



**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**

**TCP/BOT/2902 (I)  
(NEPAD Ref. 05/37 E)**

**Volume II of VII**

### **BANKABLE INVESTMENT PROJECT PROFILE**

**Pandamatenga Commercial Arable Farms  
Infrastructure Development**

*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:** Land and Water Resources Management

**Proposed Project Name:** **Pandamatenga Commercial Arable Farms Infrastructure Development Project**

**Project Area:** Pandamatenga area (North–eastern Botswana), in two lacustrine plains — the Central and Southern plains — over about 25,000 ha

**Duration of Project:** 3 years

**Estimated Cost:** Foreign Exchange ..... US\$49.02 million  
Local Cost..... US\$16.34 million  
**Total .....US\$65.36 million**

**Suggested Financing:**

<i>Source</i>	<i>US\$ million</i>	<i>% of total</i>
<i>Government</i>	16.34	25
<i>Financing institution(s)</i>	49.02	75
<i>Beneficiaries</i>	–	–
<b><i>Total</i></b>	<b>65.36</b>	<b>100</b>



**BOTSWANA:**  
**NEPAD–CAADP Bankable Investment Project Profile**  
***“Pandamatenga Commercial Arable Farms Infrastructure Development”***

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**Table of Contents**

Currency Equivalents .....	iii
Abbreviations.....	iii
<b>I. PROJECT BACKGROUND.....</b>	<b>1</b>
<b>A. Project Origin .....</b>	<b>1</b>
<b>B. General Information.....</b>	<b>1</b>
<b>II. PROJECT AREA.....</b>	<b>2</b>
<b>III. PROJECT RATIONALE.....</b>	<b>3</b>
<b>IV. PROJECT OBJECTIVES.....</b>	<b>4</b>
<b>V. PROJECT DESCRIPTION .....</b>	<b>5</b>
<b>VI. INDICATIVE COSTS .....</b>	<b>6</b>
<b>VII. PROPOSED SOURCES OF FINANCING .....</b>	<b>8</b>
<b>VIII. PROJECT BENEFITS .....</b>	<b>8</b>
<b>IX. IMPLEMENTATION ARRANGEMENTS .....</b>	<b>9</b>
<b>X. TECHNICAL ASSISTANCE .....</b>	<b>9</b>
<b>XI. ISSUES AND PROPOSED ACTIONS .....</b>	<b>9</b>
<b>XII. POSSIBLE RISKS .....</b>	<b>10</b>
<b>Appendix 1: Map of Botswana Showing the Project Area .....</b>	<b>11</b>
<b>Appendix 2: List of References .....</b>	<b>13</b>



### **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
EU	European Union
FAO	Food and Agricultural Organization of the United Nations
GDP	Gross Domestic Product
GEF	Global Environment Facility
GOB	Government of Botswana
LBW	Labour Based Works
MOA	Ministry of Agriculture
MWT	Ministry of Works and Transport
NDP	National Development Plan
NEPAD	New Partnership for Africa’s Development
NMTIP	National Medium–Term Investment Programme
SADC	Southern African Development Community



## **I. PROJECT BACKGROUND**

### **A. Project Origin**

I.1. The *Pandamatenga Commercial Arable Farms Infrastructure Development Project*, which has the objective of constructing all weather road network and drainage system in the farms, was presented by the *Ministry of Agriculture* as a component of the *Land Resources Management* project under the *National Development Plan 9* (NDP9). The project is aimed at increasing crop productivity in the commercial farms through the provision of a road network and drainage system within the farms totalling about 25,000 ha.

I.2. The Government of Botswana places high priority to the development of the infrastructure in the Pandamatenga area, as this is the major obstacle to increase the productivity of the farms in an area that is one of the most suitable for arable production in Botswana. Even with the present state of low productivity the farms’ contribution to the domestic cereal production during the *National Development Plan 8* (NDP8) averaged about 50 percent, representing a range from 9.5 percent to 92.5 percent. The total annual domestic production of major cereals, during this plan period, was on average 17,840 metric tons against an average annual requirement of 210,750 mt (MFDP, 2003). This represented only about 10 percent of the national cereal requirements and the balance was met through imports, hence, a need to increase the productivity of the farms.

I.3. The project is in line with government policy objectives of increased agricultural output and productivity to ensure long-term viability and competitiveness of the sector in both domestic and international markets; increased employment opportunities derived directly from increased agricultural output; provision of secure and productive environment for agricultural producers and food security at both household and national levels.

### **B. General Information**

I.4. Botswana is landlocked and shares borders with Zimbabwe, South Africa, Namibia and Zambia. It lies between longitudes 20° and 30°E and between latitudes 18° and 27°S. Much of the country lies north of the Tropic of Capricorn within the sub-tropical zone. It has a total land area of 582,000 km<sup>2</sup>. About two-third of the country is covered with thick layers of Kalahari Desert sand. The map below shows the location of Botswana within Southern Africa.

I.5. Botswana is not well endowed with agricultural land. Of the 5 percent of the land reported to be suitable for arable agriculture, only less than 1 percent of it is under cultivation. Generally, the soils are thin and of limited fertility while the rainfall is low and erratic with the exception of the project area.

I.6. Botswana’s agricultural sector contributes about 2.6 percent of the Gross Domestic Product (GDP). However, the sector remains an important source of food, income, employment and capital formation as 43 percent of the population still live in rural areas. While in terms of contribution to GDP the role of the agricultural sector has been declining since independence, the direct and indirect linkages of the sector to contribute to both the growth of the rural and national economy can not be underestimated.

I.7. Botswana’s agricultural sector comprises of two distinct production systems — traditional and commercial. Both production systems practice mixed farming consisting of both crop and livestock.

## II. PROJECT AREA

II.1. The proposed project area has been selected as increasing productivity would substantially contribute to cereal production in the country, and hence reduce dependency in neighbouring countries. The project area is located in North-eastern Botswana, and comprises of three lacustrine plains; the Northern, Central and Southern plains of which the latter two have been fully developed for agricultural production. The project is therefore restricted to the two plains namely the Central and the Southern plains. These two plains have been demarcated into 50 farms of average size of 500 ha, total production area being 25,074 ha. The area was selected due to its great potential of increasing cereal production, and subsequently reducing dependency on imports.

II.2. The project area is located at latitude 18°26' to 18°43' and longitude 25°27' to 25°37'. The area experiences a semi-arid climate characterized by summer rainfalls. Maximum temperatures range between 34°C to 26°C and are experienced between October to July. Minimum temperatures range between 20°C to 11°C is between November and July. Rainfall is derived from convective processes and it's highly variable even over small areas and averages 600 mm annually, thus making Pandamatenga into one of Botswana's least arid areas. Almost all rain falls between October and April, with December, January and February being the peak months. On average, the project area has just less than 30 days a year with rainfall of 5 mm or more. A substantial proportion of this rain falls in short duration of high intensity storms, thus, leading to high run-on into some farms, which become flooded instantly.

II.3. The area is dominated by vertisolic clay soils, which are potentially good farming soils. Vertisols have unique properties which require special management if their fully potential is to be realized. The soils are characterized by very high clay contents dominated by expanding lattice clay minerals which give them their characteristic physical and chemical properties. Vertisols are inherently fertile and have high water holding capacity and available moisture. When dry, the soils crack extensively in the subsoil and on wetting, they expand and the cracks close. In this condition, surface infiltration falls to virtually zero and excess water ponds or runs off. Thus, owing also to the flat topography periodic flooding is common in the farms. Effects of soil erosion are minor and soils are stable under wet and dry conditions.

II.4. Starting in 1984, large scale commercial plots of about 500 hectares each were allocated to commercial farming enterprises in the Central and Southern plains. Plots are leased on a 15-year renewable basis by the *Chobe Land Board*. At present no infrastructural developments have been provided by the Chobe Land Board in terms land lord services. The rent is nominal at about US\$0.40 per hectare per annum.

II.5. The population of the project area from the 2001 population census was 835 people (CSO, 2002). There is fluctuation in population numbers between dormant period (after planting) where population is at its lowest and active period (at harvesting) where population is at its peak owing to the labour force introduced in the area.

II.6. Crops mainly cultivated on the farms are sorghum, maize, sunflower, cotton, cowpeas/beans, millet and wheat. The area owing to its high fertility soil status and above average rainfall remains the most potential. Even rainfall is distribution the growing season and the high water retention potential of the soils facilitates two crops per season.

II.7. The area is predominantly used for commercial farming, with small areas occupied by small subsistence farming. A small horticultural project has been initiated in the area as a pilot, and it is at its

infancy, but great potential has been shown in the production of vegetables in the area as it is the only source of fresh produce.

II.8. Average crop yields in the commercial farms are low. Comparatively higher yields are observed in farms where flooding is not a problem, and improved conservation farming is practised. Due to government’s commitment to food security, the area has been designated a high priority for agricultural production. Farmers in the area have been given unlimited government support in different areas of commercial operations (e.g. markets, regulation of pesticides and insecticides usage). As the area is dominated by major commercial farmers survival strategies for subsistence farmers is through leasing out their small farms to commercial farmers and provision of farm labour. Livestock numbers are low, owing to the fact that the area is a wildlife area. Livestock is mainly for subsistence purposes.

II.9. The project area does not have most of the basic social amenities. Facilities such as the health post are non existent, and the area is not connected to the national electricity grid or any reticulated water system. Most of the area is not connected to lined telephone facilities. Communication is mostly through mobile telephones and or radios. The main source of water in the area is from boreholes. Power in most of the farmsteads and on the farm is generated through the use of diesel-powered generators. The area depends largely on Pandamatenga village for services.

II.10. Existing roads are tracks and surfaces are earth (vertisols), which are impassable during the rainy season. The drainage system is of a make-shift approach, where some individual farmers protect their micro-catchments (farms) and none of this is undertaken with a holistic approach resulting in an ineffective drainage system with more drastic loss in crop yields.

II.11. The project area is characterised by people of different origins owing to the fact that farms are leased out for commercial agricultural production. The farmers have formed a strong *Farmers Association* which administratively coordinates the farming activities. This holistic approach therefore provides an excellent framework for development activities. The *Farmers Association* is responsible for:

- Liaison with different government organisation in provision of a conducive environment for agricultural production;
- Community link, in the drive to improve the livelihood of the subsistence farmers through imparting farming knowledge;
- Coordination of the infrastructure maintenance.

### III. PROJECT RATIONALE

III.1. Pandamatenga area contains Botswana’s only large area of black cotton soils. The soils are inherently fertile and as such have high potential for arable agriculture. Due to a relatively higher average rainfall, the Pandamatenga plains were considered to have the potential to significantly increase the production of cereals. As a result, approximately 25,000 ha were identified and demarcated into 50 x 500 hectare farms. The farms were subsequently allocated to potential investors in 1984.

III.2. Estimates at that time were that each farm was capable of producing 850 to 950 mt of cereals, mainly sorghum, per annum based on projected yield of 1.7 to 1.95 mt/ha. These projections were never attained due to a number of constraints and problems, some of which included poor drainage and lack of all weather roads during the rainy season. Since their establishment, the farms

achieved yields ranging from 0.5 to 1.4 mt/ha, which are very low compared to the original projections although this is still higher than the national average yields of about 0.3 mt/ha.

III.3. The Government of Botswana places high priority to the development of the infrastructure in the Pandamatenga area because the area has potential to increase domestic cereal production. The project addresses the priorities of the country, as established in *Vision 2016* and NDP9 (2003–2009).

III.4. The project is in line with the CAADP priority areas of land and water resources management and infrastructure development. It is also inline with the third pillar of CAADP that aims at enhancing the food supply and reducing hunger. It also fits well under the Integrated Water Resources Management’s approach, as it aims at apportioning the utilization of the scarce water resources within the Pandamatenga plains for food and ecosystems.

III.5. The provision of a road network and drainage system would facilitate access into the farms and alleviate the water logging problem in the farms, which has resulted in losses estimated at about P1.7m per year or about US\$340,000. It is anticipated that the construction of the infrastructure would minimize losses caused by floods and thus undoubtedly increase the returns. An increase in the returns would have a positive implication on the productivity of the farms.

III.6. The provision of this infrastructure will yield positive results by enabling farmers to operate in a better farming environment. The improved farm efficiency will increase the yields significantly, which in turn has the potential to promote agro–industries. The rehabilitated farms will allow the entrepreneurs to plant two crops in one season because no time would be lost on re–planting as a result of crop failure due to floods. The envisaged agro–businesses are expected to create employment opportunities and improve incomes for rural people, especially in the Chobe district.

#### IV. PROJECT OBJECTIVES

IV.1. The *main objective* of the project is to increase the productivity of the Pandamatenga Commercial Arable Farms by reducing water–logging and improving access into the farms through the provision of a drainage system and road network.

IV.2. The *specific objectives* include:

- Increasing cereal production of the 25,074 ha commercial farms from the current 1.5 mt/ha to 4 mt/ha as a result of improved drainage and access roads;
- Creating favourable conditions for the development of agro–industrial enterprises;
- Reducing the foreign exchange the country spends for importing food crops;
- Enhancing the food security at the national level;
- Increasing employment opportunities.

IV.3. *Expected outputs* are:

- 160 km gravelled road network;
- 150 km drainage channels constructed and lined;
- 275 km bunds constructed on the lower boundaries of all 50 farms;

- increased yields from 1.5 mt/ha to 4 mt/ha.

## V. PROJECT DESCRIPTION

V.1. The project started in 2003 with a design phase. The objective of the design phase was to provide all necessary engineering, materials investigations and other consulting services required to construct a road network and drainage system in the Pandamatenga Commercial Arable Farms. This was subsequent to a study which was carried out in 1990 to determine the most cost-effective and environmental sound methods of resolving the drainage problem at Pandamatenga farms. Fundamental to the design phase, were updating of the hydrological study which was carried in 1990, additional topographic surveys where necessary, re-designing the main drainage and on-farm drainage systems based on new hydrological study data, and designing the road network to the working drawings level.

V.2. The design phase has already been completed by a team of Consulting Engineers. The design phase covered the following activities which have already been completed:

- Topographic surveys;
- Detailed geometric design of a road network;
- Detailed geometric design of both on-farm and main drainage systems;
- Materials investigations;
- Preparation of construction documents including cost estimates;
- Pre-contract services;
- Water investigations;
- Environmental Impact Assessment; and
- Land acquisition.

V.3. The construction phase shall include:

- Construction supervision;
- Post-contract supervision.

V.4. The project would run for three years and comprise of *two main components*:

- ***Construction of a road network of about 160 km.*** The road would be gravel surfaced (unpaved) and the road cross section shall be 8.0 m wide, 6.0 m carriageway and 2.0 m shoulders. The road network would facilitate access to each farm and also maintenance of the electric fence.
- ***Construction of a drainage system.*** Construction of earthen perimeter bunds at the lower boundaries of every farm to attenuate peak runoff, increase infiltration time and thereby harvest moisture and to collect all the runoff from the farm and allow for a controlled outflow. Construction of drainage channels both lined and unlined.

V.5. The following reports are available for the construction phase:

- Final Design Report;
- Final Drainage Design Report;

- Final Road Design Report;
- Environmental Impact Assessment Final Report;
- Final Design Report – Drawings for Drainage Component;
- Final Design Report – Drawings for Road Component;
- Project Cost Estimates;
- Tender Documents Volume 1 – Information to Tenderers;
- Tender Documents Volume 2 – Instruction to Tenders and Condition of Contract;
- Topographic Survey Report; and
- Land Expropriation Details.

## **VI. INDICATIVE COSTS**

VI.1. The total project is estimated at about US\$65.36m and covers both the Southern and the Central plains. The budget is broken down by components as follows:

NEPAD – Comprehensive Africa Agriculture Development Programme

**Botswana: Investment Project Profile “Pandamatenga Commercial Arable Farms Infrastructure Development”**

Budget Planning for Construction Phase																	
Item	Year 1				Year 2				Year 3				Year 4				Total cost
	Q1	Q2	Q3	Q4													
<b>I. The Southern Plain</b>																	
Construction costs																	
Pula million			20.00	7.00	7.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	4.20	4.20			84.40
US\$ million			4.00	1.40	1.40	1.20	1.20	1.20	1.20	1.20	1.20	1.20	0.84	0.84			16.88
Construction supervision cost																	
Pula million		0.10	0.30	0.60	0.6	0.75	0.75	0.75	0.75	0.70	0.60	0.60	0.40	0.40	0.05	0.05	7.40
US\$ million		0.02	0.06	0.012	0.012	0.15	0.15	0.15	0.15	0.14	0.12	0.12	0.08	0.08	0.01	0.01	1.48
Total budget for a quarter																	
Pula million		0.10	20.30	7.60	7.60	6.75	6.75	6.75	6.75	6.70	6.60	6.60	4.60	4.60	0.05	0.05	
US\$ million		0.02	4.06	1.52	1.52	1.35	1.35	1.35	1.35	1.34	1.32	1.32	0.92	0.92	0.01	0.01	
Total yearly budget																	
Pula million		28.00			27.85				26.65				9.30				91.80
US\$ million		5.60			5.57				5.33				1.86				18.36
<b>II. The Central Plain</b>																	
Construction costs																	
Pula million	48.00	14.00	14.00	14.00	12.00	12.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	224.00
US\$ million	9.60	2.80	2.80	2.80	2.40	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20	44.80
Construction supervision cost																	
Pula million	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.50	11.00
US\$ million	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.10	2.20
Total budget for a quarter																	
Pula million	48.70	14.70	14.70	14.70	12.70	12.70	11.70	11.70	11.70	11.70	11.70	11.70	11.70	11.70	11.70	11.50	
US\$ million	9.74	2.94	2.94	2.94	2.54	2.54	2.34	2.34	2.34	2.34	2.34	2.34	2.34	2.34	2.34	2.30	
Total yearly budget																	
Pula million		92.80			48.80				46.80				46.60				235.00
US\$ million		18.56			9.76				9.36				9.32				47.00

## **VII. PROPOSED SOURCES OF FINANCING**

VII.1. The project aims at meeting the food requirements and hence food security situation of the country. It will also significantly reduce the foreign exchange expenditures that the country spends to make up the food deficit that the population faces. All these benefits of the project are likely to attract a lot of financiers. In view of this funds are expected from such sources as the *Global Environment Facility* (GEF), the *United Nations Environment Programme* (UNEP), the *African Development Bank*, the *European Union*, the *World Bank* and other donors. Interested parties would emerge after presentation of project proposals to FAO and NEPAD.

VII.2. The contribution of government is estimated at 25 percent of the total costs, which the details would be outlined at a later stage of the project. Stakeholder contribution which is mostly in kind would be difficult to quantify at this stage.

## **VIII. PROJECT BENEFITS**

VIII.1. Pandamatenga Commercial Arable Farms have the potential to produce, on average, up to 4 mt/ha of sorghum when constraints bedevilling the farms have been removed. This translates to a realization of about 100,000 mt of sorghum per annum when the whole 25,074 ha is fully utilized and assuming that other factors that have a impact on the productivity of the farms are also changing positively. In terms of income, this translates to about US\$24m per annum. The market price of 1 mt of sorghum in Botswana is currently estimated at about US\$240/mt.

VIII.2. The current production stands, on average, at about 1.5 mt/ha of sorghum, which is less than the potential by about 2.5 mt/ha. This translates into a loss of about 63,000 mt of sorghum per annum from the potential 25,074 ha available for production. In monetary terms, this translate into a loss of approximately US\$15m per annum, using the above price. The development of the infrastructure is therefore bound to increase production, minimize losses and enable the farmers to maximize their return on their investment.

VIII.3. The project by increasing food crop production would also enhance food security at the national level. The increased production would enable the country to meet at least 50 percent of its cereal food requirements. Apart from improving food security situations at the national level the project would also enable the government to save the foreign exchange that it would otherwise be expending to ensure the food security of the population. As the enhanced production would lead to increased employment opportunities the project would also lead to increased food entitlements at house hold levels too. The increased production is also bound to lead to the development of agro industries which could lead to further growths in income and employment opportunities. Unfortunately, at this stage data is lacking to indicate quantitatively both the direct and indirect benefits that the project is likely to generate. While these need to be followed at the appraisal stage the benefit of the project in terms of enhancing food security both at national and household level, reducing hunger and poverty alleviation seem to be quite apparent.

VIII.4. The main beneficiaries of the project would be:

- Commercial farmers whose production and income would be significantly improved following the infrastructure developments;
- Small subsistence farmers in the vicinity of the commercial farms that could benefit from the increased demand for labour, improved market for inputs and output.

## **IX. IMPLEMENTATION ARRANGEMENTS**

IX.1. The project will be implemented by the *Ministry of Agriculture* in collaboration with the *Ministry of Works and Transport* (MWT) and the stakeholders of the project. However, direct responsibility for the project rests with the MOA. The MOA will be responsible for the planning and programming and for mobilizing and soliciting the support and participation of all the stakeholders of the project.

IX.2. The MWT, which is the government’s arm for civil engineering works, will be responsible for the construction part of the project. More specifically the MWT will be handling the selection of contractors and consultants and the supervision of the execution of construction work as a whole. As the project is large in magnitude, the Ministry would also continue to be involved in the maintenance of the infrastructure to ensure sustainability.

IX.3. Other stakeholders include the *Chobe Land Board*, *Pandamatenga Farmers Association* and the *Tribal Administration*. Farmer beneficiaries have been actively involved both in the initiation and design of the project. The *Farmers Association* have pledged to be fully involved from the construction through to the operation and maintenance stage.

IX.4. The MOA will establish a steering committee consisting of the representatives of the MWT and all the stakeholders. The steering committee will have broad responsibilities from the inception up to the commissioning of the project. At all stages it will see to it that:

- The project is designed and implemented in ways that it reconciles the interests and the benefits all the stakeholders of the project;
- The stakeholders fully participate and contribute to the execution of the infrastructure development;
- The *Farmers Association* are trained and equipped to participate and eventually take over the maintenance of the project.

## **X. TECHNICAL ASSISTANCE**

X.1. As the project is a large and complex to be implemented and supervised by competent contractors and consultants no role is envisaged for technical assistance.

## **XI. ISSUES AND PROPOSED ACTIONS**

XI.1. There are a number of areas which need to be examined in detail as part of further development of this project, as follows:

XI.2. ***Farming Systems.*** Continuous backstopping services by relevant specialists should continue to facilitate improved crop production. The introduction of precision farming in commercial setting has been slowly gaining momentum in Southern Africa. This has not only improved yields but also helped to reduce input costs. This system is slowly gaining ground in the project area, and its systematic promotion would go a long way in realizing the projected yield gains.

XI.3. **Diversification.** The introduction of different crops species, on rotational basis, such as legumes do not only reduce nitrogen inputs for the subsequent crop but generally improve the structure of the soil, and reduce pollution by reduction in the use of nitrogen fertilisers. To a limited extent farmers are using legumes but a diversification drive should be encouraged.

XI.4. **Labour Based Works.** Construction of a road network and drainage system would be undertaken by a qualified contractor(s) under the supervision of a competent engineer(s). As a pre-requisite in government civil engineering projects, there is a component on *Labour Based Works* (LBW) to create employment for residents in the vicinity of the project area. There is a high risk of immigrants benefiting from LWB at the expense of the residents. Proper recruitment and selection methods as stipulated in government manuals should strictly be adhered to.

XI.5. **Participation.** The harmonious, continuous communication channels currently prevailing between the beneficiaries and the government (being the proposed implementer) should be continuously nurtured for the success of the project. Involvement of farmers at all levels of project implementation forms the core to the success of the project. Contribution mostly in kind should be fostered taking into account that these roads and drainage channels are to be constructed in their farms, with a possibility of some of their land being used by the infrastructure. During construction informal construction techniques should be shown to the farmers, as most have machinery to undertake maintenance works in their farms. Construction in vertisols is complex in its nature so farmers have to be trained on maintenance procedures in cracking clays.

XI.6. **Financial.** The project is generally attractive to the beneficiaries and has been initiated by them. In areas where flooding is not an occasional occurrence higher yields have been attained, It is important to guard against unwillingness and or disowning of the project by the beneficiaries after it has been initiated. From experience government projects have experienced set backs in terms of contribution be it in kind or monetary by the beneficiary, resulting in poor maintenance of structures after they have been commissioned. It is therefore imperative that beneficiaries are tied to the project through a system where certain activities are the responsibility of the individual farmers to cultivate the spirit of ownership from the beneficiaries. Immediate benefits from a project of this magnitude cannot be readily identified, taking into account that rain-fed agriculture has so many restrictions. The notion of long-term segmented goals aimed at improving production should be entrenched in the beneficiaries with an element of periodic monitoring mechanisms of short-term goals.

## XII. POSSIBLE RISKS

XII.1. Main risks identified are:

- Failure of the *Farmers Association* to raise funds to maintain the infrastructure once it has been completed and handed over to them;
- Possibility of the farmers vandalizing the infrastructure;
- Possibility of a non-functional monitoring system for fertilizers, pesticides and herbicides leading to pollution of the water systems in neighbouring Zimbabwe from the drainage water.

**Appendix 1: Map of Botswana Showing the Project Area**



● Project area



## **Appendix 2: List of References**

1. **Arup Atkins.** 1990a. *Pandamatenga Development Study – Arable Agriculture Final Report, Ministry of Agriculture.* Gaborone.
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