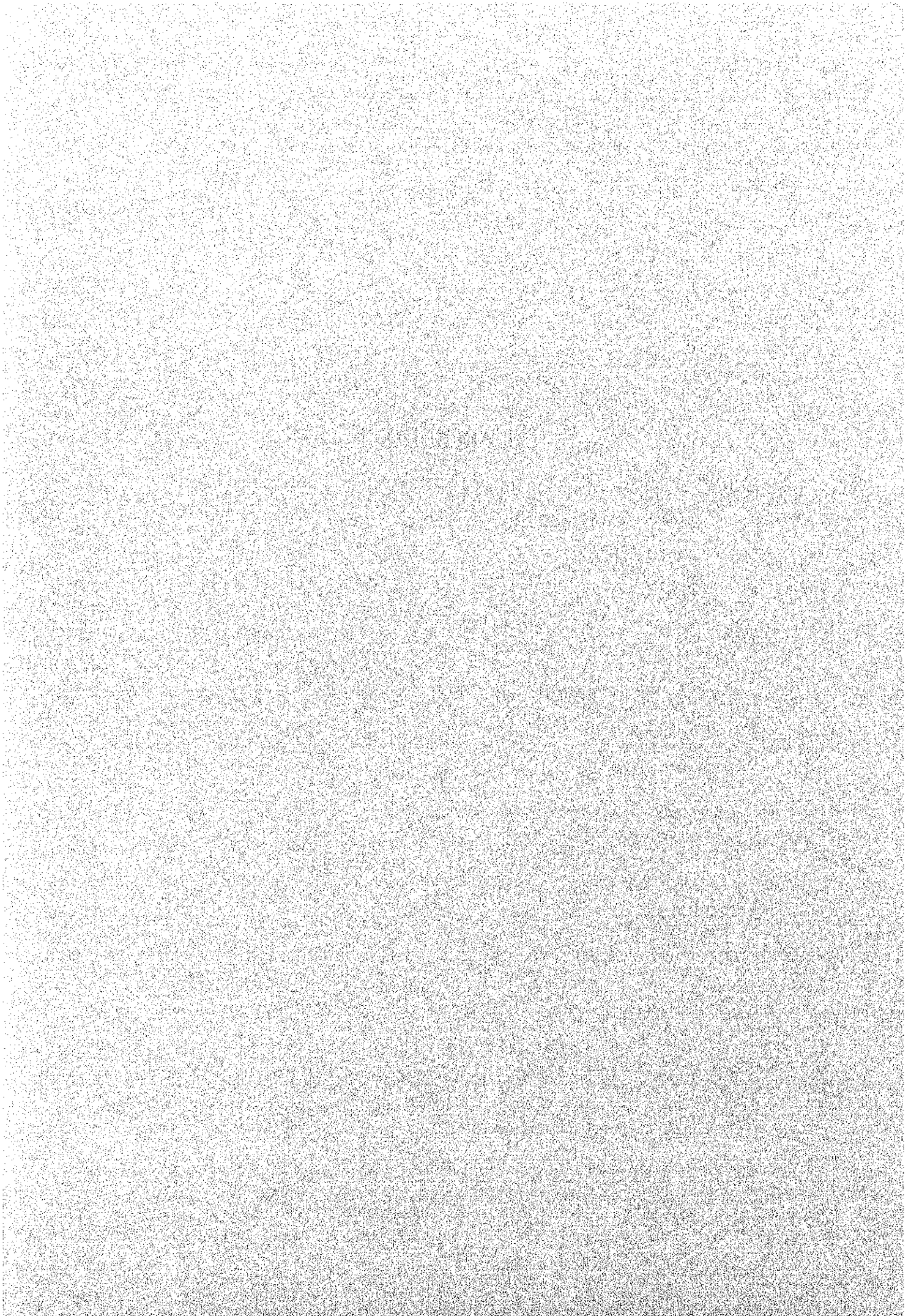


**[ APPENDIX ]**



[Appendix]

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1. Member List of Survey Team-----	A-1
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1. The first part of the document discusses the importance of maintaining accurate records of all transactions.

2. It also highlights the need for regular audits to ensure the integrity of the financial data.

3. Furthermore, the document emphasizes the role of transparency in building trust with stakeholders.

4. The following section details the various methods used to collect and analyze financial information.

5. This includes a thorough review of the company's internal controls and risk management practices.

6. The document also provides a detailed overview of the company's financial performance over the past year.

7. Finally, the report concludes with a series of recommendations for improving the company's financial health.

8. These recommendations are based on a comprehensive analysis of the company's current financial situation.

9. The document is intended to provide a clear and concise overview of the company's financial status.

10. It is hoped that this report will be helpful in making informed decisions about the company's future.

## 1. Member List of the Study Team

### A. Field Work and Basic Design

- (1) Team Leader / Agricultural Training Planner:  
MITSUHIKO OTA (Director, General Affairs Division, Tsukuba International Agricultural Training Centre, JICA)
- (2) Pump Irrigation Planner:  
SHIGEHIRO MITOMA (Engineer, Tokunoshima Development Office, Kyushu Agricultural Administration Bureau, Ministry of Agriculture, Forest and Fisheries)
- (3) Project coordinator:  
HISATOSHI OKUBO (1st Basic Design Study Division, Grand Aid Study and Design Department, JICA)
- (4) Chief Consultant / Agricultural Development Planner:  
RYOSUKE SAKANASHI (Taiyo Consultants Co., Ltd.)
- (5) Irrigation Facilities Planner:  
SHIGERU NAKADA (Taiyo Consultants Co., Ltd.)
- (6) Architecture: Planner:  
HIROSHI AZEGAMI (Taiyo Consultants Co., Ltd.)
- (7) Facilities Planner:  
TOSHINORI KUDO (Sanyu Consultants Inc.)

### B. Explanation of the Draft Report

- (1) Team Leader / Agricultural Training Planner:  
MITSUHIKO OTA (Director, General Affairs Division, Tsukuba International Agricultural Training Centre, JICA)
- (2) Pump Irrigation Planner:  
SHIGEHIRO MITOMA (Engineer, Tokunoshima Development Office, Kyushu Agricultural Administration Bureau, Ministry of Agriculture, Forest and Fisheries)
- (3) Project coordinator:  
TSUTOMU SHIMIZU (1st Basic Design Study Division, Grand Aid Study and Design Department, JICA)
- (4) Chief Consultant / Agricultural Development Planner:  
RYOSUKE SAKANASHI (Taiyo Consultants Co., Ltd.)
- (5) Irrigation Facilities Planner:  
SHIGERU NAKADA (Taiyo Consultants Co., Ltd.)
- (6) Architecture: Planner:  
HIROSHI AZEGAMI (Taiyo Consultants Co., Ltd.)

## 2. Survey Schedule

### A. Field Work

Date	Work Item
<b>Sep. 1994</b>	
1 (T)	Arrival at Harare, courtesy calls to Embassy of Japan (EOJ) and Min. of Lands, Agriculture and Water Development (MLAWD)
2 (F)	Courtesy call to Min. of Finance, discussion at MLAWD
3 (S)	Site surveys at Nyanga, Nyamaropa and Nyakomba areas
4 (S)	Site surveys at Nyamaropa and Nyakomba areas
5 (M)	Site surveys at Mutare, Nyanyadzi and Tawona areas
6 (T)	Site survey at Masvingo area
7 (W)	Discussion at MLAWD
8 (T)	Discussion at MLAWD
9 (F)	Signing of Minutes of Discussions, meeting at the World Bank, reporting to EOJ
10 (S)	(3 members leave Harare)
11 (S)	Meeting in the Team
12 (M)	Meetings at AGRITEX and DWD (Harare), meeting with Surveyor
13 (T)	Data collection from DWD and Min. of P. Const. (Harare → Nyanga)
14 (W)	Meeting at Nyanga AGRITEX, site surveys at Nyakomba and Nyamaropa
15 (T)	Site surveys at Nyakomba and Nyamaropa areas, Nyanga AGRITEX
16 (F)	- do - , ZESA Nyanga, AFC
17 (S)	- do -
18 (S)	do -
19 (M)	2 members: Site survey at Nyakomba, report to Nyanga AGRITEX, (Nyanga → Mutare) 2 members: (Nyanga → Mutare), AGRITEX and DWD in Mutare
20 (T)	2 members: AGRITEX, ZESA and DWD in Mutare 2 members: (Mutare → Harare), AGRITEX, ZESA and DWD in Mutare
21 (W)	2 members: Reporting to AGRITEX and DWD in Mutare, (Mutare → Harare) 2 members: Data collection in Harare
22 (T)	Data collection in Harare, meetings at AGRITEX and ZESA in Harare
23 (F)	Reporting to Ministry of Agriculture and Embassy of Japan
24 (S)	Data arrangement and others
25 (S)	Leave for Japan

## B. Explanation of the Draft Report

Date	Work Item
Jan. 1995	
15 (S)	Arrival at Harare
16 (M)	Courtesy calls to to Embassy of Japan (EOJ) and Min. of Lands, Agriculture and Water Development (MLAWD), discussion at MLAWD
17 (T)	Courtesy call to Min. of Finance, discussion at MLAWD
18 (W)	Signing of Minutes of Discussions, meeting at ZESA, reporting to EOJ
19 (T)	Meetings at AGRITEX and DWD
20 (F)	Data collection
21 (S)	Leave for Japan

### 3. Member List of Party Concerned in the Recipient Country

#### Ministry of Finance, Economic Planning and Development

O. M. Matshalaga	Under Secretary
A. Gunduza	Assistant Secretary
L. R. Kahari	Desk Officer

#### Ministry of Lands, Agriculture and Water Development

B. N. Ndimande	Permanent Secretary
T. Takavarasha	Deputy Secretary, Economics Dept.
K. Kapuyanyika	Ag. Chief, Agric. Economist
M. Mazwese	Senior Agric. Economist
M. Chizambire	Senior Agric. Economist
J. Makombe	Assistant Secretary

#### Department of Water Development

K. D. Landing	Director
V. H. Choga	Deputy Director of Operation Division
M. Mudzonga	Senior Civil Engineering Technician
G. T. Nyahangare	Civil Engineering Technician
D. Kagoro	Provincial Water Engineer, Mutare
T. W. Murinye	Deputy Provincial Water Engineer, Mutare
G. Pazakavambwa	Engineer, Mutare

#### Department of Agricultural, Technical and Extension Services

J. M. Makadho	Director
R. J. Chitsiko	Deputy Director
E. Chidenga	Ag. Chief Irrigation Officer
J. Mwaramba	Chief Executive Officer
L. Madiri	Acting Principal Irrigation Specialist, Harare
S. Madyiwa	Senior Irrigation Specialist, Harare
F. G. Sithole	Ag. Chief, AGRITEX, Mutare
E. Eston	Senior Agriculture Extension Specialist, Mutare
L. Forichi	Senior Irrigation Specialist, Mutare
A. Mawere	Agricultural Extension Specialist, Mutare
C. Magwa	Training Specialist, Mutare
T. Chipindura	Agric. Extension Officer, Nyanga
N. Sikume	Agric. Extension Officer, Nyanga
G. Mupakati	Extension Worker, Nyakomba



**Ministry of Public Construction and National Housing**

<b>Rahman</b>	<b>Principal Architecture, Health and Offices Div.</b>
<b>Atsumi Kaji</b>	<b>Architect (JOCV)</b>
<b>Keiko Mitoma</b>	<b>Architect (JOCV)</b>

**Zimbabwe Electricity Supply Authority (ZESA)**

<b>V. Ziwyengere</b>	<b>Planning and Materials Engineer, Harare</b>
<b>R. Mutombodzi</b>	<b>Engineer, Harare</b>
<b>S. Mupanduki</b>	<b>Planning and Materials Engineer, Mutare</b>
<b>W. Kwenda</b>	<b>Engineer, Mutare</b>
<b>W. Mufunda</b>	<b>Deputy Foreman, Nyanga</b>

**Agriculture Finance Corporation (AFC)**

<b>Mugadza S.</b>	<b>Field Loan Officer, Nyanga</b>
-------------------	-----------------------------------

**Embassy of Japan**

<b>Masaki Konishi</b>	<b>Ambassador</b>
<b>Haruo Okamoto</b>	<b>Minister</b>
<b>Takumi Ohashi</b>	<b>Consular</b>
<b>Yasuo Shoji</b>	<b>First Secretary</b>

**JOCV Office**

<b>Mutumi Narawa</b>	<b>Coordinator</b>
<b>Satoshi Azuma</b>	<b>Coordinator</b>

#### 4. Minutes of Discussions

##### A. Field Work

### MINUTES OF DISCUSSIONS BASIC DESIGN STUDY ON THE NYAKOMBA IRRIGATION DEVELOPMENT PROJECT IN THE REPUBLIC OF ZIMBABWE

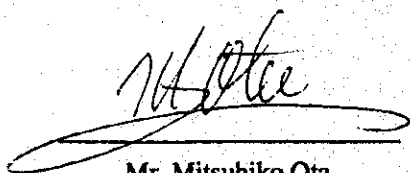
In response to a request from the Government of the Republic of Zimbabwe, the Government of Japan decided to conduct a Basic Design Study on the Nyakomba Irrigation Development Project (hereinafter referred to as "the Project") and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Zimbabwe a study team headed by Mr. Mitsuhiro Ota, Director, General Affairs Division, Tsukuba International Agricultural Training Center, JICA, from 1 to 25 September 1994.


The team held discussions with the officials concerned of the Government of Zimbabwe and conducted field surveys in the study area.

In the course of discussions and field surveys, both parties have confirmed the main items described on the attached sheets. The team will proceed to further work and prepare the Basic Design Study Report.

Harare, 9 September 1994



Mr. Mitsuhiro Ota  
Leader  
Basic Design Study Team  
JICA



Dr. B. N. Ndimande  
Permanent Secretary  
Ministry of Lands, Agriculture  
and Water Development  
Zimbabwe

## ATTACHMENT

### 1. Objective

The objective of the Project is to construct irrigation and other related facilities in the Nyakomba Ward in order to increase and stabilize the agricultural production in the area, thus contributing to income generation and welfare of the inhabitants.

### 2. Project Site

The Project site is located in the Nyakomba Ward in the north-eastern part of the Manicaland Province. (See Map in Annex-I)

### 3. Responsible and Executing Agencies

- (1) The Ministry of Lands, Agriculture and Water Development is the responsible ministry for the Project.
- (2) The Department of Agricultural, Technical and Extension Services is the implementing and executing agency.
- (3) The Department of Water Development is responsible for operation and maintenance of water systems from pumping stations to night storage dams.

### 4. Scope and Components of the Project

- (1) The scope and components of the Project will be determined after further studies and recommendations by the Basic Design Study Team and will be subject to appraisal and approval by the Government of Japan. However, the request for the Project components made by the Zimbabwean Side is as follows and illustrated in a map (Annex-II):

- (a) Construction of 5 irrigation blocks with the following facilities;
  - pumping stations with pumps
  - pipelines
  - night storage dams
  - open canal networks

*Handwritten signature*

*etc*

- (b) Construction of a project centre with the following facilities attached;
- office buildings
  - warehouses
  - workshops
  - garages
  - multipurpose halls
  - staff quarters
- (c) Procurement of agricultural machinery and operational vehicles and equipment
- (2) Both parties have agreed that the criteria such as the following will be considered for determining the final components and their scale, quantity and specifications:
- (a) a priority order of the blocks to be developed is C, B, A, D and E.
  - (b) institutional, managerial and technical competence of agencies and organizations involved in the Project
  - (c) economic viability of the Project
  - (d) geotopographical conditions of the Project site
  - (e) types of crops to be introduced
  - (f) possible disputes, both international and domestic, over land ownership, resettlement or water right, etc.
  - (g) development and prospect of the electrification project in the Project site
  - (h) availability of budgetary and technical support by the Government of Zimbabwe for operation and maintenance of the Project

*AND*

*etc*

(3) The Japanese side has made remarks on the Project components as follows:

- (a) Developing a large scale irrigation farm in a relatively short period of time might not be very effective considering time required for institutional development, technological upgrading and socio-economic change, etc.;
- (b) Therefore number of irrigation blocks to be constructed should be reduced to one or two;
- (c) Facilities and equipment to be attached to the Project should also be limited to those in absolute need;
- (d) Introduction of diesel generators to run pumps will further complicate operation and maintenance of the Project. Electrification in the Project is therefore considered vital;

(4) The Zimbabwean side has stated that:

- (a) The Zimbabwean side originally requested for development of 680 ha. However, in view of 3-a above, it is felt that at least 2 blocks should be considered.
- (b) The Zimbabwe side has understood that one or two blocks will be selected out of 5 based on the criteria agreed upon by the two sides for the Project.  
(See 4-2)
- (c) In case that Japan's Grant Aid is extended to part of the development scheme, the Zimbabwean side will make another request to the Government of Japan to realize the rest of the scheme in the future.
- (d) Sanitary, health and environmental factors should be considered where necessary.

*END*

*etc*

## 5. Technical Cooperation

The two parties have agreed that technical cooperation will boost development of the Project further. Types of technical cooperation to be considered are JOCVs (Japan Overseas Cooperation Volunteers), experts/advisors and training in Japan. Areas of cooperation can be irrigation, water management, marketing, agronomy, horticulture, livestock, etc. The Zimbabwean side will examine the need for technical cooperation and send separate requests through diplomatic channels, if necessary.

## 6. Water Right

The two parties have agreed that the water right issue over the Gairezi River with the Mozambican Government has been solved. (See Annex-III)

The Ministry of Lands, Agriculture and Water Development, through the Department of Water Development, will apply to the Water Court for water right of 680 ha.

## 7. Japan's Grant Aid System

(1) The Government of Zimbabwe will take necessary measures described in Annex-IV for smooth implementation of the Project on condition that the Grant Aid Assistance by the Government of Japan is extended to the Project.

(2) The Government of Zimbabwe has understood the system of Japanese Grant Aid explained by the team. (See Annex-V)

## 8. Schedule of the Study

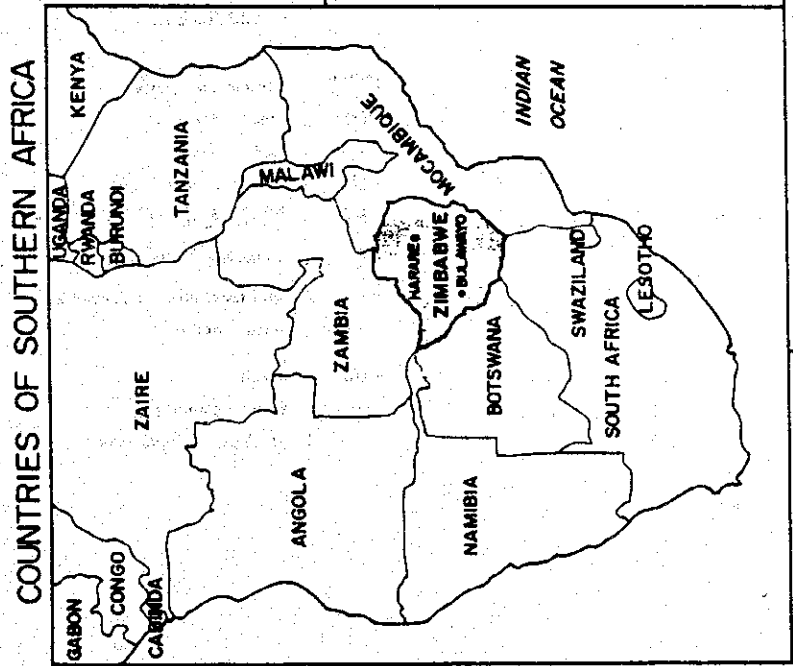
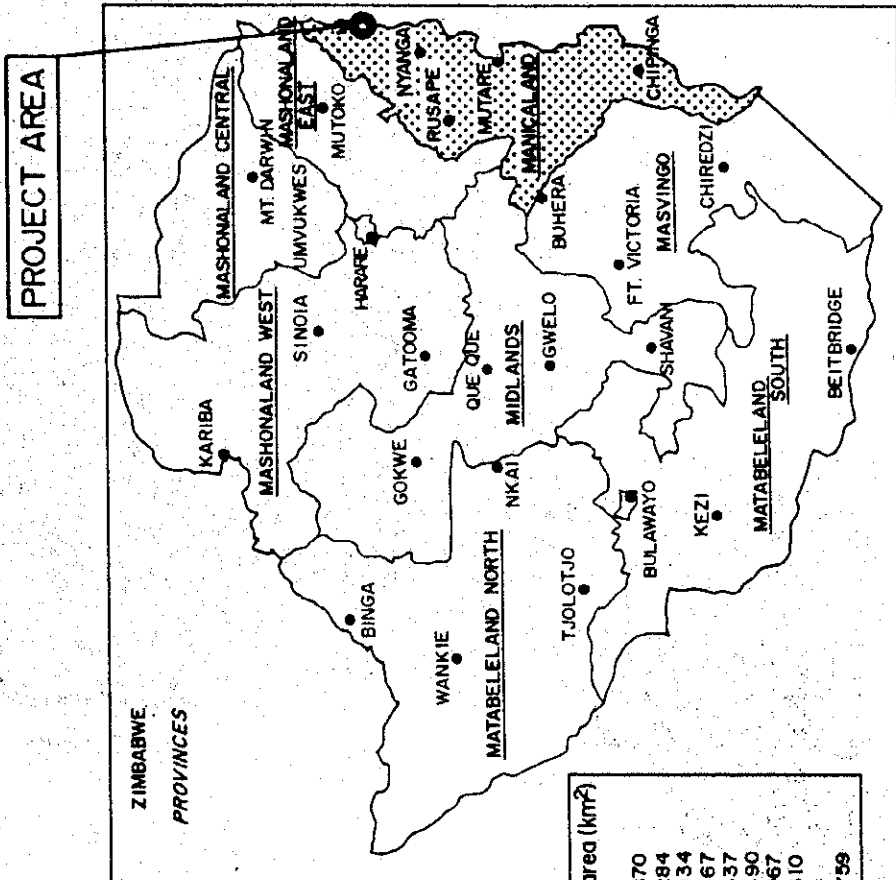
(1) The consultants will proceed to further studies in Zimbabwe until 25 September 1994.

(2) Based on the Minutes of Discussions and technical examination of the study results, JICA will prepare a draft final report and dispatch a mission to Zimbabwe to explain contents of the report around December 1994.

*Handwritten signature*

*etc*

LOCATION MAP



Land area by provinces	Land area (km <sup>2</sup> )
Manicaland	34 870
Mashonaland Central	27 284
Mashonaland East	24 934
Mashonaland West	60 467
Matabeleland North	73 537
Matabeleland South	66 390
Midlands	58 967
Masvingo	44 310
<b>Total</b>	<b>390 759</b>

*Handwritten signature*

*etc*



ZIMBABWE  
NYANGA DISTRICT  
SAUNYAMA CL

BLOCK E

NYAMANKA

BLOCK D

BLOCK C

GAREZI RIVER

BLOCK B

B-2

A-1

BLOCK A

A-2

NSD

NSD

TO NYAMANKA

LEGEND

- : IRRIGATION BLOCK
- : PUMP STATION
- : HEAD RACE
- : NIGHT STORAGE DAM
- : NYAMANKA PROJECT MANAGEMENT OFFICE (NPMO)
- : MARKETING FACILITIES
- : INTERNATIONAL BOUNDARIES
- : MAIN ROAD
- : RIVER
- : WARD BOUNDARIES
- : VILLAGE BOUNDARIES

GENERAL LAYOUT

*ate*

*BNB*







REPÚBLICA POPULAR DE MOÇAMBIQUE  
MINISTÉRIO DAS OBRAS PÚBLICAS E HABITAÇÃO  
DIRECÇÃO NACIONAL DE ÁGUAS

TO  
ZIMBABWE EMBASSY  
  
MAPUTO

Maputo, 02/08/987

Sua referência

2MP/POL/7H/5

Sua comunicação de

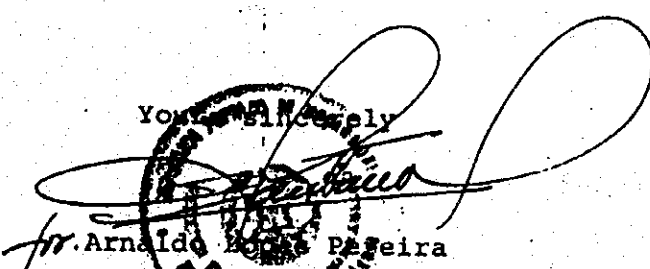
Nossa referência

845 /DNA/150/AT-DEP-F

ASSUNTO:

Concerning the CHISUMBANJE Project we sent a letter to our Ministry of Foreign Affairs. We enclose a copy of that letter.

Also we don't have objections to the NYAKOMBA Project. The Zimbabwe Government can continue with the progress of that project.

Yours sincerely  
  
Mr. Arnaldo Lopes Pereira  
National Directorate of Water

PRN/ams

*ams*

RECEIVED  
03 SEP 1987  
EMBASSY ZIMBABWE  
MAPUTO

*etc*

Telegrams: "MINFIN"  
Telex: 2141  
Telephones: 22101, 794571  
Private Bag 7705, Causeway



Reference: A/28/41

Annex II.2

MINISTRY OF FINANCE, ECONOMIC  
PLANNING AND DEVELOPMENT,  
Munhumutapa Building,  
Samora Machel Avenue,  
Harare.

17 September 1987

The First Secretary  
Embassy of Japan  
P O Box 2710  
NAKARE

Attention : Mr H Shimizu

Dear Sir

RE: NYAKOMBA IRRIGATION SCHEME - WATER RIGHTS : JAPANESE AID

I am pleased to refer to the above project which has already been submitted to you for consideration under the Project-Type Technical Cooperation Scheme.

According to your previous letter on the same subject the issue of Water Rights with the Mozambican Government had to be resolved before your Government could start on the project. I am pleased to advise you that the Mozambican Authorities have now given us an assurance that there is no need for an agreement on Water Rights and thus we can go ahead with the project.

It is our sincere hope that this will facilitate the implementation of the project.

Yours sincerely

A handwritten signature in dark ink, appearing to read "W Chirimuuta".

W Chirimuuta  
for: SECRETARY FOR FINANCE  
ECONOMIC PLANNING AND DEVELOPMENT

/ek

Handwritten initials, possibly "SJP", in dark ink.

Handwritten initials "etc" in dark ink.

## Annex-IV

### Necessary measures to be taken by the Government of Zimbabwe in case Japan's Grant Aid is extended

1. To secure the site for the Project.
2. To clear, level and reclaim the sites for the facilities prior to commencement of the construction.
3. To undertake incidental outdoor works such as gardening, fencing, gates and exterior lightning in and around the site.
4. To construct access roads to the site prior to commencement of the construction, if necessary.
5. To provide facilities for distribution of electricity, water supply, telephone, drainage, sewage and other incidental facilities to the Project site, if necessary.
  - 1) Electricity distributing line to the site.
  - 2) City water distribution main to the site.
  - 3) Drainage city main to the site.
  - 4) Telephone trunk line and the main distribution panel of building.
  - 5) General furniture such as carpets, curtains, tables, chairs and others.
6. To bear commissions to the Japanese foreign exchange bank for the banking services based upon Banking Arrangement.
7. To exempt taxes and to take necessary measures for customs clearance of the materials and equipment brought for the project at the port of disembarkation.
8. To accord Japanese nationals whose services may be required in connection with the supply of products and the services under the verified contract such facilities as may be necessary for their entry into Zimbabwe and stay therein for the performance of their work.
9. To maintain and use properly and effectively the facilities constructed and equipment purchased under the Grant.
10. To bear all the expenses other than those to be borne by the Grant, necessary for construction of facilities as well as for transportation and installation of equipment.
11. To allocate the necessary budget and personnel for the operation and maintenance of the Project.

*etc*

*BRD*

**On Japan's Grant Aid Scheme**

**1. Japan's Grant Aid Procedures**

1) The Japan's Grant Aid Program is executed by the following procedures.

- |                                 |  |
|---------------------------------|--|
| Application                     | (Request made by a recipient country)                              |
| Study                           | (Basic Design Study conducted by JICA)                             |
| Appraisal & Approval            | (Appraisal by the Government of Japan and Approval by the Cabinet) |
| Determination of Implementation | (The Notes exchanged between the both Governments)                 |

2) Firstly, an application or a request for a project made by the recipient country is examined by the Government of Japan (the Ministry of Foreign Affairs) to see whether or not it is suitable for Japan's Grant Aid. If the request is deemed suitable, the Government of Japan entrusts a study on the request to JICA (Japan International Cooperation Agency).

Secondly, JICA conducts the study (Basic Design Study), using (a) Japanese consulting firm(s).

Thirdly, the Government of Japan appraises to see whether or not the project is suitable for Japan's Grant Aid Program, based on a Basic Design Study report prepared by JICA and the results are then submitted for approval by the Cabinet.

Fourthly, the project approved by the Cabinet becomes official when pledged by the Exchange of Notes signed by the both governments.

Finally, for the implementation of the Project, JICA assists the recipient country in preparing contracts and so on.

*etc*

*BR*

## 2. Basic Design Study

### 1) Contents of the Study

The aim of the study (Basic Design Study) conducted by JICA on a project requested is to provide a basic document necessary for appraisal of the project by the Japanese Government. The contents of the Study are as follows:

- a) to confirm background objectives, benefits of the project and also institutional capacity of agencies concerned of the recipient country necessary for project implementation.
- b) to evaluate appropriateness of the project for the Grant Aid Scheme from a technical, social and economical point of view.
- c) to confirm items agreed on by the both parties concerning a basic concept of the project.
- d) to prepare a basic design of the project.
- e) to estimate cost involved in the project.

Final project components are subject to approval by the Government of Japan and therefore may differ from an original request.

Implementing the project, the Government of Japan requests the recipient country to take necessary measures involved which are itemized on Exchanges of Notes.

### 2) Selecting (a) Consulting Firm(s)

For smooth implementation of the study, JICA uses (a) consulting firm(s) registered. JICA selects (a) firm(s) through proposals submitted by firms which are interested. The firm(s) selected carry(ies) out a Basic Design Study and write(s) a report, based upon terms of reference made by JICA.

The consulting firm(s) used for the study is(are) recommended by JICA to a recipient country after Exchanges of Notes, in order to maintain technical

consistency and also to avoid possible undue delay in implementation caused if a new selection process is repeated.

### 3. Japan's Grant Aid Scheme

#### 1) What is Grant Aid ?

The Grant Aid Program provides a recipient country with non reimbursable funds needed to procure facilities, equipment and services for economic and social development of the country under principles in accordance with relevant laws of Japan. The Grant Aid is not in a form of donation or such.

#### 2) Exchange of Notes (E/N)

The Japan's Grant Aid is extended in accordance with the Notes exchanged by the both Government, in which the objectives of the project, period of execution, conditions and amount of the Grant, etc. are confirmed.

3) "The period of the Grant" means one fiscal year which the Cabinet approves the project for. Within the fiscal year, all procedures such as exchanging of the Notes, concluding a contract with (a) consulting firm(s) and (a) contractor(s) and a final payment to them must be completed.

4) Under the Grant, in principle, products and services of origins of Japan or the recipient country are to be purchased.

When the two Governments deem it necessary, the Grant may be used for the purchase of products or services of a third country origin.

However the prime contractors, namely, consulting, contractor and procurement firms, are limited to "Japanese nationals". (The term "Japanese nationals" means Japanese physical persons or Japanese juridical persons controlled by Japanese physical persons.)

5) Necessity of the "Verification"

The Government of the recipient country or its designated authority will conclude into contracts in Japanese yen with Japanese nationals. Those contracts shall be verified by the Government of Japan. The "Verification" is deemed necessary to secure accountability to Japanese tax payers.

6) Undertakings Required of the Government of the Recipient Country

In the implementation of the Grant, the recipient country is required to undertake the necessary measures such as the following:

- (1) To secure land necessary for the sites of the Project and to clear, level and reclaim the land prior to commencement of the construction.
- (2) To provide facilities for distribution of electricity, water supply and drainage and other incidental facilities in and around the sites.
- (3) To secure buildings prior to the procurement in case of the installation of the equipment.
- (4) To ensure all the expenses and prompt execution for unloading, customs clearance at the port of disembarkation and internal transportation of the products purchased under the Grant.
- (5) To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which will be imposed in the recipient country with respect to the supply of the products and services under the Verified Contracts.
- (6) To accord Japanese nationals whose services may be required in connection with the supply of the products and services under the Verified Contracts, such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work.

7) Proper Use

The recipient country is required to maintain and use facilities constructed and equipment purchased under the Grant Aid properly and effectively and to assign

*etc*

staff necessary for this operation and maintenance as well as to bear all expenses other than those to be borne by the Grant Aid.

**8) Re-export**

The products purchased under the Grant should not be re-exported from the recipient country.

**9) Banking Arrangement (B/A)**

- a) The Government of the recipient country or its designated authority should open an account in the name of Government of the recipient country in an authorized foreign exchange bank of Japan (hereinafter referred to as "the Bank"). The Government of Japan will execute the Grant by making payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the contracts verified.
- b) The payments will be made when payment requests are presented by the Bank to the Government of Japan under an authorization to pay issued by the Government of the recipient country or its designated authority.

*BMS*

*etc*



B. Explanation of the Draft Report

MINUTES OF DISCUSSIONS  
BASIC DESIGN STUDY ON THE NYAKOMBA  
IRRIGATION DEVELOPMENT PROJECT IN  
THE REPUBLIC OF ZIMBABWE  
(CONSULTATION ON DRAFT REPORT)

In September 1994, the Japan International Cooperation Agency (JICA) dispatched a Basic Design Study team on the Nyakomba Irrigation Development Project (hereinafter referred to as "the Project") to the Republic of Zimbabwe, and through discussions, field surveys, and technical examination of the results in Japan, has prepared the draft report of the study.

In order to explain and to consult the Zimbabwean side on the components of the draft report, JICA sent to Zimbabwe a study team, headed by Mr. Mitsuhiro OTA, Director, General Affairs Division, Tsukuba International Agricultural Training Center, JICA, from January 16 to 21, 1995.

As a result of discussions, both parties confirmed the main items described on the attached sheets.

Harare, January 18, 1995




Mr. Mitsuhiro OTA

Leader

Draft Report Explanation Team

JICA



Dr. B.N. Ndimande

Permanent Secretary

Ministry of Lands, Agriculture

and Water Development,

Zimbabwe

## ATTACHMENT

### 1. Components of Draft Report

The Government of Zimbabwe has agreed and accepted in principle the components of the Draft Report proposed by the team.

### 2. Japan's Grant Aid System

- (1) The Government of Zimbabwe will take the necessary measures, described in Annex I, for smooth implementation of the Project on condition that the Grant Aid assistance by the Government of Japan is extended to the Project.
- (2) The Government of Zimbabwe has understood the system of Japanese Grant Aid explained by the team. (Annex II)

### 3. Further Schedule

The team will make the Final report in accordance with the confirmed items, and send it to the Government of Zimbabwe around May 1995.

### 4. Other Issues

#### (1) Electrification Plan

The Government of Zimbabwe through ZESA has assured to complete the electrification by August 1996, including the necessary components, i.e. 11 kv transformer.

#### (2) Budget Plan

The Government of Zimbabwe through the Ministry of Lands, Agriculture and Water Development will secure the budget needed for the Project as follows:

#### The Budget for the Following in Fiscal Year, 1995/96

- a) Staff houses
- b) Water distribution from city to the site
- c) Drainage from city to the site
- d) Telephones

- e) Construction of access roads
- f) Undertaking incidental outdoor works
- g) Clearing, leveling and reclamation of site for the facilities, and firm leveling
- h) Fencing the sites of pump stations and project management facilities

The Budget for the Following in Fiscal Year, 1996/97

- i) General furniture

The Budget for the Following from Fiscal Year, 1996/97

- j) Securing budget and personnel for operation and maintenance of the Project
- (3) As per the policy of the Government of Zimbabwe, farmers will be expected to gradually take over the management of the irrigation scheme after some period of induction.
- (4) Comments from the Zimbabwean Side
- a) Water tank capacity should be increased from 2,500 l to 9,000 l.
  - b) A grader is required instead of a bulldozer as machinery for farm land consolidation.
  - c) Equipment to be procured should be attached with operation manual.
  - d) The Ministry of Lands, Agriculture and Water Development will make a follow-up of technical cooperation through the Embassy of Japan.
  - e) Staff houses will be provided by the Government of Zimbabwe.
  - f) Power will be supplied either through 11 kv or 33 kv, however the most likely supply would be through 33 kv line. In the case of 33 kv, the Zimbabwean side will provide transformers to reduce the power to 11 kv and supply to the pump stations.

*M. Otu*

*3/2/97*

Annex I: Necessary measures to be taken by the Government of Zimbabwe in case Japan's Grant Aid is executed.

1. To secure the site for the Project.
2. To clear, level and reclaim the site prior to commencement of the construction.
3. To undertake incidental outdoor works such as gardening, fencing, gates and exterior lightning in and around the site.
4. To construct the access road to the site prior to commencement of the construction.
5. To provide facilities for distribution of electricity, water supply, telephone, drainage, sewage and other incidental facilities to the Project site.
  - 1) Electricity distributing line to the site.
  - 2) City water distribution main to the site.
  - 3) Drainage city main to the site.
  - 4) Telephone trunk line and the main distribution panel of building.
  - 5) General furniture such as carpets, curtains, tables, chairs and others.
6. To bear commissions to the Japanese foreign exchange bank for the banking services based upon Banking Arrangement.
7. To exempt taxes and to take necessary measures for customs clearance of the materials and equipment brought for the project at the port of disembarkation.
8. To accord Japanese Nationals whose services may be required in connection with the supply of products and the services under the verified contract such facilities as may be necessary for their entry into Zimbabwe and stay therein for the performance of their work.
9. To maintain and use properly and effectively that the facilities constructed and equipment purchased under the Grant.
10. To bear all the expenses other than those to be borne by the Grant, necessary for construction of the facilities well as for the transportation and the installation of the equipment.
11. To allocate the necessary budget and personnel for the operation and maintenance of the Project

*M.C.T.*

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## Japan's Grant Aid Scheme

### 1. Grant Aid Procedures

1) Japan's Grant Aid Program is executed through the following procedures.

Application	(Request made by a recipient country)
Study	(Basic Design Study conducted by JICA)
Appraisal & Approval	(Appraisal by the Government of Japan and Approval by Cabinet)
Determination of Implementation	(The Notes exchanged between the Governments of Japan and the recipient country)

2) Firstly, the application or request for a Grant Aid project submitted by a recipient country is examined by the Government of Japan (the Ministry of Foreign Affairs) to determine whether or not it is eligible for Grant Aid. If the request is deemed appropriate, the Government of Japan assigns JICA (Japan International Cooperation Agency) to conduct a study on the request.

Secondly, JICA conducts the study (Basic Design Study), using (a) Japanese consulting firm(s).

Thirdly, the Government of Japan appraises the Project to see whether or not it is suitable for Japan's Grant Aid Program, based on the Basic Design Study report prepared by JICA, and the results are then submitted to the Cabinet for approval.

Fourthly, the project, once approved by the Cabinet, becomes official with the Exchange of Notes signed by the Governments of Japan and the recipient country.

Finally, for the implementation of the Project, JICA assists the recipient country in such matters as preparing tenders, contracts and so on.

*M. C. C.*

## 2. Basic Design Study

### 1) Contents of the Study

The aim of the Basic Design Study (hereinafter referred to as "the Study"), conducted by JICA on a requested project (hereinafter referred to as "the Project") is to provide a basic document necessary for the appraisal of the Project by the Japanese Government. The contents of the Study are as follows:

- a) Confirmation of the background, objectives, and benefits of the requested project and also institutional capacity of agencies concerned of the recipient country necessary for Project's implementation.
- b) Evaluation of the appropriateness of the Project to be implemented under the Grant Aid Scheme from a technical, social and economic point of view.
- c) Confirmation of items agreed on by both parties concerning the basic concept of the Project.
- d) Preparation of a basic design of the Project.
- e) Estimation of costs of the Project.

The contents of the original request are not necessarily approved in their initial form as the contents of the Grant Aid project. The Basic Design of the Project is confirmed considering the guidelines of Japan's Grant Aid Scheme.

The Government of Japan requests the Government of the recipient country to take whatever measures are necessary to ensure its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the organization in the recipient country actually implementing the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country through the Minutes of Discussions.

### 2) Selection of Consultants

For smooth implementation of the Study, JICA uses (a) registered consultant firm(s). JICA selects (a) firm(s) based on proposals submitted by interested

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firms. The firm(s) selected carry(ies) out a Basic Design Study and write(s) a report, based upon terms of reference set by JICA.

The consultant firm(s) used for the Study is(are) recommended by JICA to the recipient country to also work on the Project's implementation after Exchanges of Notes, in order to maintain technical consistency and also to avoid any undue delay in implementation should the selection process be repeated.

### **3. Japan's Grant Aid Scheme**

#### **1) What is Grant Aid ?**

The Grant Aid Program provides a recipient country with non reimbursable funds to procure facilities, equipment and services (engineering services and transportation of the products, etc.) for economic and social development of the country under principles in accordance with relevant laws and regulations of Japan. Grant Aid is not supplied through the donation of materials as such.

#### **2) Exchange of Notes (E/N)**

Japan's Grant Aid is extended in accordance with the Notes exchanged by the Governments concerned, in which the objectives of the Project, period of execution, conditions and amount of the Grant Aid, etc. are confirmed.

#### **3) "The period of the Grant Aid" means the one fiscal year which the Cabinet approves the Project for. Within the fiscal year, all procedures such as exchanging of the Notes, concluding contracts with (a) consultant firm(s) and (a) contractor(s) and a final payment to them must be completed.**

However in case of delays in delivery, installation or construction due to unforeseen factors such as weather, the period of the Grant Aid can be further extended for a maximum of one fiscal year at most by mutual agreement between the two Governments.

#### **4) Under the Grant Aid, in principle, Japanese products and services including transport or those of the recipient country are to be purchased.**

*M. C. Lee*

*S. V. I.*

When the two Governments deem it necessary, the Grant Aid may be used for the purchase of the products or services of a third country.

However the prime contractors, namely, consulting, contracting and procurement firms, are limited to "Japanese nationals". (The term "Japanese nationals" means persons of Japanese nationality or Japanese corporations controlled by persons of Japanese nationality.)

5) Necessity of the "Verification"

The Government of recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be verified by the Government of Japan. This "Verification" is deemed necessary to secure accountability to Japanese taxpayers.

6) Undertakings required of the Government of the Recipient Country

In the implementation of the Grant Aid project, the recipient country is required to undertake such necessary measures as the following:

- (1) To secure land necessary for the sites of the Project and to clear, level and reclaim the land prior to commencement of the construction.
- (2) To provide facilities for distribution of electricity, water supply and drainage and other incidental facilities in and around the sites.
- (3) To secure buildings prior to the procurement in case the installation of the equipment.
- (4) To ensure all the expenses and prompt execution for unloading, customs clearance at the port of disembarkation and internal transportation of the products purchased under the Grant Aid.
- (5) To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which will be imposed in the recipient country with respect to the supply of the products and services under the Verified Contracts.
- (6) To accord Japanese nationals whose services may be required in connection with the supply of the products and services under the Verified Contracts, such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work.



7) Proper Use

The recipient country is required to maintain and use facilities constructed and equipment purchased under the Grant Aid properly and effectively and to assign staff necessary for this operation and maintenance as well as to bear all expenses other than those covered by the Grant Aid.

8) Re-export

The products purchased under the Grand Aid should not be re-exported from the recipient country.

9) Banking Arrangement (B/A)

- a) The Government of the recipient country or its designated authority should open an account in the name of Government of the recipient country in an authorized foreign exchange bank in Japan (hereinafter referred to as "the Bank"). The Government of Japan will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the verified contracts.
- b) The payments will be made when payment requests are presented by the Bank to the Government of Japan under an authorization to pay issued by the Government of the recipient country or its designated authority.

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5. Documents Regarding the Electrification A. Letter Issued by AGRITEX



All correspondence should be addressed to the Director  
**DEPARTMENT OF AGRICULTURAL TECHNICAL AND EXTENSION SERVICES**

Ministry of Lands, Agriculture and Water Development

P.O. Box CY 639, Causeway, Harare, Zimbabwe  
Telephone : 794601 / 730821/6 Fax : 263-4-730525

REF: H/406/1

22 September 1994

**The JICA Mission**

**re: NYAKOMBA IRRIGATION DEVELOPMENT PROJECT:  
BASIC DESIGN STUDY**

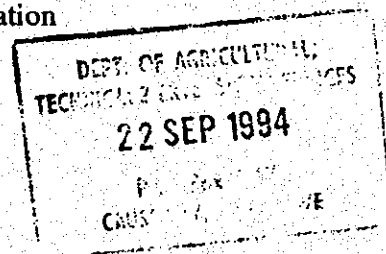
This is to confirm to you that the electrification in Nyakomba Ward will be realised by the end of the 1995 calendar year in order to supply power to this project. Agritex has confirmed with ZESA that the fortification of the power line between Mutare and Nyanga will be completed by June 1996.

**R.J. CHITSIKO  
ACTING DIRECTOR - AGRITEX**

/st

c.c. Embassy of Japan - Harare  
**Attention: Counsellor Ohashi**

Ministry of Lands, Agric. and Water Development  
**Attention: Mr Kapuyanyika - for your information**



B. Minutes of Meeting with ZESA

MINUTES OF THE MEETING ON THE ELECTRIFICATION OF NYAKOMBA IRRIGATION DEVELOPMENT PROJECT IN THE REPUBLIC OF ZIMBABWE HELD ON 18TH JANUARY 1995 AT ZIMBABWE ELECTRICITY SUPPLY COMMISSION (ZESA) HEAD OFFICE, HARARE

Present : Members of JICA Team : Ryosuke Sakanashi  
Tsutomu Shimizu

Zesa Members : V. Zinyengere  
R. Mutombodzi

Agritex : L. Madiri

Members of the JICA team requested to be informed on the progress made so far on the electrification of the Nyakomba Irrigation Development Project by the Zimbabwe Electricity Supply Commission (Zesa). Zesa members informed the meeting that :

- Tenders for the electrification of the 132kV line and substation materials contracts for the 132 kV line were being evaluated. Signing of the contracts was anticipated to be in May 1995.
- The expected date of completion of the construction of the 132kV line is August 1996.

ZESA also informed the meeting that the provision of supply line to the project area depends on AGRITEX's acceptance and payment of the required payment fees. There will be a 3 x 33 to 0,4kV substations and the sizes will depend on the load.

Agritex told the meeting that some money had already been allocated in the current financial year, 1994/95 for the Nyakomba Project. More money was requested from the Government of Zimbabwe for the next financial year, 1995/96 to meet the necessary measures to be taken by the Government of Zimbabwe in case Japan's Grant Aid is executed.

SIGNED AS CORRECT RECORD AT HARARE ON JANUARY 19, 1995 BY :

RYOSUKE SAKANASHI

.....*Ryosuke Sakanashi*.....(JICA)

TSUTOMU SHIMIZU

.....

V. ZINYENGERE

.....*Zinyengere* 19/1/95.....

R. MUTOMBODZI

.....*Mutombodzi*.....

L. MADIRI

.....*Madiri*.....

## 6. Cost Estimation Borne by the Recipient Country

### (1) Land Leveling for the Site of the Project Management Facilities

• Leveling	12,600 Z\$
• Gravel	<u>7,400 Z\$</u>
Sub Total	20,000 Z\$

### (2) Fence

• Project Management Facilities	128,000 Z\$
• Pump Stations	<u>272,000 Z\$</u>
Sub Total	400,000 Z\$

### (3) Electrification in the Nyakomba Ward

• Power Line	11,500,000 Z\$
• Transformer	<u>500,000 Z\$</u>
Sub Total	12,000,000 Z\$

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Total	12,420,000 Z\$
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7. Collection Data

(1) GOVERNMENT PUBLISHING CENTER

- 1) Budget Statement, 1994  
Presented to the Parliament of Zimbabwe on Thursday, 28 July 1994
- 2) PARLIAMENTARY DEBATES  
Vol. 21 No. 19, Wednesday, 24th August, 1994
- 3) TRANSITIONAL NATIONAL DEVELOPMENT PLAN, 1982/83 - 1984/85,  
VOLUME 1
- 4) TRANSITIONAL NATIONAL DEVELOPMENT PLAN, 1982/83 - 1984/85,  
VOLUME 2
- 5) FINANCIAL STATEMENTS 1993
- 6) MODEL BUILDING, BY - LOWS
- 7) COMBINED DEMOGRAPHIC ANALYSIS, VOLUME III, RAW DATA
- 8) The Promotion of Investment:  
Policy and Regulations, September 1991
- 9) ZIMBABWE, A Framework for Economic Reform (1991 - 95), January 18, 1991
- 10) CUSTOMS VALUATION MANUAL, JANUARY 1992
- 11) CENSUS 1992  
Zimbabwe, Preliminary Report

(2) CENTRAL STATISTICS OFFICE

- 1) INCOME TAX STATISTICS  
FOR ASSESSMENTS MADE IN RESPECT OF INCOME YEAR 1985 - 86, JULY,  
1989
- 2) Financial Statistics Report 1989
- 3) The Census of Production 1988/89  
- Mining, Manufacturing, Construction, Electricity and Water Supply -
- 4) Quarterly Prices Statistics, Bulletin 1, March 1994
- 5) PRODUCTION ACCOUNT OF AGRICULTURE, FORESTRY AND FISHING,  
1988 - 1992 (Excluding Communal Land, Resettlement Area and Small Scale Market  
Gardening)
- 6) CENSUS OF REGISTERED  
DECIDUOUS FRUIT GROWERS, 1993

- 7) Census of Resistered Poultry Producers, Fourth Quarter, 1993
- 8) LIVESTOCK ON LARGE SCALE COMMERCIAL FARMS 1993
- 9) AGRICULTURAL PRODUCTION ON COMMUNAL LAND IRRIGATION SCHEMES 1992
- 10) AGRICULTURAL PRODUCTION ON RESETTLEMENT SCHEMES 1992
- 11) AGRICULTURAL PRODUCTION ON SMALL SCALE COMMERCIAL FARMS 1990 AND 1991
- 12) CROP PRODUCTION ON LARGE SCALE COMMERCIAL FARMS 1993
- 13) CENSUS 1992  
Provincial Profile, manicaland
- 14) CENSUS 1992  
Zimbabwe, Preliminary Report
- 15) COMBINED CEMOGRAPHIC ANALYSIS, VOLUME I
- 16) COMBINED CEMOGRAPHIC ANALYSIS, VOLUME III, RAW DATA
- 17) STATISTICAL YEARBOOK 1989
- 18) Education Report, March 1993
- 19) Quarterly Migration and Tourist Statistics, September 1993
- 20) INCOME CONSUMPTION and EXPENDITURE SURVEY REPORT 1990/1991
- 21) The Input - Output Structure of the Economy of Zimbabwe 1980
- 22) National Income and Expenditure Report 1992
- 23) AGRICULTURAL DEVELOPMENT AUTHORITY ESTATES (ADA)  
(Excluding Middle Sabi Operating Division and Nijo Produce) 1988 - 93
- 24) Motor Vehicle Report, January - June, 1989
- 25) Motor Vehicle Report, July - December, 1989
- 26) Consumer Price Index, and Major Group and Group Indices
- 27) PRODUCER PRICE INDEX
- 28) Building Materials Price Index
- 29) PRODUCTION ACCOUNT OF AGRICULTURE: COMMUNAL LANDS  
Including Resettlement Areas) 1983 - 92
- 30) Stats - Flash, January - April 1994
- 31) Business Tendency Survey, June 1994

**(3) SURVEY AUTHORITY**

- 1) ZIMBABWE MAP, S=1/2,500,000
- 2) MAP: ZIMBABWE RELIEF, S=1/1,000,000
- 3) ROAD MAP OF ZIMBABWE, S=1/1,000,000
- 4) MAP: MUTARE, S=1/250,000
- 5) MAP: MUTOKO, S=1/250,000
- 6) MAP: CHIPINGE, S=1/250,000
- 7) MAP: REGINA COELI MISSION, S=1/50,000
- 8) CENTRAL HARARE MAP, S=1/15,000
- 9) MAP: ZIMBABWE POPULATION DISTRIBUTION, S=1/1,000,000: AUGUST 1982
- 10) MAP: ZIMBABWE HYDROLOGICAL ZONES, S=1/1,000,000
- 11) MAP: ZIMBABWE CLIMATIC COMFORT - DISCOMFORT BELTS AND BUILDING DESIGN
- 12) MAP: RHODESIA MEAN ANNUAL RAINFALL
- 13) MAP: RHODESIA MEAN MONTHLY RAINFALL DECEMBER
- 14) MAP: SOILS MAP OF THE FEDERATION OF RHODESIA AND NYASALAND

**(4) AGRITEX**

- 1) IRRIGATION MANUAL
- 2) HORTICULTURAL HANDBOOK
- 3) METEOROLOGICAL DATA (Station: Nyanga Experimental Farm)
- 4) Rainfall Data (Station: Nyamaropa Project Office)
- 5) AGRITEX ORGANIZATION MAP
- 6) NYANGA DISTRICT MAP: Rural District Council Ward/Village Boundaries
- 7) MANICALAND PROVINCE MAP: Rural District Word Boundaries

**(5) DWD**

- 1) **DWD ORGANIZATION MAP**
- 2) **Night Storage Dam Sample Drawing.**
- 3) **Pump Station List in Manicaland Province**

**(6) Civil Engineering Association**

- 1) **Concreat Criterium**
- 2) **Asbestos Roof Criterium**
- 3) **PVC pipe Criterium**



## 8. Boring Data

### SOIL PROFILES

#### BLOCK B

##### 1.1 Pump House

0.0 m to 2.4 m	brown alluvium clayey silt
2.4 m to 4.1 m	fawn quartz-mica schist clayey sand silt
4.1 m to 7.0 m +	fawn/brown quartz-mica schist clayey silt sand

##### 1.2 NSD

0.0 m to 1.2 m	fawn quartz-mica schist sandy silt
1.2 m to 4.1 m	fawn quartz-mica schist silty sand
4.1 m to 5.0 m +	fawn quartz-mica schist sandy silt

##### 1.3 NSD 2

0.0 m to 2.0 m	brown alluvium + quartz silty sand
2.0 m to 2.4 m	fawn/brown quartz-mica schist sandy gravel
2.4 m to 3.2 m	brown quartz-mica schist clayey sand silt
3.2 m to 5.0 m +	fawn quartz-mica schist sandy gravel

##### 1.4 NSD 3

0.0 m to 0.9 m	red/brown alluvium clayey silt sand
0.9 m to 4.1 m	brown quartz-mica schist clayey silt sand
4.1 m to 5.0 m +	fawn quartz-mica schist sandy clay silt

## SOIL PROFILES

### BLOCK C

#### 2.1 Pump House

0.0 m to 1.5 m	grey/olive/brown alluvium { quartz schist clayey silt
1.5 m to 2.3 m	brown quartz-mica schist clayey sand silt
2.3 m to 5.5 m	fawn/brown quartz-mica schist clayey silt sand
5.5 m to 6.7 m	fawn/brown quartz-mica schist silty sand
6.7 m to 7.0 m +	fawn/brown quartz-mica schist clay gravel sand

#### 2.2 NSD

0.0 m to 2.3 m	fawn/brown alluvium + quartz schist sandy gravel
2.3 m to 4.8 m	fawn/brown quartz-mica schist silty sand
4.8 m to 5.0 m +	cream/brown quartz-mica schist sandy clay silt

#### 2.3 NSD 2

0.0 m to 1.5 m	red/brown alluvium clayey silt sand
1.5 m to 4.1 m	red/brown quartz-mica schist sandy clay silt
4.1 m to 5.0 m +	orange/brown quartz-mica schist sandy clay silt

#### 2.4 NSD 3

0.0 m to 0.9 m	brown quartz-mica schist clayey silt gravel
0.9 m to 2.7 m	quartz-mica schist sandy silt
2.7 m to 3.1 m	red/brown quartz-mica schist clayey gravel sand
3.1 m to 5.0 m +	orange/brown quartz-mica schist clayey silt

## STANDARD PENETROMETER TEST RESULTS

### 3.1 Block B

DEPTH OF TEST  (m)	'N' VALUE (blows/300mm) & INDICATED BEARING CAPACITY (kPa)							
	PUMP HOUSE		NSD 1		NSD 2		NSD 3	
	N	BC	N	BC	N	BC	N	BC
1.0	16	150	47	530	32	350	37	410
2.0	14	130	60	690	22	225	55	630
3.0	18	180	34	375	32	350	38	420
4.0	13	115	52	590	30	325	41	460
5.0	10	80	26	275	56	640	60	690
6.0	4	< 50						
7.0	4	< 50						

### 3.2 Block C

DEPTH OF TEST  (m)	'N' VALUE (blows/300mm) & INDICATED BEARING CAPACITY (kPa)							
	PUMP HOUSE		NSD 1		NSD 2		NSD 3	
	N	BC	N	BC	N	BC	N	BC
1.0	11	90	>100	RFSAL	22	225	36	400
2.0	9	70	41	460	20	200	>100	RFSAL
3.0	25	265	40	445	14	130	30	325
4.0	24	250	53	605	11	90	44	495
5.0	27	290	79	825	13	115	46	520
6.0	32	350						
7.0	18	180						

## TEST RESULTS

### BLOCK B

LOCATION	DEPTH (mm)	ASCON No.	NATURAL MOISTURE CONTENT	DES (kg/m <sup>3</sup> )		SPEC. GRAVITY
				BULK	DRY	
PUMP STATION	0.0 - 2.4	19218	6.8 - 13.3	2077	1833	2.70
	2.4 - 4.1	19219	15.7	2177	1882	3.17
	4.1 - 7.0 +	19210	18.1	2110	1787	2.74
NSD 1	0.0 - 1.2	19212	6.7 - 8.3			2.81
	1.2 - 4.1	19217	12.1			2.77
	4.1 - 5.0 +	19213	12.4			2.70
NSD 2	0.0 - 2.0	19183	3.8 - 4.9			2.78
	2.0 - 2.4	19184	5.1			2.85
	2.4 - 3.2	19214	5.2			2.76
	3.2 - 5.0 +	19215	5.7			2.79
NSD 3	0.0 - 0.9	19181	5.9			2.65
	0.9 - 4.1	19179	8.7			2.78
	4.1 - 5.0 +	19180	9.9			2.73

### PUMP STATION : UNCONFINED COMPRESSIVE STRENGTHS

DEPTH (m)	LCS (kPa)
1.0	1470
2.0	800
3.0	320
4.0	390
5.0	485
6.0	215
7.0	140

**BLOCK C**

LOCATION	DEPTH (mm)	ASCON No.	NATURAL MOISTURE CONTENT	DES (kg/m <sup>3</sup> )		SPEC. GRAVITY
				BULK	DRY	
PUMP STATION	0.0 - 1.5	19277	6.7 - 14.5	2172	1897	2.65
	1.5 - 2.3	19288	13.9	2173	1908	2.62
	2.3 - 5.5	19279	16.1	2126	1831	2.66
	5.5 - 6.7	19281	17.1	2200	1879	2.62
	6.7 - 7.0 +	19282	20.9	2226	1841	2.65
NSD 1	0.0 - 2.3	19291	0.9 - 5.7			2.71
	2.3 - 4.8	19292	9.8			2.75
	4.8 - 5.0 +	19293	12.7			2.83
NSD 2	0.0 - 1.5	19216	8.9			2.68
	1.5 - 4.1	19209	15.5			2.77
	4.1 - 5.0 +	19211	17.4			2.74
NSD 3	0.0 - 0.9	19294	8.5			2.69
	0.9 - 2.7	19295	14.2			2.78
	2.7 - 3.1	19296	14.8			2.73
	3.1 - 5.0 +	19297	15.7			2.64

**PUMP STATION : UNCONFINED COMPRESSIVE STRENGTHS**

DEPTH (m)	LCS (kPa)
1.0	1660
2.0	2480
3.0	300
4.0	320
5.0	345
6.0	240
7.0	160

9. Water Requirements Calculation Data

Examination of Water Requirement

Monthly Crop Water Requirement (ETc)

		OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	YEAR
ETo (mm/day)		6.55	5.50	4.62	4.44	4.30	4.30	3.92	3.42	2.95	3.23	4.30	5.25	52.78
Cotton	Kc	0.35	0.76	1.21	1.23	1.21	0.91	0.33						
	ETc (mm/day)	2.29	4.18	5.59	5.46	5.20	3.91	1.29						
Sugarbean 2	Kc								0.72	1.05	0.76			
	ETc (mm/day)								2.12	3.39	3.27			
Maize 1	Kc	0.41	0.93	1.18	0.94	0.37								
	ETc (mm/day)	2.69	5.11	5.45	4.17	1.59								
Sugar bean 1	Kc						0.70	1.05	0.85					
	ETc (mm/day)						3.01	4.12	2.91					
Wheat	Kc	0.13							0.33	0.88	1.17	0.86		
	ETc (mm/day)	0.85							0.97	2.84	5.03	4.52		
Maize 2	Kc		0.41	0.93	1.18	0.94	0.37							
	ETc (mm/day)		2.26	4.30	5.24	4.04	1.59							
Potato	Kc							0.33	0.42	1.05	1.16	0.75		
	ETc (mm/day)							1.29	1.44	3.10	3.75	3.23		
Tomato	Kc							0.67	0.71	0.98	1.06	0.92		
	ETc (mm/day)							2.88	3.05	3.84	3.63	2.71		
Onion	Kc						0.46	0.61	0.93	1.07	1.07	0.94	0.67	
	ETc (mm/day)						1.98	2.39	3.18	3.16	3.46	4.04	3.52	
Groundnuts	Kc	0.35	0.76	1.05	1.06	0.62								
	ETc (mm/day)	2.29	4.18	4.85	4.71	2.67								

Item	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	YEAR
Net Irrigation Requirement Using Effective Dependable Rainfall for 1 ha under cultivation mm/month													
• Cotton 30%	13.2	28.6	31.4	30.5	19.5	27.2	9.2						159.6
• Sugar beans 2 30%									19.1	35.3	34.1		88.5
• Maize 1 30%	24.1	45.3	34.8	18.5	1.7								124.4
• Sugar beans 1 30%						20.5	41.6	21.3					83.4
• Wheat 2 30%	2.2								9.4	26.4	49.6	43.1	130.7
• Maize 2 30%		12.7	16.2	26.5	7.4	11.5							74.3
• Potato 27%							5.4	15.4	31.3	31.7			83.8
• Tomato 3%							0.4	2.3	2.8	3.4	3.7		12.6
• Groundnuts 5%	1.1	4.9	5.0	5.0	0								16.0
• Onion 5%						0.7	3.3	4.9	4.7	6.0	7.0	2.6	29.2
• Maize 5%	4.0	7.6	5.8	3.1	0.3	0							20.8
• Sugar beans 1 5%						3.4	7.0	4.5					14.9
• Wheat 5%	0.4								1.6	4.4	8.3	7.2	21.9
Net Irrigation Requirement (mm/month/ha)	45.0	99.1	93.2	83.6	28.9	63.3	66.9	48.4	68.9	107.2	102.7	52.9	860.1
Gross Irrigation Requir. (mm/month/ha) Ea=0.65	69.2	152.5	143.4	128.6	44.5	97.4	102.9	74.5	106.0	164.9	158.0	81.4	1323.2

Item	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	YEAR
Gross Irrigation Requir. (mm/month/ha)	69.2	152.5	143.4	128.6	44.5	97.4	102.9	74.5	106.0	164.9	158.0	81.4	1323.2
Ea=0.65													
Irrigation Supply													
Requir. (1000 m <sup>3</sup> )													<b>Total</b>
Block B 128ha	88.5	195.3	183.5	164.6	57.0	124.7	131.8	95.4	135.7	211.1	202.4	104.2	1694.2
B-1 38ha	26.3	58.0	54.5	48.9	16.9	37.0	39.1	28.3	40.3	62.7	60.0	30.9	
B-2 19ha	13.1	29.0	27.2	24.4	8.5	18.5	19.6	14.2	20.1	31.3	30.0	15.5	
B-3 71ha	49.1	108.3	101.8	91.3	31.6	69.2	73.1	52.9	75.3	117.1	112.2	57.8	
Block C 140ha	96.8	213.4	200.8	180.0	62.3	136.4	144.1	104.3	148.4	230.9	221.2	114.0	1852.6
C-1 46ha	31.8	70.2	66.0	59.2	20.5	44.8	47.3	34.3	48.8	75.9	72.7	37.4	
C-2 47ha	32.5	71.7	67.4	60.4	20.9	45.8	48.4	35.0	49.8	77.5	74.3	38.3	
C-3 47ha	32.5	71.7	67.4	60.4	20.9	45.8	48.4	35.0	49.8	7.5	74.3	38.3	



Rotation Block	Peak Demand 1 Plot (l/sec)	per ha	Irrigation Rotation day	Total Stream Size (l/sec)	Irrigation Supply per 1 time (l/sec)	Irrigation Acreege per 1 time (ha)	Irrigation hr per 1 day hr
<b>Block B</b>							
<b>A=128ha</b>							
Type-I							
a: (30%)	4.2	14	8	538	67	4.8	11.0
A=38.4ha							
b: (30%)	6.78	22.6	10	868	87	3.84	10.0
A=38.4ha							
c: (27%)	6.3	21.0	9	726	81	3.84	
A=34.6ha							
d: (3%)	6.3	21.0	9	81	9	0.42	
A=3.8ha							
Type-II							
a: (5%)	1.89	6.3	4	40	10	1.6	1.44
A=6.4ha							
b: (5%)	2.4	8.0	10	51	5	0.64	6.0
A=6.4ha							
<b>Total</b>					259		
<b>Block C</b>							
<b>A=140ha</b>							
Type-I							
a: (30%)	4.2	14	8	588	74	5.25	11.0
A=42.0ha							
b: (30%)	6.78	22.6	10	949	95	4.2	10.0
A=42.0ha							
c: (27%)	6.3	21.0	9	794	88	4.2	
A=37.8ha							
d: (3%)	6.3	21.0	9	88	10	0.42	
A=4.2ha							
Type-II							
a: (5%)	1.89	6.3	4	44	11	1.6	1.44
A=7.0ha							
b: (5%)	2.4	8.0	10	56	6	0.64	6.0
A=7.0ha							
<b>Total</b>					284		





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