



**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 V of VII

BANKABLE INVESTMENT PROJECT PROFILE

Management & Control of Quelea Birds

July 2005

BOTSWANA: Support to NEPAD–CAADP Implementation

Volume I: National Medium–Term Investment Programme (NMTIP)

Bankable Investment Project Profiles (BIPPs)

Volume II: Pandamatenga Commercial Arable Farms Infrastructure Development

Volume III: Establishment of Plant Quarantine Facility and Phytosanitary Services

**Volume IV: Establishment of an Enabling Environment for Agro–Chemicals
Management and Control**

Volume V: Management & Control of Quelea Birds

Volume VI: Beekeeping Development

Volume VII: Improvement of Tsetse Fly Control Surveillance

NEPAD–CAADP BANKABLE INVESTMENT PROJECT PROFILE

Country: Botswana

Sector of Activities: Pests control

Proposed Project Name: Management & Control of Quelea Birds

Project Area: Country–Wide

Duration of Project: 5 years

Estimated Cost: Foreign Exchange US\$2.19 million
Local Cost..... US\$0.89 million
Total US\$3.08 million

Suggested Financing:

<i>Source</i>	<i>US\$ million</i>	<i>% of total</i>
<i>Government</i>	0.89	29
<i>Financing institution(s)</i>	2.19	71
<i>Beneficiaries</i>	–	–
<i>Total</i>	3.08	100

BOTSWANA:
NEPAD–CAADP Bankable Investment Project Profile
“Management & Control of Quelea Birds”

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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
DFID	Department for International Development (UK)
FAO	Food and Agriculture Organization of the United Nations
GEF	Global Environment Facility
GTZ	German Technical Cooperation
ICOSAMP	Information Core for Southern African Migrant Pests
MOA	Ministry of Agriculture
MRL	Maximum Residue Level
NAMPAAD	National Master Plan for the Development of Arable Agriculture and Dairy Development
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
ULV	Ultra-Low Volume
UNEP	United Nations Environment Programme

I. PROJECT BACKGROUND

A. Project Origin

I.1. The project was presented by the *Ministry of Agriculture* (MOA) through the *Division of Plant Protection* as an extension of a proposal made under the *National Development Plan 9* (NDP9) on Environmental Impact Assessment. The idea of the project is to implement measures to combat migrant pests especially the quelea bird, which is prevalent in Botswana. The project aims at improving the management, control and reduction of migrant pest’s impact, to enhance the productivity of arable production. The project in NDP9 is not elaborative like the one being presented in the NEPAD–CAADP context, due to financial constraints faced by the MOA, hence the need to seek assistance to fully prepare and implement the project.

I.2. The government gives plant protection as one of the priorities in the reduction of poverty levels for communities to generate income in the rural areas. This is in line with the third pillar of CAADP that seeks to ensure the enhancement of food supply, reduction of hunger and also includes emphasis on emergencies and disasters that require food and agriculture responses.

I.3. Botswana also participates in a regional initiative that calls for the improved detection and forecasting on possible outbreaks. The SADC region currently has a network for forecasting outbreaks called *Information Core for Southern African Migrant Pests* (ICOSAMP). The objective of the network is to contribute towards cross–border communication and co–operation through utilising modern technology to establish an internet–based information system.

I.4. This 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. The activities foreseen under this project include capacity building, development of environmental, impact assessment of pest control methods and adoption of sustained technologies, development of gender friendly technologies, and initiation of crop damage assessment methods for quelea birds. Combined together, these approaches have the potential for increasing production yields. They make up the first two priorities given by government to this project within the CAADP’s *National Medium–Term Investment Programme*.

I.5. In terms of institutional and financial capabilities, government has well established extension services in various regions. The government provides funding through the annual budget to the MOA. However, government funding does not cover all activities due to budgetary constraints. Other sources of funding need to be accessed to bridge the gap not sufficiently covered by government intervention. On the other hand, non–governmental organisations are not fully involved at present due to their limited funding and dependency on donor funding. They therefore have minimal capacity to participate in such initiatives.

B. General Information

I.6. Botswana is a landlocked country situated in the centre of Southern Africa with an area approximately 582,000 km² and is located close to the subtropical high–pressure belt of the Southern Hemisphere. It has a generally flat terrain with gentle undulating hills and occasional rocky outcrops. The climate can be described as arid to semi arid. Summers are usually long (between August and March) and hot, whereas winters are short (between April and July) and can be extremely cold. About two thirds of Botswana’s land area is covered with thick sand layer of the Kalahari Desert. Annual average rainfall ranges from less than 250 mm in the South West to 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.7. 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 NDPs. In 2003 it launched NDP9, which covers the period 2003/04 to 2008/09. A World Bank study of 1999¹ 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 a middle-income country according to World Bank classification (1997).

I.8. The economic structure of Botswana has changed significantly since 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 increase in urban population from 9.1 percent in 1971 to 54.2 percent in 2001. Although contribution of agricultural sector to GDP has declined, the role of agriculture is still important to national economy in fulfilling food security objectives. The recurrence of drought and animal diseases are additional factors that negatively influence the growth of the sector.

I.9. The Agriculture sector includes livestock, crop production, horticulture fishery and forestry. Livestock, especially cattle grazing, accounts for 80 percent of the sector’s output. Over the last few years, however, the contribution of agriculture to GDP has been declining. In 2002 for example, agriculture accounted for only 2.4 percent of GDP. The proportion of the population that depends on agriculture has been declining, yet, 42.1 percent of the population still relies on agriculture for its livelihood. (NDP9)

I.10. There are two main categories of farmers; traditional and commercial. The commercial farms that are established on free land holding occupy 8 percent of the total land and represent less than 1 percent of the total number of farmers in the country. In terms of output, however, these farms support 14 percent of the cattle industry and account for 37 percent of the total production of cereals and pulses.

I.11. The traditional farms occupy 70 percent of the total land and account for 86 percent of the cattle. Two-thirds of the traditional farmers practice mixed farming. These farms are totally dependent on rain fed agriculture and hence are exposed to drought. In addition the prevalence of communal grazing system, diseases and slow adoption of technology are also hampering the growth of productivity in the traditional farms.

I.12. There are three categories of migrant pests prevalent in Botswana. These are the Red billed quelea bird, Locusts and the African armyworm.

I.13. The Red billed quelea bird (*Quelea quelea lathamii*) is a small seed-eating birds capable of consuming 4 grammes of grain per day. Quelea bird is a serious pest of sorghum and millet in Botswana. The two cereals form part of Botswana’s staple food and due to their drought tolerance’ could be grown almost all over the country. The birds occur in colonies of up to millions of birds. Normally the birds feed on grass seeds but in the absence of these they attack the crops mainly at

¹ *Botswana: A case Study of Economic Policy, Prudence and Growth*, see Appendix 2.

dough stage, sucking out the soft grain. Damage caused in individual field can be as high as 100 percent if no control measures are undertaken. Control measures involve the use of non-lethal (scarecrows, clapping of hands) and lethal methods (chemicals and explosives). The non-lethal methods are limited in their application given the shortage of labour in most agricultural settings. (The explosives can only be applied in small areas and this leaves chemical control as the major intervention in highly infested areas apart from growing crops that are not prone to quelea birds such as cowpeas.

I.14. There are three species of locust that occur in Botswana. These are the red locust (*Nomadacris septemfasciata*), African migratory locusts (*Locusta migratoria migratorioides*), and the brown locust (*Locustana pardalina*). The red locust occurs in Chobe and Ngamiland areas mostly migrate from Caprivi region in Namibia. African migratory occurs in the Boteti areas and the brown locust occurs in the southwest part of the country around the Tsabong areas.

I.15. The African armyworm (*Spodoptera exempta*) causes a serious damage on cereal crops and grassland. In an outbreak situation the caterpillars may occur in densities exceeding 1,000 per m². Outbreaks of armyworm are often scattered patches, but during heavy rains succeeding periods of drought they may attack over hundreds of square kilometres. A network of 44 pheromone trap stations is placed strategically along the border with Zambia, Zimbabwe, Namibia and South Africa. These traps are placed to monitor the activities of mature armyworm male moth, and provide early warning of infestations.

I.16. The need to control migrant pests is supported by crop losses that could occur if necessary precautions are not put in place. According to a project report on special programme for pests control in Africa done by FAO, damage on crops by pests account for up to 30 percent of total crop damage. This figure is also relevant for crop losses in Botswana. In view of the significance of damage farmers need assistance and the means to reduce these losses.

I.17. The long-term solution to reduce crop losses is to strengthen the *Division of Plant Protection* by training existing staff in the development and application of new technologies on migrant pest control. It is noted that, the three migrant pests that are a problem in Botswana are quelea birds, locusts and armyworm. The project is aimed at reducing the impact of quelea birds as they occur more often than other migrant pests, mainly concentrated in the eastern and North Western parts of the country and its control is far beyond the farmers and national capacities to contain. There is need to strengthen capacity to enable forecasting and timely control to ensure impact of quelea bird is minimized.

I.18. Effective pest management decisions depend on the ability to collect information on pest density, crop condition, climate and other various related factors. These variables should be collected through direct observation on farms. The surveillance permit numerous factors such as growth stages of crop, climatic conditions and other ancillary information to be analysed together with fluctuations in pest densities. This helps in assessment of cause for variations in pest population and further on management action to regulate such factors to keep the pest builds up in control.

I.19. The project is intended to improve on the existing management of migrant pests through capacity building and provision of baseline data on crop losses due to migrant pest. Efforts have been made in the past to control and reduce the common pests during their outbreaks. The pests outbreaks have been on the increase due to successful breeding and regional migration, hence there is need to have ready control measures to avoid widespread damage to crops and equip the *Division of Plant Protection* with reliable machinery to both conduct surveys, laboratory tests and assist in reducing the impact.

I.20. The institutions concerned by the sector of activities proposed are mainly the government through MOA, non-governmental organization assisting in improvement of rural-livelihood and the farmers practicing arable farming. In terms of institutional and financial capabilities, government has extension officers in various regions. Government provides funding through the annual budget to the MOA. However, government is unable to cover all activities due to budgetary constraints. The arable sector has to share funding with other sectors, hence the need to find other sources to enhance government intervention.

I.21. The non-governmental organizations are at present not fully involved in the migrant pests control aspects due to lack of funding. They therefore have minimal capacity to participate. The government performs controlling of migrant pests at present more especially during major outbreaks as beneficiaries of the intervention; especially small-scale farms have no capacity to control migrant pests.

I.22. The areas where the project will be implemented covers the six agricultural regions of Botswana comprising of North West, Western, Gaborone, Central, Southern and Francistown regions. However, concentration will be mostly in Francistown, Central, Gaborone, Southern and Ngamiland areas where there is high concentration of quelea and they are always under cultivation

I.23. The eastern part of the country is the backbone of arable agriculture with more fertile soils and the region is adjacent to the Limpopo drainage system with high prospects for irrigation farming, as dams and watering points are available. The Northern part has high rainfalls that support forest and dense bush. Government has earmarked this area for irrigation farming and there are farmers in the area supported by government to undertake large-scale farming in arable agriculture.

II. PROJECT AREA

II.1. The proposed project areas covers the six agricultural regions of Botswana as demarcated by the Ministry of Agriculture that comprises of North West, Western, Gaborone, Central, Southern and Francistown regions. However concentration will be mostly in Francistown, Central, Gaborone, Southern and Ngamiland areas where there is high concentration of quelea and these areas are always under cultivation. Rainfall magnitude determines existence of increased quelea bird infestation as the land will be cultivated and enough feed is available for the birds to multiply. Most arable cultivation occurs in the eastern part of the country and Pandamatenga areas. These areas are prone to pest infestations other than quelea like the red locust. Among the migrant pests quelea is the most problematic, covering almost all the agricultural regions at different times of the growing season. The choice of the whole country intervention was based on the above factors.

II.2. Botswana is characterized by low and erratic rainfall with high temperatures during the summer months. These conditions influence the multiplication of pests, as they are able to survive especially in horticultural production.

II.3. The eastern part of the country is the backbone of arable agriculture with more fertile soils and the region is adjacent to the Limpopo drainage system with high prospects for irrigation farming, as dams and watering points are available. The Northern part has high rainfalls that support forest and dense bush. Government has earmarked this area for irrigation farming and there are farmers in the area supported by government to undertake large-scale farming in arable agriculture.

II.4. According to 2001 population census, the country has a population of 1.7 million (NDP9) most of who are dependent on agriculture for their livelihood especially the rural population. Traditional farming dominates the crop sector with sorghum being the major crop, while commercial farming produces mainly high value crops such as fruits, vegetables, sunflower and cotton. During NDP9, it is projected that the agricultural sector will meet more than 10 percent of the national cereal requirements. Currently local horticultural production only accounts for about 20 percent of the national demand for vegetables and the rest is met by imports. The *National Agricultural Master Plan for Arable Agricultural and Dairy Development* (NAMPAAD) indicates that local vegetable production could be increased up to 75 percent by the year 2010.

II.5. The increase in both the arable and horticultural production would lead to a significant increase in quelea birds’ occurrence hence the need for project in order to have early warning systems to further reduce impact of the pests in arable farming. The estimated losses on crops due to pests accounts for 30 percent of total crop losses (FAO 1988).

II.6. The major target group in this project is both the small–scale and commercial arable farmers. The small–scale production is characterised by small traditional farms cultivating areas of less than a hectare to five hectares. Farmers who grow field crops in the traditional farms are hard hit when pests occur as they depend on government assistance and they constitute large population of arable farms when taken in aggregate. The commercial production comprises of larger farms that can reach 500 ha each. Currently commercial horticultural production is limited to the Tuli Block area to the east while rain–fed commercial production is mainly in the Pandamatenga area in the northern part of the country. Although there is a possibility for these farmers to pool together resources to reduce migrant pest’s infestation, the cost is high and hence there is need for government intervention nationally to assist.

II.7. The priorities of the target group are to increase production to satisfy food security at household and national level. Given constraints that include low rainfalls and high pest infestations they are unable to reach their target. There is therefore need to increase productivity by practicing proper cultivation, controlling pests and managing the use of pesticides especially to reduce migrant pests in these areas in an environmentally sustainable manner.

III. PROJECT RATIONALE

III.1. Government through the *Division of Plant Protection* has led migrant pests control in the past and present. The farmers are also currently encouraged to grow alternative crops to reduce quelea bird invasions and to use scaring devices to chase them away at a minimum scale. There have been outbreaks before and the locust invasions of the 1980s showed there is need to put in place measures and mechanisms to be always on alert especially during the cultivation period. On average 2,000 litres of pesticide are used for the control of quelea on an annual basis as compared to no use at all before 1986, this scenario necessitates a project to be financed on migrant pest control (Trade Statistics 1999).

III.2. The main aim is to effectively manage migrant pests in order to reduce crop losses that could ultimately lead to low productivity of crop output. There is need to implement cost effective and environmentally friendly management strategies to reduce migrant pest infestations. The proposed NAMPAAD programme is aimed towards increase in agricultural production and the arable rain fed component of the programme will lead to increase in occurrence of migrant pests due to increase in cultivated land. With the implementation of the Migrant Pest project, it is anticipated that nationally

there will be benefits to arable farmers both small scale and commercial as crop yields will be increase.

III.3. The various components of the project are consistent with the effective control of migrant pest population and avoid future emergencies of wide negative impact of infestation in cultivated land. The components identified are:

- Environmental Impact Assessment of pest control methods – this will involve study on impact of pest control methods on the environment in order to come up with environmentally friendly migrant pest control intervention;
- Adapt the FAO Crop Damage Assessment Methodology for quelea birds to local conditions – assessment will be performed by making surveys in the regions prone to infestation during cultivation using the methodology;
- Capacity Building – the component is for capacity building in terms of short and long-term training for Division of Plant Protection staff. The training will also focus on farmers for technology transfer through workshops and seminars;
- Promotion of the concept of integrated pest management that advocates for the use of various pest control measures;
- Evaluation and monitoring of spray techniques – this technology is to equip extension staff with proper usage of the sprays;
- Mapping the distribution patterns of quelea breeding sites – this will look at forecasting and monitoring of quelea behavioural patterns.

III.4. The project fits well within the framework of CAADP and links well with two of the CAADP pillars, these are:

- Enhancement of food supply and reduction of hunger. This 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.5. The project is linked well with the strategies and priorities of the country as well as the integration with NDP9 and *Vision 2016*. The main challenge facing the MOA in this regard is to fulfil the mandate of *Vision 2016* towards increasing productivity in the sector, make profits and contribute to sustainable development of the sector as a whole. This will ensure 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.6. The absorptive capacity in terms of institutional, manpower and financial capacities is low in the implementation of the migrant pest control project. There is a gap due to financial and manpower constraints. There is need for trained personnel to implement the project and the solution is to seek financial assistance to complement government efforts and build capacity.

IV. PROJECT OBJECTIVES

IV.1. The overall objective of the project is to control or minimize crop loss on field and eventually to, decrease migrant pests population and increase agricultural productivity by increasing crop yields.

IV.2. The *specific objectives* are:

- To effectively manage quelea birds within the country;
- To undertake studies to improve existing control strategies;
- To develop quelea crop damage assessment methodology;
- To develop a database for quelea birds;
- To minimize the impact of quelea birds on cereal crops and increase crop yields;
- To build capacity on the management of quelea birds;
- Evaluate and monitor spraying techniques.

IV.3. The *expected outputs* are:

- Reduced crop losses by about 800 mt per year saving value of US\$250,000;
- 4 research reports produced;
- Database in use and accessed by 3,000 of farmers;
- Increased cereal yields from 200 kg to 500 kg per hectare;
- Workshops conducted resulting in 3,000 farmers and 250 extension workers trained;
- 3,000 farmers use sprayers efficiently.

V. PROJECT DESCRIPTION

V.1. The project will consist of six components. These will be carried out at the same period provided funds are secured to enable *Division of Plant Protection* achieve intended goals.

V.2. All components will lead to effective and efficient management of migrant pests leading to increase in cereal production and preservation of the environment.

V.3. This also includes an element of transfer of technology. The project design will take into consideration activities that facilitate the integration of project components between individual, community and government intervention. Component 1 focuses on environmental impact assessment and is closely related with all other components of the project. The other components are not that related but overall all components are integrated to enable the *Division of Plant Protection* undertake its mandate.

Component 1: Environmental Impact Assessment of Pest Control Methods

V.4. This component will initiate a study to look at the impact of pest control methods on the environment. It will assess both the traditional, biological, chemical and integrated methods in order to

come up with environmentally safe methods. This will involve surveys & mappings, ecological/socio-economic evaluation, carry out impact assessment, analysis & results. An expert will be in place for three years to implement the project.

Component 2: Development of Crop Damage Assessment Methodology for Quelea Birds

V.5. This will be targeted at quelea birds as the predominant migratory pest in Botswana. The component will involve developing assessment tools, survey & mapping, application of the method, analysis & results. An expert will be in place for three years to implement the project.

Component 3: Capacity Building

V.6. Capacity Building will involve both short-term and long-term training of staff to strengthen the capacity of the division to implement the project. Short-term training will be for in-service training activities and will be based mainly on the technical level of various categories of trainees, availability of suitable venues for resident training activities and sites for related field work and visits.

V.7. Training will be divided into two categories of short and long term. Emphasis will be on vertebrate pests, entomology, spray technology and aerial spraying. Two pilots will be trained on aerial spraying, three staff on entomology.

V.8. Farmer training will also be conducted through workshops and seminars to equip them with necessary skills to implement the project. The major beneficiary will be farmers and hence should be trained to better use the technologies that will increase adoption rate.

Component 4: Promotion of Integrated Pest Management

V.9. This entails careful consideration of all available pest control techniques and subsequent integration of appropriate measures that will reduce multiplication of pest populations. The intervention is intended to minimize risk to human health and the environment by way of reducing usage of pesticides. The elements to be promoted will be prevention, observation and intervention by farmers, extension workers and research development of IPM packages for migrant pests best suited for Botswana conditions.

Component 5: Evaluation and Monitoring of Spray Techniques

V.10. This will involve ensuring that techniques introduced by experts have filtered to the Division and also to evaluate farmers’ reception and proper use of sprays. The evaluation will look at spraying activities like how to spray, mixing of pesticide (the pesticides currently available for quelea are ULV and do not require mixing), spraying time and management of sprays in general, calibration and safe use of pesticides. An expert will be required for a period of one year.

Component 6: Mapping the Distribution Patterns of Quelea Breeding Sites

V.11. This will involve data collection & survey, data analysis the idea is to map distribution, identify habitats and assess damage caused to the crops. This was previously done for the Northeast district and will just be extended to other regions. Expertise is available locally for the task to be carried out. The component will assist in forecasting and monitoring of quelea birds through the monitoring of breeding sites, roosting and the preferred habitat.

VI. INDICATIVE COSTS

VI.1. The total project cost, estimated at US\$3.1m, is broken down by components as follows:

Cost Summary per Component					
Component	Local	Foreign	Total (US\$)	% Foreign Exchange	% Total Base Costs
1. Environmental Impact Assessment	284,000	426,000	710,000	60	28
2. Development of Crop Damage Assessment	134,000	132,000	266,000	50	14
3. Capacity Building	291,000	679,000	970,000	70	22
4. Promotion of Integrated Migrant Pests Management	48,440	193,920	242,360	80	12
5. Evaluation and Monitoring of Spray Techniques	0	314,000	314,000	100	16
6. Mapping Distribution Patterns of Quelea Breeding Sites	0	130,000	130,000	100	8
Total Baseline Costs	757,440	1,874,920	2,632,360	71	100
Physical Contingencies (7%)	53,021	131,244	184,265		7
Price Contingencies (10%)	75,744	187,492	263,236		10
Total Project Costs	886,205	2,193,656	3,079,861		117

See detailed cost estimate in Appendix 1.

VI.2. Rates used were based on:

- 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 NDP9 estimation and applied to the project condition.

VII. PROPOSED SOURCES OF FINANCING

VII.1. Sources of funding identified at this stage include historical sources that supported the *Division of Plant Protection*. The *United Nations Environment Programme* (UNEP), supported the division in a project on strengthening the Division, the *German Technical Cooperation* (GTZ), supported the joint collaboration in fight against Migrant Pests, the UK *Department for International Development* (DFID) sponsored the ICOSAMP Workshop held in South Africa.

VII.2. Other financial powerhouses identified are *Crop Life International*, the *Global Environment Facility* (GEF), the *African Development Bank*, the *European Union*, the *World Bank*, and other bilateral donors. These will be approached for possible financing of the project, as they are presently involved in projects for developing countries. The sources have also assisted the Government of Botswana implement successful projects and chances of supporting this project are high.

VII.3. The contribution of government as indicated in the table showing indicative costs is at 25 percent of the total project costs and will be reviewed during the actual project appraisal of project. The *Division of Plant Protection* is also budgeted for under the NDP in the overall MOA budget allocation. Government will also provide offices and staff to man the project. The budget for the actual contribution of other stakeholders cannot be determined at present. However, the main beneficiaries of the project intervention being farmers could contribute through the provision of manpower.

VIII. PROJECT BENEFITS

VIII.1. The main benefits of the project would accrue to arable farmers as their farmland would be conserved and protected from further migrant pest’s infestation. The net benefit will result in improved productivity and decrease of crop imports, especially cereal import to the country. Immediate benefits would also accrue to those who gain employment directly from the arable farms, through income they will earn. The qualitative benefits of the project are:

- Acquired technical knowledge that will assist in controlling quelea bird to acceptable level and reduce annual loss of crop by a value of about US\$250,000 as shown in the Box below;
- Provision of early warning systems and timely control through the database to avoid extensive damage before mobilization to attend major quelea bird infestation;
- Safeguard food security and therefore increase agricultural production nationally and at household level;
- Availability of quelea bird information that will increase the *Division of Plant Protection* capacity to respond to an outbreak;

The benefit of the project will be realised as a result of being able to minimize quelea bird's invasions. The qualitative assessment of project is based on the following assumptions:

- 500,000 bird's colony consuming each on average 4 g of grain per day;
- Control area is 10 ha using an average of 4 l/ha, cost of 1 litre is US\$35.52;
- One control operation costs: 10 ha x 4 l/ha = 40 litres used;
- The operation will cost: 40 l x US\$35.52/l = US\$1,420.80 + cost of labour and fuel used that is assumed at US\$356.80, therefore the total logistical cost = US\$1,777.60 per colony;
- Number of colonies per year in a normal plough year is 87, therefore the total annual cost will be: US\$1,777.60 x 87 = US\$154,651.20;
- Total population of birds in a year = 87 colonies x 500,000 = 43,500,000 birds;
- Assume 65 percent of birds are controlled in the year, 43,500,000 x 65% = 28,275,000 birds controlled;
- At a daily consumption of 4 g per bird, daily damage to crops will be: 28,275,000 x 4 g = 113,100,000 g or 113.1 mt;
- Assuming the control takes 7 days, the total damage is: 113.1 mt/day x 7 days = 791.7 mt;
- 1 mt of grain costs US\$311.08;
- Each intervention saves 791.7 mt of grain at the cost of US\$311.08 per tonne, hence the total revenue saved is: US\$311.08/mt x 791.7 mt = US\$246,282.04.

VIII.2. The main beneficiaries would be:

- Both small-scale and commercial farmers as their production yields will be increased as a result of reducing impact of migrant pests in their cultivated land;
- The ministry of agriculture who would have adequate capability, facility and capacity to respond to outbreaks on time;
- By advocating for integrated pest management control, the environment will not be adversely affected hence protecting health of both farmers and consumers of arable production.

IX. IMPLEMENTATION ARRANGEMENTS

IX.1. The government has a well-established project implementation framework made up of the MOA. The *Division of Plant Protection* will directly implement the project through regional offices that are spread throughout the country. The extension officers in regions will lead the project and ensure all stakeholders are involved in the project. Consultative planning will be the tool used to ensure full participation of farmers.

IX.2. The project shall be based upon a participatory approach to improve implementation of activities and enhance productivity in the sector. Involvement of active participation will include active participation of different stakeholders’ especially Non-governmental organisations, farmers and community leaders 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.

IX.3. The direct beneficiaries of the project will be present and prospective arable farmers especially farmers living in the rural areas — women, men and youth living in the project areas. Most project activities will be implemented by the different stakeholders and farmers directly as disseminators of information and they will be trained in management and control of pests and the role of the extension officers will be mainly restricted to advisory role and monitoring & evaluation of the projects.

X. TECHNICAL ASSISTANCE REQUIREMENTS

X.1. Technical assistance will be needed in terms of expertise to train the Division staff. Other assistance will be needed for undertaking the studies identified under project description especially for spray techniques and methodologies for crop assessment. Training and expertise that will be provided will be sufficient for the *Division of Plant Protection* personnel to implement the project and therefore long-term technical assistance is not anticipated. The project would specifically need technical expertise in the following areas:

- A Vertebrate Specialist for long term assistance to train staff;
- A Spray Technology Engineer to guide in proper usage of sprays;
- A Chemist for the analyses of samples in the laboratory for the quelea bird breeding sites and crop damage assessment;
- An Environmental Specialist for the IPM strategy and environmental impact assessment components of the project.

XI. ISSUES AND PROPOSED ACTIONS

XI.1. **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. Local NGO’s have not been actively involved with migrant pests issues. Wherever possible the project should make provision for their involvement in order to foster community and private sector participation. Field staff should be trained on ways of impart knowledge to the farming community.

XI.2. **Coordination:** It should be taken into consideration that migrant pests do not respect national or international boundaries and their unanticipated movements pose specific regional problem. They are able to destroy crops in one area and migrate hundreds of kilometres to another area to repeat the damage. Particular problems are often encountered with respect to management, monitoring, forecasting and control activities. There is need to increase coordination among countries through sharing information. Organisations such as the ICOSAMP could be used to contribute towards cross-border communication and co-operation by utilizing modern technologies to establish an internet-based information system.

XI.3. **Collaboration:** The invasion of migrant pests in an area at high magnitude might not be controlled due to budget constraints, especially in developing countries. There is need to assist each other during outbreaks by pooling resources together. Bilateral and multilateral agreement could be effected to work towards the reduction in migrant pest’s damage.

XII. POSSIBLE RISKS

XII.1. The key to the success of the programme and its sustainability will depend on the **integration** of the national priorities with the regional and international programmes and priorities. Achievement of strong partnership will add to the success of the programme. Other risks are as follows:

XII.2. **Slow adoption of the technology by farmers and other stakeholders.** The participation of stakeholder ensures that the programme includes the concerns of the farmers, consumers, traders and processors in the crop sub-sector. Lack of a mechanism to ensure that the *Division of Plant Protection* designs their programmes to obtain wider involvement of stakeholders will put the programme at risk.

XII.3. **Shortage of skilled manpower** to implement migrant pest control strategies in the country will undermine the efforts of the Division to deliver the services required.

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Appendix 1: Detailed Cost Estimates

Component/Item	Unit	Quantity	Unit Cost	Total Cost
1. Environmental Impact Assessment				
Survey and Mapping			500	80,000
Ecological/Socio-Economic evaluation			500	100,000
Carrying out the Assessment			500	100,000
Analysis and Results			1,200	120,000
Expert (3 years)	person-year	3	180,000	540,000
Sub-Total				710,000
2. Development of crop Damage Assessment				
Develop Tools/ Techniques				4,000
Survey and Mapping	25%			80,000
Method Application	20%			20,000
Analysis and Results				30,000
Expert (3 years)	person-year	3	44,000	132,000
Sub-Total				266,000
3. Capacity Building				
MSc Training	person-year	6	45,000	270,000
Short-Term Training	person-year	10	10,000	100,000
Farmer Training	person	3,000	200	600,000
Sub-Total				970,000
4. Promotion of Integrated Migrant Pests Management				
Pest Surveying				40,000
Develop IPM Packages				70,440
Testing IPM Packages				88,000
Expertise	person-year	1	44,000	44,000
Sub-Total				242,360
5. Evaluation of Spray Techniques				
Evaluate Set-up of Sprayers				100,000
Introduce Spraying Techniques				30,000
Calibrate Sprayers				20,000
Training	person-year	60	20,000	120,000
Expert	person-year	1		44,000
Sub-Total				314,000
6. Mapping Distribution of Quelea Birds				
Survey and Data Collection	lump sum			78,000
Data Analysis	lump sum			39,000
Report	lump sum			13,000
Sub-Total				130,000
Grand Total (US\$)				

Sources: Division of Plant Protection; Suppliers of Equipments.

Appendix 2: List of References

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