as commercial applications are concerned, *H. procumbens* has been the preferred species, being referred to under the trade name Harpagophyti radix by pharmaceutical industry. But *H. zeyheri* is also commercially accepted in the pharmaceutical industry, and exports of Harpagophyti radix (harvested and pre-processed biologically active secondary tuber material from *H. procumbens*) in fact often contain admixtures of *H. zeyheri* material (Stewart and Cole, 2005)

3.1 Botanical and environmental characteristics

3.1.1 Description of the plant and its phenology

H. procumbens is a weedy, perennial plant with creeping annual stems, up to 2 m long, spreading from a tuberous fleshy rootstock. The above-ground stems emerge after the first rains and die back during the winter or during droughts. The stems emanate from a below-ground persistent succulent primary tuber whose taproot can extend up to 2 m deep. A number of secondary tubers, up to 25 cm long and 6 cm thick, grow off the primary tuber via lateral fleshy roots (see Figure 1). The secondary tubers accumulate a photosynthetic storage product called stachyose, which is considered an adaptation to drought conditions (Stewart and Cole, 2005). This process enables the secondary tubers to act as a strategic energy reserve on which the plant can draw for (stem) growth, reproduction (flower, fruit and seed production) and survival during times when there is little or no rainfall. During such times, above-ground foliage disappears, new photosynthetic assimilates cease to be produced, and regular sources of energy therefore dry up ((Ernst *et al*, 1988) and (Strohbach and Cole, 2007)). Because of these characteristics, devil's claw is often referred to as a geophyte.[2]

Aside from constituting a store of energy that supplements the plant's energy budget, enabling plant growth, regeneration, and survival in times of "emergency", the secondary tubers also contain the highest concentrations of the biologically active compounds that give the plant its long-known valuable medicinal properties. It is the secondary tubers, therefore, that have been harvested traditionally, and more recently also commercially, with a view to preparing herbal medicines effective in curing or alleviating various human ailments.

[2] A variety of definitions of the term "geophyte" can be found in the literature. These definitions variously highlight the ability of geophytes to store food and/or propagate by means of a special underground structure such as a bulb, rhizome, tubers or corms.

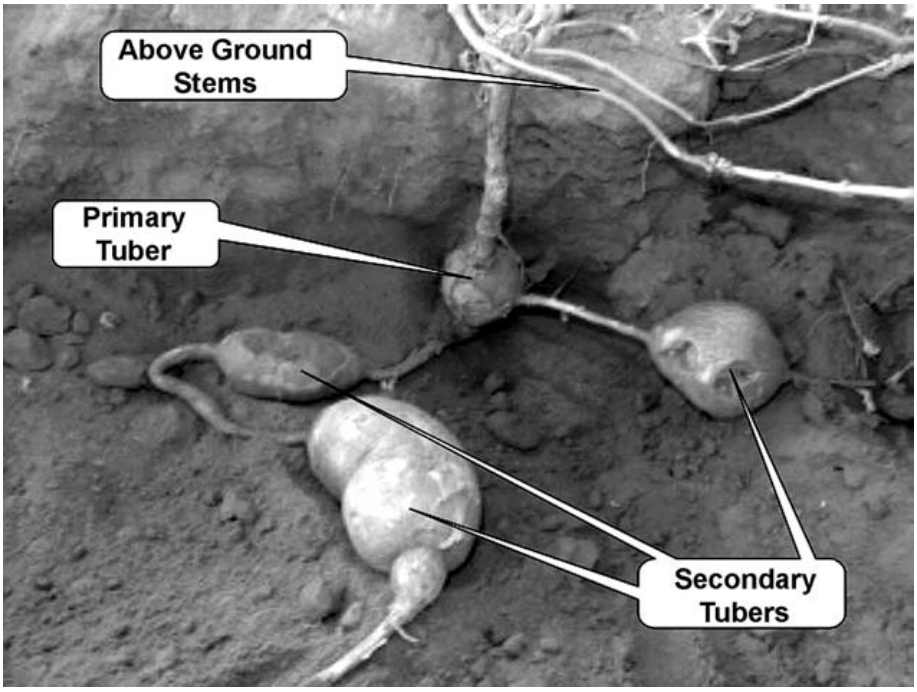


Figure 1: Photograph of an excavated *H. procumbens* plant showing the primary tuber, from which the above-ground stems emanate, and three secondary tubers connected laterally to the primary tuber by fleshy roots (Source: Stewart and Cole, 2005)

The opposite leaves of *H. procumbens* are blue-greyish-green and irregularly divided into several lobes. The tubular flowers are dark violet with a yellow and white throat. They are open for one day and pollinated by bees. The characteristic fruits, which give the plant its scientific and common names, consist of a flat central body (woody capsule) armed with two rows of recurved spines with sharp hooked thorns, one row on the edge of each side of the central capsule, as well as two straight thorns on its upper surface. Given its shape, the fruit easily entangles itself in the fur or wool of an animal, or may cling tenaciously to the foot of an animal, and is dispersed in this way.[3]

The fruit can also cripple an animal that way or, when the fruit is lodged in an animal's mouth as it grazes, this can lead to starvation or dehydration. For these reasons, it used to be considered a nuisance and removed from grazed fields by some private farmers in South Africa (before devil's claw attained commercial value) - and this may still occur today on some of the private farms in South Africa's rangelands, although there is no hard data available on how widespread this practice was and is in South Africa's rangelands ((Stewart and Cole, 2005) and Kristin Stewart, personal communication, 12 April 2011). As far as Namibia is concerned, there is no hard evidence of any removal of devil's claw fruit from any grazing fields or of anyone mentioning this practice in the country.

Each fruit contains a large number of seeds which under normal circumstances are released from the fruit gradually, over a number of years -- a likely adaptation to animal and/or wind

[3] The fruit is also reported to be dispersed by the action of wind to some extent.

dispersal. Once released from the fruit, seeds typically have a high degree of dormancy, remaining viable in the seed bank, within the top soil layer, for 20 years or more, due to their low respiration rate -- a possible adaptation to drought (Stewart and Cole, 2005).

H. zeyheri has botanical features that are similar to those of *H. procumbens*. The two species have some characteristic differences, however, specifically regarding their fruiting bodies and leaves. These are summarized in Table 1.

Table 1: Characteristic differences between *H. procumbens* and *H. zeyheri* (Source: (Strohbach, 2003))

Harpagophytum procumbens	***Harpagophytum zeyheri***
Recurved spines strongly developed on definite single spiny appendices, at least 3 spines per row	Spines in 2 rows along the central capsule, but not always on definite single spiny appendices
Spines are always bent outwards and upwards to some degree	Spines seldom bent outward, usually just protruding more or less straight from the capsule
Spines are always at least twice as long or longer than the width of the central capsule	Width of the spines seldom wider than the central capsule
Spines usually exceed the length of the central Capsule	Spines never longer than the length of the central capsule
Leaves usually 3-5 lobed	Leaves usually ovate to slightly 3-lobed

3.1.2 Adaptive plant behaviour in a variable climate and in the presence of plant competitors

Generally, functional responses to more or less predictable environmental variability and change are an important mechanism for plant survival in the long term. In the case of devil's claw, these responses are reflected in the evolution of plant life histories (Werger and Huber, 2006) that are based on the plant's characteristics as a geophyte and shaped by the highly variable climate and environment of the Kalahari. The geophytic manner of devil's claw enables the plant to deal with predictable seasonal change as experienced in the Kalahari -- from cold dry season (May – August) to hot dry season (September – December) to hot wet season/summer rains (January – April), and starting the annual seasonal cycle again. Devil's claw also exhibits considerable phenologic plasticity[4] which allows the plant to adapt its development to unpredictable inter-annual variations in rainfall patterns.

Storage of food or energy enables geophytes (such as devil's claw) to acquire resources at minimum cost (e.g. when water is readily available) and use them at times of maximum benefit (e.g. for re-sprouting during spring when no significant rain has fallen yet). Devil's claw uses stored reserves, assimilates and moisture, to produce leaves in order to synthesise storage compounds. When stored in the root system, these compounds increase the osmotic potential of the roots and thus enhance the water absorption capacity of the plant. When rainfall during the growing season is very low, the amounts of assimilates produced will generally be much smaller. In such a situation, devil's claw may not use any of its much

[4] "Phenologic plasticity" refers to the ability of a plant to undergo "ad hoc" adaptive change in flowering and fruiting behaviour, and foliage growth, in response to unpredictable environmental change.

more limited available resources to develop fruit or even to produce flowers, but allocate these limited resources entirely to storage in order to increase the chance of longer-term survival of the plant. The cost of developing fruit and the cost of developing storage must be covered by the same 'internal bank' of already stored energy reserves.

Depending on availability of resources, devil's claw will not follow the same path of plant development every year, but rather optimize its strategy in pursuit of long-term and shorter-term objectives. With long-term species survival as the primary (long-term) objective, plant individuals will, first and foremost, use available resources to produce viable seed reserves. Only when it is clear that that objective is being met will individual plants start replenishing their own resources to ensure their own survival in the shorter term. Devil's claw will optimize the narrow time window that is available every year for growth and reproduction, and then survive unfavourable seasons in the form of seeds or in a dormant state[5]. Some devil's claw populations may disappear entirely at a given point during a period of successive poor-rainfall years and re-emerge later under more favourable conditions, provided the seed bank is large enough ((Bloom *et al*, 1985) and (Strohbach and Cole, 2007)).

The generally low number of juvenile plants found within plant populations is another trait of a drought-avoider like devil's claw (Grime, 2002). This is consistent with the high innate dormancy of the seeds and the slow release of seeds from the mature fruit as an adaptation for spreading seed germination in time (Ernst *et al*, 1988). The growth rate of devil's claw seedlings is generally very low compared to other herbaceous species in semi-arid environments. Continued seedling growth is normally possible only in open sites with low levels of above-ground competition. From time to time high rates of seedling emergence and development may occur during successive years of above-average rainfall levels. Such episodic seedling recruitment events and processes, which are typical for the Kalahari environment, are a major contributor to devil's claw population growth and structure.

The absence of devil's claw in areas with relatively dense vegetation suggests a relatively low competitive ability of the plant, being outcompeted by brushes (and to a lesser extent by perennial grasses) for below-ground soil resources and for access to sunlight. This explains why devil's claw can attain high densities in disturbed (cleared, degraded and/or overgrazed) areas near communal settlements, while in less disturbed areas devil's claw is found mostly in small groups of one or few individuals (Strohbach and Cole, 2007).

3.1.3 Plant part harvested for traditional and commercial purposes, intrinsic destructiveness of harvesting and sustainable harvesting methods

Devil's claw concentrates its biologically active compounds in its secondary tubers. It is these secondary tubers, therefore, that are harvested. During harvesting operations, soil is removed around the plant, down to such a depth that (part of) the secondary tubers

[5] This refers to a state in which the plant vanishes from sight (all above-ground plant matter disappears) while the root system remains intact and thus able to produce above-ground stems and foliage during the following year or a year thereafter, should rainfall patterns improve and environmental conditions become more favourable.

become exposed and can be accessed. The exposed secondary tubers are then cut off the plant's lateral roots, and subsequently sliced and dried, before being (stored and) sold.

As mentioned above, the secondary tubers constitute a strategic energy reserve on which the plant can draw for growth, reproduction and survival during times when there is little or no rainfall. Given the critical role of the secondary tubers in the development and survival of devil's claw, harvesting these root components constitutes an intervention of high intrinsic destructiveness. Given this intrinsic risk, harvesting methods are required that do not interfere with the normal growing cycle of the plant and give the plant enough time to recover from harvesting before it is harvested again (see next bullet point).

Building on traditional harvesting knowledge held by the San, a set of sustainable devil's claw harvesting techniques has been developed, starting in the mid 1990s, with a view to minimizing the impact of commercial tuber harvesting on the devil's claw resource base. These techniques comprise a range of best practices:

- How to remove the soil around a plant to gain access to the secondary tubers without unnecessarily exposing, destabilizing or "unearthing" the whole plant;
- How to re-fill the holes around harvested plants so as to return the local soil environment as much as possible to its original state, for the benefit of both the harvested plants and roaming animals that may otherwise trip and get hurt;
- The most appropriate time period for harvesting operations (annual harvesting season);
- What proportion of available secondary tuber mass (i.e. how many of the available number secondary tubers) should be harvested (intensity of individual plant harvesting); and
- How frequently plants may be harvested – or in other words, for how many years harvested plants should be rested before they may be harvested again.

Section 7.1 and Annex A provide more information on the sustainable harvesting methods and best practices that have been developed and how they were developed. The last three aspects (bullets) above are now examined from the perspective of the economics of plant resource use.

3.1.4 The economics of plant resource use: optimizing the timing, frequency and intensity of harvesting interventions to minimize harvesting impact

In the Kalahari environment, a critical resource (limiting factor) for the development, growth and survival of devil's claw (as other plants) is water. Available levels or concentrations of soil moisture for plant development and growth depend on variable rainfall patterns. Optimizing the timing, frequency and intensity of commercial devil's claw harvesting in order to minimize harvesting impacts requires an understanding of how devil's claw prioritises the allocation and use of available external and internal resources in an environment characterized by predictable (seasonal) variations as well as unpredictable inter-annual variability.

The principal trigger for the first emergence of devil's claw plants, usually observed in October and November, is rising temperatures during spring (the hot dry season). This

emergence is often associated with, but not limited to, sporadic early rainfalls (Ihlenfeldt and Hartmann, 1970). The fewer internal energy reserves a plant has for emergence, the more it tends to rely on early rainfalls to re-sprout. For this reason, in the absence of sufficient early rains, plants with less internal reserves tend to emerge later, possibly only from late January onwards (Werger and Huber, 2006). This effect will tend to be more widespread within a given devil's claw population in the case of growing seasons that follow one or more years with below-average rainfall, as internal resources will have been drawn down during the preceding rainfall-poor year(s).

After plants emerge, their growth generally depends strongly on the availability of moisture. For devil's claw, the peak growth period normally coincides with the hottest month of the year (January). Poor rains during this critical period prevent plants not only from growing significant leafy mass but also from replenishing their internal reserves in situations where these have been used up, at least partially, to produce the early mass of flowers. These plants may show a second burst of foliage later in the season, but no longer have the resources required for sustaining this late plant growth – for which reason these late sprouters often do not survive the growing season.

Furthermore, the capacity of the secondary tubers and other parts of the root system of devil's claw to absorb soil water and take up soil nutrients depends on the concentration of the solutes in the roots relative to the concentration of minerals and other dissolved particles in the soil environment (i.e. the osmotic potential of roots relative to that of the soil environment). As the root system gets depleted in the levels of stored assimilates and thus lose its ability to serve as an internal source of energy for plant growth and development, as a result of environmental stresses like lack of rainfall during critical periods of the year, it also loses its capacity to absorb water and soil nutrients. This is a knock-on effect that serves a positive feedback mechanism accelerating plant death during times of environmental dearth (Casper and Jackson, 1997).

Devil's claw plant individuals allocate their limited resources to the following three main functions: growth, maintenance (survival), and reproduction (Bloom *et al*, 1985). Reproduction and vegetative growth occur at the same time, and consequently there is a trade-off in resource allocation between these two functions (Lopez *et al*, 2001). During one or more years with poor rainfall, plant individuals will tend to invest diminishing resources in such a way as to ensure sufficient seed output to ensure continued species survival, the plants' primary long-term objective (see Section 3.1.2) ((Grime, 2002), (Oesterheld *et al*, 2001), (Nippert *et al*, 2006), (Werger and Huber, 2006)). After a year with a very sparse or no rains during December and January and hence no growth of additional tubers, such an investment pattern may entail investing still available internal reserves in a mass of flowering during the growing season of the following year. Plants that survive these two years will have much reduced flowering rates due to the low levels of internal storage and will invest into new storage tuber production whatever assimilates can be produced during the third year. Only during successive good rainfall seasons will there be an equal share of produced assimilates going to the physiological sinks: flowering and fruiting and then storage (Chapin *et* al, 1990).

From the analysis of adaptive plant behaviour and the economics of plant resource use, as summarized above, the following conclusions have been drawn for how to optimize the timing, intensity and frequency of devil's claw harvesting toward an appropriate devil's claw resource management strategy that minimizes the harvesting impact on the plant resource (Strohbach and Cole, 2007):

- Timing of harvesting (harvesting season) – Secondary tubers should be collected at a time when the corresponding loss of internal reserves has the least impact on the fitness and functionality of the plant and does not weaken the plant to an extent that may threaten its survival. This means that harvesting should commence only in April or when the seasonal rains have ceased and should stop as soon as plants start re-sprouting during the growing season (normally during October). In phenological terms, harvesting should only start once fruits have ripened (i.e. by March-April), but is detrimental while the plant is actively growing (November – February).[6]
- Harvesting frequency (plant resting period) – The irregularity of rainfall significantly impacts on the growth rate of plants (as measured by the diameter of the primary tuber) – for which reason it is important to have a resting period for devil's claw plants of at least 3 years. This translates into a maximum plant harvesting frequency of once every 4 years. In practice, a good way of ensuring the required minimum resting period (maximum harvesting frequency) is through a rotational harvesting system whereby land destined and demarcated for devil's claw harvesting is sub-divided into a suitable number of parcels which are harvested on a rotational basis.[7] This may be complemented by annual resource surveys to determine annual harvesting quotas.[8] Surveys should take place between mid January and mid February in order to exclude late sprouters which often do not survive for long.
- Harvesting intensity -- In order not to overly affect a plant's fitness and ensure its survival, it is advantageous not to harvest all of the secondary tubers harvest of a plant in one go, but to limit the harvesting effort to only some proportion (perhaps ½ to 2/3) of the existing secondary tubers; in practice, this can be done by harvesting only those secondary tubers attached to the upper primary tuber (usually no deeper than 50 cm) or only those tubers located on one side (180 degrees) of the plant; partial tuber harvesting strategies have the added advantage of limiting the size of the hole created to access the tubers and hence reducing the impact of harvesting interventions on the target plants and roaming animals.

[6] In practice, the period of harvesting also takes into account conditions required for proper drying to take place.

[7] Such a system can be set up within organized communal structures (conservancies, community forests, etc) actively engaging in land and resource use planning or on private farms, but will be difficult to develop and implement by weaker institutional structures on communal land. Here close post-harvest monitoring will be needed to ensure that plant populations and individuals are not harvested too frequently.

[8] While annual resource surveys are especially useful in non-rotational harvesting systems, in that they provide a basis for determining harvesting quotas, they should not be considered obligatory and may, in fact, be unnecessary in rotational harvesting systems. In these systems, all plants with sufficiently large tubers can be harvested in a given demarcated (sub-)area, except for those whose tubers are too small. However, clearly demarcating land in open-access areas is not easy.

3.1.5 Effects of environmental stressors other than irregular rainfall on tuber yields and harvesting and resource management implications

Stressors like shrub encroachment, dense cover of annual grasses and creepers, and continuous high grazing levels[9] affect the development of devil's claw individuals negatively and inhibit the expansion of devil's claw populations. Plants impacted by these stressors are more susceptible to suffering damage from harvesting, unless established sustainable harvesting methods are used. At the level of plant populations, an increased presence of environmental stressors makes it more likely that informal unorganised harvesting operations will result in local over-harvesting and/or unsustainable harvesting (see section 6.1 for more details on the environmental impacts of informal devil's claw harvesting in open-access areas).

Where devil's claw harvesting is organised, using sustainable harvesting methods, however, an increased presence of stressors will tend to translate into less devil's claw being harvested, as sustainably harvestable plant population tuber yields drop. Where organised harvesting schemes undertake resource surveys to establish harvesting quotas, a greater presence of environmental stressors will be reflected in lower sustainable harvesting quotas (see section 7.1 for more details on organised sustainable harvesting, resource surveys and harvesting quotas. Conversely, sustainable tuber yields can be enhanced and harvesting quotas raised by actively managing the devil's claw resource, ensuring protection from stressors like high grazing levels and shrub encroachment (Strohbach and Cole.2007).

3.2 Geographic distribution and habitat preference

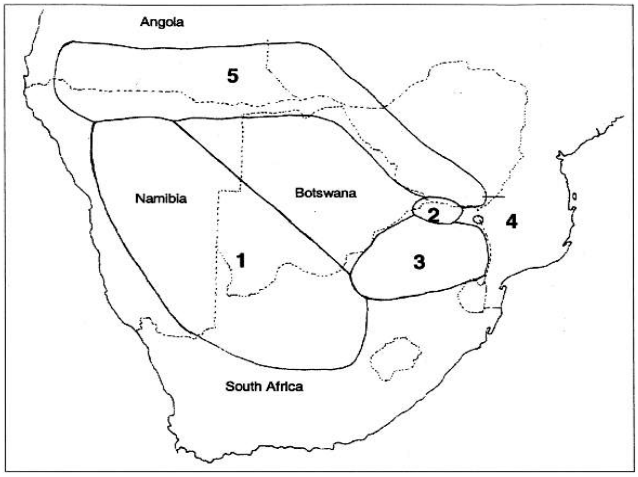
Devil's claw is found in many areas of the Kalahari characterized by deep sandy soils and low rainfall (150 – 500 mm/year) (van Wyk, 2009). Within this type of habitat, the devil's claw is found primarily in areas having a relatively thin cover of grass, herbs[10] and brushes (and hence are characterized by relatively low levels of competition for scarce water and nutrients) and not being heavily grazed. However, the plant tends to be most abundant and locally occurs in the highest densities in open-access areas which have been degraded due to overgrazing and/or trampling and where little if any vegetation is left or could re-establish itself to compete with devil's claw ((Hachfeld and Schippmann, 2002), (Strohbach and Cole, 2007), and (Stewart, 2009)).

Countries sharing the devil's claw resource comprise the so-called range states (Namibia, Botswana, and South Africa as well as Angola, Zambia, Zimbabwe, and Mozambique). Figure 2 depicts the geographic distribution of *Harpagophytum* in southern Africa, by subspecies. As will be seen, *H. procumbens* occurs mainly in Namibia but also in south-western Botswana and in some of the north-western and northern regions of South Africa. *H. zeyheri* occurs not only in parts of the range states (northern Namibia, northern and north-eastern

[9] The effect of high grazing levels on plant development can be assumed to be similar to that of harvesting (Strohbach and Cole, 2007).

[10] For instance, on a communal farm in the Okakarara District (Omaheke Region) in Namibia, devil's claw was most often found in areas where the grass cover was below 25% and exclusively found in areas where the herb cover was below 20% (Hachfeld and Schippmann, 2002).

Botswana, and northern South Africa) but also in parts of southern Angola, southern Zambia, south-western Zimbabwe, and southern Mozambique.



KEY

1. *H. procumbens spp. procumbens*
2. *H. procumbens spp. transvaalense*
3. *H. zeyheri spp. zeyheri*
4. *H. zeyheri spp. schijffii*
5. *H. zeyheri spp. sublobatum*

Figure 2: Distribution of *Harpagophytum* spp. (Source: (Ihlenfelt and Hartmann, 1970))

Figures 3 and 4 show the geographic distributions of those subspecies of *Harpagophytum* occurring in Namibia. The maps are based on available herbarium specimens and are therefore only an approximation of the "real" distribution. The distribution of *H. procumbens* ssp. *procumbens* (Figure 3) is consistent with Figure 2, when the two specimen from the West Caprivi are disregarded (see footnote to Figure 3). However, as far as the other species, *H. zeyheri*, is concerned, Figure 4, unlike Figure 2, indicates some occurrence of spp. *zeyheri* in northern Namibia, in addition to the dominant subspecies *sublobatum*.

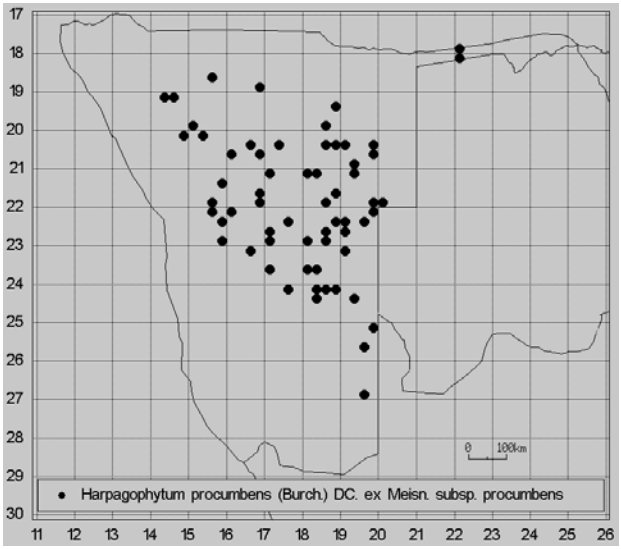


Figure 3: Distribution of *H. procumbens* spp. p*rocumbens* in Namibia[11]
(Source: National Herbarium of Namibia (WIND), 2010))

[11] The two specimen shown on the map as collected from the West Caprivi were wrongly classified as *H. procumbens* spp. *procumbens*. They have now been re-classified as *H.zeyheri* spp. *sublobatum* (E.G. Kwambeya, Director, National Herbarium of Namibia, personal communication, 19 April 2011)

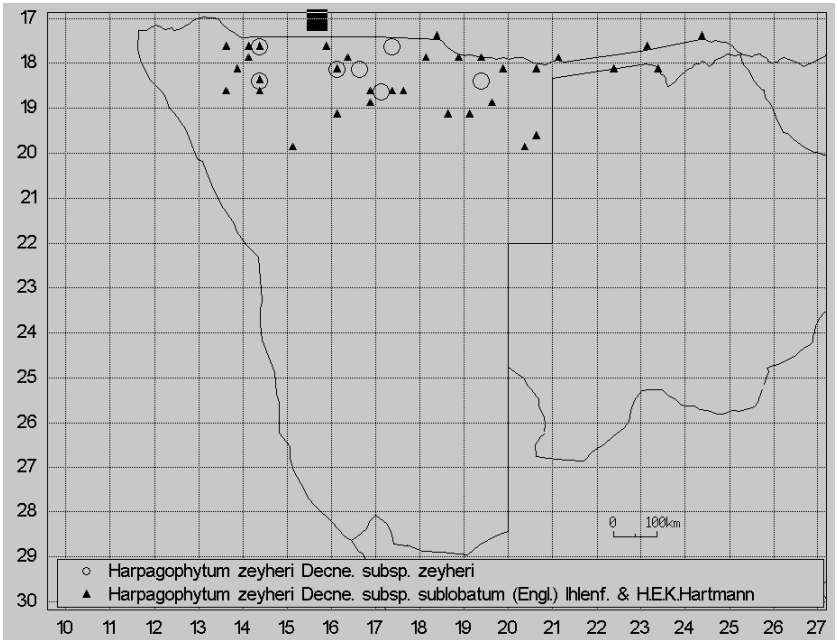


Figure 4: Distribution of *H. zeyheri* spp. *sublobatum* and ssp. *zeyheri* (Source: National Herbarium of Namibia (WIND), 2010))

3.3 Population size, densities, dynamics, and secondary tuber re-generation and yields (with and without harvesting)

In sandy Kalahari areas where devil's claw is found, it is not uniformly distributed but tends to occur in irregular patches. Its clumped distribution seems to be a reflection of its habitat preferences and seed dispersal mechanism. It reproduces relatively fast and accumulates relatively quickly in spots, often degraded, where the plant faces little competition from grass, herbs and brushes for scarce water and nutrient ((Hachfeld and Schippmann, 2002), (Strohbach and Cole, 2007), and (Stewart, 2009)).

An early resource survey in Namibia (Nott.1986) found average plant densities of 5-7 plants/ha, with local populations of up to 1,200 plants/ha. In an area between the Northern Cape and the North West Provinces of South Africa, resource surveys in sub-locations where devil's claw occurred but was not harvested, ascertained estimated average densities of 50 plants/ha in the fields, covered with dense grass, of well-managed farms and as much as 150 plants/ha in overgrazed communal lands (Stewart and Cole, 2005).

A national resource survey was conducted in Namibia in 2001-2002 as part of a Namibian National Devil's Claw Situation Analysis (NNDCSA) (Strohbach, 2003). This resource survey aimed to determine, *inter alia*, the distribution of both *H. procumbens* and *H. zeyheri*, paying special attention to population sizes and densities. A total of 158 survey records were generated from various transects carried out in different parts of the country[12] using

[12] Transects were carried out in the following regions (in the order to descending number of transects per region): Otjozondjupa, Kavango, Omusati, Omaheke, Oshikoto, Karas, Hardap, Ohangwena, Oshana, and Kunene. The survey sites were chosen with a view to complementing existing survey records from other sources --

appropriate variable area transect (VAT) methods, and transect-based determinations of local plant densities were grouped into density classes[13]. Using the survey records, and drawing on other data sources, an attempt was made to extrapolate the obtained plant densities and sustainable dry[14] tuber yields per ha (calculated from estimated average secondary tuber re-generation rates) to wider regions, by density class and on the basis of density-class-specific habitat features. This was done with a view to calculating the (estimated) overall size of the devil's claw population in Namibia as well as the national devil's claw resource potential in terms of an overall sustainable dry tuber yield.

For *H. procumbens*, this exercise arrived at an estimated (sustainable) annual national dry tuber yield of approximately 375 tonnes from a national population of roughly 56 million plants. For *H. zeyheri*, the corresponding figures were an overall dry tuber yield of approximately 90 tonnes from a national population of roughly 14 million plants. Yield calculations for both species were based on an estimated average tuber re-growth rate of 20 g dry weight per year, a figure based on studies conducted in Botswana, in habitats similar to those in Namibia, and on the assumption that plants are harvested only every second year (Strohbach.2003).

These results need to be treated with caution, however. Transects that were actually completed under the national resource survey fell short of those originally planned. As a consequence, the national data base generated by the national resource survey and other relevant surveys and data sources turned out to be less representative than anticipated.[15] These limitations cast doubt on the feasibility and credibility of extrapolating locally established survey-based devil's claw densities to wider regions and the national territory as a whole.

A field study on Population Dynamics and Sustainable Harvesting of *H. procumbens* was conducted during 2001 – 2005 in the Omaheke Region within the boundaries of two resettlement farms (*Vergenoeg* and *Ben Hur*) involved in the Sustainably Harvested Devil's Claw (SHDC) Project (Strohbach and Cole, 2007). The field work was carried at three sites that are collectively fairly representative of harvesting areas on communal land in the Kalahari. The study aimed at investigating the influence of highly variable rainfall patterns and grazing activities, and the impact of secondary tuber harvesting**,** on devil's claw populations, with a view to developing methods for a) sustainable harvesting and b) determining devil's claw harvesting quotas for potential harvesting areas. Devil's claw population densities at the study sites were determined through plant surveys using variable area transect methods developed under the SHDC Project and already used during the NNDCSA (see above). Each of the study sites was equipped with a rainfall gauge (for daily

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specifically the SHDC Project, the Ufopian Project (Hachfeld, 1999), and the Namibian Vegetation Survey – in a way that would achieve the most representative geographic coverage possible.

[13] Density classes ranged from 0-5 plants/ha (class 0) to 1501-2500 plants/ha (class 10)

[14] Harvested secondary tubers are sliced and dried before they are sold and exported. Drying reduces (or is usually assumed to reduce) the weight of harvested tuber material by a factor of 10.

[15] Dave Cole, personal communication, July 2010.

recording of rainfall by the local communities) and sub-divided into two 10m x 30m monitoring areas, one fenced (to exclude grazers) and the other unfenced.

Within each of these monitoring areas, primary tuber growth of all individual plants and plant population growth over the 4-year study period were determined by measuring the size (largest diameter) of the primary tuber of each identified individual plant as well as numbering and counting all identified plants, at the beginning (March 2001) and again at the end of the period (April 2005), accounting for dormant plants (i.e. plants that did not surface) in 2005. In addition, in order to be able to assess the influence of particular harvesting histories on the tuber size distributions of plants populations and compare plant populations with different harvesting histories, additional transects were laid near each of the three study sites and measurements taken of the primary tuber sizes (diameters) of all individual plants along these transects (up to a maximum of 200 plants). Finally, at each site a subset of 30 plants were randomly singled out for phenological monitoring on a monthly basis during the growing season (mid December – mid May)[16], so as to be able to correlate rainfall and phenological events, appropriately define tuber size classes, and properly describe and analyse population structures, dynamics and growth rates.[17]

Plants were grouped into seven age state classes, defined in terms of ranges in primary tuber diameter (taken as an indicator of a plant's overall fitness), as follows: seed (se); seedling (pl), 0.1-0.5 cm; juvenile plant (j), 0.6-1.4 cm; young reproductive plant (g1), 1.5-2.3 cm; mature reproductive plant (g2), 2.4-3.4 cm; old reproductive plant (g3), >3.5 cm; and senile plant (s), >2.0 cm. Only the g2 and g3 classes were found to have secondary tubers of harvestable size, with healthy plants from these two classes regenerating 400 – 500 g of secondary tuber material over a period of 4 years. How fast, or whether, a plant from any given age class progresses to a more advanced age class, and whether a plant might even experience a reduction in primary tuber diameter (becoming less fit) or die, was found to depend on external pressure factors, including habitat, (lack of) rainfall, grazing and harvesting. Harvested plants were found generally to have a considerably slower rate of increase in age state than plants not subjected to harvesting pressure.

The study revealed an overall devil's claw populations structure (across sites) characterised by greater proportions of plants in the g1 and g2 age state classes than in other classes, with the greatest proportion of plants in the g2 class. Regular harvesting was found to shift the peak from g2 to g1. Overall growth (net reproductive rate) of plant populations over the 4-year period was found to vary significantly across sites, ranging from growing populations (positive growth) at the two Ben Hur monitoring areas, to a stable population (no growth) at one of the *Vergenoeg* monitoring areas, to declining populations (negative growth) at the other three *Vergenoeg* monitoring areas.

[16] The following parameters were recorded: plant diameter, number of primary branches, number of flowers, numbers of immature fruit, number of mature/fully ripened fruit, and plant vigour (in terms of whether a plant is emerging, growing well, dying back, entering a dormant phase, or not emerging at all during the season).

[17] The study design did not allow for a proper determination of seed germination rates over time, as 'new' plants were not recorded during each growing season but only once, during the re-survey at the end of the 4-year study period, which made it impossible to capture the emergence of short-lived seedlings during the intervening years.

Importantly, shrinking populations could not be attributed to regular harvesting, since this merely caused a shift in the age state distribution from g2 to g1, without much, if any, impact on the ability of populations to regenerate by seed or on mortality rates. This left major stressors other than harvesting (such as grazing, irregular rainfall, and competition from other plants) as the main cause of population declines. Looking at individual age states, it was possible to closely correlate differences in population growth rates across sites with differences in the rates of new seedlings establishing – which, in turn, could not be explained beyond speculation that variations in environmental conditions like soil texture and water retention capacity might be responsible.

A very recent study examined population structure, density, growth, mortality, as well as seed and fruit production in harvested and un-harvested devil's claw populations in the Kalahari savannas of South Africa over a period of 4 years (Stewart, 2009). One of the study sites was located on a private farm in the Northern Cape Province. The other study site was located 30 km away in communal grazing lands in the North West Province. The farm was managed for abundant grasses and shrub cover and had never engaged in any devil's claw harvesting. The communal lands tended to be overgrazed, with little ground or shrub cover. Four 1-ha plots were randomly established to investigate devil's claw population densities using a statistically significant number of randomly located transects. The four plots comprised two visually similar plots on the farm as well as two plots in the communal lands, one in an un-harvested area and the other one in an area where harvesting had occurred in the past. The two farm plots were used to study the potential effects of harvesting. All non-juvenile plants (plants having developed secondary tubers) of one plot were harvested experimentally while the other plot was left un-harvested.

Estimated devil's claw population densities were found to differ greatly, ranging from 150 plants per hectare at the un-harvested-but-overgrazed communal-land plot, to 50 plants per hectare at both farm plots, to 11 plants per hectare at the harvested communal plot. This finding was interpreted as suggesting that the differences may be due to competition with grasses for water and nutrients, along the lines of the findings of other studies ((Ernst *et al*, 1988), (Hachfeld and Schippmann, 2002), (Strohbach and Cole, 2007)). The experimental removal of secondary tubers, using sustainable harvesting techniques, was found not to affect plant mortality or plant growth. Results on the impacts of sustainable harvesting broadly confirmed those obtained by the recent study summarized above (Strohbach and Cole, 2007). However, unlike the other study, harvested plants were found not to have poorer regeneration capabilities in subsequent years in comparison with un-harvested plants, but appeared resilient to harvest under the conditions of the study. Harvested and un-harvested plants survived equally well over time, and both groups of plants recovered and grew (on average) at the same rate.

4. Traditional Plant Uses and Knowledge

The indigenous San and Khoi peoples of southern Africa have harvested and used devil's claw medicinally for centuries. Knowledge about the medicinal properties and uses of devil's claw – and about methods to harvest devil's claw plants sustainably for these purposes -- also entered the traditional knowledge systems of in-migrating Bantu groups. These groups arrived in the area between 1,500 and 500 years ago, and it is likely that they

learned about devil's claw from the San. In addition to general anti-inflammatory and analgesic use, ethno-medicinal uses have been recorded for the following human health conditions: dyspepsia, fever, blood diseases, urinary- tract complaints, post-partum pain, sprains, sores, ulcers and boils (Wegener, 2000), as cited in (Krugmann *et al*, 2003).

The plants were first collected and described by European scientists in 1820, but their medicinal properties were "re-discovered" considerably later, in 1907, during German colonial rule of the former South-West Africa. In that year, a German colonist, G.H. Mehnert, became aware of certain traditional medicinal uses of his farm workers and was able to trace these to the devil's claw plant after some 'low-profile fieldwork' of his own.

This early bio-prospector exported some dried devil's claw tubers to Germany, where they were first studied by Zorn at the University of Jena in the 1950s. By 1962, the company Harpago (Pty) Ltd started exporting the tubers in larger quantities to the German company Erwin Hagen Naturheilmittel GmbH. At that early commercial stage, the dried devil's claw roots were used to make a bitter tea used mostly against dyspepsia and as a general 'blood cleanser'.

There is no evidence of any particular socio-cultural significance having been attached to the traditional medicinal use of devil's claw.

5. Commercial Harvesting and Trade: Applications, Producers and Markets, Prices, Supply and Demand, and Actors in the Value Chain

5.1 Applications

Clinical research has demonstrated the efficacy of devil's claw as an analgesic, anti-rheumatic and anti-inflammatory agent in the treatment of health conditions such as chronic joint ache or back pain. Its main commercial use today derives from an extract from the root tubers which is added to various proprietary joint-care products. It is believed that the key active ingredient consists of a group of iridoid glycosides -- harpagoside, procimbide, and harpagid -- and that the main difference in the medicinal properties and effectiveness of the sub-species *H. procumbens* and *H. zeyheri* can be attributed to the relative presence and mix of these complex organic molecules (Cole and Bennett, 2007).

In overseas developed country markets, *Harpagophytum* spp. products are either registered as herbal medicines (e.g. in France and Germany) or as food supplements (e.g. in the U.K., the Netherlands, U.S., and the Far East). Devil's claw is listed in the European Pharmacopoeia for the treatment of rheumatism and arthritic ailments. The European Pharmacopoeia describes common standards for the composition and preparation of substances used in the manufacture in order to guarantee quality. While *H. procumbens* has been listed for some time (for the above-mentioned treatments), *H. zeyheri* was added to the definition in January 2003 to cover the same devil's claw products. Recent tests on eight samples of *H. zeyheri* from the Caprivi Region revealed average harpagoside contents in tuber extracts significantly higher than the minimum content required by the European Pharmacopoeia for *H. procumbens* (1.2% harpagide and harpagoside) (Stewart and Cole, 2005).

Harpagophytum spp. are also included in the monographs of the European Scientific Cooperative on Phytotherapy (ESCOP) for the treatment of painful arthrosis, tendonitis, loss of appetite, and dyspepsia. The German Commission E, a government regulatory agency established in 1978 to assess useful herbs and publish monographs listing uses and side effects, recommends the use of devil's claw for the treatment of painful arthrosis, loss of appetite, and dyspepsia, and as a supportive therapy for degenerative disorders of the locomotive system (Cole, 2003a).

5.2 Producers and export volumes

Of the countries where devil's claw occurs[18], to date only the range states (Namibia, Botswana, and South Africa) have produced and exported significant quantities of the dried devil's claw tuber material on a commercial basis.[19] The first large-scale commercial export from the range states (Namibia) took place in 1962. Since then, the international devil's claw trade has increased substantially. Table 2 summarises available export data for the three range states from the early 1990s. Figure 5 depicts exports from Namibia for the period 1997 – 2010. It is clear that among the range states Namibia has been the predominant producer and exporter of devil's claw. Judging from those years for which export data are available for all three range states, anywhere between 85% and 99% of range state exports have originated in Namibia. This dominant position among supplier countries puts Namibia in a position to influence market prices for devil's claw, at least in principle (Bennett, 2006).

The time series of available export figures shown in Table 2 suggests that from the early 1990s international market demand for devil's claw first increased more or less steadily, until 2002, and subsequently levelled off. Peak demand in 2002 corresponded to 900,000 kg of exports from the range states (850,000 kg from Namibia), after which exports declined to annual levels between 360,000 kg and 670,000 kg. The general increase in demand for devil's claw up to 2002 has been attributed to an increase in the number of people suffering from arthritis and other locomotive disorders, well-substantiated clinical and other research data, the demonstrated effectiveness and safety of devil's claw products, and intensified marketing initiatives by product manufacturers (Grünwald, 2002).

[18] These countries are: Namibia, Botswana and South Africa (the range states, endowed with both *Harpagophytum* species) as well as Zimbabwe, Angola, Zambia and Mozambique (endowed with *H. zeyheri* only) -- see Figure 2.

[19] Beyond the range states, a small devil's claw project in Zimbabwe (Hwange district, near Victoria Falls) has sold small quantities of tuber material, less than 2,000.00 kg per annum (Cole, 2008a).

Table 2: Unprocessed devil's claw exports, 1992 – 2010

	Devil's Claw Exports (kg)				
Year	**Botswana**	**South Africa**	**Namibia**	**Namibia (% of total)**	**TOTAL**
1992	10,719	No data	96,000		**106,719**
1993	3,278	No data	66,000		**69,278**
1994	24,437	No data	158,000		**182,437**
1995	45,633	No data	284,409		**330,042**
1996	No data	No data	313,652		**313,652**
1997	5,493	No data	251,091		**256,584**
1998	501	No data	613,336		**613,837**
1999	2,050	6,936	604,335	98.5	**613,321**
2000	No data	341	379,740		**380,081**
2001	33,506	31,112	726,333	91.8	**790,951**
2002	27,950	20,619	851,016	94.6	**899,585**
2003	3,084	4,500	592,387	98.7	**599,971**
2004	42,025	14,000	331,466	85.5	**387,491**
2005	540	27,000	336,713	92.4	**364,253**
2006	2,249	No data	430,000		**432,249**
2007	No data	No data	446,000		**446,000**
2008	No data	No data	686,000		**686,000**
2009	No data	No data	378,702		**378,702**
2010	No data	No data	335,638		**335,638**
TOTAL	**201,465**	**104,508**	**7,880,818**		**8,186,791**

Botswana: Export data compiled by the Agricultural Resources Board, Ministry of Environment, Wildlife, and Tourism, and Botswana country report presented at the DCRSWG
Namibia: Export data compiled by the Directorate of Scientific Services, Ministry of Environment and Tourism
South Africa: (Raimondo and Donaldson, 2002); and the "Devil's Claw Update" presented at the DCRSWG

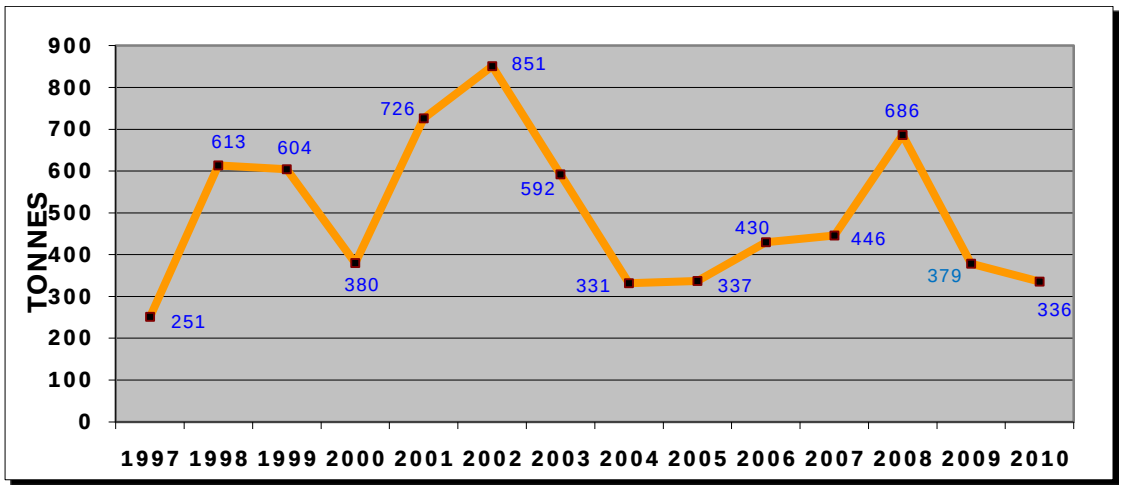

Figure 5: Total exports from Namibia (1997-2010); source: (Cole, 2011)

The apparent dip in demand in the year 2000, as reflected in the lower export figure, has been attributed to the negative message sent to the market by the then proposed listing of devil's claw in Appendix 2 of CITES (see Section 7.4). The proposed listing may also have contributed to the subsequent peak in demand, by motivating end users to stockpile raw material, given the greater perceived risk of supply disruptions. An important factor behind the decline in demand following the 2002 peak was the removal, in early 2004, of devil's claw (and a number of other natural products) from the list of prescription drugs covered by

the German public health insurance – an action that triggered a 50% drop in sales of herbal medicine (including devil's claw) by mid 2004. Other perceived reasons for the post-2002 market decline include stockpiling by some buyers and lack of a concerted marketing effort by the range states (Stewart and Cole, 2005).

In the period of 1992 to 2010, an annual average of 430,000 kg of devil's claw was traded between exporters in the range states and overseas end users. A Devil's Claw Feasibility Study carried out in 2006 (Bennett, 2006) estimated the current overall market capacity at 450,000 kg. However, strong inter-annual variation in export volumes (between 70,000 and 900,000 kg in the period of 1992–2010)) suggests that demand is largely unpredictable. During peak years, excess demand and higher prices tend to increase the risk of unsustainable harvesting, as existing (long-time) harvesters scramble to take advantage of the higher prices and keep up with demand, and as additional numbers of rural people are attracted into the market, trying to reap the greatest possible benefits from the windfall situation by harvesting and selling as much open-access devil's claw as possible during the season. The current pattern of (unpredictable) demand peaks and troughs (Figure 5) occurred twice in the past (in 1977 and 1985), but at lower export levels. The amplification of this pattern over time is a result of the integration and expansion of the world's herbal medicines market (Cole and Bennett, 2007).

These figures do not reflect (relatively minor) amounts of devil's claw traded between the range states. Nor do they make any distinction between the two devil's claw species, as exporters are not required to specify in the export application form what species they are exporting. It is widely believed that more than half of all export consignments consist of or contain *H. zeyheri* (Cole, 2008a). This is no longer seen as a problem, as *H. zeyheri* has meanwhile been included in the European Pharmacopoeia (Section 5.1) and is largely accepted within in the pharmaceutical industry (Section 3).

The figures presented in Table 2 and Figure 5 should be treated with some caution, given the (still) largely informal, unorganized nature of the devil's claw trade (notwithstanding increasing organization at the harvester and producer level) and given the inconsistencies that result from the challenges of mounting an effective harvesting and export permit system in such a context. For instance, there may be no proper central record keeping, with figures being compiled from data for different provinces, as in the case of South Africa (Cole, 2008a). Furthermore, different motivations or negligence may lead harvesting or export permit holders to over-report, under-report, or non-report on sales or exports, or to report these transactions for the wrong year, and it may be difficult for an over-stretched, under-resourced permit system to pinpoint such "deviations".

An additional generic problem arises from the fact that devil's claw, as other minor commodities, lacks its own tariff code. As such, devil's claw is lumped with other commodities and hence cannot be located as a distinct category in either the export data from the range states or the import data from end-use countries. All in all, data management is poor and market transparency is limited, which makes for uninformed market and policy decisions and dislocation between producers and consumers (Cole and Bennett, 2007).

5.3 Export destinations, end-use markets and demand drivers

5.3.1 Export destinations

Over the years, the world market for devil's claw has grown substantially both in terms of volumes exported and in terms of the number and spread of export destinations. Figure 6 shows major importing countries by volume of devil's claw imported from Namibia in 2009 and 2010 (Cole, 2011). Germany continues to be the largest importer, with devil's claw imports of more than 200,000 kg over the past two years. Other major importing countries include Italy, France and Poland[20], with imports of over 100,000 kg over the past two years, slightly more than half of Germany's. Six other countries that are spread over five continents (Europe, Africa, Asia, North America and South America), imported lesser quantities of between 58,000 kg (South Africa) and 4,000 kg (Brazil).

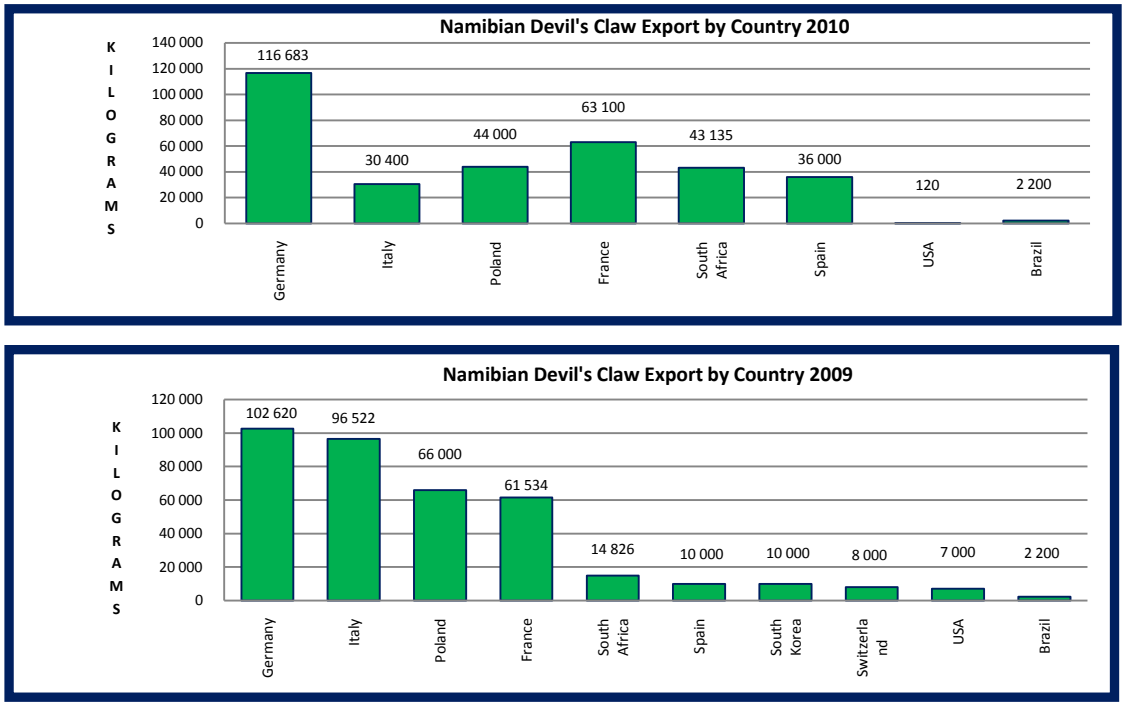

Figure 6: Destinations for devil's claw exports from Namibia in 2009 and 2010 (Source: (Cole, 2011))

Of note are the substantial inter-annual demand variations over the two-year period, notably in the case of Italy, but also in the cases of South Africa, Spain and Poland, with France being the most consistent buyer, followed by Germany. Strong inter-annual variations and relative unpredictability of levels of demand from some of the major individual importing countries add up to the 'roller-coaster' of overall market demand levels that have been experienced in recent years (see Figure 6). At the same time, the emergence new entrants (like South Korea, Switzerland, USA, and Brazil) may contribute, in time, to

[20] Poland has become a major importer (and Germany has lost some of its pre-dominance as importer) since 2006, in which year a major German importing company shifted its operational base from Germany to Poland (Cole, 2008a).

greater diversification among buyers, as some of these newcomers become significant export destinations.

5.3.2 End-use markets

A recent devil's claw feasibility study (Bennett, 2006) established the existence of three end-use markets for devil's claw, defined by its use as:

- an extract in herbal medicines, generally referred to as 'traditional herbal remedies'[21], which are sold over the counter rather than on prescription;
- a raw material for veterinary herbal remedies or animal feed supplements or an extract in a proprietary veterinary 'cure'; and
- herbal tea with therapeutic qualities.

Market end-uses of devil's claw are currently dominated by traditional herbal remedies. This end use is estimated to constitute 92% of overall marketed volumes, while the corresponding market end use shares for veterinary medicines and herbal tea are 5% and 3%, respectively. These market segments are currently rather small, but they hold potential for significant expansion (Bennett, 2006).

5.3.3 Demand drivers

Global market demand is driven by a range of forces and factors. For instance, in the target markets for devil's claw, in particular the European Union, the proportion of people consuming devil's claw generally has been increasing as populations have aged. On the other hand, devil's claw is but one of a range of possible products for arthritis and rheumatism. If other (competitive) products change in price or perceived efficacy relative to devil's claw (or vice versa), end users will switch away from or to devil's claw based products. Recently, this substitution effect accounted for a significant drop in demand for herbal remedies made from devil's claw in Germany when devil's claw was taken off the list of herbal remedies covered by the country's public health insurance.

An initiative with a potentially significant impact on global demand for devil's claw is the EC Traditional Herbal Remedy Directive (THRD). The THRD will come into force in April 2011, and it will only be after that date that it will become clear what its impact will be. The Directive means that all devil's claw products have to be registered. Registration is expensive, but enables the manufacturer to make claims on the packaging (hitherto these were not allowed). This could have two effects. It could constrain demand for devil's claw from the many existing small-scale bottlers and branders of DC products who are unregistered. It could also mean that the registered companies can sell a lot more devil's claw products because they can explain to the consumer on the packaging what effect it might have if they take the product.[22]

[21] In some countries, devil's claw 'traditional herbal remedies' fit better into the 'dietary supplements' sector and hence are referred to as food rather than medicine.

[22] Ben Bennett, personal communication, February 2011.

5.4 Supply-demand balance, market prices and resource availability

5.4.1 Prices

It is difficult to establish market prices for devil's claw because prices obtained by individual exporters are usually kept confidential and because both export prices and prices obtained by harvesters for harvested and dried tuber material are subject to significant variations across different locations and also may change over time. Factors influencing export prices include (often fluctuating) market demand (relative to supply), with the (changing) demand-supply balance, in turn, depending on whether end users have established stockpiles of already purchased material and/or whether exporters have stockpiles of still unsold material from the previous year. Prices received by harvesters vary by location and in time, depending on whether harvesters sell to intermediaries or directly to exporters and, in case of sales to intermediaries, on the length of the trade chain within Namibia.

It must be noted here as well that price change signals in the international market take some time to get down to the harvester and are diluted by the many value chain actors, both overseas and in Namibia, as they travel down the value chain (see Section 5.5 for a discussion on the value chain structure). This tends to lessen the impact of changes in global demand and international prices on harvesters and attenuate as well as delay the aggregate supply response. If it is possible to "upgrade" the currently fragmented value chain (see Section 7.9) by organising the domestic devil's claw industry (see Section 7.6 and 7.8), adding more value locally in Namibia (see Section 7.7), and thus reducing the number of value chain actors, then price messages will also have a more direct impact on harvesters and the supply response will be stronger and more immediate.

Table 3 shows market prices or price ranges (CIF)[23] for the export of devil's claw dry secondary tuber material from Namibia and for the sale of such material by harvesters, respectively. This price information, which is representative for the years 2008 -2009, draws mainly on the results of a recent Namibian exporter survey (Cole, 2008a) and on a recent INP market bulletin (MCA-N, 2010).

Table 3: Market price information for 2008-2009 (Sources: (Cole, 2008a) and (MCA-N, 2010))

		H. procumbens	***H. zeyheri***
Prices obtained by Namibian exporters	Sustainably harvested/ organic certified devil's claw	€ 5.00/ kg	
	Regular devil's claw	€ 3.00 – 4.00/ kg	€ 2.25 – 3.15/ kg
Prices received by Namibian harvesters	Sustainably harvested/ organic certified devil's claw delivered directly to exporter	N$ 20.00 - 30.00/ kg	NS 15.00 - 20.00/ kg
	Other devil's claw	N$ 6.00 – 15.00/ kg	N$ 4.00 – 12.00/ kg

[23] Cost, insurance and freight

Based on this price information, national income generated from Namibian exports of devil's claw during 2009 has been estimated at approximately € 1.06 million, or N$ 12.16 million ((MCA-N, 2010) and (Cole, 2008a)). This is a substantial amount of money. Nevertheless, it is only a small fraction (less than 5%) of the value of annual global retail sales of devil's claw products ((Cole, 2003b) and (Bennett, 2006)). Harvesters receive an even smaller proportion of the retail market value of devil's claw. 'Premium' harvesters (i.e. harvesters practicing sustainable harvesting and/or being certified organic) receive up to 2% of the retail market value, close to half of what exporters receive, whereas at the lower end of the harvester spectrum informal unorganized harvesters receive far less than 1%. See Section 5.5 for further discussion on how the market marginalizes harvesters and exporters.

5.4.2 Supply-demand balance

Devil's claw exports vary not only from year to year, but also within any given year, as Figure 7 shows for the past two years. While traditionally most of the devil's claw is exported in the second half of the year (Cole, 2008a), there are years (like 2009) which do not follow this rule. This is further indication of the variability and unpredictability of market demand for devil's claw.

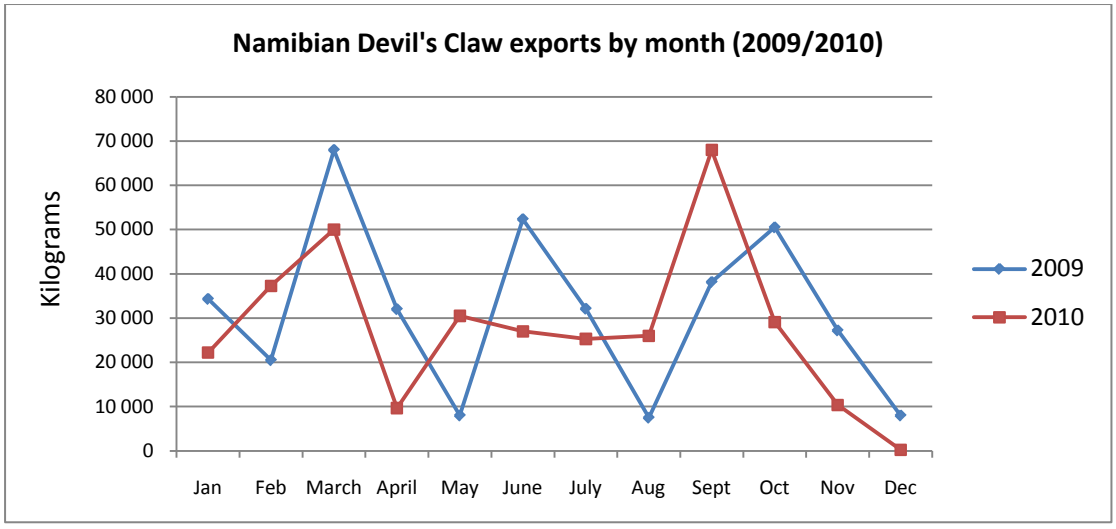

Figure 7: Namibian devil's claw exports by month during 2009 and 2010; source: (Cole, 2011)

Devil's claw supply and demand are rarely if ever evenly balanced throughout the year. There tends to be an undersupply at the beginning of the season (February – May) when harvesting has just started, and an oversupply at the end of the harvesting season (September and October). When demand is relatively high at the beginning of the season, which may cause market prices to rise temporarily, there is a greater risk that harvesters are tempted to sell low quality material (insufficiently dried secondary tuber material and/or carelessly and hence unsustainably harvested material) to meet this demand and benefit from higher prices. Conversely, at times when demand is substantially lower than supply at the end of the season, there is a risk that exporters may pay lower prices to sellers (harvesters and middlemen) which results in lower rural incomes. In this way, intra-annual

Imbalances between demand and supply may hold significant short-term and longer-term risks both for the devil's claw trade as a rural income opportunity and for the integrity of the local devil's claw resources in open-access areas.

Because of the strong inter- and intra-annual variability of market demand for devil's claw, exporters are often forced to carry over stock into the following year, which may tie up significant working capital. There have traditionally been no long-term contracts between exporters and harvesters, although this has begun to change as a result of the recent establishment of organised harvesting operations by a few PPOs (see section 7.1). In the absence of long-term contracts, it is difficult for exporters to judge how much they should buy in any given year.

5.4.3 Resource availability

There is no evidence that the size of the devil's claw resource in Namibia (and the other range states) has acted as a constraint for market supply to be able to meet market demand. On the contrary, peak annual market demand of 900,000 kg (of which 850,000 kg were supplied from Namibia) in 2002 was met largely from devil's claw harvested in open-access communal areas in four regions (Omaheke, Otjozondjupa, Caprivi and Kavango) while sizable devil's resources on private farmland, in protected areas, and on remaining communal land remained largely untapped (see section 6.1). Current average market capacity has been estimated at 450,000 kg (see section 5.2), only half of the peak in 2002, and it is considered unlikely that future market demand levels will reach or surpass the 2002 peak within the foreseeable future (next 5-10 years). Increasing proportions of devil's claw exports from Namibia have been coming from sustainable harvesting operations (see section 7.1), tending to alleviate harvesting pressures on local devil's claw populations.

All this means that there are plenty of devil's claw resources around in Namibia (and the other range states) to supply the global devil's claw market now and in the foreseeable future. It is clear that the size of devil's claw resource base in Namibia and the other range states availability has not been a limiting factor in meeting global market demand, and there is every indication that this will continue to be the case in years to come.

5.5 Value chain actors and market structure

The devil's claw value chain exhibits two classical forms of market failure (Cole and Bennett, 2007):

a) The market is highly concentrated, with power of price-setting and value capture lying in the hands of a very limited number of lead buyers overseas: in the period of 2003 – 2005, less than 10 overseas companies purchased more than a container load of devil's claw in a single year;

b) Exporters and importers are unable and/or unwilling to maintain long-term trading relationships: lead buyers regularly switch from one supplier to another, as a tactic to strengthen their negotiating position, so as to be able to buy devil's claw at the lowest possible prices.

The market is increasingly concentrated not only on the demand side (among the lead buyers) but also on the supply side (among the Namibian exporters). Since the last devil's claw 'boom' around 2001-2002, the number of major Namibian exporters has dropped from 16 to less than 10. Five or less exporters currently handle 80-90% of the export volumes, buying harvested devil's claw from agents (intermediaries) and (so far to a much lesser extent) directly from communities, with whom they have developed long-term relationships. While most of the exporters seem to have their regular suppliers, there have been examples of exporters' geographic areas of interest and influence partially overlapping. Long-term exporters pay for and store a given harvest against expected or hoped-for future orders from overseas buyers, thus assuming substantial price and market risks. Exporters manage these risks by running diversified businesses that usually include commercial farming (Cole and Bennett, 2007).

Most agents (providing regular supplies to exporters) manage harvesting teams and visit harvesting areas. However, some agents rely, partially or wholly, on smaller suppliers for devil's claw material. The exact number of agents and smaller suppliers is not known and varies with demand for devil's claw. It is estimated that during periods of high demand up to 200 agents and smaller suppliers may be operating as middlemen in the devil's claw supply chain in Namibia ((Stewart and Cole.2005) and (Cole and Bennett, 2007)).

The supply chain starts with the harvester who come from the poorest segments of society and eke out a living under marginal socio-economic conditions. For these harvesters, devil's claw sales provide a very limited yet quite significant source of income and livelihood diversification. As with middlemen, the exact number of harvesters is unknown and variable, fluctuating from year to year, and even from month to month within a given year, in response to changing levels of demand for devil's claw. The total number of harvesters is estimated to range between 5,000 and 8,000 (Stewart and Cole, 2005).

The two forms of market failure highlighted above, together with various actual or potential supply and demand problems, have been instrumental in keeping prices down at the level of the range state harvester and exporter and are responsible for the fundamental inequity in the distribution of benefits from the global devil's claw trade: of an estimated € 38 million in annual global retail sales of devil's claw products, the producing range states receive only € 1.4 million (3.7%) and harvesters as little as € 414,000 (1.1%). This inequity, combined with the open-access nature of the resource and the extreme poverty of the harvesters, lies at the heart of the industry's problems, *inter alia* encouraging over-harvesting and use of unsustainable harvesting methods (Cole and Bennett, 2007).

Tables 4 and 5 summarise supply and demand factors contributing to the problematic of the devil's claw market and industry, along with identified impacts and possible solutions.

Table 4: Devil's claw supply issues (based on: (Cole and Bennett, 2007))

Issue	Impact	Possible solution
Open (uncontrolled) access to resource harvesting areas	Supply is elastic: rising demand stimulates over-harvesting rather than higher prices to harvesters	Restrict harvesting to areas with a recognised land/resource tenure regime, which are managed within an established institutional framework and where therefore resource access can be controlled
Lack of coordination among the devil's claw producer countries (range states)	Supply management/ control in one country results in demand (buyers) shifting to a third country (another range state)	Regional production coordination on the basis of an agreed protocol, so as to manage supply by quota
Lack of quality and traceability standards and control	This gives price negotiating power to buyers	Eastablish, maintain and enforce quality and traceability standards and control systems
Selling *H. zeyheri* as *H. procumbens*	This gives price negotiating power to buyers who claim that they have to buy more raw material to make the same volume/quality of extract	Expand the market for H. zeyheri (primarily in the veterinary medicine and herbal tea sectors) Link harvesting permits (and export permits) to identified species locations

Table 5: Devil's claw demand issues (based on: (Cole and Bennett, 2007))

Issue	Impact	Possible solution
Poor generic promotion	Devil's claw finished product manufacturers and consumers unaware of product advantages over products from competitors	Generic promotion
Changes in regulatory environment in key markets (i.e. prescription rules in Germany)	Harder to enter new markets Higher chain quality conservation costs	Take control of the problem by meeting regulatory requirements in Namibia instead of outside See increased regulation as an opportunity to wrestle back market control Seek less well-regulated markets and market segments
Competition from joint-care products	Loss of market share and discounting	Generic promotion Clinical trials
On-shelf discounting of over-the-counter healthcare products	Price squeeze	Move into higher value markets (organic, fair trade, tea, veterinary medicine)
Consumer poorly informed on devil's claw efficacy and dosage	Self-medicating consumer shifts to competitor	Support better labelling regimes Generic promotion

		Clinical trials
Decline in investment in patenting and clinical trials	Fewer launches of products containing devil's claw Loss of market share	Support patenting Support clinical testing activity
Supply chain power asymmetry	Lead buyer(s) set price	Seek a 'white knight' to launch a fair trade product and make this product the market norm
Currency appreciation	Loss of market share to competing products from countries with stable or depreciating currencies Reduced income for exporters and harvesters	Introduce financial instruments in the devil's claw sector
Consumer concern about over-harvesting	Loss of market share to cultivated products	Guarantee all market supply as sustainably harvested
Problems with fair trade certification for medicinal herbs	Not possible to get formal fair trade certification for devil's claw	Concentrate on structuring production so that only fair trade is possible (e.g. pass legislation in the range states that only products meeting specified ethical and quality standards can be exported – would probably require collaboration with lead buyers)
Huge and confusing range of end products	Consumer unable to choose	Generic marketing

6. Environmental Risks and Benefits from Ongoing "Traditional" Informal Commercial Bio-trade and the INP PPO Sub-Activity

Against the background and context presented in Sections 2-5, this section identifies and assesses environmental risks and benefits, in terms of negative and positive impacts on the devil's claw resource base, resulting from commercial devil's claw harvesting, trade and export generally and from the MCA-N INP PPO Sub-Activity in particular. Section 6.1 focuses attention on the environmental risks (potential negative resource impacts) associated with ongoing bio-trade, while Section 6.2 outlines environmental benefits (positive impacts on the resource base) that are likely to result from the INP PPO Sub-Activity.

National and international responses to concerns over actual or potential over-harvesting and unsustainable harvesting of devil's claw in Namibia are discussed in Section 7.

6.1 Environmental risks (potential negative resource impacts) associated with ongoing commercial harvesting and trade

Over the past 50 years, rapidly expanding commercial devil's claw bio-trade has raised national and international concerns about the risks of over-harvesting and the use of unsustainable harvesting methods, particularly during times when the global devil's claw

market booms. While there is clear evidence of growing quantities of devil's claw storage tuber material having been exported from, and hence for the most part harvested in, Namibia over the past 5 decades, making a precise estimate of the size and distribution of the devil's claw resource in Namibia remains a challenge for various reasons, and information about the changing spatial and temporal patterns of harvesting activity and its impacts on the resource base is limited due to the informal, unorganized nature of the devil's claw trade.

As for the challenge of getting a precise picture of the devil's claw resource in Namibia, at least three factors make it difficult if not impossible to establish the spatial distribution of the devil's claw resource in Namibia and to come up with an unequivocal estimate of its overall size:

- the irregular, patchy nature of the spatial distribution of the devil's claw resource, with high-density spots spaced irregularly within lower-density areas;
- unpredictable intra-annual and inter-annual changes in plant population sizes, densities and growth dynamics in response to the highly variable climate of the Kalahari; and
- the phenologic plasticity of individual devil's claw plants, i.e. their ability to undergo "ad hoc" adaptive change in flowering and fruiting behaviour and foliage growth, including dormancy during dry spells, in response to unpredictable change in weather patterns, so as to improve chances of survival under harsh and variable environmental and climatic conditions.

Even though information about harvesting patterns is limited, there is consensus among analysts and practitioners that the majority of harvested devil's claw in Namibia has come from remote open-access communal areas within the Regions of Omaheke, Otjozondjupa, Caprivi and Kavango. Only a small proportion has been harvested within private farms by farm workers. This implies that outside the communal areas of the above-mentioned four Regions, significant devil's claw populations, found on wide stretches of private farmland, state protected land, and some of the communal land, remain largely unexploited.[24]

Therefore, the risk of possible commercial over-utilisation of devil's claw resources, does not pose any significant threat to the overall national devil's claw resource base, let alone the biological survival of the plant species. Nevertheless, in open-access areas close to larger human settlements that are easily accessible to larger numbers of informal harvesters and hence more prone to potential over-harvesting, it may threaten the "economic survival" of the plant (and hence the livelihood base of the harvesters), as plant populations decline and the economic returns to harvesters from the time and physical effort invested in devil's claw harvesting diminishes.[25] This means that the risk of over-harvesting and unsustainable harvesting methods translates into adverse impacts on the local plant resource -- as well as

[24] Ben Bennett, personal communication, November 2010

[25] Threats to the "economic survival" of declining devil's claw populations, which reduce the interest of harvesters in harvesting these populations, tend to translate into diminishing harvesting pressure on these populations, which, in turn, tends to allow these populations to recover (self-regulating system).

related negative impacts on the livelihoods of the harvesters and the sustainability of devil's claw supplies from Namibia – rather than representing a threat to the national devil's claw resource base.[26]

The background information presented in the preceding sections sheds light on the complex, multi-faceted and inter-linked nature of the range of forces and factors that contribute to the environmental risk (plant resource impacts) associated with commercial devil's claw harvesting and trade. The following intertwined risk factors combine in posing a potential threat to local devil's claw populations, especially during years of high market demand:

- Intrinsic biological destructiveness of harvesting parts of the root system, as in the case of devil's claw, which calls for appropriate harvesting techniques, if lasting damage to plants is to be avoided;
- Informal and unorganized nature of much of the devil's claw harvesting and trade (without much if any traceability and quality control of material) within Namibia, although the proportion of devil's claw exports that comes from sustainably harvested areas (some of them certified organic) has been growing substantially in recent years and by now has become quite significant (see Section 7.1);
- Open-access (or uncontrolled-access) nature of many of the communal areas where devil's claw has been traditionally harvested, making it difficult to exclude outsiders from the resource;
- Complex supply chains in Namibia, multi-stage trading before harvested material reaches exporters, few long-term relationships and purchase agreements between harvesters and exporters, exploitative trading relationships between traders and harvesters, and lack of market information on the part of harvesters;
- Extreme poverty, marginalization and consequent exploitation of the primary producers (harvesters) which are disconnected from the rest of the actors along the value chain;
- Lack of bargaining power, extreme poverty and high market demand may combine to tempt or force individual harvesters to adopt ecologically and commercially unsustainable harvesting practices and to sell low-quality material, against better knowledge, in desperate attempts to increase harvesting volumes, sales and revenues;
- Persistently low prices received (relative to global retail prices) and low value margins captured by harvesters and exporters;
- Namibian exporters are not organized, although various attempts have been made over the years to facilitate their organization (see Section 7.6);
- There are few, if any, long-term relationships between exporters and overseas buyers (importers);
- Lack of cooperation, coordination and collective action at local, national and regional levels, on the part of Namibian (and range state) actors (harvesters and

[26] This was one of the main arguments against the CITES listing proposed by Germany in 2000 (see section 7.4 for more details on the background to and outcome of Germany's proposal).

exporters), notwithstanding the establishment of a Devil's Claw Range State Working Group (see Section 7.6);

- Little or no upgrading and value addition takes place in Namibia – most or all of it occurs after export;
- Extremely skewed distribution of benefits and highly inequitable benefit-sharing along the global trade chain, with a particularly large value margin opening up between Namibian exporters and overseas buyers, captured entirely by the latter;
- Stark power asymmetry between lead buyers and supply-side actors (harvesters and exporters) in setting prices, controlling the principal value-adding stages (raw material processing and product development) and hence capturing most of the value margin;
- Limited data and information on the devil's claw resource base, spatial and temporal patterns of harvesting and trade activity, on the impact of harvesting and trade on the natural resource base in Namibia, and on the state of devil's claw populations; and
- Ineffective application and weak enforcement of policy and regulatory instruments like the devil's claw policy and permitting system in Namibia.

6.2 Environmental impacts resulting from the INP PPO Sub-Activity

6.2.1 Positive impacts

One of the conclusions of the Strategic Environmental Assessment (SEA) of the INP PPO Sub-Activity is that it is unlikely that the INP PPO Sub-Activity will have any negative effects on the devil's claw resource base and that on the contrary it is expected to have an (indirect) positive impact on the resource base and the sustainability of its commercial use (ARD, 2008). While it is conceivable that increases in market demand during the implementation of the INP PPO Sub-Activity might lead to greater pressure on open-access resources, with an increased risk of local over-harvesting in open-access areas, it is very unlikely that such increases in market demand could be triggered or induced by the INP PPO Sub-Activity. They would rather be a consequence of events and processes unrelated to the INP PPO Sub-Activity. The risk that the INP PPO Sub-Activity might, under certain circumstances, encourage over-harvesting is therefore virtually negligible.

The (indirect) positive impact of the INP PPO Sub-Activity on the health and integrity of the devil's claw resource base and the sustainability of its commercial use comes about as a result of the INP PPO Sub-Activity helping to strengthen:

- the technical capacity of PPOs to manage the resource sustainably, using tools and methods such as:
    - harvest quota setting based on resource inventories;

- established good practices for sustainable harvesting, monitoring of harvesting activities and post-harvest impact monitoring; and enrichment planting and/or cultivation[27] where appropriate;

- the organizational capacity of PPOs to:
  - develop and implement devil's claw resource management plans;
  - plan, implement and monitor harvesting; ensure quality control and traceability for all harvested material;
  - meet all requirements of the national regulatory system for devil's claw (including timely application for and renewal of MET harvesting permits as well as careful and comprehensive recording of all market transactions on the permits); and
  - exclude outsiders from harvesting;

  and

- the marketing capacity of PPOs to:
  - develop and maintain effective long-term working relationships with key exporters and (if necessary) with their intermediaries; and
  - secure 'premium' prices (and bonuses where relevant and applicable) for their sustainably harvested and traceable quality devil's claw produce from these exporters – thus having an economic incentive for sustaining their organized sustainable-harvesting system and maintaining the integrity of the local plant resource base.

6.2.2 Negative impacts

If the INP PPO Sub-Activity succeeds in helping to make greater market demand happen, it will have a positive social impact – especially in areas where organised production takes place (see Section 7.1 on recent advances in organised sustainable devil's claw production). It is conceivable, however, that market demand increases, in particular sudden demand surges, might also (or even primarily) stimulate informal unorganized and unsustainable harvesting activity in open-access areas and thus have a "perverse" negative impact on local devil's claw resources.

But as noted in section 6.2.1, in all likelihood the INP PPO Sub-Activity is not in a position to stimulate greater global market demand on its own, directly or indirectly. Indeed, major demand drivers in the user countries -- such as aging population structures in user countries, substitution of devil's claw based products by other products due to changes in relative prices, and changes in regulatory regimes governing the use of herbal medicines (see section 5.3.3) – and clearly beyond the reach of the INP PPO Sub-Activity. Any perverse impacts on devil's claw resources in Namibia and the other range states that might result from rising market demand cannot, therefore, be attributed to the INP PPO Sub-Activity.

[27] See section 7.5 for an explanation of what devil's claw cultivation and enrichment planting entails and for information on their role in the commercial production and sustainable use of devil's claw in Namibia and the region.

7. National and International Responses to Concerns over Devil's Claw Over-Harvesting in Namibia

Concerns about the risks of over-harvesting of the devil's claw and the use of unsustainable harvesting techniques in some of Namibia's harvesting areas, have triggered, or contributed to, various responses intended to promote sustainable harvesting methods and ensure sustainable resource use, either directly or indirectly by tackling other closely related risk factors (see list of risk factors in Section 6.1). Some of the responses have involved tangible interventions initiated some time ago and still active (or re-activated) in some cases. These tangible responses include:

- Organising devil's claw harvesting and trade within newly created and existing communal-area rural institutional structures and promoting sound resource management methods, sustainable harvesting and processing techniques, traceability and quality control within these structures
- Certification (organic and fair trade)
- Regulating devil's claw harvesting, trade and export on the basis of a national policy and permitting system for devil's claw
- Proposal to list devil's claw under Appendix 2 of CITES
- Devil's claw domestication, cultivation and enrichment planting
- Coordinated strategy and collective action at national and regional levels

Other responses, while looking potentially promising, have so far remained options that have not yet gone beyond conceptualization, discussion or planning stages and would have to overcome significant technical, economic, institutional and/or market hurdles before they could hope to make a difference on the ground. These still 'intangible' responses include:

- Retaining within Namibia more value added and benefits from devil's claw trade
- Declaring devil's claw a controlled product under the Agronomic Industry Act
- Capturing a global niche market for devil's claw

Each of the tangible or still intangible responses is now described and discussed in a separate sub-section.

7.1 Organising devil's claw harvesting and trade within rural institutional structures that practice sound resource management, sustainable harvesting techniques, traceability and quality control

Sustainably Harvested Devil's Claw (SHDC) project

One of the earlier and arguably most critical responses to concerns over devil's claw over-harvesting was to start organizing harvesters by registering them and by developing a local institutional mechanism and structure for managing the devil's claw enterprise (harvesting, processing, storage and sale) on the basis of improved shared information (about the resource base and the market), clear objectives, rules and responsibilities, and transparent decision-making processes. The intent was to create capacity for improved harvesting and processing practices, quality control, and traceability, with a view to developing stable long-term marketing relationships with individual exporters and securing stable higher prices for

dried tuber material. This was to create incentives for a sustainable use of the devil's claw resource and empower the harvesters to develop a sense of collective ownership both of the local devil's claw resource and of the commercial enterprise built on it.

The first major attempt at organizing harvesters in this way - the Sustainably Harvested Devil's Claw (SHDC) project - started in 1997/98 on a pre-independence resettlement farm in Omaheke called *Vergenoeg* (Afrikaans meaning 'far enough'). With support from various donors, this project quickly expanded, covering a total of 18 farms in the Omaheke Region and working with a total of 328 registered harvesters and households (representing 1,600 household members) by 1999/2000. The 18 farms collectively covered a surface area of some 307,000 hectares of rangeland under communal and commercial tenure arrangements. The project was implemented by CRIAA SA-DC, who played the role of an 'honest broker' throughout the local process of institutionalization and change. In late 2005, donor funding ended, and the project has since operated largely independently, receiving only limited support from CRIAA SA-DC.

SHDC's activities and achievements included ((Cole, 2003b) and Cole and Bennett, 2007)):

- Organizing harvesters into groups and electing a local harvesting co-ordinator (and in some cases a harvesting committee);
- Facilitating the registration of harvesters on an individual and group basis with MET to secure harvesting permits;
- Building the capacity of the harvesters to manage their harvesting and trade operations on their own;
- Providing organizational support as well as simple equipment and supplies such as scales, record books, knives, drying frames and bags;
- Assisting in the determination, allocation and enforcement of harvesting quotas and in monitoring compliance with sustainable harvesting techniques, on the basis of pre- and post-harvest biological resource surveys;
- Self-monitoring of harvesting practices, quality control spot checks, and book keeping;
- Getting the harvesting process approved and the product certified organic by the Soil Association (UK), thus ensuring international recognition of the certification and adding value to the product;
- Linking the harvesters with a specific Namibian exporter (Gamagu), thus short-cutting the informal trade chain within Namibia, and with a specific overseas buyer in the UK (Hambledon Herbs, now Organic Herb Trading Company) committed to the principle of fair trade, who undertook to buying the whole SHDC output via the Namibian exporter;
- Prior to the actual harvesting, agreeing with the Namibian exporter a minimum guaranteed price for the local product to reflect better quality of the product and value added as a result of environmentally sustainable harvesting practices and

environmentally friendly (certified organic) production - and on collecting harvested material once a sufficient quantity had been collected and paying up-front on receipt of the harvested material; and

- Negotiating with the Namibian exporter to share profits from export with the primary producers. In practice, this has resulted in the exporter in some years redistributing up to 50% of the profit margin .

The difference that SHDC has made for the primary producers in the communities/ areas in which the SHDC project worked and for their use of the local resource base are summarized in Table 6 below:

The SHDC project, and an associated five-year research programme to investigate the long-term impact of regular harvesting on plant populations' growth rates, plant regeneration and plant resting periods between harvesting interventions (Strohbach and Cole, 2007), generated an important body of knowledge, information and recommendations on good practices in devil's claw resource surveys and harvesting quota setting as well as resource monitoring and management, and on sustainable harvesting and processing methods. This body of knowledge, information and recommendations, which has informed all recent

initiatives aimed at organizing devil's claw harvesting and trade, subsequent to the SHDC project, is presented in accessible and easy-to-use form in "Devil's Claw in Namibia - Guidelines for Harvesters", a booklet produced by the SHDC project for use by organised devil's claw harvesters (CRIAA, 2007). An updated synthesis of what the booklet says about sustainable devil's claw harvesting and processing techniques forms is annexed to Namibia's new Devil's Claw Policy (MET, 2010). Annex A provides an overview of the "Guidelines for Harvesters" and reproduces the updated synthesis section on sustainable harvesting and processing techniques annexed to the new Devil's Claw Policy.

Organised devil's claw harvesting and sale within existing CBNRM structures

Some of Namibia's existing CBNRM (community-based natural resource management) structures, notably some of the conservancies and community forests, are endowed with devil's claw resources in commercially harvestable quantities. Communal-area conservancies have been established as rural resource management structures and natural resource-based commercial enterprises, starting in the late 1990s, to enable people living in communal areas to actively manage and benefit from animal wildlife resources.[28] It soon became clear, however, that animal wildlife resources could not be managed in isolation from other natural resources and that conservancies needed to practice integrated resource management therefore. This led established conservancies to try and identify plant resources such as devil's claw that could be utilized commercially and, as of late, to register (also) as community forests, as recommended (Jones, 2006), in order to gain legal rights over such plant resources as well. Unlike conservancies, community forests provide their members with legal use rights over a broad range of plant resources occurring within their boundaries, including wild-growing plant species like *Harpagophytum* spp.

[28] The Amendment to the Nature Conservation Ordinance of 1996, which provides for the establishment of conservancies, limits natural resource use rights to animal wildlife resources.

Table 6: Impact of the SHDC project on the primary producers and communities with whom it has worked; sources: (Lombard, 2002), (Krugmann *et al*., 2003), (Cole and Bennett, 2007).

Characterisation of Situation that Primary Producers found themselves in	
Prior to start of SHDC project ("without project")	***Subsequent to start of SHDC project ("with project")***
Obtained about N$1.00 (or less) up to (in exceptional cases) N$7.00 / kg for their dried, sliced devil's claw, as impoverished harvesters unable to bargain from a position of strength were effectively forced to sell at whatever price they could get	Obtained a minimum of N$20.00 / kg (2006) for their dried, sliced devil's claw
Often supplied stock under dubious credit arrangements and were often "paid" in alcohol or other consumer goods at highly inflated values	Were paid cash at strategic stages during the harvesting season
From season to season did not know for sure if buyers would turn up to purchase their stock, and had limited choices or options regarding buyers	Dealt directly with the exporter GAMAGU (Mike and Sabine Krafft, Dordabis, Namibia) with whom they are developing a practical and operational relationship (though in some areas it may become prudent to utilize "functional" middlemen from rural area to exporter) and have access, if necessary, to other important exporters/traders
Had very poor links to exporters, usually through a series of middlemen	Could plan their harvesting level and can sell all their stock every season
Only sold very limited amounts	Could and usually do sell more significant quantities than before
Had no idea of the actual weight of the material they passed on	Had scales and community storage facilities, thereby allowing each harvester to know how much they produce and sell, and allows the community to know how much they are selling to the exporter
Had no idea what the product was being used for (outside their own local utilization), or even where it was going to when it was sold	Had an improved understanding about what the product is used for in the export market, and in some cases have even met the importers of their product
Had no opportunity to link better quality supply with better prices	Understood and exploit the link between good quality material, and the higher price possibility with respect to organic certification
Had no assistance regarding ecological and sustainability issues	Were assisted annually with ecological surveys for quota setting, post-harvest surveys, and organic certification
Had no voice in the industry and no opportunity to take up issues with wider stakeholders	Had been well represented at various national and international stakeholder forums

Generally, key advantages of locating the organized harvesting and sale of devil's claw within established CBNRM structures include[29]:

- An existing organizational structure
- An approved method for equitable benefit-sharing
- Harvesting can be linked to management plans enabling resource use sustainability
- Both system provide secure tenure rights to land and/or natural resources in a defined geographical area and thus offer built-in incentives for devil's claw resources to be managed properly.

Around 2005 or shortly after, several conservancies endowed with commercially viable devil's claw resources – the Nyae Nyae and N#a Jaqna Conservancies in Otjozondjupa Region and the Kyaramacan Association within Babwata National Partk (West Caprivi) -- initiated pilot projects, with the assistance of services providers, aimed at organized commercial devil's claw harvesting and sale. While significant levels of informal devil's claw harvesting may already have been taking place on an individual basis for some time, the idea was to organize that activity within the management framework provided by the conservancy, building on the experience, knowledge and information base about devil's claw resource management and sustainable harvesting generated by the SHDC project.

Since then, all three PPOs (Nyae Nyae, N#a Jaqna, and Kyaramacan Association) have progressed to a stage where they:

- have developed and are applying a set of agreed rules and regulations for devil's claw harvesting and trade;
- are registering as harvesters those PPOs members who have undergone the required training in sustainable harvesting and who have agreed to abide by the rules and regulations for harvesting and trade;
- have developed and are implementing a devil's claw management plans that comprise monitoring during harvest (as necessary), post-harvest monitoring and impact assessment to ensure that sustainable harvesting methods as well as correct procedures for the slicing, drying and storing of devil's claw are practiced;
- have carried out surveys to better estimate the size and distribution of devil's claw populations, where necessary and feasible[30];

[29] (Shawe, 2006)

[30] In the case of the Kyaramacan Association, a detailed resource survey was conducted within Bwabwata National Park in March 2008, covering extensively the multiple use area (where the Kyaramacan Association is based) as well as parts of the core areas (where no people reside) (Cole, 2008b). In the case of the Nyae Nyae and N#a Jaqna Conservancies, it was decided not to carry out any resource surveys, given the time consuming and costly nature of resource surveys, the large combined surface area of the conservancies, the inaccessibility to vehicles of areas characterised by dense bush and forest, and the difficulty of finding devil's claw populations in the midst of the dense vegetation cover. Based on the experience of the SHDC project, the expectation is that harvesting levels will reach, but not surpass, limits that would be set by quotas calculated on the basis of resource surveys if such were carried out (Cole, 2008c).

- agree with the buyer (exporter) and specify in the written agreement with the buyer, each year prior to actual harvesting, the total amount of devil's claw to be harvested and the purchasing price; and
- have developed and are using systems to ensure quality control and traceability.

The devil's claw management plans for the Nyae Nyae and N#a Jaqna Conservancies and for the Kyaramacan Association are reproduced in Annexes B and C. Established tools for harvester monitoring and for post-harvest impact assessment, which are used in the implementation of the devil's claw management plans, are shown in Annexes D and E.

Increasing extent to which devil's claw is sustainably harvested in Namibia

Tables 7 and 8 provide an overview and update of the increasing quantities of sustainably harvested devil's claw produced by organized operations and the increasing land areas under organised devil's claw production using sustainable harvesting methods, broken down by PPO. In the early to mid 2000s (when the SHDC project was the only organized devil's claw harvesting operation), quantities of devil's claw annually harvested under institutional and management regimes that use sustainable harvesting methods, promote equitable benefit-sharing and secure higher prices for harvesters were still quite small: less than 5,000 kg per year, or about 1% or less of total exports from Namibia shown in Table 2). In recent years, however, this proportion has increased substantially (by an order of magnitude), as a result of the significant expansion in sustainably harvested devil's claw produced by the Nyae Nyae and N#a Jaqna Conservancies and the Kyaramacan Association – PPOs that are all certified organic (see Section 7.2). Approximately 10% of all exported devil's claw now comes from organizations that harvest sustainably (and some of which are certified organic). PPO land areas covered by sustainable devil's claw harvesting project activities have increased from about 3,000 km^2 in the early 2000s to more than 20,000 km^2 now.

In the longer term, it can be expected that the proportion of sustainably harvested devil's claw will increase further, as an increasing number of conservancies and other PPOs take up devil's claw harvesting with training and capacity building support from the INP PPO Sub-Activity. A total of 26 PPOs[31] have been found eligible for training and technical assistance support during the first year of implementation of the INP PPO Sub-Activity (Nott, 2010). Aside from the four former SHDC project farms in the Omaheke Region, the Nyae Nyae and N#a Jaqna Conservancies (Otjozondjupa Region)) and the Kyaramacan Association (West Caprivi), this includes PPOs that are either already involved in the commercial devil's claw trade or have a significant local devil's claw resources that could be harvested and traded in commercial quantities.

[31] Including former SHDC project participants/resettlements farms, conservancies, community forests, and one association) across the Omaheke, Otjozondjupa, Caprivi, Kavango, and Kunene Regions

Table 7: Sustainable devil's claw dried side-tuber production/sales (kg)
(Sources: (Cole and Bennett, 2007); CRIAA SA-DC personal communications; D. Cole, personal communications)

Year	1999	2000	2001	2002	2003	2004	2005	2006	2007[32]	2008	2009	2010[33]
PPO												
Vergenoeg (Omaheke resettlement farm)		3,693.0	1,257.4	66.1	504.0	631.4	340.0	0		1,135.0		
Gemsbokfontein (resettlement farm)		382.0	266.7	443.9	350.0	211.6	327.0	0		0		
Tjaka Ben Hur (resettlement farm)		0	1,065.4	806.2	726.0	1,630.2	1,056.0	0		796.0		
Donkerbos Sonneblom (resettlement farm)		0	35.1	0	2,096.0	2,479.0	185.0	3,541.0		0		
All 18 resettlement farms in Omaheke (including the four farms listed above)	5,592.4	4,075.0	2,624.6	1,316.2	3,676.0	4,952.0	1,908.0	3,541.0		1,931.0	1,605.5	
Nyae Nyae Conservancy (Otjozondjupa)		0	0	377.0	0	0	0	1,100.0	8,678.0	18,721.0	6,527.0	
N#a Jaqna Conservancy (Otjozondjupa)		0	0	0	0	0	0	0	11,628.0	31,528.0	8,685.0	
Kyaramacan Association (West Caprivi)		0	0	0	0	0	0	0	0	24,896.0	18,215.0	
Total	5,592.4	4,075.0	2,624.6	1,693.2	3,676.0	4,952.0	1,908.0	4,641.0	20,306.0	77,076.0	35,032.5	

[32] Data not available for Omaheke resettlement farms (SHDC Project ended in 2006)

[33] Data not yet available

Table 8: PPO areas covered by sustainable devil's claw harvesting project activities (km^2)
(Sources: (Cole and Bennett, 2007); CRIAA SA-DC personal communications; D. Cole, personal communications)

Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
PPO												
Vergenoeg (Omaheke resettlement farm)	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0
Gemsbokfontein (resettlement farm)	99.92	99.92	99.92	99.92	99.92	99.92	99.92	99.92	99.92	99.92	99.92	0
Tjaka Ben Hur (resettlement farm)	595.39	595.39	595.39	595.39	595.39	595.39	595.39	595.39	595.39	595.39	595.39	595.39
Donkerbos Sonneblom (resettlement farm)	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	0
All 18 resettlement farms in Omaheke (including the four farms listed above)	3,070	3,070	3,070	3,070	3,070	3,070	3,070	3,070	3,070	3,070	3,070	595.39
Nyae Nyae Conservancy (Otjozondjupa)	0	0	0	9,003	9,003	9,003	9,003	9,003	9,003	9,003	9,003	9,003
N#a Jaqna Conservancy (Otjozondjupa)	0	0	0	0	0	0	0	0	9,020	9,020	9,020	9,020
Kyaramacan Association (West Caprivi)	0	0	0	0	0	0	0	0	0	3,700[34]	3,700	3,700
Total	3,070	3,070	3,070	12,073	12,073	12,073	12,073	12,073	21,093	24,793	24,793	22,318

[34] This excludes an estimated 40% of the surface area of Babwata National Park (overall size: 6,100 km^2) made up by the three "core areas" of the Park (from East to West: Kwando core area, Buffalo core area, and Mahango core area). In future, MET may allow devil's claw harvesting in the core areas as well, provided that legal (permit-based) harvesting takes place and registered harvesters demonstrate commitment to the devil's claw management plan and harvesters rules (ARD, 2008b).

How to address the problem of the remaining informal un-organised harvesting activity

While substantial further increases in sustainably harvested devil's claw production in Namibia can be expected to result from the INP PPO Sub-Activity, it cannot be assumed that these increases will be sufficient to fully meet variable international demand. Even if PPO training in sustainable devil's claw harvesting and sound devil's claw resource management turns out to be highly successful and with the best conceivable devil's claw permit awareness building, monitoring and enforcement effort (see Section 7.3), it is very unlikely that informal un-organised harvesting activity on open-access communal land will disappear completely any time soon. The remaining risk and level of un-organised harvesting activity will continue to vary in response to changing levels of demand, rising during boom years and falling during years of low demand. In order to address this "residual" problem by managing access to wild devil's claw populations on remaining open-access communal land, an adaptation to the conservancy model (called "stewardship" scheme) has been proposed (Bennett.2006). Key elements of this scheme are outlined in Annex F.

While the proposed CBNRM-type approach is relevant, developing such a scheme would take considerable effort and time. It is therefore unlikely that this scheme could play any significant role in the short- to medium term (during the implementation timeframe of the INP PPO Sub-Activity).

7.2 Certification

This section summarises important features of certification (organic and free-trade) and its relevance and limitations for organised sustainable devil's claw harvesting and sale. More details about certification are provided in Annex G.

There are various types of certification schemes, including organic certification and free-trade certification. Organic certification generally focuses on ensuring a holistic production management system that enhances agro-ecosystem health, while free-trade certification (and social certification more generally) focuses mainly on ensuring acceptable labour conditions and the distribution of benefits to those involved in production and trade.

One of the elements of the approach taken by the SHDC project, and by the more recent projects to organize commercial devil's claw harvesting and trade (Nyae Nyae and N#a Jaqna Conservancies and the Kyaramacan Association), to achieve sustainable harvesting methods and resource use, higher prices to harvesters, and improved benefit-sharing, is organic certification. The former SHDC project participants (Omaheke resettlement farms) were not able to renew their organic certification status shortly after the SHDC project ended in 2006. But the Nyae Nyae and N#a Jaqna Conservancies and the Kyaramacan Association, who are much larger organised devil's claw producers, are currently certified organic. This means that to date virtually all sustainably harvested dry devil's claw tuber material has been produced by certified PPOs.

Certification is a market-based instrument that can be used to ensure and demonstrate resource conservation and resource use sustainability. It has been suggested that a fundamental goal behind getting devil's claw production certified organic is to seek a "niche" market within the devil's claw sector (see Section 7.9), i.e. to "recapture some aspects of

value chain governance by offering the market a higher-priced product with additional embedded value for which the market would be willing to pay a premium price" (Cole and Bennett, 2007).

Reasons for the SHDC (and other projects) to choose organic certification (and not another type of certification) include:

- A market demand for organically certified devil's claw was identified.[35]
- Organic certification would help to capture a niche market which would result in higher prices being paid to harvesters for the product, and the perceived link between compliance with the certification standards and higher prices would motivate harvesters to manage the resource sustainably.
- Organic certification would guarantee resource sustainability, quality control, as well as economic and social benefits to the harvesters.
- Organic certification, as opposed to other forms of certification, would best reflect the sustainably harvested quality of the product and facilitate product traceability. Organic certification would also confirm that all ecological and administrative requirements (ecological surveys, harvesting quotas, proper book keeping, sustainable harvesting methods and post-harvest assessments) have been met.

However, while certifying a PPO may provide assurances to customers and the market that the PPO practices sustainable harvesting, quality control and traceability, certification is not necessary for PPOs to adopt such practices. The real value of certification lies in making it possible to capture a niche market, which results in higher prices paid for devil's claw. Unless such a niche market exists or can be developed, the benefits of certification are doubtful. In its current form, however, the devil's claw market is definitely not a niche market, as it fails all tests for product differentiation and supply control, two key elements for niche marketing, as argued in Section 7.9.

The value of certification under actual PPO operating conditions in Namibia is also uncertain on economic grounds. Calculations have shown that the cost of certification by an international certifying body like the Soil Association (about N$ 30,000 per year) equalled or exceeded the profit margin of the SHDC project and would have made certification economically unviable, had certification expenses not been covered by donor funds. The unfavourable cost-benefit balance in the case of the SHDC project suggests that certification does not make economic sense unless:[36]

- less expensive (but recognised and credible) certification services can be developed in the region or in Namibia; and/or
- substantially higher devil's claw production levels and profits can be attained.

[35] The situation has changed. Market demand for organically certified devil's claw has declined since then.

[36] Covering certification costs by using donor funds does not provide a sustainable solution, as the experience of the SHDC project shows. At best, it may serve as a stop-gap measure, allowing PPOs to buy time until they are able to attain higher production levels and profits.

The latter condition (substantially larger production and profits) apply to the more recent organised devil's claw initiatives (Nyae Nyae, N#a Jaqna and the Kyaramacan Association).

7.3 Regulating devil's claw harvesting, trade and export on the basis of a national policy and permitting system for devil's claw

Concerns over possible over-harvesting and the use of unsustainable methods of harvesting led the Government in 1975 to declare devil's claw a protected plant (initially covering only *H. procumbens* and later, in 2010, also *H. zeyheri*) and to introduce a permitting system for the plant. The scope of the permitting system was reduced in 1986 to cover devil's claw exports only. Renewed concerns over possible over-utilisation of the plant motivated the promulgation of a draft policy for devil's claw in 1999 which re-introduced permits for harvesting and trade. This draft policy and its regulatory provisions (permits) were in use for 10 years, until the policy was revised and finalized in 2010 (MET, 2010). The history of (attempted) regulation and control of the evolving devil's claw bio-trade in Namibia is described in more detail in Annex H.

An assessment, in 2003, of the effectiveness of the re-introduction of the harvesting permit system, as part of the draft policy of 1999, examined permits issued in the period from 1999 to early 2003 (Cole, 2003a). The assessment concluded that the draft policy was not well understood and that there was a significant level of non-compliance with existing regulations, due to a general lack of awareness on the part of both MET and the harvesters, characterized by misinterpretations and inconsistencies. The permit system was found not to be effective and therefore not contributing to improved resource management, although it was recognised that the context in which harvesting takes place was a difficult one, making effective implementation of harvesting permits a real challenge.

The new policy ("National Policy on the Utilization of Devil's Claw (*Harpagophytum*) Products 2010") clarifies, refines, and operationalises certain provisions of the draft policy, as follows (MET, 2010):

- it establishes clear operational procedures for what traders and exporters must do to register with MET, as required;
- it stipulates a harvesting season (01 March – 31 October); and
- it refines existing permitting procedures in order to facilitate traceability of material -- specifically, it establishes clear operational procedures for traders and exporters to keep records of all transactions, indicating, *inter alia*, where (in which harvesting areas or trading locations) material was obtained.[37]

The stated aim of the new policy is "to provide a framework for addressing sustainable management of the resource as well as effectively promoting both biodiversity conservation and human development". The objective of the policy is "to outline a control mechanism that will allow MET to:

[37] Linking permits for traders to specific harvesting locations from which to purchase devil's claw is important not only for traceability but also to prevent situations where continuing parallel informal trade undercuts organised harvesting by PPOs.

- closely monitor the utilization of devil's claw;
- ensure that sustainable harvesting methods are used;
- collect information to facilitate management of, and appropriate trade in, devil's claw resources; and
- promote value addition in Namibia."

Among the eight principles on which the Policy is based, the 3rd principle captures the essence of its regulatory intent as follows: "wild harvesting of both species of *Harpagophytum* is allowed provided sustainable harvesting methods are used and harvesting and trade are done with the appropriate permits". Strategies to implement the Policy as well as objectives and underlying approaches are summarized in Annex I.

The new Devil's Claw Policy is ambitious in its aim, objectives and strategies and comprehensive in scope. If fully implemented, the Policy could go a long way to formalizing and organizing the devil's claw trade and ensuring traceability of harvested materials and sustainable harvesting methods in Namibia. However, the extent to which MET will be able to make this Policy work in practice remains to be seen. Ensuring compliance with the stipulated operational procedures (for the registration of traders and exporters and for permit applications and renewals of harvesters, traders, transporters and exporters) and with related information requirements (through report-back of harvesters, traders and exporters) will be no small task, given the number of actors involved ((up to) 8,000 harvesters, close to 100 traders, and 5 exporters), the remoteness of many of the areas where harvesters and traders operate, and low levels of education and resources among many of the harvesters.

Implementing the Policy effectively will require a considerable administrative, monitoring, enforcement, and (internal as well as external) awareness- and capacity-building effort on the part of MET which, in turn, will require sufficient human and financial resources to be mobilized and allocated, combined with the necessary political backing and institutional commitment. None of these ingredients for implementation success can be taken for granted, but all will be needed if the Policy is to improve on the poor levels of compliance with the regulations of its predecessor, the draft policy of 1999.

On the other hand, the increasing extent to which harvester groups are organised will assist MET in monitoring harvesting activities and implementing the Policy.

7.4 Proposal to list devil's claw on Appendix 2 of CITES[38]

International concerns over possible over-harvesting and unsustainable use of the devil's claw resource in the range states of Southern Africa triggered by increased levels of market demand for devil's claw, led the Government of Germany during the 11th Conference of Parties of CITES in 2000 (CoP 11; 2000) to propose listing *H. procumbens* under Appendix 2 of CITES.[39] [40] The proposal was withdrawn due to opposition from the range states, who,

[38] This section draws heavily on (Stewart and Cole, 2005)

[39] CITES (Convention on International Trade in Endangered Species) is an international legal instrument for the protection of internationally traded threatened or endangered (plant and animal) species.

inter alia, argued that little if any devil's claw harvesting was taking place on freehold farms even though they were home to significant devil's claw resources and that therefore no threat to the species existed. The range states requested additional time to be able to further research the species' biological status and assess the impact of its commercial trade on wild species populations and harvesters' incomes (Raimondo *et al*, 2003). In response, the CITES Plant Committee was instructed to commission suitable expertise to collect available biological and trade data, conduct an assessment and prepare a report for consideration by the Committee. An assessment report was submitted to the Committee at its 12th meeting in 2002. This meeting did not dwell on the merit of an Appendix 2 listing, but turned to a discussion of a possible listing under Appendix 3 of CITES. [41]

Later in 2002, CoP 12 continued the discussion on devil's claw, even though *H. procumbens* was not listed under any of the CITES Appendices. Three decisions were taken by the Parties:[42]

- The range states were called upon to "provide an update on their policies and management programmes for *H. procumbens*" (Decision 12.63);
- The range states and importing countries were called upon to "negotiate with the devil's claw industry to obtain support for management programmes that promote sustainable use and the development of communities that are managing the resource" (Decision 12.64); and
- The range states were urged to "explore how processes and mechanisms in other international treaties can be used to provide support for sustainable resource use and fair trade" (Decision 12.65).

Shortly thereafter, two Namibian stakeholder groupings dealing with devil's claw pronounced themselves on the issue of CITES protection for devil's claw. At a National Devil's Claw Stakeholder Workshop in November 2002, participants recommended against an Appendix 2 listing, but agreed to reconsider the issue. The Namibian Devil's Claw Working Group also opposed an Appendix 3 listing on the grounds that this would send the wrong signal to buyers who would likely be reluctant to buy a natural product derived from a species that is listed as endangered. This, they argued, would depress market demand and harm the livelihoods of harvesters.

At the 14th meeting of the CITES Plant Committee held in 2004, South Africa reported on positive action that had been taken in response to CoP decisions. Namibia and Botswana referred to their own measures toward managing the trade sustainably, pointing out that

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[40] Listing of a plant or animal species under Appendix 2 of CITES provides for mandatory licensing of trade in any wild or cultivated material derived from the species by both exporting and importing countries, so as to be able to monitor the quantities of the material being traded.

[41] Appendix 3 listing of a plant or animal species provides for the monitoring of trade in any wild or cultivated material derived from the species, from the exporting country all the way to the importing country, with the latter required to maintain records of all imports of the material.

[42] Importing countries were also requested to monitor devil's claw imports and report on them to CITES, although this was not done.

they had been developed and implemented prior to any CoP decision. All three range states argued in unison that they had fulfilled their obligations and that any further action should best be pursued outside the CITES framework. The Committee accepted this argument and recommended that the next CoP delete Decisions 12.63, 12.64, and 12.65. This recommendation was approved by CoP 13 in 2004.

In hindsight, even though the proposal to list devil's claw under Appendix 2 of CITES was withdrawn in 2000 and never revived, it may have had an impact, at least a temporary one, on the international market for devil's claw. For instance, the dip in demand in the year 2000 (see Table 3), some have argued, can be interpreted as a reaction of the market to the proposal to list devil's claw under CITES. It is also possible that the listing of devil's claw, or the perceived possibility thereof, is used by competitors as a way to try and increase the market share of their products to the detriment of devil's claw products (Cole.2003b). Finally, the proposal to list devil's claw may have given renewed impetus to attempts to domesticate and cultivate devil's claw (see Section 7.5) and perhaps strengthened sentiments within the pharmaceutical industry against relying on wild-harvesting and in favour of securing cultivated supplies instead.

7.5 Devil's claw domestication, cultivation and enrichment planting

What is cultivation and enrichment planting?

Cultivation of devil's claw entails growing devil's claw from seed, either by sowing seeds in the soil of the plot that has been dedicated for devil's claw cultivation or by planting seedlings, raised in nurseries from devil's claw seed, in the cultivation plot. Sowing seeds to grow devil's claw in a dedicated plot may not be the best method of cultivating devil's claw, as germination rates generally are low and plant densities would be uneven. For this reason, and in order to protect very young plants, the preferred method for devil's cultivation is to raise seedlings in nurseries and then to plant these seedlings out in the cultivation plot. When seedlings are planted out (or seeds are sown), it is important to ensure proper spacing between plant stations, given that devil's claw is a creeping plant. Normally plant seedlings are planted out (or seeds are sown) in rows, and this technique (strip cultivation) is required where drip irrigation is used.

Enrichment planting of devil's claw entails sowing or broadcasting devil's claw seeds, or planting out devil's claw seedlings that have been raised in nurseries, in areas where devil's claw occurs in the wild in order to enrich naturally occurring devil's claw populations before these may be targeted for organised wild-harvesting at an appropriate later time. The preferred method for enrichment planting is to plant out devil's claw seedlings, as this enhances the extent to which enrichment actually takes place, given the greater likelihood that plants will establish themselves and grow in the wild. By comparison, sowing or broadcasting seeds saves efforts and costs, but the extent to which enrichment actually takes place remains much more uncertain because of the low seed germination rates and the lack of protection of very young plants in the wild.

In order to improve chances of achieving substantial, lasting enrichment of naturally occurring devil's claw populations, it is important that the location targeted for enrichment is actively managed, at least during the initial stages, to reduce competition from other

vegetation for water and nutrients and to remove threats to plant growth and survival from the grazing of domestic animals. Such active management may include de-bushing the location, removing tall grass from areas where seedlings are planted out (or seeds are sown), and keeping grazing animal away from the young plants by erecting fences.

Debate about the impact of devil's claw cultivation on harvesters

As hinted in the Section 7.4, the international discussion about the advantages and disadvantages of listing devil's claw under CITES may have brought into sharper focus the debate about already ongoing efforts to domesticate and cultivate devil's claw. Two opposing scenarios about the effects of cultivation on wild-harvesting and the well-being of the wild-harvesters crystallized in the debate ((Cole, 2003a) and (Cole, 2003b)).

In the context of the proposed CITES listing, one scenario saw cultivated material being preferred by international buyers to wild-harvested material on the grounds that cultivation would solve problems of sustainability of supply and avoid negative perceived risks of resource degradation and socio-economic exploitation of poor harvesters. The scenario also assumed that rural harvesters would not have the capital, technology and access to land required for larger-scale commercial cultivation. Finally, it was considered likely that the cultivation methods which were being developed would succeed elsewhere in the world, under more favourable climatic, human resource and institutional conditions, rather than in the range states. This would make the expropriation of the rights of the original providers of the traditional knowledge complete, with the commercial farming and pharmaceutical sectors coming out as winners.

The other scenario started from the assumption that devil's claw domestication and cultivation could have a positive impact on the livelihoods of the rural harvesters if appropriate approaches and methods were used. Appropriate domestication and cultivation under the control of the rural harvesters, for instance, could actually increase their resource base, thereby improving prospects for their continued participation in the devil's claw trade. An appropriate cultivation effort might also offer an opportunity to "rehabilitate" over-harvested and/or unsustainably harvested areas or to improve the local resource base for greater sustainable harvesting returns (enrichment planting). It is pursuit of this latter scenario that in recent years has led to pilot initiatives of appropriate cultivation and enrichment planting in Namibia.

Cultivation approaches and initiatives to date

Devil's claw can be propagated from seed, vegetatively (from cuttings) or in vitro. Efforts to grow plants from seed have had little success because of the high degree of dormancy of the seed and the very low germination rates (rarely more than 1%). Successful cultivation efforts have involved micro-propagation techniques and attempts to domesticate the species. However, plants produced from cuttings do not produce a primary tuber, so that the plants cannot reproduce and hence can be harvested only once (Stewart and Cole, 2005).

In South Africa, a technique to cultivate devil's claw without irrigation or artificial fertilizers has been developed (von Willert and Sanders, 2004). Some of the previous cultivation

initiatives in South Africa and Namibia that have meanwhile been discontinued include (Cole, 2008a):

- Government of South Africa – cultivation project since 2006; transplanting tap roots into a fenced area and use of some cuttings; 40 hectares to be fenced and processing and storage facilities to be constructed;
- Prof. Dieter von Willert, South Africa – initiated cultivation project on a farm based on strip cultivation method that he developed in Namibia and South Africa; and
- University of Namibia – small research effort into devil's claw cultivation in the Okakarara area.

Exploratory activities in appropriate cultivation and enrichment planting in Namibia

Efforts are underway in Namibia to investigate the potential for appropriate cultivation and enrichment planting on communal land. A workshop was held in September 2003 to develop a strategy for appropriate cultivation and enrichment planting, and trial sites were established at the Ben Hur Development Centre (Omaheke Region) and in Okondjatu (Wild Dog Conservancy, Otjozondjupa Region) in early 2004. The idea behind these trials was to develop appropriate cultivation and enrichment planting methods for rural communities in order to ensure their continued participation in the devils claw trade (Cole and Stewart, 2005).

Current efforts of cultivated devil's claw production and enrichment planting

Cultivation is currently being pursued by at least one private farm in South Africa and one private farm in Namibia, while enrichment planting has taken place on selected communal-area conservancies in Namibia.

Cultivation in Namibia and South Africa

As far as cultivation is concerned, current production levels in Namibia are very small. A significant production effort has been made by one private farmer, with the first harvest expected this year (2011) (Gero Diekmann, personal communication 15 March 2011). The level of production expected for 2011 from this farm will be less than 1% of the annual devil's claw exports. In comparison, production levels in South Africa have been an order of magnitude higher.

Devil's claw cultivation faces a number of challenges, which explains the rapid turnover in cultivation initiatives (Cole, 2008a):

- There is a relatively long waiting period (at least 2-4 years, depending on agro-ecological conditions and rainfall)[43] before harvesting happens and returns on investment can be realised;
- Cultivation requires high levels of capital investment (laboratory equipment, greenhouse, field preparation, etc)

[43] The minimum waiting period before the first tubers can be harvested may be as little as 2 years (Mallet, personal communication, April 2011) or as much as 4 years or more (Cole, 2008a), depending on agro-ecological conditions and actual rainfall.

- Current production costs are much higher than current market prices
- It is difficult to achieve economies of scale necessary to cover production costs, let alone make a profit
- Further technical work is necessary on losses in seedlings on transplanting, disease control, varying growth rates, and yields
- Relatively high levels of skills and management are required

Enrichment planting in Namibia

Small-scale enrichment planting has been taken up in collaboration with two conservancies in Namibia – African Wild Dog and Nyae Nyae. As part of the enrichment planting effort that has been taken place at the African Wild Dog Conservancy, a nursery has been established at Okondjatu in the Otjozondjupa Region, Namibia, and two field trial plots have been established (total area: ~ 2.5 hectare). At the first plot, some 2,300 seedlings were transplanted in October 2004 and February 2005, and some 1,000 seedlings in November 2005 at the second plot. Between 1/3 (plot 2) and 2/3 (plot 1) of the seedlings showed positive growth (Cole.2008).

Enrichment planting efforts with rural communities should remain on the agenda. There is evidence of over-harvesting and significant reductions in the devil's claw resource base in certain open-access communal areas in Namibia. These areas could be rehabilitated using enrichment planting techniques, or alternative supplies could be provided from cultivated devil's claw. Appropriate cultivation could also help to expand devil's claw supplies, particularly during years when international demand for devil's claw is higher than average.

Overview of current cultivation and enrichment planting efforts

Table 9 summarises current cultivation and enrichment efforts and (in the case of cultivation) indicates estimated levels of production.

Table 9: Devil's claw cultivation and enrichment planting efforts; Sources: ((Cole, 2008a) and Gero Diekmann, personal communication, 15 March 2011)

Entity	Activity/Level of Production		
	2008	**2009**	**2010**
Cultivation (on private farms)			
Gert Olivier, private farmer (South Africa)	19,000 kg	19,000 kg (estimated)	25,000 kg (estimated)
Gero Diekmann, private farmer (Namibia)	None	None	None (First harvest in the range of 1,000 – 1,500 kg is envisaged for 2011
Enrichment planting (in communal areas)			
African Wild Dog Conservancy (Namibia)	None	Modest numbers seedlings produced in nurseries planted out in the wild for purposes of enrichment planting	
Nyae Nyae Conservancy (Namibia)	None	Modest numbers seedlings produced in nurseries planted out in the wild for purposes of enrichment planting	

7.6 Coordinated strategy and collective action at national and regional levels[44]

The SHDC Project has demonstrated the impact of collective strategy and action at the primary producer level in terms of enhanced production, trade, and livelihoods. Similar positive effects are to be expected from coordinated strategy and joint action at national and regional levels, to the extent such a strategy is feasible. Not least, national and regional actors might be able to enhance their bargaining power vis-à-vis overseas processors and manufacturers and correct the prevailing power asymmetry to their advantage.

At the national level, if the handful of Namibian exporters joined forces to exchange export market and price information and coordinate their positions and actions, they could strengthen their negotiating position vis-à-vis the buyers, collectively achieve better export prices, and retain are higher share of benefits in Namibia. Several attempts to establish a devil's claw traders' association in Namibia have failed, however, indicating a lack of commonality among the exporters.

Regionally, harvesters and exporters in the three Range States have much to gain from harmonizing devil's claw policies and strategies and from taking concerted action, and suspected illegal cross-border trade from Angola suggests that it would be wise to include Angolan stakeholders in such efforts at regional coordination and cooperation as well. But each country situation is different and national interests, to the extent they have been

[44] This section draws on (Krugmann, 2007)

articulated, differ.[45] Germany's proposal to list devil's claw on Appendix II of CITES galvanized the Range States into adopting a common position opposing the listing. This contributed to the formation of a Devil's Claw Range State Working Group (DCRSWG).

The DCRSWG were operational for some time during which, *inter alia*, they commissioned a study into the feasibility of improving the value chain for devil's claw (Bennett, 2006). This study came up with a number of recommendations on how to increase benefits from production and trade that accrue to the Range States and how to bring about relocation of power within the devil's claw value chain to the level of the Range States. However, the early momentum could not be sustained, and DCRSWG is now dormant.

7.7 Adding value to devil's claw production within Namibia

One of the ways in which a greater proportion of the overseas retail value of devil's claw products could be captured in Namibia is by adding value to devil's claw material before it is exported. To date, apart from the initial post-harvest slicing and drying, very little value is added to harvested devil's claw tubers in Namibia. However, between 60% and 80% of all devil's claw exported from Namibia goes to buyers that do no more than cleaning, grading, pre-processing (grinding) and repacking the material (Cole, 2003b). Most, if not all, of these initial testing and processing steps could easily be done in Namibia, which highlights the potential for increased value addition in the country.

In more specific terms, options to add value to devil's claw production by locating assessment, testing and processing steps within Namibia include (Shawe, 2006):

- Devil's claw quality assessment to demonstrate quality standards for exported material, with regard to criteria laid out in the European Pharmacopoeia:
    - Content of Harpagoside and other biologically active marker compounds;
    - Taxonomic identification to distinguish between *H. procumbens* and *H.zeyheri*
    - Microbiological assessment: presence of bacteria and fungi
    - Levels of aflotoxin contamination
    - Moisture content
    - Levels of radioactivity
    - Levels of heavy metals and arsenic contamination
    - Levels of pesticide residues
    - Levels of foreign organic matter
    - Presence of starch

[45] Namibia has produced and exported more than 90% of the regional DC product, up to 8,000 poor families depend on DC harvesting for their livelihoods, and a national harvesting permitting system has been reintroduced to ensure sustainable harvesting. Botswana has some harvesting and export controls in place and has marketed some of their devil's claw through Namibia. Some problems arose as a result of Namibian producers selling at lower prices than their Botswanan counterparts, due to lower transport costs. South Africa has been mainly importing and re-exporting DC as well as developing DC cultivation methods. And with the end of the civil war in Angola, this country seems to have become a source of cheap devil's claw for illegal cross-border trade, potentially undermining regular, organized harvesting, trade and export from Namibia and to a lesser extent the other range states..

    - Levels of adulteration of side tuber material (e.g. with pieces of devil's claw tap root;
- Developing a national grading system to classify harvested tuber material by the level and variability of Harpagoside content, so as to produce standardised grades, fetching higher prices, for specific markets;
- Value-added processing in different forms, such as:
    - Milling – combined with prior quality assessment and mixing of different batches to ensure more consistent (standardised) Harpagoside content
    - Producing tea grade material
    - Producing powders of standardised quality
    - Manufacturing standardised extracts.

Some options are clearly more feasible than others. Quality assessment to meet quality standards would require ISO accreditation for the national laboratory carrying out the required assays and tests as well as separate accreditation for each of the methods of analysis used. Achieving such accreditation would be quite an expensive process.

Developing and running a national grading system would require a coordinated approach to the production, marketing and trade of devil's claw, involving considerable financial and organisational support from the government or a devil's claw trade association. One of the ways this might be done, which is discussed in the next section, is by treating devil's claw as an agricultural commodity, establishing an organization to represent the devil's claw industry and developing the devil's claw industry in a systematic comprehensive manner, on the basis of known and tested models that have been applied to agricultural commodities.

Some value-added processing steps (such as milling) could easily be done in Namibia, while there would be little if any capacity at present for other value-added processing steps (such as manufacturing of standardised extracts).

Generally, attempting to export value-added products, instead of the raw material (sliced and dried tubers), will not work if overseas buyers cannot be convinced that this is in their interest or persuaded otherwise to accept importing value-added products. The acceptance of buyers is unlikely to be forthcoming, unless the global devil's claw market can be turned from a market controlled by buyers into a market controlled by sellers (see section 7.9).

7.8 Declaring devil's claw a controlled product under the Agronomic Industry Act[46]

Given the history of a lack of cooperation and coordination among Namibian exporters and other stakeholders having a stake in the devil's claw trade, the idea of establishing a consolidated marketing organization for devil's claw in Namibia was welcomed by stakeholders interviewed during the Namibian National Devil's Claw Situation Analysis. Participants at the Devil's Claw Stakeholder Workshop held in November 2002 discussed whether to establish a Devil's Claw Board within the framework of the Agronomic Industries Act (Cole, 2003a).

[46] This section is based on (Shawe, 2006), Section 7.

The Agronomic Industry Act of 1992 makes provision for the declaration of a 'Controlled Product' – an agronomic product derived from the processing of an agricultural crop. For each controlled product, there is an Advisory Committee representing the industry, which operates under the umbrella of the Namibian Agronomic Board (NAB), the statutory body responsible for implementing the Act. NAB has regulated and marketed different 'controlled products' in Namibia, with a view to import substitution/reduction, but has also developed a regulatory and marketing model aimed at promoting exports of 'controlled products' that may be useful for devil's claw.

If devil's claw were to be gazetted as a controlled crop, the National Devil's Claw Working Group (DCWG), which was established at a Devil's Claw Stakeholder Workshop in November 1999 and formally constituted by MET in 2000, could become the Devil's Claw Advisory Committee. Getting devil's claw gazetted would require a consultative process within the industry to get agreement on the conditions for export and import, obtain a reasonable consensus on the willingness to pay a levy to fund the operation of the Advisory Committee, and generally get a sense of needs and priorities across industrial actors. Of the funds raised by the levy, 60% go to NAB and 40% back to the industry. NAB levies for controlled products have typically been small (around 1% or less).

The problem is that such a percentage would not work for the devil's claw industry, since the volume of the trade would currently be too small to raise sufficient funds for NAB to administer the controlled product (and run an Advisory Committee). For this reason, it has been suggested (Shawe, 2006) that devil's claw might be lumped with other non-timber forest products to establish an overarching industry regulation and promotion structure.

Advantages of gazetting devil's claw as a controlled product would include:

- Potentially much better tracking and traceability, since border controls can be set up under conditions set by the industry, all imports and exports require a permit from NAB, and the NAB has a border post inspection mechanism;
- Synergy, sharing resources and greater controls of imports and exports through working with other commodity groups; and
- Advice available from NAB on database development, foreign trade, accounting and legal issues, and regulatory and business plan development.

7.9 Capturing a global niche market for devil's claw[47]

The devil's claw market in its current form fails all tests for product differentiation and supply control, two key elements for niche marketing (i.e. creating economic space for differentiated products in markets):

- Devil's claw harvesters are largely 'price takers', rather than 'price makers', as their product is sold as one undifferentiated quality.
- There is no connection between consumer needs/preferences one the one hand and harvesting on the other, given the fragmented nature of the value chain.[48]

[47] This section is based on (Cole and Bennett, 2007)

- The devil's claw sector has never collaborated, and no actor in the market has ever managed to grow large enough to allow for his product to be differentiated.[49]
- As the certified product constitutes only a small percentage of the total supply, consumers have not been sufficiently motivated to differentiate.[50]
- With regard to freeloading (through imitation or misrepresentation of products), the devil's claw sector has also failed to maintain a niche.[51]
- The devil's claw sector has been unable to control supply.[52]

The Namibian devil's claw value chain should be upgraded, with the aim of empowering harvesters and moving the product into a new niche. The upgrading should be done in two ways:

a) Governance of the value chain should be re-assumed in order to recover ownership and relocate the driver of the chain back with the producer – as would be achieved through the development of a secure organic and fair trade production chain. There are three dimensions to this upgrading:
    i. Management of supply to sustain the global price (the market will not grow);
    ii. Achieving conducive relative shares between the three devil's claw markets (human herbal remedy, veterinary herbal remedy, and herbal tea), in line with market dynamics;
    iii. Move devil's claw supply from its current mode of predominantly being unsustainably wild-harvested and untraceable to a standard mode of being sustainably wild-harvested, and fully traceable -- a goal to which the INP PPO Sub-Activity is expected to contribute significantly.
b) Extracts and branded ingredients should be locally produced.[53]

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[48] In 2001 it was discovered that the entire supply of organically certified Devil's Claw from the SHDC project was sold to an operation that was not producing an organically certified product. The buyer was prepared to pay a higher price for the organic product in the full knowledge that that no additional benefit would accrue to the company as a result. This is important because it broke the link between the product, producer and consumer that is an essential element of successful niche marketing.

[49] The fact that lead buyers jump between the main exporters is evidence that differentiation is not possible at this level.

[50] This is reflected in the fact that most of the organically certified devil's claw has been co-mingled after export.

[51] When *H. procumbens* export prices rise, some traders mix in *H. zeyheri*, thereby undermining product qualities the market wants. There is evidence that some of the certified organic devil's claw has been adulterated, which puts at risk even this limited niche market.

[52] Increasing harvesting and adulteration at times of high market prices transfers power to producers of end products. Undersupply of organic devil's claw fails to influence the market at all.

[53] Local extraction may require a combination of extractable products to share the overhead costs of an extraction facility and achieve economies of scale.

8. Social Impacts from "Traditional" Informal and Ongoing Organised Commercial Harvesting and Trade and with the INP PPO Sub-Activity

Against the background and context presented in Sections 2-5, this section identifies and discusses social impacts (both positive and negative) resulting from ongoing commercial devil's claw harvesting, trade and export generally and the INP PPO Sub-Activity in particular. Special attention is given gender issues and impacts and to the role and integration of women and vulnerable groups in the commercial use of devil's claw. Social impacts from "traditional" informal devil's claw harvesting and trade, already ongoing organised devil's claw harvesting and trade, and the INP PPO Sub-Activity are identified and discussed in Sections 8.1, 8.2, and 8.3, respectively.

8.1 Social impacts from traditional informal devil's claw harvesting and trade

Generally, it is well known that women and disadvantaged groups (e.g. marginalized ethnic groups) play a major role and are substantially involved in "traditional" unorganised devil's claw harvesting. However, specific gender roles and relative roles of disadvantaged/ vulnerable groups vis-à-vis other groups, are not well understood in harvesting communities. More research would be needed to better understand the gendered context and the nature/degree of participation of women and disadvantaged/ vulnerable groups in devil's claw harvesting and trade across these communities.

8.1.1 Positive impacts

The principal positive social impact from "traditional" commercial devil's claw harvesting and trade has been the cash incomes and in-kind benefits earned by thousands of resource-poor and often marginalized harvesters in Namibia, in particular men and women belonging to different marginalised ethnic sub-groups of the San, who typically have few if any other sources of income. Even though the incomes and benefits derived from informal unorganized harvesting and selling of devil's claw are very low, they tend to supplement other income sources and diversify livelihoods and (in times of hardship) may be critical to survival.

8.1.2 Negative impacts

The informal unorganized form of "traditional" devil's claw harvesting leaves the harvesters in a very weak bargaining position and often desperate to sell, for which reason they usually receive extremely low prices (much lower than the prices they could get if they organised themselves). Therefore, "traditional" harvesters' incomes are far below the incomes they could earn if they organised themselves.

8.2 Social impacts (positive and negative) associated with ongoing organised commercial harvesting and trade[54]

To date, commercial devil's claw harvesting and trade of dried and sliced devil's claw side-tubers in Namibia has taken place principally in four Regions: Omahake, Otjozondjupa, Caprivi and Kavango.

[54] This section draws heavily on (den Adel, 2010)

Generally, the main positive impact from organised commercial devil's claw harvesting and trade, compared to "traditional" informal devil's claw harvesting and trade, has been that it has provided those relatively few of the marginalised and resource-poor harvesters and traders in Namibia who have had the chance of participating in one of the organised schemes, with greater and more predictable and secure incomes and with enhanced/more diversified livelihoods compared to the incomes and livelihoods they would have enjoyed had they not been organised and compared to the incomes and livelihoods enjoyed by other informal unorganised harvesters in other locations.

In what follows, gender issues, aspects relating to the involvement of women and vulnerable groups in commercial devil's claw trade, and specific positive and negative impacts on women and vulnerable groups, are discussed for each one of these regions, based on the diagnosis of the Gender and Social Integration Plan (den Adel, 2010). The involvement of and impacts on women and vulnerable groups are examined from various perspectives including:

- Nature/degree of participation in harvesting and primary processing of the devil's claw;
- Nature/degree of participation in the selling of devil's claw;
- Extent to which benefits from harvesting and sale of devil's claw are equitably shared;
- Access to the devil's claw resource and to the land from which it is harvested;
- Degree of participation in decision-making processes – through representation in the relevant resource management committees

The discussion below is limited by the general lack of data and information on gender, vulnerable groups and the socio-economic conditions of the households and communities involved in commercial devil's claw harvesting and trade. The discussion identifies various important gender and socio-economic issues on which there is currently not enough information. Given limited understanding of these issues, further research is required to develop relevant and effective strategies to address these issues. Examples of issues for which further research is required are:

- In the Omaheke Region (resettlement farms), how can the underrepresentation of women among the San harvesters, relative to other ethnic groups, be explained? Does it reflect exclusion of women by men and/or traditional gender roles, or does it reflect that San women have other (better) livelihood options?
- Again in the Omaheke Region, is there possibly any (latent) ethnically based discrimination taking place that might affect the livelihoods of weaker San groups?
- In the Otjozondjupa Region (Herero conservancies), what are the informal "contractual" conditions governing the hiring, by influential middlemen, of young Owambo, Kavango and San men as harvesters and how can the situation be improved?

8.2.1 Omaheke Region

In the Omaheke Region, sliced and dried devil's claw *(H. procumbens)* is being produced on four resettlement farms (*Vergenoeg*, *Gemsbokfontein*, *Tjaka Ben Hur*, and *Donkerbos Sonneblom*) where organized harvesting was initiated under the Sustainably Harvested

Devil's Claw (SHDC) project in the late 1990s. Devil's claw is found both inside and outside of these farms, and all residents (men and women) have access to the resource. In the case of one of the farms (*Donkerbos Sonneblom*), the main resource is located far from the inhabited area. This forces harvesters to camp out in groups when harvesting devil's claw. Associated security concerns appear to give men a special role in devil's claw harvesting. Indeed, In the exclusively San-inhabited *Donkerbos Sonneblom* farm where devil's claw harvesting involves camping out for better resource access, all registered harvesters are men, although the slicing and drying of the harvested side-tubers is often done by women.

Both men and women harvest devil's claw on and around the resettlement farms, but in the case of two of the farms the rule exists that only one member per household is allowed to register as a harvester – in the case of male-headed households, usually the man. This can have implications for intra-household distribution of income from devil's claw and can lead to conflict, as only one household member (usually the man in male-headed households) gets paid directly by the buyer, although the harvesting and processing work may be shared between household members.

The representation of many different ethnic groups, including indigenous minorities, on the resettlement farms and among the harvesters (see Table 10) raises questions of whether there may be ethnically based tensions and exclusions, including possible ethnic discrimination with regard to access to and sharing of benefit from devil's claw. Although no *prima facie* evidence of such problems exists, this aspect needs to be investigated further. Among the ethnic groups present on the farms, it is the San who tend to have the fewest livelihood options and hence the greatest interest in harvesting and selling devil's claw as a source of income. It is the San, therefore, who would likely be the most vulnerable to any form of ethnic discrimination and exclusion.

Table 10: Ethnic mix among devil's claw harvesters on Omahake resettlement farms (Source: (den Adel, 2010))

Resettlement farm	Proportions of ethnic groups among devil's claw harvesters
Vergenoeg	San: 50% (of whom 60% Nharo and 40% Ju'/hoasi); Damara: 50%
Gemsbokfontein	Damara: 90%; San: 10% (all Nharo)
Tjaka Ben Hur	Tswana: 65%; San: 15% (all Nharo); Damara: 15%; Owambo: 5%
Donkerbos Sonneblom	San: 100% (all Ju'/hoasi)

Among the San, fewer women than men are registered as harvested. Reasons for this under-representation of women among registered San harvesters, compared to the more favourable gender balance among registered harvesters of other ethnic groups (specifically, Damara and Tswana), are not clear. Field experience of service providers suggests that San women generally are less empowered compared to women of the other ethnic groups, but it is also possible that some of the San women may have other more lucrative ways of earning an income, like making and selling crafts. This issue needs to be further researched before strategies are developed to improve the livelihoods of San women. Decision-making

structures for devil's claw harvesting and sale currently are reasonably gender-balanced across the four resettlement farms. On two of the farms (*Vergenoeg* and *Ben Hur*), coordinators appointed to facilitate registration of harvesters, organize group harvesting permits, and generally oversee devil's claw related activities, devil's claw coordinators, are currently women, while on the other two farms (*Donkerbos* and *Gemsbokfontein*) that are men. One of the two female coordinators has led, since 2005, the only elected devil's claw committee that is currently in place on any of the farms. Decision-making processes seem to be working, but the level of participation in meetings has been on the decline.

8.2.2 Otjozondjupa Region

The Otjozondjupa Region is home to seven conservancies where devil's claw is harvested. Two of them are "San conservancies" (*Nyae Nyae*, inhabited by Ju'/haosi, and *N#a Jaqna* predominantly inhabited by !Kung), while the remaining five conservancies are "Herero conservancies" (*Ondjou, African Wilddog, Okamatapati, Ozonahi*, and *Otjituuo*).

In the two San conservancies, all harvesters (men and women) have access to the resource, and both men and women can register as harvesters. Currently, about half of the registered harvesters[55] are women. With the "one member per household" rule in place, as in the case of the resettlement farms in the Omaheke region, there is a risk of intra-household income from devil's claw concentrating in the hands of the sellers (often men), without reflecting harvesting and processing work inputs from other members of the household. Conservancy Management Committees (CMCs), which have overall responsibility for devil's claw (organization of group harvesting permits, signing of purchase agreements with exporters, etc), are reasonably gender-balanced.[56] Occurrence of informal harvesting and selling of devil's claw outside of the established institutional channels implies lower prices and loss of income to these and other harvesters, but the extent to which this is happening is not known and requires further attention.

In the five Herero conservancies, access to land and natural resources by the poorer members (including devil's claw) is increasingly affected by wealthy cattle farmers (illegally) fencing off more and more land with the open or tacit agreement of the Traditional Authorities – as much as 35% of all conservancy land is fenced off already. Devil's claw harvesters are poorly organized. It is richer farmers, business men, senior councillors and other influential men in the conservancies who obtain harvesting permits, while less advantaged people often cannot afford the cost of transport to the nearest MET office or the cost of the permit. All permit holders are Herero men who usually don't harvest themselves but act as middlemen. They informally hire younger Owambo, Kavango and San men (farm workers, conservancy members, or residents of nearby towns) to do the work for them. There is a risk that these informal working relationships are exploitative in nature. Hiring practices need to be further examined and better understood before the situation can be improved.

[55] 2009 figures: 287 registered harvesters in Nyae Nyae, and 420 registered harvesters in N#a Jaqna

[56] In 2007, the CMC of the N#a jaqna conservancy was comprised of eight men and four women, while that of the Nyae Nyae conservancy consisted of 16 men and 5 women.

8.2.3 Caprivi Region

Organised devil's claw harvesting activity currently takes place only in the Bwabwata National Park, within a management framework developed under the Kyaramacan Association. Both men and women can register as harvesters and have done so in approximately equal numbers. All harvesters sell devil's claw and receive their money on an individual basis. It is not known how much work is shared within the households and how the income is shared amongst family members. An unknown amount of devil's claw is being sold outside the established institutional channels, but this situation has improved considerably with training and capacity building. Generally, societies and communities in the Caprivi Region tend to have social structures characterized by strong male leadership, with women tending to have corresponding less influence in decision-making.

8.2.4 Kavango Region

Four conservancies in the Kavango Region -- *Muduva Nyangana, George Mukoya, Joseph Mbambangandu*, and *Shamungwa* – are endowed with devil's claw resources. However, no significant organized harvesting and trade activity has taken place yet, although there are active plans for this to happen, not least with the support of the INP PPO Sub-Activity.

8.3 Social impacts from the INP PPO Sub-Activity

8.3.1 Positive impacts

In line with the findings and conclusions of the Strategic Environmental Assessment (SEA) (ARD.2008), it is anticipated that the INP PPO Sub-Activity will have (indirect) positive social impacts on the livelihoods of harvesters, relative to the current status of commercial harvesting and trade activity in the devil's claw sub-sector, in two principal ways. First, the INP PPO Sub-Activity is expected to increase the number of rural harvesters (men and women) who harvest and trade devil's claw in an organised and sustainable way and who consequently (on the basis of long-term purchasing agreements negotiated with exporters) receive higher and more stable prices and thus benefit from larger and more predictable incomes. The INP PPO Sub-Activity may also contribute to further raising and stabilising the incomes of devil's claw harvesters who already operate in organised sustainably harvesting schemes.

The INP PPO Sub-Activity is expected to bring about these (indirect) positive income effects by further strengthening existing devil's claw based PPO enterprises and by helping to build the technical, organisational and marketing capacities of a number of new PPOs that are intent on starting commercial devil's claw enterprises. These new PPOs include various existing CBNRM structures like conservancies and community forests that already have (more or less well functioning) institutional and management frameworks for (better) managed resource access (see Section 7.1).

The second expected (indirect) positive social effect from the INP PPO Sub-Activity will be a result of its efforts to address current issues of (and lack of information on) gender roles and the integration of women and vulnerable groups (or lack thereof), and attendant social risks (see Section 3.2.2) affecting (more or less) organised and managed-access PPO devil's claw enterprises, as outlined in the Gender and Social Integration Plan (GSIP) (den Adel, 2010).

This positive social effect is anticipated to materialise during the implementation phase of the INP PPO Sub-Activity, as the gender and social integration strategies and actions set out in the GSIP are implemented. But the extent to which this positive impact materialises will not only depend on how effectively and efficiently the gender and social training, research and monitoring is carried out, as an integral component of the INP PPO Sub-Activity, but also on the degree to which these activities achieve their desired outcomes at the level of PPOs, service providers, trainers, and INP PPO Sub-Activity team members. Even with the best delivery of GSIP inputs, these outcomes will be uncertain, however, as they will be influenced by a range of factors outside the control of the INP PPO Sub-Activity.

8.3.2 Negative impacts

Where a conservancy or community forest establishes an organised devil's claw harvesting scheme within its boundaries with the support of the INP PPO Sub-Activity, this may affect the welfare and livelihoods of informal harvesters in the area in different ways. It is reasonable to expect informal harvesters from the area, who are eligible to join the scheme, to want to join, once aware of the benefits of organised harvesting, and it would be in the interest of the conservancy to make every effort to encourage informal harvesters from the area to join the scheme. The impact on the livelihoods of informal harvesters from the area who get integrated in the scheme will be positive, and it is hard to think of circumstances where informal harvesters from the area could not be absorbed in the scheme or did not want to join.

However, the situation will be different for informal harvesters who are not from the area and who may have been harvesting illegally. These harvesters would not be eligible to join the scheme, and not all of them may be able to harvest elsewhere or find alternative livelihood sources, at least not immediately. It is conceivable therefore that the livelihoods of some of these informal harvesters, especially the poorer among them, are affected negatively, at least temporarily, notwithstanding the possible illegality of harvesting activities. This is not sufficient reason, of course, for not pursuing organised harvesting, as the environmental benefits are clear and the social benefits, on balance, are also positive.

9. Key Findings, Conclusions and Recommendations

9.1 Key findings and conclusions

9.1.1 Adaptive behaviour of devil's claw in a variable climate and in the presence of plant competitors

- The ability of devil's claw to store food and/or propagate by means of its secondary root tubers (i.e. its 'geophytic' manner) enables the plant to adapt to predictable seasonal change as experienced in the Kalahari. In addition, the ability of devil's claw to undergo "ad hoc" adaptive change in flowering and fruiting behaviour, and foliage growth, in response to unpredictable climatic and environmental change (i.e. its phenologic plasticity) allows the plant to adapt its development to unpredictable inter-annual variations in rainfall patterns that are common in the highly variable Kalahari climate and environment.

- Consistent with devil's claw's trait as a drought avoider, devil's claw seed has a high innate dormancy, being released very slowly from the mature fruit as an adaptation for spreading seed germination in time, devil's claw populations generally have small numbers of juvenile plants, and the growth of devil's claw seedlings is generally very low compared to other herbaceous species in semi-arid environments. From time to time, successive years of above-average rainfall levels result in high rates of seedling emergence and development (episodic seedling recruitment), typical for the Kalahari environment, which are a major contributor to devil's claw population growth and structure.

- The absence of devil's claw in areas with relatively dense vegetation suggests a relatively low competitive ability of the plant. This explains why devil's claw can attain high densities in disturbed (cleared, degraded and/or overgrazed) areas near communal settlements, while in less disturbed areas devil's claw is found mostly in small groups of one or few individuals.

9.1.2 Intrinsic destructiveness of harvesting and sustainable harvesting methods

- Given the critical role of the secondary tubers in the development and survival of devil's claw, harvesting these root components constitutes an intervention of high intrinsic destructiveness. Given this intrinsic risk, harvesting methods are required that do not interfere with the normal growing cycle of the plant and give the plant enough time to recover from harvesting before it is harvested again (see next bullet point).

- Building on traditional harvesting knowledge held by the San, a set of best-practice sustainable devil's claw harvesting techniques has been developed in recent years, with a view to minimizing the impact of commercial tuber harvesting on the devil's claw resource base. These techniques comprise a range of best practices regarding soil removal around plants during harvesting, re-filling holes after harvesting, the most appropriate time period for harvesting (annual harvesting season), how much of the available secondary tuber mass of individual plants may be harvested (intensity of individual plant harvesting), and how long plants should be rested in between successive harvesting operations (harvesting frequency).

- From existing knowledge of adaptive plant behaviour and the economics of plant resource use, largely derived from a 5-year field study (referred to in the third bullet under section 9.1.4), conclusions have been drawn for how to optimize the timing, intensity and frequency of devil's claw harvesting toward an appropriate devil's claw resource management strategy that minimizes the harvesting impact on the plant resource (see for reference to the field study from which this

9.1.3 Effects of environmental stressors other than irregular rainfall on impacts of tuber harvesting

- Stressors like shrub encroachment, dense cover of annual grasses and creepers, and continuous high grazing levels affect the development of devil's claw individuals

negatively and inhibit the expansion of devil's claw populations. Plants impacted by these stressors are more susceptible to suffering damage from harvesting, unless established sustainable harvesting methods are used. Where devil's claw resources are actively managed and protected from stressors like high grazing levels and shrub encroachment, higher sustainably harvestable tuber yields are obtained.

9.1.4 Population size, densities, dynamics, and secondary tuber re-generation and yields (with and without harvesting)

- In sandy Kalahari areas of the range states (Namibia, Botswana and South Africa as well as Angola, Zambia, Zimbabwe and Mozambique), where devil's claw is found, the plant is not uniformly distributed but tends to occur in irregular patches. Its clumped distribution seems to be a reflection of its habitat preferences and seed dispersal mechanism. It reproduces relatively fast and accumulates relatively quickly in spots, often degraded, where the plant faces little competition from grass, herbs and brushes for scarce water and nutrients.

- A national resource survey conducted in Namibia in 2001-2002 as part of a Namibian National Devil's Claw Situation Analysis (NNDCSA) was used to calculate the estimated overall size of the devil's claw population in Namibia (56 million *H. procumbens* plants and 14 million *H. zeyheri* plants) as well as the national devil's claw resource potential in terms of an overall annual sustainable dry tuber yield from the two national species populations (375,000 kg from *H. procumbens* plus 90,000 kg from *H. zeyheri*). However, these results need to be treated with caution, as the national data base generated by the national resource survey and other relevant surveys and data sources turned out to be less representative than anticipated.

- A 5-year field study on the Population Dynamics and Sustainable Harvesting of *H. procumbens*, conducted during 2001 – 2005 in the Omaheke Region within the boundaries of two resettlement farms (*Vergenoeg* and *Ben Hur*) in conjunction with the SHDC Project, found that regular harvesting did reduce the growth of the primary tuber and storage tubers, but that this did not significantly increase plant mortality if the primary tuber was not damaged during harvesting and the plant's normal growing cycle was not disturbed. The study developed rapid transect techniques for assessing the size of the devil's claw resource as well as detailed methods for calculating annual harvesting quotas from the results of the resource assessment.

- A 4-year field study (2002-2005) into the population structure, density, growth, mortality, as well as seed and fruit production in harvested and un-harvested devil's claw populations growing on different plots (including freehold farm land and communal grazing land) in the Kalahari savannas of South Africa found that secondary tuber harvesting did not affect plant mortality or plant growth. The results of the study are similar to those of the Omaheke study associated with the SHDC project. However, unlike the Omaheke study harvested plants were found not

to have poorer regeneration capabilities in subsequent years in comparison with unharvested plants, but appeared resilient to harvest under the conditions of the study. Harvested and unharvested plants survived equally well over time, and both groups of plants recovered and grew (on average) at the same rate.

9.1.5 Traditional plant uses and knowledge

- The indigenous San and Khoi peoples of southern Africa have harvested and used devil's claw medicinally since time immemorial and developed systems of traditional knowledge about medicinal uses and harvesting methods on which modern medicinal uses and current sustainable harvesting methods are based.

- There is no particular socio-cultural significance attached to the traditional medicinal use of devil's claw.

9.1.6 Commercial harvesting and trade: producers, markets, prices, supply-demand balance, resource availability, and actors in the value chain

- Namibia has been the dominant producer and exporter of devil's claw, accounting for between 85% and 99% of total exports from the range states.

- From the early 1990s, international market demand for devil's claw increased, more or less steadily, until 2002, and subsequently levelled off. Peak demand in 2002 amounted to 900,000 kg of which 850,000 kg came from Namibia. After 2002, range state exports have varied between 360,000 kg and 670,000 kg (most or all of it coming from Namibia).

- A Devil's Claw Feasibility Study carried out in 2006 estimated the current overall market capacity at 450,000 kg. However, strong inter-annual variation in export volumes (between 70,000 and 900,000 kg in the period of 1992–2010) suggests that devil's claw demand is largely unpredictable.

- Devil's claw exports vary not only from year to year, but also within any given year. Intra-annual variations may not always follow the 'rule' of undersupply early during the season and over-supply late during the season. Intra-annual variability of devil's claw demand adds to inter-annual demand variability to make a complex and hard-to-predict market situation even more complex and less predictable.

- Export figures should be treated with some caution, given the informal unorganized nature of much of the devil's claw trade and because devil's claw lacks its own export/import tariff code and is therefore lumped with other commodities.

- Germany continues to be the largest importer. Other major importing countries include Italy, France and Poland. Currently minor, but potentially significant, export destinations include countries spread over several continents (Europe, Africa, Asia, North America and South America).

- Market end-uses of devil's claw are currently dominated by traditional herbal remedies bought over the counter rather on prescription. Herbal remedy uses for new purposes are emerging, such as for pain relief. Market segments for veterinary medicines and herbal tea are currently rather small, but they hold potential for significant expansion.

- A variety of forces and factors drive global market demand. These include, aging populations in target markets such as the EC, competition from other products being sold to cure the same ailments, public health insurance coverage (or not) of devil's claw products in target markets, and the forthcoming EC Traditional Herbal Remedy Directive (THRD).

- It is difficult to establish market prices for devil's claw because export prices are usually kept confidential and because both export prices and prices obtained by harvesters for harvested and dried tuber material are subject to significant variations across different locations and also may change over time.

- For the year 2009, national income generated from Namibian exports of devil's claw has been estimated at approximately € 1.06 million, or N$ 12.16 million. While this is a substantial amount of money, it is only a small fraction (less than 5%) of the value of annual global retail sales of devil's claw products.

- Organised harvesters practicing sustainable harvesting and/or being certified organic) receive up to 2% of the retail market value, close to half of what exporters receive, whereas at the lower end of the harvester spectrum informal unorganized harvesters may receive far less than 1%.

- There is no evidence that the size of the devil's claw resource in Namibia (and the other range states) has acted as a constraint for market supply to be able to meet market demand. There are plenty of devil's claw resources available in Namibia (and the other range states) to provide the supplies necessary to meet future market demand.

- The devil's claw value chain exhibits two classical forms of market failure:
    - The market is highly concentrated, with power of price-setting and value capture lying in the hands of a very limited number of lead buyers overseas;
    - Exporters and importers are unable and/or unwilling to maintain long-term trading relationships: lead buyers regularly switch from one supplier to another, as a tactic to strengthen their negotiating position, so as to be able to buy devil's claw at the lowest possible prices.

- The market is increasingly concentrated not only on the demand side (among the lead buyers) but also on the supply side (among the Namibian exporters).

- The two forms of market failure highlighted above, together with various actual or potential supply and demand problems, have been instrumental in keeping prices down at the level of the range state harvester and exporter and are responsible for the fundamental inequity in the distribution of benefits from the global devil's claw trade. This inequity, combined with the open-access nature of the resource and the extreme poverty of the harvesters, lies at the heart of the industry's problems, *inter alia*, encouraging over-harvesting and use of unsustainable harvesting methods.

9.1.7 Environmental risks from "traditional" informal devil's claw harvesting and trade

- At least three factors make it difficult if not impossible to establish the spatial distribution of the devil's claw resource in Namibia and to come up with an unequivocal estimate of its overall size:
    - the irregular, patchy nature of the spatial distribution of the devil's claw resource
    - unpredictable intra-annual and inter-annual changes in plant population sizes, densities and growth dynamics in response to the highly variable climate of the Kalahari
    - the phenologic plasticity of individual devil's claw plants, i.e. their ability to undergo "ad hoc" adaptive change in flowering and fruiting behaviour and foliage growth, including dormancy during dry spells, in response to unpredictable changes in weather patterns.

- Information about the changing spatial and temporal patterns of harvesting activity and its impacts on the resource base is limited due to the (still largely) informal, unorganized nature of the devil's claw trade.

- There is a consensus among analysts and practitioners that most of harvested devil's claw in Namibia has come from remote open-access communal areas within the Regions of Omaheke, Otjozondjupa, Caprivi and Kavango, with only a small proportion being harvested within private farms by farm workers.

- Outside the communal areas of the above-mentioned four Regions, significant devil's claw populations, found on wide stretches of private farmland, state protected land, and some of the communal land, remain largely unexploited.

- Risks of possible over-utilisation of devil's claw resources may translate into adverse impacts on local plant resources -- as well as related negative impacts on the livelihoods of local harvesters and the sustainability of devil's claw supplies from Namibia. While over-harvesting and unsustainable harvesting may threaten the "economic survival" (commercial attractiveness) of the plant in particular locations, it poses no significant threat to the overall national (and regional) devil's claw resource base, let alone the biological survival of the plant species.

- A number of intertwined environmental, social, economic and institutional risk factors combine in posing a potential threat to local devil's claw populations,

especially during years of high market demand. These factors include: the intrinsic biological destructiveness of harvesting secondary root tubers; the informal and unorganized nature of (still much of) devil's claw harvesting and trade in Namibia; the open-access nature of many of the communal areas where harvesting takes place; extreme poverty among harvesters; persistently low prices received by most of the harvesters; lack of long-term relationships between (most of the) harvesters and exporters and between exporters and lead overseas buyers; and little or no upgrading and value addition of devil's claw tuber material within Namibia, prior to export.

9.1.8 Environmental impacts resulting from the INP PPO Sub-Activity

- It is highly doubtful that the INP PPO Sub-Activity could have any significant effect on market demand during its relatively short implementation time frame of 3.5 years. This does not mean, however, that an increase in market demand could not occur during the lifetime of the project. It rather means that any significant increase or surge in demand in the next 3-4 years would almost certainly be extraneous to the INP PPO Sub-Activity, i.e. a consequence of forces and/or events unrelated to or independent of the INP PPO Sub-Activity.

- On the other hand, the INP PPO Sub-Activity is likely to have (indirect) positive impacts on the health and integrity of the devil's claw resource base and the sustainability of its commercial use as a result of the INP PPO Sub-Activity helping to strengthen the technical, organizational and marketing capacities of eligible PPOs.

9.1.9 Organising devil's claw harvesting and trade within rural institutional structures that practice sound resource management, sustainable harvesting techniques, traceability and quality control

- The SHDC project, and an associated five-year research programme to investigate the long-term impact of regular harvesting on plant populations' growth rates, plant regeneration and plant resting periods between harvesting interventions (see 9.1.4), generated an important body of knowledge on good practices in devil's claw resource surveys and harvesting quota setting as well as resource monitoring and management, and on sustainable harvesting and processing methods. This body of knowledge has informed all subsequent initiatives aimed at organizing devil's claw harvesting and trade, subsequent to the SHDC project.

- Key advantages of locating the organized harvesting and sale of devil's claw within established CBNRM structures include:
    - An existing organizational structure
    - An approved method for equitable benefit-sharing
    - Harvesting can be linked to sustainable management plans
    - CBNRM structures provide secure tenure rights to land and/or natural resources in a defined geographical area and thus offer built-in incentives for devil's claw resources to be managed properly.

- In the early to mid 2000s (when the SHDC project was the only organized devil's claw harvesting operation), quantities of devil's claw annually harvested under institutional and management regimes that use sustainable harvesting methods, promote equitable benefit-sharing and secure higher prices for harvesters were still quite small: less than 5,000 kg per year, or about 1% or less of total exports from Namibia. This proportion has increased substantially (by an order of magnitude), as a result of the significant expansion in sustainably harvested devil's claw produced by the Nyae Nyae and N#a Jaqna Conservancies and the Kyaramacan Association – PPOs that are all certified organic. Approximately 10% of all exported devil's claw now comes from organizations that harvest sustainably (and are certified organic). PPO land areas covered by sustainable devil's claw harvesting project activities have increased from about 3,000 km^2 in the early 2000s to more than 20,000 km^2 now.

9.1.10 Certification

- Certifying a PPO may provide assurances to customers and the market that the PPO practices sustainable harvesting, quality control and traceability, but certification is not necessary for PPOs to adopt such practices.

- The real value of certification lies in making it possible to capture a niche market, which results in higher prices paid for devil's claw. Unless such a niche market exists or can be developed, the benefits of certification are doubtful. In its current form, however, the devil's claw market is definitely not a niche market, as it fails all tests for product differentiation and supply control, two key elements for niche marketing.

- The value of certification under actual PPO operating conditions in Namibia is also uncertain on economic grounds. The unfavourable cost-benefit balance in the case of the SHDC project suggests that certification does not make economic sense unless:
    - less expensive (but recognised and credible) certification services can be developed in the region or in Namibia; and/or
    - substantially higher devil's claw production levels and profits can be attained.

9.1.11 Regulating devil's claw harvesting, trade and export on the basis of a national policy and permitting system for devil's claw

- The extent to which MET will be able to make this Policy work in practice remains to be seen. Ensuring compliance with the stipulated operational procedures (for the registration of traders and exporters and for permit applications and renewals of harvesters, traders, transporters and exporters) and with related information requirements (through report-back of harvesters, traders and exporters) will be no small task, given the number of actors involved ((up to) 8,000 harvesters, close to 100 traders, and 5 exporters), the remoteness of many of the areas where harvesters and traders operate, and low levels of education and resources among many of the harvesters.

- Implementing the Policy effectively will require a considerable administrative, monitoring, enforcement, and (internal as well as external) awareness- and capacity-building effort on the part of MET which, in turn, will require sufficient human and financial resources to be mobilized and allocated, combined with the necessary political backing and institutional commitment. None of these ingredients for implementation success can be taken for granted, but all will be needed if the Policy is to improve on the poor levels of compliance with the regulations of its predecessor, the draft policy of 1999.

9.1.12 Devil's claw cultivation and enrichment planting

- Cultivation and enrichment planting efforts have so far not gone beyond an experimental stage. Recent levels of devil's claw production through cultivation on private farms in Namibia have been less than 1% of exports, while modest numbers of seedlings have been planted out for enrichment of the local natural resource base on communal land in collaboration with the SHDC project partners and two conservancies.

- Devil's claw cultivation has been facing a number of challenges, which explains the rapid turnover in cultivation initiatives:
    - Substantial waiting period (of as little as 2 years or as much as 4 years or more, depending on agro-ecological conditions and actual rainfall) before the first secondary tubers can be harvested and returns on investment can be realised;
    - High levels of capital investment are required (laboratory equipment, greenhouse, field preparation, etc);
    - Current production costs are much higher than current market prices
    - Economies of scale necessary to cover production costs, let alone make a profit, are difficult to achieve
    - Further technical work is necessary on losses in seedlings on transplanting, disease control, varying growth rates, and yields
    - Relatively high levels of skills and management are required

- There is potential for enrichment planting techniques to help rehabilitate degraded/over-harvested areas in Namibia. Enrichment planting could also help to expand devil's claw supplies, particularly during years of high demand for devil's claw.

9.1.13 Coordinated strategy and collective action at national and regional levels

- To date, several attempts to establish a devil's claw traders' association in Namibia have failed, indicating a lack of commonality among exporters.

- Regionally, harvesters and exporters in the three Range States have much to gain from harmonizing devil's claw policies and strategies and from taking concerted action on issues like regulating cross-border trade. But each country's situation is

different and national interests differ, which makes regional coordination a challenge

- A regional working group among range state stakeholders (DCRSWG) was operational for some time, but the early momentum could not be sustained, and DCRSWG is now dormant.

9.1.14 Adding value to devil's claw production in Namibia

- To date, very little value is added to harvested devil's claw tubers in Namibia. However, between 60% and 80% of all devil's claw exported from Namibia goes to buyers that do no more than cleaning, grading, pre-processing (grinding) and repacking the material. Most, if not all, of these initial testing and processing steps could easily be done in Namibia, which highlights the potential for increased value addition in the country.

- Options to add value to devil's claw production by locating assessment, testing and processing steps within Namibia include:
    - Devil's claw quality assessment to demonstrate quality standards for exported material, with regard a range internationally accepted criteria including: Harpagoside content, taxonomic identification, moisture content, levels of different chemical and biological contaminants, and levels of adulteration;
    - Developing a national grading system to classify harvested tuber material by the level and variability of Harpagoside content, so as to produce standardised grades, fetching higher prices, for specific markets; and
    - Value-added processing in different forms, including: milling (easiest option, technically feasible today) combined with prior quality assessment to ensure more consistent (standardised) content; producing tea grade material; producing powders of standardised quality; and manufacturing standardised extracts.

- Some options are clearly more feasible than others. Generally, attempting to export value-added products, instead of the raw material (sliced and dried tubers), will not work if overseas buyers cannot be convinced that this is in their interest or persuaded otherwise to accept importing value-added products.

9.1.15 Declaring devil's claw a controlled product under the Agronomic Industry Act

- Advantages of gazetting devil's claw as a controlled product include:
    - Potentially much better tracking and traceability, since border controls could be set up under conditions set by the industry, all imports and exports would require a permit from NAB, and the NAB has border post inspectors at hand;
    - Synergy, sharing resources and greater controls of imports and exports through working with other commodity groups;

- Advice would be available from NAB on database development, foreign trade, accounting and legal issues, and regulatory and business plan development.

- One problem would be that the volume of devil's claw would be too small to raise sufficient funds for the required management of devil's claw as a controlled product by NAB. For this reason, it has been suggested that devil's claw might be lumped with other non-timber forest products to establish an overarching industry regulation and promotion structure.

9.1.16 Capturing a global niche market for devil's claw

- The devil's claw market in its current form fails all tests for product differentiation and supply control, two key elements for niche marketing.

9.1.17 Social and gender issues and impacts from ongoing devil's claw harvesting and trade and the INP PPO Sub-Activity

- Commercial devil's claw harvesting and trade provides small but significant supplementary cash incomes to some of the poorest rural women and men. These cash incomes strengthen and diversify the livelihoods of those rural people and families who are too resource-poor to have many, if any, other livelihood options. In comparison with the "traditional" informal harvesting and trade, organising devil's claw production results in higher prices and incomes for harvesters and hence enhanced livelihoods.

- Both women and men are involved in devil's claw harvesting and trade. But gender equity is not always assured, and there are ways to strengthen the involvement of women and vulnerable groups. A case in point is the "one member per household" rule in devil's claw harvesting PPOs in the Omaheke Region. Application of this rule can give rise to a distribution of income from devil's claw trade between women and men that does not adequately reflect their relative contributions to the harvesting, initial processing and sale of side-tuber material.

- By helping to strengthen existing PPOs and their capacities, the INP PPO Sub-Activity is expected to have indirect positive effect on the number of individuals trained and incomes from devil's claw earned.

- There is general lack of data and information on gender, the role and integration of women and vulnerable groups in devil's claw harvesting and sale, and the socio-economic conditions of the households and communities involved in commercial devil's claw harvesting and trade. Some of the important gender and socio-economic issues on which there is currently not enough information and further research is required, are identified.

9.2 Recommendations

9.2.1 Continuing and strengthening responses to concerns over local devil's claw over-harvesting

- Proportion of organised devil's claw production –
  It is recommended that the current proportion of exported devil's claw that is harvested by PPOs using sustainable harvesting methods (based on resource inventories, harvester monitoring and post-harvest impact surveys) and implementing devil's claw resource management plans be increased further, beyond the current 10% – through provision of PPO training and capacity building in sustainable harvesting methods and sound resource management and monitoring by service providers.

- Certification –
  It is recommended that certification, in particular organic and/or fair trade certification, be further pursued as a way to capture a global niche market. For particular PPOs, certification (by international certification bodies) should be considered only where the quantities harvested are large enough such that net profits from devil's claw far exceed certification costs. The development of less expensive (but credible and internationally recognised) certification services in Southern Africa or Namibia could be pursued further.

- Implementing the new Devil's Claw Policy and permitting system –
  It is recommended that the INP PPO Sub-Activity work closely with MET in facilitating the effective implementation of the Devil's Claw Policy in those PPO areas where the INP PPO Sub-Activity will be working. Policy implementation and enforcement aspects with which the INP PPO Sub-Activity can assist MET include: ensuring that all organised harvesters have the necessary harvesting permits, monitoring during harvest and post-harvest impact monitoring to ensure that sustainable harvesting methods are used; and monitoring and reporting any illegal devil's claw harvesting and trade activities.

- Devil's claw cultivation and enrichment planting –
  It is recommended that appropriate forms of devil's claw cultivation and enrichment planting be pursued further by PPO service providers, with the active involvement of rural harvesters and with appropriate training and technical assistance support from the INP PPO Sub-Activity, as this might offer an opportunity to "rehabilitate" over-harvested areas and/or improve the local resource base for greater sustainable harvesting returns.

- Coordinated strategy and collective action at national and regional levels –
  It is recommended that efforts to get exporters to cooperate and coordinate strategies and to get regional stakeholders to harmonise actions be continued, and that currently dormant national and regional working groups (DCWG, DCRSWG) be revived.

- Capturing global niche markets for devil's claw –
  It is recommended that the devil's claw value chain be upgraded, with the aim of empowering harvesters and moving the product into a new niche: through active supply management and appropriate market development (including more value adding within Namibia where feasible), and by moving devil's claw supply from its current mode of predominantly being unsustainably wild-harvested and untraceable to a standard mode of being sustainably wild-harvested and fully traceable -- a goal to which the INP PPO Sub-Activity is expected to contribute significantly.

9.2.2 Addressing socio-economic information gaps and monitoring the integration of women and vulnerable groups

It is recommended that the Gender and Social Expert, in collaboration with other team members, conduct the necessary research to fill critical gaps in the available socio-economic information baseline and monitor changes in the socio-economic conditions over time, as an integral part of project implementation. Research should be carried out and monitoring and evaluation done, in particular, on the current and changing role and integration of women and vulnerable groups in the commercial harvesting and trade of devil's claw resources as well as on the socio-economic status and dynamics of the local communities involved in the commercial use of devil's claw. The Gender and Social Integration Plan (GSIP) should be used as a strategic and operational framework for carrying out this research and monitoring. Related priority needs and tasks are spelled out under "Strategy 2" ("Analysis of gender and vulnerable groups") and "Strategy 8" ("Monitoring and evaluation") of the GSIP.

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Annex A: Guidelines for Devil's Claw Harvesters and Sustainable Devil's Claw Harvesting and Processing Techniques

This annex provides an overview of "Devil's Claw in Namibia - Guidelines for Harvesters", a booklet produced by the SHDC Project for use by organised devil's claw harvesters (CRIAA, 2007), and reproduces an updated synthesis section on sustainable devil's claw harvesting and processing techniques annexed to Namibia's new Devil's Claw Policy (MET, 2010).

Overview of "Devil's Claw in Namibia - Guidelines for Harvesters"

Based on the results of the SHDC Project and an associate 5-year biological field research programme, this booklet provides organised devil's claw harvesters with practical, accessible and easy-to-grasp guidelines and advice on how to harvest and process devil's claw as well as related aspects concerning the devil's claw resource, devil's claw's protected status, harvest permits, harvesting season, resource assessment methods, and quality control. The booklet has the following section headings:

- Whose resource is devil's claw?
- How to get a permit
- Why do permits matter
- Harvesters "Return Forms"
- How much resource is there this year?
- Things to remember when counting the resource
- Devil's Claw Resource Survey Sheet
- How to harvest devil's claw
- How to dig
- Filling in the hope
- Slicing and quality
- Drying the sliced tubers
- Packing and storing
- Make the most of the devil's claw resource …

"Sustainable Devil's Claw Harvesting Techniques" *(Annex to new Devil's Claw Policy – reproduced here verbatim)*

Harvesting techniques:

1. Devil's claw may only be harvested between 1st March and 31th October each year. Devil's claw is a protected plant, so all harvesters need to get a permit (individual or group) from the MET before starting to harvest.
2. Harvesters must have permission to harvest from either the private landowner or from the traditional authority, regional or local government or the conservancy or community forest in the case of communal area harvesting.
3. Harvesters should choose the older plants to harvest; these usually have longer stems and leaves. Young plants should not be harvested, nor should plants that still have flowers – it is best to wait until the plant has seeds.

4. The harvester should use a sharpened stick or flattened crowbar to dig with. The hole should be about 20 cm away from the plant and should just be on one side of the plant so that only the tubers on one side of the plant are harvested – the other half of the tubers are left to help the plant to keep growing. The taproot must not be harvested.
5. When the side-tubers have been harvested, all the sand should be put back into the hole and stamped down by the harvester. (If the hole is not filled in, the devil's claw plant will die. Leaving an open hole is dangerous for wild animals, cattle and even for people.)
6. Devil's claw plants need three years to recover after they have been harvested. This means that in any one year, only a quarter of all plants in an area should be harvested.

Processing:

1. Dried devil's claw should be packed into new bags that are clean and dry. Bags should be stored in a clean, dry place and if possible on a shelf or rack.
2. Devil's claw should only be sold to a trader who has a permit for buying devil's claw from the area in which it was harvested. The trader should fill in his/her name, registration number, the date, the number of bags, the weight of the devil's claw bought, the trader's permit number and his/her signature on the harvester's 'report-back' form.
3. Within a month from the end of the harvest season, the harvester's 'report-back' form should be submitted to the MET.

Annex B: Devil's Claw Management Plan for the Nyae Nyae and N#a Jaqna Conservancies (July 2008)[57]

1. INTRODUCTION

This document outlines the components and activities of the Devil's Claw Management Plan (DCMP) for the Nyae Nyae and N≠a Jaqna conservancies situated in the Otjozondjupa region of Namibia. The DCMP is not a standalone document, it is complementary to the conservancy constitutions and other management policies as well as other operational procedures already in place with regards to the harvesting and sale of Devil's Claw. It should also be noted that this should be considered as a "living plan" that can and should be changed to make it more effective and efficient to suit local needs.

This document provides some background information on Devil's Claw in Namibia, relevant research as well as other aspects that have been considered in the preparation of the DCMP.

2. BACKGROUND

2.1 DEVIL'S CLAW

Harpagophytum, more commonly known as Devil's Claw, comprises two species: *H. procumbens* and *H. zeyheri*. The plant is a geophyte with a main taproot off which secondary or storage tubers extend, and it is these secondary storage tubers that contain the highest concentrations of secondary compounds, including Harpagoside, which are harvested for their analgesic and anti-inflammatory properties. Devil's Claw derives its name from the fruiting body which has sharp re-curved hooks protruding off the fruit.

The medicinal value of Devil's Claw for the treatment of rheumatism, arthritis and other ailments of this type has been recognised by 'western medicine' only in the last 50 years. G.H. Mehnert, an early bio-prospector, exported some dried Devil's Claw tubers to Germany where they were first studied at the University of Jena in the 1950s. In 1962, the Namibian company Harpago (Pty) Ltd started exporting Devil's Claw tubers in larger quantities to the German company Erwin Hagen Naturheilmittel GmbH.

In Namibia Devil's Claw was listed in 1977 as a protected species under the Nature Conservation Ordinance of 1975 because of increased trade and the subsequent concerns regarding its conservation status. In terms of this Ordinance, permits are required to harvest and export Devil's Claw. An average of between 350 and 400 tons of dried Devil's Claw is exported annually from Namibia.

2.2 CONSERVANCIES IN NAMIBIA

Work towards the establishment of "communal area conservancies" began in the early 1980's. After an exhaustive consultation process the Nature Conservation Amendment Act was passed in 1996 paving the way for the legal registration of communal area

[57] Source: (Cole, 2008c)

conservancies in Namibia. The first conservancy was gazetted in 1998 and by the end of 2006 the number of gazetted conservancies stood at 50 covering an area of 118,704 sq km.

An extensive consultative process, including, mapping, the drafting of constitutions, electing management bodies etc. must be undertaken before a conservancy can be gazetted. One of the central components of conservancies is the sustainable utilisation of natural resources, which implies the management thereof.

The Nyae Nyae conservancy was the first to be gazetted in February 1998. It covers an area of 9,003 sq km and has a population of about 2300. The N≠a Jaqna conservancy was gazetted in July 2003 and has a population of about 7000.

3. MANAGEMENT RATIONALE

The foundation for the development of the DCMP for the Nyae Nyae and N≠a Jaqna conservancies is based on previous experience, relevant research, traditional knowledge and consultation with stakeholders. Key aspects that have influenced the DCMP are discussed below.

3.1 THE SUSTAINABLY HARVESTED DEVIL'S CLAW PROJECT

The Sustainably Harvested Devil's Claw (SHDC) project started in 1997/98 as a pilot project on one farm, Vergenoeg (Afrikaans meaning 'far enough'), and by 1999/2000 had expanded to 17 other farms in the Omaheke Region.

In the 10 years since then an extensive body of knowledge and information has been generated. One of the most important results was the compilation of "Devil's Claw Harvester Guidelines". A key component, directly linked to resource sustainability, was the development of a sustainable harvesting method.

3.2 RESEARCH

Research on the *"Population Dynamics and Sustainable Harvesting of the Medicinal Plant Harpagophytum procumbens (Devil's Claw) in Namibia"* was carried out over a five-year period between 2001 and 2005 at three sites located on two farms, Vergenoeg and Ben Hur, in the Omaheke Region of Namibia. Two main results are relevant.

1. Detailed calculation methods to determine annual harvesting quotas were developed together with rapid techniques for assessing the quantity of the resource.

2. Regular harvesting did reduce the growth of the primary tuber and storage tubers. However, it was found that this did not significantly increase plant mortality if the primary tuber was not disturbed during harvesting and the plant's normal growing cycle was not disturbed.

3.3 RESOURCE SURVEYS

The proposed DCMP does not make provision for resource surveys to be carried out. The primary objective of resource surveys is to establish sustainable harvesting quotas for the different harvesting areas. The decision to not include resource surveys does not in any way preclude the introduction of them at a later stage should a specific need arise.

The decision not to carry out resource surveys is based on the following main reasons.

- Resource surveys are time consuming and costly
- Resource surveys only provide a guideline as not all Devil's Claw populations can be surveyed. The combined area of both conservancies is about 18,000 sq km and is characterised by dense bush and forest that is largely inaccessible to vehicles. The vegetation makes it extremely difficult to find Devil's Claw populations.
- The establishment of harvesting quotas does not imply that sustainable harvesting methods will be carried out. The harvester is ultimately the main person responsible for ensuring the sustainability of the resource at the point of harvest.

With regard to the above it should be noted that the continuous monitoring of resource populations and records of harvesting levels over several years in the SHDC harvesting areas has demonstrated that harvesting level in many cases did reach the limit of the quotas set following resource surveys.

4. DEVIL'S CLAW MANAGEMENT PLAN

4.1 PURPOSE AND AIM

The purpose of the DCMP is to provide a tool for the efficient and effective management of Devil's Claw in the Nyae Nyae and ǂNa Jaqna conservancies to ensure the sustainability of the resource for both ecological and income generating reasons.

The main aim of the DCMP is to focus on empowering the harvesters of Devil's Claw to become the managers of the resource and ensure its sustainability by creating a sense of responsibility and ownership of the resource. The SHDC project has demonstrated that if harvesters benefit consistently and predictably from their resources, they will manage them if given the responsibility and are empowered to do so.

4.2 METHODOLOGY AND COMPONENTS

The basis of the DCMP will revolve around ensuring that sustainable harvesting methods are being practised by harvesters. This will be achieved through the implementation of monitoring procedures that will be carried out at various levels by those involved. In addition to other management, training or other activities that may be carried out, ensuring that sustainable harvesting methods are being implemented in both the conservancies will be monitored through the implementation of two main activities.

4.2.1 Harvest monitoring at a local level

Both conservancies have in place mechanisms to monitor various aspects related to mainly wildlife but also other natural resources. This is carried out by "community rangers" or "game guards" who are assigned to districts within the conservancies. The monitoring information is recorded in an "event book" and the information from all the event books is consolidated at conservancy management level.

Devil's Claw will be added to the event book monitoring system. The following aspects will be monitored throughout the harvesting period.

1. Are sustainable harvesting methods being implemented?
2. Are the correct procedures for slicing, drying and storing of Devil's Claw being carried out?
3. Is there any harvesting being undertaken by unauthorised harvesters in a particular area?
4. Is there any illegal or unauthorised selling or buying taking place?
5. Potential Devil's Claw harvesting areas will also be noted during patrols

4.2.2 Post-harvest impact assessments

The post harvest impact assessment provides a useful tool for harvesters to monitor their resource and to take appropriate decisions regarding the management thereof. For example, if holes are found not to have been filled action can be taken against harvesters who harvested in that area.

The post-harvest impact assessment includes monitoring the following aspects.

- An estimation of the number of holes dug
- The percentage of the holes refilled
- The verification of the areas harvested
- The noting of discarded taproots and any re-growth of the taproots of the harvested plants

The Ministry of Environment and Tourism (MET) will assume overall responsibility for carrying out the post-harvest impact assessments on an annual basis. These surveys will be carried out in conjunction with conservancy management representatives, community rangers and harvesters.

The surveys will take place in October / November when re-growth of the harvested plants can be detected. A minimum of 3 harvesting areas in each conservancy will be selected for an assessment to be carried out.

4.3 CONSERVANCY MONITORING DISTRICTS

4.3.1 Nyae Nyae conservancy

The Nyae Nyae conservancy is divided into 4 districts which include a number of villages. Each district is represented by a number of community rangers. A total of 10 community rangers are in place and are co-ordinated by a senior field officer.

NYAE NYAE DISTRICTS AND VILLAGES

DISTRICT	NORTH	CENTRAL	WEST	SOUTH
VILLAGES	1. De#ua 2. #Om!o!oo 3. //Xa//oba 4. Octagai 5. #Abacea 6. G/oaguru	1. Makuri 2. Djxokhoe 3. !Ao=a 4. N#animh 5. N//oag!osi 6. Baraka 7. Ben se Kamp 8. Mountain pos 9. Dou pos 10. Uukoroma	1. Duin-pos 2. Kaptein pos 3. Apel pos 4. Routs pos 5. N!om/xom 6. Den/ui 7. Eagle Pos 8. G/ago!oma 9. N#amtjoha 10. //ao/omi	1. Xamsa 2. Tamboti 3. N=ama 4. !Obaha 5. #abacea 6. //auru 7. N=ama-pan 8. Magamis 9. N!aci 10. Aha mountains
GAME GUARDS	**3**	**2**	**2**	**3**

4.3.2 N≠a Jaqna conservancy

The N≠a Jaqna conservancy is also divided into 4 districts. Each district has 2 game guards.

N≠A JAQNA DISTRICTS AND VILLAGES

DISTRICT	AASVOLNESS	MANGETTI	OMATAKO	KANOVLEI
VILLAGES	1. Aasvolness 2. Pespeka 3. Vicksrus	1. Mangetti Dune 2. Luhebo 3. Kukurushe 4. Kankudi 5. Meduletu 6. Danger 7. M'kata 8. Mparara 9. Sawmill 10. Soweto 11. Mgoro	1. Omatako 2. Bubi Pos 3. Kandu 4. Kameelwoud 5. Rest Camp	1. Kanovlei 2. Grashoek 3. Rooidak hek 4. Swartak 5. Forest station 6. Etameko
GAME GUARDS	**2**	**2**	**2**	**2**

4.4 IMPLEMENTATION OF THE MANAGEMENT PLAN

Ensuring the sustainability of the Devil's Claw resource will require the involvement of all the stakeholders who will have different responsibilities and carry out certain activities in this regard. However, the conservancy management structures will assume overall responsibility for its implementation.

4.4.1 Training

Training and support will need to be provided to those involved and the DCMP will have to be explained to conservancy members in order to ensure that it is successfully implemented.

4.5 ANNUAL REVIEW

The implementation of the DCMP and the results of the monitoring process will need to be reviewed on an annual basis to ensure that the desired results are being achieved. Amendments should be made where necessary in order to improve the implementation of the DCMP.

DEVIL'S CLAW MANAGEMENT PLAN		
MONITORING LEVEL	DESCRIPTION	RESPONSIBILITY
LEVEL 4	Post harvest impact assessment	• MET • Conservancy Management • Community Game Guards / Rangers • Harvesters
LEVEL 3	• Issuing of permits • Overall co-ordination	• Conservancy Management • Traditional Authority • MET
LEVEL 2	• Correct harvesting & processing • Illegal harvesting • Illegal selling or buying • Potential harvest areas	Community Game Guards / Rangers
LEVEL 1	Correct harvesting & processing procedures carried out	Harvesters & local co-ordinators

Annex C: Devil's Claw Management Plan for the Kyaramacan Association (April 2008)[58]

1. INTRODUCTION

This document outlines the components and activities of the Devil's Claw Management Plan (DCMP) for the Kyaramacan Association (K.A) situated in the Bwabwata National Park (BNP), West Caprivi, Namibia. The DCMP is not a standalone document, it is complementary to the K.A. constitution and other management policies as well as other operational procedures already in place with regards to the harvesting and sale of Devil's Claw. It should also be noted that this should be considered as a "living plan" that can and should be changed to make it more effective and efficient to suit local needs.

This document provides some background information on Devil's Claw in Namibia, relevant research as well as other aspects that have been considered in the preparation of the DCMP.

2. BACKGROUND

2.1 DEVIL'S CLAW

Harpagophytum, more commonly known as Devil's Claw, comprises two species: *H. procumbens* and *H. zeyheri*. The plant is a geophyte with a main taproot off which secondary or storage tubers extend, and it is these secondary storage tubers that contain the highest concentrations of secondary compounds, including Harpagoside, which are harvested for their analgesic and anti-inflammatory properties. Devil's Claw derives its name from the fruiting body which has sharp re-curved hooks protruding off the fruit.

The medicinal value of Devil's Claw for the treatment of rheumatism, arthritis and other ailments of this type has been recognised by 'western medicine' only in the last 50 years. G.H. Mehnert, an early bio-prospector, exported some dried Devil's Claw tubers to Germany where they were first studied at the University of Jena in the 1950s. In 1962, the Namibian company Harpago (Pty) Ltd started exporting Devil's Claw tubers in larger quantities to the German company Erwin Hagen Naturheilmittel GmbH.

In Namibia Devil's Claw was listed in 1977 as a protected species under the Nature Conservation Ordinance of 1975 because of increased trade and the subsequent concerns regarding its conservation status. In terms of this Ordinance, permits are required to harvest and export Devil's Claw. An average of between 350 and 400 tons of dried Devil's Claw is exported annually from Namibia.

2.2 CONSERVANCIES IN NAMIBIA

Work towards the establishment of "communal area conservancies" began in the early 1980's. After an exhaustive consultation process the Nature Conservation Amendment Act was passed in 1996 paving the way for the legal registration of communal area

[58] Source: (Cole, 2008b)

conservancies in Namibia. The first conservancy was gazetted in 1998 and by the end of 2006 the number of gazetted conservancies stood at 50 covering an area of 118,704 sq km.

An extensive consultative process, including, mapping, the drafting of constitutions, electing management bodies etc. must be undertaken before a conservancy can be gazetted. One of the central components of conservancies is the sustainable utilisation of natural resources, which implies the management thereof.

Namibia Conservancy legislation enables rural communities on communal land to form and register conservancies for the purpose of sustainable utilisation of wildlife through tourism and trophy hunting. The legislation unfortunately does not cater for communities that live on state own land such as National Parks. The residents of West Caprivi in cooperation with Ministry of Environment and Tourism overcame this legal obstacle by forming an Association upon which the M.E.T bestows uncertain use rights to the land. The ultimate aim is to replace the Association with a registered Trust and to enter into a Memorandum of Understanding which will set out the terms and conditions of the collaboration between the M.E.T and the Trust with regard to land and natural resource management, benefit sharing, and tourism infrastructure development in the Bwabwata National Park in the Caprivi strip.

The Kyaramacan Peoples Association is made up of 5100 members from various ethnic groups. The Association was formed in March 2006 with the assistance of the Office of the Deputy Prime Minister as well as help from the Legal Assistance centre. Their board is made up of 8 men and 2 women who are representative of most of the ethnic groups living in West Caprivi. The Association employs 27 community game guards as well as 14 community resource monitors (who are all women). In total 51 people from the community are employed by Kyaramacan Association.

2.3 THE IMPORTANCE OF DEVILS CLAW AS A RESOURCE IN WEST CAPRIVI

Devil's Claw has an impact on the vast majority of the West Caprivi population. Local research revealed that villagers halt other income generating activities, such as basket weaving, when Devil's Claw is in season. This illustrates the important role the plant resource has in income generation. There is a pressing need for Ministry of Environment and Tourism to know what is happening in terms of volumes harvested, the location of harvesting sites, harvesting techniques, and therein, the sustainability of the process.

Approximately 80% of non income families in the West Caprivi region are dependent on plant resources for both income generation and dietary needs. Human wildlife conflict is a prominent issue with elephant, wild dog, buffalo and hippo causing the often total destruction of crops, particularly the much depended on mahangu. A lack of hunting ability and limitations placed on crop growth, means that inhabitants are increasingly turning toward veld foods. In comparison with Devil's Claw harvesting, the Ministry of Environment and Tourism has not encountered any environmental degradation from the harvesting of veldfoods.

Products of particular interest to the project include the mangetti nut *(Schinziophyton rautanenii)*, the false mopane tree (*Guibourtia coleosperma*), the Jackalberry tree (*Diospyros mespiliformus*) monkey orange (*Strychnos cocculoides*), sour plum (*Ximenia spp.*), kudu berry

(*Pseudolachnostylis maprouneifolia*). Research into the seasonal consumption, social and demographic background of harvesters, the ecological status of the plant, and the geographical spread, are all areas which warrant future investigation.

2.4 CURRENT PROBLEMS OF DEVILS CLAW IN BNP

- Illegal harvesting of Devils Claw tubers within BNP has been identified by several stakeholders including MET, CRIAA, IRDNC, WIMSA, and independent researchers
- Unsustainable harvesting methods being practiced
- Poor quality of harvested material due to unskilled harvesting methods
- Difficult to monitor harvesting practices due to the unknown distribution of Devils Claw, the unknown number of harvesters, and the lack of manpower to patrol the area.
- Low prices are obtained for the material
- Lack of coordination and management

3. MANAGEMENT RATIONALE

The foundation for the development of the DCMP for the Kyaramacan Association is based on previous experience, relevant research, traditional knowledge and consultation with stakeholders. Key aspects that have influenced the DCMP are discussed below.

3.1 THE SUSTAINABLY HARVESTED DEVIL'S CLAW PROJECT

The Sustainably Harvested Devil's Claw (SHDC) project started in 1997/98 as a pilot project on one farm, Vergenoeg (Afrikaans meaning 'far enough'), and by 1999/2000 had expanded to 17 other farms in the Omaheke Region.

In the 10 years since then an extensive body of knowledge and information has been generated. One of the most important results was the compilation of "Devil's Claw Harvester Guidelines". A key component, directly linked to resource sustainability, was the development of a sustainable harvesting method.

3.2 RESEARCH

Research on the *"Population Dynamics and Sustainable Harvesting of the Medicinal Plant Harpagophytum procumbens (Devil's Claw) in Namibia"* was carried out over a five-year period between 2001 and 2005 at three sites located on two farms, Vergenoeg and Ben Hur, in the Omaheke Region of Namibia. Two main results are relevant.

1. Detailed calculation methods to determine annual harvesting quotas were developed together with rapid techniques for assessing the quantity of the resource.
2. The regular harvesting does reduce the growth of the primary tuber and storage tubers, however, it was found that this did not significantly increase plant mortality if the primary tuber was not disturbed during harvesting and the plant's normal growing cycle was not disturbed.

3.3 RESOURCE SURVEYS

A comprehensive resource survey was carried out in March 2008 by CRIAA-IRDNC-KA-MET, covering extensively the multiple use areas and parts of the core areas of the Bwabwata National Park. Though surveys provide an indication of resource distribution, they should not been seen as a definitive indication of population status and density. The following are some limitations of surveys:

- Resource surveys are time consuming, costly and require a substantial workforce
- Resource surveys only provide a guideline as not all Devil's Claw populations can be surveyed. The Bwabwata National Park is characterised by dense bush and forest that is largely inaccessible to vehicles. The vegetation makes it extremely difficult to find Devil's Claw populations.
- The establishment of harvesting quotas does not imply that sustainable harvesting methods will be carried out. The harvester is ultimately the main person responsible for ensuring the sustainability of the resource at the point of harvest.

For the Project to be sustainable, and to optimise the benefits to the Communities, it was decided to conduct a detailed survey. Reports from the past have shown that unknown volumes of Devils Claw have been harvested by the communities living in the area. The harvesting is often conducted in an unsustainable manner and often people from other regions infiltrate the area and harvest illegally. The Ministry of Environment and Tourism, together with other stakeholders, stressed the need for this Project to minimise the illegal and unsustainable harvesting of Devils Claw, control the market, and have an indication of population status.

4. DEVIL'S CLAW MANAGEMENT PLAN

4.1 PURPOSE AND AIM

The **purpose** of the DCMP is to provide a tool for the efficient and effective management of Devil's Claw in the Bwabwata National Park, to ensure the sustainability of the resource for both ecological and income generating reasons.

The main **aim** of the DCMP is to focus on empowering the harvesters of Devil's Claw to become the managers of the resource and ensure its sustainability by creating a sense of responsibility and ownership of the resource.

4.2 METHODOLOGY AND COMPONENTS

The basis of the DCMP will revolve around ensuring that sustainable harvesting methods are being practised by harvesters. This will be achieved through the implementation of monitoring procedures that will be carried out at various levels by those involved. In addition to other management, training or other activities that may be carried out, ensuring

that sustainable harvesting methods are being implemented in Bwabwata National Park, they will be monitored through the implementation of two main activities.

4.2.1 Harvest monitoring at a local level

The Kyaramacan Association has in place mechanisms to monitor various aspects related to mainly wildlife but also other natural resources. This is carried out by "community game guards" and "community resource monitors" who are assigned to Villages within the National Park. The monitoring information is recorded in an "event book" and the information from all the event books is consolidated at National Park management level.

Devil's Claw will be added to the event book monitoring system. The following aspects will be monitored throughout the harvesting period.

1. Are sustainable harvesting methods being implemented?
2. Are the correct procedures for the drying of Devil's Claw slices being carried out?
3. Is there any harvesting being undertaken by unauthorised harvesters in a particular area?
4. Is there any illegal or unauthorised selling or buying taking place?
5. Potential Devil's Claw harvesting areas will also be noted during patrols

4.2.2 Post-harvest impact assessments

The post harvest impact assessment provides a useful tool for harvesters to monitor their resource and to take appropriate decisions regarding the management thereof, for example if holes are found not to have been filled action can be taken against harvesters who harvested in that area.

The post-harvest impact assessment includes monitoring the following aspects.

- An estimation of the number of holes dug
- The percentage of the holes refilled
- The verification of the areas harvested
- The noting of discarded taproots and any re-growth of the taproots of the harvested plants

The Ministry of Environment and Tourism (MET) will assume overall responsibility for carrying out the post-harvest impact assessments on an annual basis. These surveys will be carried out in conjunction with KA management representatives, community game guards, community resource monitors, and harvesters.

The surveys will take place in October / November when re-growth of the harvested plants can be detected. A minimum of 3 Villages in Bwabwata National Park will be selected for an assessment to be carried out.

4.3 BWABWATA NATIONAL PARK MONITORING AREAS

Inside the Bwabwata National Park the area is zoned as following; 40km West from the Kwando River is referred to as the Kwando "core area". 50km East from the Kavango River, South of the B8 main road, is referred to as Buffalo "core area". No people reside within these two core areas. The area between these two core areas is referred to as the multiple use area. This is where the 10 Villages of the Bwabwata National Park are located. A total of 27 community game guards and 14 community resource monitors operate within these areas and are supervised and coordinated by senior field officers.

BNP GAME GUARDS AND RESOURCE MONITORS

Village Code	Village Name	No. Game Guards	No. CRM's
MCH	Muc'hiku	3	2
MUS	Mushashane	2	1
MAN	Mangaranganja	2	1
OMK	Omega I	4	2
SHA	Shamakhwe	2	1
CHE	Chetto	4	2
PIP	Pipo	2	1
MAU	Mautu	2	1
OMC	Omega III	3	2
MAS	Mashambo	3	1
	Total	**27**	**14**

4.4 IMPLEMENTATION OF THE MANAGEMENT PLAN

Ensuring the sustainability of the Devil's Claw resource will require the involvement of all the stakeholders who will have different responsibilities and carry out certain activities in this regard. However, the K.A management structures will assume overall responsibility for its implementation.

4.4.1 Training

Training and support will need to be provided to those involved and the DCMP will have to be explained to K.A members in order to ensure that it is successfully implemented.

4.5 ANNUAL REVIEW

The implementation of the DCMP and the results of the monitoring process will need to be reviewed on an annual basis to ensure that the desired results are being achieved. Amendments should be made where necessary in order to improve the implementation of the DCMP.

Annex D: Devil's Claw Harvesting Monitoring Data Collection Sheet[59]

DEVIL'S CLAW HARVESTING MONITORING DATA COLLECTION SHEET																				
AREA																				
VILLAGE																				
DATE																				
SURVEYER																				
GPS Point																				
OPEN HOLES (with taproot)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
OPEN HOLES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
NEW PLANTS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
COMMENTS																				

[59] Source: (Nott, 2010b)

Annex E: Post-Harvest Impact Assessment for Devil's Claw[60]

Methodology

The post harvest impact assessment is a tool to monitor compliance during the harvesting season with sustainable harvesting methods as well as the status of the resource. Firstly a check is made as to whether the hole has been closed or not, and secondly a check is made to determine the whether the harvested plant shows signs of regrowth.

The following is noted during the surveys and recorded on the data sheet:

- FILLED HOLES (Regrowth/No growth)
- UNFILLED HOLES (Regrowth/No growth)
- NEW OR NOT HARVESTED PLANTS

The areas to be surveyed are identified by harvesters in the respective villages. Each survey team is comprised of at least 3 recorders who walk through the area in a line so that the majority of holes in the area can be recorded. The survey team should consist of CBO staff and management, harvester/s, representatives of the buyer, the support organization and MET.

Data Collection

Data is collected and entered into the sheet below.

[60] Source: (Nott, 2010b)

DEVIL'S CLAW POST HARVEST IMPACT DATA COLLECTION SHEET

AREA	
VILLAGE	
DATE	
SURVEYOR/S	

GPS COORDINATES						
START	**S**		**END**	**S**		
	E			**E**		

NUMBER OF FILLED HOLES

REGROWTH

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125
126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150

N0 GROWTH

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125
126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150

NUMBER OF UNFILLED HOLES

REGROWTH

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125
126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150

N0 GROWTH

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125
126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150

NEW OR UNHARVESTED PLANTS

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125
126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150

COMMENTS	

Annex F: Devil's Claw Stewardship System[61]

A devil's claw stewardship system is defined as a partnership between a defined community of devil's claw harvesters, a local authority with the power to manage local actors, and a suitable market agent. Government authorities would designate a specific communal area as a devil's claw stewardship after a baseline survey to determine the devil's claw population and a suitable harvesting rate. The community and local authority would then sign a stewardship agreement for a fixed period with a specific market agent. The harvesting area would be divided into four parts, with only one part being harvested each year. The marketing agent would appoint a local 'harvesting supervisor' whose income would be a percentage of the harvested value, payable only once it has been demonstrated that sustainable harvesting practices (not harvesting outside the quadrant, filling in holes, etc.) have been adhered to. A percentage of the harvest value would go to the local authority also, to serve as a community fund for promoting common interest in maintaining the stewardship principles. In case of dispute, all parties to the agreement would be allowed to seek arbitration from a third party, probably the Ministry of Environment.

Once sufficient devil's claw stewardships have been registered to meet market demand (above and beyond quantities supplied by organized PPOs), government would supply export permits only for material sourced from the stewardships. This would transform the structure of supply from an open access permit-driven structure into a community-managed closed-access structure that maintains value in terms of conservation, full product traceability and supply limitation. Such a transformation could also greatly empower the communities involved by promoting self-governance among local actors.

[61] Based on (Cole and Bennett, 2007). Stewardship areas are conceived as an adaptation of the conservancy model. However, they differ from conservancies with regard to the key resource around which the proposed CBNRM institution is (to be) structured. In the case of conservancies, the key resource has been animal wildlife, while it would be devil's claw for the proposed stewardship areas.

Annex G: Certification[62]

In order to appreciate the actual and potential role of certification in mitigating the environmental risks of commercial devil's claw harvesting and trade, it is necessary to have an understanding what certification is all about, what schemes are available for natural products, reasons for getting certified, the certification process, differences between certified and uncertified devil's claw, the costs and benefits of certification, and other advantages and disadvantages. These aspects are discussed in what follows.

Relevant certification schemes

Standards and certification schemes for "traditional agricultural production" have been well established for some time, but it is only recently that they have been developed for "natural products". There are four certification schemes of relevance to natural products (Cole and Bennett.2007):

- Forest management certification -- focuses on ecological aspects of resource management at forest, species and product level, and mainly on timber products;
- Social certification -- focuses mainly on ensuring acceptable labour conditions and the distribution of benefits to those involved in production and trade; Examples: Fair Trade Labelling Organisation; International Federation of Alternative Trade;
- Product quality certification – focuses on the product, aiming to ensure that production standards have been met;
- Organic certification – focuses on ensuring a holistic production management system that enhances agro-ecosystem health; Examples: International Federation of Organic Agricultural Movements (IFOAM); individual certification bodies such as the Soil Association and Ecocert.

Reasons for choosing organic certification

Among the available options, organic certification was selected as the best option for the devil's claw produced by the SHDC project, for the following reasons:

- A market demand for organically certified devil's claw was identified.[63]
- Organic certification would help to capture a niche market that would result in higher prices being paid for the product, making it possible for higher prices to be paid to harvesters. In turn, harvesters would recognize the direct link between compliance with the standards and higher prices paid to them, and would take resource management decisions accordingly.
- Organic certification would guarantee that production is undertaken with due care for resource sustainability and quality control, and that the harvesters benefit socially and economically.
- Organic certification, as opposed to other forms of certification, would best reflect the fact that the product is harvested in a sustainable manner, and would better

[62] The Annex draws heavily on (Cole, 2003b) and (Cole and Bennett, 2007)

[63] The situation has changed. Market demand for organically certified devil's claw has declined since then.

facilitate product traceability, thus ensuring that the 'organic' label would be more credible.

- Organic certification would also confirm that all ecological and administrative requirements, such as ecological surveys, harvesting quotas, proper book keeping, sustainable harvesting methods and post-harvest assessments, have been met.

Certification process

The Soil Association certified the SHDC project under a "group scheme", or as a "producer group". In order to qualify for group certification, the following conditions had to be met:

- The group must be organized and have an internal control system in place. A local coordinator must keep records and ensure that the internal control system functions properly.
- An external person – in the case of the SHDC project someone from CRIAA SA-DC – must pay regular visits to the production area and the findings must be recorded.
- If the internal control system is judged effective, inspections are reduced to a simpler audit of the system, with only 10-20% of the farm areas having to be inspected.[64]
- Two separate licenses are issued after the annual inspection, once compliance with the standards have been demonstrated: one for the production of devil's claw (covering the area/farm, harvesting, slicing, drying, packaging, storage and record-keeping) and the other for processing (covering the repackaging, storage and record-keeping of the local exporter.

Differences between certified and uncertified devil's claw

Differences between certified and uncertified devil's claw relate mainly to: resource sustainability, product traceability, quality control, and price. As for the concentration of active ingredients, often used as a measure of quality, there are no significant differences. Certification does not result in better quality in this respect.

A survey of leading European devil's claw product manufacturers, conducted as part of the Namibia Devil's Claw Situation Analysis in the early 2000s (Cole, 2003a), found that with one exception, none of the buyers was willing to pay more for certified devil's claw, even though the quality of non-organic material was seen as an issue. This indicates that buyers were more concerned about 'quality' in terms of the levels of active ingredients than about issues covered by organic certification, such as sustainability.

However, an issue linked to concentration of active ingredients and guaranteed by organic certification is that of traceability, or more specifically, whether the product comes from an *H. procumbens* or *H. zeyheri* area. At present, no testing for ingredients takes place in Namibia, and in most cases, the exporter supplies devil's claw samples to the buyer for testing. Local testing is technically possible and desirable in ensuring that a higher-quality material is supplied and in increasing value added in Namibia (see Section 7.7).

[64] However, it has been argued that the percentage of the farm area to be inspected should be closer to 100%.

Table 11 summarises the differences between organic and conventional production of devil's claw.

Table 11: Major differences between organic and conventional production of devil's claw in Namibia; Source: (Cole, 2003b)

Organic	Conventional
• Ecological surveys (pre- & post-harvest) • Harvest quotas set • Registration of harvesters and harvester permits • Local co-ordinator and committee in place • Capacity building and other training offered • Record keeping • Product traceability and coding • Monitoring of harvesting • Quality control at all levels • Premium price paid directly to harvesters with bonus payment after sale by exporter • Reliable partnership with local exporter • Annual inspection by certifying body • Sustainable harvesting methods employed • Secure market & access to market and other information	• No ecological surveys conducted • No harvest quotas set • No harvester registration but harvesting permits obtained on an ad hoc basis • No local co-ordinator or committee in place • No or limited capacity building or other training • No record keeping • No product traceability • No monitoring of harvesting • No harvester quality control • Market chain means harvester receives low percentage of price with no bonus payment • No reliable partnership with local exporter • No annual inspection • Unsustainable harvesting methods • Unreliable market & no market information

Proportion of devil's claw production that is certified

Table 12 shows production and price figures for organic and non-organic devil's claw in Namibia. The percentage of devil's claw production in Namibia that is certified organic is very small, less than 2% for any particular year and less than 1% for the period 1999 - 2006 as a whole. However, since 2006 organic production has grown from 3,500 kg to some 50,000 kg (more than 10% of overall production), as a result of the certification of devil's claw producing CBNRM institutions (the Nyae Nyae and N≠A Jaqna conservancies, and the Kyaramacan Association) (Cole, 2008a). Prices obtained for organic material are between 30% and 60% higher than those for non-organic material.

Table 12: Export quantities and prices of organic and non-organic devil's claw production in Namibia; Sources: (Cole and Bennett, 2007) and (Cole, 2003b)

	ORGANIC		NON-ORGANIC	
Year	**Total Sales (kg)**	**Sale Price[65] (average/N$)**	**Total Sales (kg)**	**Sale Price[66] (average/N$)**
1999	10,200	22.2	604,335	13.8
2000	7,080	25.5	379,740	14.7
2001	3,810	24.7	726,333	17.0
2002	4,650	46.2	851,016	35.2
2003	3,676	38.7	592,387	25.8
2004	4,952	35.7	331,466	25.1
2005	1,825	33.0	336,713	22.5
2006	3,541	35.7	430,000	26.7
	39,734		**4,251,990**	

Costs of organic certification

The annual average costs of certification are shown in Table 13. Total costs, which include costs of inspection, licence renewal, and air fares,[67] are substantial, but they have so far been covered by donor funds. The average cost of certification exceeds the profit margin

Table 13: Annual SHDC project sales and costs of certification, 2003-2006; Source: (Cole and Bennett, 2007)

Year	Total Sales (kg)	Sales Price (average/N$)	Total Income (N$)	Margin (N$)	Av. Cost of Certification per year (N$)
2003	3,676	38.7	137,386	27,703	29,600
2004	4,952	35.7	178,718	37,491	29,000
2005	1,825	33.0	60,298	25,271	29,000
2006	3,541	35.7	126,916	33,523	

[65] These are prices paid to exporters by buyers (FOB), figures derive from data recorded by SHDC and other institutions producing certified devil's claw (conservancies, associations)

[66] Price figures derive from data obtained from exporters, reflecting average prices only.

[67] These total costs do not include local transport costs, service provider costs, and costs of packaging, labeling and administration.

from SHDC devil's claw production. Given this unfavourable cost-benefit balance, the economic viability of certification is questionable. Certification seems viable only if:[68]

- recognised and credible certification services can be developed in the region or in Namibia; and/or
- substantially higher devil's claw production levels and profits can be attained.

It is not surprising, therefore, that the organic license of the SHDC project has lapsed since donor funding of the project ended in late 2005.

[68] Covering certification costs by using donor funds does not provide a sustainable solution, as the experience of the SHDC project shows. At best, it may serve as a stop-gap measure, allowing PPOs to buy time until they are able to attain higher production levels and profits.

Annex H: History of the Devil's Claw Policy and permitting system

Large-scale commercial exports of devil's claw[69] from Namibia started in 1962 and grew quickly. By 1975, annual exports volumes had risen to some 180,000 kg. The trend of growing export volumes raised concerns over possible over-utilisation of the devil's claw resource base. This led the Government to declare *H. procumbens* a protected plant species under the Nature Conservation Ordinance of 1975 and to introduce a permit system to control the harvesting, processing, transport, and export of side-tuber material in Namibia. With the recent revision of the Devil's Claw Policy in 2010 (see below), the 'Protected Plants' Schedule of the Ordinance has now been amended to also include *H. zeyheri* in the list of protected species, in order to broaden and strengthen the devil's claw regulatory framework.

Growing evidence of a very low level of legal harvesting in the 1980s – only a small proportion of all devil's claw side-tuber material was being produced by harvesters in possession of valid permits – contributed to the realization that that the permitting system was not working. This led the Government to suspend all existing permits for devil's claw harvesting, storing and transporting. Permit requirements for devil's claw exports were maintained, however, as this was the only part of the permit system that had worked relatively well.

By the late 1990s, devil's claw exports had increased further to around 600,000 kg, raising renewed concerns about the over-utilisation of the resource base. These concerns as well as reports about exploitation of harvesters and complaints from some land-owners about unfilled harvesting holes posing a danger to livestock and vehicles, prompted MET to re-introduce a permit system for devil's claw harvesting in 1999, as part of a draft policy entitled "Policy on the Harvesting and Export Harpagophytum Products". Its initial form was adjusted in the same year, in response from criticism from service providers and harvesters, by extending the validity of the harvesting permits from one month to the whole harvesting season and by agreeing to issue group permits (which allowed organized harvesters to share the cost of obtaining permits and reporting back on their harvesting).

[69] Initially mostly *H. procumbens* was exported, later on increasingly also *H. zeyheri*.

Annex I: New Devil's Claw Policy - implementation strategies and approaches

Table 14 below summarises the provisions for registration and permitting that have been established by the new Devil's Claw Policy.

Table 14: Overview of the permitting system established by the new Devil's Claw Policy (Source: (MET, 2010))

Strategy	Objectives	Approach
Harvesting devil's claw is subject to a permit. When applying for a permit, **harvesters** must provide: ▪ detailed personal information ▪ the location where harvesting will take place ▪ permission from the landowner (in the case of communal areas this may be the traditional authority, or the regional or local government)	To facilitate traceability of harvested material To facilitate monitoring of harvesting methods by MET To ensure that harvesters use sustainable harvesting methods during the designated harvest season in an area where they have a responsibility for the management of the resource	Harvesting permits: ▪ will be valid for one whole harvesting season ▪ may be issued to individual or group (names of all harvesters must be specified) ▪ will be valid for a particular locality only ▪ may be subject to a quota ▪ must be carried by each harvester ▪ will stipulate sustainable harvesting methods ▪ will require report-back on total weight harvested, locality from which material was harvested, to whom amounts were sold, and which dates (to be submitted within 1 month of the close of harvesting season - by end of November) ▪ will only be re-issued on receipt of satisfactory report-back and confirmation of compliance with sustainable harvesting methods
Trading and exporting devil's claw is subject to registration with MET. **Traders and exporters** must register with MET before they can apply for trade or export permits	To ensure that all traders and exporters are familiar with the requirements of the policy	The registration process includes a test to verify knowledge and understanding of the new policy and its regulations Registration will be valid for three years
Trading devil's claw is subject to a permit. When applying for a permit, **traders** must provide: ▪ detailed personal information ▪ proof of registration with MET ▪ the location from which devil's claw will be	To ensure that buying and selling activities support the sustainable utilization of the resource To ensure that the MET is supplied with appropriate information to allow for effective monitoring of harvesting and trading of devil's claw material To facilitate traceability of	Trading permits: ▪ will require traders to keep a record of all transactions, including dates, permit numbers and names of persons from whom material was bought, the quantity of material purchased during each transaction, and where the material was harvested ▪ will require trader to complete the details of transactions with harvesters on the harvesters' report-back forms,

purchased	harvested material	and to sign accordingly ▪ will require report-back on the amount of material traded, the locality from which it was sourced, the harvester from whom the material was bought, and which dates (to be submitted within 1 month of the close of harvesting season - by end of November)
Exporting devil's claw is subject to a permit. (Exporters also involved in trading require two permits: one of exporting and the other one for trading) When applying for an export permit, exporters must provide proof of registration with MET	To ensure that: ▪ exporters have acquired the products from legal sources; ▪ the material has been harvested and traded using appropriate processes	Applications for export permits must be accompanied by copies of a register showing clearly where the material originated Exports of devil's claw require phytosanitary certificates from MAWF for which valid MET-issued export permits must be provided
Cultivation of devil's claw (for commercial purposes) is generally encouraged and supported, but is subject to a permit	To ensure that MET is informed about devil's claw cultivation activities in order to see to it that these activities and their outcomes are in accordance with the aims and objectives of this Policy and other relevant policies	Cultivation permits are issued by MET under the condition that progress and final reports are submitted on an annual basis
Research on devil's claw is generally encouraged and supported, but is subject to a permit	To ensure that MET is informed about devil's claw cultivation activities in order to see to it that these activities and their outcomes are in accordance with the aims and objectives of this Policy and other relevant policies	Feasibility studies into cultivation will be regarded as research Outcomes of all research must be reported to the MET Renewal of a research permit is subject to compliance with this requirement
Transport of devil's claw material is subject to a separate permit – only for those individuals or organizations that are not already in possession of a trading or export permit		Registered traders and exporters holding a valid trading and/or export permit do not need a transport permit Transporters are not required to register with MET