

ザンビア共和国

農村開発のための灌漑計画マスタープラン調査

プロジェクトファイナディング調査報告書

平成 8 年 5 月

社団法人 海外農業開発コンサルタント協会

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まえがき

本報告書は、1996年5月12日から5月23日まで12日間にわたって実施したザンビア共和国「農村開発のための灌漑計画のマスタープラン」に係るプロジェクト・ファイナディング調査について取りまとめたものである。

本調査は、社団法人海外農業開発コンサルタント協会（ADCA）から派遣された、太陽コンサルタント株式会社の平田四郎（総括／灌漑排水）及び安部望五（農村社会／農業）の2名により実施された。

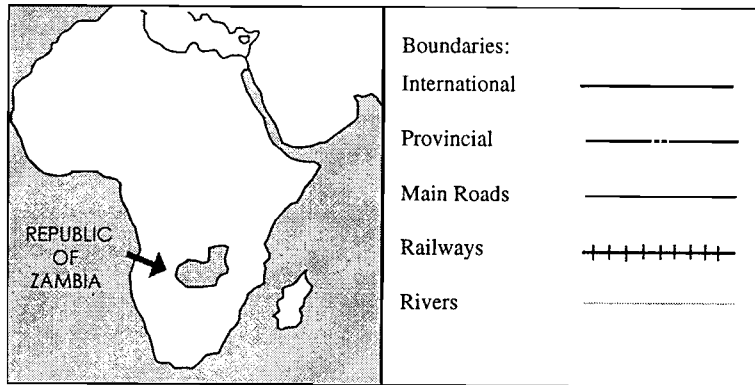
ザンビア国は1964年の独立以来、銅の生産により国家経済が支えられてきたが、1975年以降の世界的銅市場の低迷ならびに銅産業の不況により国家経済は徐々に悪化し、農村部を中心に生活が苦しく厳しくなっている。しかしながら、比較的水資源に恵まれているこの国の農牧業開発は非常に大きな可能性を秘めている。政府としても、国家開発計画（1992年）の中で、食糧自給の達成、国家資源を活用した農業の確立、市場経済化に対応した農家所得の向上、農村工業の振興と雇用の促進、農産物の輸出の振興など農業開発政策を強調している。また、1994年には農業開発に関して、国家五カ年計画に相当する農業部門投資計画：Agricultural Sector Investment Programme（ASIP）を策定し、先進国の援助協力、市場経済化の推進、小規模農民の支援、灌漑と農業機械化の促進等を優先させ、農業生産の増加を1995～1999年の実施目標としている。

このような状況を踏まえ、ザンビア国の農業食糧水産省はASIPの第一段階として全国的な灌漑開発計画の実施を予定している。この調査が同計画の一助となれば幸いである。

現地調査にあたり、在ザンビア日本大使館、JICA事務所、ザンビア政府農業食糧水産省等の関係者の協力をいただいたことをここに深く感謝いたします。

平成8年5月

太陽コンサルタント株式会社



● : 現地調査実施地区

調査対象位置図

農村開発のための灌漑計画マスタープラン調査 プロジェクト・ファインディング調査報告書

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T O R (案)

1. ザンビア国の一般概況

1.1 自然状況

1.1.1 国土

ザンビアはアフリカ中南部に位置する内陸国で、北はタンザニア、ザイール、東はジンバブエ、ボツアナ、ナミビア、西はアンゴラの8カ国に囲まれている。国土面積は753,000km²で、大部分は標高1000m～1300mの高原である。国土はザイール川とザンベジ川の流域に二分されるが、大部分はザンベジ川の流域に属している。

1.1.2 気象

ザンビアは熱帯に属するが、標高が高いため、年間を通じて比較的過ごしやすい。気候は5月～8月の冷涼乾期、9月～10月の高温乾期、11月～4月の雨期に区分される。

1.1.3 気温

最低気温は6月～7月に発現し、その月の平均気温は15～17.5℃である。最高気温は通常10月に発現し、10月の月平均気温は22.5～25℃である。降霜日数は南部で年間5～10日、西部で1～3日である。

1.1.4 降雨

雨期と乾期の差はハッキリしている。雨期は11月から4月までで、12月から2月がピークである。降水量はほとんど雨期に集中するが地域によって差があり、北部高地では年間約1500mm、首都ルサカが位置する中央部では800～1100mm、南部低地の大部分では600～800mmである。乾期には雨はほとんど降らない。

1.2 社会経済

1.2.1 人口

1994年の総人口は925万人でkm²当たり12.3人である。人口増加率は1980～1990年は3.2%、それ以降も3.0から3.5%と高い値を示している。人口は都市部に集中する傾向があり、1990年にはその値が42%となっている。また、男性は都市部に集中する傾向があり、農村部では女性の占める割合が高くなっている。

1.2.2 政治

1973年にケネス・カウンダ大統領が一党制国家の初代憲法を制定した。しかし1990年の憲

法改正により 1991 年の総選挙では“多党民主運動”のフレデリック・チルバが大統領となり、地方分権、自由市場経済を指向する政策を進めている。1996 年 10 月に総選挙が予定されている。

1.2.3 経 済

ザンビアの経済構造の特徴は銅の生産によって国家経済を支えるというモノカルチャーにある。1970 年代の銅の国際価格の下落とともに経済が落ち込み、これに代わる産業もないため、悪化の一途をたどっている、消費者物価のインフレ率をみても、1990～1993 年にかけて 92%～197% となっている。1993 年の債務返済比率も 32.8%となっている。

1.3 農 業

1.3.1 農業の現状

1988 年の耕地面積は 523 万 ha で、国土面積 753 万 km²の 7%となっている。放牧地は 3500 万 ha、森林は 2900 万 ha となっている。

農業経営は大規模商業農家、中規模農家、小規模農家の 3 種類に大別される。大規模商業農家は約 2 千戸で全農業生産量の 40%、市場流通量の 60%を占めている。中規模農家は 15 万戸程度で、畜産を兼営し、1 戸当り 3～4 ha の農地と 9 百万 ha の放牧地を使用している。一方、小規模農家は全農家の約 75%を占める 43 万戸で、耕地面積が 1 戸当り 1～2 ha の自給農業を行っているが、農業生産技術及び灌漑施設の不足から生産性は著しく低く、貧困の要因となっている。

作物生産の中では、メイズが他の作物と比べて 1 桁多い作付である。その他には綿、小麦、落花生、ミレットなどがある。ほとんどが天水農業なので、降雨の影響を直接受けている。

1.3.2 農業開発の基本政策

農業食糧水産省は農業部門投資計画 (ASIP, 1995～1999 年) を開発の基本としている。この中に政策項目として、以下の 3 項目を置いている。

- (1) 政策と制度改革
- (2) 民間部門投資の支援
- (3) 公共部門の強化と改善

また、“公共部門の強化と改善”は以下の 11 のサブプログラムから構成されている。

- (1) 農業教育訓練

- (2) 農業試験
- (3) 農業（作物）普及
- (4) 情報伝達
- (5) 畜産生産と衛生
- (6) 灌漑農業と機械化
- (7) 農産物の流通販売
- (8) 水産振興
- (9) 農産物／農業生産資材の標準・規格
- (10) 土地管理と利用
- (11) 食糧安全保障と栄養

灌漑農業については機械化とともにサブプログラムが立案されている。この中には、大規模灌漑のポテンシャルの特定とは別に、小規模農家の灌漑スキーム戦略計画及び各案件の概要が記述されている。

2. 開発の基本構想

2.1 経緯・背景

降雨の時期が偏っているザンビアにおいて、農業開発は灌漑開発と一体であり、ザンビア政府は灌漑農業開発に大きな関心を払っている。そのため、農業食糧水産省は農業部門投資計画（ASIP）を進めるに当たって、灌漑農業開発のマスタープランを策定することが重要であると考えた。一方、日本政府の無償資金協力事業としてカウング地区やカナカンタパ地区の農業農村開発計画が実施されており、また西部州モング地域の農村開発事業が本年度から実施されることになっている。以上の状況と日本の協力の実績から、ザンビア国農業食糧水産省が灌漑農業農村開発のマスタープラン調査を日本の協力で実施したいとの意向を汲み、1996年5月14日から5月22日にわたってプロジェクト・ファインディング調査を実施した。

2.2 プロジェクト概要

JICA の開発調査として行われたザンビア全国水資源開発計画調査の結果に基づいて、ASIP のサブプログラムとして灌漑農業開発のマスタープラン調査を実施する。本マスタープランは全国を対象としているが、今回の現地調査は主として首都ルサカ周辺、北部のルアプラ州 Mansa 周辺、南部の南部州 Choma 周辺で行った。地形はいずれの地区もなだらかで山が浅く、林帯が薄いため、保水性に欠けている。全国の年平均降水量は約 1000mm で、世界の平均量とほぼ等しいが、その 90% が 11 月から 4 月までの雨期に集中しているため、乾期の栽培には灌漑が必要

不可欠となっている。年間の降雨分布は南部の 700mm から北部の 1600mm へと北へ行くほど多くなっている。1994 年の総人口は 925 万人、国土面積は 75 万 km²、人口密度は 12.3 人/km² である。

3. 計画概要

中央州、北部州及び南部州を中心とした現地調査、及び農業食糧水産省の担当者や農民からのインタビュー調査から、ザンビアの農牧業は今後大きく発展する可能性があることを認識した。この理由は、①未開発の広大な土地が残されている、②年間降水量が比較的高い、③現在の一般農民の技術水準がかなり低いため、技術面の向上に相当の発展の余地が残されている、④一方企業的農業の技術水準はかなり高く、他の農業に対する一つのモデルケースとなる、⑤他にこれといった産業がなく、政府としても農業に力を入れざるを得ない、等である。

また、灌漑開発のポテンシャルの高い順から、今回現地調査を実施したルアブラ州、ルサカ州、南部州があげられる。

事業計画の対象規模は主に中小規模農業とする。大規模農業は商業的経営をしており、日本の援助の対象にはならない。

現在ほとんどの小規模農家は雨期にメイズを栽培し、その自家消費分以外を売り、また家の周辺の菜園で自家消費分のソ菜を作るという自給自足農業を行っている。この農業の水準を引き上げることで、農民の生活向上を図ることが本プロジェクトの主目的である。

営農水準を向上させるための必要条件としては下記の項目があげられる。

- a. コーヒー、タバコ、ソ菜、綿等の有効な商品作物の需要がある。
- b. 灌漑用水がある。
- c. 事業組織があり、水管理、営農指導ができる。
- d. 事業に事業資金があり、個人に営農資金がある。
- e. 道路のアクセスがよい。

以上の項目はいずれも大切であるが、灌漑用水があり、さらに商品作物がある場合には、他の条件が悪くても、農民のインセンティブが高いことが分かった。そのため、事業を成功させるには、少なくとも灌漑用水と商品作物の 2 条件を満足させる必要がある。

計画規模については以下の 2 方式が適当であると判断させる。

- a. ザンビアには数十 ha 程度の小規模灌漑開発が可能な地区が多数ある。これらを単独あるいは数地区パッケージとしてまとめて事業化する。この場合、効果の発現が早い。

- b. 大河川の流域でまとまった面積を灌漑開発できる地区がある。この場合、資金と期間を要するが、一度に大きな開発が可能である。

以上の方式に基づいてマスタープランを策定し、その中で開発の優先順位を決定する。

4. 現地調査

灌漑開発の計画規模については、1)数十 ha 程度の小規模灌漑事業を複数地区パッケージとするものと、2)大河川流域で大規模に開発するものがあると考えられる。今回現地調査をした地区については規模別にその概要を以下に示す。

(1)小規模パッケージ開発の例

1)Molumbi Coffee Project (東北部 ルアプラ州 Mansa)

計画面積 18.8ha のうち現在までにコーヒーが植えられたのは 2.8ha である。灌漑施設はあるが水路の漏水が甚だしく修理を必要としている。この為、8月ないし9月に植えるべきコーヒーの苗を、降雨を待って11月ないし12月に植えている。水不足により苗が枯れてしまうこともしばしばある。州政府は技術援助(普及員の派遣、苗の提供)を、中央政府は水路補修のためのセメントを提供している。この時の労務は農民が負担する。

Mansa 農業事務所管内にはこのようなコーヒープロジェクトが12カ所ある。今年中にはコーヒーの苗木が全体で46ha栽培されることになっている。

この地域の主な問題点は以下の通り。

- a.小規模農家の農業開発資金の不足
- b.マーケティングシステムの不備
- c.道路などのインフラストラクチャーの不備
- d.灌漑システムの不備
- e.技術援助の不足

以上、農業経営していく上で多くの制約要因があるにもかかわらず、コーヒー農家達には商品作物の栽培に対し大きな意欲を抱いており、現在の営農条件を改善することで大きく発展する可能性が非常に高いと判断される。

2) Nkandabwe Irrigation Scheme (西南部 南部州 Choma)

1968年に事業開始

受益面積：10ha、農民70人

作物：グリーンメイズ、キャベツ、トマト、タマネギ、オクラ等

水 源：掘り抜き井戸の水をダムに溜めたもの

販売先：Choma、Monze、道路事情はよい。

- ・州政府が技術援助を行っている。
- ・水利組合（農民参加）が土地と水の管理を行っている。
- ・この付近には水源を持った同じような灌漑地区が他の2カ所ある。
- ・ルアブラ州の Mansa 周辺地域と比べると、この地域は他と比べ条件が格段に良い。

(2)大規模開発の例

ルサカ東部（ルサカ州）

ルサカ州の Luangwa 川西部、国道4号線南の信託地（trust land：先住民支配地）で、首都ルサカからは約200km 東の国道沿いの低平な2万～3万 ha が対象地域である。水源は Luangwa 川支流の Lukusashi 川で、水量は多い。本流 Luangwa 川からは流入土砂が多いため、取水しない。日本政府が事業実施をしたカウंगा農業農村開発計画はこの中にある。土壌条件も比較的良く、カウंगाの実例から判断すると、ソ菜も果実も多種多様なものが栽培可能である。

5. 総合所見

現在、ASIP の実施が初期段階に入っているため、そのサブプログラムである全国灌漑マスタープランの実施は不可欠である。

技術的可能性についてはどの方式にしても技術的に難しいものはなく問題ない。

社会経済的可能性については大きな効果が期待できると判断される。特に中小規模開発の場合には安価な開発が可能であり、我が国の援助協力の対象となりうる。

現地政府、住民の反応については、意見交換した全ての人々が灌漑事業に対し大きな期待を有しており、対応は大変良いといえる。

当事業計画の意義は、確実に雨期1作を行うことで自給自足農業の水準を引き上げ、同時に貧困の軽減、生産・生活環境の向上を行うことに主眼が置かれる。

そのため、農業基盤整備だけでなく、市場・流通、農業技術援助、及び農村の生活環境改善の面からのアプローチも必要である。

当該案件に対して、他の援助国、機関の動きは特になく、ザンビア政府は日本に対して要請を出したい意向である。

まず、マスタープラン調査を行い、地域、方式を絞り込み、規模的にモデルとなる中小規模灌漑農業部分（パッケージ事業も含む）を選出し、F/S調査を行う。

添付資料

I. 調査団員・調査日程

(1) 調査団員

団長 平田 四郎 太陽コンサルタンツ株式会社

団員 安部 望五 太陽コンサルタンツ株式会社

(2) 調査日程

No.	日 程	行 程
1.	1996.5.12 (月)	移動 (東京→ シンガポール)
2.	5.13 (火)	移動 (シンガポール→ ヨハネスブルグ)
3.	5.14 (水)	移動 (ヨハネスブルグ→ ルサカ)
4.	5.15 (木)	JICA への表敬、調査内容の説明 農業食糧水産省との打ち合わせ
5.	5.16 (金)	大使館への表敬、調査内容の説明
6.	5.17 (土)	移動 (ルサカ→ マンサ) 北部州の農業局との打合せ
7.	5.18 (日)	北部州の灌漑農業案件の視察
8.	5.19 (月)	移動 (マンサ→ ルサカ) ルサカ北方の大規模農場の視察
9.	5.20 (火)	移動 (ルサカ→ リビングストーン) 南部州の大規模農場の視察
10.	5.21 (水)	移動 (リビングストーン→ ルサカ) 南部州の農業局との打合せ、小規模灌漑案件の視察
11.	5.22 (木)	農業食糧水産省への調査報告 大使館、JICA への調査報告
12.	5.23 (金)	移動 (ルサカ→ ハラレ)

Ⅱ. 面会者リスト

1. 農業食糧水産省 (MAFF)

Department of Agriculture

Mulele	Director
Mwale	Assistant Director in charge of Extention
Imataa M. Akayombokwa	Assistant Director in charge of Irrigation
Ikuo Suzuki	Agricultural Advisor (JICA Expert)

2. 日本大使館

嶋田 久俊	二等書記官
黒木	三等書記官

3. JICA サンビア事務所

Yoshinari EBATA	所長
Yoshinori KITAMURA	Assitant Resident Representative
Shinji OBUCHI	Assitant Resident Representative

4. Northern Region, Department of Agriculture

J.M. KABASO	Extension Officer
Davis KABASO	Coffee Development Officer

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Hakayube	所長
Phiri S	Irrigation Engineer

Ⅲ. 収集資料リスト

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東北地方の小川



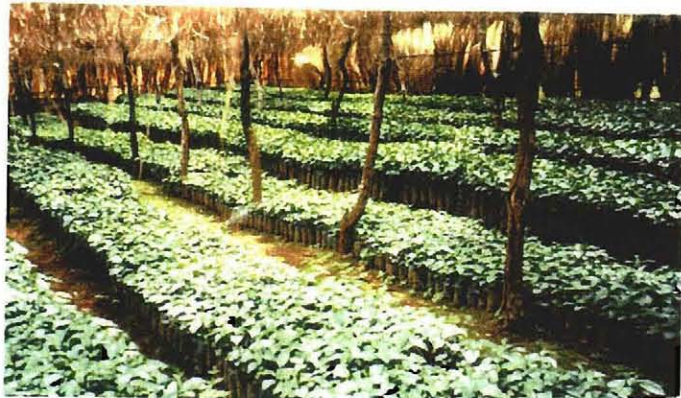
東北地方の農家（住居と菜園）



Molumbiコーヒー事業の取水施設



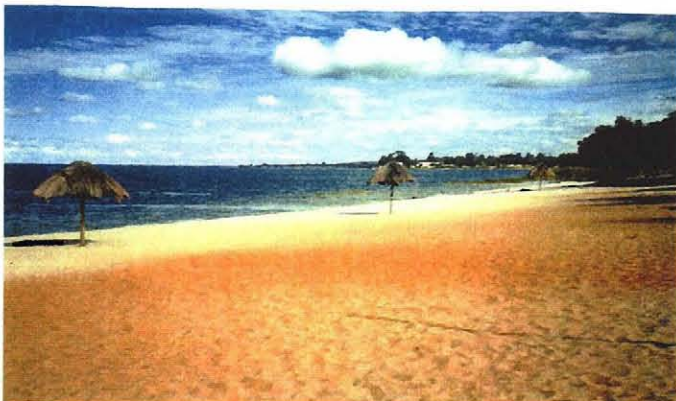
農村生活環境（井戸）



Molumbiコーヒー事業の苗場



Molumbiコーヒー事業のコーヒー栽培地



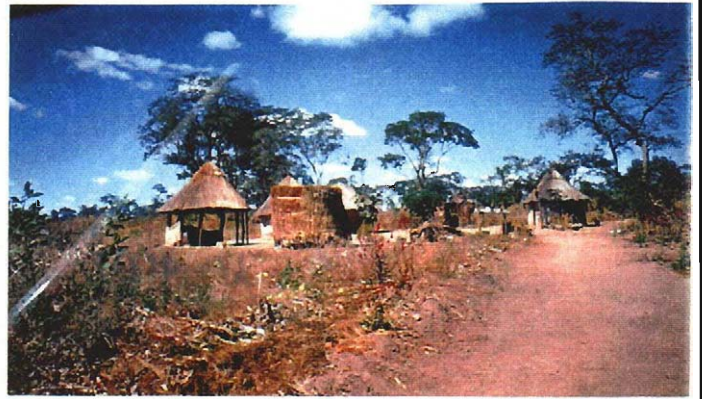
北部州のバングウェル湖



ルサカ北方の商業的農場



Nkandabwe地区の水源



典型的な農村集落



Nkandabwe地区の取水堰



Nkandabwe地区の用水路



ルサカ東部の大規模商業農場
(サトウキビ)



Nkandabwe地区の圃場



ポストハーベスト施設



ルサカ東南の大規模農場

TOR (案)

THE MASTER PLAN STUDY
ON
IRRIGATION PROGRAMMES
FOR
RURAL DEVELOPMENT

JUNE 1996

MINISTRY OF AGRICULTURE,
FOOD AND FISHERIES

REPUBLIC OF ZAMBIA

Project Category : Agricultural Development Study
Sector : Agriculture
Sub-Sector : Irrigation
Country : Republic of Zambia
Proposed Sources of Assistance: Government of Japan
Project Title : The Master Plan Study on
Irrigation Programmes for
Rural Development

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PART I GENERAL BACKGROUND

1. INTRODUCTION

1.1 General Background

Zambia covers an area of 752,614 km². It is a land locked country, and is surrounded by Tanzania, Mozambique, Malawi, Zimbabwe, Botswana, Namibia, Angola and Zaire. It lies mainly on a plateau ranging from 900 - 1,500m above sea level. The climate is sub-tropical but rather cool on the high plateau.

The rainy season is from November to April and rainfall ranges from 700mm in the South and Southwest, 800 - 1,100mm in the Central (including Lusaka and Eastern Province) to over 1,400mm per annum in the North and Northwest regions. The dry season is quite a long period from May to October for six (6) months.

According to the 1990 census on population, housing and agriculture, the total estimated population was about 7.8 million with an average annual growth rate of about 3.2% over the last decade.

About 70% of the population is concentrated in the five provinces, i.e. Southern, Central, Lusaka, Copperbelt and Eastern mainly along the line known as the old rail. The country's urban population is estimated at 42% but much higher in the above mentioned five provinces.

Administratively, Zambia is divided into 9 Provinces and 60 Districts.

Zambia's economy experienced a continuous decline since the mid-70s with a more serious condition in the last few years. The economy is over dependent on copper export earnings which account for more than 80% of the total GDP. The fall of copper prices on the international market, which started in the mid-70s and the excessive imports of goods for both consumption and production, have gradually undermined the national economy. The Government, therefore, has been relying heavily on the external borrowings to pay for the imports. This has increased the national debt to about US\$7.0 billion by the end of 1993.

1.2 Agro-ecological Zone

The country can be broadly divided into three agro-ecological zones as mentioned below;

- (1) The Northern high rainfall zone which occupies about 46% of the country and characterized by acidic soils and a low population density, where shifting cultivation, and the cultivation of sorghum, cassava and maize have been predominantly practiced.

- (2) The Central and Southern zone with the eastern plateau about 40% of the national land area, is characterized by the permanent cultivation with the predominant production of maize, groundnut and livestock.
- (3) The zone of Western semi-arid lands and the Rift Valley which occupies about 14% of the national land area, is characterized by the hot and dry climate, where agriculture production is limited to the cultivation of sorghum, millet etc., and extensive livestock rearing.

2. Agricultural Development Review

2.1 Existing Agriculture and Development

(1) Agricultural Production

Zambia has a high potential for agriculture with about 1.4 million ha cultivated annually out of the potential arable land which is estimated to be over 42 million ha. Zambia's agro-ecology permits a wide variety of farming systems and crops and there is an abundance of natural resources. Very little structural change or diversification has taken place in the agricultural sector.

Existing Area and Production of Major Crops (1990 - 1993)

(unit: '000ha/'000ton)

Year	1990/1991		1991/1992		1992/1993	
	Area	Products	Area	Products	Area	Products
Maize	580	1,448	661	483	633	1,598
Sorghum/ Millet	93	93	107	61	99	73
Oil Seeds*	217	129	124	29	130	91
Cotton	33	69	60	26	79	58
Tobacco	4	5	5	2	13	7
Rice	11	14	14	9	13	14

* included Groundnut, Sunflower, and Soybean

Source : Central Statistics Office and Early Warning Unit

Zambian agriculture is predominantly rainfed and rainfall is the major determinant of the sector's performance in a given year.

In 1993, Zambia experienced one of the worst drought periods in its history. The production of maize (the staple food crop) decreased to about one third of the planted area due to no rainfall in January to February, the major rainfall and growing period.

In Zambia the irrigation potentials with various surface water resources are considered very high, but only 6% of these potentials are currently utilized.

Therefore, the irrigation development could realize one of the best options for diversifying the agricultural development in large and small scales, and for promoting the sector of export - oriented crops in the country. This would improve the export earnings for the country if more high value crops were produced for exporting. In addition, the country has a long dry period which needs irrigation applications for farming proceedings.

(2) Crops

Maize is the main staple crop and occupies 60 to 70% of the cultivated land in the country. Cropped areas and production conditions of the main crops are described in the following. All crops are domestically consumed except tobacco, coffee, flowers which are for export purposes.

2.2 Irrigation Policy

The Government of Zambia considers the achievement of food security and self sufficiency in food production as the prime objective of agricultural development. To this end as well as to diversify agricultural production including export orientation the Government puts high priority to irrigated agriculture and actively promotes irrigation developments.

2.3 Institutional Condition for Irrigation

The irrigation and Land Husbandry Branch in the Ministry of Agriculture, Food and Fisheries is responsible for the task of irrigation development through its Irrigation Section. But this section lacks of adequate equipment and facilities as well as technical staff to be fully functional and operational. Institutional weakness of this section makes it difficult to handle the development plans for irrigation and related development programmes caused by the lack of practical experiences by the staff. The restructuring process under the ASIP programme will meet most of these shortfalls. However elaborate training programmes both at field (practical) and theoretical levels will still be necessary.

2.4 Development Potential

(1) Natural Resources

(1) Climate

The mean annual temperature in Zambia is largely within the moderate range of 18 C - 22 C. During December to February the day time temperature vary between 20.4C - 26.3 C and the night time temperatures vary between 17.3 C - 21.8 C. Maximum air temperatures are not a limiting factor for growing most crops and they are usually below 35C except in the major river valleys.

The mean yearly relative humidity varies from 55% around the shores of Lake Bangweulu in the north, although on a daily basis to as low as 25%, in some areas particularly during the hot dry season. During the main crop growing period (rainy season) the mean relative humidity of above 70% is observed in most areas.

In the higher rainfall areas sunshine may be less than optimum for some of the annual growth there. However, even during the rainy season the average sunshine generally exceeds 4 hours per day.

Winds are generally abundant in Zambia. However, they do not adversely effect the crop growth except during thunderstorms. The recording periods on evaporation are rather short and variable from station to station that it is difficult to draw a meaningful conclusion.

Rainfall is very important in Zambia. The seasonal minimum assured rainfall varies from 229mm at Katondwe Mission near the Luangwa Zambezi confluence, to 1,103mm at Samfya on the shores of Lake Bangweulu. However, many stations in Zambia have a dependable rainfall ranging between 600 - 800mm, corresponding to an average seasonal rainfall of about 850 - 1,000mm, but there is no rainfall at all for a long period from May to October.

The Southern African region experienced a severe drought in 1991/1992 which is adversely affected the crop production. Maize which is the staple food crop was severely affected by this drought, resulting in a very low yield. The drought was more serious in the southern part of Zambia. It is believed that this scale of drought occurs once in every 50 years by probability.

In ordinary circumstances, Zambia has a small scale drought once every 2.5 years, a medium scale drought once every 5 years and a serious drought once every 10 years.

(2) Water Resources

Zambia can be considered to be one of the fortunate African countries as far as water potential is concerned. Water potential is estimated at about 90 billion cubic meters (cu.m) of annual run-off and about 150 billion cu.m in storage water comprising of reservoirs, swamps and lakes.

(3) Land Resources

Land in Zambia is owned by the state and can be divided into two categories of tenureship; State land and Traditional land. State land which is about 6% is almost exhausted and is largely occupied by urban settlement and commercial farms. The current and potential land utilization is shown below;

Total geographical	72,260,000 ha
Total land area	74,338,000 ha
(Forest reserve)	(5,945,540 ha)
(National parks)	(6,472,360 ha)
State land	4,515,000 ha
Reserved trust land & other land	70,745,000 ha
Agricultural land	37,620,000 ha
(Cultivable)	(11,400,000 ha)
(Regularly cultivable)	(5,670,000 ha)
(Annual crops)	(2,670,000 ha)
(Perennial & shifting)	(3,000,000 ha)
(Irrigable)	(14,880,000 ha)

(2) Human Resources

Population (1990 census) 7,800,000

Population Distribution

(0 - 5 years)	(1,600,000)
0 - 15 years	4,000,000
15 - 64 years	3,708,000
Over 65 years	92,000

Labour Force

Total employed	1,000,000
Informal	500,000
	(105,000 in agricultural sector)
Formal	500,000
	(50,000 in agricultural sector)

It has been estimated that 54% of formal sector participation have an educational level above grade 8 - 12.

Participation

There are estimated 466,000 subsistence farmers, 122,400 small scale farmers, 22, 100 small/medium commercial and 750 - 1,000 large scale farmers in the country.

Women constitute 58% of the population and have responsibility of about 75% of the labour on subsistence farms, their primary responsibilities include land clearing, tilling, planting, weeding, harvesting and transportation. Men on the other hand clear and till and help in planting.

(3) Socio-economy

Abundant energy resources are available and the woodland and forest produce over 14 million cubic meters of wood fuel annually contributing 66% of the total energy needed. The country has over 1,750 MW generating capacity. Proven coal reserves exceed 30M tones and satisfy 9 % of the demand.

The country's only major energy import is petroleum, providing 12% of the energy demand for which Zambia has a bulk supply pipeline and its own refinery.

Copper is Zambia's leading export commodity and remains the fulcrum of the country's economy. Zambia has no oil, no natural gas, little uranium oxide, some deposits of low grade coal but rich in hydropower.

3. General Economic Environment And Policy

3.1 Economic Situation and Agriculture

Zambia's economic environment during the last decade has been characterized by a slow overall economic growth, declining employment, falling real income, high inflation rates, heavy dependence on copper exports which are declining on the international market, large current account deficits, sizable and growing external debts and large fiscal deficits. This environment has had a damaging impact on agricultural growth in Zambia. Consequently the importation of food has been necessary once every three (3) years and the sector's performance has been shown as below potential. Since 1991 the Zambian economy has been liberalized and state-owned enterprises have since been privatized step by step, resulting in a gradual change for a healthy national economy.

3.2 Agricultural Strategy

Some analysis of strategic issues in Zambia agriculture provides a reasonable basis for identifying some strategic objectives and policy options for agricultural development in the country for the next four (4) years up to the year 2000 under the ASIP programme. The following insists a necessary strategy for increasing the agricultural production.

- (1) Improve the incentive structure for all farmers through the irrigation development.
- (2) Enable smallholder farmers to participate in growth by increasing their access to rural infrastructure and human capital facilities and services.
- (3) Encourage the use of labour on which most rural Zambians depend for their income.
- (4) Encourage increasing use of the most readily available resources to most farmer's land
- (5) Promote the production and use of new adaptability among smallholder farmers including resource disadvantaged farmers.
- (6) Promote the development of sustainable agricultural programmes.

The challenge facing Zambia in its effort to develop agriculture and transform it into a major economic growth is very large. Achieving a pattern of agricultural development that can successfully meet these long-term objectives will require the Government to implement a carefully designed and prioritized Agricultural Sector Investment Programme (ASIP). This programme aims at providing the macroeconomics and institutional framework for developing agriculture.

3.3 Agricultural Sector Investment Programme (ASIP)

This programme aims at addressing issues pertaining to policies and institutional measures specifically intending to stimulate the agricultural growth.

Zambia will have to implement a special and long term programme to specifically increase the agricultural growth. Three priority areas should underpin the design of these programmes;

- (1) increasing sustainable agricultural productivity on smallholder agriculture.
- (2) development of new and sustainable sources of agricultural growth.
- (3) assuring wider participation of the poor in agricultural growth.

PART II TERMS OF REFERENCE

1. Needs for Master Plan Study on Irrigation Programmes for Rural Development.

The Ministry of Agriculture, Food and Fisheries does not have enough manpower capability, technology and funds for irrigated agricultural development. It also lacks an effective Irrigation Engineering Section which will be responsible for the provision of technical services on irrigation institutional farming enterprises and individual farmers.

The main constraint for understanding this study has been due to lack of existing adequate data, no concept and justification of projects for "irrigated agriculture" in the country and agricultural development in the future. The Ministry of Agriculture, Food and Fisheries needs to prepare future plan to strengthen agricultural development through a sub-sectoral approach such as irrigated agriculture, developing and institutional strengthening of the Irrigation Engineering Section, in order to systematically achieve the following targets;

- (1) To increase the irrigated agricultural production in order to attain the stabilized self sufficiency in food production for the country by the year 2015.
- (2) To improve the standard of living for the rural households and guarantee more work for the population in the agricultural sector.
- (3) To strengthen institutional organization of the Ministry of Agriculture, Food and Fisheries and strengthen the irrigation engineering section in the Department of Agriculture.
- (4) To contribute to the effectiveness of the irrigation sub-programme in ASIP.

As a matter of fact, this Master Plan Study will facilitate, improve and enhance planning and invest in the agricultural sector especially in the Irrigation Sub-sector and the IES in the Ministry of Agriculture, Food and Fisheries.

2. Objectives of the Study

- (1) To carry out a preliminary assessment of the agricultural sector in Zambia and to collect data for agricultural development.
- (2) To evaluate the agricultural potential of the country on a sub-sectoral basis in irrigated agriculture and the irrigation engineering section.

- (3) To formulate a strategy for effective exploitation of the natural, agricultural resources in relation to agro-sociological zone basis.
- (4) To prepare development plans on the strengthening of irrigation sub-sector and strengthening the irrigation engineering section for the 21st century on the basis of this study.

3. Study Outlines

3.1 Proposed Study Methodologies

The proposed methods of the study is to formulate the Master Plan of Zambia's irrigation development up to 2015 through agricultural sub-sectoring on irrigated agriculture and building up of the irrigation engineering section. The proposed master plan study will be made by evaluating and/or assessing major categories such as potential for irrigated agriculture, existing crop production processing and marketing, resettlement and/or environment, existing agricultural development and infrastructure, rural development and women in development with detailed analysis, potential growth capacity and possible investment programme for sub-sectors in the framework of rural development.

3.2 Project Prioritization

Priority projects will be identified and listed up to 2015 by irrigated agriculture. Priorities will also be divided into periodic categories as follows: (a) as short term up to 2000, (b) medium term up to 2010 and (c) long term up to 2015 for the important irrigated agricultural development projects. These will indicate definite strategies for agricultural development and will form the priorities for the projects to be implemented.

3.3 Preparation of Development Plans

Detailed irrigated agricultural development plans will be prepared through the feasibility study, such as an establishment plan for the irrigation engineering section which is the most prioritized project by irrigation sub-programme in the ASIP and rehabilitation or improvement plan for the proposed project with high priority.

4. Scope of the Study

4.1 General

The Government of Japan and the Government of Zambia shall jointly carry out the study. About eighteen months (18) is required to carry out fundamental data collection and analysis, field survey of existing project, evaluation and formulation of new irrigation projects and how to construct the infrastructure such as irrigation system for both the dry and wet seasons. The study includes many components such as rural infrastructure, meteorology, hydrology, soil capability, and marketing systems, as well as environmental factors, social infrastructures and other basic investigations.

4.2 Scope of the Study

In order to prepare a Master Plan on irrigation programmes for rural development in the Republic of Zambia and to present recommendations for the implementation of the irrigated agriculture, emphasis in the study will be put on the identification of bottlenecks and constraints for development and the identification of solutions and development possibilities. The development plans will be prioritized according to types of irrigation schemes, i.e. small scale and large scale in the framework of rural development.

(1) Fact-finding

In general, the following survey areas will be covered, and settings and socio-economic situation in the country will be studied to acquire basic information, data and useful reference for sectional development.

- basic natural resources on climate, land and water resources
- natural resources including human resources in the country
- major past and present development activities by foreign government and international organizations.

(2) Review of the Present Conditions for Development

The present situation of sector development in irrigated agriculture and social infrastructure will be analyzed. Then current bottlenecks and constraints for development will be identified.

- irrigated agriculture, infrastructure, processing and marketing facilities
- physical conditions
- resources availability and irrigated agricultural infrastructure
- current irrigated agricultural activities
- promotion policies and institutions
- social infrastructure
- transportation
- public utilities
- land conservation, consolidation and elevation
- manpower
- irrigation engineering section and enhancement plan in ASIP

(3) Assessment of Development

Development will be assessed on a sectoral basis from the technical and economic point of view. Analysis of development needs, capability, constraints and impacts will also be included.

The analysis on the study results of the above (2) will be reviewed in relation to the present state of development.

These will then be evaluated in order to improve the income level and living conditions of the existing farmers through the improvement of production per unit area.

- Irrigated agricultural development
- Irrigated agricultural infrastructure development
- Irrigated agricultural institutional development
- Irrigated agricultural processing and marketing system development

The requirements for future social infrastructures will also be examined. Assessments on future social economic conditions of the above examination are as follows:

- Projection on future socio-economic and industrial situation
- Future transportation needs
- Future public utilities and energy
- Urban and rural structure plan and land conservation

(4) Preparation of Irrigated Agricultural Development Plan

Based on the above survey results, the proposal to strengthen plan for irrigated agriculture and construction unit will be put forward. Then, by integrating the related elements and establishing the components, the irrigation/construction development plan will be formulated with the priority projects being identified.

(5) Implementation and Investment Plans

The following areas will be studied for the above mentioned plan.

- Proposals for detailed study and/or basic design for the implementation
- Preliminary cost estimates for identified projects
- Implementation schedule for identified projects

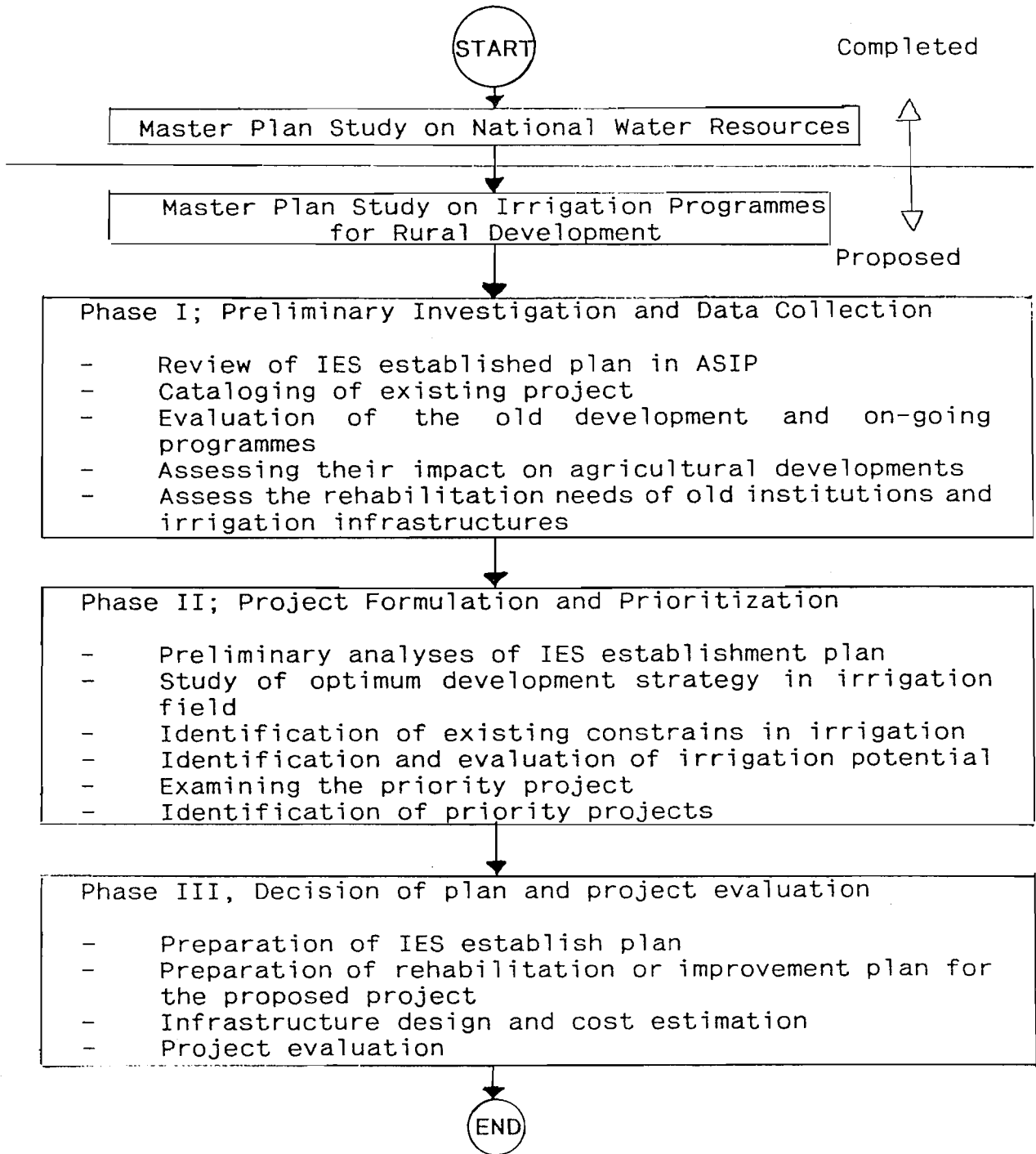
4.3 Study Plan

The irrigation master plan study on irrigated agriculture up to 2015 will be undertaken by both the Japanese study-team and the Zambian counterparts-team. This study will be divided into the following three (3) phases;

(1) Phase I : Preliminary Investigation, Data Collection

Preliminary investigation and data collection will be made on the following items;

- Review of Irrigation sub-sector in ASIP



Flowchart of the Study

- Identify the existing projects
- Evaluation of the old development and on-going programmes
- Assessment of the impact of irrigated agricultural development
- Assessment of the rehabilitation needs for old institutions and irrigation infrastructures

(2) Phase II : Master Plan Study

This phase will comprise of new proposals for irrigated agricultural development programmes. The study to formulate short, medium and long term agricultural development strategy in the country will be carried out using an irrigated approach.

The Projects requiring priority and urgent implementation will be determined through the formulation of the master plan study. An institutional building plan for the irrigation sector in Department of Agriculture will be prepared in accordance with ASIP.

- Preliminary analysis of irrigation engineering establishment plan
- Study of optimum development strategy in the irrigation sub-sector
- Identification of existing constraints in irrigation
- Identification and evaluation of irrigation potential
- Examining the priority among the projects in the sub-sector
- Identification of priority projects for rural development
- Preparation of the Master Plan

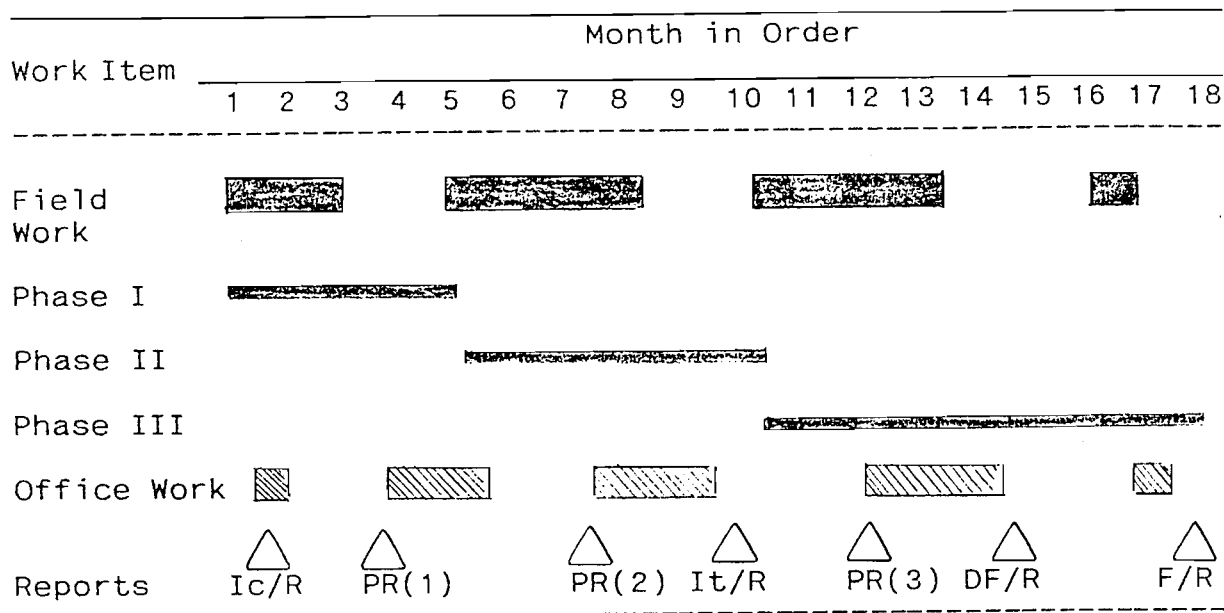
(3) Phase III : Feasibility Study

- Preparation of IES establishment
- Preparation of rehabilitation or improvement plan for the proposed projects
- Infrastructure design and cost estimation
- Project evaluation

4.4 Work Schedule

The study will require approximately 18 months to execute all the components of fundamental data collection and analysis, field survey, existing projects evaluation and new projects formulation, and project prioritization.

Tentative Work Schedule



4.5 Expertise Requirement

The Zambian counterparts team and the Japanese study team are required for the related surveys and studies. The whole study procedure should work together by experts from various fields as proposed below:

Experts and Study Team

Field	Study Team	
	Required man	- month
	Japanese	Zambian
1. Project Leader (Co-leader)	15	-
2. Hydro-Meteorologist	10	10
3. Irrigation Engineer	15	15
4. Agronomist/Extension Specialist	15	15
5. Soil Scientist/Land Use Planner	10	10
6. Inland-fisheries Specialist	08	08
7. Forestry & Environment Specialist	10	10
8. Marketing Specialist	10	10
9. Socio-Economist	10	10
10. Project Evaluator	15	15
11. Infrastructure Design & Cost Estimator	10	10
12. Water Management Specialist	12	12
Total man-month	140	140

4.6 Reports

The study team will prepare the following reports in English to the Government of Japan and the Government of Zambia in the course of the study.

- Inception Report : at the commencement of Phase I study
- Progress Report 1 : at the end of Phase I study
- Progress Report 2 : at the end of Phase II study
- Interim Report : at the beginning of Phase III study
- Progress Report 3 : at the end of Phase III study
- Draft Final Report : at the end of Phase III study
- Final Report : Final Report will be prepared within one (1) month after the submission of Draft Final Report

5. Expenditures/Cost Estimate

The Government of Japan shall meet all expenditure requirements for the Master Plan Study including survey works, procurement of materials, transportation, etc.

6. Training of the Study Team

It is requested that The Government of Japan will provide training opportunities to the Zambian counterparts team participating in the study including skills for preparations of the related reports in the framework of technical transfer for building up corresponding local expertise in Zambia's Ministry of Agriculture, Food and Fisheries.

7. Executing Agency

The Ministry of Agriculture, Food and Fisheries (Department of Agriculture) shall execute the cooperation in the study proceedings with assistance of the Japanese Government and the Water Affairs, Ministry of Energy and Water Development.

The Coordinating Committee will comprise of the Planning Unit, Ministry of Agriculture, Food and Fisheries i.e. Veterinary and Tsetse Control Services, Fisheries, Forestry together with Development of Water Affairs, Lands, Resettlement Department under Vice-President's Office and other related authorities of the Government.