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1　調査団員氏名、所属

1　調査団員氏名、所属

インセプションレポート説明調査団および現地調査実施調査団

職　務		氏　名	所　属
1．総括	：	高橋　順二	国際協力事業団　JICA国際協力専門員
2．技術参与	：	井爪　宏	農林水産省東海農政局計画部地域計画課水利技官
3．計画管理	：	清水　勉	国際協力事業団　無償資金協力調査部第一課
4．業務主任・農業開発	：	田中　重之	日本工営株式会社
5．灌漑排水計画	：	京泉　憲治	日本工営株式会社
6．取水計画	：	一恩　英二	日本工営株式会社
7．施設設計	：	鍋田　和伸	日本工営株式会社
8．運営・維持管理計画	：	島崎　斉	日本工営株式会社

基本設計概要書案説明調査団

職　務		氏　名	所　属
1．総括	：	高橋　順二	国際協力事業団　JICA国際協力専門員
2．業務主任・農業開発	：	田中　重之	日本工営株式会社
3．灌漑排水計画	：	京泉　憲治	日本工営株式会社

2　調査日程

2. 調査日程

調査日程（1996年９月８日～10月12日）

日順	日付	曜日	団員移動内容	宿泊地	調査内容
1	9/8	日	田中、島崎、京泉、一恩、鍋田 成田発アムステルダム着	アムステルダム	
2	9/9	月	アムステルダム発	機中泊	団内打ち合わせ
3	9/10	火	マラウイ国リロンゲ着	リロンゲ	JICAマラウイ事務所表敬訪問
4	9/11	水	高橋団長、井爪、清水（官団員） リロンゲ到着	リロンゲ	団内打ち合わせ
5	9/12	木		リロンゲ	JICA、潅漑水資源省、大蔵省、 農業畜産開発省、潅漑局表敬訪問
6	9/13	金	サリマへ移動	サリマ	サリマ農業開発局へ表敬訪問
7	9/14	土		サリマ	現地調査
8	9/15	日		サリマ	現地調査
9	9/16	月		サリマ	サリマ農業開発局で協議
10	9/17	火	リロンゲへ移動	リロンゲ	潅漑局と議事録（案）協議 コンサルタント3名現地調査
11	9/18	水		リロンゲ	議事録署名、JICAへ報告 コンサルタント3名現地調査
12	9/19	木	高橋団長、井爪、清水（官団員） 帰国	サリマ	現地調査
13	9/20	金		サリマ	現地調査
14	9/21	土		サリマ	資料整理
15	9/22	日		サリマ	現地調査
16	9/23	月		サリマ	現地調査
17	9/24	火		サリマ	現地調査
18	9/25	水		サリマ	現地調査
19	9/26	木		サリマ	現地調査
20	9/27	金		サリマ	現地調査
21	9/28	土		サリマ	資料整理
22	9/29	日		サリマ	現地調査
23	9/30	月		サリマ	現地調査
24	10/1	火		サリマ	現地調査
25	10/2	水		サリマ	現地調査
26	10/3	木		サリマ	現地調査
27	10/4	金		サリマ	現地調査
28	10/5	土	島崎、鍋田帰国	サリマ	資料整理/現地調査
29	10/6	日		サリマ	現地調査
30	10/7	月		サリマ	現地調査
31	10/8	火		サリマ	現地調査
32	10/9	水		リロンゲ	移動、潅漑局報告
33	10/10	木	田中、京泉、一恩帰国	機中泊	移動、JICA報告
34	10/11	金	アムステルダム着発	機中泊	移動
35	10/12	土		成田	移動

基本設計概要書案説明調査団調査日程（1996年11月25日～12月７日）

日順	日付	曜日	団員移動内容	宿泊地	調査内容
1	11/25	月	田中、京泉 成田発アムステルダム着・発	機中泊	移動
2	11/26	火	マラウイ国リロンゲ着	リロンゲ	移動
3	11/27	水	高橋団長リロンゲ到着	リロンゲ	JICAマラウイ事務所表敬・説明
4	11/28	木		リロンゲ	JICA、潅漑水資源省、大蔵省、 農業畜産開発省、潅漑局表敬協議
5	11/29	金	サリマへ移動	リロンゲ	サリマ農業開発局へ表敬・協議
6	11/30	土		サリマ	団内打合せ
7	12/1	日	リロンゲへ移動	リロンゲ	移動
8	12/2	月		リロンゲ	潅漑局と議事録（案）協議
9	12/3	火		リロンゲ	議事録署名、JICAへ報告
10	12/4	水	ルサカへ移動	ルサカ	移動
11	12/5	木	ルサカ発	機中泊	日本大使館報告、移動
12	12/6	金	ロンドン着・発	機中泊	移動
13	12/7	土	東京着		移動

3　相手国関係者リスト

3 相手国関係者リスト

1. Ministry of Irrigation and Water Development

Mr. K. Manjolo	Principal Secretary
Dr. C. P. Mzembe	Controller of Irrigation Services
Mr. Mphande	Deputy Controller of Irrigation Services
Mr. J. K. Chisenga	Principal Irrigation Officer
Mr. M. T. N. Mpitapita	Irrigation Officer
Mr. G. Nkhonjera	Irrigation Officer
Mr. Peter Kuester	Malawi-German Cooperation, Programme Coordinator
山　脇　正　男	JICA専門家

2. Ministry of Agriculture and Livestock Development

Dr. A. S. Kumwenda	Controller of Agricultural Services
Mr. D. C. Kamwendo	Chief Planning Officer
Mr. E. K. Mphande	Principal Economist, Planning Division
Mr. Clement C. Nyirongo	Principal Economist, Planning Division
Mr. C. Kanyinji	Economist, Planning Division

3. Salima ADD

Mr. E. P. Chingamba	Programme Manager
Mr. R. H. Padambo	Principal Irrigation Officer
Mr. F. J. Chakholoma	Deputy Programme Manager
Mr. B. C. Munthali	Senior Agricultural Extension Officer
Mr. B. W. Ngauma	Project Officer
Ms. A. B. Chiumia	Training Officer
Mr. G. R. Katapa	Ex. Development Officer, Mtakataka EPA
Mr. J. C. Nkomaula	Land Husbandry Officer
Mr. A. M. Mphamba	Assistant Project Officer
Mr. N. Y. Chauluntha	Assistant Irrigation Officer
Mr. C. J. Chamasowa	Assistant Irrigation Officer
Mr. R. G. Demba	Acting General Crops Officer
Mr. G. M. C. Mbubzi	Acting Visual Aids Officer
Mr. M. A. Hezekiya	Development Officer, Mtakataka EPA

4. Ministry of Finance

Mr, J. C. T. Nthani	Deputy Secretary (Bilateral)
Mr. John M. Mhango	Senior Assistant Secretary

5. Ministry of Economic Planning & Development

橋本　吉之	JICA専門家

6. TA Kachindamoto

Mr. Kachindamoto	Chief of TA
Mr. Mtembanji	Group Village Headman, Mtembanji

7. Ministry of Health & Population, Community Health Science Unit

Mr. Hmjbs Shaba	Programme Manager, Bilharzia Control
Mr. C. Ziba	Programme Manager, Malaria Control

8. European Union

Mr. Paul M. A. Schildkamp	Rural Development Advisor

9. JICA マラウイ事務所

喜多村　裕介	所長
小嶋　良輔	次長
関　徹男	所員
香川　顕夫	所員

4　当該国の社会・経済事情

4. 当該国の社会・経済事情

国　名	マラウイ共和国
	The Republic of Malawi

一般指標					
政体	共和制	*1	首都	リロンゲ	*1
元首	President Dr. Hastings K. BANDA	*1	主要都市	ブランタイヤ	*1
独立年月日	1964年07月06日	*1	経済活動可人口	4,000千人（1992年）	*1
人種(部族)構成	チュワ、ニャンガ、チュムブコ	*1	義務教育年数	8年間（1994年）	*1
言語・公用語	英語、チュワ語	*1	初等教育就学率	- %	
宗教	大部分は部族宗教、その他は	*1	初等教育終了率	42.0 %（1990年）	*5
	キリスト教、イスラム教	*1	識字率	22.0 %（1966年）	*5
国連加盟	1964年12月	*2	人口密度	103.4482 人/km2（1994年）	*4
世銀・IMF加盟	1965年07月	*3	人口増加率	- 1.09 %（1994年）	*4
			平均寿命	平均40.48　男39.61　女41.37	*4
			5歳児未満死亡率	230 / 1000（1992年）	*5
面積	118.48千km2	*4	加可一供給量	2,050.0 cal/日/人	*5
人口	9,732.409千人（1994年）	*4			

経済指標					
通貨単位	マラウイ・クワチャ	*1	貿易量	（1992年）	*10
為替レート(US$)	1US$ = 15.2585　（08月）	*6	輸出	384.0百万ドル	*10
会計年度	4月～3月	*1	輸入	718.0百万ドル	*10
国家予算	（1990年）	*7	輸入カバー率	0.8 %	*11
歳入	373.3百万ドル	*7	主要輸出品目	たばこ、茶、砂糖、コヒー、落花生	*1
歳出	478.7百万ドル	*7	主要輸入品目	食品、石油製品、消費財、輸送機器	*1
国際収支	60.2百万ドル	*7	日本への輸出	69.0百万ドル（1992年）	*12
ODA受領額	521.00百万ドル（1992年）	*8	日本からの輸入	40.0百万ドル（1992年）	*12
国内総生産(GDP)	1,974.00百万ドル（1993年）	*9			
一人当たりGNP	200.0ドル（1993年）	*9	外貨準備総額	121.46百万ドル（1995年）	*6
GDP産業別構成	農業　28.0 %　（1992年）	*10	対外債務残高	1,699.0百万ドル（1992年）	*11
	鉱工業　22.0%　（1992年）		対外債務返済率	24.3%（1992年）	*11
	サービス業　50.0%　（1992年）		インフレ率	15.3%（1992年）	*8
産業別雇用	農業　87.0%　（1992年）	*5			
	鉱工業　5.0%　（1992年）				
	サービス業　8.0%　（1992年）		国家開発計画	改造第二次開発計画	*13
経済成長率	- %	*8			

気象（1975年～1983年平均）場所：Lilongwe　（標高　1100m）

月	1	2	3	4	5	6	7	8	9	10	11	12	平均/計
最高気温	27.0	27.0	27.0	27.0	25.0	23.0	23.0	25.0	27.0	30.0	29.0	28.0	26.5 ℃
最低気温	17.0	17.0	16.0	14.0	11.0	8.0	7.0	8.0	12.0	15.0	17.0	18.0	13.3 ℃
平均気温	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0 ℃
降水量	208.0	218.0	125.0	43.0	3.0	0.0	0.0	0.0	0.0	0.0	53.0	125.0	775.0 mm
雨期/乾期	雨	雨			乾	乾	乾	乾	乾	乾		雨	

*1　The World Factbook (C.I.A)(1993)
*2　United Nations Information Center (FAX)(1994)
*3　Development Assistance Annual Report (1995)
*4　Tge World Fact Book (1995)
*5　Human Development Report (1994)
*6　InternationalFinancial Statictics (1995)
*7　International Financial Statictics Yearbook (1994)
*8　World Development Report (1994)
*9　World Tables (1995)
*10　World Tables (1994)
*11　World Debt Tables 1993 - 1994 (1993)
*12　世界の国一覧（外務省外務報道官編集）(1993)
*13　最新世界各国要覧 (1995)
*16　World Weather Guide (1990)

国　名	マラウイ共和国
	The Republic of Malawi

我が国におけるODAの実績				（資金協力は約束額ベース、単位：億円）
項目＼暦年	1989	1990	1991	1992
無償資金協力	2,043.64	2,328.47	2,515.30	2,699.97
技術協力	2,146.74	1,989.63	2,050.70	2,194.95
有償資金協力	5,161.42	5,676.39	7,364.47	5,852.05
総額	9,351.80	10,148.49	11,930.47	10,746.97

当該国に対する我が国ODAの実績				（支出総額、単位：百万ドル）
項目	1990	1991	1992	1993
無償資金協力	4.55	5.85	4.98	8.84
技術協力	12.14	12.60	20.81	17.45
有償資金協力	25.26	-0.92	-2.10	-2.17
総額	41.95	17.53	23.69	24.12

OECD諸国の経済協力実績						（支出総額、単位：百万ドル）
	贈与（1）		有償資金協力	政府開発援助（ODA）	その他政府資金及び民間資金	経済協力総額
		技術協力	（2）	（1）＋（2）＝（3）	（4）	（3）＋（4）
二国間援助	196.60	51.90	11.30	207.90	5.40	213.30
（主要供与国）						
1. イギリス	42.90	17.80	-3.50	39.40	7.00	46.40
2. ドイツ	41.00	8.30	2.70	43.70	-1.00	42.70
3. アメリカ	27.00	15.00	0.00	27.00	0.00	27.00
4. 日本	25.80	5.00	-2.10	23.70	0.00	23.70
多国間援助	241.20	50.80	127.40	368.60	-12.10	356.50
（主要援助機関）						
1. WFP	0.00	0.00	0.00	0.00	0.00	0.00
2. IDA	0.00	0.00	0.00	0.00	0.00	0.00
その他	0.00	0.00	0.00	0.00	0.00	0.00
合計	437.80	102.70	138.70	576.50	-6.70	569.80

援助受入窓口機関	
技術	関係省庁→大統領府経済計画開発局→大蔵省
無償	関係省庁→大統領府経済計画開発局→大蔵省
協力隊	関係省庁→大統領府経済計画開発局→大蔵省

5　その他のデータ

5.1　伝統的行政区長（TA）による本計画に対する協力確認書

5.2　伝統的行政区調（TA）による土地配分確約書

5.1 伝統的行政区長（TA）による本計画に対する協力確認書

June 6, 1996

FROM : T A KACHINDAMOTO, DEDZA

TO : THE PROGRAMME MANAGER, SALIMA ADD,
PRIVATE BAG 1, SALIMA

cc : The District Commissioner, P O Box 140, Dedza.

The Secretary for Agriculture and Livestock Development,
P O Box 30134, Lilongwe 3.

The Secretary for Irrigation and Water Development,
Private Bag 390, Lilongwe 3

The Secretary for Works, Private Bag 316, Lilongwe 3.

MEMORANDUM OF UNDERSTANDING :
BWANJE VALLEY SMALLHOLDER IRRIGATION PROJECT

I, T A Kachindamoto, wish to confirm that my people and I are very interested with the proposed Bwanje Valley Smallholder Irrigation Development Project. The proposed project, if implemented, will help in alleviating poverty in the area which is due to low crop production caused by erratic rainfall.

I will support the implementation of the project through mobilisation of farmers in the area in order that they participate in the development activities as well as the O & M thereafter. I, therefore, hereby request that the proposed project be implemented as soon as possible.

Sign : .....
T A KACHINDAMOTO

.....
DISTRICT COMMISSIONER
(DEDZA)
(Witness)

5.2 伝統的行政区長（TA）による土地配分確約書

Ref. No JICA/1 ..... Date: .....

TO WHOM IT MAY CONCERN

COMMITMENT OF LAND ALLOCATION
TO FARMERS IN BWANJE VALLEY IRRIGATION PROJECT

I, Traditional Authority Kachindamoto of Dedza District in Malawi hereby confirm that land in the Irrigation Project Area Falls under my jurisdiction . As such, I confirm that it will be allocated to beneficiaries of the project fairly.

SIGNED : .....Kachindamoto.....

T.A. KACHINDAMOTO

1 - OCT 1996

DATE : ....1/10/96.....

WITNESSED BY : .....W. R. Y. NYIRENDA.....

for DISTRICT COMMISSIONER, DEDZA

DISTRICT COMMISSIONER 1 OCT 1996 P.O. BOX 140, DEDZA

6　参考資料リスト

6.1　参考資料リスト
6.2　付表・付図
6.3　基本設計図

6.1 参考資料リスト

No.	資料名	発行年	発行者
1.	Approval to the Development of Self-help Irrigation Scheme in Malawi	Jan. 1996	Department of Irrigation
2.	Planning on Re-organization of the Ministry of Irrigation and Water Development	Aug. 1996	Department of Water
3.	Schedule of Established Offices	Feb. 1996	Department of Irrigation
4.	Hierarchical Relation s Between Extension Services and Irrigation Services	1994	- do -
5.	List of All Staff of Development of Irrigation	1996	- do -
6.	Present Farmers Organization in Mtandamula	Sep. 1996	Salima ADD
7.	Draft Constitution, Irrigation Schemes	Sep. 1996	- do -
8.	Resume of Main findings from Brainstorming Session, Irrigation Sub-section	Aug. 1996	Danish International Development Agency
9.	Development of Agricultural Cooperatives and Farmer Organization in Malawi	Mar. 1996	JICA
10.	Water Act	1971	Government of Malawi
11.	1996/97 Project Activities	Apr. 1996	Department of Irrigation
12.	Organization of Department of Irrigation	Jul-94	Department of Human Resources Management
13.	Location of Existing Government-Managed Irrigation Schemes	Apr. 1994	Code and Partners
14.	Location of Proposal/Existing Self-Help Irrigation Schemes	Apr. 1994	- do -
15.	Policy Framework for Poverty Alleviation Programme	Oct. 1995	Government of Malawi
16.	Present Organization Structural Chart of the Salima ADD	Apr. 1993	MAID
17.	Smallholder Food Security Project, Main Report and Annexes	Nov. 1993	IFAD
18.	Appraisal Report, Agricultural Service Report	Jul-93	ADB
19.	Application of Form for a grant of water right		Government of Malawi
20.	Spare Parts Distribution and Local Manufacturer		
21.	Community Based Management of Rural Groundwater Supplies in Malawi	Sep. 1995	Save the Children Fund (UK)
22.	Salima Agricultural Development Division , BRIEF	1996	Salima ADD
23.	Bridge Design Spec., Nov. 1988	1988	MOW
24.	National Environmental Action Plan, Volume 1: THE ACTION PLAN	1994	Dept. of Research and Environmental Affairs

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図-4-6 給水施設維持管理組織図 …… F-11
図-4-7 精米機維持管理組織図 …… F-12
図-4-8 道路維持管理組織図 …… F-13

6.3 基本設計図

図面リスト

番号	図面番号	図面表題		
	一般図			
1	MP-01	計画位置図		
2	MP-02	灌漑排水施設及び道路計画概要図		
3	MP-03	農村給水施設計画位置図		
	頭首工			
4	HW-01	一般平面図		
5	HW-02	平面図		
6	HW-03	構造図		(1/2)
7	HW-04	構造図		(2/2)
8	HW-05	管理棟		
	灌漑排水施設			
9	ID-01	灌漑用水路系統図		
10	ID-02	排水路系統図		
11	ID-3	標準断面図		
12	ID-4	縦断図	幹線用水路	(1/3)
13	ID-5		幹線用水路	(2/3)
14	ID-6		幹線用水路	(3/3)
15	ID-7		支線用水路-1	(1/2)
16	ID-8		支線用水路-1	(2/2)
17	ID-9		支線用水路-2	(1/2)
18	ID-10		支線用水路-2	(2/2)
19	ID-11		支線用水路-2-1	
20	ID-12		支線用水路-3	(1/2)
21	ID-13		支線用水路-3	(2/2)
22	ID-14	縦断図	排水路-1	(1/2)
23	ID-15		排水路-1	(2/2)
24	ID-16		排水路-2	(1/2)
25	ID-17		排水路-2	(2/2)
26	ID-18		排水路-2-1	
27	ID-19		排水路-3	(1/2)
28	ID-20		排水路-3	(2/2)
29	ID-21		排水路-4	(1/2)
30	ID-22		排水路-4	(2/2)
31	ID-23		洪水防御堤	(1/3)
32	ID-24		洪水防御堤	(2/3)
33	ID-25		洪水防御堤	(3/3)
34	ID-26	平面分水工		
35	ID-27	分水工		
36	ID-28	用水路落差工及びカルバート		
37	ID-29	排水路横断工及びカルバート		
38	ID-30	排水路落差工		
39	ID-31	歩道橋		
40	ID-32	三次水路及び付帯構造物		
	農村道路			
41	RR-01	標準断面図及び潜函橋		
42	RR-02	縦断図	農村道路-1	
	農村給水			
43	RW-01	井戸断面及び付帯構造物		
	収穫後処理施設			
44	PH-01	精米所建家		

付表

表-2-1　月別降雨量

No.	Year	Month												Total	Rainfall Station
		Nov	Dec	Jan.	Feb.	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct		
1.	1952/53			152	68	182	25	0	0	0	0	0	0	427	Mua Mission
2.	1953/54	0	316	165	168	17	0	0	0	0	0	12	17	695	- do -
3.	1954/55	101	180	287	386	157	16	0	0	11	0	0	0	1,138	- do -
4.	1955/56	10	267	343	236	168	142	0	0	0	0	0	16	1,182	- do -
5.	1956/57	78	312	373	269	167	188	3	0	0	8	0	0	1,398	- do -
6.	1957/58	0	178	277	301	83	82	0	0	0	0	6	7	934	- do -
7.	1958/59	39	138	198	329	155	0	16	0	0	0	2	18	895	- do -
8.	1959/60	26	332	181	185	221	23	9	0	0	0	16	0	993	- do -
9.	1960/61	4	163	198	343	245	23	0	7	0	0	0	5	988	- do -
10.	1961/62	48	104	254	170	178	37	0	0	0	0	0	0	791	- do -
11.	1962/63	164	234	383	336	171	0	0	0	0	0	0	0	1,288	- do -
12.	1963/64	85	184	348	180	32	8	0	0	0	0	0	0	837	- do -
13.	1964/65	64	128	332	192	200	4	0	1	0	0	0	0	921	- do -
14.	1965/66	78	84	210	298	55	0	0	0	0	0	0	2	727	- do -
15.	1966/67	28	190	188	184	236	25	11	2	4	0	0	6	874	- do -
16.	1967/68	26	146	180	161	80	60	7	21	0	0	0	0	681	- do -
17.	1968/69	0	270	350	151	198	41	0	0	0	2	30	0	1,042	- do -
18.	1969/70	63	297	251	89	0	46	0	0	0	0	0	0	746	- do -
19.	1970/71	102	242	196	221	61	13	2	0	0	0	0	0	837	- do -
20.	1971/72	0	223	297	279	98	31	0	0	0	3	0	3	934	- do -
21.	1972/73	14	306	211	141	76	129	1	0	0	0	0	0	878	- do -
22.	1973/74	3	230	246	349	218	29	26	25	1	0	0	0	1,127	- do -
23.	1974/75	44	137	163	264	216	34	0	0	0	0	0	0	858	- do -
24.	1975/76	29	290	294	356	261	140	0	0	0	0	0	6	1,376	- do -
25.	1976/77	21	179	363	251	203	5	0	0	0	0	0	0	1,022	- do -
26.	1977/78	125	248	431	294	358	62	0	0	0	0	0	0	1,518	- do -
27.	1978/79	0	0	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	-	
28.	1979/80	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	-	
29.	1980/81	N.A.	N.A.	0	0	0	0	0	0	*	*	*	*	-	Mtakataka Airwing
30.	1981/82	5	175	120	156	52	51	0	0	0	0	0	7	566	- do -
31.	1982/83	0	0	*	*	*	*	0	2	0	0	0	2	-	- do -
32.	1983/84	23	117	52	324	146	1	14	10	0	0	0	42	729	- do -
33.	1984/85	101	174	97	161	265	203	74	0	0	0	0	0	1,075	- do -
34.	1985/86	87	319	107	116	147	34	0	0	*	*	*	*	810	- do -
35.	1986/87	*	*	*	*	*	*	*	*	*	*	*	*	-	
36.	1987/88	*	*	*	*	*	*	*	*	*	*	0	0	-	
37.	1988/89	21	85	435	380	233	14	4	0	*	*	*	*	1,172	- do -
38.	1989/90	107	313	193	145	49	0	18	*	*	*	*	*	825	- do -
39.	1990/91	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	-	
40.	1991/92	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	-	
41.	1992/93	3	112	233	354	153	69	0	2	8	0	0	2	936	- do -
42.	1993/94	84	37	244	122	41	7	0	0	0	0	0	3	538	- do -
43.	1994/95	0	53	188	106	52	2	0	0	0	0	0	0	401	- do -
44.	1995/96	33	162	200	401	187	0	22						1,005	- do -
	Mean	43.7	187.2	236.2	228.8	144.9	41.7	5.4	1.9	0.7	0.4	1.9	4.0	921.2	

Note: * is missing data.
N.A. is not available.

Source : Department of Meteorology

表-2-2　計画地区の気象条件

	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Average	Periods
(1) Temperature (℃)														1979-87
Max.	32.6	30.1	29.7	29.5	30.3	29.7	28.5	26.4	26.3	28.1	31.0	32.3	29.5	
Min.	23.6	22.7	22.2	21.8	21.9	20.6	18.3	16.0	16.0	17.4	19.6	22.4	20.2	
Average	28.1	26.4	26.0	25.7	26.1	25.2	23.4	21.2	21.2	22.8	25.3	27.0	24.9	
(2) Wind Speed(m/sec)	2.8	2.4	1.9	1.8	2.0	2.2	2.2	2.4	2.5	2.5	2.6	3.0	2.4	1979-87
(3) Relative Humidity (%)	60	78	79	80	75	70	64	61	58	55	53	53	66	1979-87
(4) Sunshine Hours (hours/d	9.0	6.9	6.6	6.8	8.1	8.6	9.4	8.9	8.8	9.6	9.8	9.8	8.5	1979-87
(5) Evaporation(mm)	225	187	165	138	167	168	160	145	152	173	194	240	176.2	1953-78

Source : National early warning system for food security (Technical Paper No.2) Potential evapotranspiration studies in Malawi, October, 1989.
Meteorological Department, Ministry of Transport and Communications

表-2-3　ナミコクウェ川水質調査

Labo No.	111		136		
Date of test	18-Jun-93		11-Oct-95		
Date of sampling	21-May-93				
Sampling Place:	Salima-Balaka Road,Dedza				
	mg/l	me/l	mg/l	me/l	FAO Guideline
Carbonate	0.00	0.00	0.00	0.00	0 - 0.1 me/l
Bicarbonate	95.00	1.56	48.00	0.79	0 - 10 me/l
Chloride	5.00	0.14	5.80	0.16	0 - 30 me/l
sulphate	0.40	0.01	2.80	0.06	0 - 20 me/l
Nitrate	0.00	0.00	0.00	0.00	-
Fluoride	0.00	0.00	0.00	0.00	-
		1.71		1.01	
Sodium	25.00	1.09	5.00	0.22	0 - 40 me/l
Potassium	2.90	0.07	1.40	0.04	0 - 2 mg/l
Calcium	9.60	0.48	9.60	0.48	0 - 20 me/l
Magnesium	1.50	0.12	4.40	0.36	0 - 5 me/l
Iron	0.65	0.02	0.12	0.00	-
Manganese	0.00	0.00	0.00	0.00	-
		1.79		1.10	
pH		6.52		7.6	6.0 - 8.5
EC		160		0	
Computed EC		168		106	
TDS		94		96	
Computed TDS		92		57	0 - 2000 mg/l
Ionic Balance%		-2.32		-4.28	
Silica		1.0		5	
Suspended Solids		42		0	
Turbidity(NTU)		25		6	
Hardness(CaCO3)		31		42	
Alkalinity(CACO3)		77		39	

Data source : Laboratory of Water Department

表-3-1　ナミコクウェ川月平均流出量（1/3）

River name : Combination of Namikokwe River and Nadzipokwe River　　Area : 159.1 km2

Unit: m3/sec

	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Average
1953-54	*	*	*	*	*	*	*	*	*	*	*	*	*
1954-55	*	*	*	*	*	*	*	*	*	*	*	*	*
1955-56	*	*	*	*	*	*	*	*	*	*	*	*	*
1956-57	*	*	*	*	*	*	*	*	*	*	*	*	*
1957-58	*	*	*	*	*	1.831	0.799	0.588	0.390	0.261	0.258	0.053	0.809
1958-59	0.078	*	*	5.586	4.266	1.589	0.908	0.644	0.436	0.250	0.168	0.089	1.386
1959-60	0.697	1.752	2.087	4.354	7.556	2.448	1.361	0.906	0.657	0.419	0.247	0.106	1.883
1960-61	0.067	0.329	2.562	3.751	13.401	3.201	1.876	0.986	0.920	0.664	0.388	0.251	2.366
1961-62	0.422	1.777	4.892	7.697	4.339	4.094	2.046	1.453	1.040	0.688	0.353	0.206	2.417
1962-63	0.371	1.115	6.181	12.932	7.534	3.481	1.856	1.240	0.875	0.528	0.432	0.224	3.064
1963-64	0.899	1.471	3.999	6.523	2.354	1.271	0.955	0.709	0.536	0.351	0.189	0.123	1.615
1964-65	0.293	0.977	4.426	6.359	4.853	3.312	1.872	1.374	1.043	0.818	0.676	0.471	2.206
1965-66	0.249	0.637	1.670	6.337	5.336	1.453	1.003	0.587	0.385	0.270	0.229	0.082	1.520
1966-67	0.098	1.343	1.557	2.979	3.674	2.361	1.343	0.914	0.645	0.414	0.247	0.151	1.311
1967-68	1.788	4.795	21.640	10.991	42.885	15.435	6.177	4.355	3.211	2.554	1.793	1.082	9.726
1968-69	0.269	3.401	9.011	7.120	6.109	4.632	1.899	1.247	0.788	0.572	0.397	0.223	2.972
1969-70	0.206	5.295	6.413	2.184	2.271	1.573	0.772	0.515	0.377	0.262	0.140	0.094	1.675
1970-71	0.718	*	*	*	*	*	*	*	*	*	*	*	1.014
1971-72	*	*	*	*	3.731	*	*	0.828	0.693	0.536	0.293	0.157	1.134
1972-73	0.173	*	*	*	*	2.344	1.400	0.741	0.493	0.317	0.191	0.135	0.929
1973-74	0.059	*	*	10.518	5.227	8.537	*	*	*	*	*	*	5.717
1974-75	*	*	*	*	*	*	*	*	*	*	*	*	*
1975-76	*	*	*	*	*	*	3.026	1.728	1.087	0.798	0.467	0.300	1.524
1976-77	0.197	0.885	1.815	2.250	6.788	2.393	1.128	0.834	0.605	0.441	0.282	*	1.505
1977-78	0.784	*	*	*	*	*	*	1.690	1.264	0.798	0.478	0.301	1.933
1978-79	*	*	*	*	*	*	*	1.183	0.878	0.655	0.347	0.241	1.575
1979-80	*	4.336	2.875	2.926	1.223	2.359	1.093	0.688	0.494	0.330	0.202	0.254	1.501
1980-81	0.140	19.313	7.061	14.175	7.899	2.391	1.368	0.782	0.572	*	0.275	*	5.105
1981-82	*	*	*	*	*	*	*	*	*	*	*	*	2.916
1982-83	*	*	*	9.226	*	*	0.717	0.475	0.354	0.274	0.165	0.116	1.645
1983-84	0.110	2.505	2.478	*	*	2.233	1.059	0.766	0.538	0.335	0.197	0.124	1.149
1984-85	0.249	5.409	2.717	7.121	*	3.862	1.758	1.178	0.824	0.577	0.429	0.282	2.338
1985-86	0.430	16.569	14.527	*	*	4.337	2.072	1.342	0.937	0.652	0.435	0.418	4.152
1986-87	0.426	*	*	7.966	5.298	2.910	1.322	0.874	0.623	0.442	0.294	0.241	2.086
1987-88	0.125	0.879	8.475	9.193	6.419	2.457	1.237	0.792	0.549	0.367	0.252	0.281	2.586
1988-89	1.223	2.154	7.308	14.650	14.985	4.999	3.398	1.981	1.311	0.947	0.585	0.343	4.490
1989-90	0.449	7.995	9.468	4.955	2.795	1.930	1.197	0.650	0.468	0.359	0.246	0.146	2.555
1990-91	0.097	1.433	8.925	5.736	3.480	1.791	0.907	0.625	0.558	0.371	0.193	0.232	2.029
1991-92	0.126	1.467	2.422	0.578	2.166	0.760	0.337	0.286	0.228	0.171	0.117	0.063	0.727
1992-93	0.072	1.185	1.907	5.119	4.954	3.206	1.315	0.769	0.574	0.418	0.280	*	1.680
1993-94	0.378	0.251	1.396	2.556	0.980	0.969	0.351	0.258	0.219	0.166	0.111	0.084	0.643
1994-95	0.054	0.077	2.404	4.601	0.966	0.425	0.223	0.176	0.127	0.105	0.054	0.027	0.770
1995-96	0.032	0.314	1.863	*	*	*	*	*	*	*	*	*	0.736
Average	0.364	3.372	5.388	6.607	6.596	3.153	1.509	1.005	0.726	0.518	0.336	0.223	2.247

Source : Water Department, Ministry of Irrigation and Water Development

表-3-1　ナミコクウェ川月平均流出量（2/3）

River name : Nadzipokwe　　Station No.: 3.E.1

Area : 30.1 km2　　Unit: m3/sec

	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Average
1953-54	0.001	0.173	0.559	3.370	1.244	0.662	0.234	0.146	0.093	0.077	0.036	0.007	0.550
1954-55	0.019	0.027	1.147	3.388	2.405	0.834	0.336	0.225	0.146	0.185	0.100	0.036	0.737
1955-56	0.023	0.534	0.601	2.119	1.451	4.284	1.254	0.564	0.352	0.195	0.207	0.135	0.977
1956-57	0.148	0.910	2.577	4.214	2.239	2.841	1.158	0.469	0.239	0.149	0.046	0.016	1.250
1957-58	0.003	0.125	0.690	0.749	1.777	0.542	0.191	0.139	0.077	0.047	0.105	0.013	0.371
1958-59	0.033	0.128	0.249	1.111	0.845	0.397	0.202	0.133	0.072	0.031	0.017	0.001	0.268
1959-60	0.000	0.370	0.539	0.718	1.651	0.639	0.372	0.238	0.169	0.115	0.083	0.003	0.408
1960-61	0.000	0.067	0.951	1.283	4.680	0.994	0.525	0.339	0.254	0.181	0.084	0.057	0.785
1961-62	0.127	0.310	0.794	1.512	0.963	0.969	0.451	0.325	0.230	0.166	0.066	0.008	0.493
1962-63	0.070	0.413	2.024	3.724	1.979	0.893	0.526	0.357	0.269	0.192	0.118	0.069	0.886
1963-64	0.305	0.246	1.364	1.869	0.626	0.392	0.279	0.183	0.107	0.087	0.057	0.028	0.462
1964-65	0.171	0.434	1.156	1.565	1.571	0.942	0.728	0.633	0.561	0.496	0.418	0.316	0.749
1965-66	0.062	0.146	0.413	0.897	0.712	0.274	0.164	0.102	0.082	0.059	0.031	0.011	0.246
1966-67	0.020	0.364	0.458	0.690	0.982	0.410	0.360	0.238	0.164	0.107	0.072	0.032	0.325
1967-68	1.656	2.937	19.875	9.394	39.211	13.651	5.447	3.838	2.842	2.330	1.649	0.999	8.652
1968-69	0.043	1.435	4.108	2.100	1.773	0.928	0.523	0.358	0.250	0.167	0.106	0.068	0.988
1969-70	0.065	3.038	1.887	1.665	0.491	0.390	0.205	0.127	0.087	0.061	0.034	0.019	0.672
1970-71	0.442	2.574	2.424	1.357	0.970	0.463	0.240	0.160	0.097	0.053	0.038	0.036	0.738
1971-72	0.070	0.284	0.733	0.476	0.695	0.500	0.219	0.154	0.112	0.083	0.058	0.055	0.286
1972-73	0.063	1.712	0.465	0.729	0.604	0.963	0.643	0.182	0.116	0.078	0.043	0.026	0.469
1973-74	0.019	0.796	1.510	1.362	1.677	1.048	0.615	0.394	0.268	0.126	0.058	0.026	0.658
1974-75	0.037	0.128	0.333	0.309	1.862	0.338	0.134	0.077	0.053	0.033	0.025	0.022	*
1975-76	0.050	0.604	1.365	1.390	*	1.191	0.634	0.428	0.283	0.188	0.107	0.057	0.572
1976-77	0.041	0.165	0.690	0.496	1.059	0.461	0.251	0.159	0.106	0.064	0.032	*	0.320
1977-78	0.024	*	*	*	1.937	1.027	0.653	0.410	0.241	0.170	0.118	0.085	0.518
1978-79	*	*	*	*	2.050	0.799	0.445	0.311	0.262	0.183	0.093	0.065	0.526
1979-80	*	1.406	0.487	0.417	0.307	0.514	0.191	0.098	0.082	0.060	0.040	0.052	0.332
1980-81	0.039	9.359	1.946	2.547	3.111	0.499	0.274	0.190	0.131	0.098	0.074	0.033	1.525
1981-82	0.017	1.791	4.540	4.462	*	*	*	*	*	*	*	*	2.703
1982-83	*	0.718	0.600	1.095	0.619	0.303	0.195	0.136	0.112	0.096	0.060	0.038	0.361
1983-84	0.044	1.286	0.366	1.051	0.892	0.373	0.254	0.212	0.148	0.094	0.042	0.021	0.398
1984-85	0.066	1.017	0.827	1.007	1.893	0.773	0.425	0.310	0.259	0.183	0.142	0.098	0.583
1985-86	0.147	3.541	1.576	0.908	0.275	0.612	0.352	0.312	0.225	0.162	0.112	0.083	0.692
1986-87	0.078	0.204	0.994	1.019	0.677	0.496	0.281	0.210	0.155	0.114	0.073	0.061	0.363
1987-88	0.027	0.062	1.131	1.585	1.167	0.461	0.295	0.231	0.165	0.098	0.054	0.052	0.444
1988-89	0.055	0.386	4.548	3.320	3.022	1.027	0.584	0.387	0.286	0.234	0.117	0.056	1.169
1989-90	0.083	1.159	1.068	0.849	0.488	0.333	0.274	0.168	0.114	0.087	0.047	0.029	0.392
1990-91	0.022	0.106	1.314	0.714	0.495	0.278	0.186	0.139	0.119	0.074	0.041	0.031	0.293
1991-92	0.030	0.840	0.369	0.186	0.261	0.147	0.080	0.051	0.044	0.032	0.020	0.014	0.173
1992-93	0.006	0.089	0.564	0.517	0.526	0.305	0.197	0.145	0.104	0.095	0.069	*	0.238
1993-94	0.107	0.083	0.246	0.285	0.120	0.061	0.039	0.035	0.033	0.026	0.019	0.024	0.090
1994-95	0.015	0.011	0.319	0.348	0.118	0.046	0.025	0.021	0.012	0.011	0.007	0.002	0.078
1995-96	0.004	0.041	0.485	*	*	*	*	*	*	*	*	*	0.177
Average	0.112	1.037	1.714	1.492	2.280	0.931	0.472	0.322	0.235	0.175	0.117	0.074	0.774

Source : Water Department, Ministry of Irrigation and Water Development

表-3-1　ナミコクウェ川月平均流出量（3/3）

River name : Namikokwe　　Station No.: 3.E.2

Area : 129 km2　　Unit: m3/sec

	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Average
1953-54	*	*	*	*	*	*	*	*	*	*	*	*	*
1954-55	*	*	*	*	*	*	*	*	*	*	*	*	*
1955-56	*	*	*	*	*	*	*	*	*	*	*	*	*
1956-57	*	*	*	*	*	*	*	*	*	*	*	*	*
1957-58	*	*	*	*	*	1.288	0.608	0.450	0.313	0.215	0.153	0.041	0.438
1958-59	0.045	*	*	4.475	3.422	1.192	0.706	0.511	0.364	0.219	0.151	0.089	1.117
1959-60	0.697	1.382	1.548	3.636	5.905	1.810	0.989	0.668	0.488	0.304	0.165	0.103	1.475
1960-61	0.067	0.262	1.611	2.467	8.721	2.207	1.351	0.646	0.666	0.483	0.304	0.194	1.582
1961-62	0.295	1.467	4.097	6.185	3.375	3.125	1.595	1.127	0.810	0.523	0.288	0.198	1.924
1962-63	0.301	0.702	4.157	9.208	5.555	2.587	1.330	0.882	0.606	0.337	0.314	0.155	2.178
1963-64	0.593	1.225	2.635	4.654	1.727	0.880	0.675	0.526	0.429	0.264	0.133	0.095	1.153
1964-65	0.122	0.543	3.271	4.794	3.283	2.370	1.144	0.741	0.481	0.322	0.258	0.156	1.457
1965-66	0.187	0.491	1.257	5.440	4.624	1.180	0.840	0.485	0.303	0.211	0.198	0.071	1.274
1966-67	0.079	0.979	1.099	2.289	2.692	1.951	0.983	0.677	0.481	0.307	0.175	0.119	0.986
1967-68	0.132	1.858	1.765	1.597	3.674	1.784	0.730	0.517	0.369	0.224	0.144	0.083	1.073
1968-69	0.225	1.966	4.903	5.021	4.336	3.704	1.376	0.889	0.538	0.405	0.291	0.155	1.984
1969-70	0.141	2.257	4.527	0.519	1.780	1.183	0.567	0.388	0.290	0.201	0.106	0.075	1.003
1970-71	0.276	*	*	*	*	*	*	*	*	*	*	*	0.276
1971-72	*	*	*	*	3.037	*	*	0.673	0.581	0.454	0.235	0.103	0.847
1972-73	0.111	*	*	*	*	1.381	0.756	0.559	0.377	0.240	0.148	0.109	0.460
1973-74	0.039	*	*	9.156	3.550	7.489	*	*	*	*	*	*	5.059
1974-75	*	*	*	*	*	*	*	*	*	*	*	*	*
1975-76	*	*	*	*	*	*	2.392	1.300	0.804	0.609	0.360	0.243	0.952
1976-77	0.156	0.720	1.124	1.754	5.729	1.932	0.877	0.675	0.499	0.377	0.250	0.117	1.184
1977-78	0.760	0.802	6.249	*	*	*	*	1.280	1.023	0.628	0.360	0.215	1.415
1978-79	*	3.905	*	*	*	*	*	0.871	0.616	0.472	0.253	0.176	1.049
1979-80	0.898	2.931	2.388	2.509	0.917	1.845	0.902	0.590	0.412	0.270	0.163	0.202	1.169
1980-81	0.101	9.954	5.114	11.628	4.788	1.892	1.094	0.592	0.440	*	0.201	*	3.580
1981-82	*	*	*	*	*	*	*	*	*	*	0.179	0.247	0.213
1982-83	0.675	*	*	8.131	*	*	0.522	0.339	0.242	0.178	0.105	0.078	1.284
1983-84	0.065	1.219	2.112	*	*	1.860	0.805	0.554	0.391	0.241	0.156	0.103	0.751
1984-85	0.183	4.393	1.890	6.115	*	3.090	1.332	0.868	0.565	0.394	0.286	0.184	1.754
1985-86	0.283	13.028	12.951	*	*	3.725	1.720	1.030	0.712	0.490	0.323	0.335	3.460
1986-87	0.348	*	*	6.947	4.621	2.414	1.041	0.664	0.468	0.328	0.221	0.180	1.723
1987-88	0.098	0.818	7.345	7.608	5.252	1.995	0.942	0.561	0.384	0.269	0.198	0.229	2.142
1988-89	1.168	1.768	2.760	11.330	11.964	3.972	2.814	1.594	1.025	0.713	0.468	0.286	3.322
1989-90	0.366	6.836	8.399	4.106	2.307	1.597	0.923	0.482	0.354	0.273	0.199	0.117	2.163
1990-91	0.074	1.327	7.611	5.022	2.985	1.513	0.721	0.486	0.439	0.297	0.152	0.201	1.736
1991/92	0.097	0.628	2.054	0.392	1.906	0.613	0.257	0.235	0.183	0.140	0.097	0.050	0.554
1992/93	0.066	1.096	1.343	4.601	4.427	2.901	1.118	0.624	0.469	0.323	0.211	0.128	1.442
1993/94	0.271	0.168	1.150	2.271	0.860	0.908	0.312	0.223	0.185	0.140	0.092	0.060	0.553
1994/95	0.039	0.066	2.085	4.253	0.848	0.379	0.198	0.155	0.114	0.094	0.046	0.025	0.692
1995/96	0.028	0.273	1.378	*	*	*	*	*	*	*	*	*	0.560
Average	0.272	2.252	3.586	5.041	3.934	2.159	1.020	0.672	0.483	0.332	0.211	0.145	1.473

Source : Water Department, Ministry of Irrigation and Water Development

表-3-2　　旬 別 灌 漑 用 水 量　(1/2)

Unit : liter/sec./ha

Month		1957/58	1958/59	1959/60	1960/61	1961/62	1962/63	1963/64	1964/65	1965/66	1966/67	1967/68	1968/69	1969/70	1970/71	1971/72	1972/73
Nov	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dec	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	3	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69
Jan	1	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69
	2	1.04	0.85	1.39	0.69	0.69	0.69	0.83	0.69	0.72	1.00	0.72	0.69	0.69	0.92	0.72	0.90
	3	0.50	0.75	0.50	0.78	0.64	0.50	0.50	0.85	1.27	0.67	0.72	0.50	0.50	0.50	0.50	0.50
Feb	1	0.45	0.34	0.74	0.34	1.08	0.34	1.04	1.07	0.87	0.90	1.39	0.41	0.60	0.96	0.34	0.87
	2	0.34	0.54	0.63	0.34	0.34	0.34	0.34	0.34	0.34	0.95	0.34	0.90	1.39	0.34	1.21	0.65
	3	0.30	0.08	0.69	0.73	1.39	0.64	1.23	1.10	0.65	0.19	1.23	1.39	1.39	0.88	0.08	1.14
Mar	1	0.74	0.36	0.84	0.36	1.41	0.75	1.41	0.36	0.92	1.27	0.88	0.71	1.41	1.17	1.05	1.41
	2	1.23	1.28	0.37	0.65	0.74	0.49	1.16	1.16	1.42	0.37	1.12	0.87	1.42	1.16	1.42	1.11
	3	1.40	1.40	1.40	1.04	0.45	1.25	1.40	0.74	1.40	0.45	1.40	0.69	1.40	1.25	0.89	0.97
Apr	1	0.42	1.26	1.26	1.26	1.11	1.26	1.26	1.26	1.26	1.26	1.11	1.26	1.26	1.26	1.26	0.22
	2	1.29	1.29	1.05	1.09	1.29	1.29	1.29	1.29	1.29	1.29	0.85	1.07	0.82	1.29	0.97	1.29
	3	1.06	1.06	1.06	1.06	0.85	1.06	1.06	1.06	1.06	0.92	1.06	0.85	1.06	1.06	1.06	1.06
May	1	0.55	0.37	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55
	2	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19
	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Jun	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
	3	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Jul	1	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23
	2	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38
	3	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49
Aug	1	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
	2	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
	3	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Sept	1	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
	2	0.42	0.42	0.27	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.10	0.42	0.42	0.42	0.42
	3	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
Oct	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maximum		1.40	1.40	1.40	1.26	1.41	1.29	1.41	1.29	1.42	1.29	1.40	1.39	1.42	1.29	1.42	1.41

表-3-2　　旬 別 灌 漑 用 水 量　(2/2)

Unit : liter/sec./ha

Month		1973/74	1974/75	1975/76	1976/77	1977/78	1981/82	1983/84	1984/85	1985/86	1988/89	1989/90	1992/93	1993/94	1994/95	1995/96	Average	Maximum
Nov	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dec	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	3	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69
Jan	1	0.69	0.81	0.69	0.69	0.69	0.77	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.70	0.81
	2	0.69	0.76	0.72	0.69	0.69	1.11	1.18	1.39	1.39	0.71	0.69	0.69	0.93	0.69	0.78	0.85	1.39
	3	0.63	0.60	0.65	0.50	0.50	0.71	1.34	1.28	1.34	0.50	1.32	1.26	0.57	1.33	1.07	0.77	1.34
Feb	1	0.34	0.76	0.34	0.98	0.34	0.57	0.34	0.70	1.14	0.34	0.54	0.80	0.34	1.04	0.34	0.67	1.39
	2	0.34	0.34	0.34	1.23	0.34	0.76	1.39	0.46	0.66	0.50	0.95	0.34	1.39	1.15	0.34	0.64	1.39
	3	0.54	0.22	1.04	0.08	0.58	1.18	0.51	1.39	1.10	0.66	1.12	0.22	1.39	0.73	0.08	0.77	1.39
Mar	1	0.75	0.36	0.36	0.49	0.36	1.00	0.44	0.96	1.08	0.36	1.41	0.76	1.41	1.18	0.36	0.85	1.41
	2	0.37	1.02	0.80	0.41	0.37	1.42	1.27	0.37	0.92	1.00	1.42	0.88	1.16	1.42	0.60	0.95	1.42
	3	1.15	0.99	1.19	1.27	0.89	1.27	1.05	0.45	0.78	1.02	0.96	1.05	1.24	1.10	1.40	1.08	1.40
Apr	1	1.01	0.95	0.57	1.26	0.67	1.15	1.26	0.26	1.10	1.26	1.26	1.26	1.26	1.26		1.09	1.26
	2	1.29	1.29	1.12	1.29	1.29	0.88	1.29	0.51	1.29	1.29	1.29	0.65	1.29	1.29		1.16	1.29
	3	1.06	1.06	0.49	1.06	1.06	1.06	1.06	0.76	0.90	0.93	1.06	1.06	1.06	1.06		1.00	1.06
May	1	0.38	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.39	0.55	0.55	0.55		0.53	0.55
	2	0.19	0.19	0.19	0.19	0.19	0.19	0.04	0.00	0.19	0.19	0.19	0.19	0.19	0.19		0.18	0.19
	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0
Jun	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0
	2	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04		0.04	0.04
	3	0.00	0.10	0.10	0.10	0.10	0.10	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10		0.10	0.10
Jul	1	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23		0.23	0.23
	2	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38		0.38	0.38
	3	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49	0.49		0.49	0.49
Aug	1	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78		0.78	0.78
	2	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86		0.86	0.86
	3	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87		0.87	0.87
Sept	1	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81		0.81	0.81
	2	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42		0.40	0.42
	3	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09		0.09	0.09
Oct	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0
	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0
	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0
Maximum		1.29	1.29	1.19	1.29	1.29	1.42	1.39	1.39	1.39	1.29	1.42	1.26	1.41	1.42	1.40		

表-3-3　灌漑可能面積

No.	Cropping Year	Rainy Season Cropping Irrigable Area(ha)	(Xi-Xo)	(Xi-Xo)^2	No.	Cropping Year	Dry Season Cropping Irrigable Area(ha)	(Xi-Xo)	(Xi-Xo)^2
1.	1968/69	3,035	1602.52	2,568,075.92	1.	1966/67	635	370.13	136,996.54
2.	1961/62	2,537	1104.52	1,219,968.27	2.	1988/89	607	342.13	117,053.23
3.	1988/89	2,424	991.52	983,115.36	3.	1968/69	410	145.13	21,062.84
4.	1958/59	2,279	846.52	716,599.05	4.	1960/61	398	133.13	17,723.71
5.	1964/65	2,122	689.52	475,440.23	5.	1977/78	395	130.13	16,933.93
6.	1977/78	2,007	574.52	330,075.23	6.	1984/85	339	74.13	5,495.32
7.	1985/86	1,826	393.52	154,859.36	7.	1964/65	322	57.13	3,263.89
8.	1966/67	1,708	275.52	75,912.23	8.	1961/62	293	28.13	791.32
9.	1983/84	1,415	-17.48	305.49	9.	1959/60	287	22.13	489.76
10.	1967/68	1,383	-49.48	2,448.10	10.	1962/63	271	6.13	37.58
11.	1962/63	1,345	-87.48	7,652.45	11.	1976/77	263	-1.87	3.50
12.	1992/93	1,298	-134.48	18,084.40	12.	1985/86	234	-30.87	952.93
13.	1963/64	1,197	-235.48	55,450.01	13.	1963/64	212	-52.87	2,795.19
14.	1960/61	1,148	-284.48	80,927.88	14.	1983/84	195	-69.87	4,881.76
15.	1976/77	1,148	-284.48	80,927.88	15.	1958/59	193	-71.87	5,165.23
16.	1965/66	1,116	-316.48	100,158.49	16.	1965/66	190	-74.87	5,605.45
17.	1969/70	1,104	-328.48	107,897.97	17.	1967/68	178	-86.87	7,546.32
18.	1989/90	856	-576.48	332,327.19	18.	1992/93	140	-124.87	15,592.41
19.	1959/60	820	-612.48	375,129.62	19.	1989/90	133	-131.87	17,389.58
20.	1957/58	805	-627.48	393,728.97	20.	1969/70	123	-141.87	20,126.97
21.	1984/85	789	-643.48	414,064.27	21.	1993/94	108	-156.87	24,608.06
22.	1993/94	395	-1037.48	1,076,361.14	22.	1957/58	98	-166.87	27,845.45
23.	1994/95	190	-1242.48	1,543,752.23	23.	1994/95	68	-196.87	38,757.63
			Total	11,113,261.74				Total	491,118.61

n= 23
Xo= 1432.48
1/a= 983.04
X= Xo+(1/a)*z

T	z	X
1/5	-0.5951	847.47
1/10	-0.9062	541.65
1/30	-1.2971	157.38
1/50	-1.4522	4.91

n= 23
Xo= 264.87
1/a= 206.65
X= Xo+(1/a)*z

T	z	X
1/5	-0.5951	141.89
1/10	-0.9062	77.60
1/30	-1.2971	-3.18
1/50	-1.4522	-35.23

Note: T:Return period
z:Normal variable
X:Probable maximum daily rainfall(mm)
n:Number of data
Xo:Average maximum daily rainfall (mm)

表-3-4　既往最大日流量

(m3/sec.)

Year	Date	Discharge		Total
		Namikokwe	Nazipokwe	
1958/59	Mar.1	14.74	1.27	16.01
1959/60	Mar.28	29.16	0.84	30.00
1960/61	Mar.4	121.18	33.90	155.08
1961/62	Ja.17	14.25	0.80	15.05
1962/63	Feb.22	14.77	3.21	17.98
1963/64	Dec.23	13.24	0.86	14.10
1964/65	Jan.1	8.61	1.36	9.97
1965/66	Feb.20	20.47	1.27	21.74
1966/67	Feb.21	8.06	0.31	8.37
1967/68	Dec.18	34.51	0.20	34.71
1968/69	Jan.29	39.15	29.00	68.15
1969/70	Dec.17	15.37	4.04	19.41
1970/71	*	*	*	*
1971/72	*	*	*	*
1972/73	*	*	*	*
1973/74	*	*	*	*
1974/75	*	*	*	*
1975/76	*	*	*	*
1976/77	Jan.24	18.45	7.07	25.52
1977/78	*	*	*	*
1978/79	*	*	*	*
1979/80	Dec.24	41.84	7.00	48.84
1980/81	Dec.28	41.00	16.50	57.50
1981/82	Feb.7	130.16	20.02	150.18
1982/83	Feb.14	65.70	1.70	67.40
1983/84	*	*	*	*
1984/85	Feb.8	15.84	1.50	17.34
1985/86	Dec.24	117.13	0.61	117.74
1986/87	Feb.14	31.40	5.81	37.21
1987/88	Jan.25	79.02	1.22	80.24
1988/89	Jan.30	89.01	3.63	92.64
1989/90	Dec.30	44.04	6.50	50.54
1990/91	Dec.9	22.08	0.08	22.16
1991/92	Jan.18	6.27	0.24	6.51
1992/93	Feb.25	22.30	0.66	22.96
1993/94	Feb.6	7.10	0.44	7.54
1994/95	Feb.22	28.25	1.24	29.49

Source : Water Department, Ministry of Irrigation and Water Development

表-3-5　計画地区既存井戸調査

Name of Village Group	Data and Conditions of Existing Boreholes							Water Committee		Remark
	No	Name of Village	Registration Number	Construction Year	User of Village	Condition	Name of Pump	Establishment Year	Water Fee (year/household)	
MTHEMBANJI	1	Dziko	Not constructed	-	-	-	-	-	-	To be provided with borehole and pump
	2	Mkondorire	Not constructed	-	-	-	-	-	-	To be provided with borehole and pump
	3	Chatewa	Not constructed	-	-	-	-	-	-	To be provided with borehole and pump
	4	Mthembanji	BB 49	1988	Mthembanji	Not working	Meera	Existing	No collection	Plunger has fallen in borehole. To be provided with borehole and pump
	5	Mbangali	Not constructed	-	-	-	-	-	-	To be provided with borehole and pump
	6	Bwannamakowa	Not constructed	-	-	-	-	-	-	To be provided with borehole and pump
	7	Garuanenji	KB 223	1995	Gruanenji, Dziko	Working	Afridev	Not existing	-	Functinal
	8	Mwasinja	SM 115	1994	Mwasinja	Not working	Afridev			Plunger has fallen in borehole. To be provided with borehole and pump
KAFULAMA	9	Maiwaza	PI 355	1993	Maiwasa	Working	Afridev	Existing	KW 2.0	Functional
	10	Mlongoti	PI 356	1993	Mlongoti	Working	Afridev	Existing	-	Requesting DOW to replace bearing at the cost of committee
	11	Maluza	Not constructed	-	-	-	-	-	-	To be provided with borehole and pump
BWANARI	12	Madziatsasi	FC 37	1995	Madziatsasi	Working	Afridev	-	-	Functinal
	13	Nankumba	-	No pump	-	-	-	-	-	DOW will install pump.
	14	Msolo	Nil	-	-	-	-	-	-	To be provided with borehole and pump
	15	Fole	KG 209	1995	Fole	Working	Afridev	Existing	KW 5.0	DOW gave training to committee.
	16	Bwanali	M 149	No pump	-	-	-	-	-	DOW will install pump.
MCHANJA	17	Mchanja	KB 227	1994	Mchanja Mdulambale Nbongwe	Working	Afridev	Existing	KW 5.0	DOW gave training to committee.
	18	Mdulambale	Not constructed	-	-	-	-	-	-	To be provided with borehole and pump
	19	Kamwendo	CC 124 CU 65	1996 1994	Kamwendo, Khoswe Mchembo	Working	Afridev Afridev	Existing	KW 5.0	Functinal
	20	Khoswe	Not constructed	-	-	-	-	-	-	To be provided with borehole and pump
	21	Mchembo	L 366	Before 1964	Mchembo	Working in many leakage	Not defined	Not existing	-	Pump is too old. User dosen't know committee. To be replaced with new borehole and pump
	22	Nbongwe	Not constructed	-	-	-	-	-	-	To be provided with borehole and pump

表-3-6　既存井戸工事調査

Name of Village Group	No	Name of Village	Registration Number	Depth of Well (m)	Borehole Dia. (mm)	Casing & Screen Dia. (mm)	Depth of Screen Pipe (length) (m)	Yield (lit/min)	Depth of Pump Suction (m)
MTHEMBANJI	1	Dziko	No borehole						
	2	Mkondorire	No borehole						
	3	Chatewa	No borehole						
	4	Mthembanji	BB 49	-	-	-	-	-	-
	5	Mbangali	No borehole						
	6	Bwannamakowa	No borehole						
	7	Gamanenji	KB 223	38.43	152	152	9.13-38.43 (29.30)	54.70	30.50
	8	Mwasinja	SM 115	46.36	203	152	29.90-46.36 (16.46)	182.40	30.50
KAFULAMA	9	Maiwaza	PI 355	-	-	-	-	-	-
	10	Mlongoti	PI 356	-	-	-	-	-	-
	11	Maluza	No borehole						
BWANARI	12	Madziatsasi	FC 37	51.85	203	152	33.55-51.85 (18.30)	97.60	45.70
	13	Nankumba	Digged well but No number	-	-	-	-	-	-
	14	Msolo	No borehole						
	15	Fole	GK 209	51.85	203	152	13.72-51.85 (38.13)	30.40	42.70
	16	Bwanali	M 149	30.50	203	152	-	60.00	-
MCHANJA	17	Mchanja	KB 227	-	-	-	-	-	-
	18	Mdulambale	No borehole						
	19	Kamwendo	CC 124	35.50	203	152	6.50-35.50 (29.00)	1.50	-
		Kamwendo	CU 65	-	-	-	-	-	-
	20	Khoswe	No borehole						
	21	Mchembo	L 366	28.30	152	152	24.40-28.30 (3.90)	70.40	22.60
	22	Nhongwe	No borehole						

Source : Water Department, Ministry of Irrigation and Water Development

表-3-7　計画地区既存井戸水質検査

Item	Unit	Maizawa Borehole PI 355	Garuanenji Borehole KB223	Mchembo Borehole L366	Kamwendo Borehole CC124	Madziatsasi Borehole FC 37	WHO Guideline	Malawi Bureau of Standards	Dept. of Water Temporary Guideline
Turbidity	NTU	0.6	1.6	1.6	0.86	1.2	5	5	25
pH value	-	7.2	7.6	7.8	7.6	6.9	6.5-8.5	6.5-8.0	6.0-9.5
Electric Conductivity	us/cm	750	672	484	707	398	-	-	-
Total Hardness	mg/L	350	192	229	146	152	500	500	800
Total Iron	mg/L3	0.05	0.06	0.17	0.11	0.55	1	1	3
Chloride	mg/L	109	41	2	14	1	600	600	750
Coliform Group	Count/100ml	0	53	0	2	0	0	0	50

Sampling Date : September 28, 1996

表-3-8　計画地区米及びメイズ消費量調査

Name of Village Group	Village			Average Consumption(Kg/Capita/year)		Remark
	No	Name of Village	Population (Nos)	Paddy (kg/capita/year)	Maize (kg/capita/year)	(Popula. at P/S) (Nos)
MTHEMBANJI			4,745	332,150	996,450	4,660
	1	Dziko	640	44,800	134,400	
	2	Mkondorire	510	35,700	107,100	
	3	Chatewa	535	37,450	112,350	
	4	Mthembanji	785	54,950	164,850	
	5	Mbangali	310	21,700	65,100	
	6	Bwannamakowa	225	15,750	47,250	
	7	Garuanenji	640	44,800	134,400	
	8	Mwasinja	1,100	77,000	231,000	
KAFULAMA			2,160	151,200	453,600	2,160
	9	Maiwaza	720	50,400	151,200	
	10	Mlongoti	885	61,950	185,850	
	11	Maluza	555	38,850	116,550	
BWANARI			3,000	210,000	630,000	3,040
	12	Madziatsasi	895	62,650	187,950	
	13	Nankumba	565	39,550	118,650	
	14	Msolo	565	39,550	118,650	
	15	Fole	645	45,150	135,450	
	16	Bwanali	330	23,100	69,300	
MCHANJA			3,240	226,800	680,400	3,240
	17	Mchanja	840	58,800	176,400	
	18	Mdulambale	625	43,750	131,250	
	19	Kamwendo	850	59,500	178,500	
	20	Khoswe	240	16,800	50,400	
	21	Mchembo	215	15,050	45,150	
	22	Ndongwe	470	32,900	98,700	

Source: Salima ADD

Note: Consumption of Paddy = 70 kg/capita/year

Consumption of Maize = 210 kg/capita/year

表-3-9　精米機台数算定

Description	Unit	Name of Village Group			
		Mthembanji	Kafulama	Bwanari	Mchanja
1 Consumption of rice	kg/month/capita	5.8	5.8	5.8	5.8
2 Population	Persons	4,745	2,160	3,000	3,240
3 Total consumption	kg/month	27,521	12,528	17,400	18,792
4 Required capacity of rice mill					
(1) Milling day 25days/month	kg/month	1,101	501	696	752
(2) Milling hour 8hrs./day	kg/day	138	63	87	94
5 Required capacity and Numbers of rice mill					
(1) Required capacity	kg/hr.	138	63	87	94
(2) Required nos. 100-120kg/hr.	no	1	1	1	1

表-3-10　基本設計図

番号		図面番号	図面表題		
	一般図				
1		MP-01	計画位置図		
2		MP-02	灌漑排水施設及び道路計画概要図		
3		MP-03	農村給水施設計画位置図		
	頭首工				
4		HW-01	一般平面図		
5		HW-02	平面図		
6		HW-03	構造図		(1/2)
7		HW-04	構造図		(2/2)
8		HW-05	管理棟		
	灌漑排水施設				
9		ID-01	灌漑用水路系統図		
10		ID-02	排水路系統図		
11		ID-3	標準断面図		
12		ID-4	縦断図	幹線用水路	(1/3)
13		ID-5		幹線用水路	(2/3)
14		ID-6		幹線用水路	(3/3)
15		ID-7		支線用水路-1	(1/2)
16		ID-8		支線用水路-1	(2/2)
17		ID-9		支線用水路-2	(1/2)
18		ID-10		支線用水路-2	(2/2)
19		ID-11		支線用水路-2-1	
20		ID-12		支線用水路-3	(1/2)
21		ID-13		支線用水路-3	(2/2)
22		ID-14	縦断図	排水路-1	(1/2)
23		ID-15		排水路-1	(2/2)
24		ID-16		排水路-2	(1/2)
25		ID-17		排水路-2	(2/2)
26		ID-18		排水路-2-1	
27		ID-19		排水路-3	(1/2)
28		ID-20		排水路-3	(2/2)
29		ID-21		排水路-4	(1/2)
30		ID-22		排水路-4	(2/2)
31		ID-23		洪水防御堤	(1/3)
32		ID-24		洪水防御堤	(2/3)
33		ID-25		洪水防御堤	(3/3)
34		ID-26	平面分水工		
35		ID-27	分水工		
36		ID-28	用水路落差工及びカルバート		
37		ID-29	排水路横断工及びカルバート		
38		ID-30	排水路落差工		
39		ID-31	歩道橋		
40		ID-32	三次水路及び付帯構造物		
	農村道路				
41		RR-01	標準断面図及び潜函橋		
42		RR-02	縦断図	農村道路-1	
	農村給水				
43		RW-01	井戸断面及び付帯構造物		
	収穫後処理施設				
44		PH-01	精米所建家		

表-3-11　建設管理事務所の作業内容

(1) Project Manager

- Execute overall office management.
- Coordinate with ministries and government agencies.
- Keep close communication with Consultant and Contractor.
- Organize regular tripartite meeting among Government, Consultant and Contractor.
- Organize regular meeting with Farmers Construction Committee.
- Prepare necessary documents.

(2) Technical Section 1

- Execute quality control for concrete work, earth work and construction materials.
- Check quantity and progress control.
- Attend regular tripartite meeting.
- Check the finished work (dimension, elevation, etc.).
- Provide the Project Manager with necessary information, data and report.

(3) Technical Section 2

- Execute quality control for concrete work, earth work and construction materials.
- Check quantity and progress control.
- Attend regular tripartite meeting.
- Check the finished work (dimension, elevation, etc.).

(4) Guidance Section

- Prepare working schedule in cooperation with Farmers Construction Committee.
- Provide farmers with timely and appropriate technical guidance for construction .
- Execute quality control and progress control for the farmers works.
- Keep close communication with Farmers Construction Committee.
- Attend regular tripartite meeting.
- Adjust the progress of farmers works in the light of actual progress of the Contractor's work.
- Put careful attention upon relation between farmers and the Contractor, to avoid any dispute in construction work.
- Prepare a progress report .

(5) Administrative Section

- Perform the office secretarial and other services such as correspondence, typing, copying, filing, compiling, collecting, receiving, submitting, keeping, and distributing letters and documents.
- Manage recruiting personnel under approval of the Project Manager.

(6) Financial Section

- Estimate cost and prepare budget proposal.
- Make payment of salary for all local staff.
- Maintain office accounts and prepare annual office finance statement for auditing.
- Prepare a financial report.

表-4-1　農民参加工事
小排水路工事

	Unit	Name of Drainage Canal					Remark
		DC-1	DC-2	DC-2-1	DC-3	DC-4	
Canal length	km	1.94	4.13	1.58	1.85	1.39	10.89
Excavation volume	m3	4,700	10,600	3,500	4,100	3,400	26,300
Requirement per unit work	man/day	0.75	0.75	0.75	0.75	0.75	
Required total man power	man/day	6,267	14,133	4,667	5,467	4,533	
Proposed construction time	-	May.- Oct 1999	May.- Oct 1999	May.- Oct 1998	May.- Oct 1998	May.- Oct 1998	120 days each season
Required man power	man/day	52	118	39	46	38	
Required man power in season	man/day		170			122	

表-4-2 農民参加工事
張芝工事

Branch Irrigation Canal

	Unit	Name of Branch Irrigation Canal				Remark
		BC-1	BC-2	BC-2-1	BC-3	
Canl length	km	4.92	4.33	0.73	4.8	14.78
Area of sodding	m2	17,700	16,200	2,000	22,300	58,200
Requirement per unit work	man/day	8.5	8.5	8.5	8.5	
Required total man power	man/day	2,082	1,906	235	2,624	
Proposed construction time	-	- Nov 1998 - Apr 1999 -				120 days
Required man power	man/day	17	16	2	22	
Required man power in season	man/day				57	

Inspection Road

	Unit	Name of Inspection Road						Remark
		IR-1	IR-2	IR-3	IR-4	IR-5	IR-6	
Road length	km	0.90	2.30	2.70	3.50	1.00	3.30	13.70
Area of sodding	m2	3,300	5,000	5,900	7,600	18,100	7,200	47,100
Requirement per unit work	man/day	8.5	8.5	8.5	8.5	8.5	8.5	
Required total man power	man/day	388	588	694	894	2129	847	
Proposed construction time	-	- Nov 1998 - Apr 1999 -						120 days
Required man power	man/day	3	5	6	7	18	7	
Required man power in season	man/day						46	

New Road

	Unit	Name of Road New road-1
Road length	km	2.30
Area of sodding	m2	5,000
Requirement per unit work	man/day	8.5
Required total man power	man/day	588
Proposed construction time	-	- Nov 1998 - Apr 1999 -
Required man power	man/day	5
Required man power in season	man/day	5

表-4-3　維持管理事務所の作業内容(1/2)

(1) O & M Officer

- Execute overall office management.
- Coordinate with ministries and government agencies.
- Keep close communication with Farmers Organization.
- Prepare necessary documents.

(2) O & M Section

- Prepare annual operation and maintenance plan including cost.
- Collect and compile technical inventory for the project facilities.
- Prepare and keep irrigation network drawings and maps.
- Prepare seasonal irrigation schedule on the basis of cropping plan.
- Calculate the discharges required on main, branch and sub-branch canal and at the Namikokuwe headworks.
- Review the above seasonal irrigation schedule and discharges required on respective canals and at the Namikokuwe headworks.
- Carry out routine maintenance works for the Namikokuwe headworks, canals, drains and related structures.
- Prepare tender documents in collaboration with Administration Section for repairs of project facilities
- Execute repairing of irrigation and drainage facilities by hired labors/contractor
- Make physical progress control and quality control of repairing works.
- Prepare reports on daily O & M patrol, periodic inspection, damages of project facilities.
- Prepare records and reports on regular maintenance, periodic maintenance, emergency repairs and annual maintenance.
- Prepare a progress report on operation and maintenance implementation.

(3) Monitoring Section

- Collect meteorological and rainfall data relating to the Project.
- Compile data on water level and discharge of Namikokuwe river at the headwork site.
- Compile data on daily releasing discharge from the intake of Namikokuwe headwork.
- Compile data on daily releasing discharge from the Namikokuwe headworks to the downstream side.
- Compile data on settling basin operation.
- Compile data on scouring sluice gate operation.
- Collect data on planted crops, cropped area and crop yield in the project area.
- Collect data on canal conveyance losses of canals.
- Record of operation and maintenance costs.
- Estimate of scheme maintenance fee.
- Prepare a progress report on monitoring works.

(4) Farmers Training Section

- Prepare a guidance program to the farmers organization for proper operation and maintenance of project facilities.
- Prepare guidance papers on O & M works.
- Provide lectures for the farmers organization based on the guidance papers.
- Provide the on-the-job training for the farmers at the site, such as gate operation, measurement of discharge, cleaning of canals, etc.

表-4-3　維持管理事務所の作業内容(2/2)

- Execute the training on administrative and accounting works, in cooperation with the Administration and Financial Sections.
- Arrangement of project inspection tour.
- Organize the meetings between the farmers organization and the O & M Section or the Monitoring Section.

(5) Administrative Section

- Prepare contract documents in collaboration with O & M Section for repairs of project facilities
- Perform the office secretarial and other services such as correspondence, typing, copying, filing, compiling, collecting, receiving, submitting, keeping, and distributing letters and documents.
- Manage recruiting personnel under approval of the Project Manager.
- Give the farmers organization lectures on administrative matters in cooperation with the Farmers Training Section.

(6) Financial Section

- Estimate cost and prepare budget proposal.
- Make payment of salary for all local staff.
- Maintain office accounts and prepare annual office finance statement for auditing.
- Give the farmers organization lectures on financial matters in cooperation with the Farmers Training Section.
- Prepare a financial report.

表-4-4　農民組織の作業内容(1/3)

(1) Land Allocation Committee
- Allocate plots to farmers.
- Settle land disputes.
- Discipline farmers having violated the constitution which could not be settled at lower committees.

(2) Main Committee
- Prepare the constitution.
- Execute seasonal allocation of plots
- Organize and conduct meetings.
- Organize welfare activities.
- Collect the scheme maintenance fee for headworks and Main Canal
- Review the discussion results in the respective Sub-Committees, and inform the Area Committees and Block Committees and Club Committees of the review results.
- Supervise the Area Committees.

(a) Marketing Sub-Committee (in consultation with Salima ADD)
- Prepare crop calendar for whole area .
- Review the actually planted areas of crops based on the information from the Area Committees.
- Arrange the cooperative purchasing system for agricultural inputs based on the information from the Area Committees.
- Arrange the cooperative selling system of agricultural products based on the information from the Area Committees.
- Arrange loan for farmers based on the information from the Area Committees.
- Report the Main Committee on the results of the above.

(b) Water Distribution Sub-Committee (in consultation with Section Bwanje Valley)
- Prepare seasonal irrigation calendar.
- Calculate seasonal water demand of crops.
- Calculate seasonal canal discharge.
- Calculate seasonal released discharge at diversion points on each canal.
- Assign gate operators at headworks and Main Canal.
- Report the Main Committee on the results of the above.

(c) O & M Sub-Committee (in consultation with Section Bwanje Valley)
- Prepare the annual maintenance program for each canal system.
- Carry out daily and periodic patrols to headworks and Main Canal.
- Execute routine maintenance works for headworks and Main Canal.
- Discuss with the Section Bwanje Valley on large repairs.
- Prepare repair plan and allocate the works to each Area Committee.
- Prepare records on regular maintenance, periodic maintenance, emergency repairs for headworks and Main Canal.
- Calculate the scheme maintenance feee for headworks and Main Canal.
- Report the Main Committee on the results of the above.

(d) Disciplinary Sub-Committee
- Discipline farmers had the violated behaviors against the constitution.
- Settle disputes among farmers which could not be settled at the Area Committee.
- Report the Main Committee on the results of the above.

表-4-4　農民組織の作業内容(2/3)

(3) Area Committee

- Organize and conduct meetings.
- Organize welfare activities.
- Collect the scheme maintenance fee for Branch Canals and drains
- Review the information from the Main Committee, and request its Sub-Committees to take necessary actions.
- Review the discussion results in the respective Sub-Committees, and report to the Main Committee.
- Supervise the Block Committees.

(a) Marketing Sub-Committee

- Compile the actually planted areas of crops based on the report from the Block Committee.
- Review the actually planted areas of crops.
- Calculate fertilizer volume.
- Check need of loan arrangement.
- Calculate agricultural products based on the report from the Block Committee.
- Report the Area Committee on the results of the above.

(b) Water Distribution Sub-Committee

- Assign the gate operators on Branch/Sub-Branch Canals.
- Execute water distribution based on the calculated released discharge.
- Report the Main Committee on the results of the above.

(c) O & M Sub-Committee

- Carry out daily and periodic patrols for Branch and Sub-Branch Canals.
- Execute routine maintenance works for Branch and Sub-Branch Canals.
- Discuss with the Main Committee on large repairs under the approval of Area Committee.
- Prepare records on regular maintenance, periodic maintenance, emergency repairs for Branch and Sub-Branch Canals.
- Calculate irrigation services charge for Branch and Sub-Branch Canals.
- Report the Area Committee on the results of the above.

(d) Disciplinary Sub-Committee

- Discipline farmers having had the violated behaviors against the constitution.
- Settle disputes among farmers which could not be settled at the Block Committee.
- Report the Area Committee on the results of the above.

(4) Block Committee

- Organize and conduct meetings.
- Compile agricultural practices at Block area based on the information from the Club Committees, and report to the Area Committee.
- Collect the scheme maintenance fee for feeder canals
- Review the information from the Main Committee, and request its Sub-Committees to take necessary actions.
- Review the discussion results in the respective Sub-Committees, and report to the Area Committee.
- Supervise the Club Committees.

表-4-4　農民組織の作業内容(3/3)

(a) Water Distribution Sub-Committee

- Examine the actually planted areas and africultural products.
- Execute water distribution based on the calculated released discharge.
- Examine whether the released discharge is enough or not, based on information from the Club Committees.
- Report the Block Committee on the results of the above.

(b) O & M Sub-Committee

- Carry out daily and periodic patrols for Feeder Canals.
- Execute routine maintenance works for Feeder Canals.
- Prepare records on regular maintenance, periodic maintenance, emergency repairs for Feeder Canals.
- Calculate irrigation services charge for Feeder Canals.
- Report the Block Committee on the results of the above.

(5) Club Committee

- Organize and conduct meetings.
- Monitor agricultural practices at respective Club area, and report to the Block Committee.
- Collect the scheme maintenance fee for club area.
- Examine whether the released discharge is enough or not, and report to the Block Committee.
- Identify and register the members.
- Appraise and recommend members for seasonal loans.
- Keep records of loans.
- Execute loan services and recovery.
- Discipline farmers having had the violated behaviors against the constitution.
- Organize women activities.

表-4-5　維持管理費の算定

Initial Stage		Final Stage	
Description	Amount in KW	Description	Amount in KW
(a) Government		(a) Government	
- Salary of government staff	510,000	- Salary of government staff	39,000
- Office running cost	220,000	- Office running cost	15,000
- Mobile running cost	94,000	- Mobile running cost	9,000
Total	824,000	Total	63,000
Cost per ha	1,030	Cost per ha	79
(b) Farmers		(b) Farmers	
- Farmers organization running cost	103,000	- Farmers organization running cost	206,000
- Maintenance by equipment	123,500	- Maintenance by equipment	185,300
- Material cost	50,000	- Material cost	75,000
- Replacement cost (annual basis)	365,000	- Replacement cost (annual basis)	365,000
Total	641,500	Total	831,300
Cost per ha	802	Cost per ha	1,039
Cost per 0.4 ha	321	Cost per 0.4 ha	416

Note:

(1) Salaries for government staff for O & M Office are estimated using the government rates.

(2) Office running cost is estimated by adding 50 % to the actual expenditures for the Salima ADD.

(3) Mobile running cost is estimated for three cars.

(4) Farmers organization running cost is estimated for meeting, stationary , transportation etc.

(5) Maintenance cost by equipment is estimated on the rental basis.

(6) Material cost is estimated by multiplying 0.1% of total material cost for structures.

(7) Replacement cost for gates and screens are estimated based on 20 years life time and 10 % of sulvage value.

Note:

(1) Thirty % of total salaries for government staff for Section Bwanje Valley of Salima ADD is applied for this project.

(2) Thirty % of KW 50,000 of office running cost is applied for the project.

(3) Thirty % of KW31,200 of mobile running cost is applied .

(4) Farmers organization running cost is estimated for meeting, stationary , transportation etc.

(5) Maintenance cost by equipment is estimated on the rental basis.

(6) Material cost is estimated by multiplying 0.15% of total material cost for structures.

(7) Replacement cost for gates and screens are estimated based on 20 years life time and 10 % of sulvage value.

表-4-6　ムタンダムラ既存潅漑地区での農家経営収支の分析

Description	Irrigated Paddy (Milled Rice)			Irrigated Maize			Rainfed Maize			Vegetables		
	Unit Yield (kg)	Unit Price (KW)	Amount (KW)	Unit Yield (kg)	Unit Price (KW)	Amount (KW)	Unit Yield (kg)	Unit Price (KW)	Amount (KW)	Unit Yield (kg)	Unit Price (KW)	Amount (KW)
(1) Gross Revenue	2,925.0	8.0	23,400.0	2,000.0	2.5	5,000.0	1,000.0	2.5	2,500.0			27,800.0
(2) Farm Inputs												
(a) Seeds	40.0	5.3	212.0	25.0	11.7	292.5	60.0	3.5	210.0			1,345.3
(b) Fertilizers												6,920.8
- Urea	190.0	7.1	1,349.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
- TSP	54.0	6.7	361.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sub-total			1,710.8			0.0			0.0			6,920.8
(c) Miscellaneous (5%)			96.1			14.6			10.5			413.3
(d) Total			2,018.9			307.1			220.5			8,679.4
(3) Net Return (KW)			21,381.1			4,692.9			2,279.5			19,120.6
(4) Cropped Area (ha)			0.4			0.03			1.0			0.03
(5) Net Return per Cropped Area (KW)			8,552.4			140.8			2,279.5			573.6
(6) Total Surplus												**11,546.3**

Note: (1) The calculation is executed in the same manner with the Feasibility Study.

(2) The price of irrigated paddy (milled rice) is estimated using the ratio of farm gate prices at F/S time and the current one.

(3) The prices of Urea and TSP for paddy and maize show the current price, but those for vegetables are assumed using the ration of exchange rate to US$ at F/S time and the current time (3.531).

(4) The gross revenue for vegetables is conservatively assumed two times of that at F/S time considering the inflation rate.

表-4-7　　天水田地区での農家経営収支の分析

Description	Irrigated Paddy			Irrigated Maize			Rainfed Maize			Vegetables		
	Unit Yield (kg)	Unit Price (KW)	Amount (KW)	Unit Yield (kg)	Unit Price (KW)	Amount (KW)	Unit Yield (kg)	Unit Price (KW)	Amount (KW)	Unit Yield (kg)	Unit Price (KW)	Amount (KW)
(1) Gross Revenue	2,925.0	8.0	23,400.0	2,000.0	2.5	5,000.0	1,000.0	2.5	2,500.0			27,800.0
(2) Farm Inputs												
(a) Seeds	40.0	5.3	212.0	25.0	11.7	292.5	60.0	3.5	210.0			1,345.3
(b) Fertilizers												6,920.8
- Urea	190.0	7.1	1,349.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
- TSP	54.0	6.7	361.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sub-total			1,710.8			0.0			0.0			6,920.8
(c) Miscellaneous (5%)			96.1			14.6			10.5			413.3
(d) Total			2,018.9			307.1			220.5			8,679.4
(3) Net Return (KW)			21,381.1			4,692.9			2,279.5			19,120.6
(4) Cropped Area (ha)			0.36			0.03			0.83			0.03
(5) Net Return per Cropped Area (KW)			7,697.2			140.8			1,892.0			573.6
(6) Total Surplus												**10,303.6**

Note: (1) The calculation is executed in the same manner with the Feasibility Study.

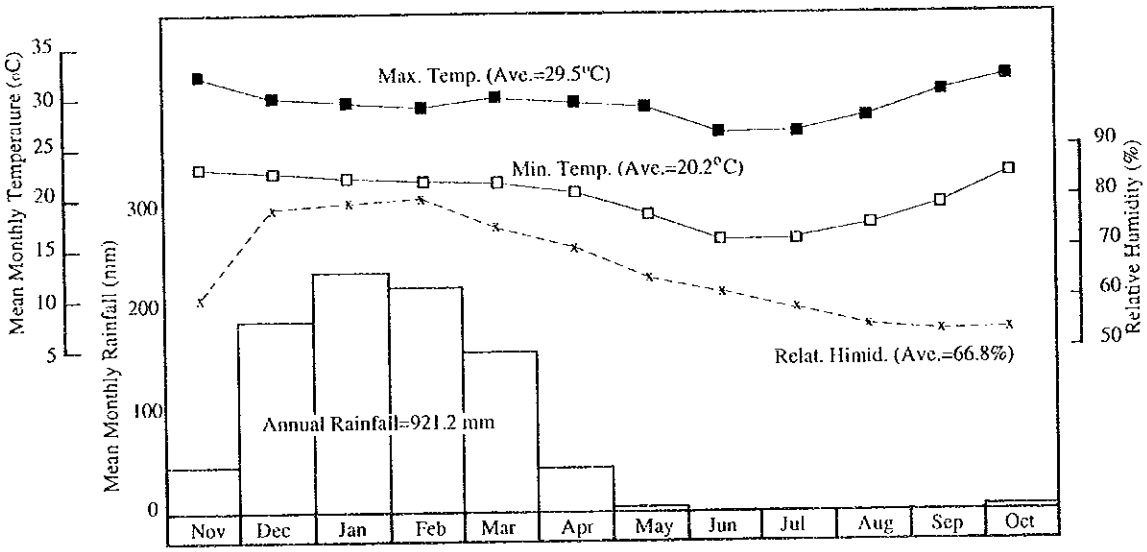
(2) The price of irrigated paddy (milled rice) is estimated using the ratio of farm gate prices at F/S time and the current one.

(3) The prices of Urea and TSP for paddy and maize show the current price, but those for vegetables are assumed using the ration of exchange rate to US$ at F/S time and the current time (3.531).

(4) The gross revenue for vegetables is conservatively assumed two times of that at F/S time considering the inflation rate.

付図

図-3-1　計画作付け体系



Note : Temperature and humidity data are of Monkey Bay Station.
Annual rainfall data are of Mua Mission and Mtakataka Airwing.

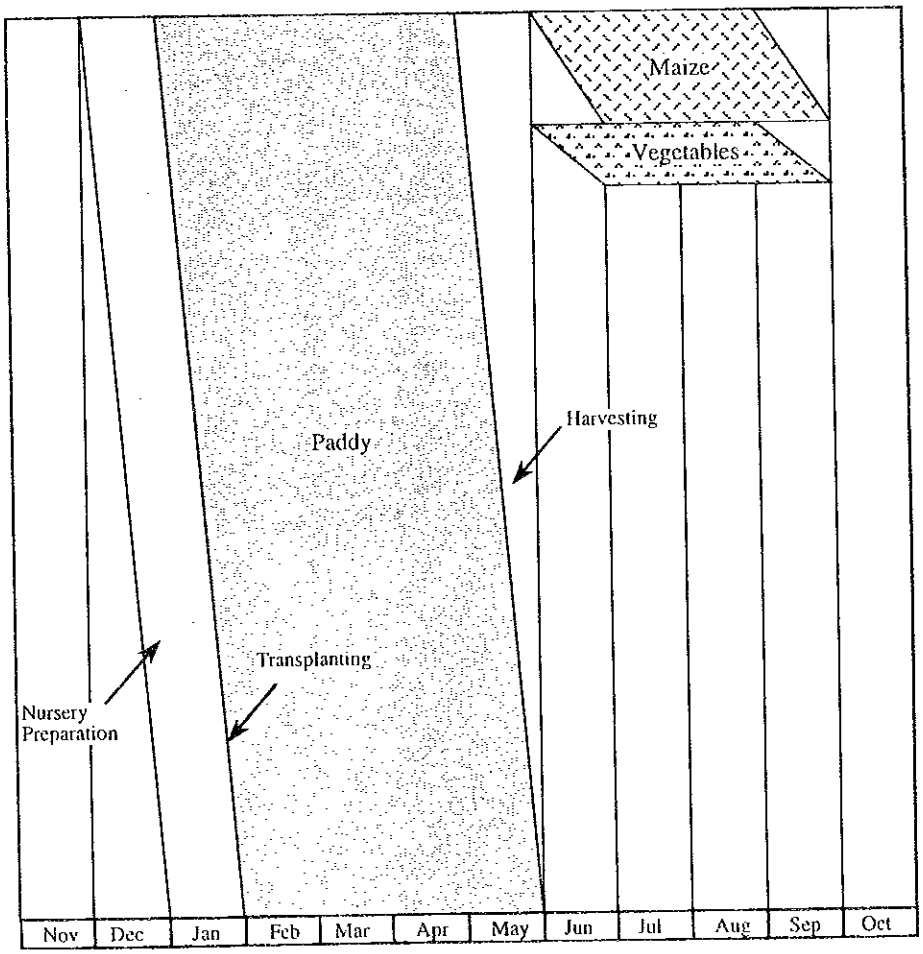


図-3-2　　灌漑可能面積

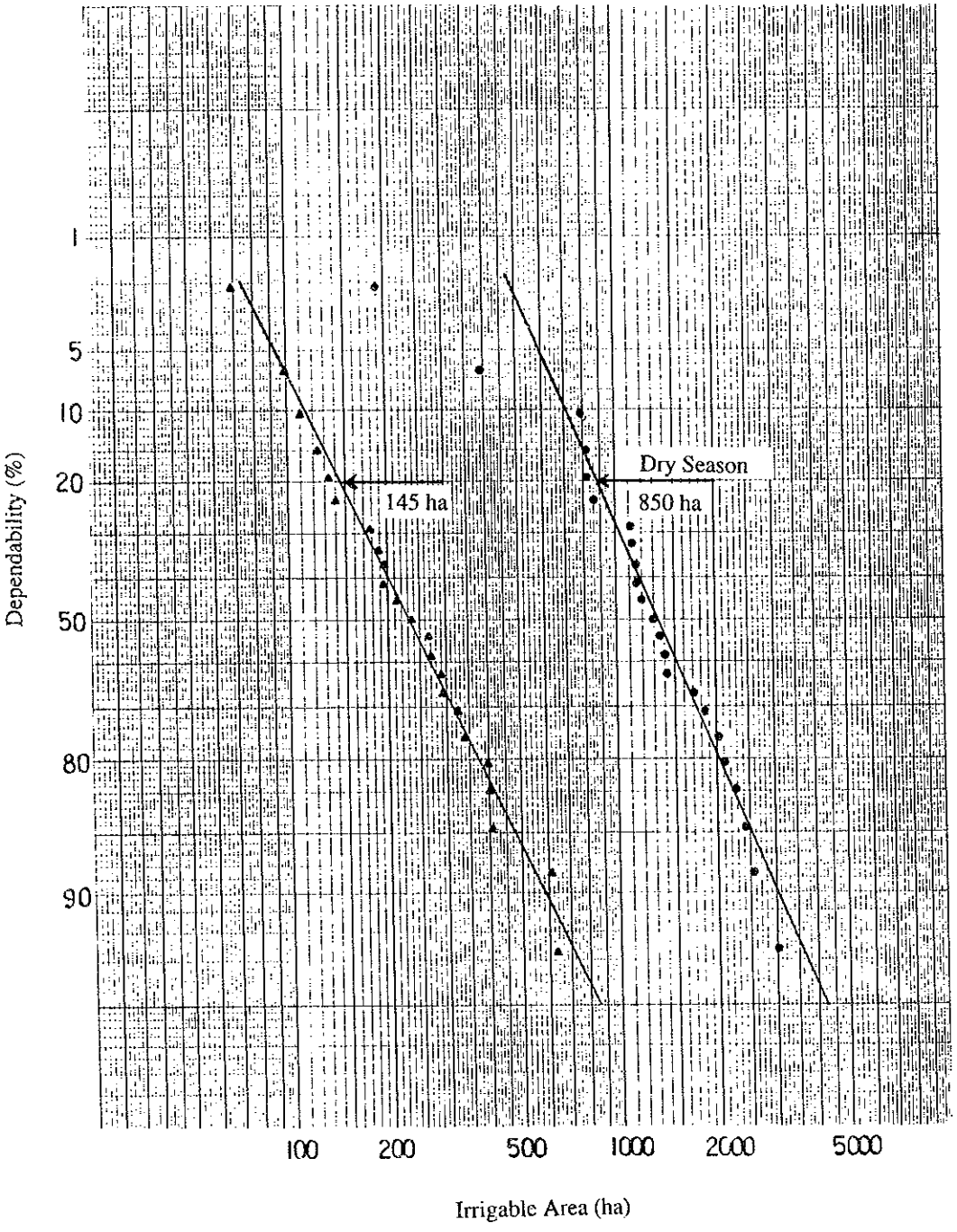

Dry Season
145 ha
850 ha
Dependability (%)
1
5
10
20
50
80
90
100
200
500
1000
2000
5000
Irrigable Area (ha)

図-3-3　　確率洪水量

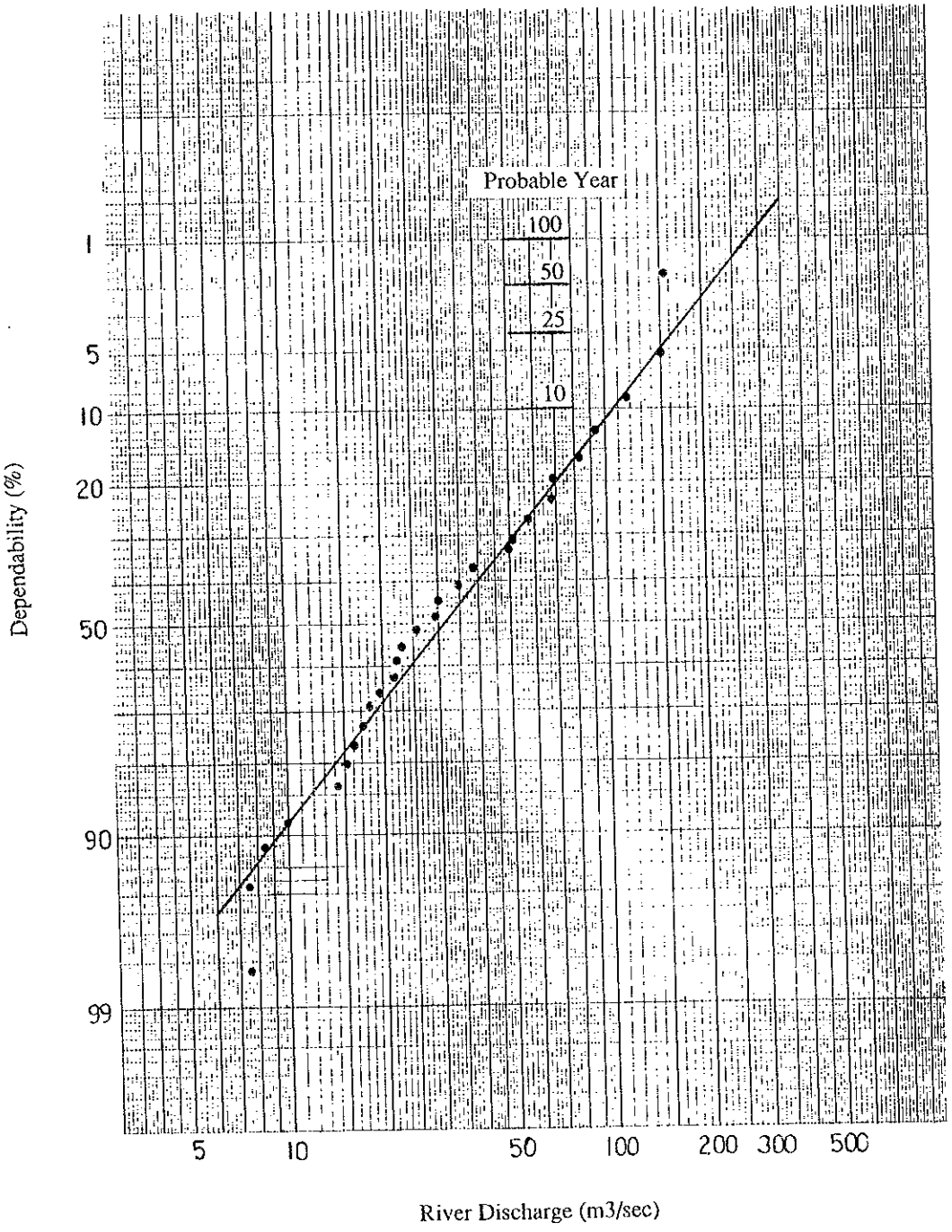

Probable Year
100
50
25
10
1
5
10
20
50
90
99
Dependability (%)
5
10
50
100
200
300
500
River Discharge (m3/sec)

図-3-4　灌漑水資源開発省組織図

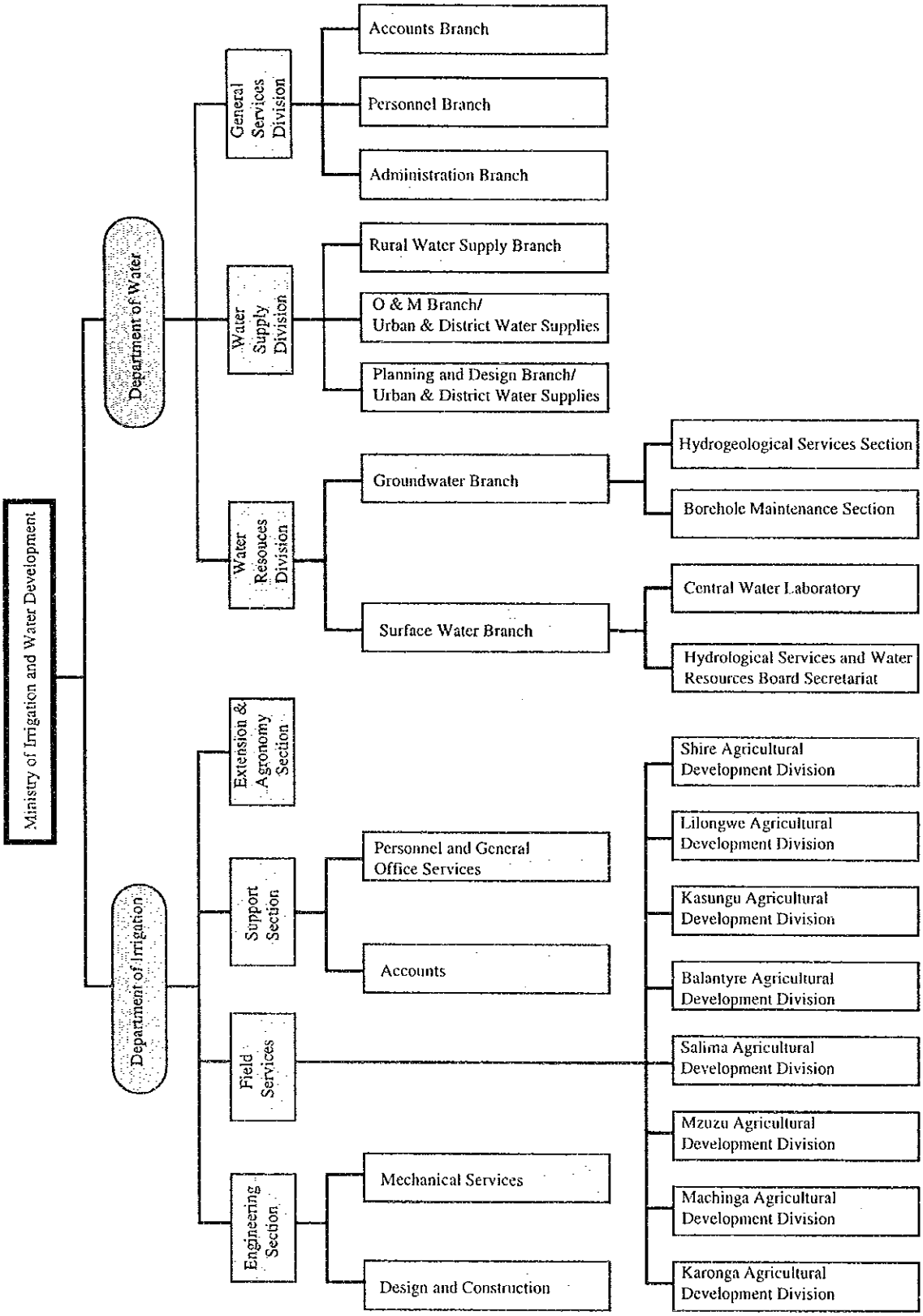


図-3-5　計画実施体制組織図

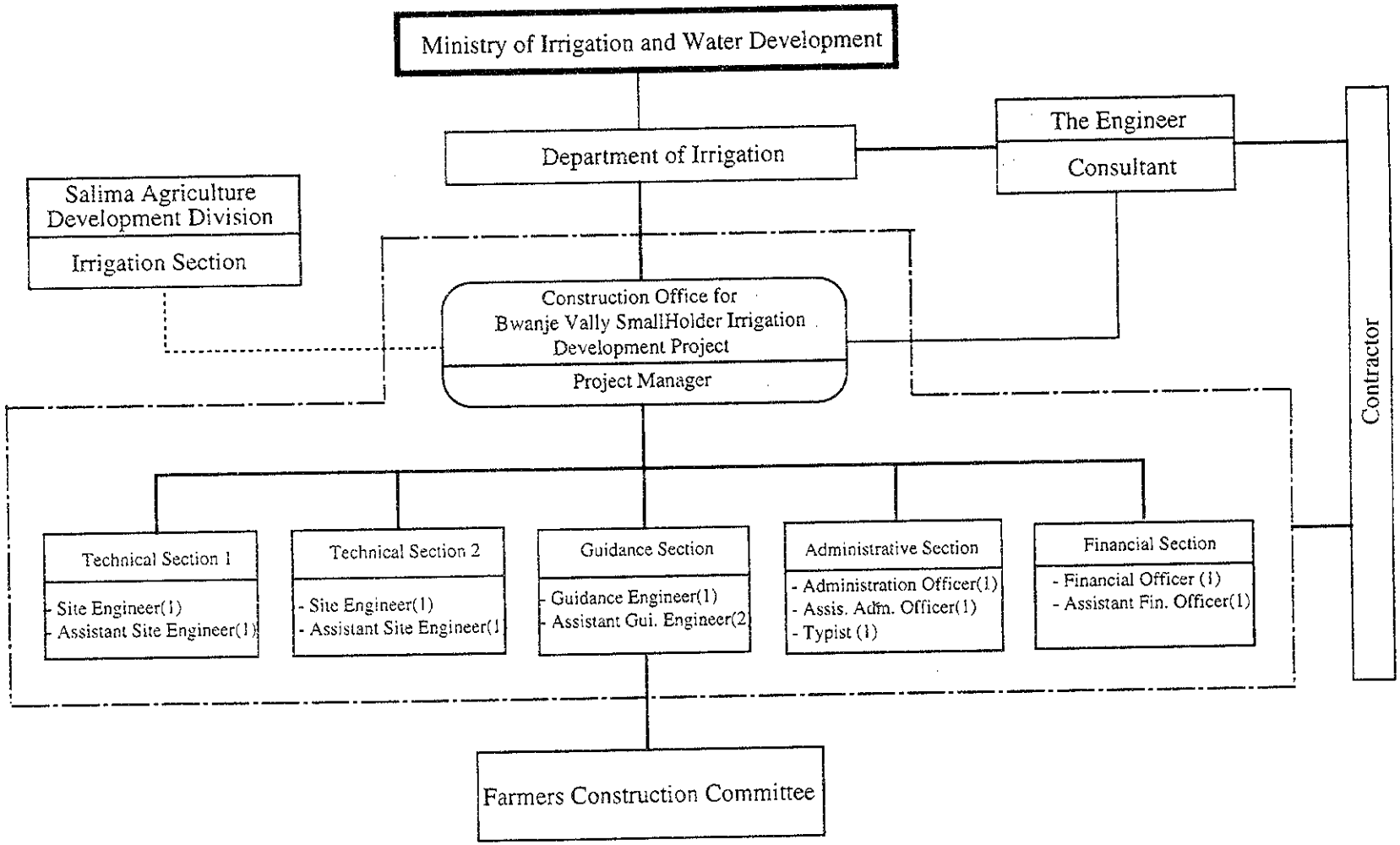


図-4-1　ムタンダムラ地区農民組織図

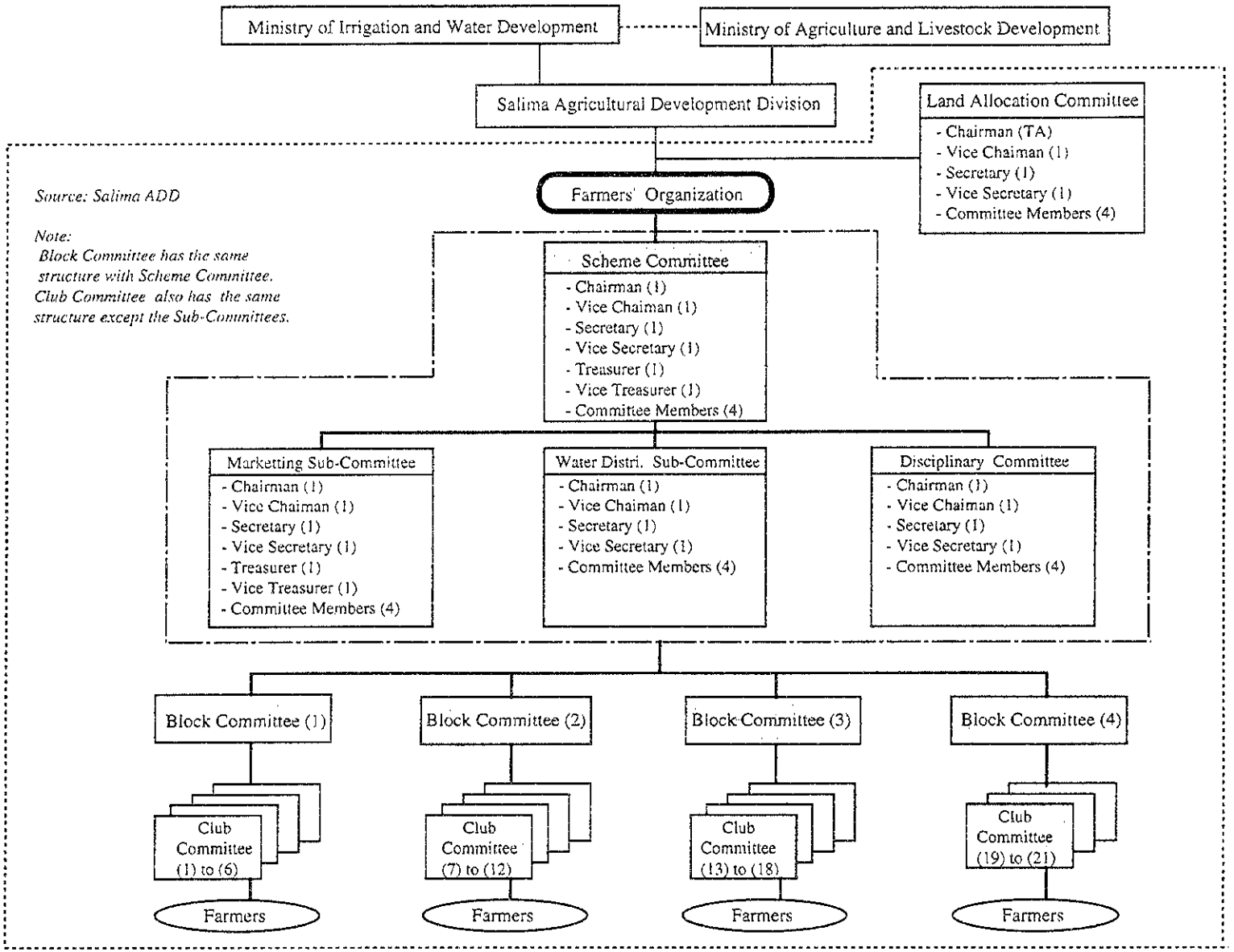


図-4-2　サリマ農業開発区組織図

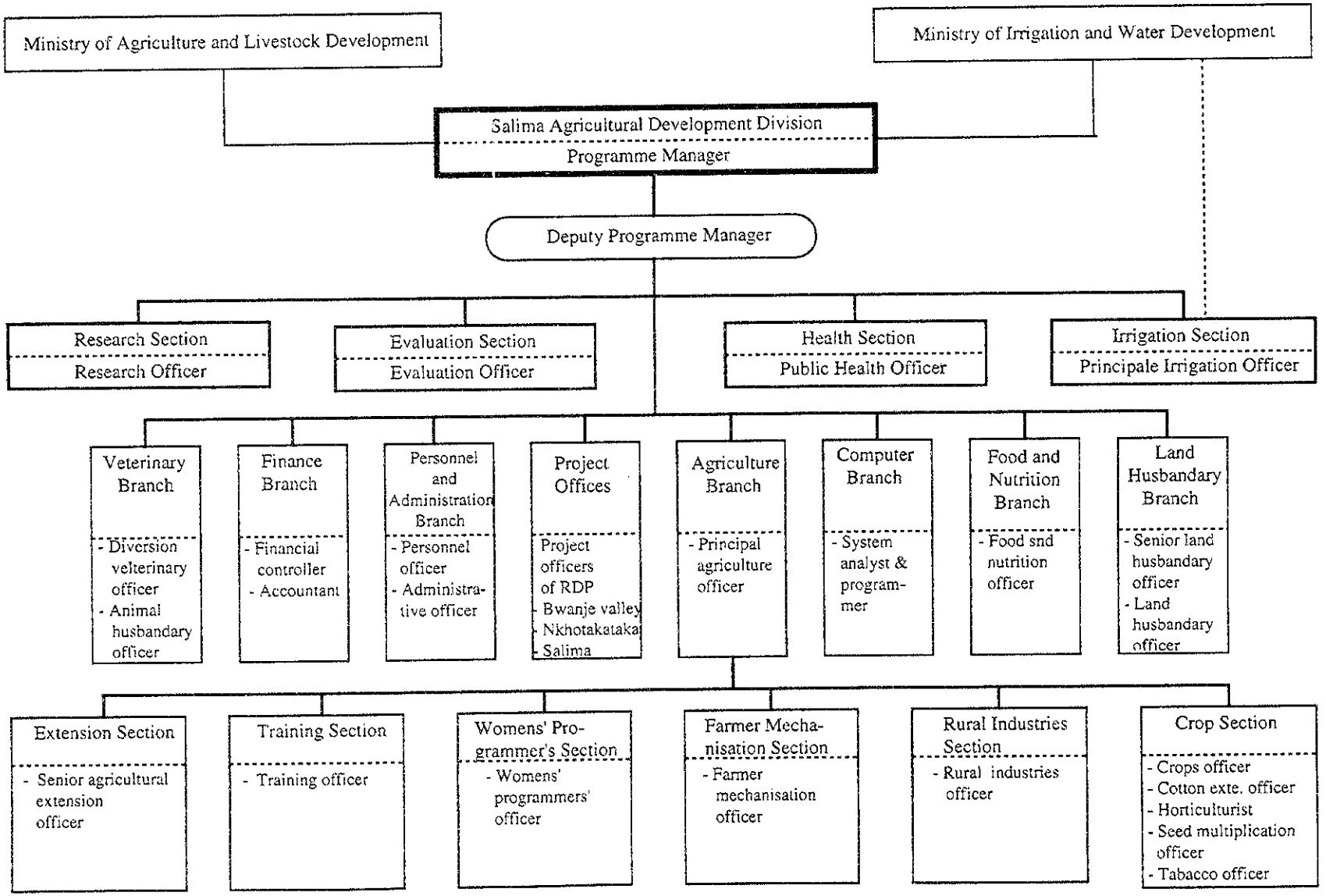


図-4-3　　灌漑局と農業・畜産開発省との関係図

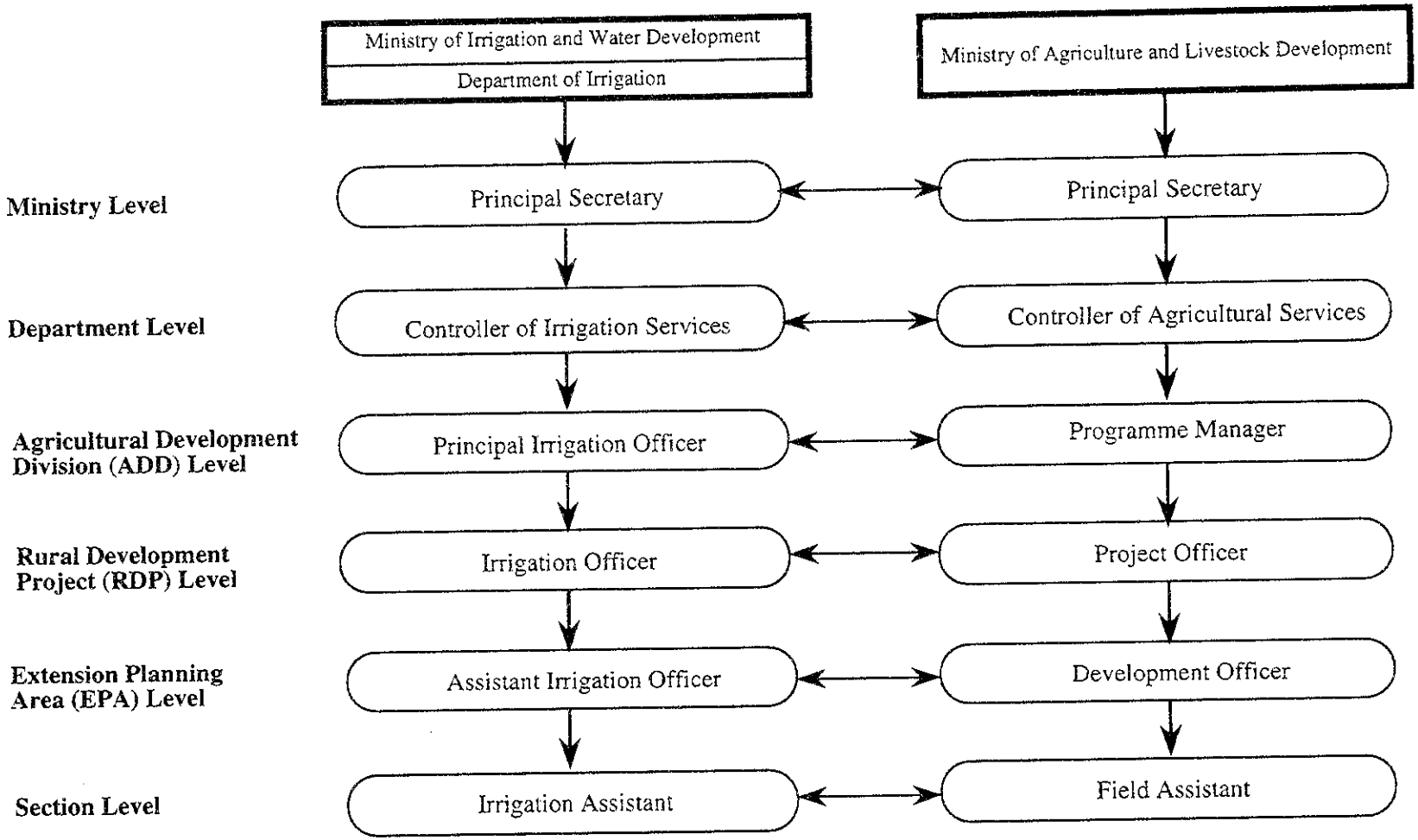


図-4-4　計画維持管理事務所組織図

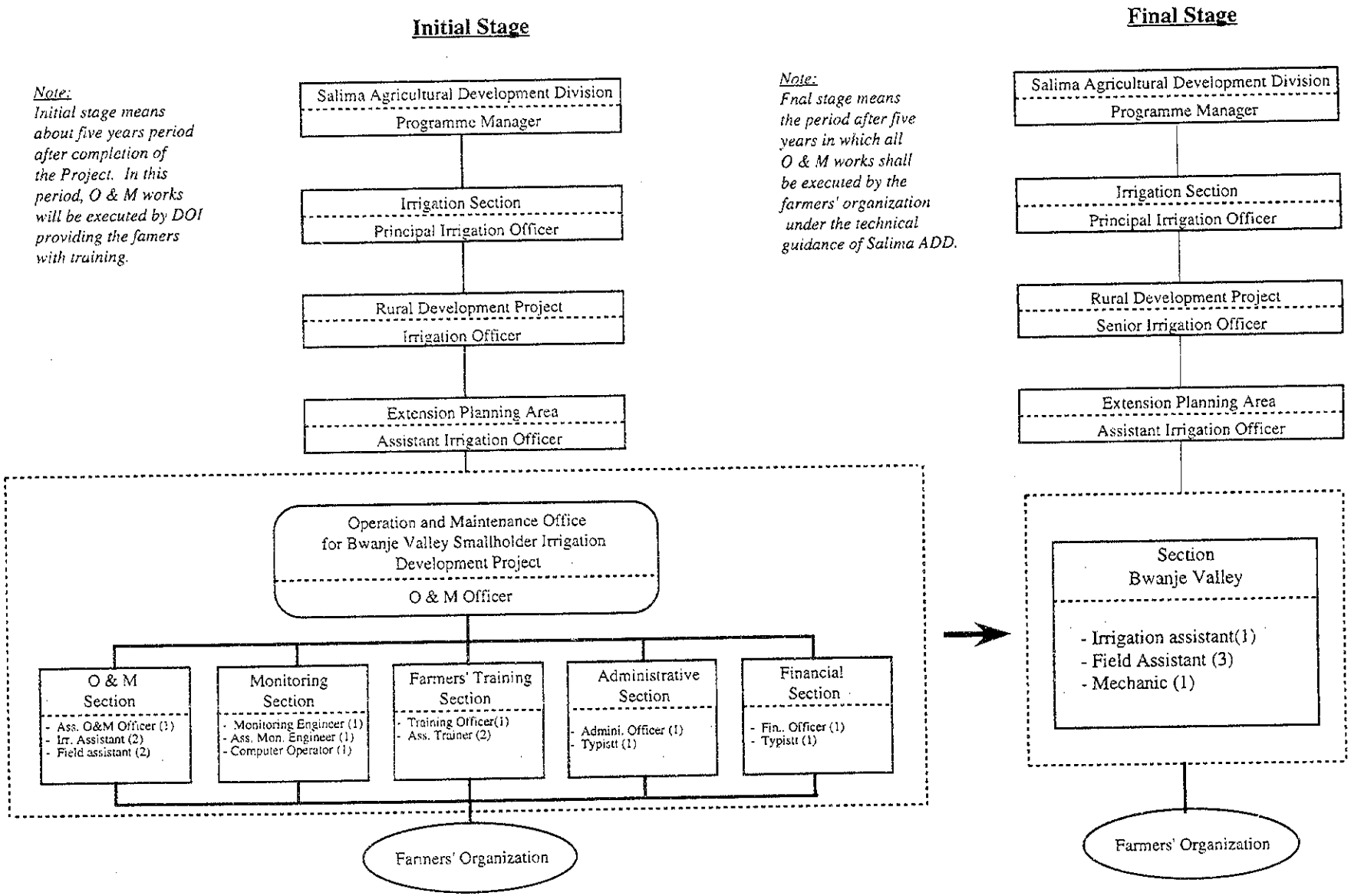


図-4-5　計画農民組織図

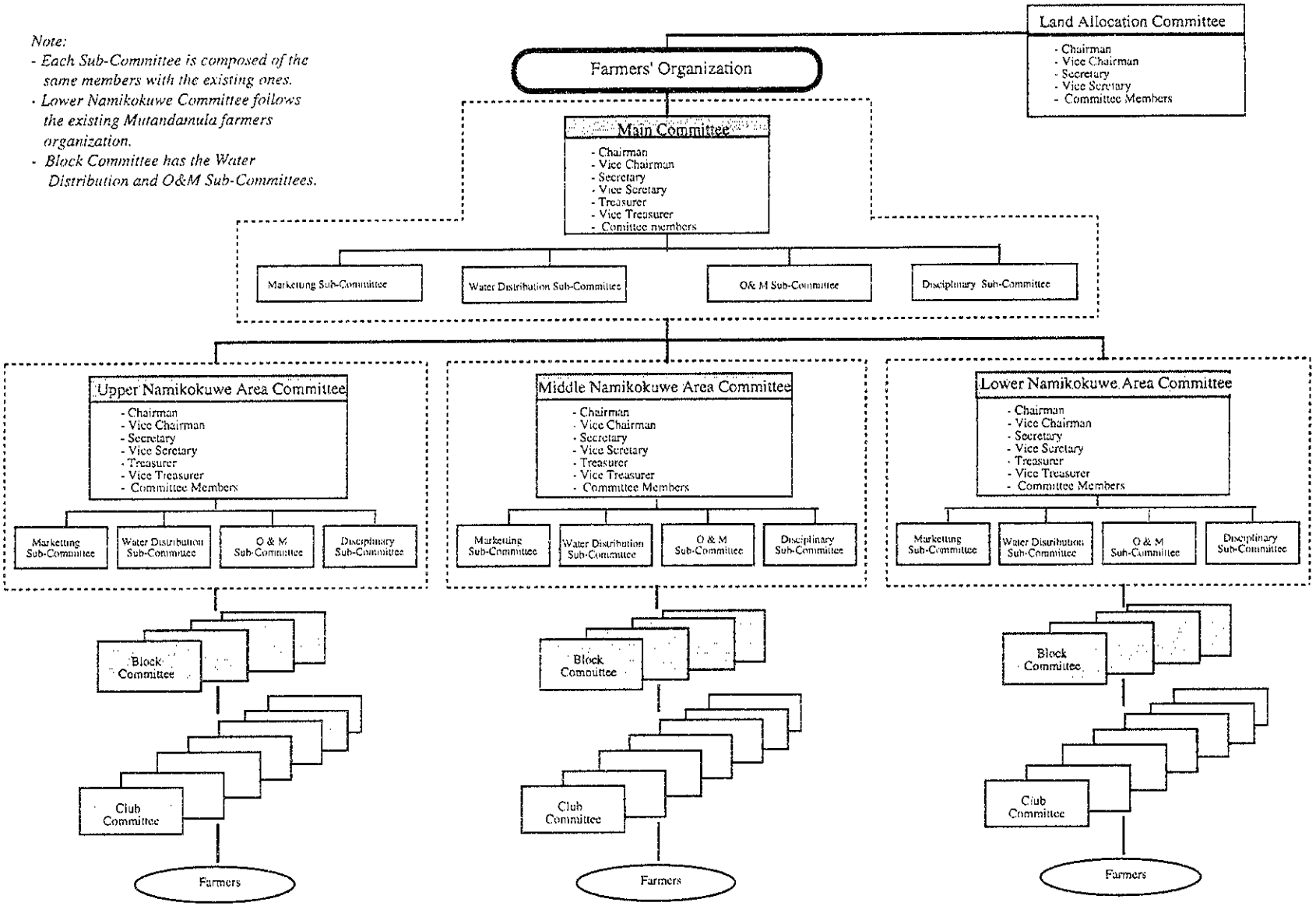
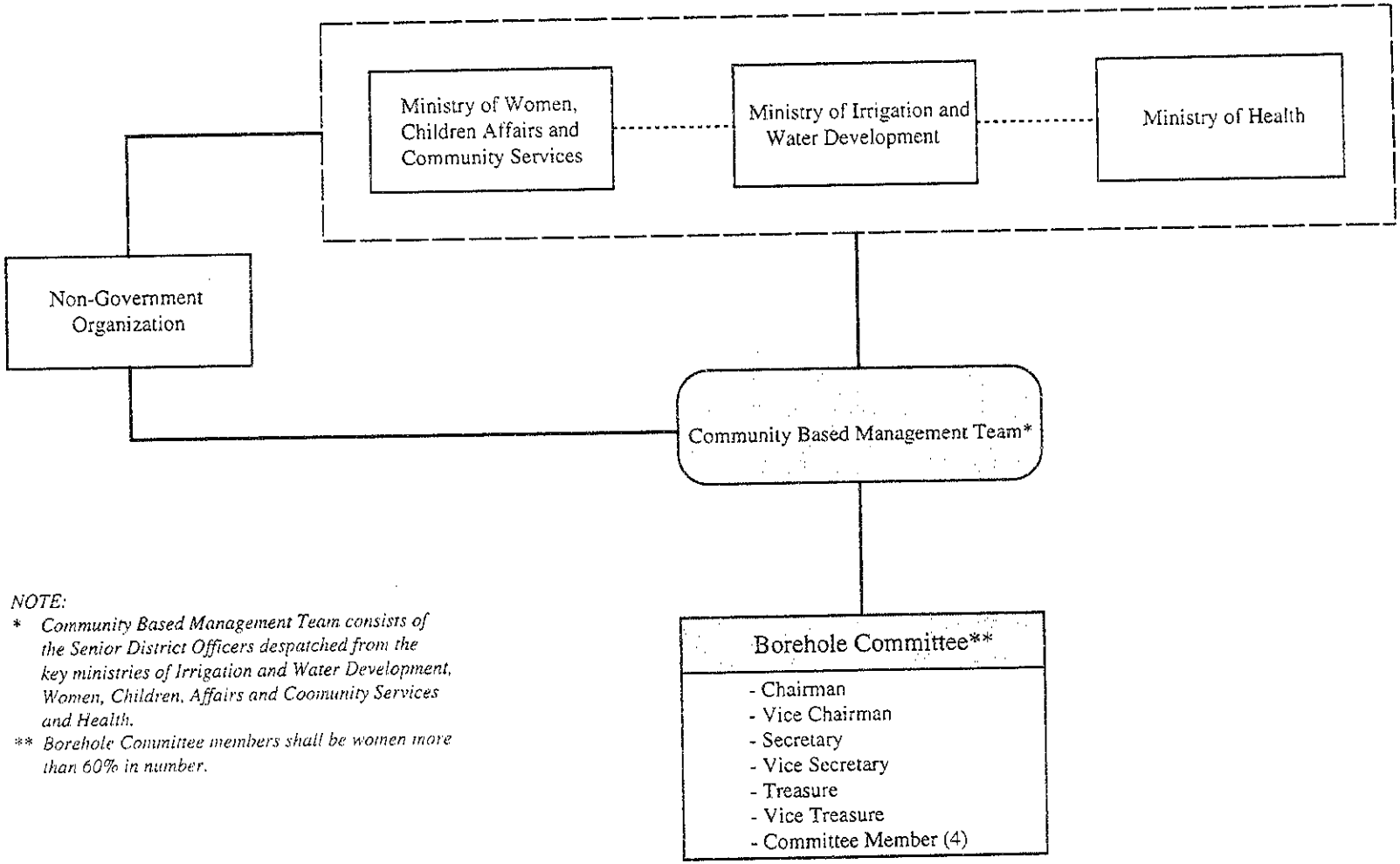

Note:
- Each Sub-Committee is composed of the same members with the existing ones.
- Lower Namikokuwe Committee follows the existing Mutandamula farmers organization.
- Block Committee has the Water Distribution and O&M Sub-Committees.
Land Allocation Committee
- Chairman
- Vice Chairman
- Secretary
- Vice Secretary
- Committee Members
Farmers' Organization
Main Committee
- Chairman
- Vice Chairman
- Secretary
- Vice Secretary
- Treasurer
- Vice Treasurer
- Comittee members
Marketing Sub-Committee
Water Distribution Sub-Committee
O& M Sub-Committee
Disciplinary Sub-Committee
Upper Namikokuwe Area Committee
- Chairman
- Vice Chairman
- Secretary
- Vice Secretary
- Treasurer
- Vice Treasurer
- Committee Members
Marketing Sub-Committee
Water Distribution Sub-Committee
O & M Sub-Committee
Disciplinary Sub-Committee
Middle Namikokuwe Area Committee
- Chairman
- Vice Chairman
- Secretary
- Vice Secretary
- Treasurer
- Vice Treasurer
- Committee Members
Marketing Sub-Committee
Water Distribution Sub-Committee
O & M Sub-Committee
Disciplinary Sub-Committee
Lower Namikokuwe Area Committee
- Chairman
- Vice Chairman
- Secretary
- Vice Secretary
- Treasurer
- Vice Treasurer
- Committee Members
Marketing Sub-Committee
Water Distribution Sub-Committee
O & M Sub-Committee
Disciplinary Sub-Committee
Block Committee
Club Committee
Farmers
Block Committee
Club Committee
Farmers
Block Committee
Club Committee
Farmers

図-4-6　給水施設維持管理組織図

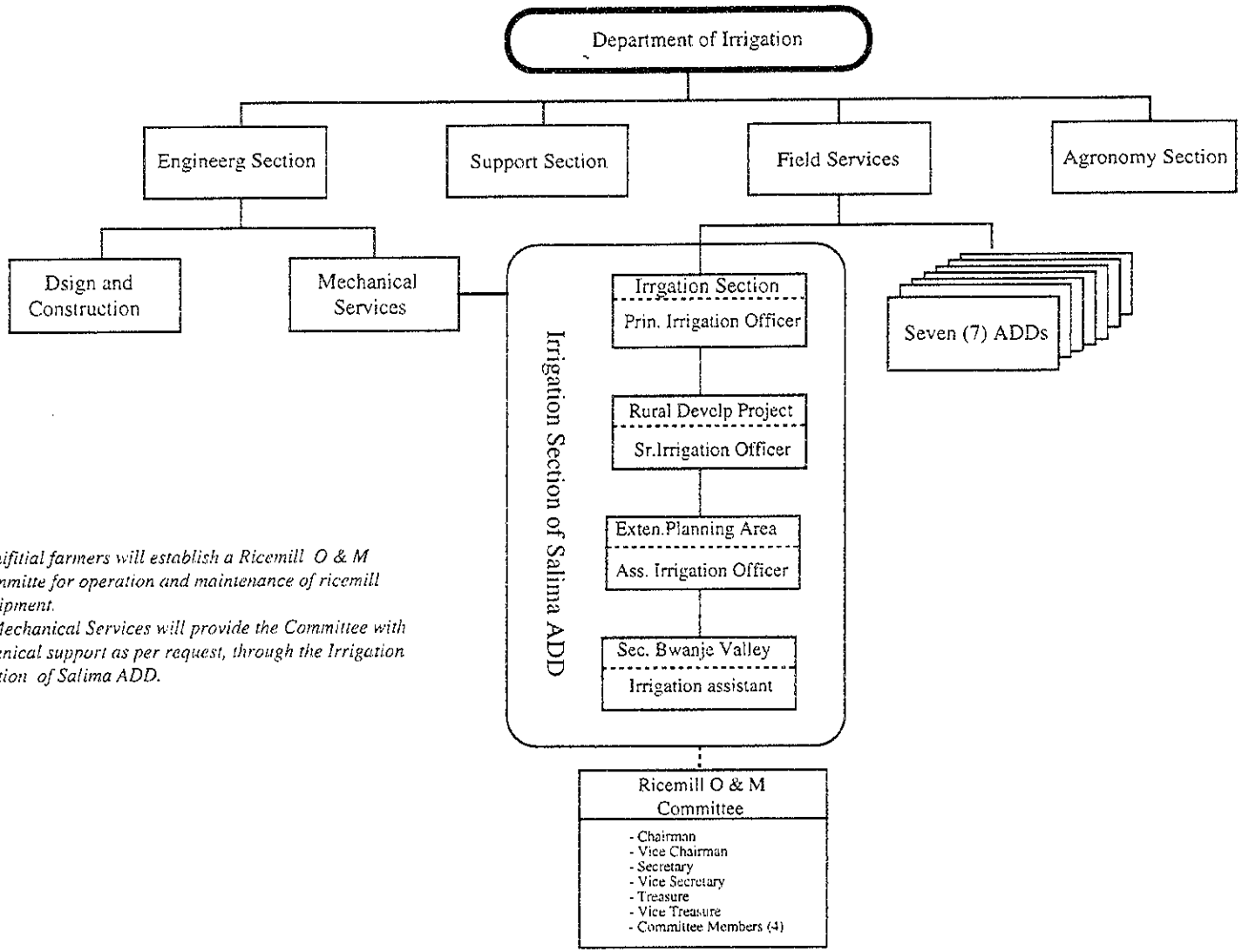


NOTE:

* *Community Based Management Team consists of the Senior District Officers despatched from the key ministries of Irrigation and Water Development, Women, Children, Affairs and Coomunity Services and Health.*

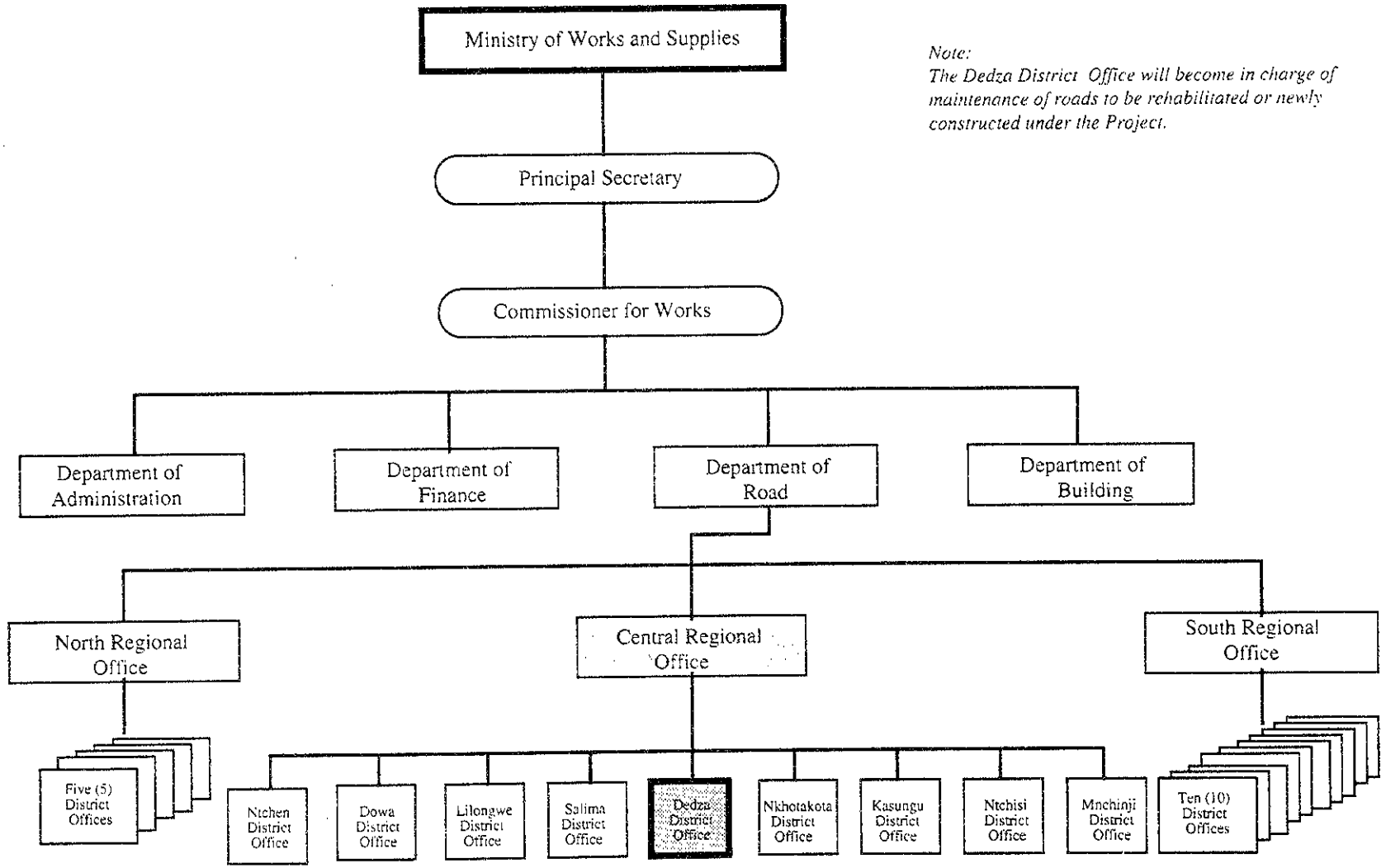
** *Borehole Committee members shall be women more than 60% in number.*

図-4-7　精米機維持管理組織図



Note:
- *Benifitial farmers will establish a Ricemill O & M Committe for operation and maintenance of ricemill equipment.*
- *A Mechanical Services will provide the Committee with technical support as per request, through the Irrigation Section of Salima ADD.*

図-4-8　道路維持管理組織図



Note:
The Dedza District Office will become in charge of maintenance of roads to be rehabilitated or newly constructed under the Project.