ANNEX E

Institutional Framework and Improvement Schemes in PBLS Area

ANNEX E
INSTITUTIONAL FRAMEWORK AND IMPROVEMENT SCHEMES IN PBLS AREA

CONTENTS

1. INSTITUTIONAL FRAMEWORK

1.1 Outline of the Existing Organizations

1.1.1 PBLS system

The Northwest Selangor Integrated Agricultural Development Project (PBLS) has been undertaken in the project area. Though being near completion, an institutional framework established during PBLS implementation still remains, and coordination in terms of integrated agricultural support services is effective. The management system of PBLS is a coordinative type through committees at various levels.

Two Districts of Kuala Selangor and Sabak Bernam are the objective area of PBLS, which has been further divided into five Areas: Kuala Selangor North and South, and Sabak Bernam North, Central and South. Area divided as above includes "irrigation area", "drainage area" and "coastal belt". The irrigation compartments from Sawah Sempadan to Bagan Terap have been declared as "irrigation areas" where irrigation water supply is practiced by DID for paddy cultivation. Of the above five , only three Areas involve "irrigation area" as follows:

PBLS Area	Irrigation compartments involved
Kuala Selangor North	Sawah Sempadan and Sungai Burong
Sabak Bernam South	Sekinchan, Sungai Leman, Pasir Panjang and Sungai Nipah
Sabak Bernam Central	Panchang Bedena and Bagan Terap

The coordinating body of PBLS is the Project Office (PBLS Office) directly under the Ministry of Agriculture (MOA). The chairemanship of the various committees is its major function. In addition, the PBLS Office maintains liaison with component agencies and extends assistance in planning aspects. Monitoring and evaluation of PBLS progress are also of importance. Some pilot projects to demonstrate effective use of completed irrigation facilities have been carried out as well.

The agencies to be coordinated in PBLS implementation consist of the following.

a. Drainage and Irrigation Department (DID)
b. Department of Agriculture (DOA)
c. Farmers' Organization Authority (FOA)
d. Agricultural Bank Malaysia (Bank Pertanian Malaysia, BPM)
e. Malaysian Agricultural Research and Development Institute (MARDI)
g. Mobile Land Units of the Federal Department of Land and Mines
h. District Offices, Kuala Selangor and Sabak Bernam
i. Other related agencies such as the Federal Agricultural Marketing Authority (FAMA) and the National Paddy and Rice Board (LPN).

Of the above enumerated, the key agencies or implementing components are the first five: namely, DID, DOA, FOA, BPM and MARDI.

As project facilities, two office complexes have been built during the course of PBLS. The principal complex is located at Kuala Selangor and a branch complex at Sungai Besar. In the principal complex, PBLS Office and coordinators or representatives of the component agencies are stationed. At several strategical places, one Farmers Development Centre (FDC) and 11 Farmers Development Sub-centres (FDScs) have been constructed to provide office spaces for field staff of the component agencies. Such field staff are mainly composed of the DID irrigation staff and the extension staff of DOA.

1.1.2 Functions of the component agencies

The basic roles of DID are construction, operation and maintenance of irrigation and drainage facilities. It acts as an engineering arm within MOA; civil and construction works are entrusted, except for large-scale infrastructure, by the other agencies under the Ministry. The personnel of DID are divided into two: one is those in charge of development and another is for operation and maintenance. The former is mostly the Federal DID staff and the latter comprises the State DID. The irrigation and drainage facilities are handed over to the State DID for operation and maintenance after the completion by the Federal DID.

The Federal DID staff in PBLS area are stationed either at principal complex, Kuala Selangor, or at branch complex, Sungai Besar. One Project Eingineer, Kuala Selangor, supervises all these staff. Major tasks are con-

struction supervision and commissioning (test operation of the completed facilities). In case of irrigation facilities, all the design works have been done in the Federal DID Headquarters, and actual construction under the contracts. Tender calling is a job of the State DID Headquarters, Shah Alam. As majority of facility construction is finished, the Federal DID staff is awaiting new works under 5MP.

Extension services are provided by DOA, through which farmers are guided and trained with agricultural technology. These are usually carried out by the State DOA personnel in the field. The Federal DOA disposes its staff to assist and train these State DOA staff for extension, providing with the respective services of crop protection, farm mechanization, soil testing and crop production planning. Stationed at principal complex, Kuala Selangor, one Project Agriculture Officer coordinates and supervises the whole DOA staff in PBLS area, either the Federal or the State. He is a Federal DOA personnel, but reports to the State Director, DOA.

A sole agency to register, organize, control and supervise the Farmers' Organization (FO) is FOA under the provisions of Act 110. Five Area FOs have been set up in PBLS area, of which three Area FOs are located in paddy growing areas. FOA seconds its officers to Area FOs to provide management practices and necessary arrangements. To coordinate five Area FOs, one Component Head is stationed at project complex, Kuala Selangor. Directly to him, the Farm Mechanization Centre (PMP) is attached to provide with rental machinery services for land preparation and harvesting.

Institutional credit facilities have been provided by BPM to individual farmers. It is a financing arm of MOA. Credits are usually channeled through the Local Credit Centres (LCCs). In case of paddy credit, interest rate is set at 2% per season from 1986. The reduction of number of LCCs is the prevailing policy of the State Branch Manager, Tanjong Karang. The State Branch, BPM Selangor, has two branch offices in PBLS area: one is in the project complex, Kuala Selangor, and another branch at FDC, Sungai Besar. In each FDSc, office spaces have been reserved for BPM: however, credit officers of either branch office are sent only once a week.

One liaison officer of MARDI is sent to the project complex, Kuala Selangor, wherever necessary. The Research Station of MARDI is located at Tanjong Karang, conducting specialized research in paddy growing

technology. MARDI acts as a breeder of basic seeds to supply DOA. Close relationship has been maintained with DOA such as in setting up of demonstration plots.

1.2 Coordination Committees

A coordinative committee system has been applied to PBLS. Committee set-up is, from top to down, as follows:

a. Steering Committee
b. Implementation Committee
c. District Inter-agency Coordination, Planning and Liaison Committee (DICPLC)
d. Area Inter-agency Coordination, Planning and Liaison Committee (AICPLC)
e. Technical-Social Advisory Committee

The Steering Committee settles policy matters for PBLS implementation, jointly chaired by both the Secretary General, MOA, and the State Secretary, Selangor. Members are all the heads of component agencies at Federal, State and Project levels, two District Officers concerned and four State Assemblymen. It has met once in every six months recently.

The Implementation Committee has the following fixed members with the meeting scheduled once a month.

- Project Director, PBLS (Chairman)
- Deputy Project Director, PBLS
- Agriculture Officer, PBLS (Secretary)
- 2 Chairmen of AICPLC, PBLS
- Project Engineer, DID, PBLS
- Senior Engineer, DID, Kuala Selangor
- Project Agriculture Officer, DOA, PBLS
- District Agriculture Officers, DOA, Kuala Selangor and Sabak Bernam
- Component Head, FOA, PBLS
- State Branch Manager, BPM
- Liaison Officer, MARDI, PBLS

- Assistant District Officers (in change of land), Kuala Selangor and Sabak Bernam

The major discussion item is implementation schedule of PBLS. The Paddy Planting Schedule Committee has the same membership, characterized as a sub-committee of the Implementation Committee, but additional four representatives of LPN rice-mill complexes attend in view of procurement activities of paddy in the area.

The Deputy Project Director, PBLS Office, chairs DICPLCs in both the Districts of Kuala Selangor District and Sabak Bernam. Attendants are District-level heads of the component agencies and meeting is held once a month. Discussion items include farming progress, status of agricultural services of various agencies and pest outbreak. Water schedule is one of the subjects and feedback from component agencies is taken.

In case of AICPLC, the frequency of its meeting is fortnightly and one chairman in each District is nominated from the officers of PBLS Office. The chairman holds the meetings of two AICPLCs in the Kuala Selangor District, and of three AICPLCs in the Sabak Beram District, respectively. Attendants comprise Area-level officers of the component agencies. Majority of them come from the State DID and DOA. Mostly the requests from the farmers are discussed.

The Technical and Social Advisory Committee has been established for a specific project in PBLS area. Except for that promoted by the PBLS Office, the chairmanship is taken by an initiating agency of the project and the other component agencies are called to attend the meeting.

1.3 Ketua Blok System

All over the PBLS area, there exist small units of farmers according to area demarcation assigned as "sub-blocks" and the head is called a Ketua Blok (block head). Out of all 612 Ketua Bloks, 357 are in paddy growing areas. The number of the Ketua Bloks in eight irrigation compartments is as follows:

Compartment	No. of Ketua Blok
1. Sawah Sempadan	39
2. Sungai Burong	68
3. Sekinchan	32
4. Sungai Leman	34
5. Pasir Panjang	35
6. Sungai Nipah	44
7. Panchang Bedena	66
8. Bagan Terap	39
Total	**357**

A sub-block in an irrigation area is bounded by cross-bunds and drains, extending both sides of one tertiary canal in the new system. Usually, 50 farm lots are contained in one sub-block, thus approximately 50 farmers operating. One of these farmers is appointed as a Ketua Blok.

Appointment of the Ketua Bloks is the task of AICPLC sub-committee, consisting of DOA, DID, FOA and BPM (appointment period: one year). The criteria of selection of nominees are, (1) progressive farmer working on his own land, (2) leadership in the sub-block, (3) capability of reading and writing, (4) non-government employee , (5) living in the sub-block, (6) willingness to be voluntary worker, (7) member of the Village Security and Development Committee, or person capable of cooperation with the Committee, and (8) membership of Area FO. Placing support from the State Assemblyman and signing of the Senior Engineer, DID, Kuala Selangor is required to conclude an appointment.

The obligations of the Ketua Blok are stipulated by the PBLS Office as in the following.

a. Being channels of all agencies in terms of services provided to farmers
b. Information dissemination and feed-back from the farmers
c. Leadership inside the sub-block
d. Initiation and advisory roles to farmers on agricultural technology, water management, mechanization, and credits
e. Attendance at all meetings, training, and dialogue sessions arranged by government agencies
f. Working closely with a Ketua Kampong (village head) and

with the Village Security and Development Committee

The actual situation in utilizing the Ketua Bloks by major four component agencies of PBLS, which comprise DOA, DID, FOA and BPM, is as under:

DOA: In extension services, the Ketua Bloks act as representative farmers to disseminate technological knowledge and advices from DOA and to get a feedback from the farmers as well as in keeping good field conditions. During the seasons, crop protection work is delegated; the Ketua Blok arranges the application forms to DOA of insecticides and rodenticides. Arrangement of machinery works inside sub-blocks are also entrusted. In Sekinchan, the Ketua Blok is just a contract person.

DID: Water-related matters are notified through the Ketua Blok to farmers. The Ketua Blok is expected to follow up water use among the farmers inside a sub-block. On the other hand, the Ketua Blok reports to DID on farmers' obedience, demands and claims as well as conditions of irrigation system and damages in the infrastructure.

FOA: Distribution of government fertilizer subsidy is arranged by the Ketua Blok upon the request of farmers. For Area FO, Tanjong Karang, the Ketua Blok provides fertilizers directly to farmers with commissions and transportation fees. FOA has nominated the Ketua Blok as a broker of PMP machinery. Another function is the encouragement of the farmers to become members of Area FO. Feedback of farmers' opinions on Area FO is not expected, since there is another channel through the Farmers' Units inside Area FO.

BPM: Most of the Ketua Bloks are commission agents of BPM, named as LCCs. The Ketua Bloks promote and assist farmers to get loans, pass loan money to, collect money from and repay on behalf of farmers. In one sub-block, some other persons have also been appointed as LCCs; thus the Ketua Blok is not the only LCC. Reduction of LCCs is the prevailing policy of BPM, Selangor.

Various agricultural support services are channeled through the Ketua Blok and government agencies expect to attain a sound follow-up as well as effective feedback from the farmers in utilizing this Ketua Blok system. The closest relationship with the Ketua Blok has been maintained by DOA for extension purposes. The training of the Ketua Blok has been conducted by DOA to upgrade their capabilities. Next is DID, which aims at improving water management activities among the farmers to ensure its irrigation water supply. These agencies have attempted to obtain farmers' cooperation in contact with the Ketua Blok.

Adherence to the recommended farming schedule in the sub-block is to be followed-up by the Ketua Blok: this is AICPLC's hope and extension efforts of DOA have been concentrated on this point. If the coordination is properly done by the Ketua Blok, no delay would take place. However, in the past several years, planting delay has frequently occurred in irrigation compartments except for Sekinchan. Enumerated major reasons are delay of irrigation, not enough water supply, failure in machinery arrangement, weather conditions, improper seeds, personal problems and so forth. But this is partly because the Ketua Blok system is not functioning well and also the Ketua Blok cannot coordinate farming practices inside the sub-block.

As such system lacks the aspect of organizing farmers around the the Ketua Blok, linkage or connection among the farmers should be maintained through the efforts of the Ketua Blok. The effectiveness of the system relies on the personality and coordinating ability of the Ketua Blok himself. When a Ketua Blok is active and well-qualified in coordination, everything would go well. Otherwise, the system would become nominal. The Ketua Blok would gain financially as a result of the position. Sometimes, the Ketua Blok seems to be only a machine broker or the commission agent of local finance. The other functions attached to the Ketua Blok are neglected. In such cases, farmers' cooperation would hardly be obtained as against the expectation of the government agencies.

To keep the Ketua Blok system working, an annual evaluation has been carried out also by AICPLC sub-committee. Evaluation items are as follows:

a. water management (30 points, DID only)
b. frequency of attendance to meetings,

dialogue and training sessions	(15 points, DOA only)
c. increase in membership of Area FO	(10 points, FOA only)
d. introduction of new technology	(15 points, DID and DOA)
e. information dissemination and feedback functions	(10 points each).
f. repayment of credits on behalf of farmers	(10 points, BPM only)
g. relationship with farmers inside the sub-block	(10 points each).

If any agency puts point 0, the Ketua Blok would automatically be terminated. If the total points do not reach 50, a warning letter is sent by AICPLC. When the Ketua Blok does not agree, he may appeal to the PBLS Office. Replacement of an unsuitable Ketua Blok might be possible, applying these procedures. However, so far actual termination has taken place in the most serious cases and almost all the same persons remain as the Ketua Bloks from the beginning.

1.4 System to Promote Scheduled Cropping

The decision is made at first in a meeting of the Paddy Planting Schedule Committee. Planting dates are determined to eight irrigation compartments so as to meet the dates for the beginning and end of water supply. The schedule is then notified to the public in the gazette by the the respective District Offices under the State Government. Each component agency of PBLS has to prepare its own services to farmers in line with the gazetted schedule of planting.

Detailed planning on the dates to be recommended for farming activities is carried out in a meeting of AICPLCs. The following items are discussed among the field officers of the component agencies.

- construction and improvement of batas
- cutting and burning paddy stalks
- land preparation (first ploughing)
- application of weedicides
- second ploughing and planting
- weeding
- fertilizer application

- pest control
- harvesting

The duration of each activity and its time limit are determined according to the gazetted planting schedule mainly based on the guidelines prepared by DOA. Roles of each component agency are further clarified.

Farmers are then informed of the recommended farming schedule through the Ketua Bloks, notices, posters and meetings. A letter to each Ketua Blok is sent by AICPLC, containing the recommended dates of the respective farming activities including water supply. Afterwards, a meeting with all the Ketua Bloks in the area under each AICPLC is held to remind them of the farming schedule for the next season. All the AICPLC members attend this meeting. The Ketua Blok disseminates the recommended farming schedule to the farmers in the sub-block. Notices are put up on boards which stand at the places attracting attention of the farmers. The boards are so designed that only the replacement of the dating part might be enough, showing selected items such as land preparation, planting, fertilizer application, pest control and harvesting, besides the water supply period. Posters, at several public places, are auxiliary methods in providing information. Talks with farmers are conducted in the meeting, sub-block by sub-block, by DOA extension staff together with the field personnel of other agencies. In this case, the Ketua Blok is requested to call farmers to attend the dialogue.

After the recommended farming schedule is informed, adherence to it rests with farmers. The Ketua Blok is, however, to ensure the farmers in the sub-block to follow the schedule. He is not only the information dissemination channel but a coordinator as well as a leader inside the sub-block. In addition, several kind of agricultural services by the government agencies have been provided through the Ketua Blok. With these functions properly working, the Ketua Blok would be able to make the recommended farming schedule to be followed. In anticipation of this, AICPLC pays an allowance (M$30/month) to the Ketua Blok. The funds come from the State DID and actual payment is done through Area FOs.

2. IMPROVEMENT SCHEMES

2.1 Group Farming Promoted by DOA

Promotion of group farming under the programme "Projek Kelompok Padi" started in 1983. After the experiences of extension by the training and visit (2L) system, DOA has applied new methodology. It aims at the intensification of roles of the Ketua Bloks by setting up of the farmers' committee. An extension staff of DOA, usually Agricultural Technician, selects suitable irrigation sub-blocks and encourages the Ketua Bloks to form a farmers' committee. Committee members, usually five to ten persons, are identified from the active farmers and also motivated by extension staff. Once the farmers' committee is organized, it carries out planning on farming activities to be taken in a group. The following is the activities for group farmers.

- arrangement of machinery work for land preparation excavating field drains and harvesting
- group guarantee for BPM credits
- supply of agricultural inputs
- pest control

Through the efforts of the extension staff, the following is the areas where the farmers' committees have been already organized.

Sawah Sempadan (2 projects) :	Block G Blocks L and M
Sungai Burong (7 projects):	Block A Blocks B and H Blocks C and I Block E Block K Blocks M and N (Block O, soon) Blocks L and U
Sekinchan (none)	
Sungai Leman (2 projects):	Blocks L_6 (half), L_{12} and L_{18}(2/3) Block L_7 (half)

Pasir Panjang (2 projects):	Block P_3 Block P_{10} (half)
Sungai Nipah (3 projects):	Block N_2 (half) Block N_8 (33 out of 80 farm lots) Block N_{13} (half)
Panchang Bedena (4 projects):	Parit 1 Barat Parit 2 (Sungai Haji Dorani) K.T.10 Parit 4 (Sungai Haji Dorani) Parit 5/2 Barat
Bagan Terap (2 projects):	Parit 6/2-7 Timor Parit 12 (Sungai Panjang)

One farmers' committee covers one to four sub-blocks. Extension staff of DOA plays a role as an advisor to the farmers' committee and, after the set-up, the Agriculture Technician would shift to new target areas. The farmers' committee implements its own programmes on paddy farming operation autonomously. When the performance of group operation is proved successful, the funds of the "Field Improvement Scheme" are allocated (M$100/acre) by the development staff of DOA. The farmers' committee becomes responsible for the distribution of the allocated money inside for such works as land leveling, excavating and repairing field drains, tree-cutting and removal of islands. According to DOA's explanation, the whole project area would be covered with this group farming, by 1990, except for Sekinchan.

In the group farming promoted by DOA, the Ketua Blok is usually a leader of the farmers' committee established, but not necessarily the chairman. Between the Ketua Blok and the farmers, there are farmers' committee members. Consequently, information dissemination channels are strengthened and coordinating functions of the Ketua Blok are also improved. Besides, provision of machinery work facilitates the timing of farming practices to be uniform in the area.

For the above reasons, an adherence to the recommended farming schedule is usually better in the area under the group farming. Furthermore, fund allocation for field improvement becomes incentives to the farmers. Although enforcement aspects are scarce in the group

farming, better performances have been attained as in anticipation of DOA. From its start in 1983, not many sub-blocks have dropped out from the group farming, once the farmers' committee was organized. The coverage of group activities usually reaches to all the farmers in the sub-blocks involved.

DOA alone has promoted the group farming. The presence of the Technical and Social Advisory Committee initiated by the PBLS Office is only nominal and not much participation of other agencies is found. In some places, the farmers' committees suffer from lack of cooperation of FOA and BPM: they have no alternative sources of chemical supply other than Area FO; credits of BPM are stopped after the interviews to the farmers on committee's performances. In the activities to be taken in groups, water management functions are not included except for provision of field drains, nor do the participation of DID irrigation staff. Lack of support of the other agencies is thus noticed and it is the greatest defect of the group farming.

The activities in groups vary according to the farmers' committee resolutions. It is difficult to enumerate other general characteristics. However, it can be pointed out that the success of the group farming depends on the selection and ability of the committee members. Loose financial control and corruption may take place at any time, if unsuitable members are included in the farmers' committee.

2.2 Paddy Mini-estates under Area FOs

Paddy Mini-estate is one of the special projects of Area FOs. First one was started at Sri Tiram Jaya, Sawah Sempadan, in 1984 under the management of Area FO, Tanjong Karang. Once it succeeded, other Area FOs, Sabak Bernam and Pasir Panjang, have also adopted the same concepts. Paddy Mini-estates, on-going as of June 30,1986, number five: (1) Area FO, Tanjong Karang: Sri Tiram Jaya, Sawah Sempadan(424 ha, 283 farmers); Block H, Sawah Sempadan(26.7 ha, 11 farmers); and Block SB, Sungai Burong(43.7 ha, 26 farmers), (2) Area FO, Pasir Panjang: Block P_5 and P_{11}, Pasir Panjang(83.8 ha, 56 farmers), and (3) Area FO, Sabak Bernam: Kampong Sungai Haji Dorani and Kampong Sungai Liman, Panchang Bedena (112.5 ha, 278 farmers).

The characteristics of Mini-estates lie in the setting up of its own farming schedule based on the recommendation of AICPLC and its enforcement by field supervisors. The Ketua Bloks in the Mini-estate area normally become these field supervisors. Three large-scale Mini-estates under the different Area FOs have the following number of field supervisors.

Location	Area FO	Field Supervisors (of which Ketua Bloks)
a. Sri Tiram Jaya, Sawah Sempadan	Tanjong Karang	6 (5)
b. Block P_{11}(half) and Block P_5(whole), Pasir Panjang	Pasir Panjang	1 (0)
c. Kg. Sg. Hj. Dorani and Kg. Sg. Liman, Panchang Bedena	Sabak Bernam	6 (6)

To become members of the Mini-estate, farmers are requested to conclude an agreement with the management. The following are the conditions in the agreement.

a. Farmers must become the members of Area FO.
b. Farmers should have the right of their own land.
c. Income of farmers should come from their own land.
d. Agricultural inputs will be supplied by Area FO.
e. All machinery works will be provided by Area FO.
f. All the non-machinery works will be done by farmers, according to the planting schedule set up by the management. When farmers cannot do, the management will get other persons to do so, and the costs will be later charged to the members. They must agree.
g. Harvesting will be done by Area FO, with PMP machineries.
h. Money from the sales of paddy will go to Area FO first. The management will pay farmers, after the deduction of the costs spent.
i. If the yield is not good, farmers might pay-back the cost in other seasons.
j. Area FO imposes service charges on the expenses which have been advanced.

This is self-explanatory. The Mini-estate is a kind of group farming under the management of Area FO. In terms of water management, three Mini-estates under Area FO, Tanjong Karang, have shown a successful performance, since the field supervisors close and open the field offtakes on tertiary canals according to farming schedule established. These three Mini-estates pay allowances (M$ 8 to 14 per day) to their field supervisors. However, in other two Mini-estates, operation of offtake pipes is left to farmers' hands and not such prominent performances are observed in water management.

In addition to the farming schedules established, Mini-estates provide with machinery works including harvesting to participants. PMP heavy machinery is allocated into Mini-estate area preferentially, which is a great advantage. Agricultural inputs are also supplied smoothly from Area FOs. These services help to attain the set-up farming schedules. To machinery work except for harvesting and extra supply of agricultural inputs, the management imposes service charges (Area FOs, Tanjong Karang and Pasir Panjang : 6 % of the commercial prices per season, and Area FO, Sabak Bernam: 4 % per season).

In Mini-estates, the set-up farming schedule is usually followed by the participants. This is because field supervisors strongly enforce the farming schedule and because the machinery arrangement accords with it. Financial conditions of Area FO are secured in the payment procedures in paddy sales. Managerial control of Area FO is thus strong in Mini-estates.

For the farmer lacking ample labour force in his household, this system might be better, since the management will provide everything including labour work even if service charges are deducted from the earnings. On the other hand, to an independent and self-reliant farmer, it might be the nuisance: he cannot do anything other than follow the management decisions. The most disturbing fact is financial control by Area FO. It is said that a farmers' committee which did not agree with this condition during the negotiations with FOA officers abandoned it to become a Mini-estate.

The policy of FOA to expand Mini-estate projects is "slow and steady". Mini-estates are gradually spreading over the outside areas of the existing ones. The strong support of PBLS Office has helped this. The Technical and Social Advisory Committee is well functioning in supporting

Mini-estate projects: an inter-agency coordination has so far been maintained. Problems would occur in adverse situations: the existing Mini-estates have not experienced the decrease of yield against the previous year. The system might deteriorate, if it happen.

2.3 Pilot Projects of PBLS Office

A Pilot Project of PBLS Office was first started along TASN 16, Sungai Nipah. Later selected tertiary lines were as under:

Tertiary canal	Compartment
TASS 9	Sawah Sempadan
TASB 4	Sungai Burong
TASL 10	Sungai Leman
TABT 16b	Bagan Terap
TAPB 5b	Panchang Bedena
TASB 9	Sungai Burong.

Projects have already been finished or stopped in case of the first one along TASN 16 and the first three above. The last one just started in 1986 in view of not good performance of farming practices along the line, compared to Sekinchan.

Objectives of these Projects are demonstration of water management and to show how to use new irrigation facilities to farmers who are accustomed to the old back-flooding system. Especially, necessity of building batas has been emphasized. The training and visit (2L) system is applied in the actual activities: the Ketua Bloks are called to look at the demonstration work, then briefing is given to the farmers. The Pilot Project Committee is formed with the chairmanship of PBLS Office (members: officers of all the agencies serving the selected tertiary line, the Ketua Bloks and other farmers). To coordinate farming practices, every effort is made along the line.

2.4 Water Management Extension Pilot Project

TASB 4, where a Pilot Project of PBLS Office was implemented, has been again selected for a specific project. It is the Water Management Extension Pilot Project directly under the Senior Engineer, Kuala Selangor.

In view of the remaining batas which were constructed in the former Pilot Project, the area in Sungai Burong has been selected as a target area.

This is a trial project of the State DID to establish effective extension methods of water management to the irrigation staff, aiming at reduction of water wastage at on-farm level. Apart from this major objective, an inter-agency coordination as well as strengthening farmers' activities in a group in water management are emphasized. It started on January 15, 1986, and already two seasons have passed. The objective area comprises sub-blocks E_2, K_2, T_2 and Z_2 along TASB 4.

To attain the aimed inter-agency coordination, the Technical and Social Advisory Committee has been organized. Officers of DOA, BPM, Area FO, Tanjong Karang, and PBLS Office are called to attend the meetings chaired by the Engineer in charge of the Pilot Project. The irrigation Inspector(I.I.) and Irrigation Overseer (I.O.) of the Pilot Project team are also members. The Water Management Committee for TASB 4 is a committee with both these officers and the representative farmers (four Ketua Bloks and their four assistants) from the respective sub-blocks covering one tertiary line. In each sub-block, the Water Management Sub-committee has been established with the Ketua Blok as a chairman and five representative farmers. The same officers as above attend these Sub-committees as advisors.

Besides the holding of these committee meetings, activities of the Pilot Project team have been undertaken in the field. Dialogue sessions and a direct contact with farmers are conducted by the Pilot Project team officers (Engineer, I.I. and I.O). Data concerning water discharge at constant head orifice offtakes and cross-bund checks, water level in conduit at cross-bunds, conditions of batas and offtake pipes, and farming practices have been recorded. Investigation on the reason of a late planting was conducted in the second season.

Whilst the guidelines stipulate effective utilization of the group farming under the "Projek Kelompok", the actual situation is not significant. In sub-blocks E_2 and K_2, the farmers' committees have been organized by DOA extension staff. The Water Management Sub-committees in sub-blocks E_2 and K_2 consist of almost the same members. However, direct approach to these farmers' committees is scarce. The activities are concentrated on dialogue sessions in the Sub-committees or the direct

talks with farmers.

In the meetings with the representative farmers at FDSc, Sungai Burong, lectures are firstly given, followed by the discussion among all the members. Information given in lectures are: volume of water intake, operation methods of offtake and drain pipes, usage of siphon, maintaining of batas, etc. by DID; weeding, fertilizer application and practical farming methods by DOA; and occasionally grading system by LPN. In the field, I.I. and I.O of the Pilot Project team also give farmers information on water management and sometimes persuade them to improve field devices such as batas and field drains.

Utilization of the Ketua Blok system has been employed in the formation of the Water Management Committee and Sub-Committees by the Pilot Project team. For this reason, an extra payment of M$50/month has been offered to four Ketua Bloks in the Pilot Project area. It is observed, however, that the Ketua Blok system has not been so effective in disseminating information from the officers. When individual farmers are invited to attend meetings and dialogue sessions, arrangement is entrusted to the Ketua Blok. So far, the participation of farmers has not been encouraging. Out of 52 lots in the sub-block, the largest number of the participants was 19 (on October 11, 1986, for sub-block K2). This is partly because the farmers' attitude is not responsive and partly because the channel through the Ketua Blok is not enough for calling farmers. Thus, the Pilot Project team has attempted to search an alternative way of communication with the farmers. One is the tracing of operators' whereabouts from a land owner. Another is sending letters by dispatch system directly to farmers.

3. TRAINING FACILITIES FOR THE IRRIGATION STAFF

No formal training course has been conducted in the area. To new recruits of I.Is and I.Os, preliminary training for the positions are given. Others are all on an on-the-job basis with no specific programmes. The following training facilities outside have been utilizeded, occasionally to train the irrigation staff.

3.1 National Water Management Training Centre, Kota Bharu

Since 1981, the National Water Management Training Centre (NWMTC) has conducted training courses on water management. At the moment, four and eight weeks training courses for I.Is and I.Os, two and four weeks courses for the Technical Assistants, two weeks courses for the Engineers, and one day courses for farmers are available, each of which can allow up to 40 participants. Training curriculum is divided into four major fields: agriculture, rice cultivation, irrigation and drainage, and water management. Agricultural aspects have been rather stressed in the curriculum.

3.2 DID Ampang Training School, Kuala Lumpur

To all DID staff from the Junior Technicians to the Engineers including clerks, 20 courses covering the fields from technical aspects to personal attitudes have been prepared for 1986. An average of 400 trainees are accepted every year, including some I.Is and I.Os. Water management aspects are excluded from the courses which continue seven to eigth weeks for the Technicians and three days to one week for the Engineers.

3.3 Motivation Course by PBLS Office

This is for the purpose of strengthening spirit and capability of AICPLC members as a team. Three courses are prepared each year, to which almost 35 persons, including I.Is and I.Os, participate at Serdang for three days. Lecturers come from the University Pertanian Malaysia.

ANNEX F

Manual for
Operation and Maintenance of
Tanjong Karang Irrigation Project

ANNEX F

MANUAL FOR OPERATION AND MAINTENANCE OF TANJONG KARANG IRRIGATION PROJECT

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1. INTRODUCTION

1.1 Objective

The success of an irrigation project depends ultimately upon proper water management which assures the distribution of irrigation water in a timely and efficient manner so as to meet crop water requirements. In addition, proper maintenance of the project facilities is indispensable for keeping the system functioning properly and consistently. The objective of this Operation and Maintenance (O&M) Manual is to establish procedures for operation and maintenance of project facilities to ensure proper water management.

1.2 Basic Concepts of Water Management

The basic concepts of water management of the Tanjong Karang Irrigation Project are summarized as follows:

(1) Jurisdiction

DID has jurisdiction over all activities of O&M of the project facilities. The state DID, Selangor, has responsibility for the execution of O&M work. The staff of the state DID make all delivery changes and shut offs in accordance with the irrigation schedule and field conditions.

(2) Fixed irrigation schedule

The proposed cropping schedule of the project has been prepared after taking into account various hydro-meteorological and agronomic factors. These factors include the best use of available water sources, the annual and seasonal pattern of rainfall, farming practices, growing period of paddy, timing of harvesting and out-breaks of insects. The irrigation schedule has been designed to match the proposed cropping schedule. It has been found that water will be short if the cropping schedule is delayed over 30 days. It is, therefore, of utmost important to keep to the fixed irrigation schedule for proper water management of the project.

(3) Importance of maintenance

Weeds grow fast. There is a lot of rubbish and debris in the system. These prevent project facilities functioning well and cause many water-related problems. It cannot be emphasized enough that proper maintenance is imperative for project facilities. At present, DID are solely responsible for maintenance. However, DID cannot do all that is required with the limited number of staff. Farmers must be urged to participate in the maintenance work, especially in keeping tertiary canals free of weeds, rubbish and debris, in order to improve the reliability of their own water supply.

(4) Effective use of Bernam river water

The main water source of the project is the runoff of the Bernam river. The intake at the Bernam River Headworks (BRH) is of the run-of-river type. This must be taken into account in executing water management of the project. During normal season when enough water is available, the water management can be lenient. During water shortage, however, stricter water management is required.

(5) Measures to be taken during water shortage

Even after the proposed improvement work is completed and proper water management is achieved, water will still be short probably once or twice in ten years. In times of water shortage, priority should be given to distributing water evenly to the whole project area.

(6) Monitoring for proper water management

The gradient of the Main Canal is so gentle that discharge in every section of the Main Canal is greatly influenced by changes in water level. Even if the discharge is precisely measured in a certain section of the Main Canal, it includes the amount of water derived from the change in storage volume in the Main Canal. This makes discharge measurement meaningless. On the other hand, since the intake at BRH is of the run-of-river type, a much water as is possible can be taken according to the demands by the project area. Thus, it is not important for water management to know discharges at certain sites of the system. What is important is the regular monitoring of water levels at suitable sites throughout the system.

2. DESCRIPTION OF PROJECT FACILITIES

2.1 General

The existing irrigation system comprises the main conveyance system and distribution canal system. The main conveyance system includes a diversion headworks on the Bernam river, the Feeder Canal connecting the Bernam river to the Tengi river and the Main Canal. There is also a pumphouse at Bagan Terap, which accommodates three units of mixed flow pumps with diesel engines. These pumps are operated to supplement water to an area of 1,200 ha in the Bagan Terap compartment and 320 ha in the Sungai Panjang area in case of water shortage in the main conveyance system. The location of these irrigation facilities is illustrated in Fig. F-1.

2.2 Main Conveyance System

Bernam River Headworks comprises a diversion barrage 30 m (100 ft) wide constructed across the Bernam river, an intake which diverts water into the Feeder Canal, and a scour sluice on the left side of the barrage. It is located at about 39 km (24.5 miles) upstream from the Tengi Headworks. The diversion barrage is provided with three sets of radial gates which back up the water level to 9.6 m (+31.5 ft). Six sluice gates, each 1.5 m wide, are equipped at the intake to divert a maximum of 30.6 cu.m/s (1,080 cusec) of water to the Feeder Canal. One gate of the scour sluice is always open and a minimum 1.5 cu.m/s (53 cusec) of water is allowed to flow downstream through the scour sluice.

The Feeder Canal conveys the water diverted from BRH to the Tengi river. It runs for some 14.5 km (9 miles) through virgin jungle along the eastern side of the Tanjong Karang swamp. The improved Tengi river runs a further 24.5 km (15.25 miles) through the jungle swamp to the Tengi Headworks and the Main Canal.

The Main Canal runs for 3.3 km south to irrigate the Sawah Sempadan compartment and 34.6 km north to irrigate the remaining compartments. The total length of the Main Canal is 37.9 km. **The Tengi Headworks** functions to maintain water in the Main Canal to the required Full Supply Level (FSL). The water level in the Main Canal is controlled by

three cross regulators and **two spillways** provided on the Main Canal. In the upstream two cross regulators, automatic gates are equipped and the water level is constantly kept at FSL. One spillway near the Tengi Headworks has the capacity to discharge 72 cu.m/s (2,550 cusec) into the Tengi river and the other at Haji Dorani High Level Drain 35 cu.m/s (1,250 cusec) into the sea. The flow capacity of the Main Canal is to meet the maximum water requirement of the project.

2.3 Distribution Network

The system is composed of secondary and tertiary canals. Secondary canals are found in three compartments, namely Sawah Sempadan, Panchang Bedena and Bagan Terap. They command a number of tertiary canals. In other compartments, the tertiary canals are spaced at 400 m intervals at about right angles to and taking off directly from the Main Canal. A typical layout of tertiary canals is shown in Fig. F-2. Most of the present distribution network consists of concrete conduits. Six tertiary canals in Sawah Sempadan are exceptional, being concrete lined canals of trapezoidal shape.

Each tertiary canal has an offtake at the head of the canal. The offtake is either a constant head orifice offtake or an adjustable weir offtake. The offtake regulates the amount of water required in the tertiary canal. The water level in the tertiary canal is controlled by means of checks and 'slots' provided along the tertiary canal. In normal irrigation, water is supplied to each lot through an offtake pipe. The flow capacity of the offtake pipes is insufficient, however, to cope with peak water requirement during the presaturation for dry direct seeding. Farmers are allowed to use syphons during presaturation.

2.4 Drainage Network

The drainage network in the project area consists of field ditches with an outlet pipe in each farm lot, tertiary drains and main drains. A tertiary drain collects water from field ditches and disposes of it into a main drain. The main drain is connected with the coastal belt drain. Excess water is finally released by gravity to the sea through tidal gates provided on the coastal belt drain.

3. IRRIGATION SCHEDULE

3.1 Water Supply and Demand

3.1.1 Supply source

The irrigation water for the Tanjong Karang Irrigation Project is derived from three sources; (1) Rainfall in the paddy field, (2) Bernam River and (3) Tengi river.

The runoff from the upper catchment of the Tengi river is considerable during rainy months. However, runoff as well as seepage from the swamp is very small during dry months, when the water is most definitely needed for the project area. These contributions as water sources are, therefore, neglected. Water demand is primarily supplied by rainfall in paddy field and the flow diverted from the Bernam river. Rainfall is important but highly variable. It is, therefore, disregarded in the irrigation water supply schedule.

3.1.2 Water requirements

Unit water requirements for irrigation in the Tanjong Karang Irrigation Project area are:

a. Presaturation	: 2.338 lit/s/ha	(30 acres/cusec)
b. Normal irrigation	: 1.313 lit/s/ha	(53 acres/cusec)
c. Vegetables	: 1.231 lit/s/ha	(57 acres/cusec)

In normal times, the whole project area of 18,980 ha is irrigated by the Main Canal. The Bagan Terap pumphouse is operated only in time of water shortage.

The project area is divided into three Irrigation Schedule Areas (ISA) with an overall crop staggering period of 90 days in each cropping season. The maximum water requirement occurs when presaturation is practiced in the ISA located furthest downstream. The maximum water requirement is adopted as the design discharge of the main conveyance system. The irrigation diagram is illustrated as shown in Fig. F-3.

3.2 Method of Water Distribution

3.2.1 Irrigation schedule areas

The project area is divided into three ISAs as shown in the table below. The Irrigation Schedule Areas are illustrated in Fig. F-4.

Unit : ha

ISA	Compartment	Paddy	Vegetables	Total
No. 1	Sungai Burong	2,890	350	3,240
	Sekinchan	1,640	170	1,810
	Sungai Leman	1,680	140	1,820
	Sub-total	**6,210**	**660**	**6,870**
No. 2	Sawah Sempadan	2,310	-	2,310
	Pasir Panjang	1,470	-	1,470
	Sungai Nipah	1,940	-	1,940
	Panchang Bedena (a-a)	950	-	950
	Panchang Bedena (extension)	160	-	160
	Sub-total	**6,830**	**-**	**6,830**
No. 3	Panchang Bedena (b-b & c-c)	2,310	-	2,310
	Bagan Terap	2,650	-	2,650
	Sungai Panjang	320	-	320
	Sub-total	**5,280**	**-**	**5,280**
	Total	**18,320**	**660**	**18,980**

3.2.2 Fixed irrigation schedule

The supply of water should follow the fixed irrigation schedule as shown in Fig. F-5.

3.2.3 Operation of irrigation schedule

(1) At the start of each crop season, ISA-1 receives its presaturation supply in the first 30 days while ISA-2 and ISA-3 do not get any supply.

(2) In the next 30 days, ISA-1 gets a normal irrigation supply while ISA-2 receives its presaturation supply. There is no supply to ISA-3.

(3) In the next 30 days, ISA-1 and ISA-2 get a normal irrigation supply while ISA-3 gets the presaturation supply.

(4) After 90 days, all areas receive the normal irrigation supply.

(5) The normal irrigation supply is practiced for 85 days.

(6) The depth of water in paddy fields has to be kept at about 10 cm (4 inches).

(7) The supply of water is stopped 25 days before harvesting.

4. O&M OF MAIN CONVEYANCE SYSTEM

4.1 Bernam River Headworks

4.1.1 Operation

(1) The radial gates on the barrage should be so operated that the upstream water level of BRH is kept between 9.6 m (31.5 ft) and 10.1 m (33.0 ft).

(2) If the radial gates have to be opened to fulfill the above requirement, the middle gate should be opened first, the right gate second and the left gate last.

(3) If a radial gate is partially opened, the opening should be more than 15 cm (0.5 ft) in order to prevent vibrations of the gate.

(4) The number of intake gates to be opened should be so determined that the upstream water level of each cross regulator and the water level in the c-c line can be kept at FSL.

(5) If intake gates have to be closed, the gates should be closed starting from upstream to downstream.

(6) Partial opening of intake gates must be prohibited.

(7) The scour gate should normally be fully opened. When the upstream water level at each cross regulator and the water level in the c-c line cannot be kept at FSL, even when all intake gates are opened, the scour gate should be closed to reduce the flow through the scour sluice to 1.5 cu.m/s.

4.1.2 Maintenance

(1) The screens in front of intake gates should always be kept clean. If the screens are kept clean, there is a relationship between water levels upstream of BRH and 200 m downstream of the intake in the Feeder Canal as shown in Fig. F-6. Water levels at the both sites should be measured twice a day at 9 a.m and 3 p.m.

The result of these measurements should be plotted on the figure. If the plot lies above the line in the figure, it will indicate an accumulation of rubbish in front of the screens. The screens should be cleaned immediately.

(2) Cleaning and grass cutting around BRH and the Feeder Canal should be done adequately.

(3) About 300 m of the Bernam river upstream BRH together with the whole of the Feeder Canal should be desilted and the slopes be trimmed by a dragline excavator stationed at BRH once every two years.

(4) The following occasional maintenance should be done.

a. Repainting of metal and concrete surfaces once in two years.
b. Replacement of lifting cables once in three years.
c. Replacement of rubber seals once in three years.

4.2 Main Canal

4.2.1 Operation

(1) The water level in the Main Canal is controlled and stabilized by three cross regulators.

(2) The water level should be maintained at the following FSLs.

Structure	Location	FSL
Cross regulator No.1	TASL 10	4.1(13.4 ft)
Cross regulator No.2	PB a-a	3.8(12.5 ft)
Cross regulator No.3	End of Canal	3.7(12.0 ft)
Secondary canal c-c	PB c-c	3.4(11.0 ft)

(3) In order to maintain FSLs at the location stated above, it is also important to control and regulate the withdrawal of water from the Main Canal.

(4) Withdrawal of water for irrigation must only be carried out

through the offtakes provided at the head of tertiary canals. The amount of water withdrawn for a particular tertiary canal should be as scheduled.

(5) Estimated withdrawals of water from the Main Canal during the planting season are as follows:

(Unit : cu.m/s)

	Presaturation Period			Normal
	I (0-30 days)	II (31-60 days)	III (61-90 days)	Irrigation Period
Paddy				
ISA 1 (6,210 ha)	14.52	8.15	8.15	8.15
ISA 2 (6,830 ha)	0.0	15.97	8.97	8.97
ISA 3 (5,280 ha)	0.0	0.0	12.34	6.93
Vegetables (660 ha)	0.81	0.81	0.81	0.81
Water supply	0.35	0.35	0.35	0.35
Total	**15.68**	**25.28**	**30.62**	**25.21**

(6) The gates of the Tengi Headworks and spillways should usually be closed and any excess flow should be spilled to maintain the required FSLs of the Main Canal at the respective structures.

(7) Only at exceptionally high discharges during the rainy season the gates should be opened so that the flood discharge can go through quickly. When the water level at the spillways exceeds the following, the gates of the spillways should be opened.

Tengi spillway	4.5 m (14.7 ft)
Haji Dorani spillway	3.9 m (12.7 ft)

(8) As soon as the flood discharge ceases and the water level drops to FSL, the gates should be closed.

4.2.2 Maintenance

(1) Clearing and weeding in the Main Canal should be undertaken every four months.

(2) The following occasional maintenance should be done:

a. Desilting work once in four years. The work should include the desilting in the Tengi river.
b. Making up the bund of the Main Canal once in five years.
c. Repainting of metal and concrete surfaces of related structures of the Main Canal once in two years.
d. Replacement of lifting cables and rubber seals of related structures of the Main Canal once in three years.
e. Checking and repair of staff gauges prior to each cropping season.

4.3 Measures During Water Shortage

The gates which makes the upstream level constant are provided at cross regulators No. 1 and No. 2. The upstream water level at these two cross regulators is automatically kept at FSL. The aim of operation of BRH is to maintain the water level in the c-c line of Panchang Bedena at FSL of 3.4 m (11.0 ft). If the FSL in the c-c line cannot be maintained, even though as much water is diverted as possible from the intake, leakage along the Main Canal, if any, should be quickly located and stopped. Over-tapping at CHOs should be prohibited. If it can be confirmed that there is no significant leakage and over-tapping, it is a time of water shortage and the following measures need to be taken.

First step to be taken against water shortage

(1) Growing stage of paddy should be checked and if there is an area where no water is required, the water supply to such area should be stopped.

(2) The offtake gate at the head of the d-d line should be closed, and the pumps at Bagan Terap should be operated to supply water to the 1,200 ha in the Bagan Terap compartment and the 320 ha in the Sungai Panjang.

(3) For the remaining area, the water should be evenly distributed. In order to achieve even distribution, cross regulators should be so

operated that the water level in the Main Canal is equally lowered below FSLs at the upstream of each cross regulator.

(4) Inspection of water level in the Main Canal should be made more frequently than in normal conditions and at least three times a day.

Second step to be taken against water shortage:

(5) If the drawdown of water level becomes more than 10 cm below FSLs, it is a time of severe drought and rotational irrigation should be applied in the Main Canal.

(6) Half of the offtakes in each compartment should be opened and the remaining half offtakes closed for two days. Such operation should be made alternately and repeated throughout the whole area.

(7) Any area under presaturation should be excluded from the above rotational irrigation and water should be supplied continuously.

5. O&M OF DISTRIBUTION NETWORK

5.1 Operation

5.1.1 Presaturation

(1) The irrigation schedule for a tertiary canal should be identified.

(2) Rotational irrigation should be practiced in a tertiary canal. The proposed rotation blocks are shown in Fig. F-7.

(3) The check gate for the rotation block No. 1 should be closed.

(4) Offtake gates should be opened and so controlled to maintain FSL in the tertiary canal. To control discharge, only a turnout gate should be operated and an orifice gate should be fully opened.

(5) After presaturation is over for the rotation block No. 1, the check gate for rotation block No. 1 should be opened and presaturation should be started in rotation block No. 2.

(6) After presaturation is over for the rotation block No. 2, the check gate for rotation block No. 2 should be opened and presaturation should be started in rotation block No. 3.

(7) The maximum presaturation period should be about 10 days for each rotation block.

(8) FSL in a tertiary canal should be maintained for 30 days during presaturation.

(9) The water level in a tertiary canal should be inspected twice a day by the gatekeeper and maintained at FSL.

5.1.2. Normal irrigation

(1) After the presaturation is over, the height of check gates and slots should be adjusted at the heights which have been predetermined.

(2) A turnout gate should be so operated to maintain the water level in a tertiary canal at normal supply level (NSL).

(3) NSL in a tertiary canal should be maintained during normal irrigation period.

(4) The normal irrigation period is 85 days.

(5) Irrigation supply should be stopped 25 days before harvesting.

5.1.3. Irrigation for vegetables

(1) Irrigation for vegetables should be continued as required throughout the year.

(2) Offtake gates and check gates should be properly controlled to fulfill the above requirement.

5.2 Maintenance

(1) Prior to every crop season, the following work should be undertaken:

a. removal of rubbish and debris from the canal system,
b. checking that slots and checks are in order, and
c. repainting FSL and NSL as necessary.

(2) The screen installed in front of offtakes should be kept clean all the time.

(3) Leakage, if found, should be repaired as soon as possible.

(4) Rubbish, weeds and debris in a tertiary canal should be removed regularly and the canal system should be kept clean.

(5) The following occasional maintenance should be made:

a. repainting metal and concrete surfaces once in two years, and
b. re-marking of FSL and NSL on walls of conduits every year.

5.3 O&M of Drainage Network

5.3.1 Operation

(1) All the drainage control gates should be closed two weeks prior to the start of presaturation.

(2) Water level in a drain should be maintained as high as possible but should not harm paddy cropping.

(3) Drainage control gates should be opened 25 days before harvesting.

(4) If some fields are affected by the above operation, and if water demand of these fields increases, irrigation water should be supplied additionally to these fields.

5.3.2 Maintenance

(1) Weeding and clearance of the drainage network should be done four times a year.

(2) Desilting should be made once in four years.

6. MONITORING AND RECORDING

6.1 Monitoring Schedule of the Main Conveyance System

6.1.1 Monitoring items

The most important element in water management of the main conveyance system is to stabilize and maintain the water level in the Main Canal at FSLs. It is, therefore, essential to regularly monitor and record water levels at the following seven sites.

1. Upstream water level of BRH
2. Water level at the head of the Feeder Canal (200 m downstream of BRH)
3. Upstream water level of Tengi Headworks
4. Upstream water level of cross regulator No.1
5. Upstream water level of cross regulator No.2
6. Upstream water level of cross regulator No.3
7. Water level at the head of the c-c line

6.1.2 Monitoring System

Water levels at the seven sites above should be observed twice a day, at 9 a.m. and 3 p.m., and recorded in the format in Table F-1 by the gatekeepers/operators of the Main Conveyance System Operation and Maintenance Unit (MOMU). The observed data should be informed to both the main and branch offices. The head of MOMU, Engineer, should analyze the data in order to maintain the water level in the Main Canal at FSL. When the water level in the Main Canal becomes below FSL or any problems arise in the main conveyance system, the staff of MOMU should promptly inform situations and problems to the Engineer, MOMU, for taking necessary action. The Engineer, MOMU, should give instructions to the staff of MOMU, the Chief Irrigation Inspector and Senior Irrigation Inspectors, on the method of controlling BRH, cross regulators, spillways, end control gates at the ends of the c-c line, and constant head orifice offtakes.

6.1.3 Recording

The Technical Assistant of MOMU should compile records on the water management of the main conveyance system under the Engineer. The items to be recorded are as listed below.

a. Water level at the seven sites listed above,
b. Operation of facilities on the main conveyance system,
c. Measures taken during water shortage, and
d. Maintenance of the main conveyance system.

6.1.4 Communication

The radio telecommunication system of the project is illustrated in Fig. F-8. The main station is established in DID, Tanjong Karang, and connected with DID, Kuala Selangor. A branch station is set up in DID, Sungai Besar. In addition to the above, seven sub-stations are built up at the following sites. Facilities and area covered by each sub-station are summarized below.

Name of Sub-station	Location	Facilities and area covered
1. BRH	BRH quarters	BRH Feeder Canal
2. Sawah Sempadan	FDSc, SS	Tengi Headworks Tengi Spillway Sawah Sempadan compartment
3. Sungai Burong	FDSc, SB	Sungai Burong compartment
4. Sekinchan	FDSc, S	Regulator No. 1 Sekinchan compartment Sungai Leman compartment
5. Pasir Panjang	DID station	Pasir Panjang compartment
6. Sungai Nipah	FDSc, SN	Sungai Nipah compartment

7. Sungai Besar	FDC, SB	Regulator No. 2 Regulator No. 3 Haji Dorani Spillway Secondary canal a-a line Secondary canal b-b line Secondary canal c-c line Secondary canal d-d line End control gates on the c-c Bagan Terap pumphouse Panchang Bedena compartment Bagan Terap compartment

6.2 Monitoring Schedule of the Distribution Network

6.2.1 Monitoring items

In order to enable necessary action to be taken to rectify water problems and to promote proper on-farm water management practices, it is important to monitor the day-to-day water situation in the distribution network. The following water level should be monitored daily for each tertiary canal and recorded in the format in Table F-2.

1. Water level in the Main Canal in front of the offtake,
2. Water level at the head of tertiary canal,
3. Upstream and downstream water level of each check structure,
4. Water level at the end of tertiary canal, and
5. Water level in drain at the end control gate.

For the proper water management of the project, it is of the utmost importance to keep to the fixed irrigation schedule. Thus, farming activities which affect the water management should also be monitored in addition to the above, in order to pinpoint water-related problems. Weekly monitoring on farming activities should be done for each lot by classifying the activities into the following six categories. The result of observation should be compiled in the format in Tables F-3 and F-4, using the symbols below.

Symbol	Monitoring Items
A	Direct seeding completed
B	Presaturation started
C	Presaturation completed
D	Transplanting completed
E	Normal irrigation stopped
F	Harvesting completed

6.2.2 Monitoring system

Water level at the sites above should be observed twice a day, at 9 a.m. and 3 p.m., by the gatekeeper of each tertiary canal. When the water level in a tertiary canal is below FSL/NSL, measures should be taken at the site by the gatekeeper by means of cleaning the tertiary canal and/or controlling the offtake gate, check gates and slots. If the situation is beyond the capacity of the gatekeeper, the Irrigation Overseer in charge should be informed. The Irrigation Overseer should inspect the site and analyze the cause of problems to report to the Irrigation Inspector. For remedial action, the Irrigation Inspector should issue directives to the relevant staff.

Weekly data on the farming activities recorded by gatekeepers should be transferred to the Irrigation Overseer. Then the Irrigation Overseer should check data and send them to the Irrigation Inspector, and the Irrigation Inspector should analyze the data. If no farming activities have started even though water had been supplied over the past two weeks, the Irrigation Inspector will have to bring this to the attention of the Area Inter-Agencies Coordination, Planning and Liaison Committee so that corrective measures can be carried out. When all farming activities for one cropping season are completed in one compartment, Irrigation Inspector should prepare maps showing the delay of farming activities from the fixed schedule. The analysis of these maps is quite effective to pinpoint lots and areas with water-related problems, and to take necessary actions for solving them.

All data and information as well as instructions given should be properly recorded and neatly compiled. The Irrigation Inspector should have responsibility for compiling data and information and submitting them to the Senior Irrigation Inspector every month. Data on the farming

activities should be summarized as exampled in Figs. F-9 and F-10. The implementation of irrigation of each cropping season should be analyzed by an Engineer in charge of the distribution network for promoting good on-farm water management practice. The overall coordination, including an application of trial operations, should be undertaken by the Engineer in charge.

7. ORGANIZATION AND DUTIES

7.1 Organization

Organization for operation and maintenance of project facilities is shown in Fig. F-11. A head of the organization is the Senior Engineer, Kuala Selangor, whose administrative powers extend to the whole PBLS area. One Engineer administers the whole Tanjong Karang Irrigation Scheme, responsible for all matters relating to the irrigation system. Under the Engineer in charge of the whole irrigation system, two Engineers are appointed either for the main conveyance system or for the distribution network. The former Engineer is a head of MOMU, composed of three teams for BRH, spillways and cross regulators. Another Engineer takes charge of the technical coordination for the distribution network. The actual operation and maintenance of the irrigation system is executed by the Chief Irrigation Inspector. The whole irrigation area is divided into two, with one Senior Irrigation Inspector appointed to each half. The area is further divided into irrigation compartments which are supervised by the Irrigation Inspectors. Under the Irrigation Inspectors, the Irrigation Overseers and gatekeepers are appointed in individual compartments for operation and maintenance.

7.2. Duty List

7.2.1 Senior Engineer

1. General administration, financial control and staff control.
2. Overall operation and maintenance of facilities, equipments and infrastructure.
3. Coordination with other government agencies.
4. Policy making on irrigation water management including fixing the irrigation schedule.
5. Review of staff performances and effectiveness in irrigation water management, so as to adjust staff strength and the irrigation schedule.
6. Budget proposals for the whole area.
7. Other duties delegated by the State Director.
   (Note: The above duties of the Senior Engineer are only irrigation-related matters picked-up)

7.2.2 Engineer (in charge of irrigation)

1. Administration and control of finance and personnel for irrigation, including allocation of activities among the irrigation staff.
2. Operation and maintenance of irrigation and drainage systems in irrigation areas.
3. Planning and implementation of water management according to the irrigation schedule.
4. Ensuring proper operation procedures for the irrigation system.
5. Preparation of maintenance programmes with the estimates.
6. Coordination with other agencies in terms of water management.
7. Organizing and instituting training programmes.
8. Other duties delegated by the Senior Engineer.

7.2.3 Engineer (head of MOMU)

1. Operation and maintenance of BRH, cross regulators and spillways along the Main Canal.
2. Regulation of water level in the Main Canal through the analysis of the monitored data.
3. Supervision on and instruction to the staff of MOMU.
4. Preparation of indents for maintenance work of the related structures and facilities.
5. Supervision of tenders for repair, normal maintenance, desilting, etc.
6. Liaison with other irrigation staff, in terms of water level regulation for the main conveyance system.
7. Training of MOMU staff.
8. Other duties instructed by his superior.

7.2.4 Engineer (in charge of the distribution network)

1. Planning and preparation of extension programmes in water management, based on the trial results on TASB 4.
2. Ensuring effective and efficient water management through the analysis of the monitored data in the distribution network.
3. Supervision of works of the Pilot Project team for TASB 4.
4. Review and analysis of trial operations in tertiary canals.
5. Review of water management extension in individual

compartments.

6. Technical coordination on operation and maintenance of the distribution network.
7. Advice on training of the staff in individual irrigation compartments.
8. Other duties instructed by his superior.

7.2.5 Chief Irrigation Inspector

1. Management, use and control of irrigation water in the whole Tanjong Karang Irrigation Scheme area.
2. Withdrawal from the Main Canal, and water allocation in the distribution network, according to the fixed irrigation schedule.
3. Area-wide coordination of activities of the irrigation staff covering eight compartments.
4. Liaison with other agencies in terms of irrigation water management.
5. Submission of field reports on water supply situation, water usage by farmers, farming progress, and staff performances.
6. Other duties as instructed by the senior officers.

7.2.6 Senior Irrigation Inspector

1. Water management within his area, according to the fixed irrigation schedule.
2. Scheduling and execution of operation and maintenance work.
3. Coordination with Irrigation Inspectors and Irrigation Overseers under his charge.
4. Review of area-wide water requirements and water allocation in the distribution network.
5. Liaison with other agencies in the area.
6. Investigation of area problems and complaints from the farmers.
7. Other duties as instructed by the senior officers.

7.2.7 MOMU staff

(1) Technical Assistant

1. Assistance to the Engineer, MOMU.
2. Compiling the records of water level alteration along the main

conveyance system.

3. Compliling the records of operation and maintenance of facilities/ structures.
4. Recording the measures taken by MOMU staff.
5. Liaison with other irrigation staff on behalf of the Engineer, MOMU.
6. Other duties as instructed by the Engineer, MOMU.

(2) Special-grade Irrigation Overseer, BRH

1. Operation and maintenance of BRH.
2. Supervision of the work of BRH team.
3. Inspection/Investigation of working conditions of BRH.
4. Instruction to gatekeepers on clearing rubbish around BRH, through the analysis of the monitored data.
5. Other duties as instructed by the Engineer, MOMU.

(3) Gatekeepers/Operators

1. Operation of structures or facilities as assigned.
2. Minor maintenance work of the assigned structures or facilities.
3. Ensuring good-working conditions of the structures or facilities.
4. Gauging the water level at the selected points.
5. Reporting to the Engineer, MOMU, on any problem as well as radical alteration of water level.
6. Clearing of rubbish or any obstruction around the structures.
7. Other duties as instructed by the senior officers.

7.2.8 Irrigation staff in a compartment

(1) Irrigation Inspector

1. Operation and maintenance of irrigation and drainage system within a particular irrigation compartment.
2. Distribution of water from the Main Canal in tertiary canals, according to the irrigation schedule.
3. Control of water level in drains.
4. Inspection of field conditions, including canals, drains, bunds and structures to make sure that they function properly.
5. Administration of contractors' quotations for normal maintenance such as clearing and repair.

6. Arrangement of duties of Irrigation Overseers and gatekeepers under him, and supervision of their discipline.
7. Compiling and recording of irrigation water supply, structure operation and water requirements in the compartment.
8. Survey, calibration and gauging works on structures, drains and canals to assess their performance.
9. Monitoring of farming progress together with agricultural extension staff.
10. Investigation on complaints or requests by farmers and from the public.
11. Encouragement of farmers to obtain their cooperation in water management and to keep intimate relationship.
12. Attendance at meetings, dialogue sessions, etc. with farmers and with other agencies.
13. Submission of status reports on irrigation and drainage systems and infrastructure, progress report on paddy planting, record of water supply, machine returns, expenditure estimates and record of the payment of wages.
14. Ordering and stocktaking of P.O.L, providing spares, etc, for the pumphouse/mobile pumps in the area, and supervision of their operation.
15. Training of his subordinates.
16. Other duties as instructed by the senior officers.

(2) Irrigation Overseer

1. Operation and maintenance of irrigation and drainage systems within the area assigned by the Irrigation Inspector.
2. Ensuring effective irrigation water management by getting farmers' involvement and cooperation.
3. Instruction and supervision of the gatekeepers' work in the operation of offtakes and control structures, as instructed by the Irrigation Inspector.
4. Inspection of field conditions of all canals, drains, bunds and control structures as well as water levels, to identify problems or shortcomings in the irrigation and drainage systems.
5. Monitoring of farming activities and planting progress.
6. Record of water level, and water supply and demand situation.
7. Supervision of duties of gatekeepers, departmental labours, and other workers, including preparation of check rolls and claims.

8. Supervision of contract work for maintenance.
9. Investigation on farmers' complaints and requests and to report these to the Irrigation Inspector.
10. Encouragement of farmers to obtain their cooperation in clearing canals and drains.
11. Attendance at meetings, dialogue sessions, etc. with farmers and with other agencies.
12. Submission of reports on field conditions and problems, water supply and demand situation, farming progress, machine returns and, wages.
13. Ensuring pumps and machines being operated properly.
14. Other duties instructed by the senior officers.

(3) Gatekeeper

1. Operation of control structures of irrigation and drainage systems as instructed by the Irrigation Overseer.
2. Maintenance work of structures as instructed by the Irrigation Overseer.
3. Daily checks on irrigation water supply and drainage discharge, including record of water level in the distribution network.
4. Checking, identifying and reporting to the Irrigation Overseer of any shortage or damage in irrigation and drainage systems.
5. Checking and removing rubbish and obstructions in the distribution network, as instructed by the Irrigation Overseer.
6. Assistance to the Irrigation Overseer in encouraging farmers and in coupling reports.
7. Attendance at training sessions.
8. Other duties instructed by the senior officers.

8. AMENDMENT

The procedures and methods shown in this Manual will need to be revised from time to time, using current feedback and data obtained from daily operation and maintenance work.

TABLES

Table F-1 WATER LEVEL IN MAIN CONVEYANCE SYSTEM

Date Time	U/S BRH	Head of Feeder Canal	Intake Discharge	U/S Tengi H.W.	U/S Req.1	U/S Req.2	U/S Req.3	Head of c-c line
FSL	-	-	-	-	4.1 m	3.8 m	3.7 m	3.4 m

Table F-2 WATER LEVEL IN DISTRIBUTION NETWORK

Date & Time	U/S Offtake	Head of Tertiary	U/S C/S 4	D/S C/S 4	U/S C/S 3	D/S C/S 3	U/S C/S 2	D/S C/S 2	U/S C/S 1	D/S C/S 1	End of Tertiary	U/S E/C 1	U/S E/C 2	U/S E/C 3	U/S E/C 4	U/S E/C 5
FSL																
NSL																

Note : C/S: Check structure E/S: End control gate

Table F-3 FIELD NOTE OF FARMING ACTIVITY

Tertiary Canal __________________________
Name of Operator __________________________

Lot No.	Activity	Use of Syphon	Offtake	Offtake	Use of Syphon	Activity	Lot No.

Symbol	Monitoring Items
A	Direct seeding completed
B	Presaturation started
C	Presaturation completed
D	Transplanting completed
E	Normal irrigation stopped
F	Harvesting completed

Offtake / - Open
X - Closed

Use of syphon S

Table F-4 FARMING ACTIVITY

Date	(Month)										
Lot /No.	(Date)										

Offtake √ - Open Activity A ~ D
X - Closed

FIGURES

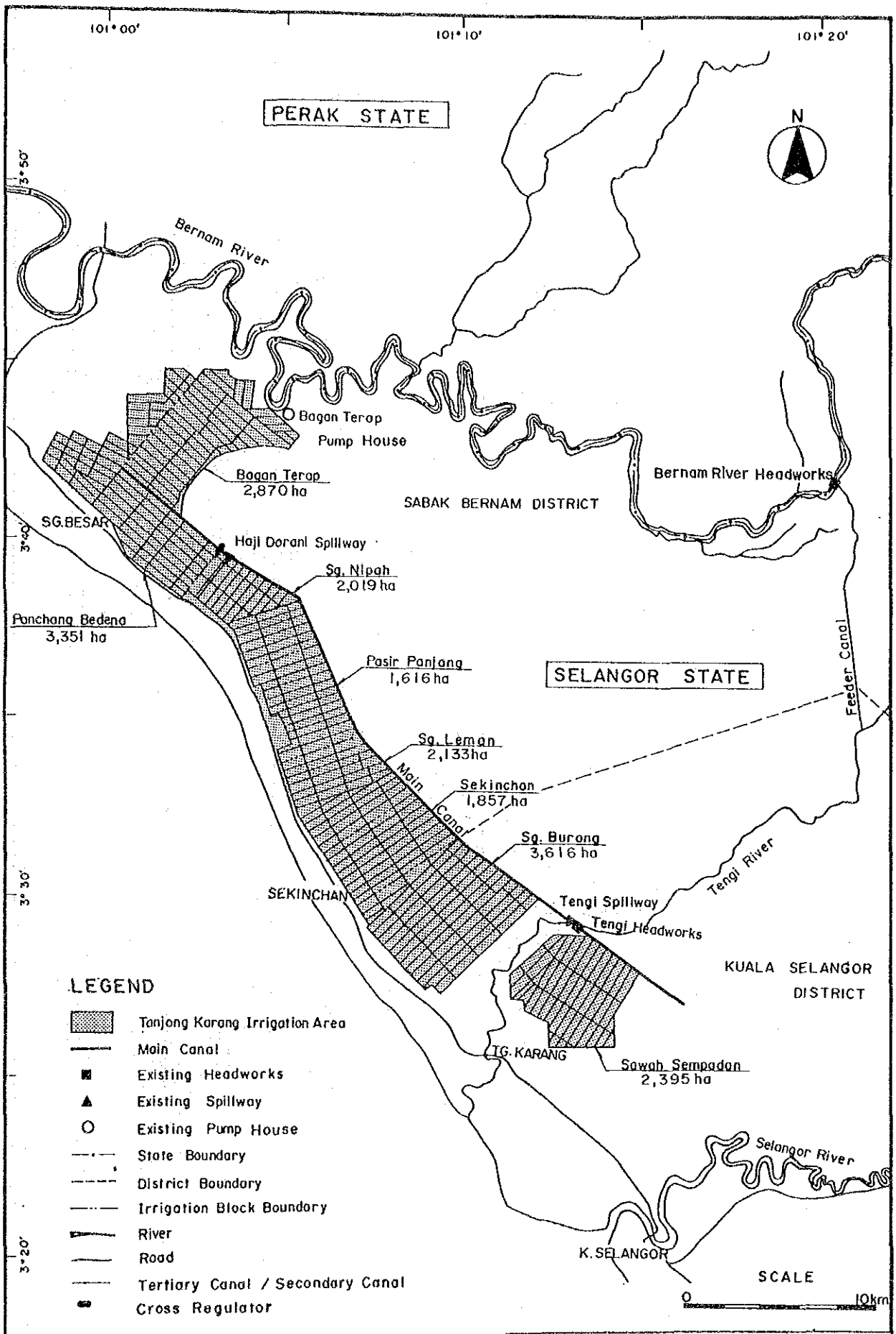

Fig.F-1 Location of Main Conveyance System

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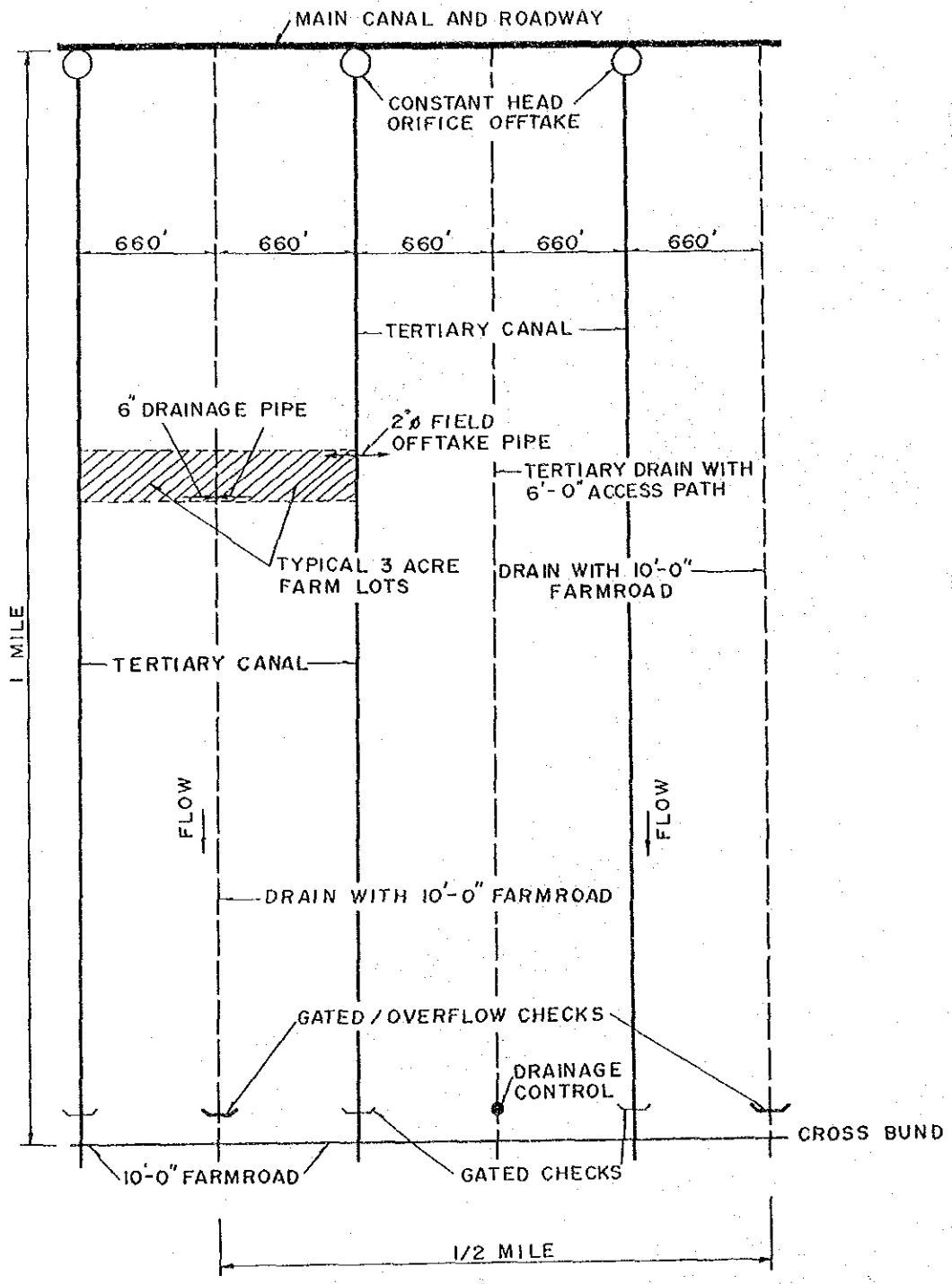

Fig.F-2 Typical Layout of Tertiary Canals

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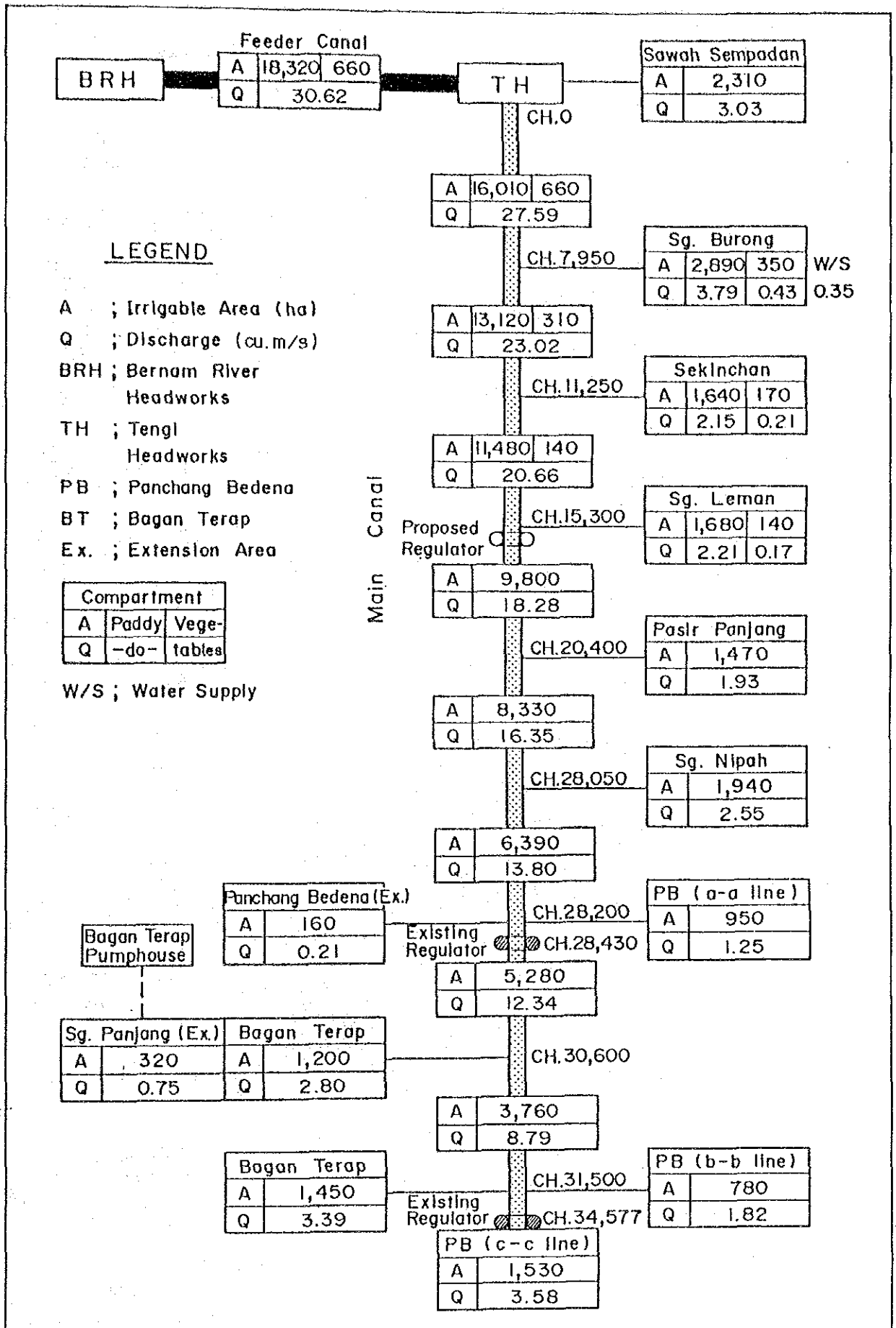

Fig.F-3 Irrigation Diagram of Main Canal

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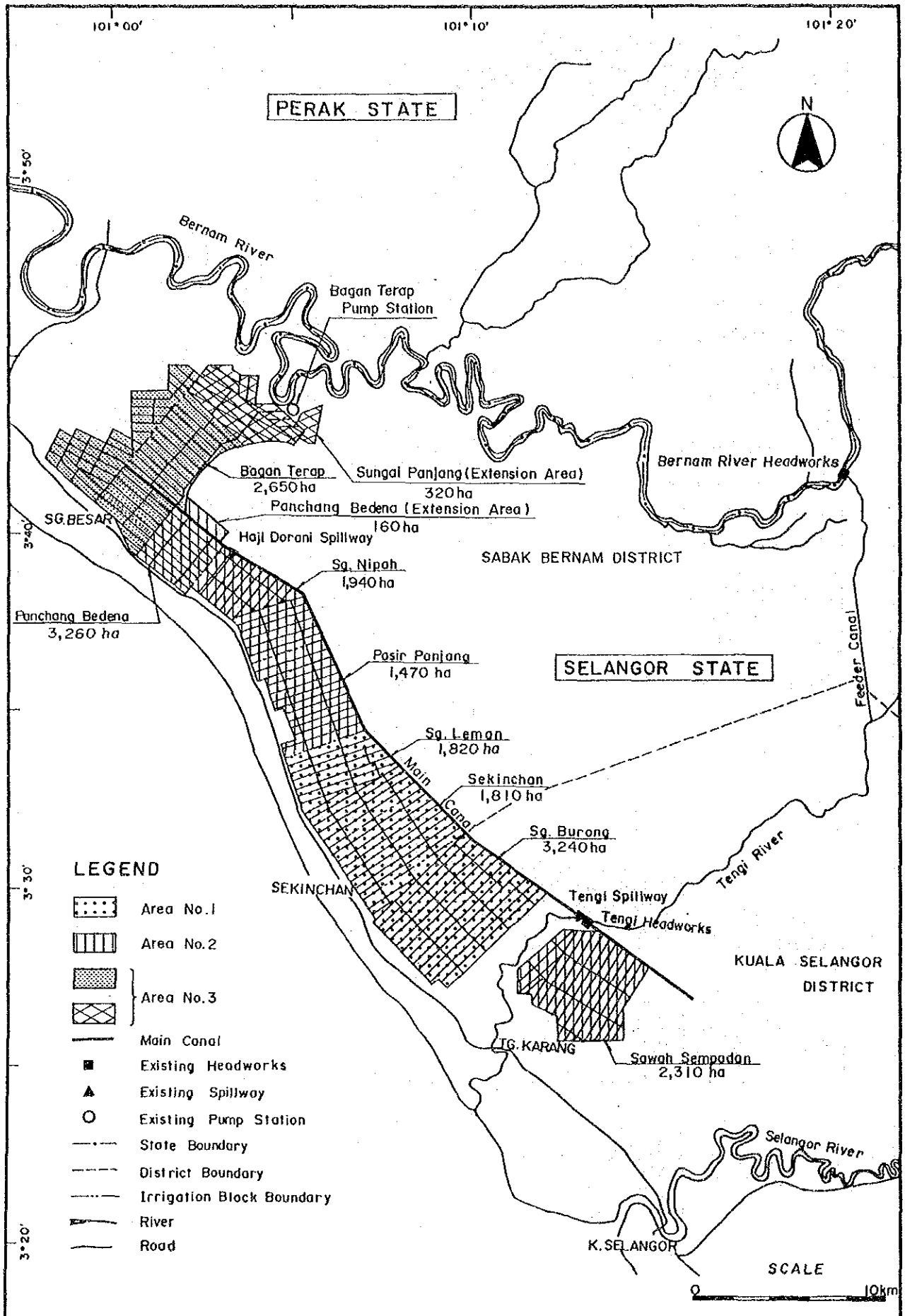

Fig. F-4 Irrigation Schedule Area

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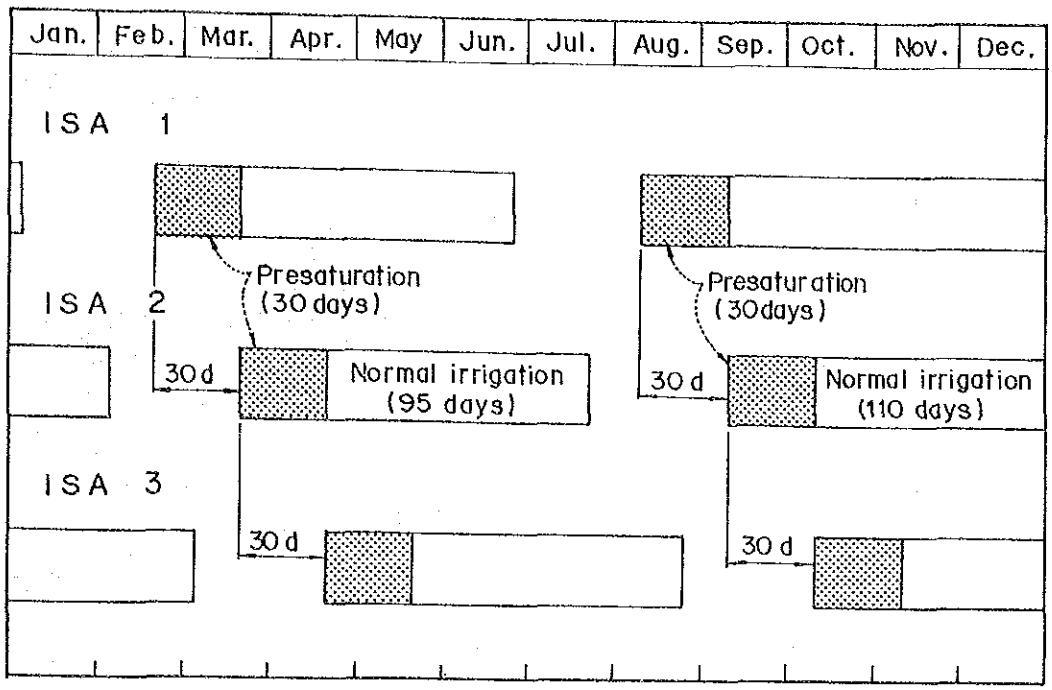

ISA 1 : Sg. Burong, Sekinchan and Sg. Leman
ISA 2 : Sawah Sempadan, Pasir Panjang, Sg. Nipah and Panchang Bedena (a-a)
ISA 3 : Panchang Bedena (b-b, c-c), Bagan Terap and Sg. Panjang

Fig.F-5 Fixed Irrigation Schedule

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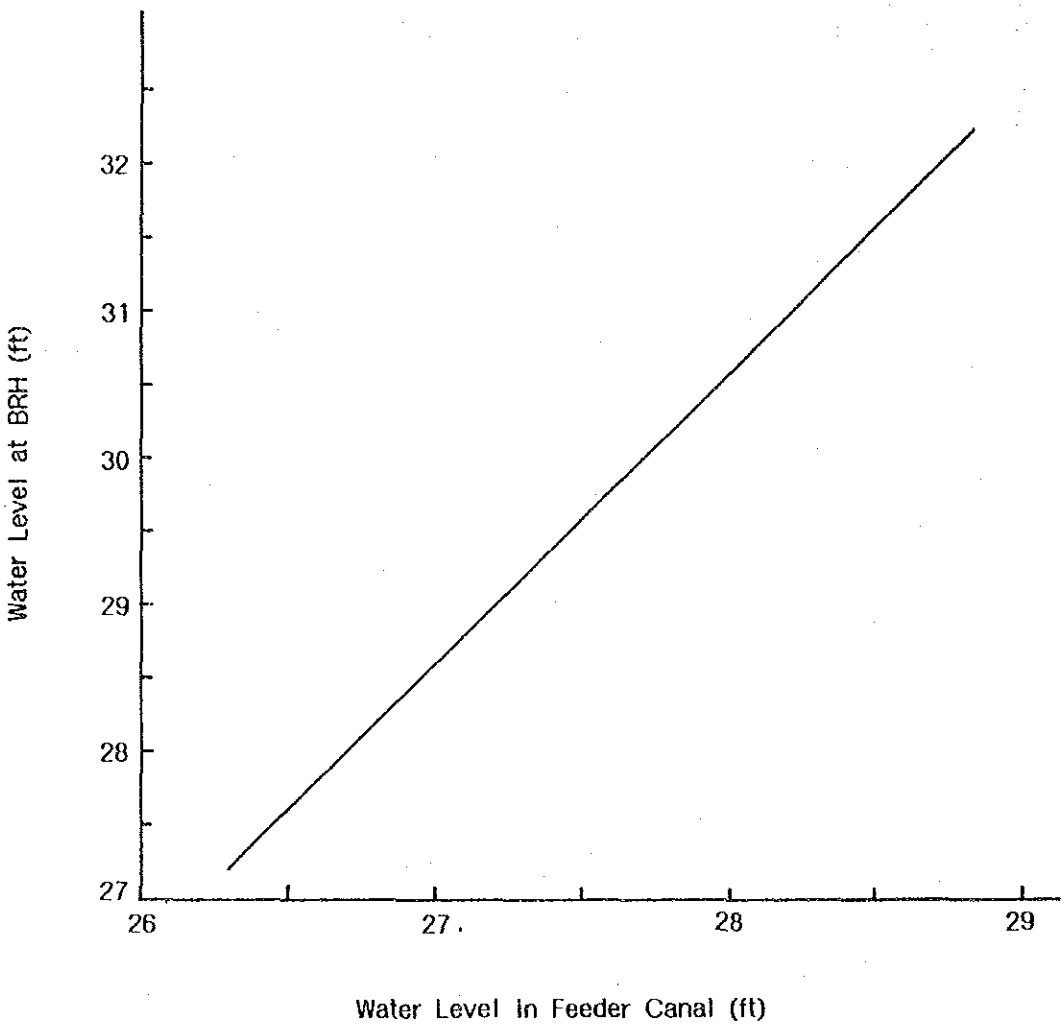

Fig.F-6 Relationship of Water Levels between BRH and Feeder Canal

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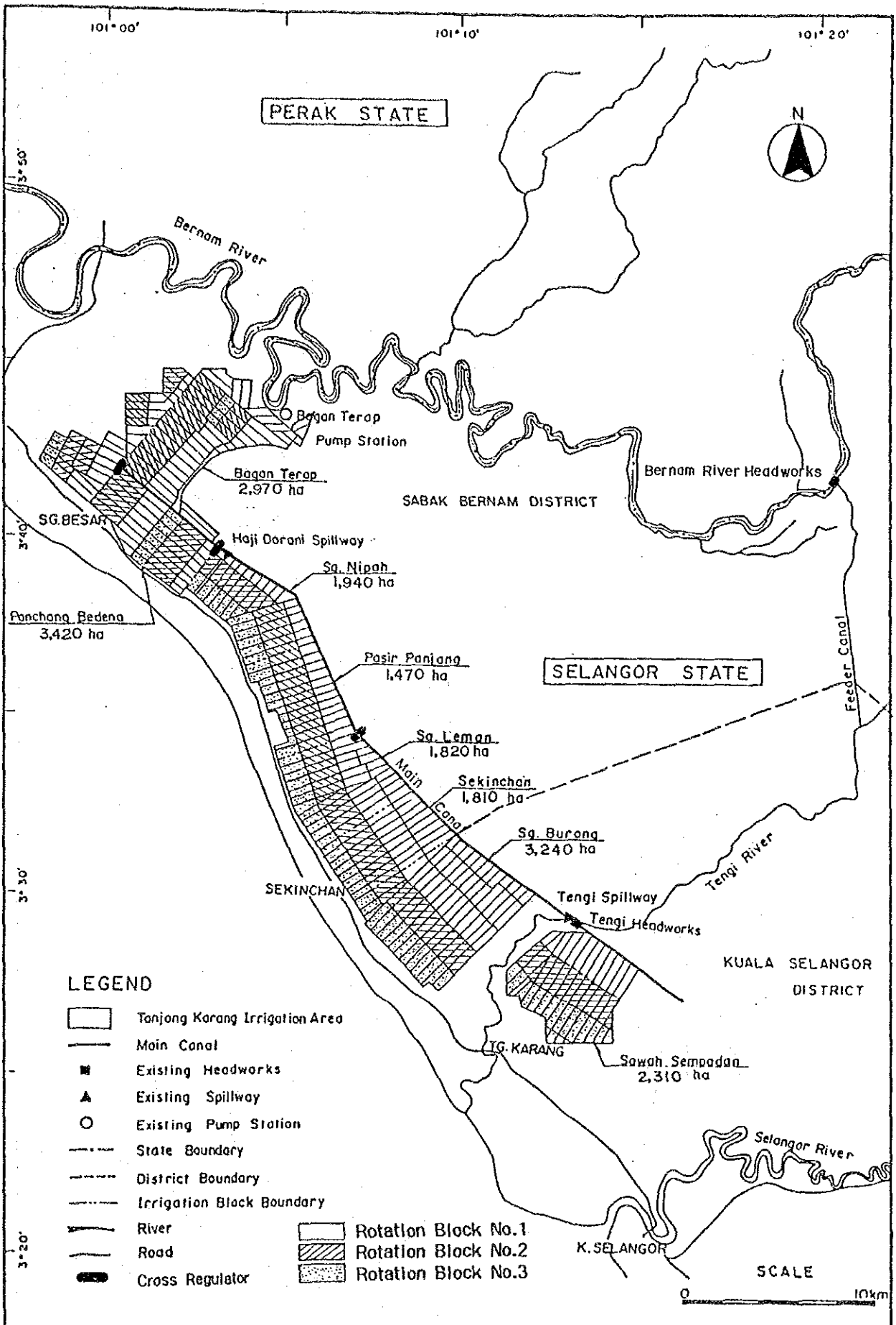

Fig.F-7 Rotation Blocks of Tertiary Canals

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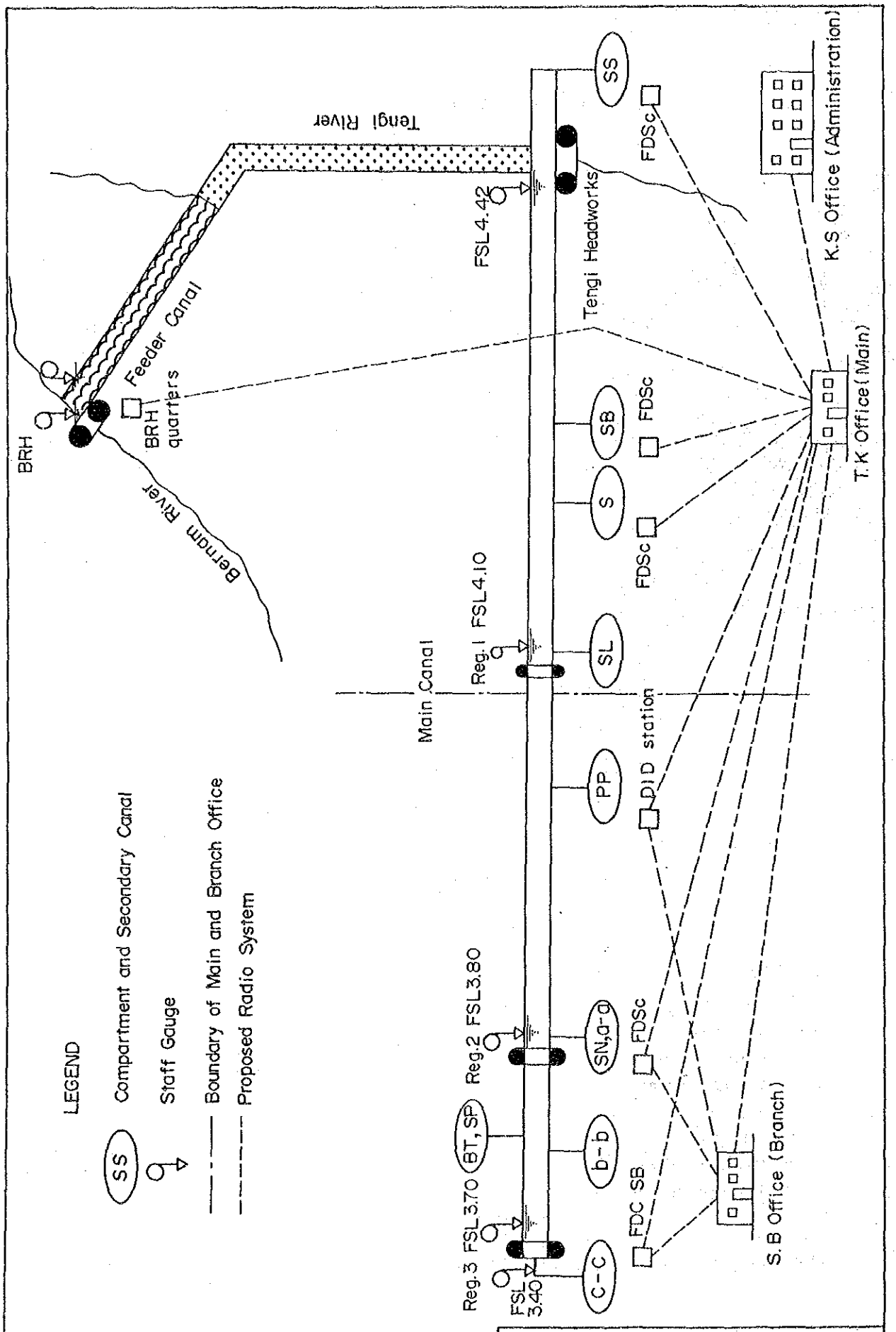

Fig.F-8 Radio Communication System

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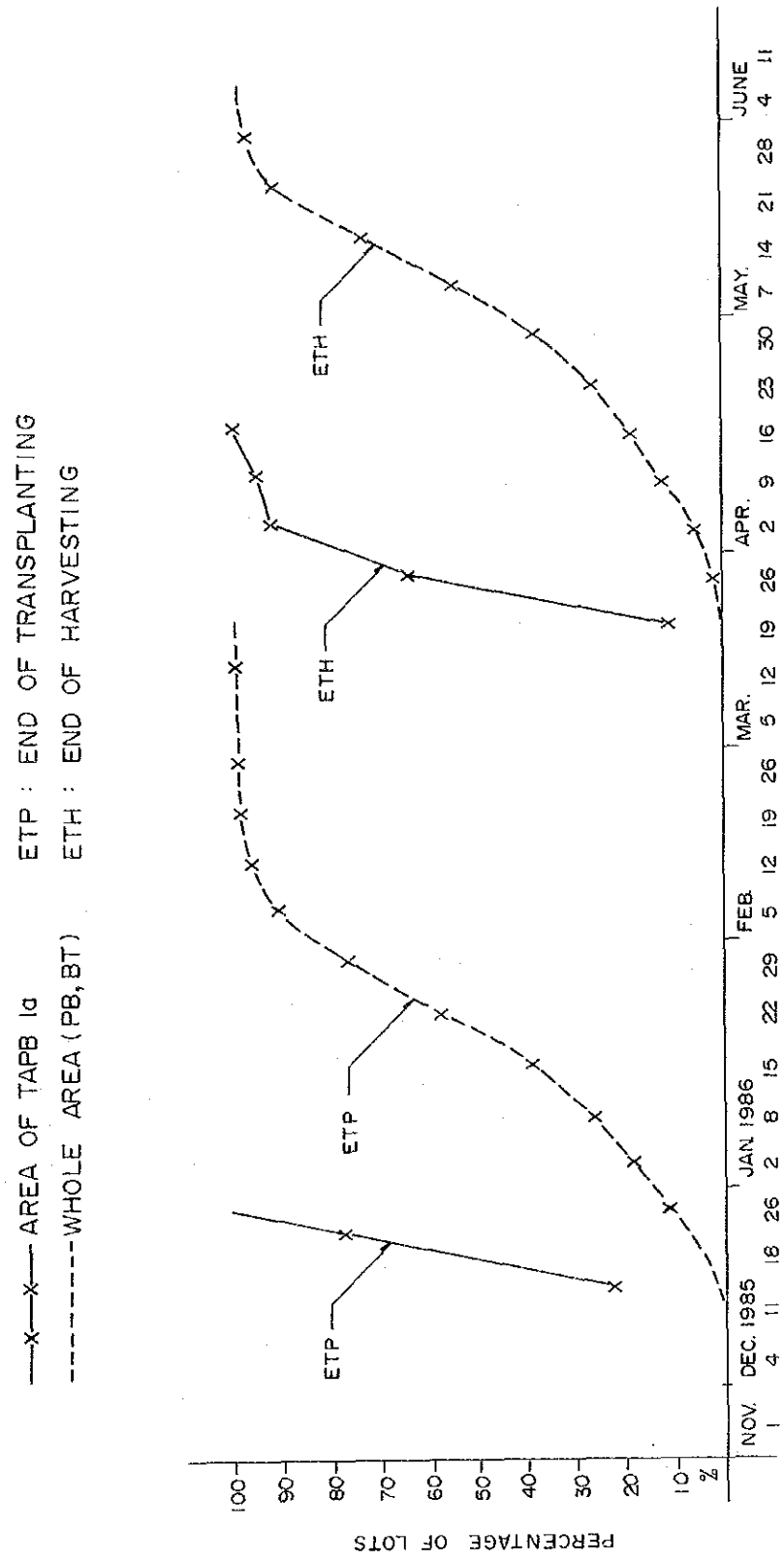

Fig.F-9 Implementation of Farming

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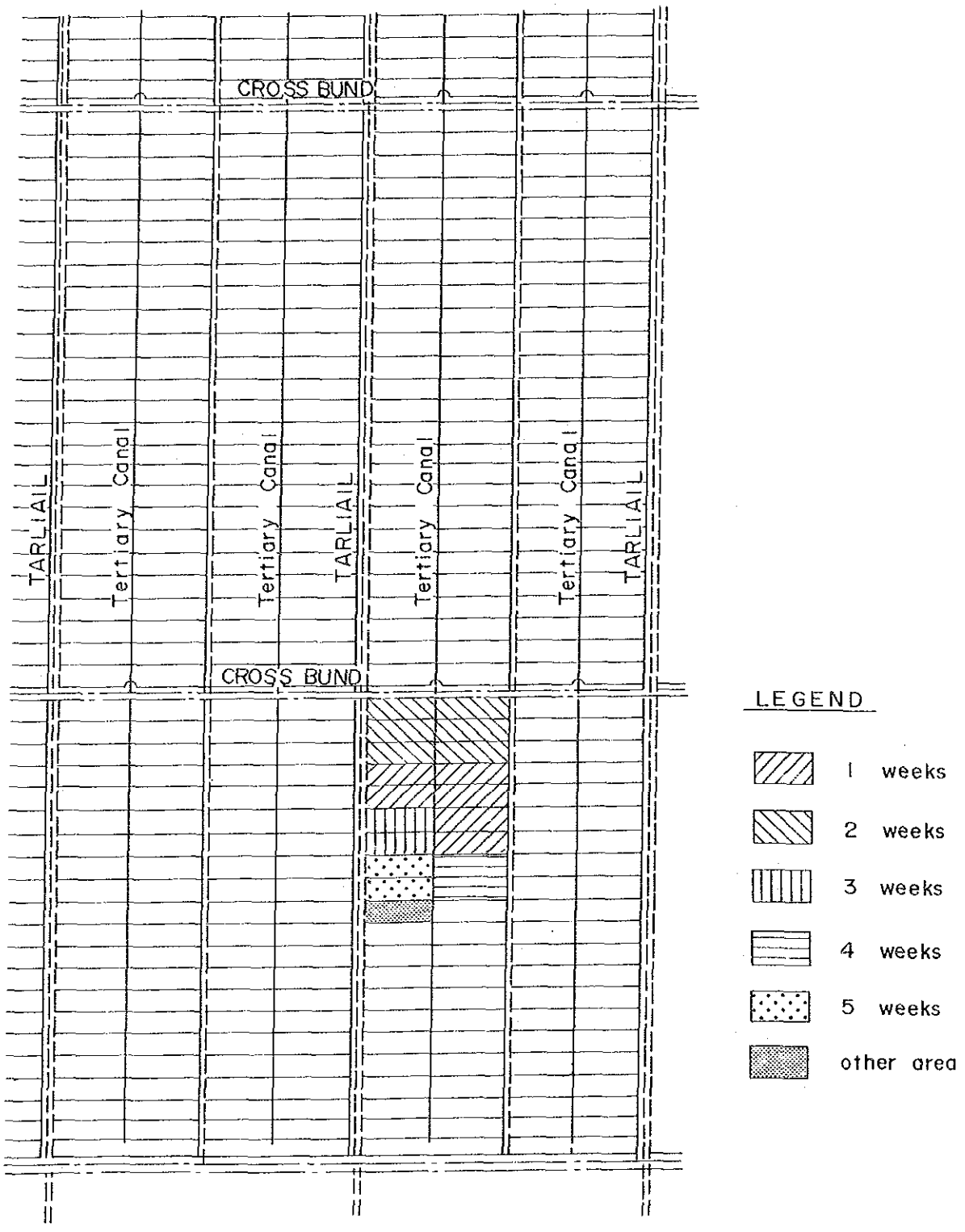

Fig.F-10 Delay of Farming Activity

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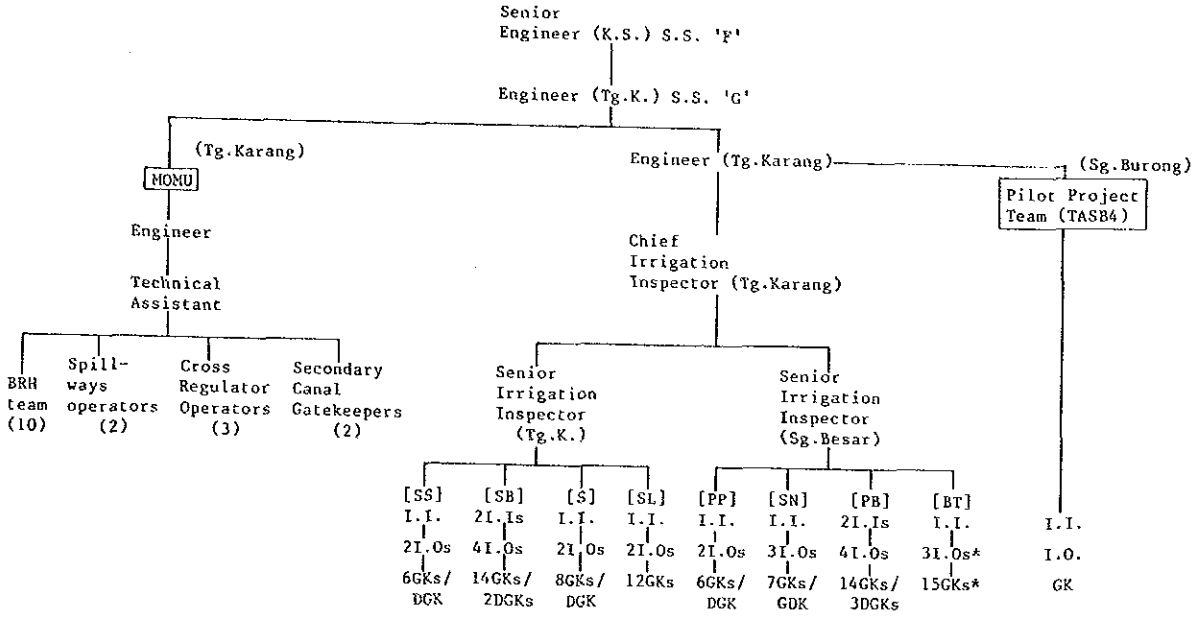

Remarks: (1): MOMU: Main Conveyance System Operation/Maintenance Unit

(2): *: Including Irrigation Overseer and gatekeepers for Sg. Panjang

(3): ( ): location or number of staff

(4): I.I.: Irrigation Inspector I.O.: Irrigation Overseer

(5): GK: Gatekeeper, DGK: Drainage Gatekeeper

Fig.F-11 Organization for Operation and Maintenance

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