New Partnership for
Africa's Development (NEPAD)

Comprehensive Africa Agriculture
Development Programme (CAADP)

Food and Agriculture Organization
of the United Nations

Investment Centre Division

GOVERNMENT OF THE REPUBLIC OF BOTSWANA

SUPPORT TO NEPAD–CAADP IMPLEMENTATION

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Volume VI of VII

BANKABLE INVESTMENT PROJECT PROFILE

Beekeeping Development

July 2005

BOTSWANA: Support to NEPAD–CAADP Implementation

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NEPAD–CAADP BANKABLE INVESTMENT PROJECT PROFILE

Country: Botswana

Sector of Activities: Beekeeping

Proposed Project Name: **Beekeeping Development**

Project Area: Country–Wide

Duration of Project: 5 years

Estimated Cost: Foreign Exchange ..... US$1.77 million
Local Cost ..... US$1.00 million
Total ..... US$2.77 million

Suggested Financing:

Source	***US$ million***	***% of total***
Government	1.00	36
Financing institution(s)	1.77	64
Beneficiaries	–	–
Total	***2.77***	***100***

BOTSWANA:

NEPAD–CAADP Bankable Investment Project Profile

"Beekeeping Development"

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Currency Equivalents

(July 2005)

Local Currency	=	Botswana Pula (P)
US$1.00	=	P5.49
P1.00	=	US$0.18

Abbreviations

CAADP	Comprehensive Africa Agriculture Development Programme
CEDA	Citizen Entrepreneurial Development Agency
DDF	Domestic Development Fund
MOA	Ministry of Agriculture
NAMPAAD	National Master Plan for the Development of Arable Agriculture and Diary Development
NDB	National Development Bank
NDP	National Development Plan
NEPAD	New Partnership for Africa's Development
NGO	Non–Governmental Organisation
NMTIP	National Medium–Term Investment Programme
SADC	Southern African Development Community

I. PROJECT BACKGROUND

A. Project Origin

I.1. The *National Development Plan* 9 (NDP9) gives priority to beekeeping programs both from the point of view of diversifying agricultural products and enhancing the incomes of the farmers. Accordingly, the *Ministry of Agriculture* (MOA) through its *Beekeeping Section* had proposed a project for execution during NDP9. The objective of the project is to facilitate an increase in production of honey through establishment of farmer demonstration and community apiaries and also to upgrade the existing demonstration and community apiaries in six agricultural regions. The project in NDP9 is not as elaborate as the one being presented for the NEPAD–CAADP financing due to resource constraints faced by the ministry of agriculture and hence the need to seek assistance to fully implement the project.

I.2. This project is in line with the third CAADP pillar that seeks to ensure the enhancement of food supply and reduction of hunger. The project also coincides with the fourth pillar of CAADP that is intended to promote the development of appropriate technologies that reduce production constraints, increase productivity of agricultural output and conserve the environment. To some extent it also conforms to the second pillar that seeks to improve rural infrastructure and trade related capacities as the project has components devised to develop efficient marketing of beekeeping products.

I.3. The activities foreseen under this project include capacity building, improvement of extension delivery services, development of better bee breeds, diversified beekeeping products and adoption of sustained technologies, establishment of income generating projects, and initiation of research on Varroa mite pest to increase potential for higher production. These make up the first three priorities given by the Government to this project within the CAADP's *National Medium–Term Investment Programme* (NMTIP).

I.4. In terms of institutional and financial capabilities, the government has well established extension services in various regions. The government provides funding through the annual budget to the MOA. However, government is unable to cover all activities due to budgetary constraints. The beekeeping sector has to share funding with other sectors within the MOA, hence the need to find other sources of funding to enhance government intervention. On the other hand, non–governmental organisations are at present not fully involved in the beekeeping project due to lack of funding. They therefore have minimal capacity to participate.

B. General Information

I.5. Botswana is a landlocked country with a total land area of 582,000 km^2 and is located close to the subtropical high–pressure belt of the Southern Hemisphere. Much of the country is flat, with gentle undulations and occasional outcrops. About two thirds of Botswana's land area is covered with thick sand layer of the Kalahari Desert. The country is largely arid or semi–arid with annual average of rainfall ranging from less than 250 mm in the Southwest and slightly over 650 mm in the Northeast. This means that the country receives low rainfall and has high temperatures. Due to these semi arid climatic conditions, most rivers in Botswana are ephemeral and hence valleys are usually dry except during rainy seasons. Given this scenario, there is high inter–annual variability of rainfall and drought is a recurring element of Botswana's climate.

I.6. The economy of Botswana has developed well in both sustained growth and by provision of social benefits to its people. Since independence, Botswana's economy has been directed by

development plans and to date has successfully implemented 8 National Development Plans. In 2003 it launched NDP9, which covers the period 2003/04 to 2008/09. A World Bank study of 1999[1] indicates that for the past three decades real per capita Income grew by more than 7 percent annually. Botswana's per capita GDP at US$3,000 has put the country under the category of middle–income country according to World Bank classification (1997).

I.7. The economic structure of Botswana has changed significantly post independence period. At independence, agriculture accounted for 42 percent of GDP and has declined to 2.6 percent in 2000/01 while that of mining, a sector virtually non–existent in 1966, reached 36.5 percent (NDP9). The structural change of the economy is even more reflected by the increase in urban population that jumped from 9.1 percent in 1971 to 54.2 percent in 2001. Although the contribution of agricultural sector to GDP is declining the role of agriculture is still important as 43 percent of the population depends on agriculture. The low contribution of agriculture to the GDP is, therefore, a reflection of the low productivity of the labour force engaged in agriculture. The recurrence of drought and animal diseases are additional factors that negatively influence the growth of the sector.

C. Beekeeping

I.8. Although Botswana has achieved a high economic growth rate since independence, the country is still experiencing high levels of poverty especially in rural areas. With the majority of Botswana's poorest people living in uncertainties occasioned by fluctuating environment, a variety of livelihood strategies such as beekeeping need to be adapted and improved to ensure sustainable livelihoods. The beekeeping sector plays a major role in rural socio–economic development and environmental conservation. Beekeeping is a source of food (honey, pollen, royal jelly and brood), medicinal purposes (honey, propolis, and bee venom), and raw material (beeswax, beeswax candle, cosmetic, and textile lubricants) for various industries and provides good income for the rural population. During NDP7, for example domestic honey production contributed 1.5 percent of the demand (206 mt) of honey imported into the country over a period of six years. During NDP8, however, its contribution increased to 11.8 percent of demand (123 mt) of honey imported into the country in a period of 6 years, which in monetary terms translates to about US$336,000.

I.9. As a result of such encouraging developments the government of Botswana is under taking a wide range of initiatives to diversify the agriculture sector with the view to strengthening the poverty alleviation efforts. Beekeeping is one of the strategies accorded high priority to diversify the crop sub–sector with the objectives of creating more employment opportunities, incomes and hence, alleviating poverty.

I.10. Beekeeping is largely affected by climatic conditions such as long and short torrential rains, very cold and hot temperatures, however its socio–economic performance under favourable circumstances can repay occasional losses and often double beekeepers' rewards. For example in Botswana under normal conditions, a bee colony managed well in a top bar hive can produce between 15 kg and 20 kg of surplus comb honey for a beekeeper annually. With the current reviewed prices of comb honey for farmers ranging between P20 to P30 per kilogram, this will come close to P 600 per colony per annum, therefore an apiary with 10 colonies will be P6,000, which is equivalent to around $1,100. This represent a lot of income to an ordinary farmer who is dependent on agriculture.

I.11. However, beekeeping in Botswana like in many countries in the SADC regions is characterized by low–level technology, limited investment, low productivity, low quality and lack of

[1] *Botswana: A case Study of Economic Policy, Prudence and Growth*, see Annex 6.

market initiatives. Hence, even though beekeeping has proved to be a worthwhile enterprise to the farming communities in Botswana, one major outstanding problem is low productivity. This table below sums up honey production levels of people involved (individual, groups and clubs) in beekeeping against the number of colonies they keep as reflected in the *Beekeeping Annual Reports* (1993 to 1997). As the table shows more and more people are involved in beekeeping but the increase in number and the additions of colonies do not result in a concomitant rise in production levels. Normally as the number of bee colonies increase, honey production is expected to increase following the unit/colony production increases. As Table 1 below demonstrates, only few colonies are harvested every year while the majority remain dormant and unproductive which indicates the prevalence of management problems. Although the resources are not exploited to the maximum, the financial returns are still quite high.

Table 1: Beekeeping Production Inventory 1993 to Date

	1993/94	1994/95	1995/96	1996/97	1997/98	1998/99	1999/00	2000/01	2001/02	2002/03	2003/04
No. of people involved	189	754	840	1,334	1,503	2,052	1,950	1,214	1,009	2,070	2,298
Absconded colonies			62	68	100	216	328	184	289	499	444
No. of bee colonies	121	205	216	365	603	372	340	785	973	729	502
No. of colonies harvested	27	39	49	67	69	50	124	223	189	168	136
kg of honey harvested	231	351	531	980	1,523	838	602	3,949	3,963	2,311	1,206
Income generated	2,724	4,344	8,545	10,496	18,021	7,451	14,202	53,809	80,654	45,139	24,295
Average kg per colony	8.6	9	10.8	14.6	22.1	16.8	4.9	17.7	21	13.8	8.9

Source: Beekeeping Report 2003/2004

II. PROJECT AREA

II.1. The proposed project area covers the six agricultural regions of Botswana as designated by the Ministry of Agriculture and comprises of, Gaborone, Central, Southern Western, Northwest and Francistown regions (see attached map). The overall contributions of the regions in terms of honey production levels and income generated in different years has some interesting propositions worth noting. In 2000/01 the Western region produced less than Gaborone and Southern but the financial returns were high owing to the scarcity of honey in the region. Imported honey was also in short supply. Likewise, North West region in 2003/04 produced less than the big regions (Gaborone, Central, Southern and Western) and yet the financial returns were better as compared to rest, simply because demand of honey was high while the supply was very low in this tourist area and again penetration of imported honey to this area is very limited. A brief overview of the ecological patterns of the agricultural regions is presented below.

II.2. ***Gaborone Agricultural Region.*** The Gaborone region is located in the south–eastern part of Botswana and covers three District Councils of South East, Kgatleng and Kweneng. The natural vegetation of this area consists of several varieties of savannah type with acacia shrub in the southern, eastern and northern, while in the west is basically covered with shrub savannah. In the South East District, many species of aloe and a large variety of grasses which are suitable for grazing and Beekeeping undertaking. The vegetation around dams in this area especially Notwane, Taung, Metsemaswaana, Metsemotlha Rivers add an ample value of bee forage around these rivers and also forms the habitat of wild colonies, which during swarming period capturing of such swarms becomes easy. The area is characterized by low and erratic rainfall with high temperatures during the summer months. The Gaborone region as compared to other regions is blessed with community woodlots and plantations that are source of bee forage for beekeeping projects established closed to them.

II.3. ***Central Agricultural Region.*** The central agricultural region is located in the Central District and it consists of 6 District Agricultural Offices in Boteti, Serowe, Palapye, Mahalapye, Machaneng, Selibe–Phikwe and Bobonong. The average rainfall in the Central region ranges between 350 mm in the east around Bobonong Sub–District to just over 500 mm in the southeast that is in Machaneng and Mahalapye Sub–Districts. The major rivers in the Central District are Bonwapitse, Mahalapye, Lotsane, Motloutse and Shashe in the northern and they drain in the eastern direction into Limpopo River that forms the eastern border between Botswana and South Africa. The soils adjacent to these rivers are very rich in fluvisols, hence very fertile and provide the areas with variety of multipurpose bee plant species especially the acacia species. During the agricultural crop season especially when the rains are good, the bee forage around both Mahalapye and Palapye Agricultral Offices becomes very attractive for bee pollination. In addition to this the areas adjacent to the Limpopo drainage system with high prospects for irrigation farming in the Tuli Block area would be a boost for honey production and a habitual reservoir for wild colonies.

II.4. ***Southern Agricultural Region.*** The southern agricultural region is within the Southern District that is located in the south–eastern corner of Botswana. The area consists of gently undulating plains with a range of hills in the north–eastern corner and sub–desert sand in the west known as Ngwaketse–Kgalagadi. The vegetation ranges from open tree savannah in the eastern portions to grassy rangelands with islands of trees in the west. The climate of the District is generally warm and dry with rainy season occurring between October and April. The rivers are confined to the hilly areas in the north–eastern part of the District with abundance of dams, while pans and haffirs are common in southern areas. About 30 percent to 35 percent of arable land is being cultivated and rest is exclusively used for grazing. The ecologically status of the vegetation and even the climatic condition are very conducive for beekeeping and hence southern region comes as the third honey producing area in beekeeping production records.

II.5. ***Western Agricultural Region.*** The Western region covers the Kgalagadi North and South and Ghanzi District. Arable farming in these areas is low as the areas are semi–deserts and soils are not suitable for crop farming, but the area is good for livestock farming and large livestock ranches are located in this region. Beekeeping does well in the Kgalagadi areas due to some drought resistant bee plants especially the highly populated shrubs. This area has done well in beekeeping since it was established and can be a hub of bee activities in Botswana. Hence, small farmers unable to keep livestock could benefit from the beekeeping activities. The sand–dune project carried out by some conservation organisations are also benefiting the beekeepers especially in the Kgalagadi North

II.6. ***North–West Agricultural Region.*** This region covers the Okavango Delta, Ngami and the Chobe District. Beekeeping in the North West is disadvantaged by lack of research as the bee species in the area seem to be prone to swarming tendencies and hence a combined research and bee breeding station is proposed to find out how these discrepancies could be overcome. The Okavango delta is a bee reserve base for bee population in Botswana during severe drought periods. The irrigation of cash crops in the Chobe district at Pandamatenga is ideal for Bee pollination services to the commercial farmers hence the area is chosen as potential Beekeeping area. The main constraints for small farmers are the elephant population that destroys the miyomho woodland that is good for beekeeping.

II.7. ***Francistown Agricultural Region.*** The Francistown region is predominately covered by the mophane woodland and it is not a bee plant species. However during good rainy season, the arable farmers boost beekeeping production in the area as they plough crops like groundnuts and watermelons that are good bee plant species. Although the arable fields are small, they are often supplemented by backyard gardening. The low level practice of livestock and arable farming in this region makes beekeeping an option for farmers to increase their output and hence can be an attractive venture.

II.8. The major target group will be both small–scale (i.e. backyard beekeeping farmers with 1 to 5 bee colonies) and medium scale (beekeepers with 10 or more bee colonies) trained in basic beekeeping techniques. Government offers training to farmers and experience has shown that the training is sufficient to start a small–scale bee–keeping project. According to NDP8 production figures honey production per unit stock is 20 kg of comb honey and 1 kg of beeswax per hive/annum. The specific constraints of the target group are that of lack of proper bee management, inadequate application of bee pest control measures, limited access to credit facilities, drought effects and lack of bee products marketing facilities. These constraints are further aggravated by inadequate extension coverage, lack of special skills and research undertaking in the beekeeping section.

II.9. The priority of the group target is to increase honey production and set up beekeepers marketing associations and therefore reduce importation of honey and other bee products. This will enhance beekeepers standard of living through income generated from sales of bee products and also improve crop yields through bee pollination.

III. PROJECT RATIONALE

III.1. The promotion of beekeeping programmes and projects in Botswana has been mainly the responsibility of the government while the private sector/NGOs are playing a very minimal role. However, the importance of beekeeping in terms of social and economic benefits such as alleviation of poverty, creation of employment, improvement in health status, improved crop yields through bee pollination and incorporation in conservation programmes can not be underestimated. On the whole beekeeping programs are very instrumental in diversification strategies of the national economy. In furtherance of these same objectives the present project aims at increasing production levels of beekeeping, yields and enhances incomes and food security at households' levels. Thus, the project fits well within the framework of CAADP and links with the two CAADP pillars stated below:

- *Enhancement of food supply and reduction of hunger* which includes emphasis on emergencies and disasters that require food and agricultural responses; and
- *Development of agricultural research, technological dissemination and adoption of sustainable long–term productivity growth*.

III.2. The various components of the project are also consistent with the development objectives of the government and in particular with the diversification of agricultural products. The components identified are:

- *Training of 6 technical officers and 4 artisans* to acquire more appropriate beekeeping skills – this will involve short and long term training to ensure increase of the Beekeeping Section capacity to deliver;
- *Provision of 6 vehicles for regional offices* – to enable them to offer effective extension delivery of services to beekeeping farmers;
- *Establishing of two Bee Breeding Stations* in North West and Southern regions for the production of better and high yielding stock of bee colonies;
- *Establishment of two Bee Products Processing Plants* in Gaborone and Central regions to process bee honey and other bee products in order to add value and utilise all raw materials from bees;

- *Farmer training* – aims to equip farmers with techniques and good management practices for increased productivity in the beekeeping sub–sector;
- *Establishing 50 income generating projects* – this will be done for the selected farmers to practise beekeeping commercial by introducing a revolving loan fund to offer loans;
- *Research on Varroa mites pest* – these are predominant pests that affect beekeeping in conditions such as Botswana. The studying and observation of their breeding patterns and effect on beekeeping industry will be researched.

III.3. The project is linked well with the strategies and priorities of the country as elaborated in NDP9 and *Vision 2016*. The main challenge facing the MOA in this regard is to fulfil the mandates of *Vision 2016* and the ministry's strategic business plan towards increasing productivity of the sector, to ensure that the sector contributes effectively to economic development, poverty alleviation, food security, and improvement of the quality of life and the sustainable utilization of natural resources.

III.4. The absorptive capacity in terms of institutional, manpower and financial capacities is low in the implementation of a beekeeping project as farmers have taken beekeeping at a small scale. There is a gap due to financial and manpower constraints. There is need for trained personnel and informed community to implement the project and the solution is to seek financial assistance to complement government efforts and build capacity for farmers to realize potential of beekeeping as a source of revenue for both individual farmers and the economy.

IV. PROJECT OBJECTIVES

IV.1. The ***overall objective*** of the project is to develop competitive and sustainable beekeeping industry in Botswana.

IV.2. The ***specific objective****s* are:

- To improve the quality and manpower capacity of the *Beekeeping Section* staff in the Regions and Districts for quick delivery of extension service to the farming community that entails training 6 technicians to become professionals and 4 artisans to become technicians;
- To train beekeepers on elementary, intermediate and advanced beekeeping techniques for good apiary management;
- To conduct field day apiary demonstrations for beekeepers to learn by doing;
- To provide at least 6 project vehicles for close project monitoring and supervision in the regions;
- To facilitate establishment of 50 viable income–generating projects in identified potential beekeeping areas through a revolving loan funding mechanism;
- To facilitate formation of 6 Beekeepers Associations;
- To facilitate planting of drought resistant and multi–purpose bee plant species to improve bee forage around apiaries;

- To promote formation of Beekeeping Associations/Cooperatives for establishment of two Bee Products Processing Plants in Central and Gaborone regions, respectively;
- To breed quality bee stock for increased bee productivity by establishing two Breeding Stations, one in the North (Maun) and another in the South (Kanye);
- To conduct research on types of bee species and behavioural responses to bee manipulations in Botswana;
- To conduct feasibility study on the effects of bee pests and diseases on bee population and provide control measures.

IV.3. The ***expected outputs*** are:

- *Training:*
  - 6 professionals and 4 technicians trained;
  - 350 farmers trained;
  - 30 field day apiary demonstrations conducted;
  - 6 vehicles procured and deployed to regions.
- *Production:*
  - 50 viable income–generating projects established;
  - 500 bee plant species planted;
  - 40 percent improvement in crop yield due to bee pollination;
  - 6 Beekeeping Associations established.
- *Studies:* 2 feasibility studies conducted.

V. PROJECT DESCRIPTION

V.1. The project components are closely interrelated and are critical for the provision of specialised skills in various beekeeping aspects, better bee management practices; research undertakings, increased farm incomes and timely service delivery to stakeholders that are geared towards increased honey production. The project components described below are in line with the CAADP pillars as explained in the section that dwells on project rationale.

Component 1: Training of Skilled Beekeeping Professionals

V.2. The training of the 6 Technical Officers shall involve acquiring specialised skills on various aspects of beekeeping such as bee botany, entomology, agro–meteorology, environmental studies and natural resources management that are currently required to improve beekeeping service delivery. After acquiring the professional skills the officers would be deployed to regional and district offices to serve the farming community.

V.3. Similarly the trained technicians will be deployed to manage identified and potential beekeeping projects or even to serve at district level. This will ensure that the bee products processing plants and breed stations envisaged under component 3 and 4 are efficiently managed.

<u>Component 2:</u> Provision of Six Vehicles for the Regions

V.4. This is intended for the regions to offer efficient and effective extension service delivery to the farming community. The MOA's transport system is in adequate to meet the transport requirements of the extension services. During the critical times of beekeeping seasons of breeding and honey harvesting extension officers face problems of transportation to give the farmers assistance at the needed time. To improve the extension services that farmers get and ensure rising yields of the beekeeping industry the provision of additional fleets of transport would be quite essential.

<u>Component 3:</u> Establishment of Two Bee Breeding Stations in Northwest and Southern Regions

V.5. The purpose of a bee breeding station is to produce better bee stocks of bee colonies, especially queen bees that are productive, sociable, and tolerant and with behavioural traits that are adaptable to Botswana's environmental conditions.

V.6. The North West station will cater for Francis Town and Central regions because of proximity to each other and have similar environmental conditions. The Southern region station will cater for the Gaborone and Western regions as their social sphere; environmental, climatological, ecological patterns are almost similar.

V.7. Samples of queen bees produced from the stations will undergo comparative analysis with the traditional species and their performances observed. Queens with quality yields will then be introduced into farmer's bee colonies for trials; if they prove successful they will be introduced to farmer's colonies for honey production.

V.8. Targeted research will be an important and integrated part of all the project components, and will be carried out in collaboration with the communities, local university and research institutions as well as with relevant universities outside the country. The MOA through the *Beekeeping Section* will be playing a coordinating and fund–raising role in this connection.

V.9. A combination of scientific, practical and indigenous knowledge is needed to implement the various activities specified in components 1, 2, and 4. Applied research is needed in the following: behavioural traits of bee species to the ecological and climatological patterns; manipulation aspect of beekeeping; production possibilities, record keeping, swarm collection and breeding stages; beekeeping resource management (e.g. develop participatory planning methods and develop community beekeeping register); beekeeping marketing alternatives (e.g. marketing information, policy formulation, supplementary feeding to stimulate production) and technology transfer (e.g. training seminars conferences or workshops and farm visits) The breeding station can be used as a basis for comparative analysis with a regional as well as a local focus, which together will serve as a platform for further monitoring of bees production sector. Personnel (including students and prospective bee farmers) may visit the station as part of the training component of the project.

<u>Component 4:</u> Establishment of Two Bee Products Processing Plants in Southern and Central Regions

V.10. Although there are significant variations in regional production levels, as from 1992/93 to date, there is a need to establish two Bee Products Processing Plants to diversify the main bee products (honey & beeswax) into other by–products that can enhance not only quality of bee products but even

niche market of value added beehive products. The facilities of this kind could be replicated in other Regions and even Districts when they have yielded better results.

V.11. The two processing plants will be constructed in Gaborone and Central regions as their production levels are convincingly increasing as compared to other regions. The demand of bee products in the regions is high especially in the city of Gaborone. In the initial stages they will be under control of the government management with a view to transfer ownership and management to Beekeeping Associations when fully developed. The associations are expected to be more organised before such transfers are made.

Component 5: Farmer Training

V.12. Seminars and workshops will be undertaken to provide additional skills necessary to implement the planned activities. Exchange visits and joint workshops will allow for institutional arrangements, tools and technologies to be shared between regions and communities. Apiary demonstrations will be conducted for on–site training whereby model farmers will be sharing with other farmers on better bee management practises. Beekeepers will also be mobilised to form Beekeepers associations in the six agricultural regions.

Component 6: Establish 50 Income–Generating Projects

V.13. The beekeeping section will facilitate establishment of fifty individual incomes generating projects in order to contribute towards alleviation of poverty and setting up viable bee keeping farms. The selected farmers shall operate on a revolving loan funding and will be expected to repay the loans at reasonable interest rates. The projects will be rolled out to other farmers as initial borrowers repay. The choice of farmers will be based on their commitment and innovative capability in the beekeeping industry. The current programme of funding farmer demonstrators with DDF funding has shown that some farmers need funding to expand their apiaries and they are able to contribute 30 percent down payments to secure the revolving grants.

V.14. The MOA will procure the necessary project inputs and hand them to the selected farmers and perform close monitoring to ensure success of project to emulate successes of the DDF project currently being implemented. The increased yields from the income generating projects shall provide the processing Plants with adequate supply of comb honey and therefore sustain the two processing facilities throughput.

Component 7: Research on Varroa Mites Pest

V.15. The Varroa mites have been identified as the greatest threat to the bee population and hence need to have research on the mite in order to reduce its impact. The mites invade honeybees and are menaces to wild colonies that live in hallowing trees and other cavities. They feed on both brood and adults by puncturing the body and sucking the body fluids of the bee. Reducing the impact is important as bee farming is depended on the wild bees to restock hives. Several pesticides will be tested together with adopting integrated pest management in reducing the Varroa mites.

VI. INDICATIVE COSTS

VI.1. The total project cost, estimated at US$2.77m, is broken down by components as shown in Table 2 below.

Table 2: Cost Summary per Component

Component	Local	Foreign	Total (US$)	% Foreign Exchange	% Total Base Costs
1. Training	160,000	584,000	744,000	78	31
2. Vehicles (6)	0	220,400	220,400	100	9
3. Breeding Stations (2)	73,950	165,880	239,830	69	10
4. Processing Plant (2)	439,350	82,000	521,350	16	22
5. Farmer Training/Beekeepers Associations	50,000	100,000	150,000	67	6
6. 50 Income Generating Project	87,000	122,000	209,000	58	9
7. Research on Varroa Mites Pest	45,400	237,000	282,400	84	12
Total Baseline Costs	855,700	1,511,280	2,366,980	64	100
Physical Contingencies (7%)	59,899	105,790	165,689		7
Price Contingencies (10%)	85,570	151,128	236,698		10
Total Project Costs	1,001,169	1,768,198	2,769,367		117

See detailed cost estimate in Annex 1.

VI.2. Rates used were based on:

- The projections are made on best estimates and on past *Beekeeping Section* projects and studies;
- Buildings were based on *Department of Architectural and Building Services*;
- Indicative costs from suppliers of equipment and materials;
- Market rates prevalent for Botswana, especially for farmer training initiatives;
- Capacity Building – rate of course duration were based on past costs and prevailing market rates based on high cost estimation of UK based courses;
- Other information was solicited from past reports and applied to the project condition;
- Expertise was estimated basing on past *Beekeeping Section* hire of experts and adjusted for inflation and advice provided by the Section.

VII. PROPOSED SOURCES OF FINANCING

VII.1. Sources of funding identified at this stage include historical sources that supported the Beekeeping Section in the past and these includes: European Union in support of establishment of *4B Youth Clubs* and community apiaries, The private sector in particular the local pesticide industry could contribute in the form of training farmers on the safe use of pesticides and taking back the empty pesticide containers for safe disposal.

VII.2. The contribution of government as indicated in the table showing indicative costs is at 33 percent of the total project costs and will be reviewed during the actual project appraisal of project. As the project is still at identification level, the actual contribution of other stakeholders cannot be

determined. It should be noted that the government has been supporting the beekeeping project as demonstrated in the successive NDPs. However, the main beneficiaries of the project i.e. farmers could also contribute through the provision of manpower and participation in utilising what the project offers by setting up beekeeping projects.

VII.3. Sources of funding identified are the *African Development Bank, European Union, World Bank* and other bilateral donors. These sources are at present supporting the Government of Botswana and have in the past supported successful project; this will enhance chances to support the beekeeping project. The beekeeping project will assist in setting up commercial projects for both communities and individuals. Business plans based on cost/ benefit analysis will be formulated and presented to private sector such as banks and other government funding institutions like CEDA and NDB more especially for farmer's in a position to practise beekeeping on a commercial scale. These financial institutions had been set up to economically empower citizens to generate incomes and create employment.

VIII. PROJECT BENEFITS

VIII.1. The ***main benefits*** of the project will accrue nationally by translation into increases in productivity levels and yield in beekeeping industry.

VIII.2. ***Specific benefits*** of the project will include:

- Promoting the goal of alleviation of poverty amongst rural and urban communities through generation of income by selling bee products. The proposal is to set up 50 income generating projects. Given the model of 15 bee colonies producing quantities shown in Annex 5, gross income for the 50 projects will amount to US$145,000 and total costs to US$101,000; hence the additional net income is estimated at about US$44,000.

- Import substitution – In value terms, imports into the country were US$336,000 for NDP8. Estimated honey imports for NDP9 are projected to be US$408,000. By establishing the 50 income generating projects, this will be reduced to US$263,000 (US$408,000–US$145,000);

- Improving the health status of citizens by availing bee products as supplementary nutritional foodstuff and for medicinal purposes;

- Integrating other agricultural projects through bee pollination of crops and fruits trees to attain better crop yields;

- Conserving and protecting the country's bee population against pest's predators, diseases, bush fires and drought;

- Creation of employment for the community hence assisting government in reduction of unemployment especially for women and youth; and

VIII.3. The ***main beneficiaries*** would be:

- Both small–scale and commercial farmers who would supplement arable and livestock farming by integrating beekeeping practises.

- The general public whose health would be improved by using bee products as supplementary foodstuff and for medicinal purposes.

- The MOA who would have adequate facilities to both train, process bee products and transfer beekeeping technology to farmers.
- The beekeeping industry that will improve yields.

VIII.4. Preliminary comparison of benefits with costs of the project is reflected by model of a profitable project of beekeeping together with expected yields that will render enterprises profitable. This model is presented in Annex 5.

IX. IMPLEMENTATION ARRANGEMENTS

IX.1. The MOA through its *Beekeeping Section* that is under *Department of Forestry and Range Ecology and Beekeeping* will implement the project; however the operations of the proposed project will require training of available staff and short–term expertise. Detailed implementation arrangements will be finalized during project appraisal.

IX.2. The project should be based upon a participatory approach to improve implementation of activities and enhance productivity in the sector. Active participation will include different stakeholders in all aspects of project design, implementation monitoring and evaluation. Active participation ensures that stakeholders enjoy ownership of the project and will therefore increase its success and realization of objectives set. These stakeholders include farmers, community based organizations and non–governmental organizations (NGOs), government technical administration at both the central, district and community level.

X. TECHNICAL ASSISTANCE REQUIREMENTS

X.1. The *Beekeeping Section* will need expertise to kick–start the project on the establishment of the three breeding stations, establishment of the Bee Products Processing Plants and research on Varroa Mite pests. The project would need technical expertise in the following areas:

- An expert conversant with several bee species in the establishment and implementation of the breeding stations;
- An expert conversant and experienced in establishment of processing plant;
- A research specialist to set up the laboratory, initiate the testing procedures and train staff on Varroa mites pests.

X.2. Short–term technical assistance will also be required for:

- Establishment of 50 beekeeping income generating projects;
- The development of integrated pest management packages for Varroa mite pests.

X.3. The area of technical assistance in the beekeeping project required will not be that expensive as the section has developed overtime and can handle most of the implementation. The required expertise will be on the setting up of demonstration apiaries as turnkey projects that will be led by beekeeping expert and handed over to the professionals and technicians that will be trained; this is contained as per one of the projects component.

XI. ISSUES AND PROPOSED ACTIONS

XI.1. ***Stakeholder participation:*** Participation of the farmers is critical in the successful implementation of this project. Farmers should be trained to implement the project at individual farm level. The beekeeping extension officers will liaise with local NGOs and the private sector interested in beekeeping programmes development. Wherever possible the project should also make provision for involvement of other relevant institutions in order to foster community participation.

XI.2. ***Co–operation:*** The use of pesticides to reduce pests, weeds and predators in arable and horticultural farming can adversely affect the beekeeping industry if application of the pesticides on affected farms is done when plants are on bloom. This is because during day– time when plants are on bloom bees are busy foraging on them. Before application of pesticides beekeepers have to be informed about the type of pesticide used and its toxicity period. The information is important for beekeepers, as they would either opt to move the bee–hives or confine the colonies within the beehives.

XI.3. ***Collaboration:*** The destruction of the bee forage by veld fires can reduce honey yields and lead to bee colonies absconding or migrating to better areas. As a result of this problem beekeepers need to collaborate with farmers' conservation committees in the country which strife to educate the community on the disadvantages of veld fires on natural resources. Both beekeepers and conservation farmers should promote measures like fire controls and maintenance of firebreaks.

XI.4. ***Coordination:*** It should be taken into consideration that the spread of bee pests and diseases through the natural processes such as migration and swarming of bees do not respect national or international boundaries and their unanticipated movements pose specific regional problem. Particular problems are often encountered with respect to management, monitoring, and forecasting and control measures. There is need to increase coordination among countries through sharing information through formation of networks. Organisations such as the *Plant Protection of South Africa* could be used to contribute towards cross–border communication and co–operation by utilizing modern technologies to establish an Internet–based information system.

XII. POSSIBLE RISKS

XII.1. The main possible risks identified are the low participation of farmers and other stakeholders. Other risks are the following:

- Untimely honey harvest of bee colonies more especially when bees divide themselves when they got enough food in the hive and run short of combs to store more food — this is a problem because output could be compromised. There is need for more extension services time to guide farmers on the appropriate time for harvesting;
- Absconding due to bee pests, predators and diseases. The bees could also abscond due to inadequate bee management practices. Bee farmers should practise all management aspects of in order to have increased yields from colonies they kept;
- Inadequate swarming prevention and control mechanism;
- Climatic conditions that are characterized by excessive heat & very cold temperatures, inadequate rainfall and continuous rains for periods of two weeks can reduce the

livelihood of a colony be successful. There should always be a good environment for the bees to survive;

- Prolonged drought and veld fires as plants and trees are not available for pollination to generate honey products.

ANNEXES

Annex 1: Detailed Cost Estimates

Annex 2: Summary of Absconded Colonies & Causes (2003/04)

Annex 3: Beekeeping Staff Situation (2004/05)

Annex 4: NDP 7 & 8 Honey Production Levels

Annex 5: Model of Profitable Beekeeping Project

Annex 6: List of References

Annex 1: Detailed Cost Estimates

Component/Item	Unit	Quantity	Unit Cost	Total Cost
1. Training				
MSc	person/year	2 officers x 2 years	45,000	180,000
BSc	person/year	6 officers x 3 years	20,000	360,000
Diploma	person/year	4 officers x 3 years	12,000	144,000
Short–Term Training	person	10 officers	6,000	60,000
Sub–Total				744,000
2. Vehicles				
4x4 Toyota Hilux	N°	2	30,000	60,000
4.5l Landcruiser	N°	2	53,000	106,000
4x2 Toyota Hilux	N°	2	27,200	54,400
Sub–Total				220,400
3. Breeding Stations (2)				
Buildings	m^2	35		51,000
Fencing	10%			5,100
Construction and Design	20%			10,200
Electrical & Mechanical	15%			7,650
Equipments	as listed			97,880
Technical Expert	person–month	18		68,000
Sub–Total				239,830
4. Processing Plants (2)				
Buildings	m^2	303	1,000	303,000
Fencing	10%			30,300
Construction and Design	20%			60,600
Electrical & Mechanical	15%			45,450
Equipments	as listed			60,000
Technical Expert	person–month	6		22,000
Sub–Total				521,350
5. Farmer Training				
Workshops/Seminars	N°	3	24,000	72,000
Exchange Visits	N°	2	24,000	48,000
Formation – Beekeepers Association	N°	6	5,000	30,000
Sub–Total				150,000
6. Income Generating Project				
Surveying				45,000
Selection of Projects				20,000
Loan Funding				100,000
Monitoring and Evaluation				44,000
Sub–Total				209,000
6. Research on Varroa Mites Pest				
Pest Survey				40,000
Ecological assessment				70,400
Research				88,000
Analysis and Results				40,000
Expert	person–year	1	44,000	44,000
Sub–Total				282,400
Grand Total (US$)				

Annex 2: Summary of Absconded Colonies & Causes (2003/04)

Type of Project Category	Prev.	Curr.	A	B	C	D	E	F	G	H	I	J	K	L
Self–Funded Individuals	132	122	21	0	2	35	52	7	5	0	0	0	0	0
Farmer Demonstrators	96	74	1	0	0	0	67	1	1	4	0	0	0	0
FAP/CEDA Projects	62	0	0	0	0	0	0	0	0	0	0	0	0	0
Community Groups	64	46	4	0	0	13	22	5	2	0	0	0	0	0
4B Clubs	62	55	12	0	1	10	15	14	0	2	0	0	1	0
Institutions	9	31	1	0	0	6	14	9	1	0	0	0	0	0
MOA Demo Apiaries	21	27	0	3	0	4	8	2	0	10	0	0	0	0
Total	446	444	39	3	3	68	178	38	9	16	0	0	1	0

Key:

A – for Ants	E – for Drought effects	I – for Bee pirate invasion
B – for Hive beetles	F – for Lack of proper bee management	J – for Robbery
C – for Wax moth	G – for Insecticides/chemicals	K – for Foolds
D – for Animal Disturbance	H – for Human disturbance	L – for Unknown reasons

Source: Beekeeping Sectional Report 2003/2004

Annex 3: Beekeeping Staff Situation (2004/05)

Station	Title	Employee Name	Level of Education
Gaborone HQ	Principal Beekeeping Officer	Kepaletswe, Khaliso M.	BSc – Animal Biology
Gaborone HQ	Senior Beekeeping Officer	Ngakane, Kooreng P.	BSc – Rural Resource Management
Kang	Principal Tech. Officer	Dimeku, Boatlametse P.	National Diploma in Beekeeping
Gabarone	Principal Tech. Officer	Montshioa, James M.	National Diploma in Beekeeping
Serowe	Principal Tech. Officer	Ebineng, Lethata H.	National Diploma in Beekeeping
Kanye	Principal Tech. Officer	Segobaetso, Hildah T.	National Diploma in Beekeeping
F/Town	Principal Tech. Officer	Kgosiemang, Lucas M.	National Diploma in Beekeeping
Maun	Sr. Technical Officer	Madisa, Eunice M.	National Diploma in Beekeeping
Gabarone	Sr. Technical Officer	Mpopang, Margaret P.	National Diploma in Beekeeping
Molepolole	Technical Officer	Kabelo Ramathudi	Diploma in General Agriculture
S/Phikwe	Technical Officer	Thabo Masie	Diploma in General Agriculture
Shakawe	Technical Officer	Boti Rabankgang	Diploma in General Agriculture
Mahalapye	Prin. Technical Assistant	Ntshonono, Mareko O.	Certificate in Beekeeping
Molepolole	Sr. Technical Assistant I	Mogwera, Masego	Certificate in Beekeeping
Kasane	Sr. Technical Assistant I	Mokokwe, Victor Fiki	Certificate in Beekeeping
Goodhope	Sr. Technical Assistant I	Tshetlho, Sophie	Certificate in Beekeeping
Letlhakane	Sr. Technical Assistant II	Morwaakang, Rebecca	Certificate in General Agriculture
Jwaneng	Sr. Technical Assistant II	Solomon, Mpho	Certificate in Beekeeping
Shakawe	Sr. Technical Assistant II	Zambesi, Ambukani	Certificate in Beekeeping

Annex 4: NDP 7 & 8 Honey Production Levels

NDP7 Production					
I. Production Levels for Self–funded Individuals					
Period	No. of self–funded individuals	No. of colonies	No. of harvested colonies	Harvested production (kg)	Average production per unit (kg)
1992/93	120	75	11	170	15.5
1993/94	84	68	6	95	15.8
1994/95	145	95	18	264	14.7
1995/96	155	140	30	442	14.7
1996/97	191	245	48	712	14.8
Sub–Total	695	623	113	1,683	14.8
II. Production Levels for 4B Youth Clubs					
Period	No. of 4B Youth Clubs	No. of colonies	No. of harvested colonies	Harvested production (kg)	Average production per unit (kg)
1992/93	20	26	8	125	15.6
1993/94	25	32	9	136	15.1
1994/95	35	50	7	110	15.7
1995/96	54	65	6	90	15
1996/97	85	112	17	257	15.1
Sub–Total	219	285	47	718	15.3
III. Production Levels for Community Groups					
Period	No. of community groups	No. of colonies	No. of harvested colonies	Harvested production (kg)	Average production per unit (kg)
1992/93	4	6	1	8	8
1993/94	5	12	1	18	18
1994/95	7	12	10	49	4.5
1995/96	10	31	1	6	6
1996/97	13	8	1	11	11
Sub–Total	39	69	14	92	6.6
IV. Production Levels for MOA Demonstration Apiaries					
Period	No. of demo apiaries	No. of colonies	No. of harvested colonies	Harvested production (kg)	Average production per unit (kg)
1992/93	8	46	10	150	15
1993/94	16	55	11	170	15.4
1994/95	11	49	4	55	13.8
1995/96	23	63	12	180	15
1996/97	19	74	1	11	11
Sub–total	77	287	38	566	14.9
Total	1,030	1,264	212	3,059	14.4
Source: Beekeeping Section, MOA.					

NDP8 Production					
I. Production Levels for Self–funded Individuals					
Period	No. of self–funded individuals	No. of colonies	No. of harvested colonies	Harvested production (kg)	Average production per unit (kg)
1992/93	244	331	43	1,063	24.7
1993/94	245	263	32	673	21
1994/95	222	232	63	464	7.4
1994/95	228	447	121	2,838	23.5
1995/96	249	591	131	2,968	22.7
1996/97	297	443	118	2,060	17.5
Sub–Total	1,485	2307	508	10,066	19.8
II. Production Levels for 4B Youth Clubs					
Period	No. of 4B Youth Clubs	No. of colonies	No. of harvested colonies	Harvested production (kg)	Average production per unit (kg)
1997/98	9	49	5	181	36.2
1998/99	18	16	1	32	32
1999/00	16	24	4	25	6.3
2000/01	16	60	20	132	6.6
2001/02	24	76	12	222	18.5
2002/03	31	55	10	73	7.3
Sub–Total	114	280	52	665	12.8
III. Production Levels for Community Groups					
Period	No. of community groups	No. of colonies	No. of harvested colonies	Harvested production (kg)	Average production per unit (kg)
1997/98	113	225	7	279	39.9
1998/99	104	104	5	164	32.8
1999/00	85	84	36	113	3.1
2000/01	97	121	41	355	8.7
2001/02	78	106	18	484	26.9
2002/03	121	103	16	150	9.4
Sub–Total	598	743	123	1,545	12.6
IV. Production Levels for MOA Demonstration Apiaries					
Period	No. of demo apiaries	No. of colonies	No. of harvested colonies	Harvested production (kg)	Average production per unit (kg)
1997/98	21	95	14	326	23.3
1998/99	24	90	12	240	20
1999/00	40	97	21	271	12.9
2000/01	23	94	41	421	10.3
2001/02	22	125	28	638	22.8
2002/03	23	92	24	206	8.6
Sub–total	153	593	140	2,102	15
Total	2,350	3,923	823	14,378	17.5

Source: Beekeeping Section, MOA.

Annex 5: Model of Profitable Beekeeping Project

- A model project with 15 bee colonies whereby 1 unit stock or a colony that is industrious and productive is able to produce 20 kg of comb honey and 1 kg of beeswax per annum when all factors of production are adequately stable and conducive. The amount of beeswax could be more than this if frame hives are used;
- Thus 15 bee colonies @ 20 kg of comb honey per annum = 300 kg of comb honey;
- 20 kg of comb honey processed = 19 kg liquid honey (bottled) plus 1 kg of beeswax;
- 200 kg of comb honey processed = 190 kg of liquid honey plus 10 kg of beeswax;
- 1 kg of comb honey unprocessed @ P40.00

Income/Expenditure Analysis of the Model						
	A	B	C	D	E	F
Commodity	Cost/kg	Qty/annum	Total cost (A x B)	Market price	Total revenue (B x D)	Profit (E - C)
1 kg comb honey	P28.50	100 kg	P2,850.00	P40.00	P4,000.00	P1,150.00
1 kg of bottled honey	P27.70	190 kg	P5,263.00	P45.00	P8,550.00	P3,287.00
1 kg of beeswax	P100.48	10 kg	P1,004.80	P50.00	P500.00	(P504.80)
Total			P9,117.80		P13,050.00	P3,932.20
Source: Beekeeping Section, MOA.						

Annex 6: List of References

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