2. リアムカナンかんがい末端施設パイロット農場（かんがい面積：506 ha）

インドネシア 南カリマンタン州

(1) 目　　的　：リアムカナンかんがい計画（26,000 ha）の実施にそなえて計画地区内にパイロット農場を設置し，かんがい末端施設に関する必要な諸技術の確立とかんがい農法の普及方法の確立を期する。

(2) 経　　緯　：1978年7月~12月．リアムカナンかんがい計画ＦＳにおいてパイロット農場の設置を勧告。

1981年1月~2月．リアムカナンパイロット農場技術協力に関する事前調査。

1981年1月~12月．南カリマンタン州公共事業部による実施設計実施。

ＤＤの実施（日本工営）

1981年度，無償資金協力（約７億円）

1982年4月~1983年3月．建設（施工，間組，エンジニアリング，サービス，日本工営）

1983年4月　　．南カリマンタン州公共事業部が管理所を設置。

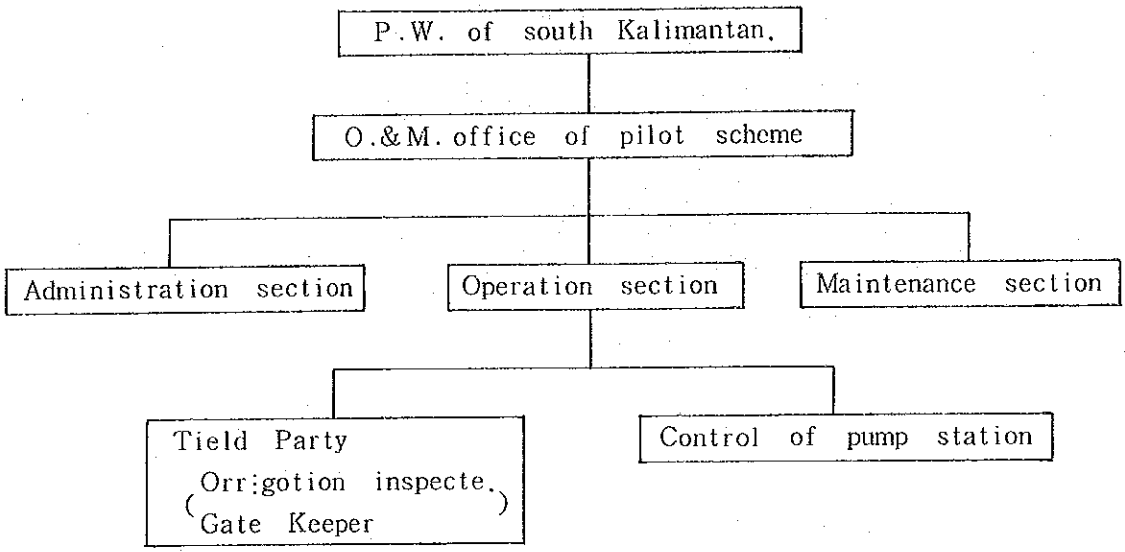
（管理所は1983年4月~1985年3月（２ケ年）の予定）

(3) 施設内容　：導水路；$\ell = 1,307\,m$，$Q = 0.703\ m^3/s$，　揚水機；$\phi\ 600mm$・２台・$Q = 44\ m^3/min$（Max），　パイプライン；$\phi\ 900mm$・$\ell = 1,703\,m$，　ファームポンド；$V = 17,532\,m^3$，　かんがい水路；$\ell = 11,354\,m$（２次　3,794 m，３次　7,560 m），　排水路；$\ell = 15,094\,m$（２次　2,486 m，３次　12,608 m），排水ゲート；２門，　管理道路；$\ell = 12,866\,m$（２次　6,777 m，３次　6,089 m），　その他，堤防；$\ell = 1,544\,m$，　モニタリング装置；一式，　自記水位計；４ケ処，　気象観測施設；１ケ処。

(4) 土壌．気象等：パイロット地区は標高０m~1.0 mの範囲で約$^1/_{8000}$のコウ配。土質　clay & silty clay，年雨量　1,200mm~4,300mm，　2,600mm，約70％は雨期（11月~４月）に降る。又，６月~９月に長期の旱魃が続く傾向がある。湿度．年平均80％，日蒸発量．雨期3.4mm．乾期4.1mm。

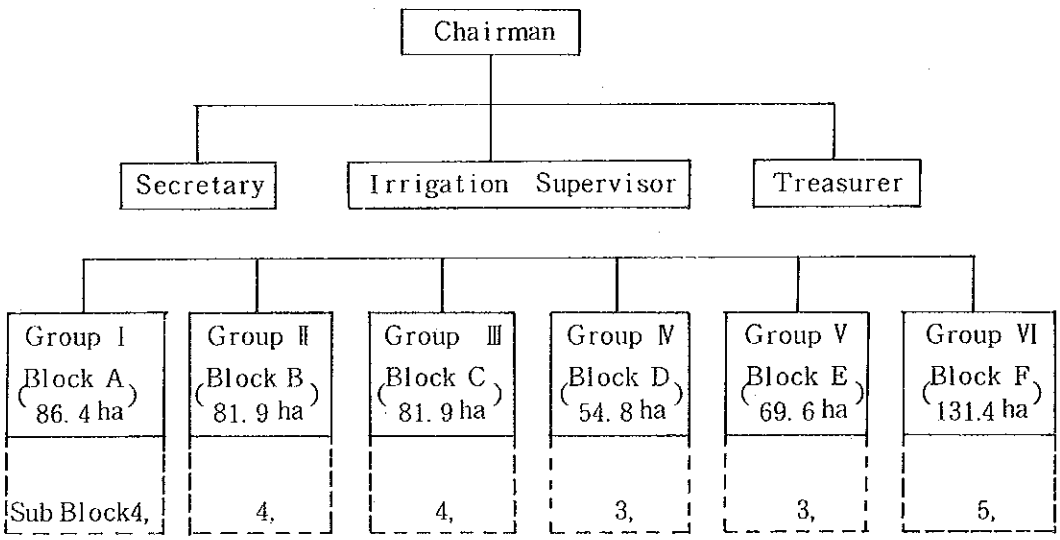
(5) 施設管理機構

① 州政府公共事業部パイロット施設管理所




| | | | | | |
|---|---|---|---|---|---|
| 当初計画職員数 | 22名 | ＞28名 | 現在職員数（専任） | 5名 | ＞9名 |
| Tield Party | 6名 | | Tield Party | 4名 | |

② 農民水利組合



(6) 末端水管理上の諸問題

① 技術上の問題・・・低地帯における水利コントロール（特に雨期の排水）が技術的に可能か。

イ 雨期における排水コントロールが不十分・・・新品種の導入を不可能にする。（調査計画上の問題点）

ロ ほ場内の４次水路設置が進まない。（83年12月までに約50％）

理由，営農面積小のため潰地を嫌う傾向が強い。

ハ 施設の建設は同一施工者により　工事を行うべきである。

当地区の場合　かんがい施設・・・無償資金

排水施設と機場上屋・・・ローカル資金

結果からみて工事の質量に差があるため一体として機能すべき効果が妨げられたことが多い。

② 農民側に起因する問題（社会制度，土地制度に結びついた問題ともいえる）。

イ 個々に農民の主張が強く二期稲作（11月～２月）の集団化が不充分のため用水量のロスが多い。

将来施設の管理を任ずべき農民水利組合の育成強化を積極的に進めなければならない。

ロ 水田耕作のため農民の横断する３次水路に法崩れが生じ通水を妨げることが意外に多い。

③ 州政府側に起因する問題（行政指導のあり方に結びついた問題）。

イ 農業者の積極的な協力が必要である。

現在１名の普及員がパイロット地区に専任配置されているが，新しい営農技術の導入のためには入念な営農指導が必要である。

ロ かんがい農業に関するＰＲを農民層に対して積極的に行うべきである。

(7) 管理費用

1984／85 の予定では公共事業省直轄分（導入水路，ポンプ運転，二次水路の維持管理は約３万ＵＳ　（60ＵＳ　／ha 程度）

## 3. インドネシアにおける技術対応の問題点

(1) 大縮尺地形図作成の仕様について（特に低平地用）

Ｆ／Ｓ，Ｄ／Ｄに用いられる 1／5000 地形図については，その用途が全体のプランニングに用いられる他，ターシォリ水路の図上設計に用いようと云う意図がある。そこで標準的な５ｍコンターの地形図ではこのような目的に達しない。インドネシア国内のかんがい事業の場合，いろいろと検討された結果，オルソフォトマップに 100ｍ間隔のスポット水準測量点をプロットしたものが実用的であると認められている。スポットの水準位置は地上測量による場合（測線方向ポールによる見通しテープによる測距）と引伸空中写真上にプリックする場合とがある。いずれもオル，ソフオトに転記する際に誤差を生ずるが，機械図化によるコンター描画に比較して水準の精度は格段に高い。一般にＪＩＣＡのおこなう図化の場合，その仕様書が相手側に明らかにされていないので，とかく図化の精度が悪いということになりがちである。又，作業開始後，プランオブオペレーションの検討の段階で生ずる相手国側の要請はチームとＪＩＣＡとの契約に含まれていないとの理由で採りあ

げられない場合が多い。ＪＩＣＡが契約する際の特別仕様事項について充分な検討が必要とされる。

(2) 低平地の排水計画について

計画地区内に低平地が含まれる場合

① 地形図の標高の精度

② 河口（又は合流点）の水位（変動する）

③ 許容湛水深

等々極めて技術的にむずかしい要素を含んでいる。更に許容湛水深と在来種水稲作付等の問題もあって，短期間に調査計画をとりまとめることは計画の精度と関連し困難である。更に気象の周年的な変化，又は長周期の変化等をも考慮に入れなければ，計画としてなり立たないか，又はその様な予測の不確実な現象に対応する機械用排水方式を導入する計画とせざるを得ないが，米の生産水準と考え合わせると維持管理コストとの関係から実施不能の場合も考えられる。今後，低平地（低湿地）開発のウェイトが高まるなかで，基本的にどのように考えて対処していくか充分な検討が必要である。

(3) 大規模排水機場，大規模排水樋門関係資料

上記に関連して大規模排水機場，大規模排水樋門の設計例維持管理に要する費用の実績等の資料が必要とされる。関連して日本における河口堰，アオ取水の実施例の資料も必要となっている。

(4) 水文資料不足の場合の対応

タンクモデル法等で解析する場合でも実証となる資料は少しでも多い方がより正確な推定をすることができる。必要な水文観測は相手国が実施するようにＳ／Ｗで決められる場合が多いが，実際には単年度の調査では対応不充分であり，調査の終るころようやく観測が始まる。これは相手側の対応を改善すべきであるが，実務としては調査団が必要機材を携行し直ちに観測するのが有効である。

(5) マイクロフィルム化のための図面（製図規格）

一般に報告書等に添付される図面はマイクロフィルムにより縮小されたものがコピーされて添付されるが，図面の細線，数字等が不鮮明となりやすい。マイクロフィルム化するための製図規格が必要である。

(6) コンピューターの利用

水収支計算，不等流計算，構造物計算等既存のリフトフェアーによる計算例が多くなっている。したがって計算結果を示されただけでは具体的にどのように考えて，どのような順序でどのように計算していくのかわからない場合がある。しかし技術者を対象とする技術力の向上のためには，このような実例が一番有効であると考えられる。しかしながら，これは個人の技術力の向上であり，昨今のコンピューターシステムを導入したシステム化した技術力向上とはその基礎となっても，直接つながらない面があり，今後どのようにコンピューターシステムを導入していくか充分に検討する必要がある。

(7) 比較設計，比較案

かんがい開発について，Ｍ／Ｐ→Ｆ／Ｓ→Ｄ／Ｄと進められていくが，以前の経緯に沿って比較設計がおこなわれにくい傾向があり，又これは（以前の経緯で進むことは）ＪＩＣＡと又は相手国と契約するコンサルタントにとっては最短の経路であり最も容易な方法であるとも考えられる。

## 4. インドネシアにおける灌漑用水管理事業ＣＩＴＡＧＡＭＰＯＲ ＰＲＯＪＥＣＴの紹介

インドネシア；公共事業省　水資源総局
かんがい局　技術計画部
松　居　正　治

インドネシアでは，第一次五ケ年計画以降かんがいシステムの修復事業および新規かんがい開発事業が公共事業者で強力におし推められてきている。可成りの幹線施設は国際融資機関の協力を得て整備された。近年は農業省の管轄である第三次水路以下末端施設についても，重要なProjectについては，公共事業省の支援が行われている。事業効果を計画的に達成するためには，末端施設を整備して農場レベルの水管理を適切に行うことが重要であるとの認識が高まりつつある。ＡＤＢは，中部ジャワにおいてTajum Irrigation Project, Gawbarsari & Pesanggraban Irrigation Rebabilitation Project, Sempor Dam Project などに対して融資し支援して来た。新たに，これらの project Area 65,000ha を対象とした Irrigation Water Mavageweut Project in Citagampor in Ceutral Javaについても理解をしめし，インドネシア側の要請に対応して，一部財政支援が行われている。

公共事業省は本project をIst April 1981に下記の目的をもって発足させた。

The main purposses of this Project are to develop the efficient water distribution systems and to insure optimum on-farm utilization of water for increasing crop production and farm income through the trainings and demonstrations on water management and the improved package practices of crop cultivation.

このProject の技術指導は，TaiwanのＳＩNOTEC Engineering Consultauts Incが受注し，そのConsulting Service は22 March 1982 に開始され，４ケ年の計画で進行中である。数多くの問題と困難があるようであるが，現在は丁度中間でありInterim Report が提出された段階である。

この種のproject は相当のWeiglit を官民の教育研修におく必要があり，本Project のTerms of Reference とTraining Aspect は，将来の参考になる点も多いと考えられるので以下に御紹介することにした。

(1) 計画地域

| | | |
|---|---|---|
| ① | Lower Citanduy Irrigation Project Area | 24,000 ha |
| ② | Sempor Dam and Irrigation Project Area | 17,800 ha |
| ③ | Gambarsari – Pesanggraban Rebabilitation Project | 20,000 ha |
| ④ | Tajum Inigation Project | 3,400 ha |
| | 合計 | 65,400 ha |

位置はFig. 1 に示す

(2) 計画事業の組織図　　Fig. 2 に示す

(3) 事業実施協力機関図　　Fig. 3 に示す

(4) Terms of Reference　　Reference －1に示す

(5) 研修計画は次の3段階で実施される。

① First Groupとして，公共事業省のProject Staff, seksi staff および農業関係のMiddle Level Extension Worker（Group －A）

② Second Groupとして，灌漑施設のSystem Operator，Irrigation Field Officer Gate keeperなど。

③ Third GroupとしてVillage Wate MasterとKeyfarmerの国内研修と海外研修が計画されている。若干の説明をReference －2に示す。

また，Tentative Plan of Training Course Group－A，program for Group－B Teaching Seminarを Reference 3.4に示す。

(6) そ の 他

Consultantが作成したRegulation for Water Users Associationを Reference 5に示す。

# LOCATION MAP
# OF CITAGAMPOR PROJECT
Scale 1 : 400.000

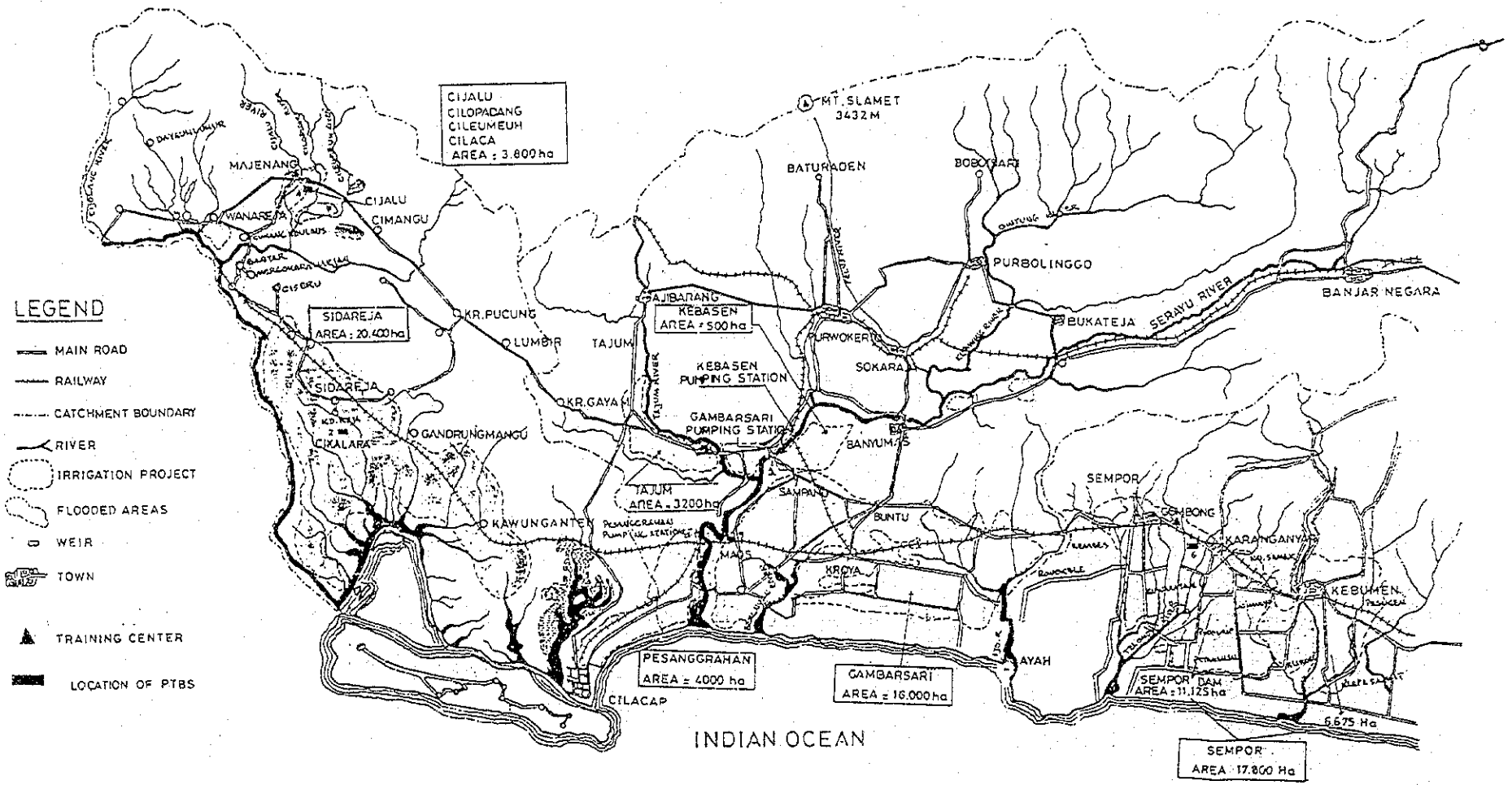


FIGURE: 2.

ORGANIZATION CHART OF IRRIGATION WATER MANAGEMENT PROJECT
IN CITAGAMPOR, CENTRAL JAVA

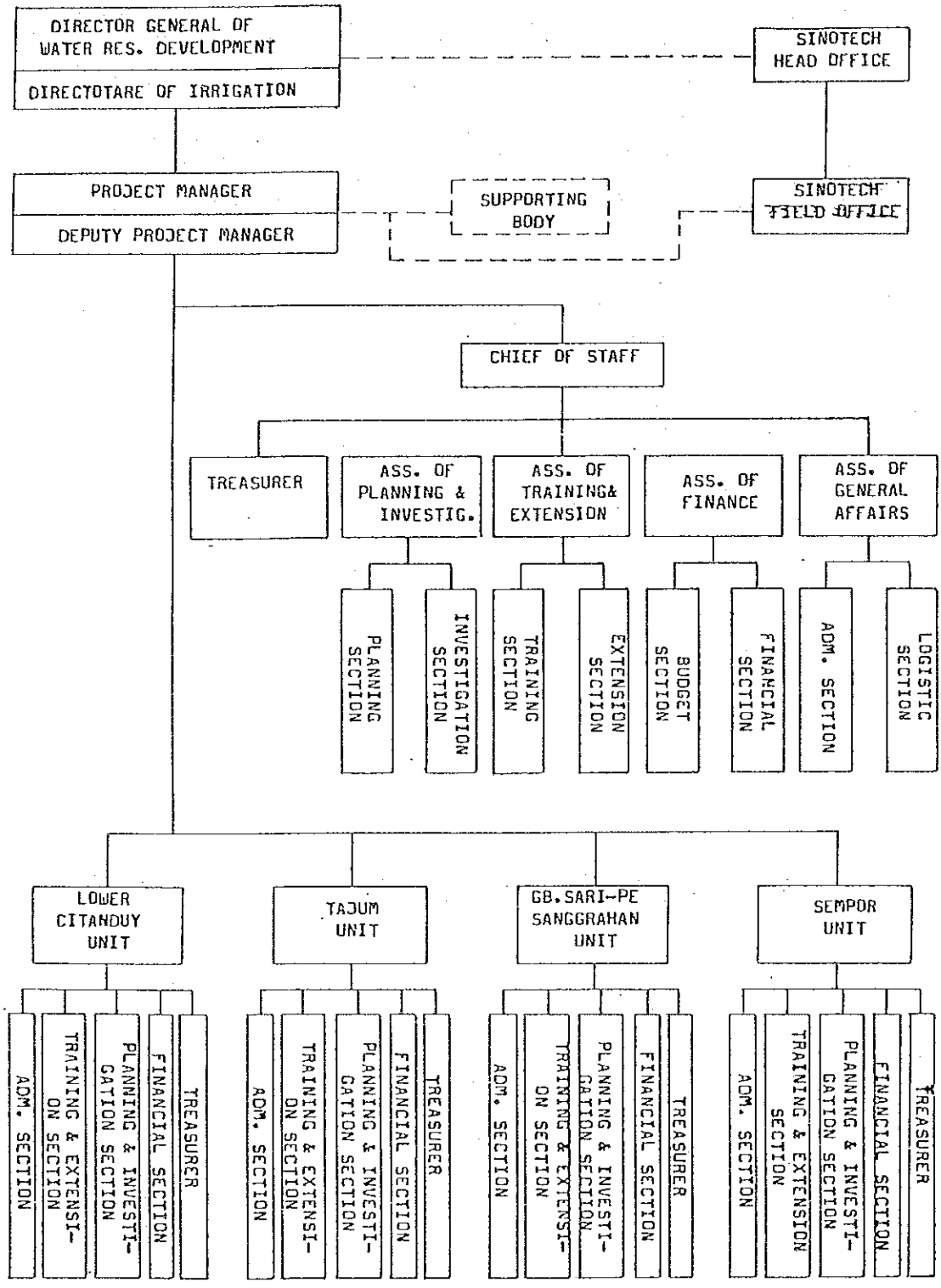
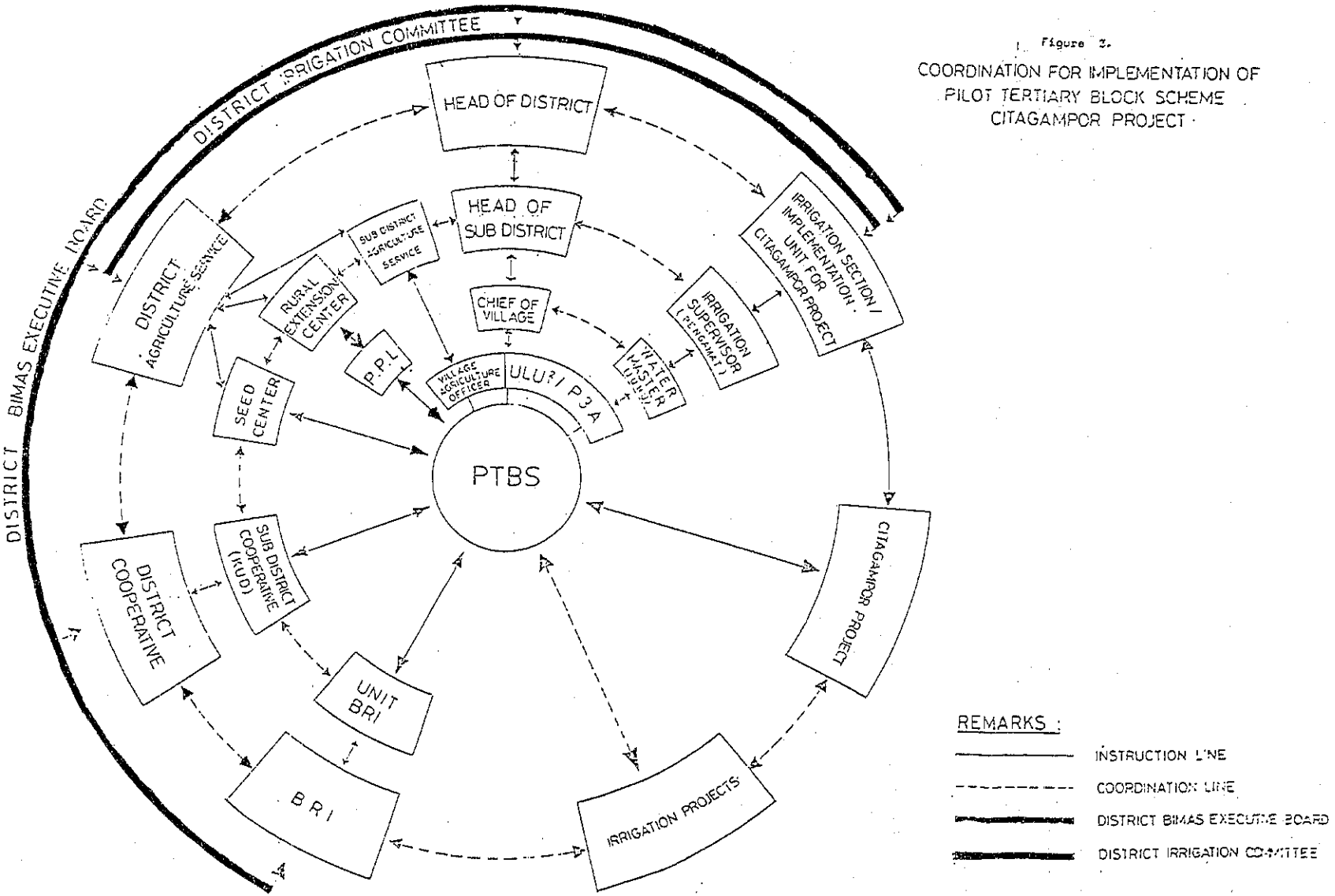


Figure 3.

COORDINATION FOR IMPLEMENTATION OF PILOT TERTIARY BLOCK SCHEME CITAGAMPOR PROJECT



Reference-1

APPENDIX-A

REVISED TERMS OF REFERENCE (Interim Report Nov: 1983)

1. Objective of the Services

An experienced Foreign Consulting Firm would be engaged to assist the Directorate General of Water Resources Development in development of efficient water distribution systems and to insure optimum on-farm utilization of this water for crop production.

2. Scope of Services

The water management will be carried out in four Projects in the Central Java Province. The four projects are :

The Lower Citanduy Irrigation Project covering 24,200 ha
The Sempor Dam and Irrigation Project covering 17,800 ha
The Gambarsari-Pesanggrahan Rehabilitation Project covering 20,000 ha
The Tajum Irrigation Project covering 3,400 ha

The Consultants will assist DGWRD in :

2.1. Establishing or continuing pilot tertiary block schemes in the above four Projects of 50-90 ha each to :

(1) Generate benchmark information and establish criteria for optimum utilization.

(2) Develop efficient water use and delivery procedures on the pilot tertiary block areas so as to encourage cooperation among Public Works personnel, local government personnel, other local agencies and water users associations.

(3) Conduct coordination delivery system management training and demonstration for project Operation and Maintenance.

2.2. Developing programs and improving skills at DPU Seksi and Water User level operation by determining local water use pattern and practices before water delivery starts. Then operate the delivery system according to local consensus for DPU Seksi and Water Users. As confidence cooperation develop further programs to include improved efficiency of water use and syncronized water delivery to achieve optimum agricultural productions are to be formulated.

2.3. Developing special programs to gain DPU Seksi operator cooperating with water users association within the Project time-frame and beyond, and the operational procedures to reinforce the improved two-way linkage between the delivery system and the water users association to improve water and other input use efficiency at an accelerated pace.

2.4. Cooperating with Department of Agriculture (Dinas Pertanian) in integration of water management with total packages of practices under various local conditions. Cooperation includes use of pilot tertiary block scheme facilities for demonstration/training programs for water management under the local conditions.

2.5. Checking and reviewing existing manuals and practises of the O & M and preparing a detailed Operation and Maintenance plan for the Project facilities including :

(1) Standard and criteria for both routine and emergency operation and maintenance. The use of generalized trasient flow Computer models is required to determine response time of the irrigation and drainage systems.

(2) Standard and criteria for rotating water irrigation systems to be developed or improved by the Project.
Testing of the rotation criteria on transient flow computer models is required.

(3) Arrangement for record-keeping which will permit current evaluation of the physical conditions of any portion of the entire irrigation and drainage system.

(4) Arrangement for personnel (including training), facilities and resources required for water management and sustained operation and maintenance.

(5) Specific guidelines and procedures for regular consultation with the water users in accordance with Government regulation.

2.6. Assisting the Public Works Section in implementing the proposed detailed O & M plan.

2.7. Carrying out the training for irrigation main system operators, field agricultural extention workers and supervisors, on-farm members and key members of the water users association in proper water management.

3. Expertise Required

For proposed Consulting Services, it is anticipated that the total expertise required will not exceed 135 man-month within a period of four years (48 months).

Expertise required will be :

(1) Water Management Specialist/Team Leader

Highly experienced, minimum 12 years in irrigation and drainage fields for operation and maintenance and water management, with substantial experience in managing agricultural development projects. Experience in tropical region will be an advantage.
He will have to be capable to act as the Consultant's Team Leader.

(2) Irrigated Agriculture Specialist

With sufficient experience of minimum 10 years in tropical soils and crops in particular, irrigated double rice cropping and compenents in the establishment and supervision of pilot tertiary block schemes.

(3) Hydro-Meteorologist

With sufficient experience in hydro-meteorology minimum 8 years in collecting and analyzing hydrologic and meteorologic data.
He must have experience in transient flow computer models for irrigation system.

(4) O & M Specialist

With sufficient experience of minimum 10 years in operation and maintenance of irrigation and drainage projects.

(5) Irrigation Implementation Specialist

With sufficient experience of minimum 10 years in planning and supervising irrigation and drainage programs for double rice cropping and palawija crops.

(6) Water Management Specialist of Pumping Irrigation System

With sufficient experience of minimum 10 years in planning and supervising the pump irrigation operation for double rice cropping and palawija crops.

(7) Reservoir Operation Specialist

With sufficient experience of minimum 10 years in planning and supervising reservoir operation for irrigation water supply.

(8) Water Balance Investigation Specialist

With sufficient experience of minimum 10 years in planning and supervising water management for paddy and palawija crops.
He must have experience in planning, implementing and reporting the water balance investigation at field level, tertiary system and main system.

(9) Sub-surface Drainage Specialist

With sufficient experience of minimum 10 years in drainage works particularly sub-surface drainage for growing palawija crops in low-lying irrigated paddy areas.

(10) Electricity Supply Specialist

With sufficient experience of minimum 10 years in designs and operation of inter-changing electricity supply for pumping station from generators to line electricity supply.

(11) Other Specialist

With sufficient experience in special fields as may be required in the course of carrying out the works,

4. Reporting Requirements

Consultants will submit English language reports to the DGWRD and Bank during the services. Bank's copies of such reports will be air mailed at the same time copies are supplied to DGWRD.
All reports and drawings will be in English language and of standard dimensions. The metric system will be used exclusively in all reports, drawings and calculations.
The reports shall include the explanation of work. In addition, the Consultants will arrange for a continuous photographic record on colour slides and colour photographs throughout the execution of the Project.

Consultant's reports required in carrying out the services will consist of :

(1) An inception report (25 copies to the DGWRD and 5 copies to the Bank) at the end of the second month after the commencement of duties.

(2) Monthly and quarterly report (25 copies to the DGWRD and 5 copies to the Bank) every month and every three months, respectively, describing :

- The Consultant's activities during the reporting period.
- A summary of interim findings.
- A brief description of the proposed activities of each team member for the subsequent reporting period.

(3) Interim Report (25 copies to the DGWRD and 5 copies to the Bank)

Interim Report should be submitted after eighteen (18) months of the assignment, consisting among others :

- Consultants findings of the present O & M procedures and practices, and problem areas.
- Draft recommendation of the proposed detailed O & M plan and its implementation for each Seksi.

The recommendation should cover the staffing, organizing and budgetting, and needs of equipment.

(4) At the end of services, a set of final report (25 copies to the DGWRD and 5 copies to the Bank) covering overall consulting services for the Project.

During the implementation of the services the Consultant is responsible for transfer of knowledge and experience to the Indonesian counterparts. Therefore at the end of the services the Consultant has to submit a lectures note describing major/essential aspects of their lectures and instruction within the frame works of the transfer of knowledge (50 copies to the DGWRD and 5 copies to the Bank)

5. General Remarks

The Consultants would also take into account the followings :

5.1. The Consultants project personnel will have to organize their own facilities for translating existing reports and data relevant to the Project.

5.2. The Consultants project personnel should adopt themselves as quickly as possible to the Indonesian situation and conditions, especially the local living and working conditions at the job-site.

5.3. The Consultants should purchase on behalf of the Government such as educational equipment, hydrological equipment, office equipment and other equipment, necessary for the successful implementation of the assignment.

5.4. Since the Project has multi-aspects and has to be functional in supporting other national development programs, the Consultant should be aware that beginning from the early stage of the Project, proper coordination with other Ministries, Directorate Generals such as the Directorate General for Food Crop Agriculture, Directorate General of Land Use Planning etc., should be taken into consideration according to the guidance from the Ministry.

5.5. Employment of the Consultant's Services :

(1) The total man-months will not exceed 135 man-months.

(2) Execution of the works will require close contact and good cooperation with the DGWRD Executing Body.

(3) The Consultant should commence the work within 30 days after the effectiveness of the contract.

5.6. Employment of other specialist of the local consulting services, if necessary:

(1) Other specialists from the local consultants in special fields are required in the course of carrying out the works.

(2) Total man-months for the local consultants are estimated to be 30.

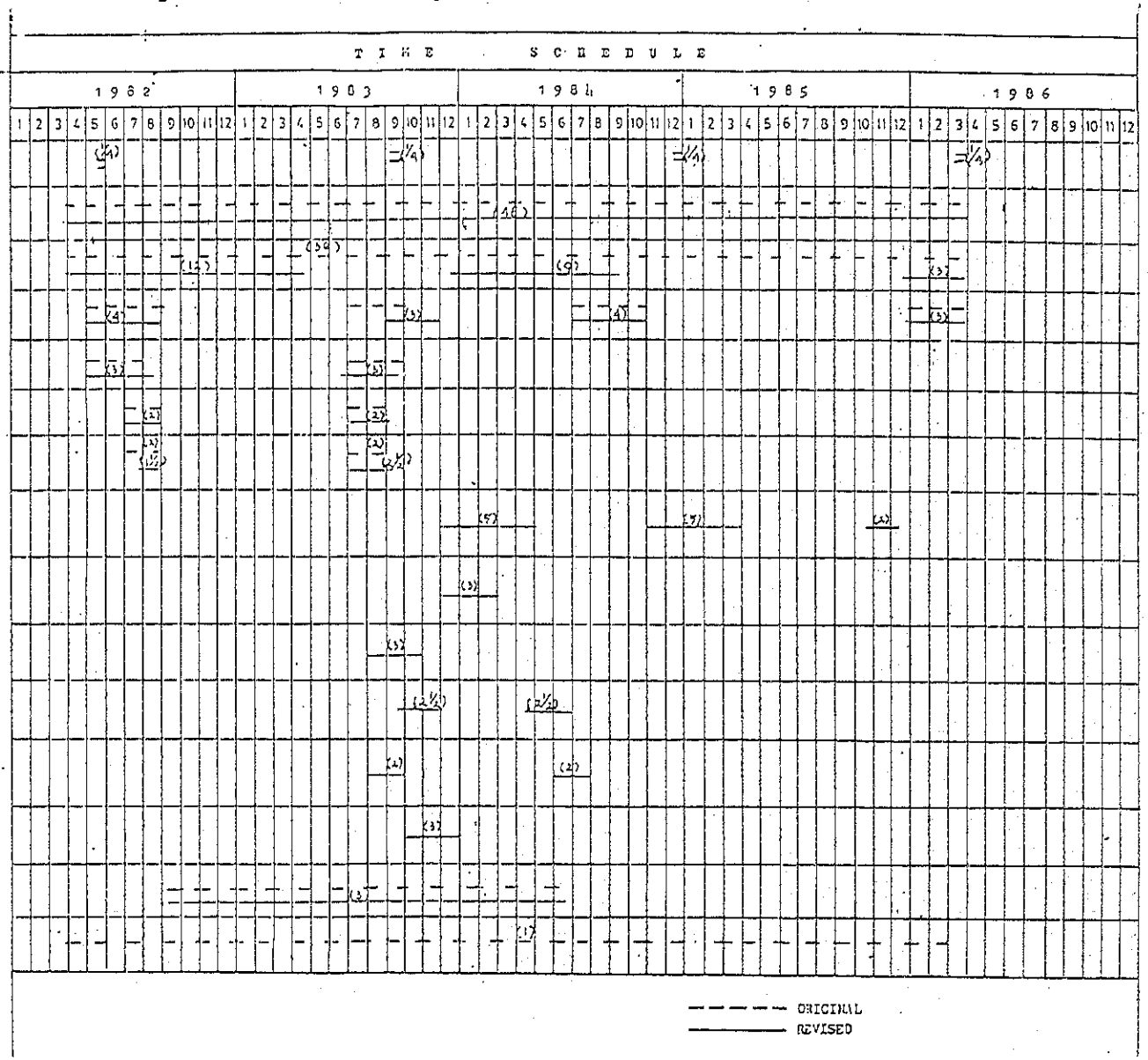
(3) The local consultants shall be recruited by the Ministry independently.

5.7. The base office will be located in Purwokerto, Central Java Province. However, in executing the consulting services the Consultants are required to live at the job-sites frequently as depends on the work necessity.

5.8. Consulting Firms from developed member countries who have been invited are encouraged to collaborate with domestic consultants or consultant from other developing member countries.

# Assignmeut Suhedule of Expert

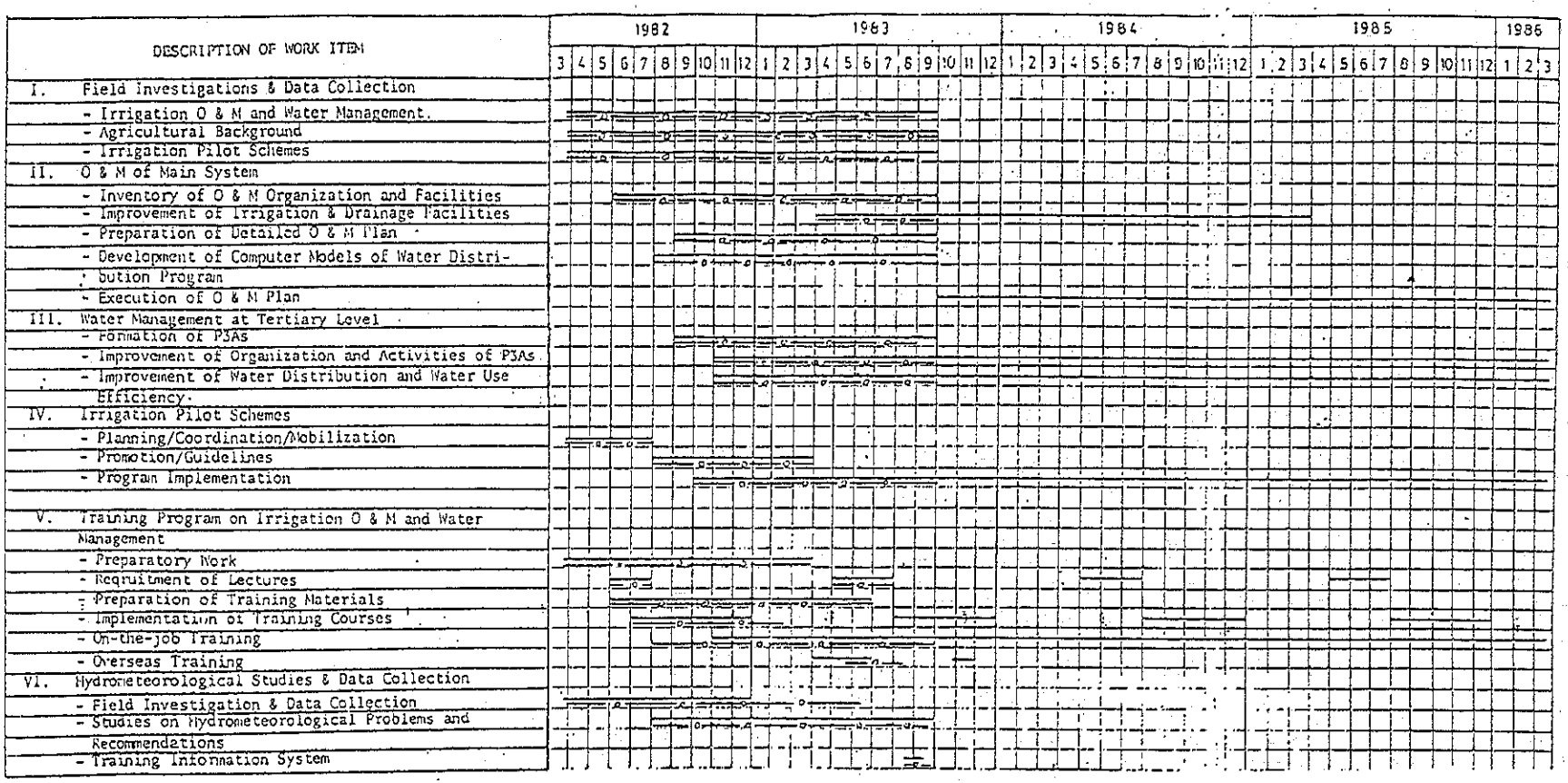
| NAME / SPECIALIST | M / M |
|---|---|
| 1. Y. K. YANG<br>Project Director. | 1 |
| 2. S. F. WU / Team Leader<br>Water Management Specialist. | 48 |
| 3. H. D. TSENG<br>Irrigation Agriculture Specialist. | 24 |
| 4. S. C. LEE<br>O & M Specialist. | 14 |
| 5. T. H. LEE<br>Water Management Specialist. | 6 |
| 6. C. E. FAN<br>Irrigation Specialist. | 4 |
| 7. R. Y. WANG<br>Hydrometeorological Specialist. | 4 |
| 8. S. C. LEE<br>Irrigation Implementation Specialist. | 12 |
| 9. J. P. CHU<br>Water Management Specialist of Pumping System. | 3 |
| 10. R. T. HSIUNG<br>Reservoir Specialist. | 3 |
| 11. J. S. HSU<br>Water Balance Investigation Specialist. | 5 |
| 12. C. T. WU<br>Sub Surface Drainage Specialist. | 4 |
| 13. S. H. LIN<br>Electricity Supply Specialist. | 3 |
| 14. Computer Programming in Home Office. | 3 |
| 15. Home Office Support. | 1 |
| TOTAL : | 135 |



CONSULTING SERVICES FOR CITAGAMPOR PROJECT

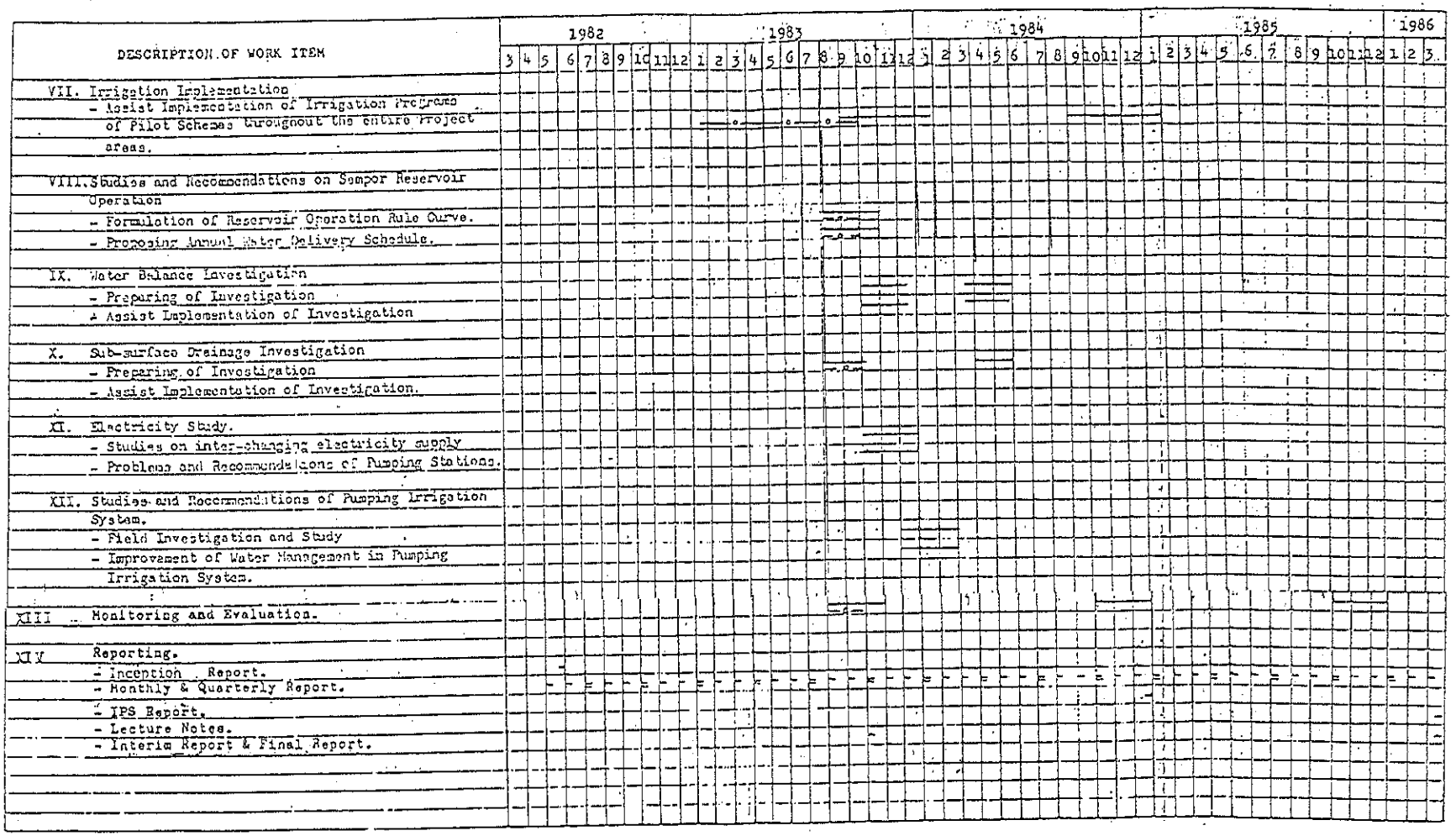
REVISED IMPLEMENTATION SCHEDULE

APPENDIX-C




—— Proposed progress

—o— Actual progress


DESCRIPTION OF WORK ITEM
1982
1983
1984
1985
1986
3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3
VII. Irrigation Implementation
- Assist Implementation of Irrigation Programs of Pilot Schemes throughout the entire Project areas.
VIII. Studies and Recommendations on Sempor Reservoir Operation
- Formulation of Reservoir Operation Rule Curve.
- Proposing Annual Water Delivery Schedule.
IX. Water Balance Investigation
- Preparing of Investigation
- Assist Implementation of Investigation
X. Sub-surface Drainage Investigation
- Preparing of Investigation
- Assist Implementation of Investigation.
XI. Electricity Study.
- Studies on inter-changing electricity supply
- Problems and Recommendations of Pumping Stations.
XII. Studies and Recommendations of Pumping Irrigation System.
- Field Investigation and Study
- Improvement of Water Management in Pumping Irrigation System.
XIII Monitoring and Evaluation.
XIV Reporting.
- Inception Report.
- Monthly & Quarterly Report.
- IPS Report.
- Lecture Notes.
- Interim Report & Final Report.

## 3.5. TRAINING PROGRAM

### 3.5.1. IN-COUNTRY TRAINING

In-country training has been carried out since late August 1982. The only one Group-A training was the first program carried out by the Project in August-September 1982 for a period of three weeks. The 41 participants consist of middle level staff from the Projects, DPUP Wilayah and Seksi, Agricultural Service of Wilayah and Kabupaten, and Rural Development Division of Kabupaten, whose jobs are concerned with O & M and or water management.

Based on inquiries made at the end of Group-A training, it was found that :

- 35 % of the lecture subjects given in the course were new to the participants, 36 % deepened the knowledges of the participants and 29 % were refresher.

- 60 % and 40 % of the lecture subjects gave much benefit and sufficient benefit respectively to the participants.

- Lecture hours of 79 % of the lecture subjects were considered sufficient, while 21 % were considered insufficient.

- The way/methodology of teaching was 44 % considered good and 54.2 % sufficient, and was only 1.8 % considered insufficient.

Group-B training has been carried out since December 1982. As of mid October 1983, training of four batches of Group-B had been conducted. The participants were junior level staff consisting of chief of Ranting, PFM, PPL, kecamatan agricultural officer and staff from related Divisions of Kabupaten Government. Most of the lecturers were selected from the participants of Group-A training.

Following list the number of participants and the period of training already conducted.

| Group | Number of Participants | Training Period | | |
|---|---|---|---|---|
| | | Days | From | To |
| A | 41 | 21 | 23-8-1982 | 17-9-1982 |
| B | 48 | 14 | 6-12-1982 | 18-12-1982 |
| | 48 | 14 | 3-1-1983 | 15-1-1983 |
| | 49 | 14 | 9-2-1983 | 22-2-1983 |
| | 44 | 14 | 16-3-1983 | 29-3-1983 |
| Total | 230 | | | |

According to the inquiries on the implementation of lectures, lecture subjects and the methodology of teaching, the following results have been concluded :

- 57.2 % of the lecture subjects given in the course were new to the participants, 27 % deepened the knowledges of the participants and only 15 % were refresher.

- 56 % and 41 % of the lecture subjects gave the participants much benefit and sufficient benefit respectively.

- Lecture hours of 77.5 % of the lecture subjects were considered sufficient, while 20.5 % were considered insufficient.

- The way/methodology of teaching was 44.4 % considered good and 48.8 % sufficient, and was only 6.2 % considered insufficient.

Group-C training which may include farm level personnel consisting of Ulu-Ulu and their assistants, key farmers, gate keepers and weir operator, has not been conducted since the construction of the three training centers respectively in Lower Citanduy, Gambarsari-Pesanggrahan, and Sempor Units were just completed. The first batch of training for Group-C will be conducted before the end of October 1983.

After the completion of several training programs for Group-A and Group-B, it is obvious that the water management courses for the middle and junior level staffs were not enough since they still do not put into practices what they have been taught during the training courses. It seems that they already understood the theory of water management. However, it still takes time for them to practice what they have learnt because they are lack of practical experience in implementation.

As for the Group-B training, practicing the techniques from demonstration is more important than the transfer of theoritical knowledge.

### 3.5.2. OVERSEAS TRAINING

The First Group short-term overseas training program in Taiwan for the two trainees was successfully concluded as from June 6 to June 19, 1983. The two trainees are :

- Drs. Hamuji Waluyo BIE, Chief of SUb-Directorate of O & M, DOI, DGWRD.
- Mr. Paul Santosa MSc., Deputy Project Manager of CITAGAMPOR Project.

As for the Second Group short-term overseas training program for the two trainees, according to the schedule, the program will last for 14 days in Asian countries , starting from 30 October 1983 and ending at 12 November 1983. These two trainees are :

- Ir. Martopo, Chief of Water Resources Sub-Service, Central Java Provincial Public Works Service, and as member of Project Directives.

- Ir. Kismadi, Chief of DPUP Wilayah Banyumas, and as Project Manager of CITAGAMPOR Project.

The long-term overseas training program in Taiwan for the four trainees as from 9 May to 6 August 1983, had been successfully concluded. They are as follows :

- Three trainees from CITAGAMPOR Project are Ir. Achmad Ngubadah, Iskandar Zulkarnain BE and Slamet Legowo BIE.
- One trainee for DOI is Budiantoro BE.

As for evaluation of training, according to the SINOTECH Head office in Taipei, it was informed that the four participants trained in Taiwan have studied hard and got excellent results. In general both the long-term and the First Group short-term overseas training programs had been carried out satisfactorily. They were impressed with the successful operation and water management in the foreign country they visited and thus set up a positive concept on proper water management.

According to the impression of the four long-term trainees, they provided the following opinions :

- The implementation of the program as a whole is satisfactory.
- Based on the original schedule, two-third of the program are lectures and one-third are field trips and field practices. It would be better if the time for field practices be increase to two-third of the whole period, while that for lectures be decreased to one-third only.
- More emphasis could be given to practical operation and management.
- Introduction to detailed theory may be reduced to minimum.
- Opportunity should be given to trainees to practice the operation and management of irrigation systems jointly with the O & M personnel of the host agencies.

- The trainees may individually or jointly simulate a program for operation and management and practicipate in actual implementation. Then review and discussion of the perfonnance have to be made.

- After the completion of overseas training and returning to the home country, the trainees may prepare a program for water management of an irrigation system and be in charge of supervision of field operation within a Seksi or Ranting.

Reference-3

APPENDIX- B

Monthly Report No.3
June : 1982

## TENTATIVE PLAN

## LECTURES AND ALLOCATED TIMES FOR THE TRAINING COURSE OF GROUP-A ( Middle Level Staff )
( Dates : August 23-September 15, 1982 )

| | Subject | Time (hrs) | Lecturer | Remarks |
|---|---|---|---|---|
| I. | Opening Speech | 1 | Mr. Soewasono | |
| II. | Special Aspect Related to Irrigation Water Management | 13 | | |
| | 1. Laws/Regulations Concerned | | | |
| | - National Aspect | 2 | Mr. Sudiro<br>Chief of Legal Office, DGWRD | |
| | - Regional Aspect | 1 | Chief of Water Resources Division, DPUP of Central Java | |
| | 2. Public Relations | 2 | To be from PUSDIKLAT Surabaya | |
| | 3. Rural Sociology | 2 | To be from local University | |
| | 4. Extension of Irrigation Water Management | 2 | Mr. Soekadaryanto<br>Chief, Sub-Dit. O & M, DOI | |
| | 5. Practices of Management and Discipline in Thinking | 4 | Mr. Subandi<br>Irrigation Advisor to Minister of PW. | Using an article by Minister of PW |

| | Subject | Time (hrs) | Lecturer | Remarks |
|---|---|---|---|---|
| III. | Crop Cultivation & Farm Management | 21 | | See svllabuses in Appendix-C |
| | 1. Soil-Water-Plant Relationships | 12 | Mr. H. D. Tseng Irr. Agri. Specialist. | Lecture Notes by H. D. Tseng |
| | 2. Crop Production in Irrigated Paddy Land | 3 | - idem - and one from M O A | - idem.- |
| | 3. Cropping Pattern, Cropping Calendar & Cropping Intensity | 3 | - idem - | - idem - |
| | 4. Farming Program for the Tertiary Block | 3 | - idem - | - idem - |
| IV. | Water management at On-Farm & Off-Farm Levels | 84 | | See svllabuses in Appendix-C |
| | 1. Agro & Hydro-meteorology for Irrigation Water Management | 10 | Mr. R. Y. Wang Hydrometeorologist | Lecture Notes by R. Y. Wang |
| | 2. Water Quality & Irrigation | 4 | Mr. Paul S. Deputy Project Manager | Lecture Notes by T. H. Lee and Paul Santosa |
| | 3. Drainage in Agricultural Land | 3 | - idem - | - idem - |
| | 4. Crop & Irrigation Water Requirements | 11 | Mr. C. E. Kan Irr. Specialist | Lecture Notes by C. E. Kan |

| | Subject | Time (hrs) | Lecturer | Remarks |
|---|---|---|---|---|
| 5. | Irrigation System | 3 | Mr. S. F. Wu Team Leader/ W.M. Specilaist | Lecture Notes by S.F. Wu |
| 6. | Preparation of O & M Plan | 8 | Mr. S. C. Lee O & M Specialist | Lecture Notes by S. C. Lee |
| 7. | Layout of Irrigation & Drainage Systems | 7 | Mr. S. F. Wu | Lecture Notes by Mr. S. F. Wu |
| 8. | Orgaizations for Irrigation Water Management | 4 | - idem - & Mr. Sudiro | Lecture Notes by T. H. Lee |
| 9. | Technical O & M of Main System Facilities | 10 | Mr. S. C. Lee | Lecture Notes by S. C. Lee |
| 10. | Water Management at Tertiary Level | 10 | Mr. S. F. Wu | Lecture Notes by T. H. Lee |
| 11. | Integrated Irrigation Water Management | 3 | Mr. Abdurachim, Chief, Division of Operation Staff, PROSIDA | Lecture Notes by T. H. Lee |
| 12. | O & M Plan for the IPS of Sempor Unit | 11 | Mr. S. C. Lee | To be used as an exercise for trainees and then discussed and explained. |
| V. | Special Lecturing | 4 | | See syllabuses in Appendix-C |
| 1. | Farmers Associations in Taiwan | 2 | Mr. Y. K. Yang General Manager | |

| | Subject | Time (hrs) | Lecturer | Remarks |
|---|---|---|---|---|
| | | | Sinotech Branch Office in Jakarta/Farmers Institution Specialist | |
| | 2. Irrigation Associations in Taiwan | 2 | Mr. S. F. Wu | |
| VI. | Film Shows (Irr. & Agri.) | 6 | | |
| VII. | Homework/Exercises | 10 | | |
| VIII. | Field Trips | 6 | | PIB & IPS |
| IX. | Discussions | 3 | | |
| X. | Tests | 3 | | |
| XI. | Others | 8 | | To be arranged later. |
| XII. | Closing Speech | 1 | | |
| XIII. | Study Tour | 3 days | | |
| | T o t a l · | 160 hrs plus 3 days | | |

Note : Every weekday the class hours are 9 including 4 in the morning, 3 in the afternoon and 2 in the evening.

## SYLLABUSES OF LECTURE SUBJECTS

## III. CROP CULTIVATION AND FARM MANAGEMENT

### III-1. Soil-Water-Plant Relationships (12 hours)

This course covers three sections which are given as follows:

1. Soil-water relations.
2. Plant-water relations.
3. Soil-water-plant relations.

In the first section, the physical properties of soils which included soil texture, soil structure, soil porosity and soil consistence are explained. About the natures of soil-moisture, which covers the forms of soil-moisture, the retention of water by soil, soil-moisture contents, the available soil-moisture and readily available moisture are described. On the soil-moisture movements, the transport of water in the soil and the factors influencing water absorption are explained. About measurements of soil-moisture, the soil sampling and the methods for this purpose are briefly discussed.

In the second section talks the plant-water relation to understand water absorption, conduction, and transpiration, the root system in relation to irrigation, the root development of palawija and irrigation practices, and response of paddy to water regime.

In the third section discuss the concepts of soil-water as well as nutrient availability by crops in relation to soil, plant growth in relation to drainage and salinity, water requirements of crops, the paddy soils, and yield responses to water appearing from paddy rice, corn and soybean, among others.

### III-2. Crop Production in Irrigated Paddy Land

The contents of this lecture consist of the following,

with the information available for the project area to be illustrated:

1. Introduction.

2. Cultural Practices for Crop Production.

3. On-farm Water Management on Crop Production.

4. INSUS, BIMAS, INMAS & Agricultural Extension Programs on Crop Production.

The first section introduces the present crop production in irrigated and non-irrigated paddy lands in Central Java in general, in the project area in particular.

The second section discusses the present cultural practices and the constraints on the crop production in irrigated paddy lands, and introduces the improved cultural practices for irrigated crop production.

The third section discusses the organization of farmers, and on-farm O & M personnel for tertiary water management on crop production in the irrigated paddy lands.

The forth section introduces the INSUS, BIMAS, INMAS and Food Crop Extension Programs on crop production in irrigated paddy lands.

III-3. Cropping Pattern, Cropping Calendar & Cropping Intensity (3 hrs

The first section of the subject introduces the importance of irrigation to the cropping pattern, cropping calendar and cropping intensity; and in turn, of the latter three items to the water management plan as well as practices.

Then in the second section are illustrated the approaches

to increase the cropping intensity in an irrigation district.

Subsequently the physical, social and economic factors influencing the cropping pattern in an irrigation district are discussed. Among these factors discussed in details are plant growing period and irrigation requirement, soil, climate, source and availability abd quality of water, farming practice, water distribution practice, system maintenance practice, plant protection, drainage and local particulars.

Then a sample cropping pattern of Sidomulyo PTB of Sempor Unite is presented illustrating the preparation of it, in order to more effectively impart the trainees clearer impression.

At the end are discussed the principles to arrange the irrigation plan and cropping calender based on fixed cropping pattern, and the need to adjust the cropping pattern.

III-4. Farming Program for Tertiary Block (3 hrs)

This course covers the sections as follows:

1. Introduction.
2. Data and Information for Farming Program.
3. Coordinations with Related Agencies and Farmers.
4. Preparing Farming Program: Sample from Maos PTB.
5. Implementation, Monitoring, Evaluation, and Extension.

The first section of introduction is to explain the objectives and the importance of farming program to the water management at tertiary level.

The second section is to discuss what kinds of data and ininformation to be collected and complied for preparing a farming program.

The third section is to explain the importance of coordinations between related agencies and key-farmers for the decisions on credit, inputs supplies, on-farm water management, cropping patterns and the improved cultural practices, etc.

A sample of the proposed farming program for Maos PTB is given in the fourth section for explanation of the items to be mentioned in the farming program.

In the fifth section are covered the activities and working schedule for implementation, the record forms for monitoring, the farmers' meeting and data collection for evaluation, and the extention of farming program and on-farm water management to the other tertiary blocks in the project area.

## IV. IRRIGATION WATER MANAGEMENT AT OFF-FARM AND ON-FARM LEVELS

### IV -1. Agro- & Hydro- meteorology for Irrigation Water Management ( 10 hours ).

Beginning from the introduction to hydrological cycle on the earth, various hydrological elements are illustrated and their relations with agriculture are explained. Among the elements, those most concerned with sawah agriculture and irrigation as well as drainage are stressed, such as evaporation & ET, infiltration and intake, runoff at farms, basic flows in the rivers, storage in the reservoir, etc.

Principles, methods and recording of measuring major agro- and hydro- meteorological data are briefly explained. General guidance on maintenance and calibration of the equipment are explained.

Finally application of various water resources and agro- and hydro- meteorological data to irrigation water management is described. This includes estimation of ET in relation to crops and the growing stages, estimation and utilization of effective rainfall, calculation of water availability, cause and control of sediment and erosion adjustment of irrigation plan, water management, etc.

### IV -2. Water Quality & Irrigation ( 4 hours )

This subject is mainly concerned with chemical aspect of water quality. It first mentions the effects of water quality on soil and agriculture, and then comes to the point of how to evaluate irrigation water quality and its standards for use.

Then tolerance of major crops to salinity is given, followed by use of saline water of irrigation by considering the leaching requirement.

At the end, the Cikapala PTB is selected as a sample area to explain the concept of water quality and irrigation relationship.

## IV.-3. Drainage in Agricultural Land ( 3 hours )

Drainage problems in agricultural land and damages to crops caused by submergence are discussed, followed by explanations on the sources of exess water that lead to poor drainage. Then drainage practices, including engineering and non- engineering, at farm level are introducted.

Besides, different practices required for different crop fields are stressed, together with consideration of benefit-cost ratio.

Lastly, simple methods to identify drainage problems are given.

## III-4. Crop and Irrigation Water Requirements ( 11 hours )

The method to obtain the crop water requirements by means of mathematical or experimental formula, and fields experiments are described, and the variations of these requirements with crop growing stages are noted as well.

Besides crop water requirements, other elements constituting the irrigation requirements are discussed subsequently. Since the irrigation requirements of a certain irrigation system vary with time (farming progresses and crop growths), and with place (locations

where water to be delivered), discussions on the irrigation requirements at different stages of a crop season and at different regulatory structures are given.

Also the field survey of experiments required to obtain the data of conveyance losses, farm wastes and effective rainfall are briefly described.

The Sempor IPS is taken as a sample area for illustrating the crop and irrigation water requirements.

## IV -5. Irrigation System ( 3 hours )

Among the three types of irrigation system, only the open channel one is detailed, while the sprinkling and dripping ones are simply introduced.

Components of an irrigation system are then illustrated. the canal part is divided into conveyance and distribution system; and the auxiliary structures are classified into control, conveyance and measurement ones, from the viewpoint of the functions of structures.

In addition, basic and simple hydraulic principles are explained on the canals and control as well as measurement structures. Then the factors effecting the proper funtionong of irrigation are discussed.

## IV.-6. Preparation of O & M Plan ( 8 hours )

The operation plan is first introduced. It includes the annual irrigation plans set for target, and the periodical plans worked out for routine water distribution.

Firstly the basic information required for preparation

of annual irrigation plan are explained, succeeding by the relationship between cropping patterns, golongan system and annual irrigation plan, as well as the analysis of water balance. Then general procedures to prepare such plans are given.

Then, procedures of water delivery scheduling, including golongan and rotional systems and emergency treatment, are described.

Maintenance program based on the physical condition of irrigation and drainage systems is also a part of the lecture. At the last is explained how to estimate the annual O & M cost needed.

IV-7. Layout of Irrigation & Drainage Systems ( 7 hours )

Firstly the relationship between system layout and system O & M is presented. Then with the listing of the fundamentals of funtional system, principles of system layouts at both main and tertiary levels are discussed. Details of technical aspect including survey and design are omitted in this subject. But the criteria used in the layout of the systems in general, the tertiary level in particular, in the Project area are outlined.

IV-8. Organizatios for Irrigation Water Management ( 4 hours )

The existing organizations, i.e. DPUP, especially Seksi & Ranting, and P3A/Dharma Tirta, respectively for operating and maintaining the irrigation main systems and on-farm systems in the Project area are outlined in this subject.

The basic requirements of an organization, including organic structure, staffing, budgeting, office facilities and equipment and regulation are discussed. Irrigation committee is additionally

presented for discussion too.

The responsibilities of the organizations at various levels from the main to the tertiary system O & M are outlined too. In carrying out their undertakings, whether special program or routine activities, the need of proper management including work programming, control and monitoring, and achievement evaluation are briefly described.

The irrigation water management organizations should keep good inter and intra agencies coordinations and cooperation, therefore discussions on this connection are stressed.

## IV-9. Technical O & M of Main System Facilities ( 10 hrs )

In the beginning, general principles of operation of major structures, pumping station, reservoir, and drainage system are described. The major structures to be mentioned here include headstructure (diversion weir , intake and desilting basin), division structure, check structure, and wasteway structure.

Then, methods and procedures of water distribution will be explained. As for the measurement of water, only Romijn gate, Cipolleti weir, and Parshall flume will be described in detail, while the other measuring devices will be mentioned briefly.

Implementation of maintenance of irrigation and drainage system including routine, periodic, annual and emergency repairs is a part of the lecture. Also, the equipment and facilities required for O & M personnel are included.

The next chapter explains the data recording and processing, updating irrigation plan and evaluating irrigation accomplishment.

Finally, control of sediment intrusion into the canals by means of properly regulating the headwork is discussed.

IV-10. Water Management at Tertiary Level ( 10 hours )

Procedures and practices of on-farm water management, including irrigation and drainage, are presented. Implementation of on-farm water management requires an on-farm irrigation plan, of which the irrigation period must synchronize with that arranged for main system concerned. Thus preparation of such a plan is detailed, which includes collection and use of basic data, and scheduling of irrigation under different availabilities of water.

More emphasis is given at the rotational irrigation, because it requires the irrigation operators to have proper skill for carryong out such a practice. Emergency treatment like intermittent irrigation is given too.

Water application greatly influences the water use efficiency at farm, hence, methods of application of irrigation water at paddy sawah and palawija farms are illustrated, and plot-to-plot irrigation practice are noted. Moreover water application in connection with farming practices are discussed.

Drainage practices at on-farm level are given, outlining how to minimize the excess water impairing agricultural plants.

Finally the subject briefly introduces the proper mechanism required for implementing the water management at tertiary level. For more details about the mechanism are given in another subject entitled "Organizations for Irrigation Water Management".

IV.-11. Integrated Irrigation Water Management ( 3 hrs )

In the beginning, integrated irrigation water management is defined and its importance to good water management and to irrigated agriculture is then interpreted.

Subsequently, major problems presently prevailing in irrigated agriculture are raised. This leads to the approaches toward integrated irrigation water management.

Based on the integrated concept, measures to realize the improved water management of an irrigation system are discussed, which comprise researches and extention work, good system layout and design, proper system O & M, education and training, and last but not the least, socio-economic incentives to farmer and O & M personnel.

IV-12. O & M plan of IPS ( 11 hrs )

The IPS in Sempor Unit is taken as a sample area to explain the procedures of preparing O & M plan for it. Before the explanation is given, how to prepare an O & M plan for the sample area will be given to the trainees as homework exercise as soon as the Subjects of III-6 and III-10 have been lectured.

## V. SPECIAL LECTURES

### V-1. Farmers Associations in Taiwan ( 2 hrs )

In this subject is given introduction to the organizations, functions, activities and achievements of the farmers associations, described the role of the farmers associations in development of the agriculture, also outlined the governmental supervision and guidance, and finally concluded with agricultural extension service, in Taiwan.

### V-2. Irrigation Association in Taiwan ( 2 hrs )

This topic introduces the IRRIGATION ASSOCIATIONS in Taiwan, and in the same time, they are compared with their counterparts in Indonesia.

Prior to introducing the current organizations of irrigation associations, the history of development of the associations in Taiwan is briefed, and its relation with changes of agricultural-environment as well as rural society structure.

How the irrigation associations in Taiwan make planning, implement and monitoring and evaluation of their activities is simply reported.

Furthermore the legal basis, governmental support and supervision, and the coordinations are briefed.

This subject then concludes with the role the associations have played in the agricultural development in Taiwan.

Reference – 4

Monthly Report No. 8
Nov : 1982

## P R E F A C E

This program is aimed to give information to candidates participants and instructors, and others concerning everything relating to teaching seminar for Group-B on irrigation water management consisting of executive personnel, those who are of the same grade as Section Head of Public Works Service, Irrigation Section, of Public Works Services, Irrigation Projects, Local Government and People Agriculture Services, all in the Irrigation Water Management in CITAGAMPOR Project Area.

May this program be of any use.

Purwokerto, November 5, 1982.

IRRIGATION WATER MANAGEMENT IN
CITAGAMPOR PROJECT.
Project Manager,

Ir. KISMADI
NIP.110.012.[illegible]

S.F. [illegible]
Team Leader of
SINOTECH ENGINEERING
CONSULTANTS, INC

## I. INTRODUCTION

Irrigation Water Management of CITAGAMPOR Project has its aim to create any system of effective and efficient water management (for supporting optimum production increase a.o. in efforts to improve the quality and expansion of intensification of arable land) at irrigation network in completed way (in the main and at farm level systems).

On the main jobs for the CITAGAMPOR Project is to carry out education and extension through teaching seminars and courses.

Seminars and courses are divided into several groups :

a. Group-A, consisting of middle level officers, i.e. Head of PU Seksi/PU-Wiyah personnel, Kabupaten Agricultural Service personnel, Local Government officers concerned with irrigation water management.

b. Group-B consisting of Chief of Irrigation Section, Water Master, PPM, Mantri Tani, PPL and Chief of Village.

c. Group-C consiting of officers at farm level and farmers namely, Ulu-ulu, key-farmer, P3A and prominent persons.

This program has been composed especially for the course on irrigation water management for Group-B to be held in 4 stages in this 1982/1983 F.Y. and started on December 6,1982 upto December 18, 1982 for the 1st stage, while for the other stages will be followed the timetable for Group-B as shown on hereto attached appendix (APPENDIX 3).

## II. AIM OF IRRIGATION WATER MANAGEMENT COURSE FOR GROUP-B.

The mian aim of giving this course is to obtain united language and improvement of knowledge and skill/efforts of PU personnel, Local Governmental personnel, Agriculture Service personnel who are in close relation to irrigation services to the community, in order to get optimum utilization of irrigation water and the existing of irrigation input shall be secured.

We will understandably achieve through this course:

1. The participants will improve their konowledge and skill especially on irrigation water management.

2. The participants will be able to forward their findings and besides they will take conclusions through discussions and questionnaires.

3. The participants will train themselves to work cooperatively based on mutually appreciation and being acceptable for the group's or other's idea and opinion.

4. The participants will be trained to understand knowledge discipline and work by planning.

5. The participants will leave the courses taking with them the obtained results to practise and to expand them broadly to the other personnel.

III. PARTICIPANTS OF THE COURSE

Candidates for the courses in each stage consist of :

3.1. Proj. Unit personnel consist of Chief of Irrigation Section and Technical Staff at a total of 19 persons.

3.2. CITAGAMPOR personnel consisting of 4 persons.

3.3. Local Governmental personnel concerned with irrigation water management at a total of 12 persons (included chief of village).

3.4. Kabupaten/Kecamatan Agiculture Service at a total of 10 persons, consisting of Mantri Tani and PPM / PPS.

Grand total is 45 persons. Specified list of participants from each PU Section, Local Government and Agriculture Service is seen on hereto attached sheet. (Appendices - 3 and 6)

IV. IMPLEMENTATION OF COURSE

The course for every stage is to be carried within 13 days and to be started on December 6, 1982 for the 1st stage through December 18, 1982. Timetables for implementation and subject matters are attached hereto (APPENDICES 2 & 3). The course will be held in the Office of Irrigation Water Management in CITAGAMPOR Project, Jl. Jendoral Gatot Soebroto No.III.5b Purwokerto.

V. COURSE STAGE

Materials to be lectured shall be matters of practices and easily understandable samples, and explanations by audio visual, etc.

5.1. Theoretical lecture/education :

The Instructors give their lectures from dictations, brochures, object lessons. Then shall be held discussion on the given lectures either the participants themselves or among the participants and lecturers.
Besides, the participants may get training matters to do in the night after finishing the lecture.

5.2. Field Study Stage :

It is hoped that the previously obtained theoretical matters should visually be studied and practised in field. Objects to be observed are: Gambarsari-Posanggrahan, Maos, Kali Kudi, PTP Citanduy or Maos.Kali Kudi and Gambarsari Pump Station.

5.3. Film and Slide Show Stage :

It is hoped that from the previous theoretically obtained lessons and knowledge they will visually get them from the film and slide. It then will be followed by discussion.

5.4. Study Tour Stage :

It is hoped that study on objects concerning with the aim of training will give compared study as new knowledge materials or for better insurance on realization of the previously received theories. Then follows field discussion.

This study tour is scheduled to Cung Section, Kabupaten Tegal.

5.5. Overall Discussion :

After all participants have got lectures, then follow questionnaires and field investigation, hence general discussion among participants, to be divided into groups led by one team as moderators to make conclusions from materials previously obtained so that united findings and principles summed up can cooperatively be implemented by each of the participants in their jobs.

5.6. Final Evaluation :

By terminating the course evaluation on implementation value and participant's ability in taking the lectured materials, is of important meaning.

Evaluation of participant's ability shall be carried out in two ways :

A. By multiple choice system, questionnaires and at once several answers will be given to the participants each to choose the exact answer out of it.

B. By completion of drawings or something else with clarifications or explanations where they principally lack of.
The participants may, by means of this system, easily remember and understand the problems.

VI. INSTRUCTORS

Instructors will be officials of Agriculture Service, Central Java Provincial Public Works Service/Regional, Irrigation Projects and Local Govern who are regarded as qualified to give instructions to the course.

VII. CERTIFICATE

After they have finished atending the course, the participants will receive a certificate, issued by the Education and Training Central (Pusdiklat) of the Minister of Public Works as follows :

1. Present at the course for minimum 80 %.
2. Join the field investigation and study tour.
3. Join the discussion and final evaluation.

VIII. CURRICULUM AND SYLLABUSES

The curriculum and syllabuses for this course are arranged as specified in the heroto attached sheet.

IX. ACCOMODATION AND TRANSPORTATION

1. For the participants of the course the Committee is providing accomodation, Logoment for those from outside of Purwokorto, meal and snack food during attending the lectures.
2. The participants got local transportation fare, while the fare to and from the course location is on the responsibility of the service sender.

X. CLOSING

Matters not mentioned in this Manual yet will be arranged later.

APPENDIX-1

# S Y L L A B U S

## OF LESSON MATERIAL FOR IRRIGATION WATER MANAGEMENT COURSE

## GROUP-B

1. Oponing : Director of Irrigation.
   Proadvice & Speech
   T i m e : Throo (3) lessons.

2. Lesson Subject : Relating among Soil - Cropping - Water ( RTA )
   Instructor : Ir. I. Sukamto.
   T i m e : Ton (10) lessons.

   Syllabus :
   Covers throo parts :

   a. Relation botween Soil and Cropping.
      It discusses tho function of soil as mediator for plant growing, soil fortilization, tho physical charactoristics of soil such as soil toxturo, soil structuro, soil porousity and soil consistency, and growing stages ospocially of paddy rico and palawija.

   b. Relation botween Cropping and Water.
      It doscribos tho function of water toward cropping and its influonco on water quality, shortago and oxcoss of water toward agricultural production ospocially paddy rico and palawija

   c. Relation botween Soil, Water and Cropping.
      It doscribos soveral kinds of soil moisturo and irrigation water roquiromonts according to crop growing oithor for paddy rico or palawija.

   d. Data collection and nocossary information, suporvision and documentation.

3. Lesson Subject : Irrigation Water Quality and Drainago at Agricultural Arablo Land (KAD ).
   Instructor : Paul Santosa MSc.
   T i m e : Six (6) lessons.

   Syllabus :
   It doscribos water quality (mainly chomical aspoct) and drainago in agricultural offorts ospocially paddy rico and palawija, influonco of water quality and water oxcoss on soil and cropping, salt intrusion and water oxcoss, collection, inspection and data & information collection roquirod for water quality and drainago, also agronomical as woll as tochnical (onginooring) undortakings in ovorcoming water quality and drainago problems.

4. Lesson Subject : Agricultural Program on Irrigated arable sawah. ( PPS )

Instructor : Soewartoyo.

T i m e : Ten (10) lessons.

Syllabus :

It covers factors in agricultural undertakings on irrigated arable sawah, land preparation, seeds providing, funds, fertilizer, posticides, equipment, power, post-harvest period, marketting and technically cropping either for paddy rice or palawija.

Irrigation water management and agricultural programming describe how important at agricultural programming is for agricultural efforts in general and specially irrigation water management, cropping pattern, cropping calendar, cropping intensity.

Agricultural programming at Farm level covers planning, implementation, guidance/extension (BIMAS, INMAS, INSUS) and Bodies and services concerned with agricultural programming at farm level covering Irrigation Committee, Satpol Bimas (Mass guidance), P3A, Gapoktan (Farmer group), including Laws/Regulations still in force.

5. Lesson Subject : Irrigation water Management on-farm Level (PAT).

Instructor : Ir. Achmad Ngubadah

T i m e : Ten (10) lessons.

Syllabus :

It covers the importance of irrigation water management for agricultural programming in irrigation system as well as on-farm level, planning, implementation, supervision, information and compilation of requirements, and guidance/extension at farm level, agencies, services, P3A.Dharma Tirta, including work mechanism and Laws / Regulations still in force.

6. Lesson Subject : O & M of Main & On-farm level O & M (EPI)

Instructor : Mulyadi BIE.

T i m e : Ten (10)lessons.

Syllabus :

This lecture covers the definition of irrigation water exploitation and maintenance, function of irrigation system facilities, the importance of irrigation system O & M, agrixultural program irrigation water, organization, personnel, responsibilities, funds, planning, implementation, guidance, data/information, way of inspecting and notifying, and compilation of requirements for main as well as on-farm level irrigation, including existing Laws / Regulations.

7. Lesson Subject : Integrated Approach in Irrigation Water Management ( PPA ).

Instructor : Adi Rianto SH & Paul Santosa MSc

T i m e : Eight (8) lessons.

Syllabus :

1. The importance of integration of services, agencies, organizations and the community in direct or indirect relation to irrigation water management within the efforts to achieve effective and efficient irrigation water management and insurance of everlasting either of water or of irrigation network.

2. The roles of integrated services, agencies, organizations and community being important factors in the integration irrigation water management which covers :

- The importance to understand that irrigation wafer form any limited means and requires any prestation, cost and power for procurement; in connection with other agricultural production inputs.
- In prOcurement, utilization and insuring the everlasing of water and effective as well as efficient irrigation system there are needed organization, funds, equipment and tecgnology, and how to manage it in order to meet the secheduled goal.

8. Lesson Subject : Ways to interviewing (CHW).

Instructor : Drs. Soemardi.

T i m e : Eight (8) lessons.

Syllabus :

This lecture gives knowledge and ways for collecting data by interview directly to the farmer to get information and necessary clarifications, especially concerning irrigation system management and agricultural economics.

The way to interview covers :

1. The art how to interview
2. Human charavteristics
3. Politeness in interviewing
4. Purpose of interviewing
5. How to interview
6. To get thoughts for interviewing
7. Required conditions for having interview.

9. Lectures :

A. Speech matter : Irrigation Association in Taiwan (IAT)
Speaker : Mr. Y/K/ Yang & Paul Santosa MSc
Time : For (4) lectures.

Material :

Explanations will be given concerning the existing farmers organization in Taiwan covering :

1. General information.
2. Basic and principle of farmers organization.
3. Structure of organization.
4. Rules and work mechanism.

B. Speech matter : Irrigation Association in Taiwan (IAT)
Speaker : Mr. S/F/ Wu & Paul Santosa MSc.
Time : Four (4) lectures.

Material :

Explanation will be given on existing irrigation organization in Taiwan covering :

1. General information.
   1.1. The importance of irrigation organization.
   1.2. History and background of setting up.
2. Situation of irrigation organization.
   2.1. Membership.
   2.2. Structure of organization.
3. Rules and Work Mechanism.
   3.1. Exploitation Rules.
   3.2. Water distribution rules.
   3.3. Monitoring and Evaluation.

C. Speech matter : SUBAK Irrigation Organization in Bali ( OIS ).
Speaker : Ir. Cokorde Raka Wedana
Time : Six (6) lectures.

Material :

Explanations will be given on irrigation organization in Bali called Subak covering :

1. Subak organization.
2. Activities of Subak.
3. Funds.
4. Equipment.
5. Personnel.
6. Management.
7. Technology and Skill.

Appendix-C

# C U R R I C U L U M

## LESSON SUBJECTS OF IRRIGATION WATER MANAGEMENT COURSE OF GROUP-B

| NO. | I T E M | CODE | TIME | INSTRUCTOR |
|---|---|---|---|---|
| 1. | Opening speech | SB | 3 | Director of Irrigation |
| 2. | Relation of SOIL-WATER-CROPPING | HTA | 10 | Ir. Y. Sukamto |
| 3. | Irrigation Water Quality and Drainage in Irrigated Arable Sawah. | KAD | 6 | Paul Santosa MSc. |
| 4. | Agricultural Programming for Irrigated Arable Sawah. | PPS | 10 | Soewartoyo |
| 5. | On-farm Irrigation Water Management. | PAT | 10 | Ir. Achmad Ngubadah |
| 6. | Exploitation and Maintenance of Main Irrigation System and On-Farm Irrigation System. | EPI | 10 | Mulyadi BIE. |
| 7. | Integrated Approach in Irrigation Water Management. | PPA | 8 | Adi Rianto SH & Paul Santosa MSc. |
| 8. | Principle and Method of Interview | PMW | 8 | Drs. Soemardi |
| 9. | Lecturos | | | |
| | A. Laws and Government Regulations. | UPP | 3 | Soodiro SH |
| | B. Farmer's Association in Taiwan. | FAT | 3 | Mr. Y.K. Yang & Paul Santosa MDc. |
| | C. Irrigation Association in Taiwan | IAT | 3 | Mr. S.F. Wu & Paul Santosa MSc |
| | D. SUBAK Irrigation Organization. | OIS | 6 | Ir. Cokorda Raka Wedana |
| 10. | Film & Slide Show | F.S. | 8 | |
| 11. | Field Investigation | PLP | 1 | day |
| 12. | Study Tour | KWS | 2 | days |
| 13. | Discussion | DKS | 4 | hours |
| 14. | Evaluation | Ev | 5 | hours |
| 15. | Closing | PT | 2 | hours |
| | T o t a l : | | 108 | hours 3 days |

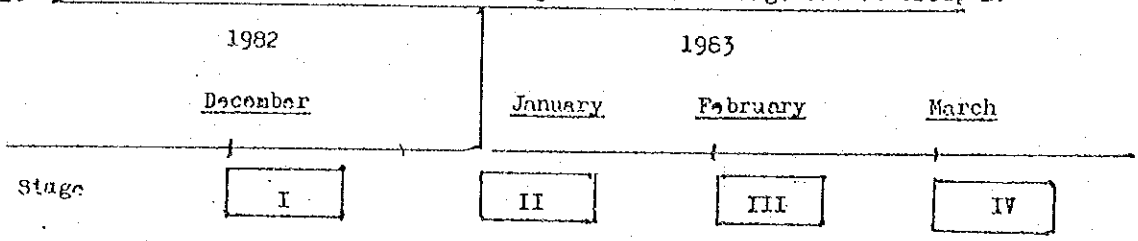
APPENDIX 3

Implementation Timetable and Total of Participants

Irrigation Water Management of Group B

- in Fiscal Year 1982/1983 -

I. Timetable for Implementation of Irrigation Water Management of Group-B.




II. Total of Participants for Group-B

| Stage | PUBLIC WORKS SERVICE | | | | | KABUPATEN LOCAL Gvt. | | | KAB. AGR. Serv. | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CITAGAM POR Project | Citanduy Unit | Tajum Unit | Gambarsari Unit | Sompor Unit | Cilacap | Banyumas | Kobumon | Cilacap | Banyumas | Kobumon | |
| I | 4 | 4 | 4 | 6 | 5 | 4 | 4 | 4 | 3 | 3 | 4 | 45 |
| II | 4 | 4 | 4 | 6 | 5 | 4 | 4 | 4 | 3 | 4 | 3 | 45 |
| III | 4 | 4 | 4 | 6 | 5 | 4 | 4 | 4 | 4 | 3 | 3 | 45 |
| IV | 4 | 4 | 4 | 6 | 5 | 4 | 4 | 4 | 3 | 3 | 4 | 45 |

APPENDIX 1.

Timetable for Implementation Course
Irrigation Water Management of Group - B
First Stage
December 6, 1982 upto December 18, 1982
in fiscal year 1982/1983

| Activities | Timetable | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | December 1982 | | | | | | | | | | | | |
| | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| | M | T | W | Th | F | Sa | Su | M | T | W | Th | F | Sa |
| I. Opening | — | | | | | | | | | | | | |
| II. In the Meeting Room | — | — | — | — | — | — | | — | — | — | | | |
| III. Field Investigation | | | | | | | | | | | — | — | |
| IV. Study Tour | | | | | | | | | | | | — | |
| V. Discussion | | | | | | | | | | | | | — |
| VI. Evaluation | | | | | | | | | | | | | — |
| V. Closing | | | | | | | | | | | | | — |

APPENDIX 5

Timetible for Lesson Subjects

Irrigation Water Management Course of Group - B

First team

| No. | Time | December 1982 | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | M | T | W | Th | F | Sa | Su | M | T | W | Th | F | Sa | Su | M | |
| | | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | |
| I. | 07:30 - 08:15 | PB | HTA | PPS | PAT | EPi | EPi | | FAT | OIS | PPA | PL | KW | KW | | | |
| II. | 08:15 - 09:00 | PB | HTA | PPS | PAT | EPi | EPi | | FAT | OIS | PPA | PL | KW | KW | | | |
| III. | 09:00 - 09:45 | PB | HTA | PPS | PAT | EPi | EPi | | FAT | OIS | PPA | PL | KW | KW | | | |
| | 09:45 - 10:00 | | | | | | | | | | | | | | | | |
| IV. | 10:00 - 10:45 | HTA | KAD | PPS | PPS | EPi | EPi | | FAT | OIS | PPA | PL | KW | KW | | | |
| V. | 10:45 - 11:30 | HTA | KAD | PPS | PPS | EPi | EPi | | IAT | OIS | PPA | PL | KW | KW | | | |
| VI | 11:30 - 12:15 | HTA | KAD | PPS | PPS | - | PMW | | IAT | OIS | PPA | PL | KW | KW | | | |
| | 12:15 - 12:45 | | | | | | | | | | | | | | | | |
| VII. | 12:45 - 13:30 | KAD | HTA | PPS | PAT | - | PMW | | IAT | PMW | PPA | PL | KW | KW | | | |
| VIII. | 13:30 - 14:15 | KAD | HTA | PAT | PAT | - | PMW | | IAT | PMW | PAA | PL | KW | KW | | | |
| IX. | 14:15 - 15:00 | KAD | HTA | PAT | PAT | FS | PMW | | PMW | FS | FS | PL | KW | KW | | | |
| | 15:00 - 15:15 | | | | | | | | | | | | | | | | |
| X. | 15:15 - 16:00 | FS | HTA | PAT | PAT | FS | FS | | PMW | FS | FS | PL | KW | KW | | | |

PB = 3 hrs lesson
HTA = 10 "
KAD = 6 "
PPS = 10 "
PAT = 10 "

EPi = 10 hrs lesson
PMW = 8 "
PPA = 8 "
FAT = 4 "
IAT = 1 "

OIS = 6 hrs lesson
FS = 8 "
DKS = 4 "
EV = 5 "
PT = 1 "

PL = 1 day
KW = 2 day

Total = 105 hrs lesson
3 day.

# DRAFT ON PROPOSED REGULATION FOR WATER USERS(P3A/DHARMA TIRTA)ASSOCIATION

In the name of God The Almighty.

## P R E F A C E

That water is God's Gift overall time needed by human being.
That to get irrigation water up to field blocks efforts and a lot of cost are required. Consequently, utilization of irrigation water shall continuously be carried out efficiently, effectively, justly and evenly and purposed for improvement of prosperousity of the farmers community.
That for attaining above mentioned purpose it is only reachable by efforts of the farmers.

Aware of above mentioned matters and based on :

1. Law number 11 of the Year 1974 concerning Irrigation.
2. Government's Regulation number 22 of the Year 1982 concerning Water Ordering.
3. Government's Regulation number 23 of the Year 1982 concerning Irrigation.
4. Decision Letter of the Governor Head of First Region of Central Java numbered HUK. 188/1975 dated 23 December 1975.

We farmers set up an association for farmers waterusers under the following Regulations.

DRAFT ON PROPOSED REGULATION
FOR DHARMA TIRTA

REGULATION FOR DHARMA TIRTA . . . . . .

## CHAPTER I

## NAME AND WORK AREA

### Article 1

1. This association is called Dharma Tirta . . . . . .
2. Work Area of this association covers the Irrigation at Farm Level system :
   a. Receives irrigation water supply through Intake/Water source, Secundary Canal . . . . . , Primary Canal . . . . . , of . . . . . irrigation system.
   b. Status of the Irrigation system is Technical/Semi Technical/Simple.
   c. Extent of . . . . . work area = . . . . . ha.
   d. Situated at village . . . . . Sub-Distric . . . . . Regency . . . ha
      village . . . . . Sub-Distric . . . . . Regency . . . ha
      village . . . . . Sub-Distric . . . . . Regency . . . ha
      etc.
      Central Java Province.

## CHAPTER II

## PRINCIPLE, AIM AND PURPOSE

### Article 2

This association stands on Mutual Aid Principle based on " Pancasila ".

Article 3

This association aims to succeed in development efforts at farm level in the context of improvement of social welfare in general and of farmers in particular.

Article 4

This association's purpose is effectively, efficiently, continuously, justly and evenly provision and ordering of irrigation water.

CHAPTER III

SCOPE OF WORK

ARTICLE 5

The scope of activities covers :
Authority, exploitation, management, utilization and security of water included its sources for irrigation at farm level system, (as from Ulu-Ulu Vak/Ulu-Ulu/Ili-Ili) arranged in Administration Order :

(a) Development, rehabilitation, repair, exploitation and maintenence of irrigation at farm level system included in the work area.

(b) Undertakings in agriculture production inputs on place/Kiosks easily reached by members.

(c) Guidance to members so that they can apply Panca Usaha (five Undertakings).

(d) Efforts in logical prices for agricultural production through coordination in management and mutually marketing.

(e) Assisting in efforts of the Government in irrigation and agriculture programming.

## CHAPTER IV

## MEMBERSHIP

### Article 6

1. Every party utilizing irrigation water either personally or incorporated, and socially shall be member of the Waterusers Association.
2. A new membership is valid after being registered in the List of Member Book.

### Article 7

Membership ends :

a. No more tills the concerned land.
b. No more utilizes the irrigation water.
c. Dies.
d. The association is set off.

### Article 8

Every member has to do the same job and the same responsibility, namely :

a. Consider and realize development, rehabilitation, exploitation and maintenance of irrigation at farm level system belonging to this work area.
b. Practise, follow and secure the regulation, Administration Order and Decision of members meetings.
c. Assisting in progress of the association.
d. Pay the contribution and other funds as fixed by the Association.
e. Realize ideas as mentioned in the regulations of Administration Order and decided by the members as well.
f. Present and actively participate in members meetings.
g. Oblige to manage irrigation water effectively and effeciently.

Article 9

Every member has the same right as others :

a. To receive services in water distribution and others acoording to the orders in vorce in the existing association.
b. To give findings and vote in the members meetings.
c. Supervices the way of organizing.
d. Elect and to be elected as a board member.

CHAPTER V

B O A R D

Article 10

The Board members are elected by out of and for the members which is ordered in the Administration Order.

Article 11

1. The Board is composed as follows :

- Chairman/Vice Chairman
- Secretary
- Treasurer
- Section of Irrigation Input
- Section of Production Affairs
- Section of Marketing Affairs
- Section of Funds
- Chief of Block
- Chief of Group

2. Other sections can be added, if necessary.

Article 12

To be elected as board member the following requirements shall be met :

1. CHAIRMAN

a. Member of Dharma Tirta Association.
b. At least graduated from the Primary School.
c. Posseses at least 1 ha rice field, if possible.
d. Experienced in rice culvation.
e. Capable to serve his co-members well.
f. Has a good reputation among the members.
g. Has leadership characters.
h. Has a good relation with Head of Village, Ulu-Ulu Vak/Ulu-Ulu, Ili-Ili and non official leaders.
i. Lives in the village belonging to work area of the association.
j. No village board member or Ulu-Ulu Vak.
k. No businessman.

2. SECRETARY :

a. Member of Dharma Tirta Association.
b. At list gradeted from the Yunior High School.
c. At experienced in rice cultifation.
d. Capible to serve his co-members well.
e. Has a good reportation among the members.
f. Has leadership characters.
g. Has a good relation with Head of Village, Ulu-Ulu Vak/Ulu-Ulu, Ili-Ili and non official leaders.
h. Lives in the village belonging to work area of the association.
l. No village Board member or Ulu-Ulu Vak.
k. No businessman.

3. TREASURER :

a. Member of Dharma Tirta Association.
b. Experienced in Treasureship.
c. Has a good reputation among the members.

d. Has leadership characters.

e. Has a good relation with Head of Village, Ulu-Ulu Vak/Ulu-Ulu, Ili-Ili and non official leaders,

f. Lives in the village belonging to work area of the association.

g. No village board member or Ulu-Ulu Vak.

h. No businessman.

4. CHIEF OF BLOCK/GROUP

a. Member of Dharma Tirta Association.

b. Posseses at least 0,5 ha rice field, if possible.

c. Connector farmer/Key-farmer.

d. Has a good reputation among the members.

e. Has leadership characters.

f. Has a good relation with Head of Village, Ulu-Ulu Vak/Ulu-Ulu, Ili-Ili and non official leaders.

g. Lives in the village belonging to work area of the association.

h. No village board member or Ulu-Ulu Vak.

i. No businessman.

## Article 13

1. Job and responsibility of board member are :

a. Lead and improve effectively the association.

b. Prepare work programming for the association.

c. Practise, follow and secure the Regulation, Administration Order and Decision of members meetings.

d. Ordering and Supervising job of the members.

e. Register board and members in a book.

f. Keep and take care of Association's Treasure.

g. Prepare loss effected by faults, negligence, misuse of power and compentation.

h. Release instructions and decisions of the Committee to the members.

i. Carry out all instructions and decision of the Irrigation Committee.

j. Assist in succeeding of Government programming on Irrigation and agriculture.

h. Report and give response to the members conserning everything realated to the association as results of board prestation in the past.

2. Job and responsibility of every board member is descerhed in the Administration Order.

## Article 14

The Board has the right to :

1. To get services in water distribution and other services according to the rules in force.
2. Speak out findings and give votes in members meeting.
3. Conduct control on performing of the Association.
4. Elect and to be elected.
5. Receive reward for his prestation.
   (Mentioned in the Administration Order).

## Article 15

## MEMBERS MEETING

1. Members meeting of Dharma Tirta . . . . . has the highest power.
2. Members meeting makes the following decisions : Regulations, Administration Order and Special Rules.
3. Within one cropping season members ; meetings are held on :
   a. Fixing harvest season.
   b. Two weeks after water supply to tertiary block/starting of palawija cropping.
   c. Two weeks before cropping.
   d. By ocouring of urgent occations.
4. A members meeting can be performed :
   a. When half of the total members of the Association in present.
   b. When less then half of the total members of the Association, is present, the members meeting shall be pusponed for a week.
   c. If the same event happens the members meeting shall be performed with the same program.
5. A conclusion of a members meeting is valid when two third of the present members are in favour.

Article 16

BOARD MEETING

A Board Meeting is held :

a. Once in 35 (selapan) days on selapan eve . . . . . .

b. By occuring of urgent event to be handled soon.

CHAPTER VI

COST STATEMENT

Article 17

1. The Association is defrayed by :
   a. Entree of the member.
   b. Contribution.
   c. Collection of funds or goods from the members.
   d. Fine money against offends.
   e. Other legal sources.
2. The amount of the funds as mentioned in a to d in point one of this Article is determined in the members meeting.
3. Expenses out of this funds are described in the Administration Order.

CHAPTER VII

GUIDANCE & CONTROL

Article 18

1. Guidance and control consist of . . . . . carried out by Irrigation Committee.
2. Daily Guidance and control on Dharma Tirta Association . . . . . is executed by Kecamatan Irrigation Committee and Chief of Villages concerned.

## CAHPTER VIII

## OFFENCES AND SANCTIONS

### Article 19

1. Offence against Regulations, Administration Order and Decisions of members meeting will get sanction as much as described in the Administration Order.
2. Sanction given to a Board Member is twice of that given to member for the same offence.
3. Sanction shall be carried out three days after decision is fixed.
4. In case after limit time the sanction has not carried out yet, the concerned person will be given twice the sanction.
5. Offence three times done subsequently within one season, concerned person will get sanction not to be served by the Association as described in Administration Order.

## CHAPTER IX

## C L O S I N G

### Article 20

1. Alteration in Regulations is made after found accord by 2/3 of all the members of the Association.
2. Everything not mentioned yet in this Regulation, is explained in the Administration Order.
3. This Regulation is in force since issued by the Authority.

# (5) ON FARM WATER MANAGEMENT

By

Ir. Suhaedi Wiraatmadja

DIRECTOR GENERAL OF FOOD CROPS

DIRECTORATE GENERAL OF FOOD CROP AGRICULTURE

MINISTRY OF AGRICULTURE

Presented in The Seminar on World Bank Participation in Indonesia Development (A Joint Program Between World Bank and Central Indonesian Press Association) Held in Jakarta December 5 thru 9, 1983.

C O N T E N T

# ONFARM WATER MANAGEMENT

## I. INTRODUCTION

Concordant to General Pattern of Long Range Development Program, in The Fourth Five Year Development Plan (Pelita IV), the priority is given to the development of economic field with the emphasis on agricultural sector as to continue the efforts of to settle the self sufficiency in food and to improve industries.

As we know, the main commodity determining food self sufficiency is rice crop and then are followed by secondary and horticultural crops. Most of the area used for rice cultivation is irrigated or wet land.

Based on BPS (Central Bureau of Statistics) data (1978), the area of wet land in Indonesia is 7.398,181 hectars which can be classified according to its water resources development as follows :

| | |
|---|---|
| - Technical | 1,489,629 ha |
| - Semi Technical | 953,213 ha |
| - Simple (Sederhana) | 147,871 ha |
| - Rainfed | 2,259,056 ha |
| - Rural irrigation | 1,838,879 ha |
| - Tidal, swampy and marsh land | 455,842 ha |
| - Others | 253,692 ha |

From rice production of 1968 through 1976 it can be seen that the role of irrigated area is quite big, that is 81% of the rice production came from irrigated areas (paddy rice land) and such condition still exists at present (Statistical Information On Indonesian Agriculture, 1978).

As we know, in Five Efforts, we always talk about five inputs of farming business, those are : fertilizer, pesticide, seed, land, ands water. Fertilizer and pesticide are the materials that can be produced either manufactorily or naturally; seed can be produced in seed centres while land is the farm input which continuously stand by. On the other hand, water is a natural resource which can not be produced or to be made available in a big quantity, while it is needed plentifully such as for flooding of rice field.

We depend very much on the natural process that is rainfal and water cyclus. By other words the quantity and timing of water availability for farming (especially rice field) need to be considered and observed.
Because that kind of irrigation water character, management factor is very determinant whether this farm input can be utilized efficiency and timely or not.

Particularly in irrigated area or rice field there is no doubt that water is one of the main determinants in the successfulness of food crops. When we talk about management, willing or not willing we also should talk about the people or personnel involved in the management itself.

In onfarm water management (tertiary level), there are two parties who are involved directly, those are government and farmers, the water users. The participants of the government officials among others are : to give technical aid, to do supervisory work and to deliver technological input of irrigation structure and water management, to organize the farmers in water user groups, etc.

The farmers, the beneficiaries have their participations in the form of : to maintain the irrigation network, to distribute water equally, to take part in repairing the irrigation system, to collect water charge for the O & M of the irrigation network etc. For conducting their participation, the farmers group themselves in water user association.

## II. GOVERNMENT POLICY IN IRRIGATION WATER MANAGEMENT

In the Government Regulation No. 22, 1982 concerning Water Use and Management there is a kind of classification of the existing irrigation :

a. Irrigation area which its development is done by government (government irrigation scheme).

b. Irrigation area which its development is carried out by local community (non government irrigation scheme).

Government irrigation is any irrigation scheme which its dam, reservoir, intake structure and main system and part of its onfarm system (tertiary canals) are fully developed by the government.

Up to now, the farmers are considered not yet able to manage the head work and the main system of the government irrigation, so the O & M of them is still conducted by the government. Irrigation water management in the main system (up to tertiary turnout gate) is still handled by the government. The government mentioned here is either Central or Local.

Further on, the Government Regulation (PP) No.23, 1982 says that the O & M onfarm irrigation network is the responsibility of the farmers, the beneficiaries. It means that automatically the farmers should be responsible for onfarm water managment, so that all the members of farmer community who have farming business in the concerned tertiary area be able to receive water timely, sufficiently and equally.

Non government irrigation area in line with its name is irrigation which is developed by non government agency., Initiative for site selection, design and its construction come from farmers/comunity.

Under certain circumtances, the government gives aids and assistances but not on a continuous basis. These aid and assistance are usually only stimulative. Thus, the whole responsibilities starting from construction up to the O & M of the system of non government scheme are in the hand of the farmers.

For handling and managing O & M of the irrigation network either of the government or non government scheme, the farmers should form and establish association which will be able to hold the responsibilities.
MPR (Indonesian Congress) Decision No. II/MPR/1983 in one of the paragraphs says as follows :
"For utilizing irrigation network optimally the tertiary and quaternary network need to be continuously developed. Further on, the awareness, ability and participation of the farmers in the better O & M activities need to be continuously improved, among others through the establishment and development of water user groups. So, it is clear that the farmer water user groups are decided as the main roler in the O & M of irrigation network.

Government Regulation No. 23, 1982, chapter IV, paragraph 20, concerning irrigation says that Local Government, concordance to the development of irrigation should set-up the fromation and the development of water user association which organizationally, technically, and financially are able to be responsible for the tasks of developemnt, rehabilitation and O & M of irrigation network of tertiary, quaternary, village and Subak.

Further on, it is said that any parties utilizing irrigation water, either individually or firm and Social Agency, should become and be the member of Water User Association. Based on this stipulation, the government either through Government Regulation or MPR Decision states the existence of Water User Association (P3A) in the whole existing irrigation area.

In certain provinces such as West Java, Central Java, East Java, West Sumatera, Lampung, North Sumatera, the Governor, the Head of the Area (Province) have issued Letter of Decision concerning Water User Association (P3A) in line with Gov. Regulation No. 22 & 23, 1982. Even, some of the Governors issued the Decision long time before the issuance of the Gov. Regulation No. 22 & 23.

The Regulation No. 23, 1982 also says that there is another institution for discussing irrigation water management. This institution is named Irrigation Committee at provincial and at Kabupaten (Distric) level. The members of the Committees are the representatives of Local Government, Local Water Resources Agencies, and other Technical Agencies Concerned (Provincial and Kabupaten Agriculture Service).

## III. PROBLEM AREAS

As it has been mentioned, irrigated area has a big role in increasing food production. Actually, this role is still possible to be improved if onfarm water utilization could be more effective and more efficient. Based on some observations, the efficiency of water use is still low, i.e. in some areas from 2.5 to 3 l/sec/ha. Our recommendation in general is 1.2 l/sec/ha. In some limited areas it has been found that the water application at the field is around 0.6 l/sec/ha, such as in Blimbing Village, Sukohardjo Kabupaten, Central Java. The efficiency of water application certainly will effect the use of the existing water, so it can enlarge the area of harvest, particularly in dry season, at least about 50%.

In Karawang District, in the period of 1963 to 1969, the area that could be planted in dry season was about 45,000 ha. At present, by practising better application method of water through intensive guidance againts Water

User Association (P3A), the area that can be planted in dry season about 95,000 ha. By that way, in a relatively short period of time, the area of harvest could be increased about more than 100%, (Water application in Karawang from 1963 to 1969, on an average was between 1.6 and 2 ℓ/sec/ha, while in 1981 - 1982 was averagely 0.8 ℓ/sec/ha) *)

From the above mentioned data, it is quite clear that the role of onfarm water utilization is very important (water use efficiency). IRRI report says that the success of irrigation development depends on onfarm water management (the efficiency of not less than 60%).

The success of onfarm water use efficiency depends very much on the farmers activities themselves, particularly of those who are grouped in P3A.

The government policy for this matter is very clear as stipulated in Government Regulation No.23, 1982, in Chapter IV, paragraph 20 as it has been described before. The question at present is how to make farmers know, will have willingness and be able to arrange water in tertiary level. So, how to make farmers will form water User Assiciation (P3A) and how to make them know and be skillful to implement the activities that should be their responsibilities and to be able to solve their problems, and how to make farmers be able to utilize onfarm irrigation networks and be able to organize the accosiation properly.

Data show that the P3A still need to be improved. In the whole area of Indonesia, there have been formed 11,828 units over whelming the area of 1,362,854 ha. From that amount, it is estimated that only about 30% are active (data provided by Directorate of Agriculture Area Development, 1981). For encouraging their activities, either in government or non government irrigation scheme, the most important thing is how to make farmers have the sense of belonging in order to make them have the sense of responsibility so that they can be self-initiative, self-help and self-funding in carrying out

In government irrigation scheme, due to the initiative and the fund are mostly from the government, the dependency of farmers on the government is very dominant (including for onfarm activities). This is the reason why

*) Report of Karawang District Agriculture Service and Jatiluhur Authority.

the development and the O & M of onfarm system are still mostly done by the government. During the Third Five Year Plan (Pelita III), there is about two million ha of irrigation areas which construction of their tertiaries are funded by government. Other than that, for the O & M of tertiary systems, the government also provides a big amount of money. Actually, this activity does not necessarily exist, if farmers have understood that it is their own responsibility. Thus, farmer participation for construction and O & M is still very little. It is quite possible that this lack of participation, because farmers have lack of sense of belonging due to lack of involvement since the beginning of irrigation development.

In non government irrigation scheme (rural irrigation) the situation is somewhat different. In this area, because the initiative of irrigation development was from the people, they have had their sense of belonging but still do not have appropriate ability in organization and skill. so in this area, the question is how to increase their skill in technical water management and how to improve their ability to organize themselves better and how to be better selfhelp.

Further problem is how to coordinate government agencies involved in water management, particularly those are in the Irrigation Committee. Although the government policy for this matter is already clear as stipulated in the Law No. 11, 1974 and Government Regulation No. 23, 1982 that there is a Committee for irrigation affairs, but the function and the tasks of the individual agencies are still very dim, so that the activity of the coordination Team is still not settled and a little bit confused. This has been proved by the establishment of the committees which are mostly found at provincial and Kabupaten level, not much in Kecamatan (Sub Distric) and village level yet. The problems to be solved are mostly found in Sub Distric and or Village level.

Most of the Irrigation Committees of Distric level at present have their orientation more on water distribution such as rotation among blocks, making decision for irrigation and drain schedule, very little attention on giving guidance to water user association and cropping calendar.

## IV. PROBLEM APPROACH

In the frame work of problem solving that concern the aspects of how to improve knowledge and to increase skill, management, and how to increase the ability of farmers to organize themselves better, how to make them have the sense of responsibility, participation and also coordination, an integrated activitiy of various government agencies in the field of research, extension, education, trials and experiments concerning agronomy engineering and institution is needed.

In management aspects government agencies for Village Community Development and Manpower Development and some private sector agencies will and should be involved.

Directorate General of Food Crops (DGFC), concordant to its function and task, i.e. responsible for increasing food production and food crop farmer community development, is trying to take some steps as follows .

1. Water User Association development

For farmer participation development in irrigation network utilization and onfarm water management, farmers community should be involved in irrigation development at the very early stage in order to make them have the sense of belonging and take a part in the responsibility. At present, a pilot project activity called High Performance Sederhana Irrigation System (HPSIS) which is emphasized on the participation of farmers in onfarm water management is being carried out.

This pilot is a joint activitiy among DGFC, Directorate General of Water Resources Development (DGWRD), USAID and Ford Foundation. *)

In this Participatory Approach, there are 3 systems :

1.1. System Management

1.2. System Development and Management

1.3. System Development

1.1. System Management

A method of to establish farmer participation in irrigation area where its tertiary networks (onfarm) has been constructed.

*) It is conducted in 8 provinces with 15 sites (North Sumatera, West Sumatera, South Sumatera, Lampung, West Java, West Nusa Tenggara, South Sulawesi and North Sulawesi). In West Java, there is also 11 sites as Model Block in Citanduy Project.

In this type, the main activity is to establish and to strengthen P3A (by providing Basic and Implementation Regulation) and to improve and to increase farmers ability and skill. Water distribution pattern is connected with cropping pattern and appropriate water distribution in the field level are the main issues and activities conducted by P3A under an intensive supervision and guidance.

1.2. System Development and Management

A method of to establish farmer participation in irrigation area where its onfarm irrigation networks has not been completely contructed.

In this system Development And Management, farmers are involved starting from survey and design up to construction and O & M of onfarm networks.

Farmers, in this case P3A are invited to discuss mutually for site selection, layout of irrigation networks and are involved in its onfarm construction. The farmers are also involved in the O & M and onfarm water management.

1.3. System Development.

A method of establishing farmers participation in government irrigation scheme, where there is no any dam, main system and onfarm system, in this System Development, farmers (P3A) are involved in a mutual discussion at the period for site selection including site of the dam and layout of the system (main and onfarm) and they are also involved in the implementation of construction work. After construction, the farmers involve in water management activites.

In increasing farmers ability to organize their association, one of the outstanding Key-Farmers or outstanding local leader is assigned as Community Organizer (CO). The CO functions as mediator between community (their aspiration) and government, so that it is expected that there will be a harmonious activity in the field. Further on, the CO can deliver technology transfer in increasing the ability of the farmers in onfarm water management (as innovator) and the CO also seems to be a dependable person in developing and organizing Water User Association (P3A).

The CO is not a government official and also a technician as PPL (Agriculture Field Extension Official) but the CO should have a strong leadership in organizing the Community in the development activities. The CO should be continuously together with and among the farmers and involve daily in the farmers activities.

The COs are trained intensively either in theory or practical work in the fileds of institutional development, agromy, engineering and other. The trainings are carried out in several phases : theory, data collection in the field (3 months), seminar (presentation) and also reporting, and program application.

2. Rural Irrigation

For Rural Irrigation where the community has already had the sense of belonging but do not have technical skill and knowhow of to organize association properly, the activities are to increase the ability for organizing the association and some technical work and to improve farmers selfhelp in efficient water management.

In Rural Irrigation *), COs are also needed for improving the ability to organize the association and to increase farmers technical skill. For developing farmers self help and fund, the government will give some stimulative fund in the form of sample-design, construction material (cement, etc). By implementing this approach it is expected that there will be an improvement in the quality of Rural Irrigation Scheme, so that there will be an increasing of cropping intensity from an average one crop a year becoming two rice crops even it is expected to have two rice crops and one secondary crop. So, from the area of Rural Irrigation covering 1,449,642 ha with its average yield at present two tons of grain rice (unhusk) in a relatively short time, there will be double yield per hectar, i.e. 4 ton per year and there will be an additional production about 5,798,448 tons of grain.

Other impacts of the activity among others are : employment, decreasing of shifting cultivation and deforestation, reducing urbanization and erosion control.

3. Research and trial in Water Management

For supporting present onfarm water management to be more effective and efficient, research in onfarm water management plays quite important role.

*) Rural Irrigation Scheme are located mostly in mountaneous areas (300 to 750 m above sea level), usually covering the area of not more than 500 ha each; the scheme is usually called Upper Irrigation.

Relation among soil, water and crop and people managing them needs to be studied. The study deals with agronomy (water requirement, cropping pattern), irrigation engineering (maintenance of irrigation networks, sample design, construction, water distribution), climatology (effective rainfall, temperature, relative humidity, etc) and sociology (land allocation, water-charge, sanction, etc).
A cooperation with Agency For Agriculture Research And Development (AARD), Sukamandi Station has been formulated and started for West Java. The results of the study will be continued with trials, demonstrations, experiments etc which will be conducted in Agriculture Rural Extension Centre (REC).

4 Inter Agencies Coordination

In the frame work of improving inter agencies coordination (agencies involved in onfarm water management or Irrigation Committee), and in strengthening P3A institution though the implementation of Government Regulation No.23, 1982, the DGFC (MOA), DGWRD (MPW), and some Agencies in the Ministry of Home Affairs (MHA) is : proposing a Presidential Instruction.
It is expected that in very near future, The Presidential Instruction on P3A can be released. In the final draft of that Instruction, the tasks and functions of individual Government Supervisory Agency are stated clearly MHA is the responsible agency for coordination and establishment and the development of P3A.
MPW is responsible for engineering aspects (Survey-design, Construction and O & M). MOA is responsible for P3A development int the field of agriculture extension, training and has responsibility in the aspects of agronomy, onfarm water requirement, etc.

5. Improvement of ability and skill of officials and mechanism of supervision guidance

Within the frame of increasing and improving the ability and skill of government officials, a training called training for the trainess is being carried out by FAO, AAETE (Agency for Agriculture Education, Training and Extension) and DGFC. As the first step of that program, training for PPS (Agriculture Extension Specialist) of the District

(Kabupaten) level in Java was conducted in Agriculture Training Centre, Cihea West Java.

In the training held in Cihea, both theory and field practices were given covering classical hours for increasing knowledge and introducing equipments and instruments with their application, and also onfarm water management in the field.

The first phase was held during November 1983 in Cihea, and the second phase is for problem data collection and simultaneously methods of problem solutions which will be tried to be applied in the related area of the PPS. This phase needs about three months.

The third phase is the presentation of the results of the field in the form of a seminar and simultaneously to set up activity program. This phase needs about two weeks and to be held also in Cihea. The fourth phase is program implementation and evaluation of this activity.

Having participated in the training, the PPSs are expected to have sufficient knowledge and skill and be able to deliver and to channelize the result of the training to the other officials, particularly to the PPM (Senior Field Agriculture Extension Official) and PPL.

Within the frame of increasing and improving supervisory work for the P3A by field official, particularly PPL through Training & Visit (TV) System, DGFC has conducted some activities as follows :

a) A workshop on onfarm water management for Provincial Agriculture Officials held in Sukabumi, West Java,
b) Symposiums on P3A held in (1) Medan (attended by representatives from Aceh, West Sumatera, Riau and North Sumatera), (2) Palembang (attended by representatives from Jambi, Lampung, Bengkulu and South Sumatera), (3) Bandung (attended by representatives from East Java, Central Java, West Kalimantan and West Java), (4) Banjar Baru (attended by representatives from Central Kalimantan, East Kalimantan and South Kalimantan), (5) Ujung Pandang (attended by representatives from North Sulawesi, Central Sulawesi, South East Sulawesi and South Sulawesi), (6) Mataram (attended by representatives from Bali, East Nusa Tenggara and West Nusa Tenggara).

(c) Workshop for Citanduy Project dealing with WILKEL (Extension Group Area) and irrigation vicinity.
The results of the fore-mentioned activities are : (1) for P3A supervisory work, extension program through TV System by PPL needs to be implemented, (2) WILKEL and onfarm irrigation vicinity need to be absolutely

As a draft, the followings are proposed :

a) If a WILKEL is coincide with working area of a P3A in a tertiary block, the Committee of the WILKEL concerned will also be the Committee of the related P3A. Head of Irrigation of the WILKEL will become the ULU-ULU (Water Management Chief) of the P3A. Each quaternary block will become P3A sub group and the Chief of the Block should be elected by and among the farmers.

b) If working area of a P3A is not coincide with a WILKEL, it might consist of several WILKELs, the Committee of P3A are elected from the Committee of the WILKELs. One of the WILKEL Committee members is elected and assigned as ULU-ULU of the P3A concerned.
Each WILKEL is regarded as one block in a P3A and Head of Irrigation Section of a WILKEL is elected and assigned as ILI-ILI (Water Management Assistant) or Head of Block of the related P3A.

## V. CLOSING

Irrigated land is very potential areas and in the previous Pelita it supported the increasing of rice (husked) about 80% from total National Production. The increase of rice production in irrigated area still can be intensified, if water management (after construction) can be improved. It is estimated that by increasing the efficiency of water use, harvest area in dry season can be increased about 50%.

One of the methods of improving onfarm water management is to increase the efficiency of water use through more participation of farmers (P3A). The way to rise participation is to make the farmers have the sense of belongings to the irrigation scheme.

In this case MOA is trying to develop two kinds, Systems Management and System Development And Management, Rural Irrigation Schemes in short period of time can support the increase of food production, by increasing farmers (P3A) skill and ability through giving them stimulative fund. The result expected is to increase the quality of the area of 1,449,642 ha which produce an additional amount of 5,798;448 tons of rice grain (unhusked). Within the scope of supervisory work for the farmers, Coordination Team in the form of Irrigation Committee need to be settled. To implement this, Presidential Instruction to be issued will lead the agencies concerned.

For supporting the successfulness of onfarm water management, a further study in this field is required. At present, an onfarm Water Management Centre is being proposed.

The results of research activities will be further developed through trials, experiments and demonstrations to be conducted in REC which is expected simultaneously to become Water Management Station.

# (6) ON THE MODEL TEST OF WATER MEASUREMENT DEVICES AT PADDY FIELD

## —— D.P.M.A ——

by Masaaki UEDA （植 田 昌 明）

Expert (JICA) - Divistion of Hydraulic,
Instituante of Hydraulic Engineering
Jalan 193 Ir. H. Juanda, BANDUNG. INDONESIA

6, March, 1984
JAKARTA

I. Gate and weir type

Gate and weir are in use as a standard discharge measuring device and, as such, is described in the Irrigation standard in INDONESIA.

I confined this description to the matter under consideration at D.P.M.A, Bandung, INDONESIA in conection with Hydraulic Investigation.

The water measurement device to be installed at the tertiary or quarterly level of the paddy field.

D.P.M.A had carried out several kind of these field. The establishment of discharge rating curve is the main purpose of the required model test.

Some of example about these, I would like to inform as technical note here.

Introduction

1). ROMIJN MOVABLE WEIR (See Fig.1. - 4.)

2). CRUMP GATE (See Fig.5. - 7.)
ENGLISH
DUTCH

3). CIPPOLETTI (See Fig.8. - 9.)

II. Prevailing problem of Measuring device

1). To know under Sub-merge condition of discharge

2). To know the influence of upstream and downstream distance and shape, topology.

3). To make the discharge coefficient simplefy.

4). To get alternative discharge, independent of water depth Variations.

5). To know sediment and wind influence.

6). To know the maintenance.

III. Example of case atudy

(See Fig. 10. — 16)

1). Box and sill type measurement,

water depth, water elevation measuring.

25 point matrix method (lateral 5 and Departure 5)

Water elevation

Storage capacity

Flow Vector

Boundary conditions

Flow capacity at the paddy to paddy Field.

2). Experimental Result in D.P.M.A

(See Fig. 17. — 20)

3). Some case works in INDONESIA

(See Fig. 1. — 7)

Romijn

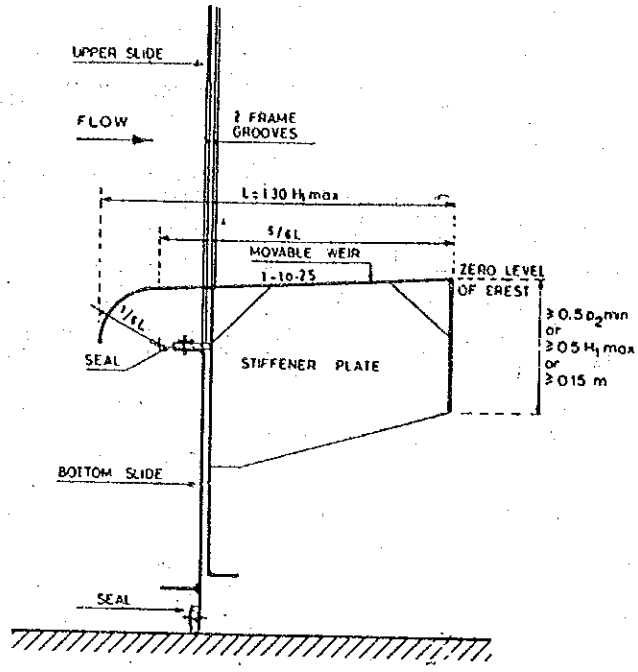



*Fig. 1 . The Romijn movable weir.*

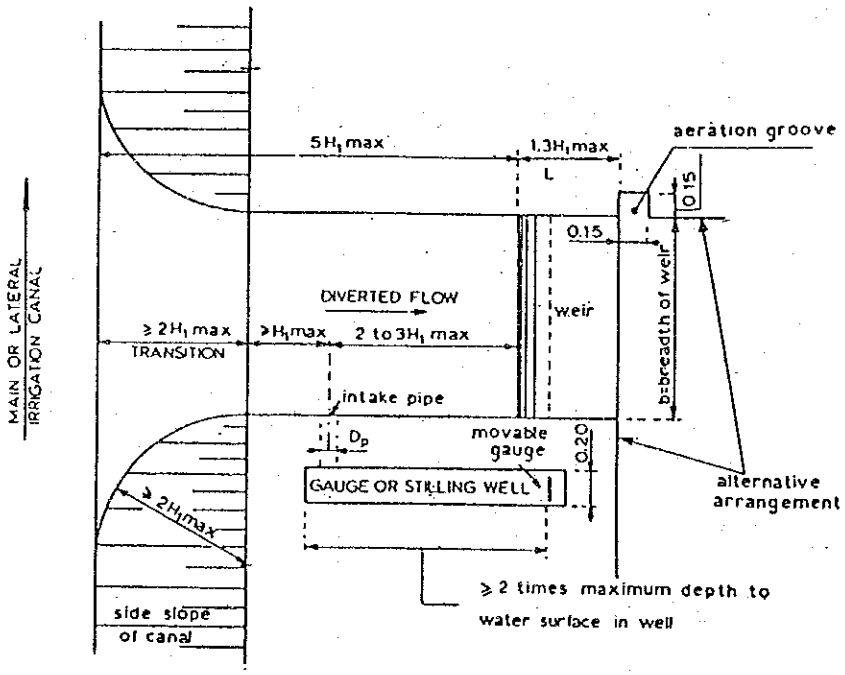



*Fig. 2 . Hydraulic dimensions of weir abutments.*

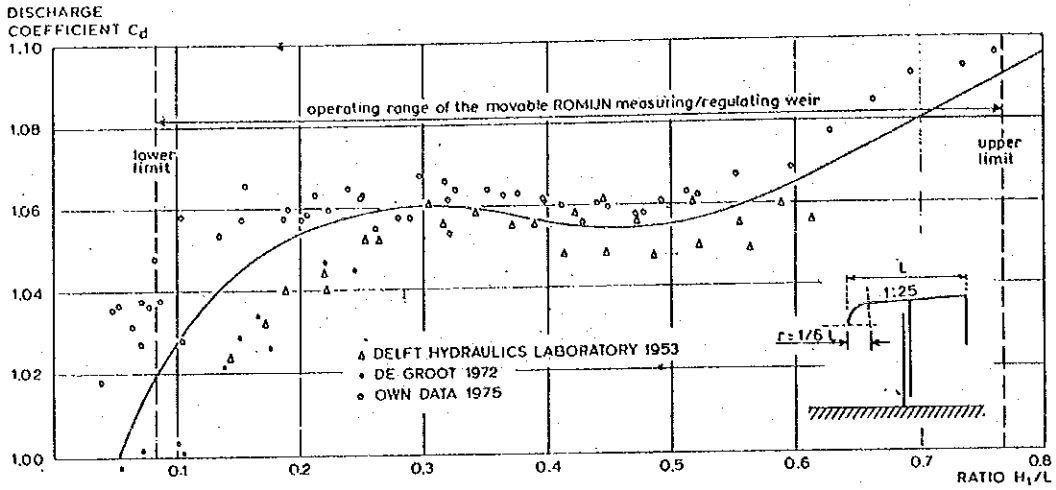



*Fig. 3 . Values of $C_d$ as a function of $H_1/L$ for the Romijn weir.*

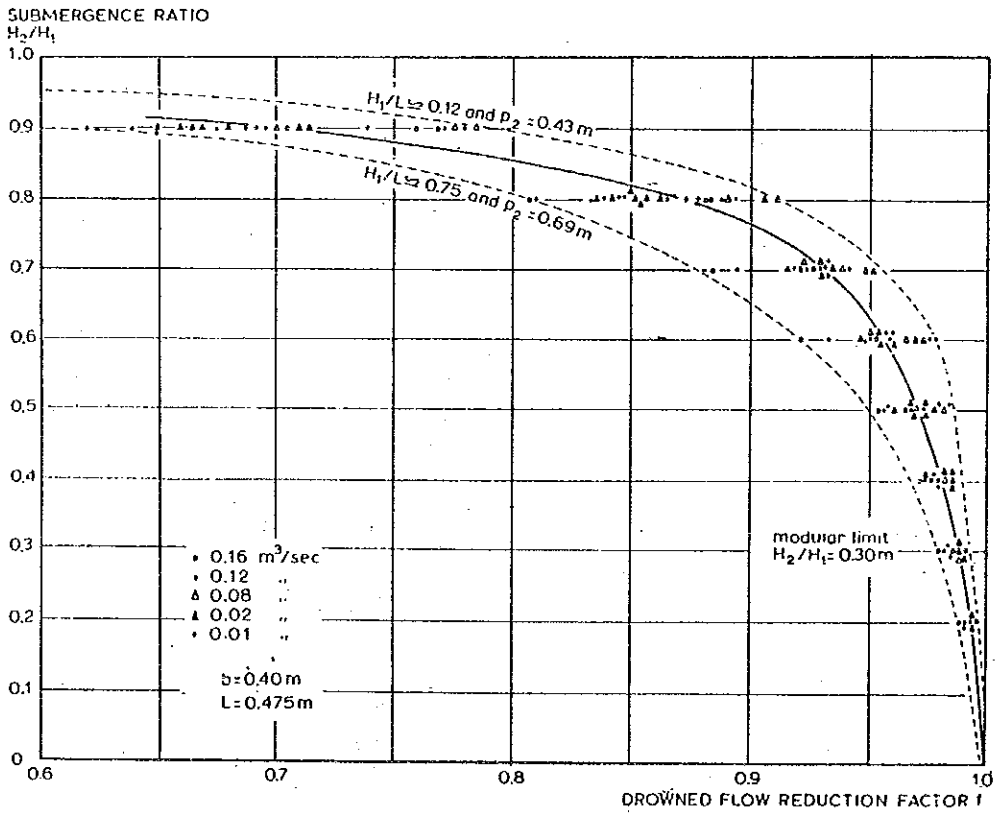
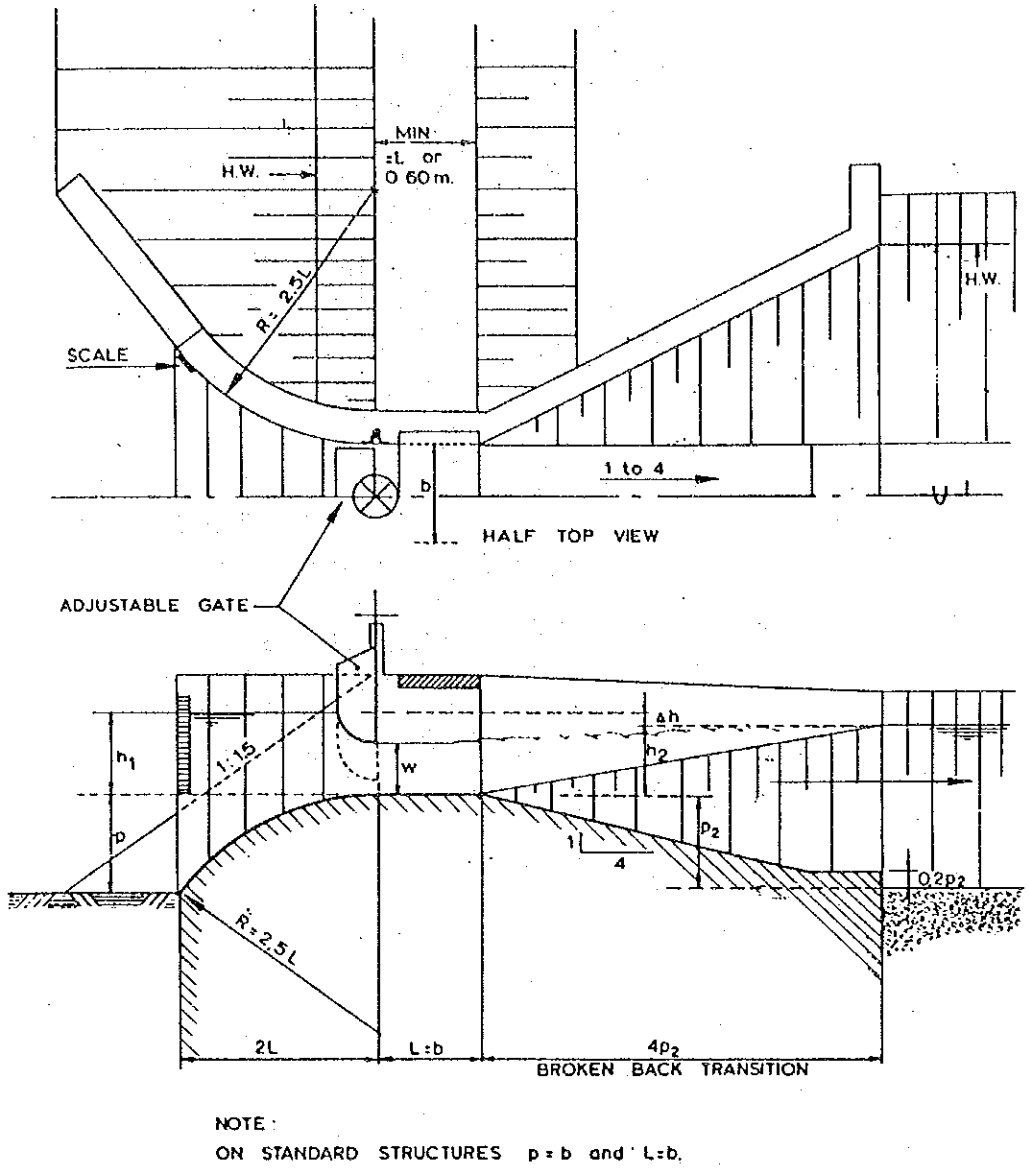



*Fig. 4 Drowned flow reduction factor for Romijn weir.*

Crump-De Gruyter adjustable orifice




NOTE :
ON STANDARD STRUCTURES p = b and L=b.

*Fig. 5 The Crump-De Gruyter adjustable orifice dimensions as a function of $h_1$ and b.*

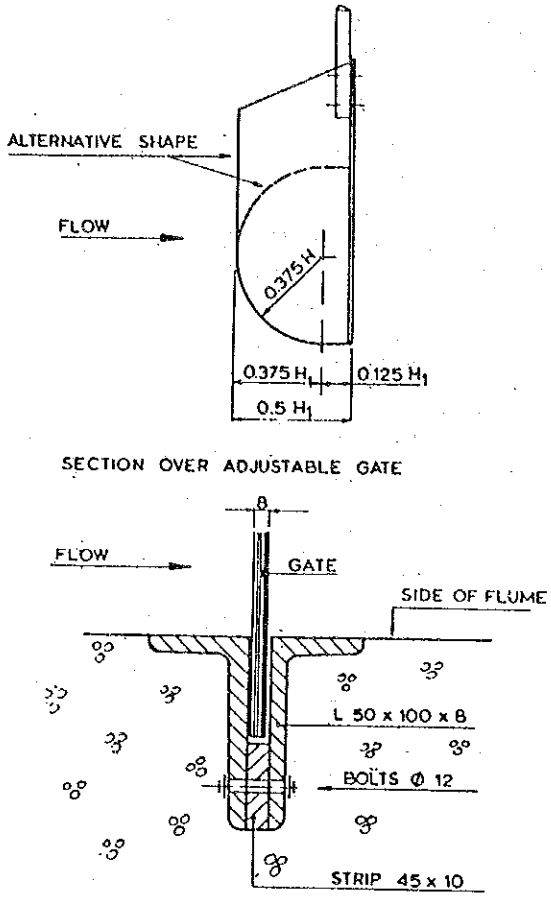



*Fig. 6 . (cont.)*

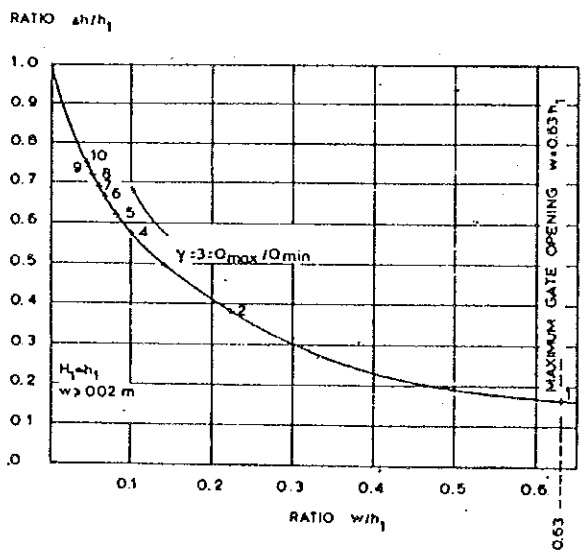



*Fig. 7 . Characteristics of the Crump-De Gruyter adjustable orifice (after F.de Gruyter, 1926).*

Cipoletti weir

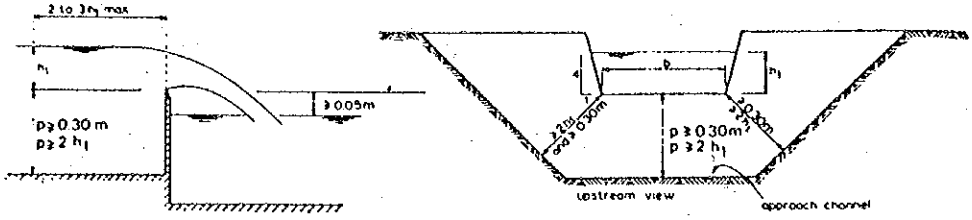



*Fig. 8 . Definition sketch of a Cipoletti weir.*

Fig. 9 *Cipoletti weir.*

Evaluation of discharge

The basic-head-discharge equation for the Cipoletti weir is the same as that of a rectangular fully contracted weir. Hence

$$Q = C_d C_v \frac{2}{3} (2g)^{0.5} b h_1^{1.5}$$

where, within certain limits of application, the discharge coefficient $C_d$ equals 0.63. The approach velocity coefficient $C_v$ may be obtained from Figure 1.12. A rating table for the discharge q in $m^3/sec/m$ with negligible approach velocity is presented in Table

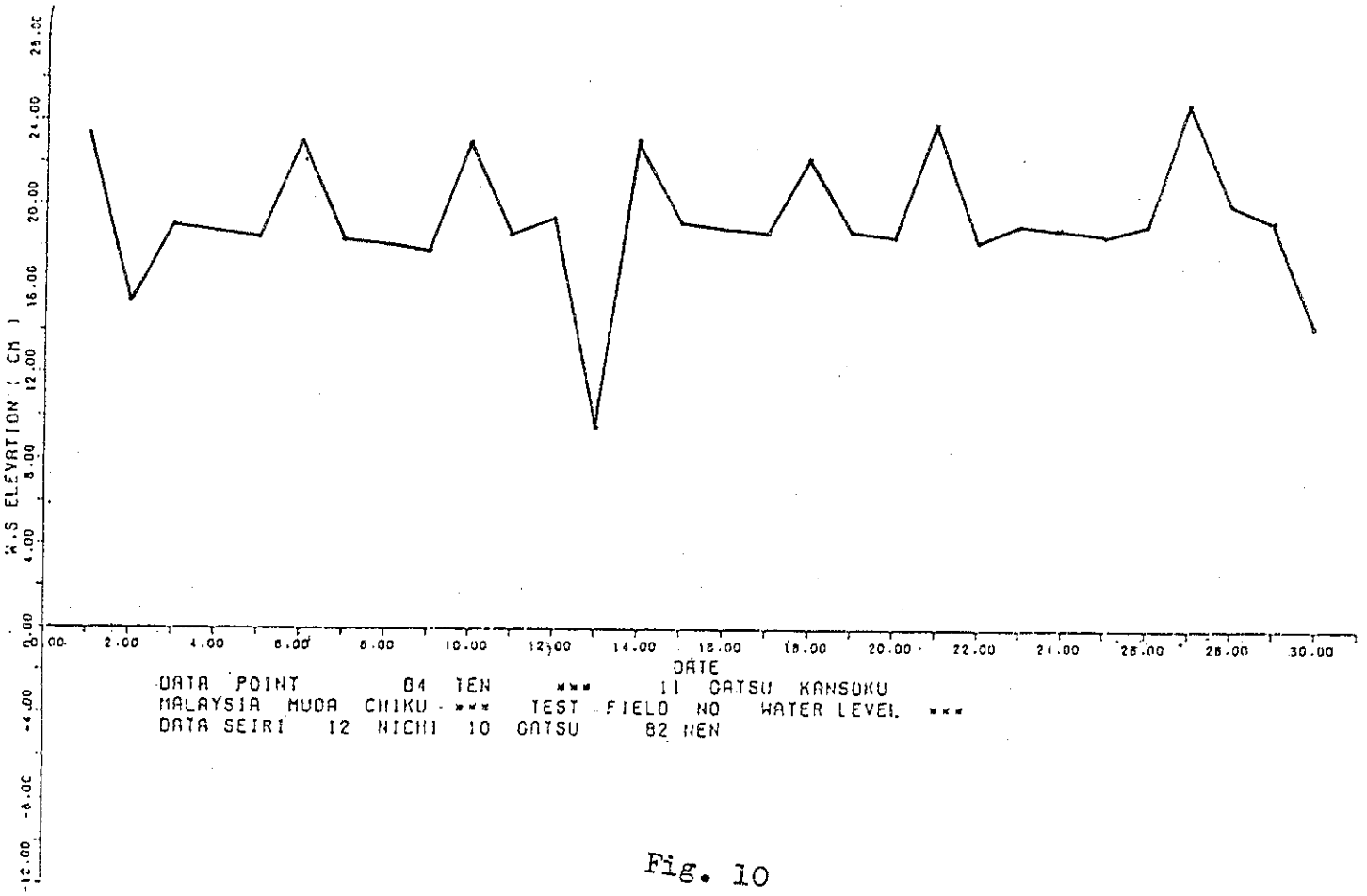

W.S ELEVATION ( CM )
25.00
24.00
20.00
16.00
12.00
8.00
4.00
0.00
-4.00
-8.00
-12.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
20.00
22.00
24.00
26.00
28.00
30.00
DATE
DATA POINT 84 TEN *** 11 GATSU KANSOKU
MALAYSIA MUDA CHIKU *** TEST FIELD NO WATER LEVEL ***
DATA SEIRI 12 NICHI 10 GATSU 82 NEN

Fig. 10

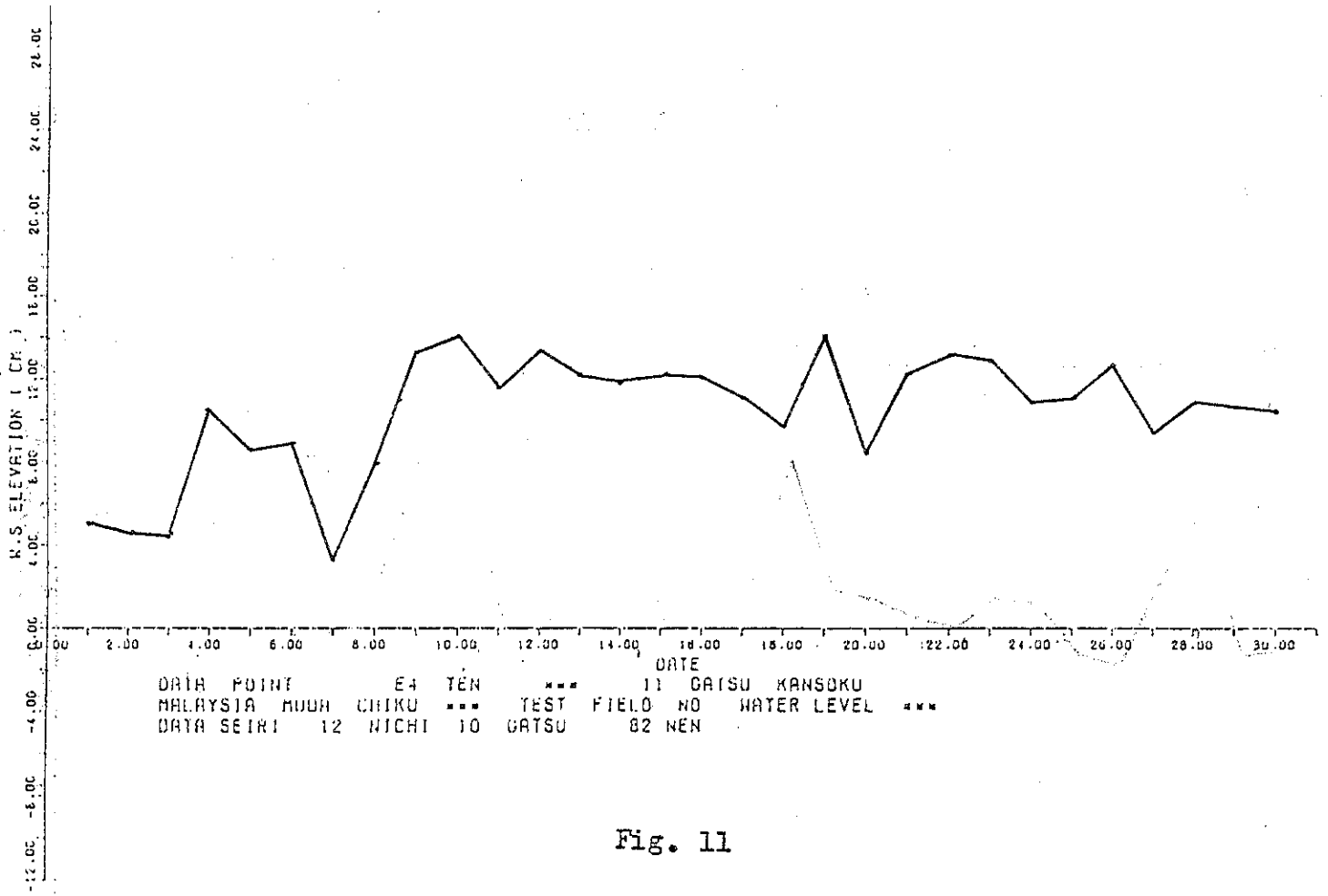

M.S ELEVATION ( CM )
24.00
20.00
16.00
12.00
8.00
4.00
0.00
-4.00
-8.00
-12.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
20.00
22.00
24.00
26.00
28.00
30.00
DATE
DATA POINT E4 TEN *** 11 GATSU KANSOKU
MALAYSIA MUDA CHIKU *** TEST FIELD NO WATER LEVEL ***
DATA SEIRI 12 NICHI 10 GATSU 82 NEN

Fig. 11

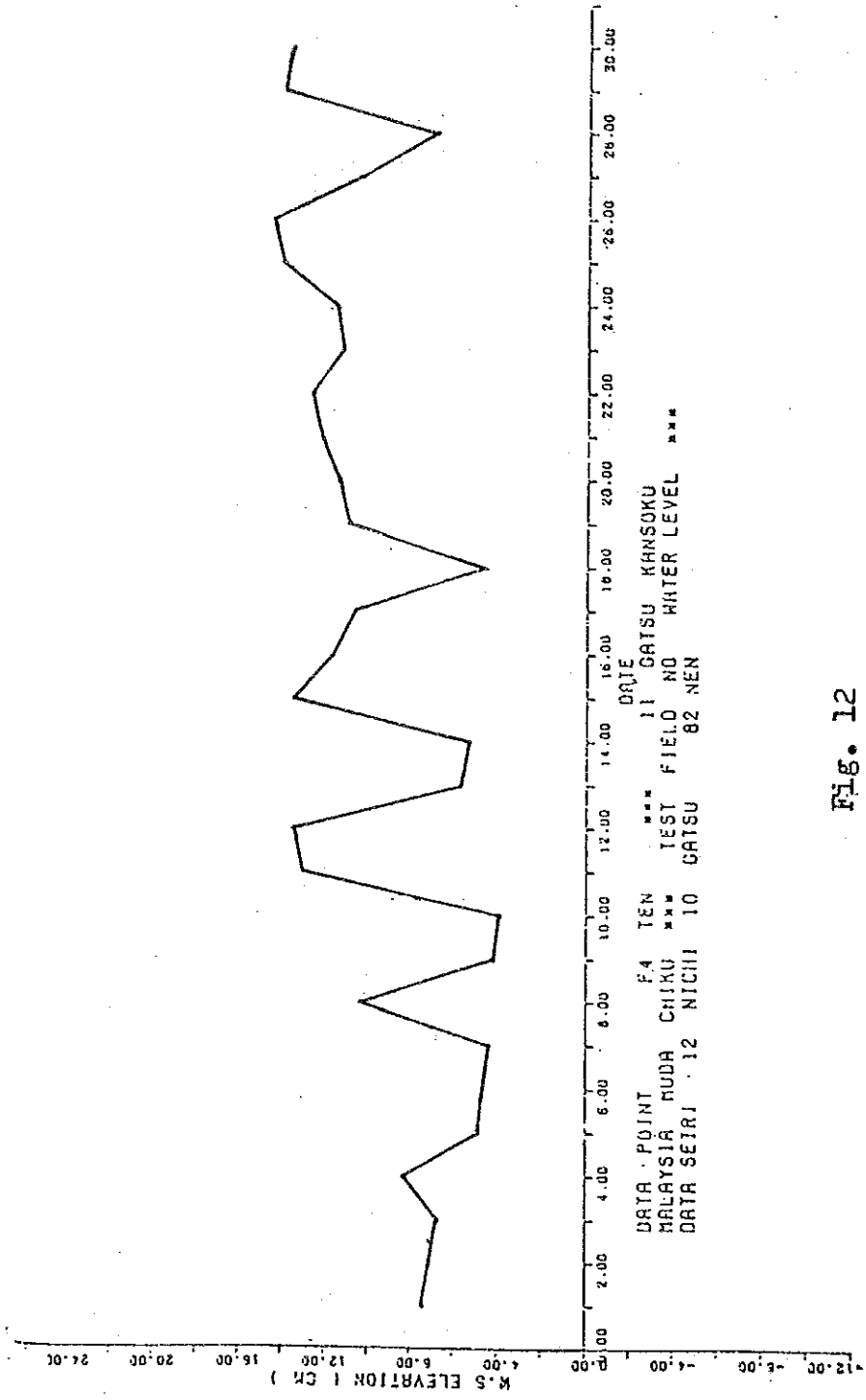

W.S ELEVATION ( CM )
DATA POINT F4 TEN *** 11 GATSU KANSOKU
MALAYSIA KUDA CHIKU *** TEST FIELD NO WATER LEVEL ***
DATA SEIRI 12 NICHI 10 GATSU 82 NEN
DATE

Fig. 12

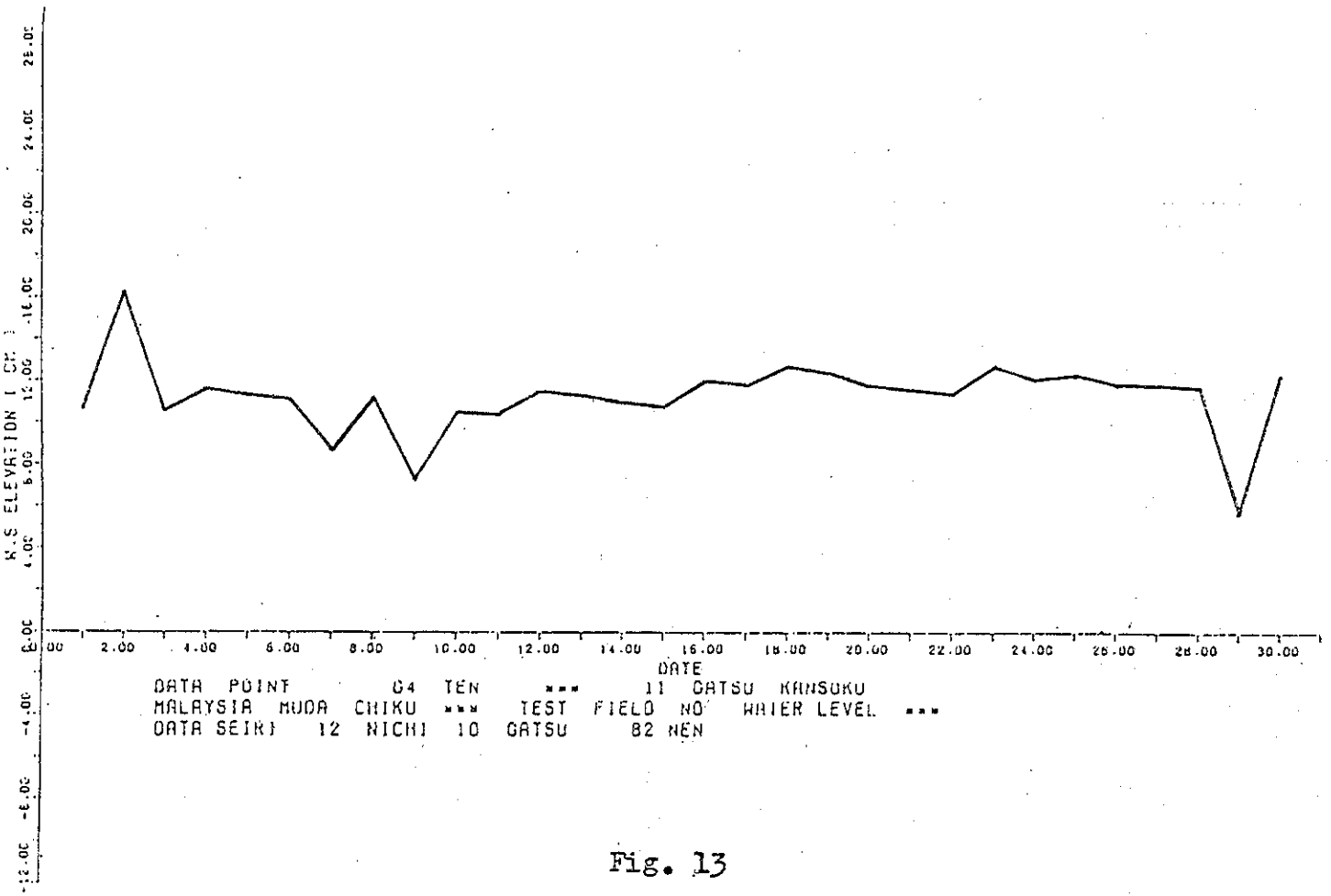

M.S ELEVATION ( CM )
28.00
24.00
20.00
16.00
12.00
8.00
4.00
0.00
-4.00
-8.00
-12.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
20.00
22.00
24.00
26.00
28.00
30.00
DATE
DATA POINT G4 TEN *** 11 GATSU KANSOKU
MALAYSIA MUDA CHIKU *** TEST FIELD NO WATER LEVEL ***
DATA SEIKI 12 NICHI 10 GATSU 82 NEN

Fig. 13

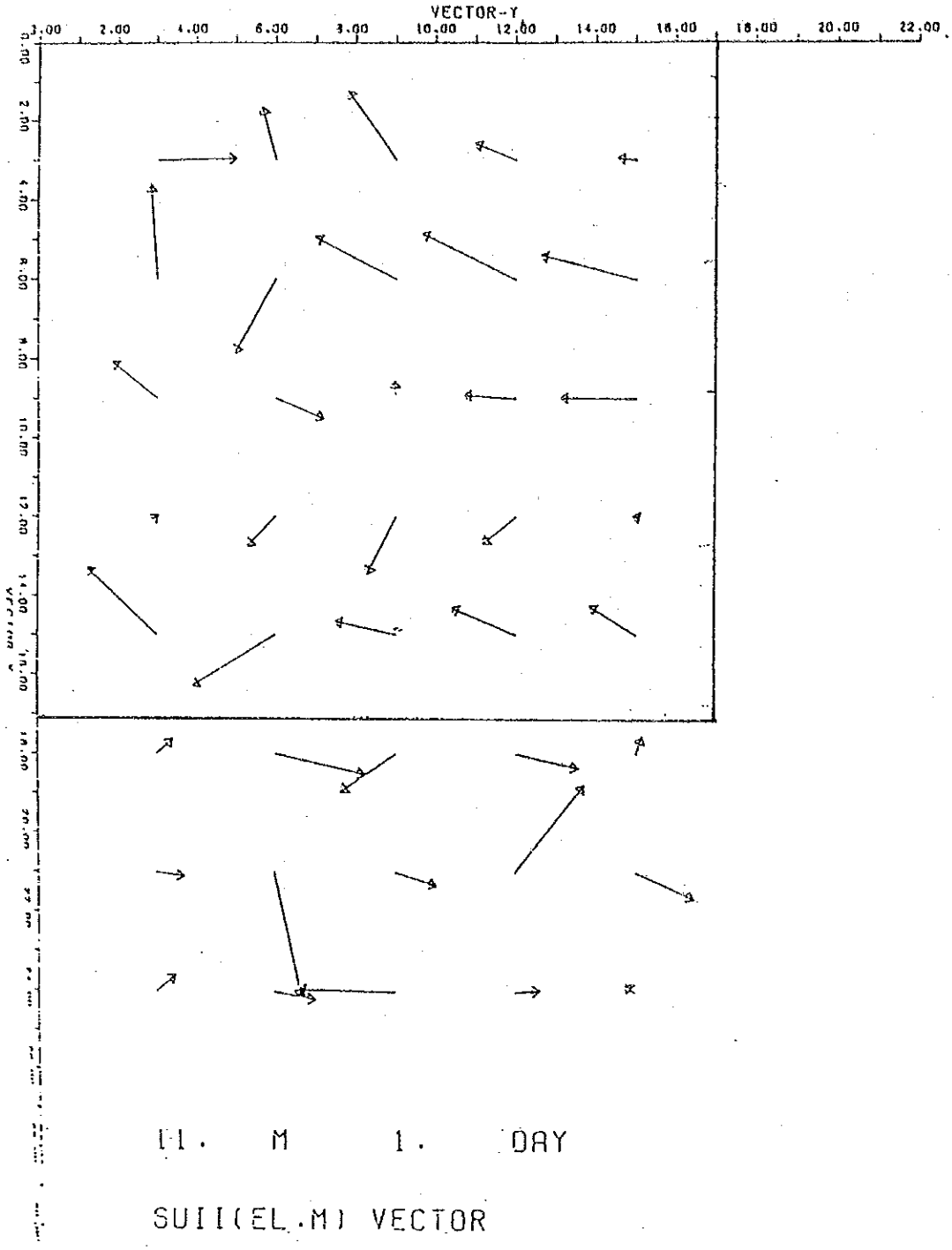

VECTOR-Y
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
20.00
22.00
11. M 1. DAY
SUI(EL.M) VECTOR

Fig. 14

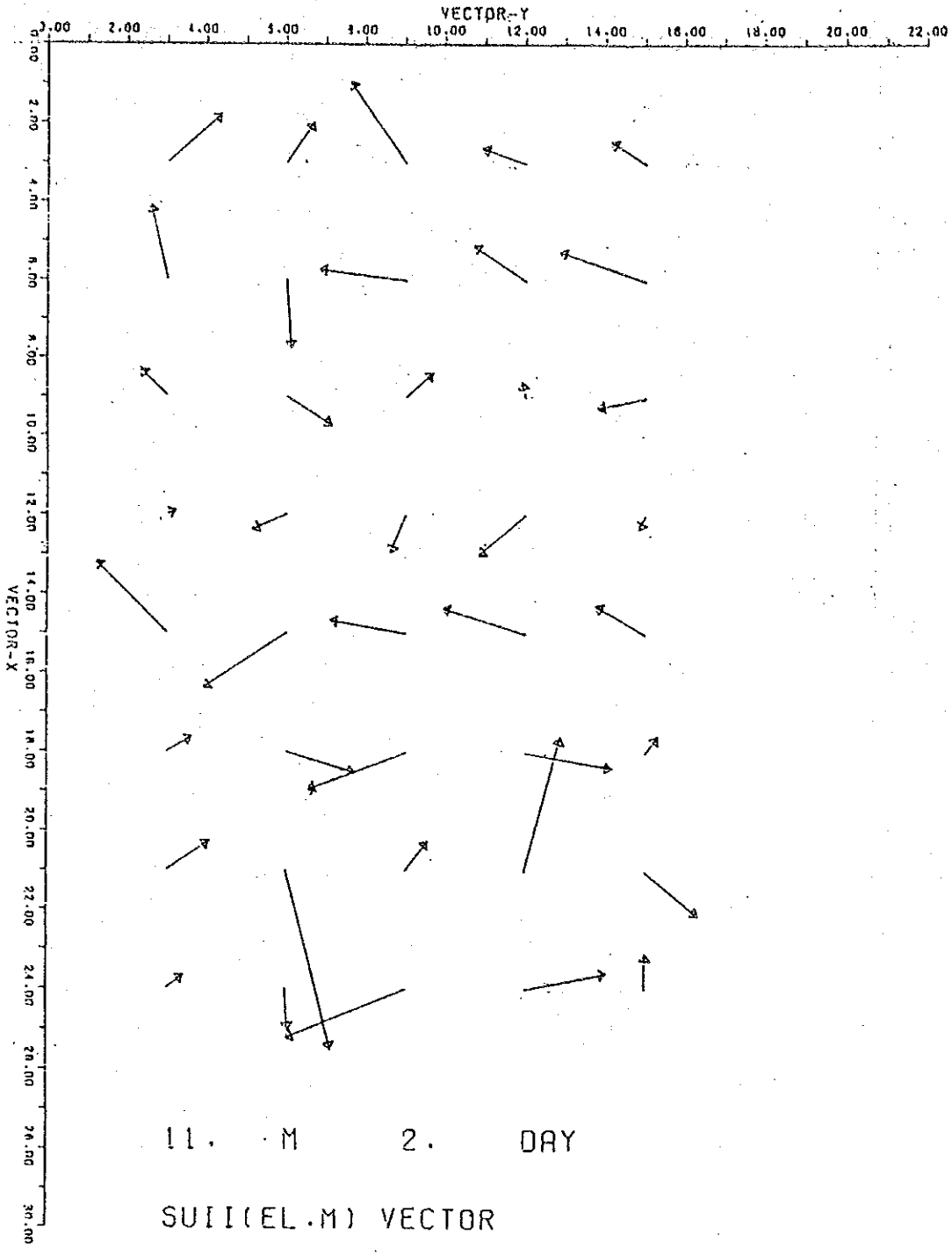



Fig. 15

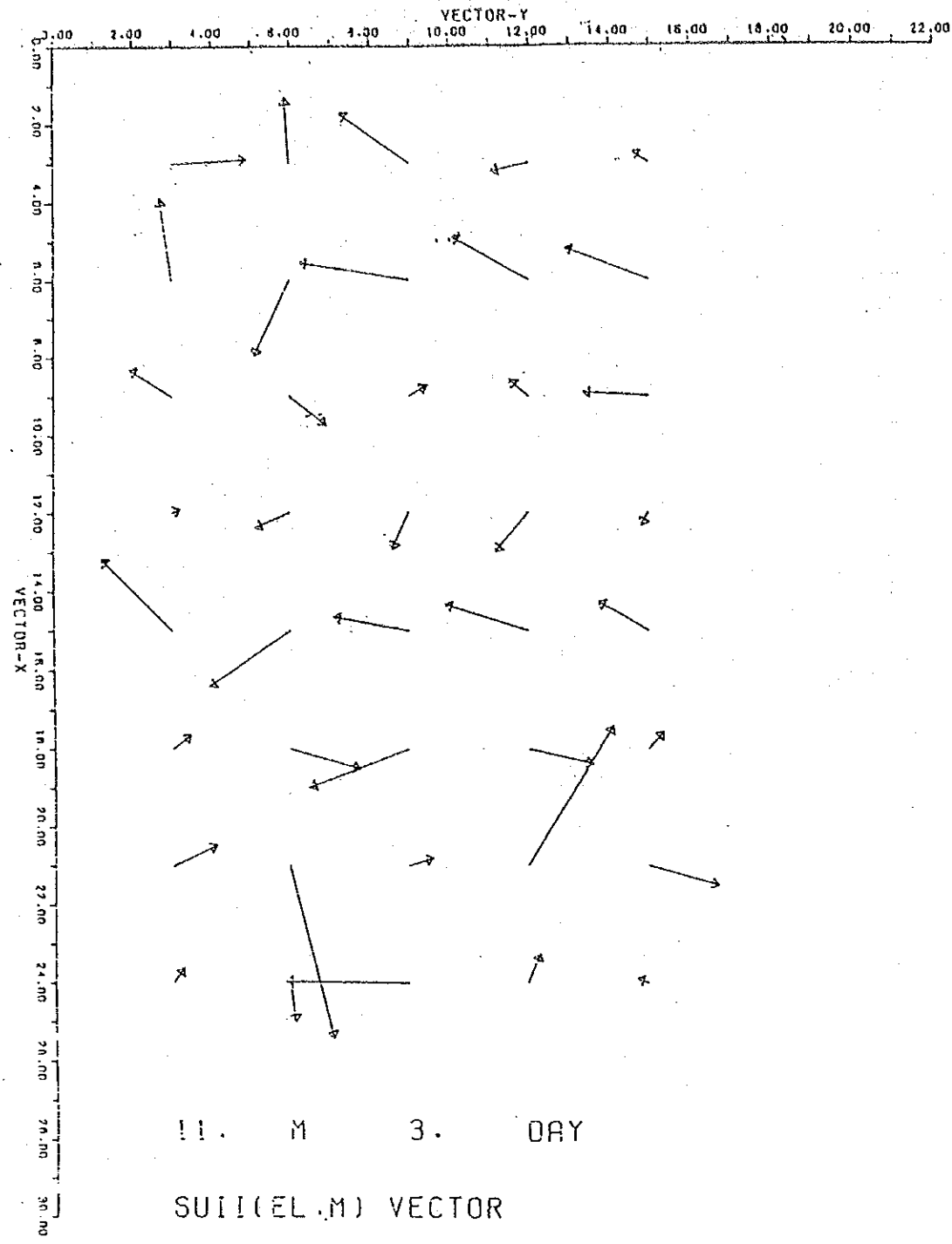
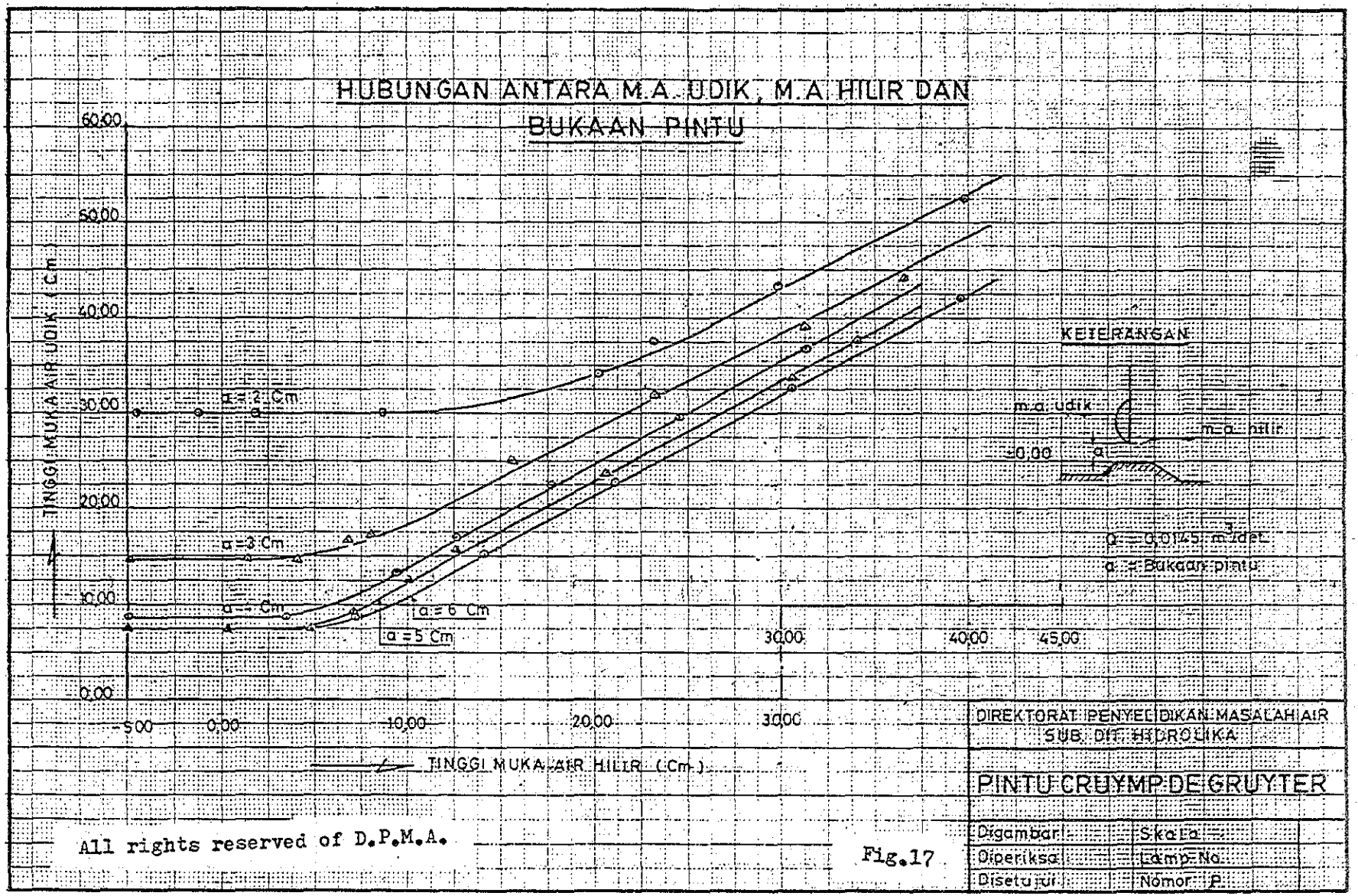



Fig. 16


HUBUNGAN ANTARA M.A. UDIK, M.A. HILIR DAN
BUKAAN PINTU
TINGGI MUKA AIR UDIK (Cm)
60,00
50,00
40,00
30,00
20,00
10,00
0,00
-5,00
0,00
10,00
20,00
30,00
40,00
45,00
a = 3 Cm
a = 4 Cm
a = 5 Cm
a = 6 Cm
TINGGI MUKA AIR HILIR (Cm)
KETERANGAN
m.a. udik
m.a. hilir
-0,00
Q = 0,0145 m³/det.
a = Bukaan pintu
All rights reserved of D.P.M.A.
Fig.17
DIREKTORAT PENYELIDIKAN MASALAH AIR
SUB. DIT. HIDROLIKA
PINTU CRUYMP DE GRUYTER
Digambar
Diperiksa
Disetujui
Skala
Lamp. No.
Nomor

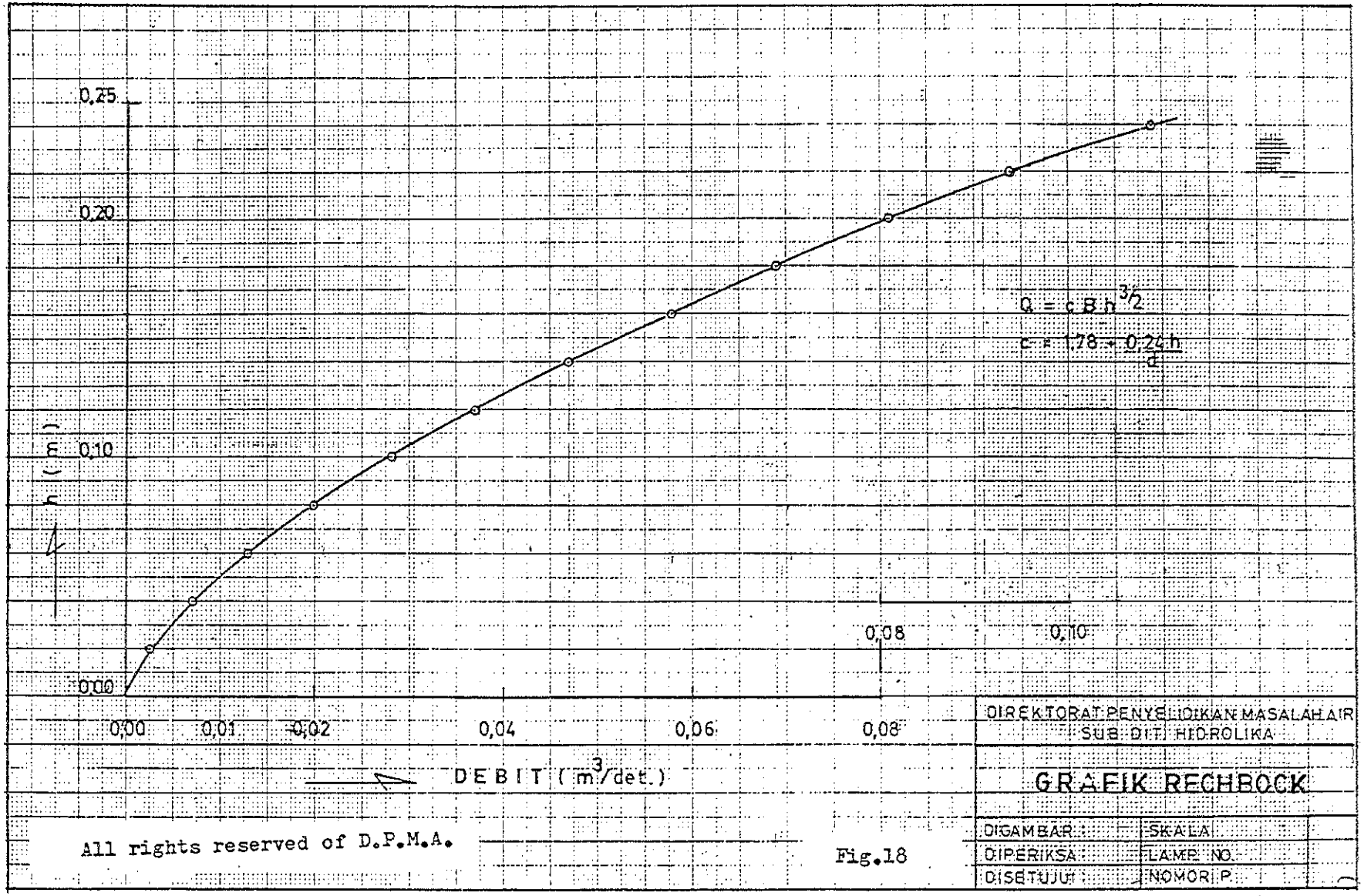





Fig.18

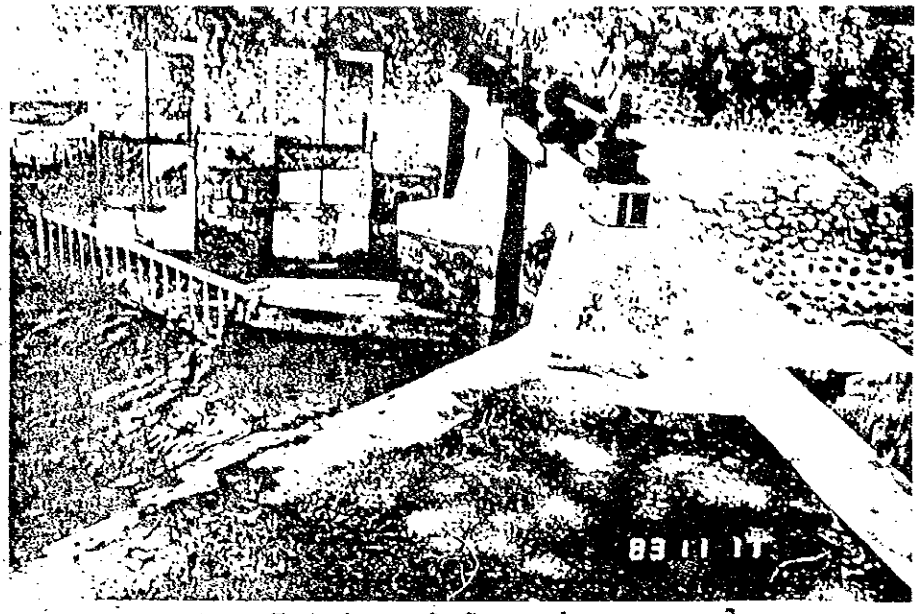


Photo - 1 Intake of Secondary canal and CRUMP Gate

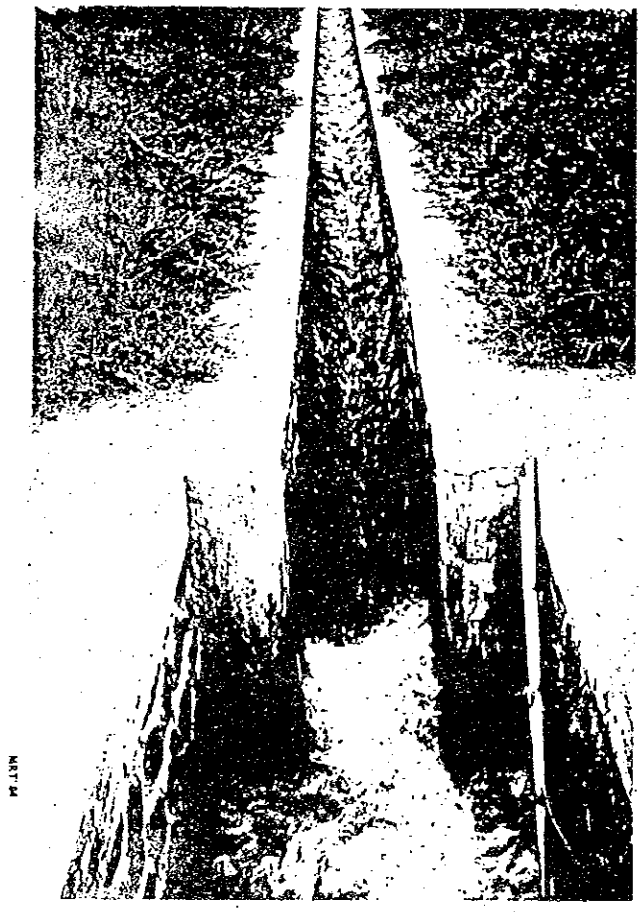


Photo - 2 Transistion canal to secondary canal

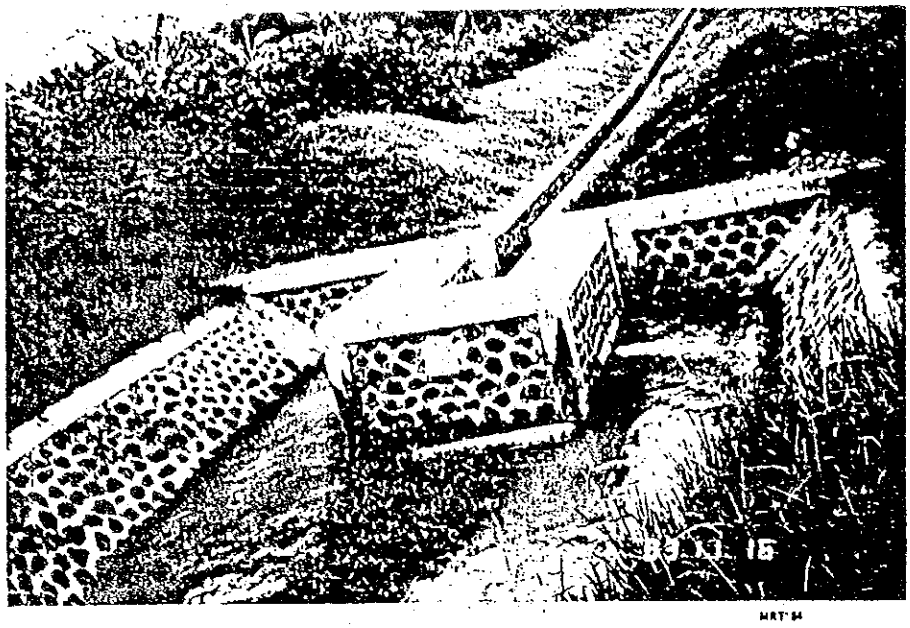


Photo - 3 Secondary canal

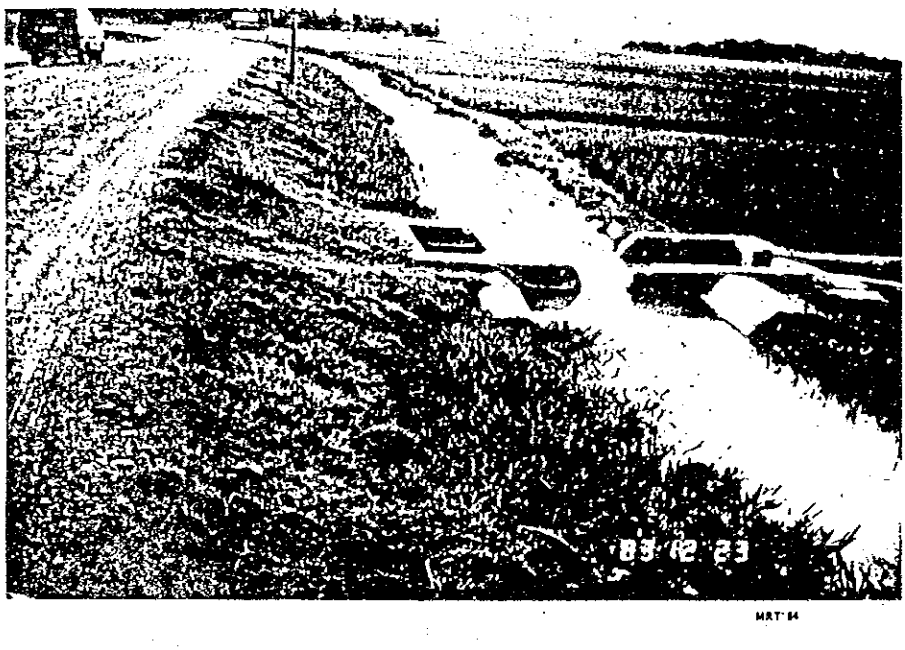


Photo - 4 Box type diversion

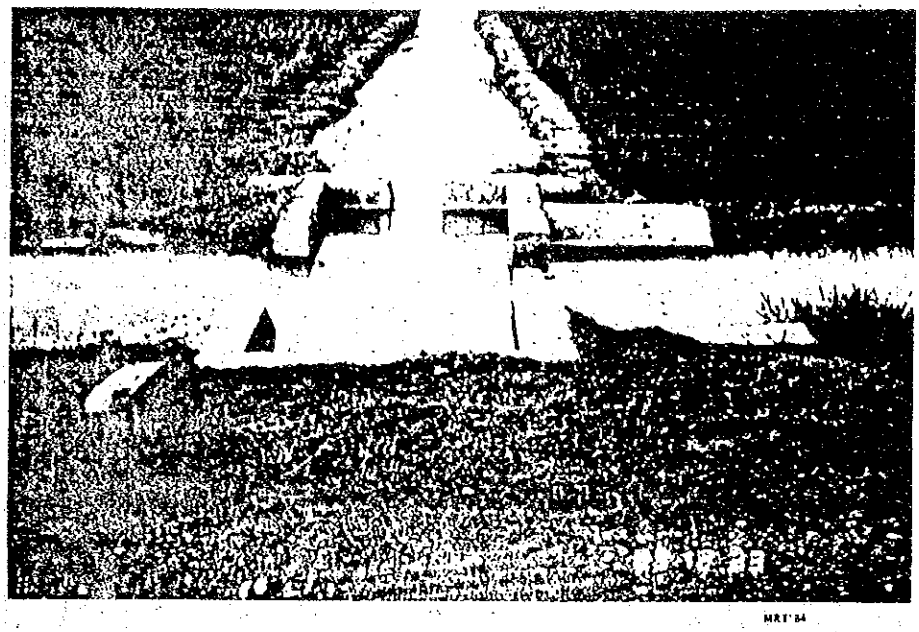


Photo - 5 Box type divestion

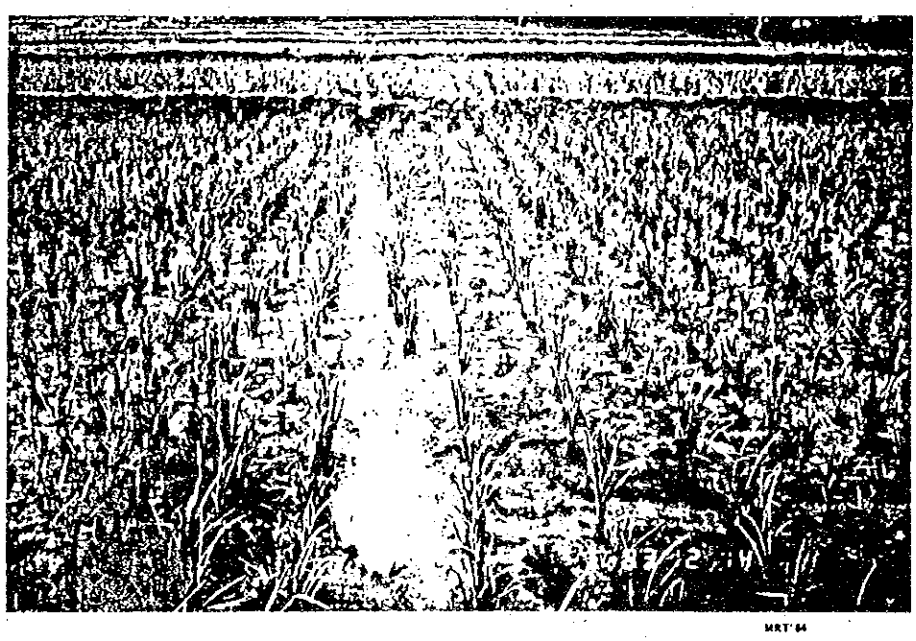


Photo - 6 Ditch in the paddy Field

Photo - 7 Ditch in the paddy field

# (7) タイ国に於ける水管理の現況と問題点

1984

タイかんがい農業開発計画

チーム・リーダー

中　島　淳一郎

# 目　　次

# タイ国に於ける水管理の現況と問題点

タイかんがい農業開発計画チーム・リーダー
中　島　淳一郎

## 1. まえがき

1969年にチャオピア川上流域のシンブリ地区でパイロットとして1,100ライ（176ha）のほ場整備が始めてタイ国で開始されて現在まで15年が経過し，1974年には「ほ場整備法」が制定され，すでに811,851ライ（約13万ha）が完了した。その間開発手法もインテンシブからエクステンシブえと移行し，又整備後の施設，維持管理，水管理，国庫補助及償還金の徴収，農民組織の編成，強化等種々の問題に直面している。云うまでもなくタイ経済の基調をなすものは農業であり，農林水産業の国内総生産額シエアは23.9%（1981年日本は3.5 %）に達しており，その中でも米は主要な位置を占めていることは周知の事実である。

タイ国のほ場整備事業促進の背景は，日本の場合の機械化による省力効果を目的とするとは大きく異なり，配水の効率化による栽培面積の拡大及び用排水コントロールによる高収量品種の導入といづれも米の増産を目的としたものである。

水資源の開発についても勢力的に取り組んで来ており，建設省のダムの有効貯水量は406億$m^3$に達し，この量は国土全体の年平均流出量概算1,200億$m^3$の1/3に相当する。条件に恵まれたダムサイトはほゞ無くなり，今後の開発には多額の費用を要するのは必然であるが，更に地道な水資源の開発と合わせて，開発された用水を如何に効率的に使用するか，即ち水管理問題が重要な課題となって来ている。

## 2. 水管理に対する政府組織

ほ場整備事業に対する制度的仕組みについてはすべて政府指導によって実施される。即ち，新規地区の決定から工事実施まで，勿論私有財産に手をかける事業であるので，地区決定に当っては，法律の定めるところにより50%以上の地主の同意を得なければ勅令により決定出来ないし，実施に際しては100%の同意を得なければ工事の実施にかゝれないのは我が国の場合と同様であるが，しかし工事完了後事業成果の受け皿となる土地改良区に匹敵する様な農民グループの組織的な編成はない。

このことは，工事の粗悪さによる水掛り不良田，日本で云う所の〝欠陥ほ場〟に対する風当りが直接大きな反響として事業所に対して現われず，現われてもCentral Land Consolidation office から事業実施県に職員を派遣し設置しているProvincial land consolidation office に対する不満として現われ，担当職員が事業所との橋渡しに飛び歩く結果を招くにすぎないし，事後農民によるWater Users' Groupを指導して結成させ，維持管理，水管理の指導をしつゝ工事の成果を生かそうとしても，〝欠陥ほ場〟を割り当てられた農民はそっぽをむき，又それを担当する職員，即ちWater master，zone manに水管理の意識及び技術を十分にマスターしている者は少なく，ＲＩＤは先ずこの様な職員のトレーニングに力を入れている段階である。

2－1）ＲＩＤの水管理に対する組織（添付組織図参照）

ｉ）ＲＩＤ本部

管理部（O＆M Division）が担当し，更に担当課としては

用水管理課（仮訳）　（Water Management & Operation）

ほ場用水開発課（仮訳）　（On−farm Water usage Development）

かんがい農業課（仮訳）　（Irrigation Agriculture）

がありそれぞれの分野及び担当地区を決めて分担して維持管理，水管理，データー収集に当っている。

ｉ－ｉ）用水管理課（Water Management & Operation）

データー解析及び維持管理業務全般を全国レベルで担当している。

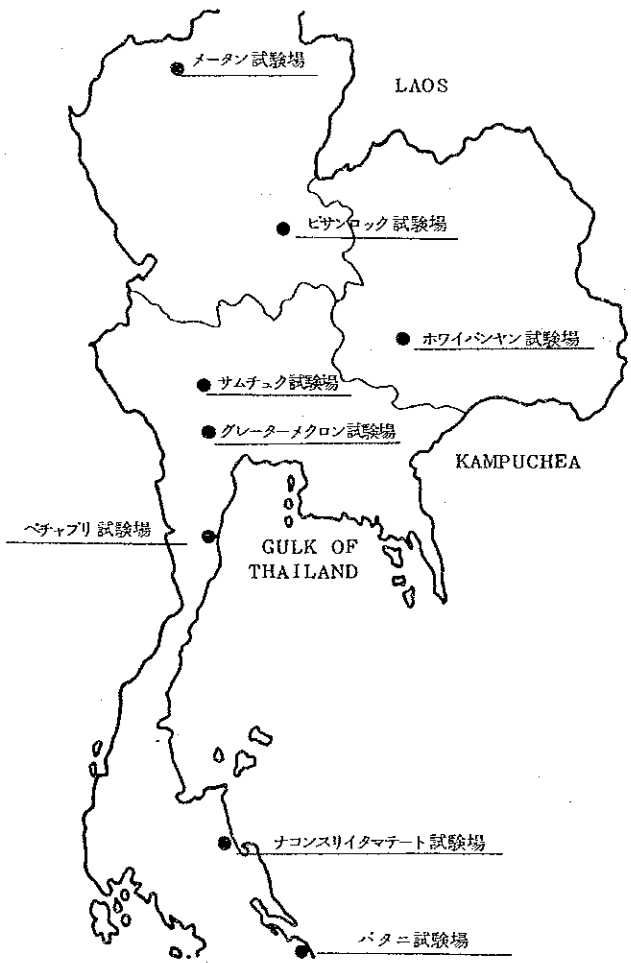
ｉ－ⅱ）ほ場用水開発課（On−farm Water Usage Development）

主として，ほ場レベルでの水管理の研修をほ場整備完了地区に於て実施している。本課にはトレーナーが配置されて地区を分担して現地に於て研修を行っている。

ｉ－ⅲ）かんがい農業課（Irrigated Agriculture）

主として用水量の基本的問題にかゝわり，全国に８ケ所のWater usage Reserch stationを配し，データーを収集し，解析し，水計算手法の研究を行っており，従ってこの課にはAgronomist及びIrrigation Engineerが配置されている。

Water Usage reserch station 配置図



ⅱ）出先機関

ＲＩＤは全国を12の地区に分割して地方事務所（Regional office）を設置し，管内の基幹かんがい施設の維持管理，小規模土地改良事業の実施，かんがい施設の改良工事等を行わせており更に地方事務所の出先として維持管理事務所（O＆M office）を配置し施設の維持管理，水管理を実施している。

メクロン地区を例に挙げると

- かんがい局（Royal Irrigation Department）
  - 維持管理部（O＆M Division）
    - 第10地方事務所（Regional 10 office）
      - カンパンセン維持管理事務所（管轄面積A＝50,650 ㏊）
      - ナコンパトム　〃　（A＝60,048 ㏊）
      - ナコンチユム　〃　（A＝46,240 ㏊）
      - ラジブリ（左岸）　〃　（A＝34,208 ㏊）
      - タ　マ　カ　〃　（A＝50,304 ㏊）
      - ラジブリ（右岸）　〃　（A＝53,968 ㏊）
      - パノムトン　〃　（A＝59,072 ㏊）
      - ソンピーノン　〃　（A＝55,424 ㏊）
      - バンレエン　〃　（A＝56,240 ㏊）

ⅱ－ｉ）ウオーター・マスター（Water master），ゾーン・マン（zone man）

上記維持管理事務所には維持管理及び水管理を担当する。

職員としてウオーター，マスタ及びゾーン・マンを配置している。

配置状況

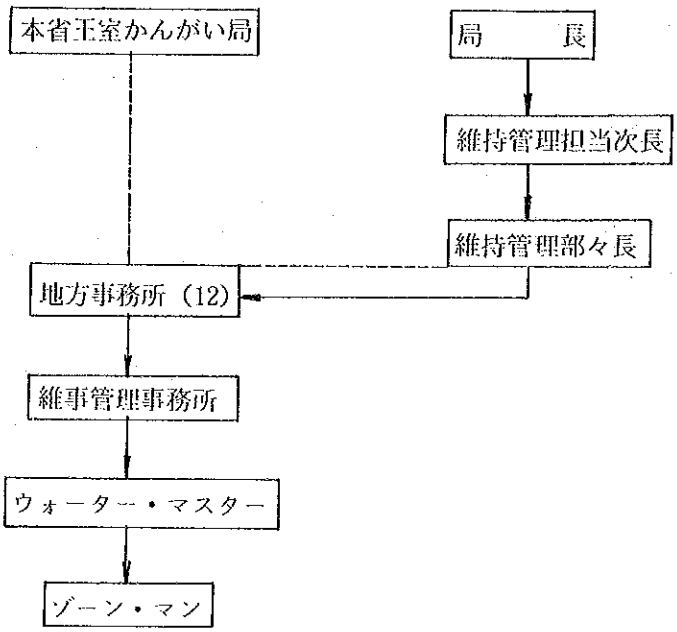
| 地　域 | ウオーター・マスター | ゾーンマン | Irrigation by Controlled flooding | ほ場整備済 | デイッチ・アンド・ダイク済 | 整備済面積計 |
|---|---|---|---|---|---|---|
| 北　部 | 34人 | 110人 | 494,500 ㏊ | 887㏊ | 23,396㏊ | 518,783㏊ |
| 東北部 | 76 | 180 | 709,500 | 1,000 | 20,281 | 730,781 |
| 中　部 | 148 | 585 | 688,000 | 10,122 | 144,594 | 842,716 |
| 南　部 | 22 | 63 | 258,000 | － | 3,322 | 261,322 |
| 計 | 280 | 938 | 2,150,000 | 12,009 | 191,593 | 2,353,602 |

平均１人当り分担面積

| 地　域 | ウオーター・マスタ１人当ゾーン・マン人数 | ウオーター・マスター | | ゾーン・マン | |
|---|---|---|---|---|---|
| | | かんがい開発地域 | ほ場整備地域 | かんがい開発地域 | ほ場整備地域 |
| 北　部 | 3.2　人 | 14,544㏊／人 | 714㏊／人 | 4,495㏊／人 | 221㏊／人 |
| 東北部 | 2.4 | 9,335 | 280 | 3,942 | 118 |
| 中　部 | 4.0 | 4,649 | 1,045 | 1,176 | 264 |
| 南　部 | 2.9 | 11,727 | 151 | 4,095 | 53 |
| 計 | 3.4 | 7,679 | 727 | 2,292 | 217 |

※　ほ場整備及デイッチ・アンド・ダイク地域

ウォーター・マスター及ゾーン・マンの全体的な位置づけは下記の如くである。




ウォーター・マスターの業務内容

イ）　担当地域内に於ける維持管理業務を担当する。

ロ）　年度，かんがい計画及び栽培計画の策定に当りプロジエクト・エンジニアを補佐する。

ハ）　維持管理を円滑にすゝめるための関係職員に対するコーディネーションを行う。

ニ）　植付け時期以前にゾーン・マンと共に情報の収集を行い，技師に提供し，それを基に技師は栽培，水管理，配水計画を策定する。

ホ）　ゾーン・マン及そのスタッフからかんがい及び営農に関するすべての中間報告を集め水管理計画（ブロック別の）を策定し，必要が生じれば配水計画の手直しを行う。

ヘ）　分担地区内に於ける手直し工事，修理，災害復旧についての報告書を作成提出する。

ト）　水管理組合職員との連繋を密に保つ

チ）　水管理組合の育成に努めその機能が円滑に発揮出来るようにする

リ）　基幹水利施設である幹線用水路の維持管理を行う。

ゾーン・マンの業務内容

ウォーター・マスターの仕事を補佐する他，主として下記業務を行う。

イ）　ラテラル水路の分水工から始まる第二次派線路の維持管理を監督する。

ロ）　農民との連繋を密にし，ターシャリー水路及びファーム・デッチの補修工事を監督する。

ハ）　植付期以前に担当区域の作付計画及び水配分計画を策定する。

ニ）　承認後水配分計画表を水管理組合を通じて，個々の農家に配布する。

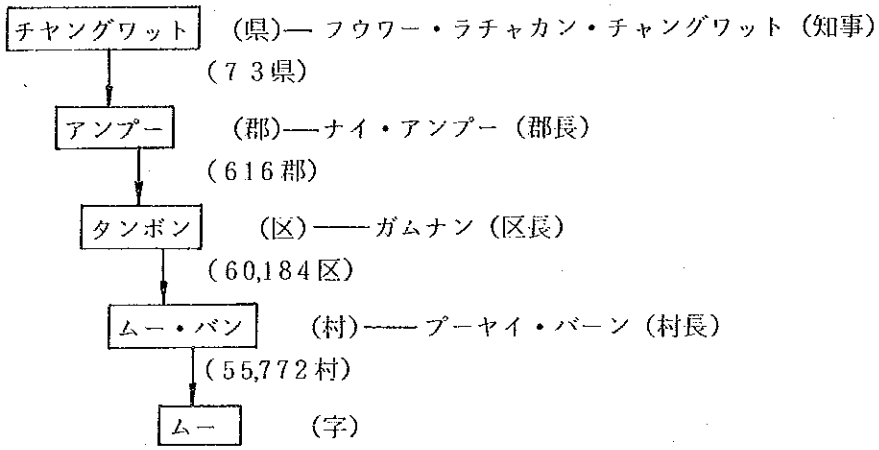
ホ）　分水工のゲートの開閉操作を行う。

上記の如き業務に従事しているのはウォーター・マスター及びゾーン・マーンの学歴であるが，ウォーター・マスターは，一部ＲＩＤが開いているイリゲーション・スクール（高校卒業後３年間の専門教育）の卒業生であり他はゾーン・マンの経験を経て優秀な者が昇格する。

ゾーン・マンは職業学校卒業の学歴を有している程度で専門知識は有していない。仕事を通じ，又，トレーニングをうけてその必要な知識を身につけていくのである。

２－２）地方行政機構

タイ国の地方行政機構と密接な関連があるので，その機構について述べる。




県知事，郡長は内務官僚が任命されるが，村長は村の長として互選され，更に村長の中から行政区の長として区長が選ばれる。

地元の長としては，村長が大きな役割を果しているが，中央政府の出先機関である郡役場との接触には区長が大きな役目を果している。

## ３　水管理に対する農民組織

３－１）クルム・プー・チャイナム（水管理組合）

自発的な組合の結成は見られず，政府主導型により，特に圃場整備完了地点を重点に結成されている。

現在水管理組合課がかんがい局の中に設置されており，組合の指導にあたっている。結成組合数は187組合，面積は560千㏊に及ぶが特に極く少数の組合を除いては，ウォーター・マスター及びゾーンマンの指示に消極的に従っている程度である。

３－２）水管理の事例

３－２－１）北部タイのかんがい用水管理の実例

３－２－１－１）パータク・プロジェクトの例

本プロジェクトは，かんがい面積9,600㏊（50,000ライ）を有するかんがいプロジェクトであり，1948年に着工され，1954年に完成した。

ＲＩＤの維持管理事務所が管理している３本の幹線水路のうち，一本はＲＩＤが建設

したものであるが，他の２本は以前農民自身により建設されたものをその後ＲＩＤが改良したものである。

更に３本の幹線水路より13本の支線水路が分岐しているが，更に支線水路より分水している末端水路をも含めてすべて農民自身により建設されたものである。

ⅰ）（水路維持管理区分）

ａ）ＲＩＤ維持管理事務所は幹線水路だけを管理している。

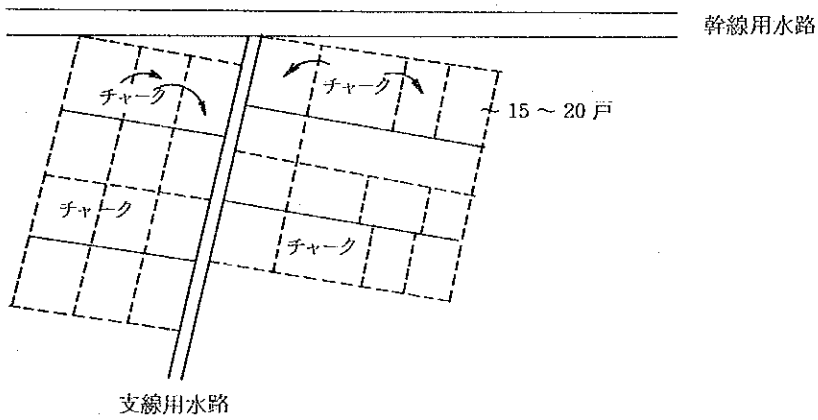
ｂ）支線及派線水路は受益農民によって管理されている。

ⅱ）水利組合

本地域に於ける農民組織は２つある。

ａ）チャーク（Sectionの意味）

チャークは，支線水路から分水される末端水路に沿って15～20戸の用水農家によって構成されている小単位の末端用水受益農民組織である。




「チャーク」の代表者は「ファナー・チャーク」と呼ばれ関係農民によって選ばれる。「ファナー・チャーク」は完全な名誉職であるが，維持管理に関する事項については極めて強い権限を有している。

ｂ）スワン

「スワン」は一つの支線ごとに，支線水路の長短に関係なく存在している。「スワン」の代表者は「ファナー・ムアン・ファーイ」と呼ばれ関係農民によって選ばれる。この代表者も完全な無報酬の名誉職である。

ⅲ）農民による水路の維持管理

水路の維持管理は年１回農民の負担で行われる。「スワン」内の水路の維持管理については「ファナー・チォーク」は，末端水路に沿って存在している多数の「チャーク」の代表者と相互に連絡をとって維持管理に必要な労力を「チャーク」から供出して必要な作業を行う責任を負わされている。この責任を果たすため「ファナー・チャーク」は強い権限を有している。

①所属の「チャーク」の各農家から所要労力を提出させる権限　②罰則を与える権限

（通常２－３ tang，最高は30 tangまで（注）tangは籾をはかるのに用いる容量単位通例20ℓ，約10Kg）である。

ⅳ）水管理の実態

用水については特に乾期作が大きな問題であり，乾期作が開始される前に，給水計画作成委員会が開催される。

委員会の構成は

委員長　ナイ・アンプー（郡長）

ＲＩＤ職員及びゾーン・マン

アンプー（郡）及びタンボン（村）の農業普及関係職員

アンプーの農業協同組合関係職員

各「ファナー・チャーク」

関係農民及び幹線水路から用水の供給をうけている農業以外の産業関係者は自由に参加しうる。

出席者は通常200～300名となる。

会議はＲＩＤの維持管理事務所より，その年の天候状況によって乾期間に供給しうる水量の報告から始まる。

この報告を基に自由討議が長時間くり返され，議論の内容は主として水量を基準にした乾期作の作付計画に集中する。

会議の主題は，①常に乾期に於ける給水量の少ないことが中心となり農民から各種の要求や質問が多くている。

この会議に於て，全体の給水量と，各「スワン」に対する供給量が決定され，この給水計画にもとづいて，地域農民は夫々の判断により作物栽培を選択し，次期農作業が開始される。ゾーン・マンがこの計画に基いて幹線より支線に用水を供給する。ゾーン・マンは常に「チャーク」と連絡を保っているので「チャーク」の要求を熟知しており，一方アンプーに配属されている農業普及員も常に積極的にゾーンマンと連繋関係を保っている。

3－2－1－2）メー・タン（Mae Taeng）プロジェクトの例

本プロジェクトはチェンマイ県にあり1955年に着工，1957年に完了した最北端はメー・タン郡からサンパトン郡に至る５つの郡をカバーする幹線水路延長74.5 kmのかんがいプロジェクトである。

延長74.5 kmの幹線水路からは26本の支線水路が分岐し，支線水路延長は249.2 kmに達する。

最大支線延長は209km，最短支線延長は0.5 kmである。

幹線水路と支線水路はＲＩＤにより施工され末端水路は農民の手により作られた。

プロジェクトの受益面積は23,696 ha（148,102 ライ）である。

ⅰ）水利組合

この地域の水利組合組織は２つある。

「チャーク」と「サマーコム・プー・チャイナム・チョンプラタン」である。

後者はFarmers' Association to use irrigation waterという意味である。

a）チャーク

支線水路に1つづつチャークと云う農民組織がある。従って本地区の場合大小26のチャークがある。

パータク・プロジェクトのスワンに相当する組織である。

各チャークごとに1人のファナーチャークが農民の会合によって選ばれる。

b）サマーコム・プー・チャイナム・チョンプラタン

本プロジェクトには2つの同上組織がある。その1つは，メータン郡とメーキム郡を他の1つはムアン郡，マンドン郡及サンパトン郡をカバーしている。

各サマーコム・プー・チャイナム・チョンプラタンには委員長，秘書，出納係がいるが，すべて無報酬で名誉職であり，任期は2年である。これらの役職は関係郡のファナー・チャーク会議によって選出される。

現在委員長はＲＩＤを退職した人がその任に当っている。

ⅱ）農民による水路の維持管理

いずこのプロジェクトに於てもそうであるが，幹，支線水路はＲＩＤのO&M Office が管理しており，末端水路の維持管理のみが農民の手によって行われている。

ファナー・チャークは1年1回，末端水路の状況に応じて農民より所要の労力の供出を求め，この労力によって末端水路のすべてを修理通水可能のように維持している。

ⅲ）用　水　費

1農業シーズン，1ライ（40$m$×40$m$＝1600$m^2$)当り5バーツ（約60円）の用水費を農民に賦課している。ファナーチャークが徴収する。

ⅳ）ファナー・チャークの権限

この地域に於ては，ファナー・チャークは徴収した用水費の25%を自己の活動費及びその他の費用に使用するために自動的にファナー・チャークの収入となる。ＲＩＤの維持管理事務所は用水の受益面積を自己管理するには相当の責任とスタッフ，費用が必要とみとめたものである。

ⅴ）送水計画及実施

送水計画は年1回開催される維持管理事務所とサマーコムで構成される委員会によって決定される。

このプロジェクトに於ては，ゾーン・マンは支線水路の数によって配置されずかんがい面積1オライ（1,600ヘクタール）について1人の割合で配置されており全体で15人である。

送水開始10日前にゾーン・マデより各チャークに対して送水期間と送水量を決定通告して送水することが形成上はなっているが，実質的には形式的な通告をする前にゾーンマンとチャークの間で話し合いがあり，チャークの要求を相当考慮して行われる。

3－2－2）メクロン川右岸かんがいプロジェクトの水管理構想

メクロン川右岸かんがいプロジェクトは66,000 ヘクタールに対するほ場整備プロジェクトであり，ＲＩＤが1982年より世銀の借款によって工事を実施中であり，すでに1983年までに5,000ヘクタールを整備した。

本プロジェクト実施に際し，ＲＩＤはオランダのコンサルタンツであるＩＬＡＣＯとコンサルタンツ契約を結んでいるが，ＩＬＡＣＯが提出している本地区に対する水管理構想を簡単に紹介する。

ⅰ）水管理に対する関係官庁の業務分担の明確化

a）かんがい用水の供給と配分については頭首工からほ場レベルまでＲＩＤの維持管理事務所職員によってコントロールし，ほ場レベルに於てはその維持管理は農民の責に於て実施すること。

b）農業普及局は出先事務所を通じてContact farmer（農家10戸に当し１戸位の割り合いで，コンタクト・ファーアーを設けて）え営農技術を指導する。

c）農業振興局は，各分野に於て農民の協同組合の設立をはかる。政府はすでに，ほ場整備区域内に於ける農民の維持管理組織については農業振興局の管轄権に入ることを決定している。

d）上記３局はターシャリー（tertiary 第三次派線水路）ごとに結成される農民組合に働きかける。

ⅱ）水管理組合

同様のプロジェクト（例えばチャオピアかんがい改良プロジェクト）に於て，下記の農民水管理組合の設立については，すでに上記３局で合意されている。

a）水管理組合は１つのサービス・ユニット（オフ・テークによって水をかけられる区域：オフ・テークとはサービス・ユニットに対する取入口）内のすべての農民を組合員とする。

b）サブ・グループは大体10農家位から成り，かんがい溝の配置や管理を考えて組織する。

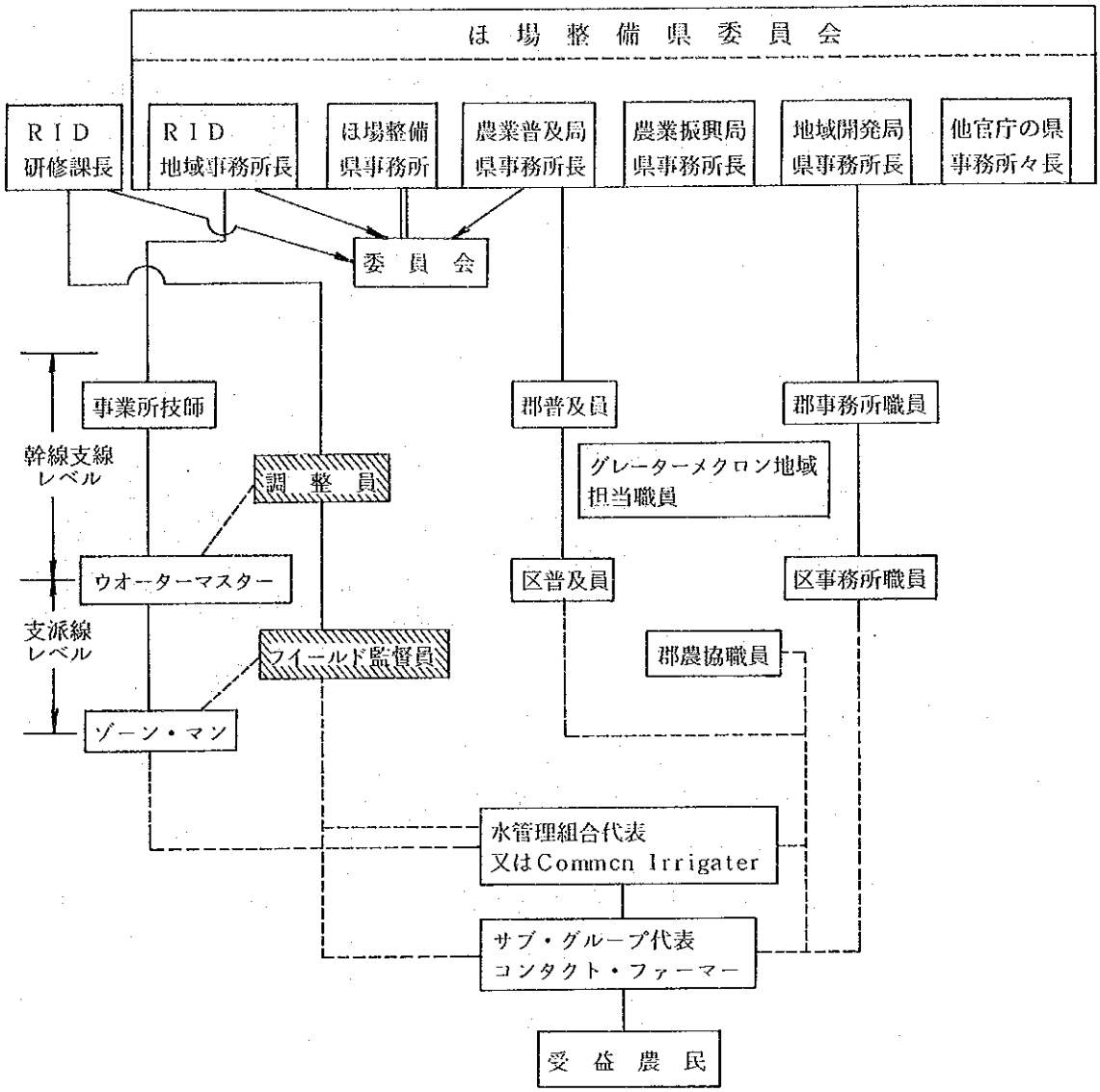
ⅲ）ＲＩＤの実施班（Task Force）の結成

ほ場整備工事が終った部分に対して，直ちに実施班は活動を開始し，水管理の技術面のみではなく農民の組織化にもとりくむ。これには，地域開発局（Community Development Deportment）も協力する。

ⅳ）委員会（Working Committee）

委員会を結成し，メクロン右岸かんがいプロジェクトのＲＩＤの職員と農業普及局，農協振興局，地域開発局，ほ場整備県事務所間の円滑なるコーディネーションを計る。

以上，メクロン川右岸かんがいプロジェクト地域内の水管理プログラムの組織をまとめると次の如くである。



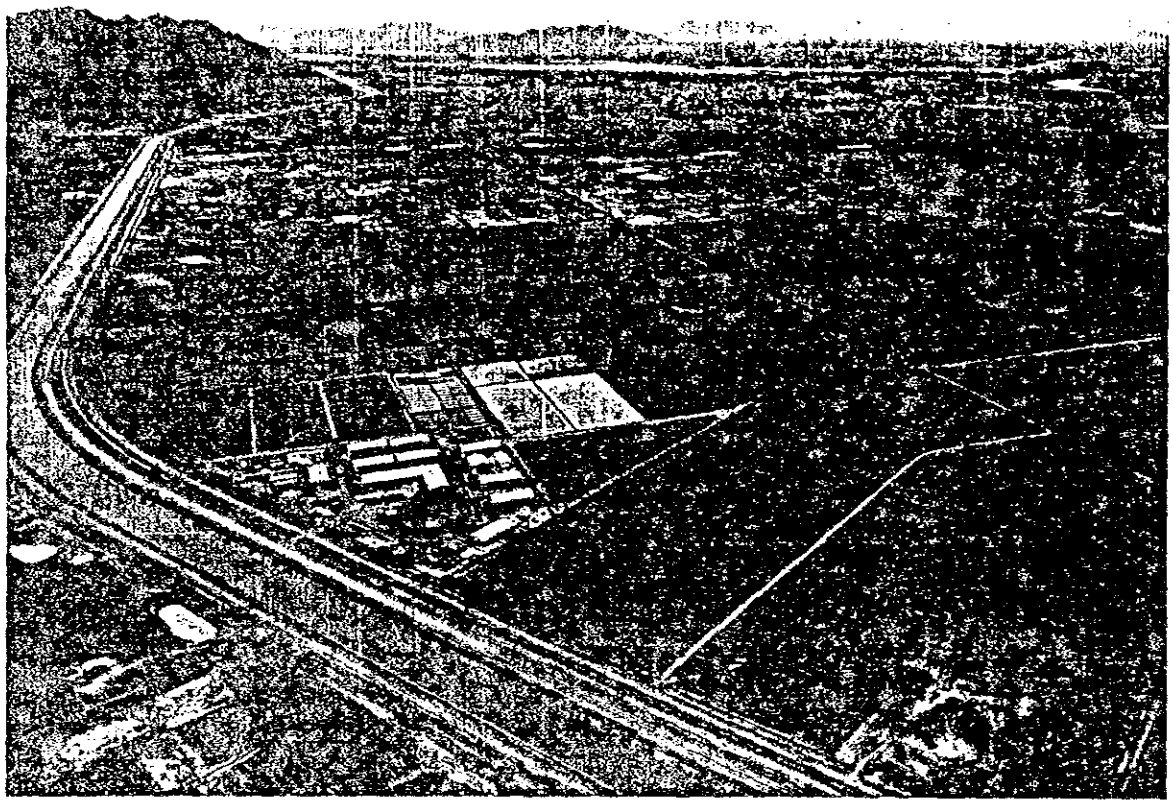

本構想は将来計画であり，未だ機能していない。

しかし，非常に大がかりなものであり，タイ国に於ける今後の水管理組織を考える場合大きな参考になるのではないかと思われる。

3－2－3）メクロンパイロットプロジェクト

メクロン・パイロット・プロジェクトは，日本のタイ国に対する技術協力プロジェクト〝タイかんがい農業開発計画〟の中のサブ・プロジェクトの1つであり，ＲＩＤの管轄下にあり，インテンシブな開発手法によるNo.1地区と，エクステンシブな開発手法によるNo.2地区とからなっている。

インテンシブ（Intensive）手法とは下のNo.1地区の写真が示す如く区画の整形即ち換地を伴う整備方法であり，それに対しエクステンシブ（Extensive）手法とは，現況区画沿いに用排水路及び道路を沿わせるもので区画の整形は行わない。

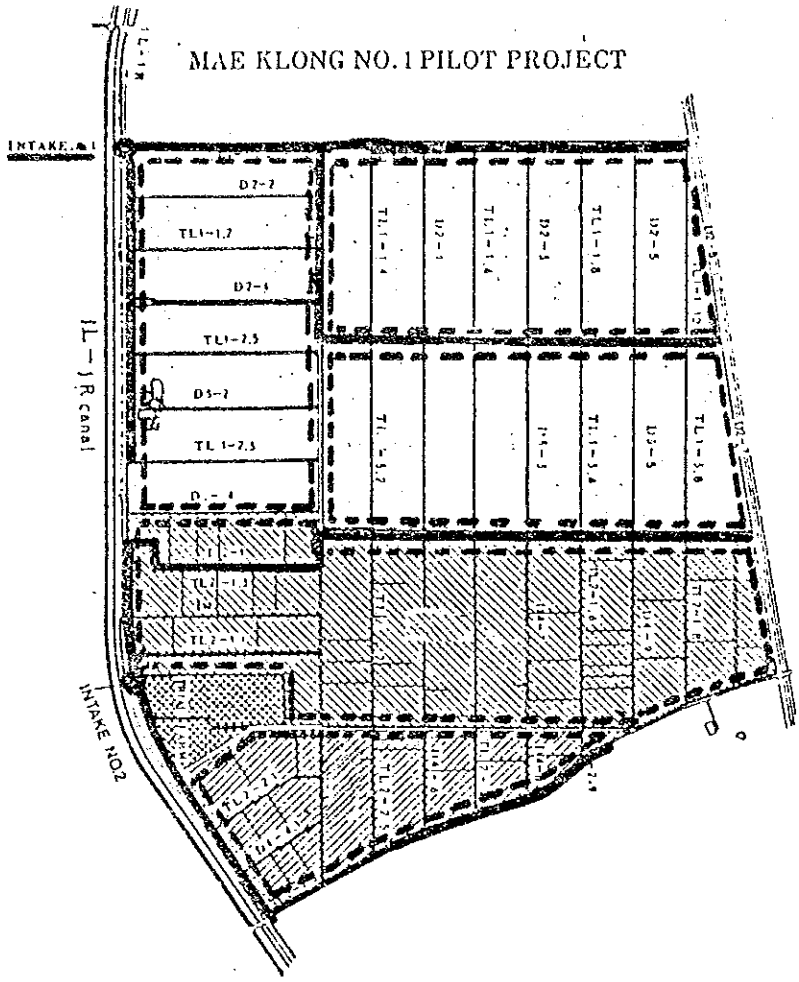


こゝでは，インテンシブ手法のNo.1地区についての水管理について筆者の担当のプロジェクトでもあるので詳しくのべたい。

ｉ）プロジェクトの位置

No.1地区は，バンコックより130㎞北西の戦場に架ける場又はクワイ川マーチの歌で有名なカンチャナブリ県タムアン郡バンマイ区に位置し，前述のメクロン川右岸かんがいプロジェクトの上流部にある。

ii）プロジェクトの概要




地区面積は 408.7 ha，　実耕地面積は 367.8 ha

トライアル・ファーム　9.9 ha

道・水路敷地 25.9 ha

宅地・池　5.1 ha

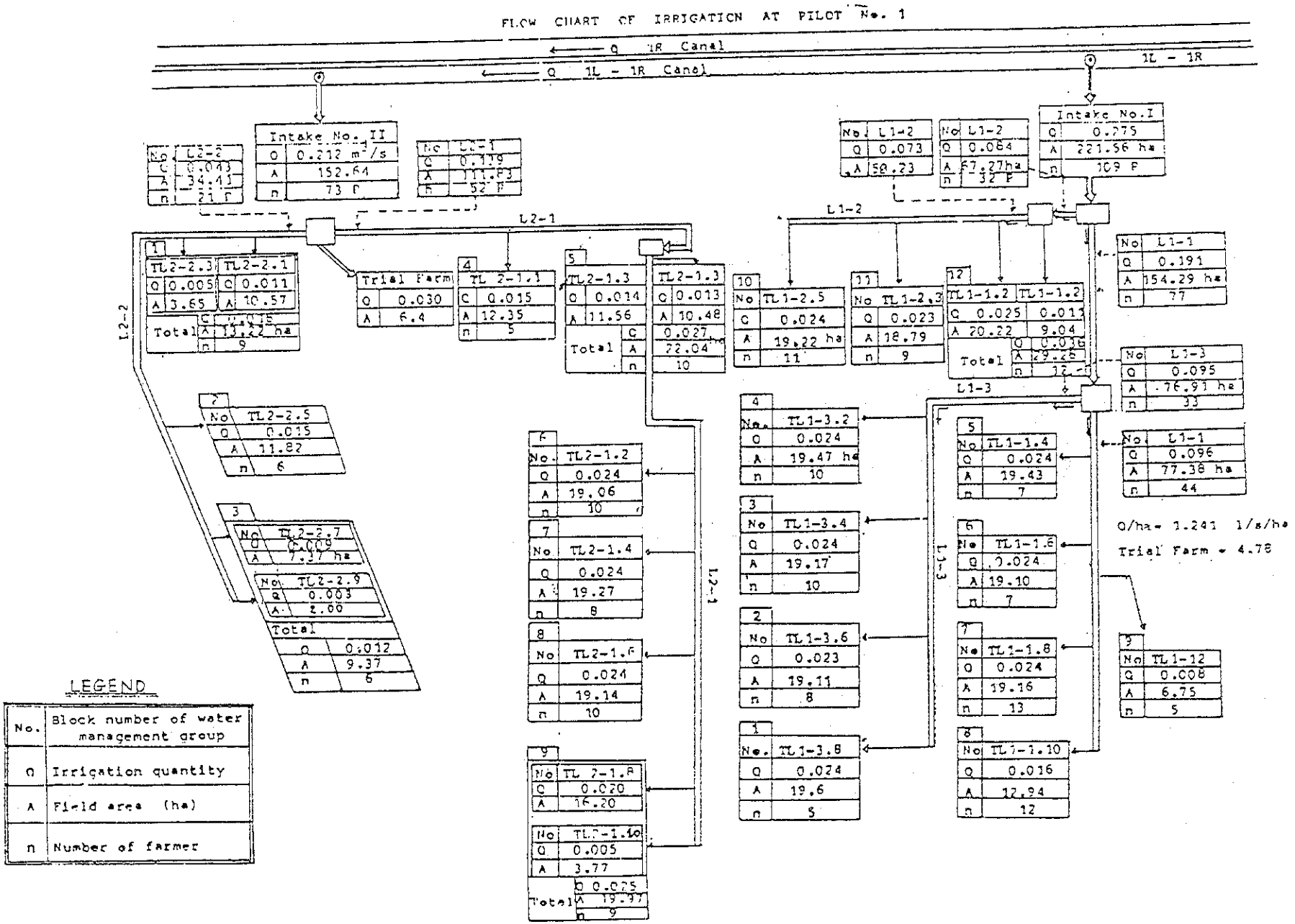
で地区の用水源は，1L－1R Canal の始点に設置されたポンプ場であり，口径500㎜の立軸ポンプが3台（1台は予備）設置されており，計画揚水量は 1,064 ㎥／Sである。

地区の西を1L－1R Canal が走り，東には幹線排水路が走っている。

取水口は1L－1R に設置し，No.1，No.2の2ケ所から地区内のかんがいを行う。

用水系統模式図で現わすと次頁の如くなる。

# FLOW CHART OF IRRIGATION AT PILOT No. 1



ⅲ）水　管　理

a）ＲＩＤ，タマカ維持管理事務所（Tamaka O＆M office）

本地区に於ても，管理区分は他地区の場合と同様に明確に区分されている。即ち，機場及びそれに接続する１Ｌ－１Ｒと，取水口№１及び№２までを事務所が管理し，その後は農民の責に於て行うことにしている。

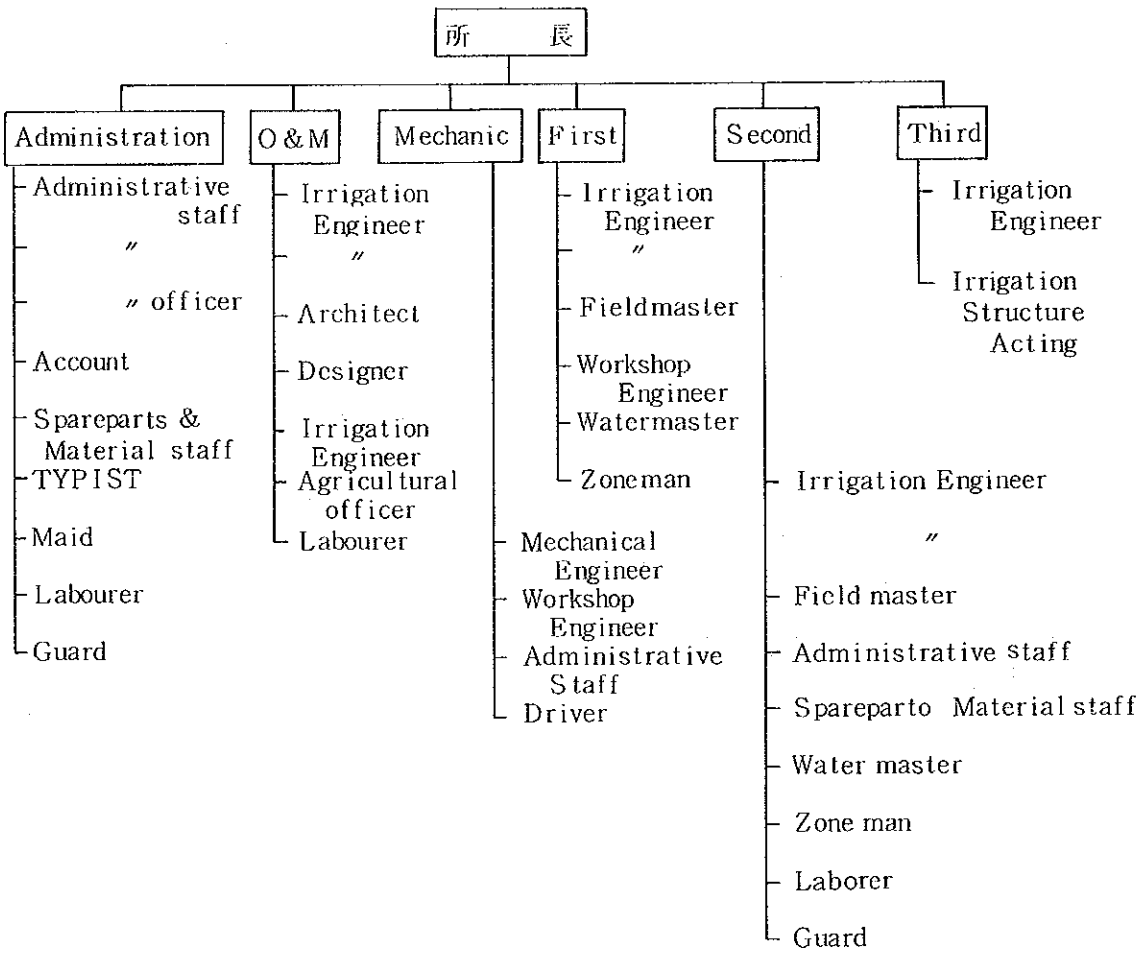
こゝで維持管理事務所にタマカ・オフィスを例に挙げてその内容を記載する。

タマカ　O＆M officeの概要

管轄区域　：　３１４,４００ライ（５０,３０４㏊）

管轄水路総延長　：　３３８,６００m

組織



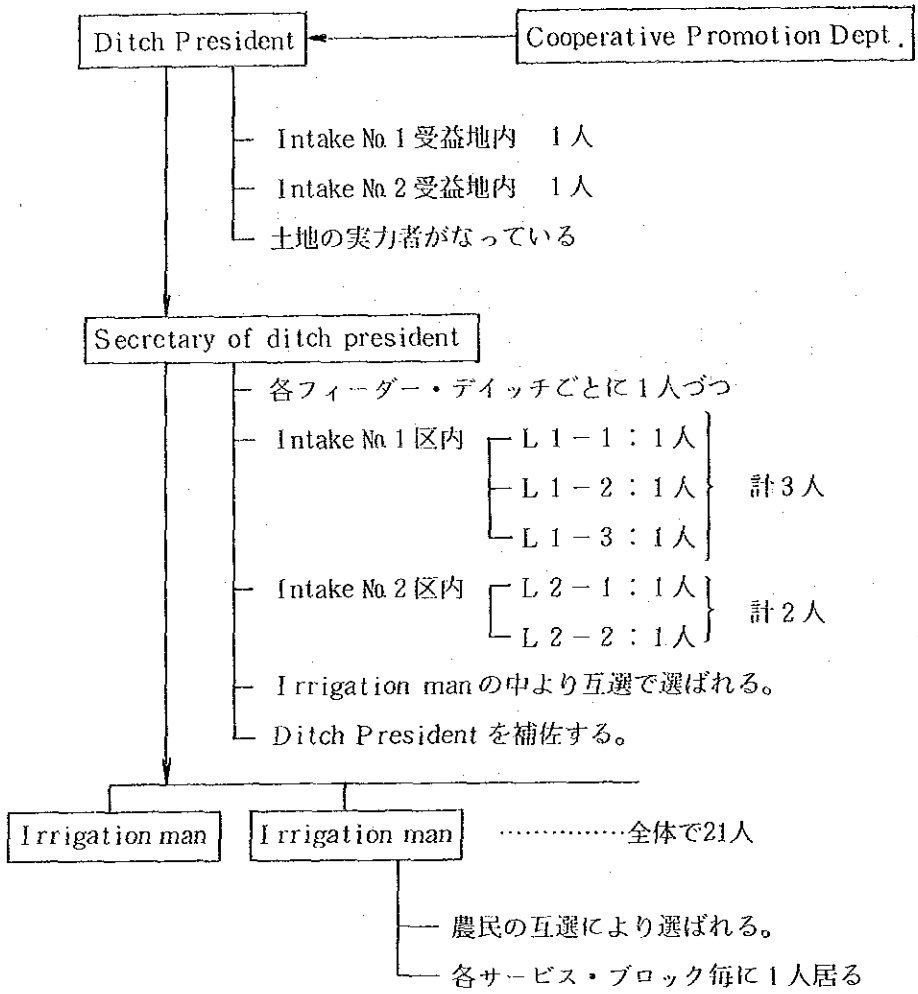

Officer　13人

Parmanent employee　１９０人

Water master　３人

Zone man　12人

b) 農 民 組 織




Ditch President ：無報酬で任期は1年主としてタマカO&M officeとの交渉協議に当っている。

維持管理：1作当り45B／rai 年間90B／raiをCooperative Promotion Depertment（CPD）が徴収している。

徴収された金は，施設のメンテナンス費に当てられ，出て来た農民に目当として支払われている。

本組織は御多聞にもれず，自分等らでの積極的活動は何もない。すべて，タマカO&M office及びCPDが主体となり，メンテナンスを重点に実施している現状である。