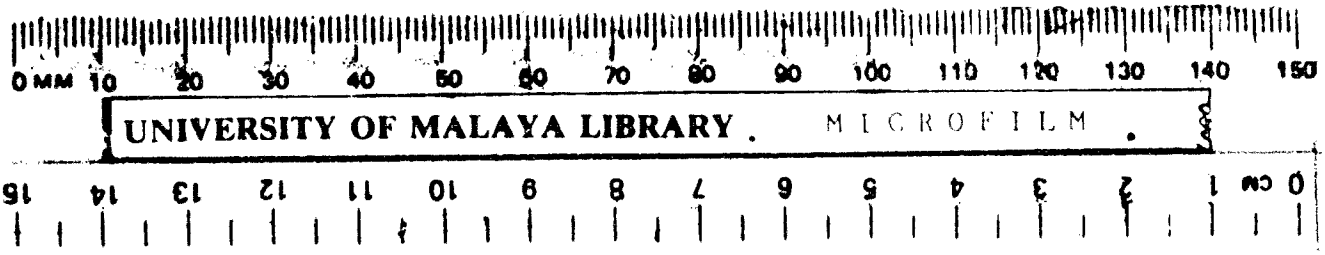

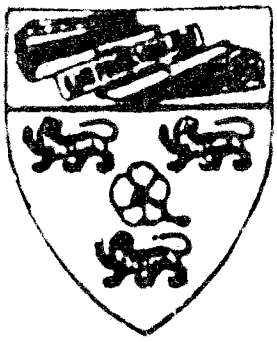

MULA

TANJONG KARANG SURVEY - PHASE IV

A STUDY OF THE INTER AND INTRA-BLOCKS YIELD VARIATIONS IN BLOCKS D, E, F, K, Q, R, P, S, T, U, V, AND W, IN SAWAH SEMPADAN

by

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A Graduation Exercise presented to the University of Malaya in part fulfilment towards the Degree of Bachelor of Arts with Honours in Economics

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CHAPTER I

INTRODUCTION

Rice which is one of the oldest and most important of the foodcrops is the staple diet of the great majority of the inhabitants of Malaysia. Next to rubber, rice occupies the largest area of cultivated land; in fact it occupies about one-sixth of Malaya's cultivated land. In 1959 over 934,000 acres were planted with padi comprising 873,000 acres under wet padi and 61,000 under dry padi.[1] By now the total acreage under padi cultivation has increased tremendously.

Padi is an entirely a smallholder's crop and although the main areas are to be found in the states of Perlis, Kedah, Province Wellesley, Kelantan, Trengganu and north of Perak, it is also important in the small holding agriculture in all parts of Malaya.

The importance of rice in Malaya or in most of the Asian countries, cannot be overemphasied. Great as the dependence of the Malayan population is on rice for their staple diet, yet "local production was only sufficient to cover about 60% of Malaya's rice requirement, with the remainder, amounting to about 400,000 tons being imported mainly from Thailand and Burma at a cost of about $155 million".[2] So far, never more than two-thirds of the requirements of the population has been produced locally.

Dependence on foreign countries for rice is not actually standing on firm economic ground, especially enhanced by the present political situation. The need to achieve self-sufficiency or at least semi-self-sufficiency is therefore a matter of great economic importance and one of urgency.

An examination of the Second Five Year Plan will show the great emphasis placed on padi alone; in fact, "the planned programme of the Federal and State Departments of Agriculture involves capital outlays

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[1] These figures were taken from the Official Year Book, Federation of Malaya, 1961. Page 274.

[2] Annual Report of the Board of Directors - For the year ended December 31, 1964. Bank Negara Malaysia (Central Bank of Malaysia) Laporan Tahunan dan Penyata Kira2 (Annual Report and Statement of Accounts) 1964 pg. 10.

of $20 million and additional recurrent expenditure for:

a) the development and expansion of Federal Padi and Dry Land Stations where investigation and research into double-cropping, off-season cropping and adaptation of various crops will be intensified;

b) expansion of soil survey capacity and further research into soil types and their potentials for various cropping patterns and into soil management practices to achieve increased productivity;

c) promotion of the use of improved padi seeds;

d) extension activities to foster better cultivation practices and more productive cropping patterns;

e) control of pests, insects and plant disease."[3]

The Malayan Government is therefore, committed to achieve self-sufficiency in rice. Besides the Government, this problem also has great interest for the Department of Economics, University of Malaya.

The Department of Economics has carried out various research survey projects with two main aims and they are:

i) to train its students in the methods of doing research-training them to collect, compile, analyse and present the collected data; and,

ii) to unearth, in the cause of the surveys, evidences and information which will provide some solutions to help the Government in achieving its aims.

Among the many projects undertaken by this Department was the one at Tanjong Karang, one of the rice bowls of Malaya. In this survey which is spread out over a period of five years (1962-1966) different aspects of certain sections,[4] especially Sawah Sempadan, have been studied, for example in 1964, the study was on "Land Ownerships and Control.". This year, it was decided to make a study of the "Inter and Intra-Blocks Yield Variations in Sawah Sempadan."

---

[3] Second Five Year Plan, 1961-1965, pg. 33.

[4] Sections here refer to the five padi growing areas, viz., Sawah Sempadan, Sungei Burong, Sekinchan, Sungei Leman and Sungei Pasir Panjang that made up Tanjong Karang.

The survey was carried out by a group of twelve students comprising of five Third Year and seven Second Year students from the Department of Economics, University of Malaya. This survey which was conducted within a time period of three weeks, April 15th, 1965, to May 8th, 1965, constitutes the Fourth Phase of the Tanjong Karang survey project undertaken by the Department of Economics, University of Malaya.

Objective of Study:-

The objectives of this study are to study:-

i) the average yield of padi per acre in the twelve[5] blocks of Sawah Sempadan;

ii) the Inter-Block yield variations in the twelve Blocks;

iii) the Intra-Block yield variations in the twelve Blocks;

iv) to investigate into the various factors which are responsible for the yield variations; and

v) to make some suggestions for improving the average yield and for the reduction in the inequality of padi yields in general but with emphasis on the twelve Blocks under study.

Within the framework of these five main objectives, emphasis will also be placed on double-cropping especially that which relates to the introduction of padi malinja.

Plan and Scope of Study:-

With the above objectives in view a survey was accordingly conducted by the above said twelve students from the Department of Economics, University of Malaya.

Since the survey which was conducted within three weeks (April 15th, 1965 to May 8th, 1965) does not permit a 100% coverage of the area owing to the limited time, only 5.8% of the Sawah Sempadan was covered. This 5.8% was derived from random selection. On the basis of the simple random selection, 5 lots were selected from each of the twenty-three Blocks in Sawah Sempadan. In all a total of 115 lots were selected out of a total of 1,974 lots in the Sawah Sempadan area. It was hoped that this 5.8% random selection will give us a good representation of the yield variations in Sawah Sempadan.

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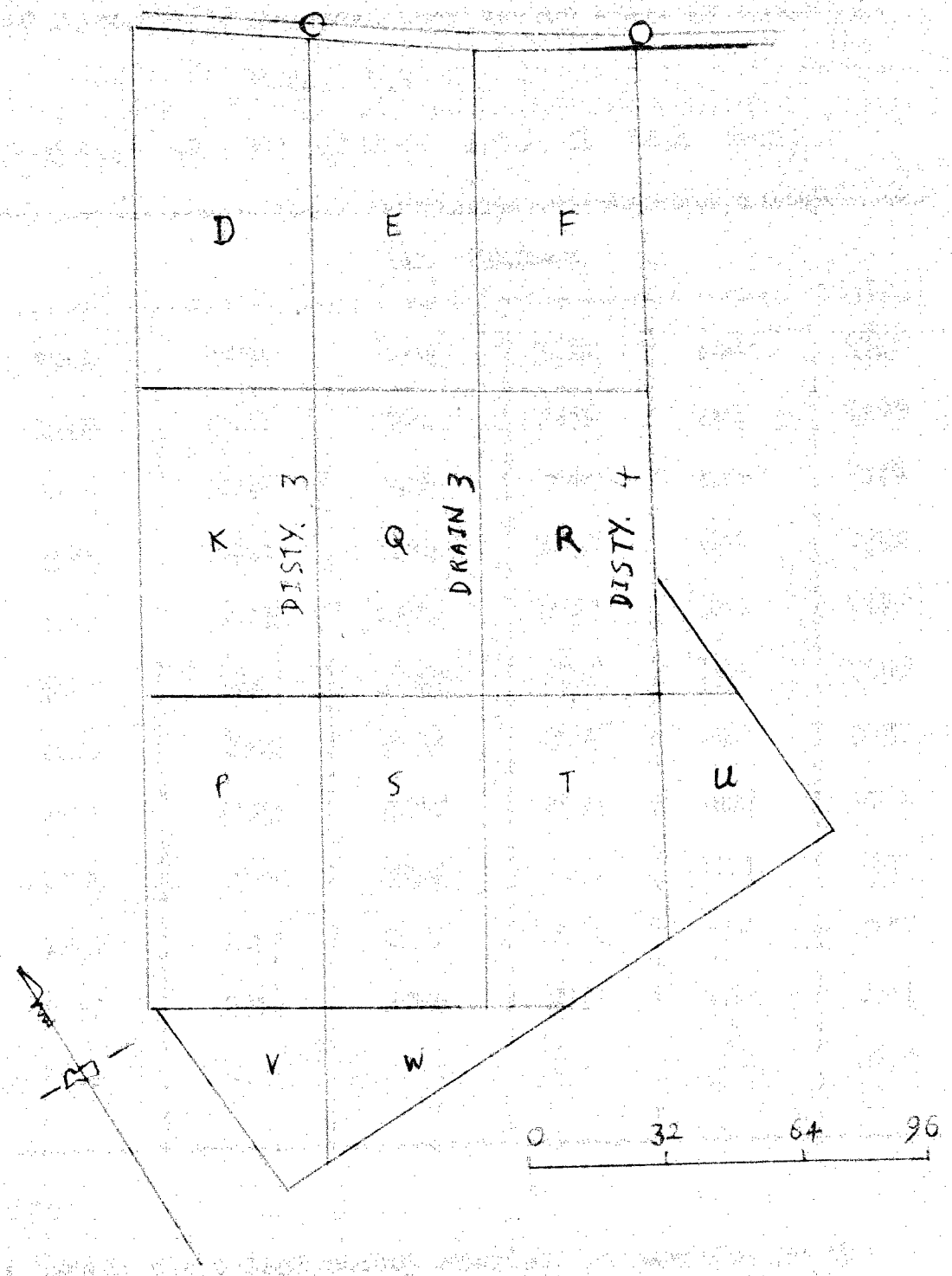
[5] These twelve Blocks, namely Blocks, D, E, F, K, Q, R, P, S, T, U, V and W were selected by the writer for her study.

The writer has selected for her study, twelve Blocks, namely Blocks, D, E, F, K, Q, R, P, S, T, U, V and W. This area is shown in Block map I:1.

BLOCK MAP 1:1

LOCATION OF BLOCKS SELECTED FOR STUDY IN SAWAH SEMPADAN



This Block Map shows the 12 Blocks under study.

The total number of lots randomly selected from these Blocks was 60 or 5.7% of the total number of lots in the 12 Blocks. In terms of the total area for the 12 Blocks, only 178.23 acres or 2.9% of Sarawak Sempadan was covered. Out of the 60 lots, information was only available for 58 lots, or 5.5% of the total number of lots in the 12 Blocks. Information for the 2 lots namely Lot No. 2456 Block E and Lot No. 2056 Block F, were not available as the land was uncultivated.

Tabulated below are the Lot Numbers of the 60 lots which were randomly selected from the 12 Blocks. They are as shown in Table 1:1

TABLE 1:1

DISTRIBUTION OF THE SAMPLED LOTS IN EACH BLOCK

Blocks	Lot Numbers					
D	3011	3039	3040	3052	and	3056
E	2518	2487	2444	2456	and	2460
F	2056	2096	2108	2097	and	2101
K	2926	2982	2896	2920	and	2992
Q	2567	2619	2544	2604	and	2612
R	2151	2211	2149	2217	and	2225
P	2845	2853	2854	2791	and	2847
S	2673	2725	2678	2731	and	2696
T	2399	2324	2392	2378	and	2398
U	2292	2254	2274	2293	and	2303
V	2761	2764	2786	2779	and	2781
W	2733	2752	2735	2743	and	2736

Methodology:-

Weeks before the actual survey started, preparation in the form of selection of the topic, selection of lots, preparation of Questionnaires, the procedure in which the survey was to be conducted etc., were carried out by the Department of Economics, University of Malaya.

The students worked in pairs, each pair (with the exception of one pair which consisted of two second-year students) consisted of one Third Year and one Second Year student. The aim behind this procedure was that the Third Year students who were already familiar with the area could familiarize the Second Year students with the area. Each pair was given four Blocks or twenty lots to study. The task of each student was to collect information for 10 lots.

Information was collected by means of Questionnaire TKFS 4/65 prepared by the Department of Economics, University of Malaya. A copy of this Questionnaire is seen in Appendix I. Although the twenty-two questions in the Schedule covered the salient features of the survey, additional information and observations were also noted down.

The study was carried out mainly in the field but visits were also made to the nearby kampongs to locate some of the operators.

In the course of the field work, briefing sessions were held almost every night for the first two weeks, the primary purposes being to explain and familiarize the students with the schedules (TKFS 4/65) and to solve any problems which cropped up in the course of the field work. Students were also given valuable advice on the correct and best procedure of interviewing by Professor Ungku A. Aziz. There is no doubt that all these were of immense value to the stuients.

The writer has selected for her field survey Blocks D and K but she also interviewed some operators in other Blocks particularly those of Blocks P and V. Besides the field work, the writer also visited the Department of Agriculture and the Drainage and Irrigation Department (D.I.D.) in Tanjong Karang as well as the Department of Agriculture (particularly the Soil Science Section) and the Information Department in Kuala Lumpur to collect further information for her study.

Terminology:-

Owing to the existence of some words which have several meanings and where only one of them is used in this study and also owing to the existence of some unique features in the padi area of Sawah Sempadan, particularly those in relation to the ownership of land, there is an urgent need in this study to be precise and accurate with regards to the terminology.

There are eight important terms that need to be considered:-

a) lot

b) farm

c) holding

d) ownership and operation

e) fragmentation

f) subdivision

g) de jure and

h) de facto

A "lot" which is synonous with "piece" is here taken to mean "one unbroken or undivided area that is defined or described in a document of ownership or title."[6] The lot may be of any size and is registered only under one title. However, for nearly every lot of land alienated in the S.S. an acre of kampong land elsewhere has also been alienated; and since they are registered under one title, it resulted in 2 lots being registered under a single title.

It is obvious, however, that such bendong-cum-kampong combination though registered under a single title, is actually made up of two separate lots, for physically, the two are divided and separate. Moreover, even the Land Office recognises the separate entity of each through its allocation of a separate lot no. See Appendix II "Approval for Application of Land (Land Rule 5)" particularly under 6 (i).

A "farm" is a unit of production based on land which has all the resources for its working and which is also a unit of management and control. A "farm" may consist of one or many pieces of land, and the pieces may be contiguous or scattered. The person who works the land is called a farmer or operator. The farmer may or may not own the land he farms.

A "holding" on the other hand, "comprises all the land owned by one person. It is a unit of ownership".[7] The pieces may or may not be contiguous and may or may not be cultivated by the owner.

From the notions of the holding and the farm it follows that a person can play two separate roles, that of owner and that of operator. "Ownership is a legal term denoting possession of a piece of land. Operation is an economic term indicating that a person is trying to produce something from the land."[8]

"Fragmentation", on the other hand, "is a technical term that describes a condition where farms that consist of several pieces of land have the pieces so scattered that the economic efficiency of the farm is lowered".[9]

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[6] Professor Ungku Aziz, Subdivision of Estates in Malaya, 1951-1960, Vol. 1 pg. 11.

[7] Ibid pg. 11.

[8] Ibid, pg. 12.

[9] Ibid, pg. 13.

The difference between de jure and de facto is this: De Jure situation means the situation as it exists legally in the document and treatment of the Land Office while a de facto situation denotes a situation as it exists practically on the ground.

Further specific definitions of certain words will be given at the beginning of each Chapter to remove any ambiguity as to the usage of the words.

PHOTOGRAPH I

WEIGHING PADI

This Photograph shows how padi was weighed during the survey. Here the padi was put into tin for weighing

CHAPTER II

GENERAL CHARACTERISTICS OF THE SAWAH SEMPADAN AREA

Location and Historical Background

Sawah Sempadan, a rice growing area is situated about 50 miles North-West of Kuala Lumpur and about two miles to the North-East of the town of Tanjong Karang in the District of Kuala Selangor. Together with the other four padi growing areas, namely Sungei Burong, Sekinchan, Sungei Leman and Sungei Pasir Panjang, it constitutes the Tanjong Karang Project, one of the big projects undertaken by the Malayan Government to convert vast areas of virgin jungles and swamps into productive agricultural land.

Originally a part of the huge Tanjong Karang and Tengi swamps which together cover an area of 530 square miles, Sawah Sempadan was developed in the 1920's as part of the Tanjong Karang Project.

In 1953, the Drainage and Irrigation Department carried out survey with a view to convert the large Tanjong Karang swamp into a rice-growing area. The investigations revealed that with the exception of a belt 2 to 4 miles wide, parallel to the coast, the area was over-laid with peat and decaying organic material to a considerable depth over 20 feet in many places. However, a scheme, henceforth known as the Tanjong Karang Drainage Irrigation Scheme was designed to develop the coastal belt 2 to 4 miles long, comprising of a Headwork on the Sungei Tengi, a main canal 2½ miles long running south to irrigate Sawah Sempadan, another main canal 17 miles long running north to the Panchang Bedina area, many miles of internal drains and distributaries and a perimeter bund with control gates along the western boundary of the padi area to separate the padi area from the kampong area and to hold water in the padi area. The Headworks was completed in 1956. Finally the official opening of the Bernam River Headworks in April, 1965, marks the completion of the final phase of the $17.5 million Tanjong Karang Irrigation Scheme which now provides a total of 50,000 acres under padi with water. In terms of new area brought under padi cultivation through the provision of irrigation facilities by the Government, the Tanjong Karang project is the largest irrigation scheme in Malaya.

Colonisation, Settlement and Administration

Along with the project work, went colonisation, settlement and administration. Long before the formation of an Advisory Committee formed before the 1939-1945 War, Javanese and Sumatran settlers had begun clearing the virgin jungles and settling there but then development

was very haphazard. But with the establishment of the above mentioned Committee, development begun to take shape and progress was comparatively rapid. The settlement of Tanjong Karang came under the supervision of a Colonisation Officer who worked under the guidance of the District Officer. In the alienation of land, one lot usually 3 acres of padi land and one acre of kampong land were then allotted to each settler on a free T.O.L. (Temporary Occupation Licence).

Layout

a) Blocks

Sawah Sempadan often abbreviated as S.S. has a total area of approximately 6,100 acres. Irrigated by a network of distributaries laid out alternately with drains, the whole area is systematically partitioned by these irrigation canals and drains into twenty-three Blocks which in some cases are of unequal size. Along each of the drains and distributaries run a road, some of which are of the laterite type. Horizontally, each Block is separated from one another by a road.

Each Block is designated with a capital letter of the Roman alphabet and they run from A to W. Proceeding from the main canal downwards, the Blocks can be classified into four rows and the arrangement is as follows:-

Row 1 consisting of Blocks, A, B, C, D, E and F
Row 2 consisting of Blocks, G, H, I, J, K, Q and R
Row 3 consisting of Blocks, L, M, N, O, P, S, T and U
Row 4 consisting of Blocks, V and W
Map 2:1 will illustrate the layout of Sawah Sempadan by Blocks.

b) Size of Lots

Each Block is divided into several lots. With the exception of 9 Blocks which consist of 104 lots each, there are great variations in the number of lots in each Block. On the basis of lots per Block therefore, there will be variations in the size of the Blocks as seen in Block Map 2:1.

The distribution of padi lots by area is shown in Table 2:1. It will be observed in Table 2:1 that at least 80 per cent of lots in each row fall between 2 and 4 acres. The area of each lot varies within the range of .91 of an acre (Lot No. 2786 Block V) and 5.037 acres (Lot No. 2896 Block K). This can be seen in Appendix III.

Table 2:2 shows the total and average acreage of the lots by rows. The 60 lots have an acreage of 178.23 acres. Taking the 4 rows together, the average area of a lot is 2.97 acres which is roughly or approximately 3.0 acres in size. Three acres per lot, can therefore be accepted as the normal size of a padi lot in the enumerated Blocks.

BLOCK MAP 2:1

LAYOUT OF SAWAH SEMPADAN BY BLOCKS

[illegible]ENT OF ECONOMICS. SEPTEMBER 1962.

SAWAH SEMPADAN

(6,100 ACRES)

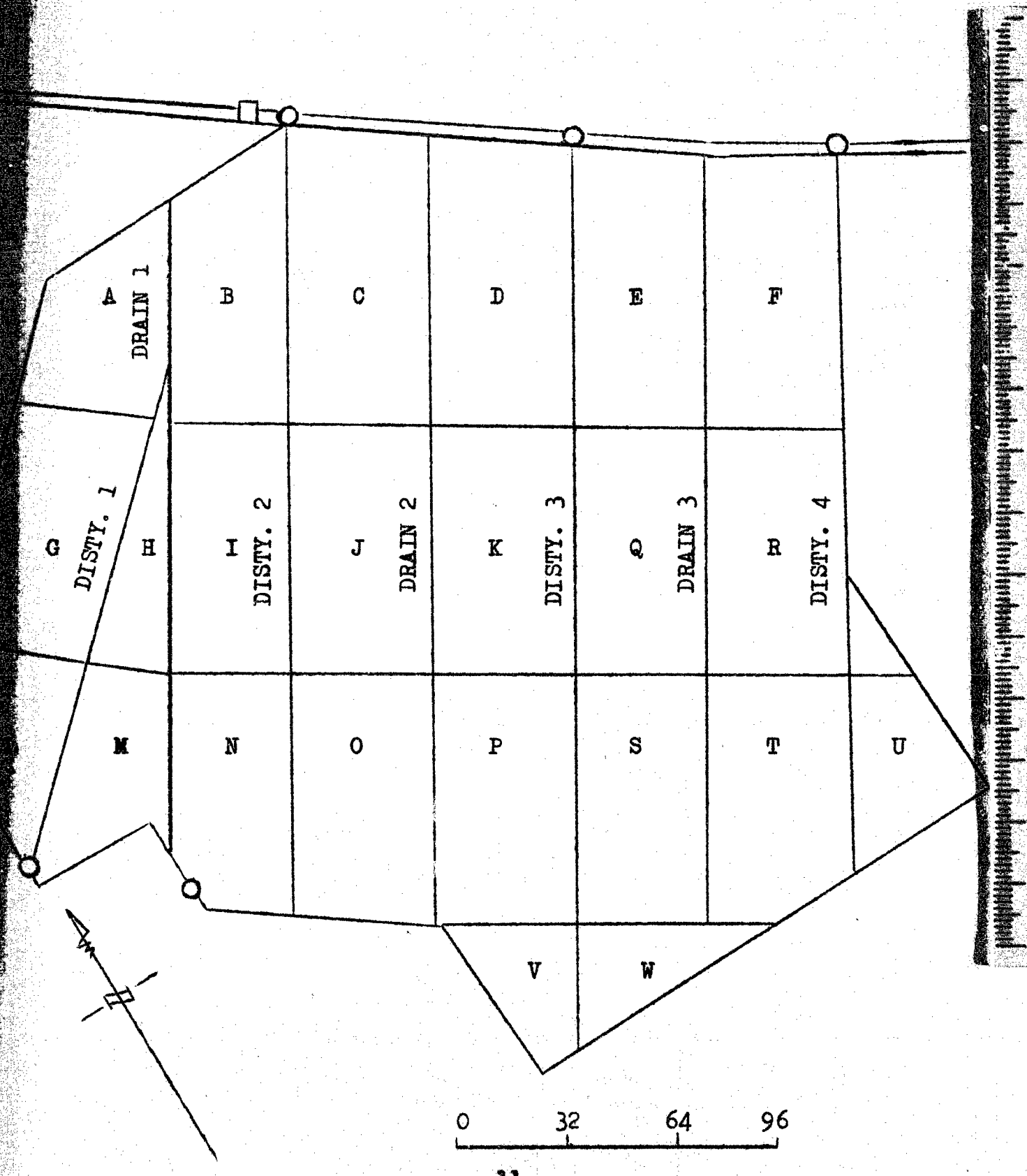

TABLE 2:1

DISTRIBUTION OF PADI LOTS BY AREA*

Area (Acres)	Total No. of Lots	Frequency of Lots							
		Row 1		Row 2		Row 3		Row 4	
		Absolute No. of Lots	% of Row Total	Absolute No. of Lots	% of Row Total	Absolute No. of Lots	% of Row Total	Absolute No. of Lots	% of Row Total
Less than 1	1	-	-	-	-	-	-	1	10.0
1 and less than 2	2	-	-	-	-	2	10.0	-	-
2 and less than 3	32	8	53.3	6	40.0	12	60.0	6	60.0
3 and less than 4	23	7	46.7	8	53.3	5	25.0	3	30.0
4 and less than 5	1	-	-	-	-	1	5.0	-	-
5 and less than 6	1	-	-	1	6.6	-	-	-	-
Total	60	15	100.0	15	99.9	20	100.0	10	100.0

TABLE 2:2

TOTAL ACREAGE OF THE LOTS BY ROWS

Row	Total No. of Lots	Total Acreage of Lots	Average Area per Lot (Acres)	Average Area Per Lot - to 1 decimal Place
1	15	44.81	2.99	3.0
2	15	46.97	3.13	3.1
3	20	58.21	2.91	2.9
4	10	28.24	2.82	2.8
	60	178.23	2.97	3.0

*The Table is calculated only for Lots under this study. This will be maintained for all subsequent Tables.

Subdivision and Fragmentation

Subdivision and Fragmentation hold a very important place in the padi area of Sawah Sempadan. These were in fact, the essence for the peculiar nature of land ownership, land control, and operation in Sawah Sempadan.

In the original alienation of land to the landless farmers, it was clearly expressed in condition 1 of the Approval for Application of Land that "The land hereby alienated shall not be subdivided provided in Section 50 or Section 121 of the Land Code nor shall Lot No. .....(Bendang) be held by separate Entry in the Mukim Register from Lot No. ..... (Kampong)"[1] but then as time passes, some owners out of necessity, or through inheritance, divided the original lot given to them into two or more sub-parts. These sub-parts are henceforth known as sub-lots. Thus if a lot was divided into two parts, irrespective of the acreage of each part, then the original lot, now constitute two sub-lots. These "sub-lots", as contrasted with the "lot" do not have a legal title for with reference to Expressed Condition 4 of the Approval of Application for land which states "The land hereby alienated shall not be transferred or leased unless such transfer or lease is to a single individual person who relates to the whole or both Lot No. (.....) and Lot No. ....."[2] it is clear then only the name of one person can be registered as the owner of the lot.

The Government therefore does not recognise the owners or co-owners or joint-owners as they are called, of the sub-divided lots which (subdivision) may have sprung from the process or inheritance, sale or gift, the latter, representing a situation where an owner may make a gift of part or even at times, the whole of the lot to a relative(s) or friend(s), usually very close relative(s) or friend(s). The first two are more common while the latter is very rare for in fact, only one such case of giftee subdivision was reported.

The fact that the Government does not recognise subdivision as such has lead many people to call such a situation as "concealed" subdivision. It is concealed in the sense that the Government does not know about it. Nevertheless both terms whether concealed subdivision or subdivision can be used, for they mean the same thing.

We now proceed to analyse the extent of subdivision in the surveyed lots. The extent of subdivision among the lots is shown in Table 2:3.

Table 2:3 shows the extent and degree of subdivision within the surveyed lots. It will be observed that out of a total of 58 lots, 13 lots or 22.4% of the total underwent the process of subdivision while 45 lots or 77.6% of the total did not undergo such a process. Out of

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[1] See Appendix II - Approval for the Application of Land.

[2] Ibid. Appendix II

TABLE 2:3

EXTENT AND DEGREE OF SUBDIVISION

Land Ownership	Lots and/or Sub-lots							
	No.(s) of Lots/	Percentage of Total	Divided into 2 sub-lots		Divided into 3 sub-lots		Divided into 4 sub-lots	
			No.(s) of Lots	No.(s) of sub-lots	No.(s) of Lots	No.(s) of sub-lots	No.(s) of Lots	No.(s) of sub-lots
Subdivision	13	22.4	10	20	1	3	2	8
No sub-division	45	77.6	-	-	-	-	-	-
Total	58	100.0	10	20	1	3	2	8

the 13 lots which were subject to the process of subdivision, there were 2 lots where each was subdivided into 4 sub-lots.This represents what might be called extreme cases of subdivision, extreme in the sense that a lot was divided into three or more sub-lots.

Subdivision brings with it a host of characteristic problems and it was one of the main factors responsible for the peculiar nature of landownership, control and operation in Sawah Sempadan. Subdivision and its resultant characteristics tend to promote economic inefficiency, which manifests itself mainly in the form of lower yield. It results in economic inefficiency because the area of the subdivided lots is often too small for a farmer to operate efficiently. This is particularly true in view of the fact that most of the lots are on an average only 3 acres in size. Although the most economic size of a farm has not yet been established in Malaya, this 3 acre padi lot together with one acre kampong land was an attempt towards the establishment of an economic size of a padi farm. If this is so, then clearly the subdivision of the lot, has a very significant implication in that 22.4% of the lots are operated at a size which is not most economic to do so (this is on the assumption that the farmers do not operate other lots or sub-lots).

Fragmentation

The discussion of subdivision automatically brings in also the discussion of fragmentation, for both of them form the twin pillow that are in the main responsible for the peculiar nature of Landownership, Control and Operation in Sawah Sempadan as a whole.

Strictly speaking, the term "fragmentation" refers to a situation which arises as a result of a holding or a farm being made up of

more than one lot or sub-lots and that these lots and/or sub-lots are so scattered in location that the economic efficiency of the holding or farm is reduced.

Fragmentation may be effected through sale, inheritance or gift, and the transfer may be by lots intact or by sub-lots. If the transfer is made to someone who already holds the land in the area, it leads to fragmentation of his holdings; and if he operates his fragmented holding himself, or "ask" someone to operate it wholly, a fragmented farm ultimately emerges. Thus fragmentation is of two types, i) fragmentation of a holding ii) fragmentation of a farm.

It is difficult to determine the extent and degree of fragmentation in this study on the basis of the available information but on such basis two tables can be drawn to show as far as possible the extent of fragmentation of farms and fragmentation of holdings respectively. But as this juncture it must be noted that in the case of fragmentation of farms only padi lots and/or sub-padi-lots are taken into consideration. Hence, provision has to be made for lots and/or sub-lots of coconut or other crop land outside the Sawah Sempadan which the operater may own and/or operate

TABLE 2:4

FRAGMENTATION OF FARMS BY LOTS AND SUB-LOTS

Types of Lot(s) and/or Sub-lots Operates	Total No. of Operators	Total No. of Lots and/or sub-lots operated	No. of Lots and/or sub-lots in the survey area	No. of Lots and/or sub-lots outside survey area but within Sawah Sempadan
One Lot Operators	56	56	56	-
Two Lots and/or Sub-Lots Operators	19	38	19	19
Three Lots and/or Sub-lots Operators	4	12	4	8
Total	79	106	79	27

This Table shows that there are 79 operaters altogether and between them they operate 106 lots and/or sub-lots, of which 79 lots and/or sub-lots were in the survey area itself while 27 lots and/or sub-lots were outside the survey lots. The latter may or may not be within the same Block but they fall within the Sawah Sempadan area. Then there are 4 operators who each operate 3 lots and/or sub-lots. Between them they operate 12 lots and/or sub-lots altogether and

out of these 12 lots and/or sub lots, 4 of the lots and/or sub-lots are within the survey lots and 8 of the lots and/or sub-lots are outside the survey lots.

From the analysis of Table 2:4 then, it can be said that fragmentation of farms are mainly of the "two lots and/or sub-lots operators" type.

Analogous to the fragmentation of farms is the fragmentation of holdings in respect of ownership.

A "holding" as defined in Chapter I is a unit of ownership. It comprises all the land (lots and/or sub-lots) owned by one person. At this juncture it must be pointed out that, as in the case of fragmentation of farm sg in the case of fragmentation of holding only the padi lots and/or sub-padi-lots within Sawah Sempadan are taken into consideration. Provision therefore has also to be made for the fact that an owner may also own other land such as the coconut land outside Sawah Sempadan.

TABLE 2:5

FRAGMENTATION OF HOLDINGS BY LOTS AND/OR SUB-LOTS

Type of lots and/or sub-lots owners of Holdings	Total No. of owners	Total No. of Lots and/or sub-lots owned	No. of Lots and/or sub-lots in the survey area	No. of Lots and/or sub-lots outside the survey area but within Sawah Sempadan
*One Lot and/or Sub Lot Owners	58	58	58	-
Two Lots and/or Sub Lots Owners	18	36	18	18
Three Lots and/or Sub Lots Owners	4	12	4	8
Total	70	106	70	26

*Strictly speaking, this category does not fall under the terminology "fragmentation" according to the meaning of the term. But nevertheless it was included here to show the extent of the prevalence of a 1 lot or sub-lot holdings.

The above Table shows that a total of 106 lots and/or sub-lots constitute the holdings of 70 owners. Of the 70 owners, 58 of them have holdings consisting of one lot and/or sub-lot each, while 18 owners have holdings made up of 2 padi-lots and/or sub/lots each, and together these 18 owners have 36 lots or sub-lots, out of which 18 lots and/or sub-lots were distributed within survey lots themselves and 18 lots and/or sub-lots outside the survey lots but within Sawah Sempadan.

Then there were 4 owners each of whom has a holding made up of 3 lots and/or sub lots. These holdings constitute 12 lots and/or sub-lots; out of these 4 lots and/or sub-lots are within the survey area while 8 lots and/or sub-lots are outside the survey area.

As was the case in the fragmentation of farms, the lots and/or sub-lots of the owners are in most cases, quite far from the sampled lots. Very rarely are they located close to these lots, even though they may fall within the same Block.

Fragmentation whether of holdings or farms spell inefficiency in the ownership and operation of land. This inefficiency will lead to low productivity, with poverty as the ultimate result.

Size of Household

In Sawah Sempadan, the bulk of the population falls into two major 4thnic groups, namely the Malays and the Javanese. A survey carried out by a group of students from the Department of Economics, University of Malaya in 1962, revealed that out of a total population of 5,819 at that time, 2,798 were Malays, while 3,111 belonged to the category of "Others". The latter comprises mainly of Javanese, though there were a sprinkle here and there of Menangkabaus, Banjarese and Buginese.

The term "household" as used in this study has a much wider meaning than the word "family". A family only takes into consideration the married couple and their children, if any. The term "household" on the other hand, comprises of a group of people living together in the same house and sharing a common house-keeping budget. If a few relatives or friends stay with the farmer and they contribute towards the general house-keeping with regards to food and other basic necessities then they are part of that household.

Based on the data collected in the 1962 survey the following Table was derived.

Table 2:6 indicates that there is quite a great deal of variations in; i) the number of households and ii) the average size of the households in the Blocks. As far as the variation in the number of households by Blocks is concerned it will be seen that it varies from as high as 34 households per Block (Block Q and S to as low as no household in a Block (Block V)). In terms of the total number of households in the whole of S.S. these two blocks (Q and S) contain 6.84% each.

TABLE 2:6

*DISTRIBUTION OF MALAY HOUSEHOLDS AND AVERAGE SIZE OF THE HOUSEHOLDS FOR THE FOLLOWING BLOCKS

Row		Number of Household	Number of Persons	Average Size of Household
1				
Blocks	D	25	135	5.4
	E	26	156	5.5
	F	8	38	5.0
Row Total		59	329	5.6
2				
Blocks	K	22	161	7.3
	Q	34	223	5.9
	R	21	138	6.7
Row Total		77	522	6.8
3				
Blocks	P	28	189	6.8
	S	34	210	5.7
	T	18	84	4.6
	U	7	38	5.4
Row Total		87	521	6.0
4				
Blocks	V	0	0	0
	W	3	13	4.4
Row Total		3	13	4.4
Total		226	1,385	6.1

*The above Table is an extract from Table 3:2 of the below mentioned source. Source:- "Distribution of Malay Households and Average Size of the Households for the Individual Blocks". Pg. 25 Tanjong Karang Survey - Phase II. Socio-economic Survey of Sawah Sempadan. A study of Malay Population of Blocks A-W by Sheikh Othman b. Sheikh Salim.

Though there are great variations in terms of number of households, there is not much variation in the average size of a household whether by Blocks or Rows. A comparison in terms of average household size of the 4 rows will reveal that the average household size of the area is 6.1, that is to say, the average household consist of 6 persons. Normally a lot will contain one household except may be in the case of sub-divided lots, where two households may appear on one lot. On the other hand, there are some lots where the family does not stay on the lot itself, but in one of the nearby kampongs like Kampong Batu Tiga, Kampong Hujong Permatang etc., or on another lot which may be in the same Block or in another Block.

Drainage and Irrigation

The whole of Sawah Sempadan is an elaborated network of irrigation canals. This area is irrigated by four distributaries and drained off by three drains. Controlling the distributaries and drains is one headwork situated at the entrance to Sawah Sempadan and three offtakes. The headwork together with the offtakes are situated along the main canal which is supplied with water by the Catchment Area.

From the main canal flows the distributaries and together with drains they form the main drainage and irrigation system of the Sawah Sempadan.

During irrigation period, three offtakes will be opened thus allowing water . the distributaries. By closing the Control Drops which resemble well-like structures as shown in Photograph 2 and which are situated midway in each distributary, water will go up to the required level and from there enter the fields through offtake pipes which lead into the fields and which are laid at an interval of 10 chains. The water will also go along the crossbunds and these will act as distributaries and from the crossbund distributaries there are also offtake pipes which will lead the water into the fields. At the same time, water in the chain will be maintained so as to check percolation.

During the irrigation period the water in the fields will be 4" to 6" and will remain there for four to five months but the height of the water varies with the stages of growth. Initially, at a level of 4" to 6" the water is slowly allowed to go off until 3" to 4" as the flowering period approaches, and as the padi nears harvesting, the water will only be maintained at 1" to 2". Finally it is drained off when harvesting time commences.

The water is drained off by means of the drains and these are controlled by two Drainage Gates which are situated at Block S and Block V. During the draining off process, the Drainage Gates are opened and the water flows into Sungei Tengi and off to the sea.

The Sawah Sempadan Irrigation and Drainage Scheme is indeed a very efficient one upon which much of the success of Sawah Sempadan as a whole depends.

PHOTOGRAPH 2

The photograph above shows two Control Drops. It will be seen from the above Photograph that these Control Drops resemble a well-like structure.

Economic Activities and Life of the People

As Sawah Sempadan is a padi growing area, it is only normal to find that, all, with the exception of a few teachers and/or shopkeepers, are padi farmers. These farmers are somewhat "self-sufficient" in that they grow their own padi and use it for local consumption, though the surplus is sold either to the Co-operatives or to local traders. Whatever income they derive from its sale, they use it to buy clothings and other basic necessities. The farmers also grow other types of crops such as vegetables, different types of fruits, maize, sweet potatoes, etc. to substantiate their meagre income.

The life of the farmer, is therefore, a hard one. For them life is more or less a routine work.

Besides padi cultivation, and the cultivation of other miscellaneous crops to substantiate their income from padi, the farmers also engage in canal fishing. These can be done by any member of the family. In this activity 4 main methods are used and two of them are shown in Photographs 3 and 4.

Hard and simple though their lives are, these farmers do lead a varied and happy life. Social functions in the form of marriages, celebrations and other festivals such as Hari Raya, are times of joy and gaiety. Besides, the Monday Market at Tanjong Karang is also a place of attraction.

PHOTOGRAPH 3

CANAL FISHING - NET CASTING

This Photograph shows a farmer engaged in canal fishing. The method used here is that of net casting.

PHOTOGRAPH 4

CANAL FISHING - FISH TRAP

This Photograph shows another method of fishing by means of laying fish traps across the canal.

CHAPTER III

SYSTEMS OF OWNERSHIP AND OPERATION AND OTHER FACTORS RESPONSIBLE FOR YIELD VARIATIONS

Agriculture: Unique Industry

Agriculture is an important part of nature and as such it is only to be expected that it's dependence on climatic and other biological factors is very great. It is very dependent upon the climate, the soil, the water supply, etc., and the resultant yield is not only affected by the influence or interaction of the above, but also by such thing as diseases, pests, and many cultural practices. The former together constitutes what are called exogenous factors for which the farmer has no control.

Owing to the interaction of two or more of these exogenous factors, particularly those of a biological nature, the input-output ratio is never fixed. The term, technical uncertainty, is often used to denote this variability and uncertainty. This technical uncertainty means that the yield of any crop is not fixed, in other words, it varies from place to place and from time to time. Thus the same yield will not be obtained from two areas of equal size, equal fertility, equal amount of seeds sown (and of the same variety of seeds) and equal amount of labour spent on them.

This Chapter proposes to study the various main factors responsible for yield variations under two main headings:

i) Systems of Ownership and Operation with more emphasis on land tenure and

ii) Other factors responsible for Yield Variations namely,

a) Soil,

b) Use of fertilizer,

c) Water conditions/supply,

d) Cultural practices with regard to the period/dates of sowing, transplanting and harvesting and also the methods of harvesting,

e) Crop rotation with regard to the cultivation of maize or other crops or leaving the land fallow,

f) Varieties of mii cultivated,

g) Pests and diseases, and

h) Remedial actions taken against pests and diseases.

The first one, that is, the systems of ownership and operation will be studied in greater detail while the second one labelled as "Other Factors" will be studied in lesser detail as they will be analysed in great detail in Chapters IV and V in conjunction with the analysis of Inter and Intra-Block Yield Variations respectively.

Systems of Ownership and Operation

Broadly classified, the different systems of ownership and operation, fall into four main categories:

i) Single owner and operator

ii) Multiple or Joint Owner and Operators,

iii) Family Relationship and

iv) Tenant Operator(s)

i) Single Owner and Operator

In this system, the farmer not only owns the padi lot but he also operates it himself. On the whole it was observed that this was the most prominent among the four systems practised in the area. This is illustrated in Table 3:1

From Table 3:1 it will be seen that 26 lots or 44.8% out of the 58 lots fall in this category of single owner-operator.

The predominance of single owner-operators is attributed mainly to two reasons. In the first place there is in Agriculture the peculiar nature where the padi farmers usually stay on the lot itself. In other words, there is what is called the integration of home and business, while in the second place, the size of the lot is on the average only 3 acres, and if more than two (or even one operator) operators work on it, there is a concealed state of disguised unemployment. A lot of about 3 acres can only be worked more economically on the single owner-operator basis. Single owner-operator does not mean that only the owner and no one in his family or whom he hires can work on the land. What it really means here is that only one family can work more economically on an average size lot of 3 acres.

Owing to the more economical operation as explained above, and also to the deeper interest shown by owner operators on their land, it will be seen from the same Table that this system of ownership and operation on the whole gives a higher yield compared to the other systems as shown in the Table. This system gives an average yield of 248 gantangs per acre as compared to 244 gantangs per acre, 219 gantangs per acre, and 175 gantangs per acre, for the multiple/joint owner-operators,

family relationship and tenant operators systems of operation respectively. Thus the comparatively higher yield per acre obtained under the single owner-operator system of operation confirms, therefore, the statement that owner operators, especially single owner-operator, are inclined to pay more attention to the efficient management of the land.

TABLE 5:1

DISTRIBUTION OF LOTS UNDER DIFFERENT SYSTEMS OF OWNERSHIP AND OPERATION AND THE RESULTANT YIELDS

Systems of Operation	No. of Lots	Percentage of Total No. of Lots	Average Yield (Per Acre) (Gantangs)
Single Owner-Operator	26	44.8	248
Multiple/Joint Owner-Operators	14	24.1	244
Family Relationship	8	13.8	219
Tenant Operators	10	17.2	175
Total	58	99.9	222

ii) Multiple/Joint Owner-Operators

In the original alienation of land, a farmer is given one lot of padi land (about 3 acres in size) and one lot (about 1 acre in size) of coconut land, the latter in one of the nearby kampongs. Initially the lots were issued to the farmers on the Approved Application basis (A.A. that is Approval for Application of Land) but later they could be obtained on the T.O.L basis (that is, Temporary Occupation Licence). Some have obtained E.M.R. (that is, Entry into Mukim Register).

The farmers who were given the land are supposed to follow six conditions as laid out in the Approval of Application for Land * (Land Rule 5).

According to expressed condition 1, 4, and 6 in the Approval of Application for Land which state "The Land hereby alienated shall not be subdivided as provided in Section 50 or Section 101 of the Land Code nor shall Lot No. .... (Bendong) be held by a separate entry in the Mukim Register from Lot No. ....(Kampong)".

* See Appendix II.

"The land hereby alienated shall not be transferred or leased unless such transfer or lease is to a single individual person and relates to the whole of both Lot No. ..... and Lot No. ....."

"The land hereby alienated shall not be transferred or charged or leased without the written consent of the Ruler in Council" respectively, no land can have more than one owner or leased out but then de facto, it was found that in some cases the lot was subdivided or leased out as discussed in Chapter II.

Owing to subdivision of the land which may be due to one or a combination of the following, like

i) inheritance,

ii) purchase of land by two or more buyers from the original owner(s) and

iii) purchase of part of the lot from the original owner, multiple or joint ownership results. Such owners cannot legally have their names registered because de jure only one person's name can appear in the Land Record. Consequently this gives rise to concealed de facto ownership. This is because the Government forbids any subdivision of land and that means, no co-ownership is allowed. Such types of sub-division are usually based on the mutual agreement and trust between the parties concerned.

From Table 3:1 it was found that 14 lots out of 58 lots are involved in this type of sub-division of land ownership. The 14 lots constitute 24:1% of the total number of lots.

In all these cases the co or joint-owners operate the land themselves, with each of the co/joint owners operating their particular portion, with no sharing in the labour or expenses except for water and land rates which they shared equally.

From the point of view of economic efficiency such multiple/joint ownership and operation have undesirable effects on the whole. Such undesirable effects spring mainly from the fact, that each area is too small for the farmers to operate efficiently. Consequently they give a lower yield per acre compared to that of single owner operator(s). The former gives an average yield of 244 gantangs per acre as seen in Table 3:1.

iii) Family Relationship and Co-operation

Family relationship type of operation arises from two main sources:

i) where the owner "gives" the whole lot to one or more of his/her children to operate and he/she (owner)

may or may not operate the land at all. In such cases usually the owners do not charge rent of any kind and normally the owners pay for the land and water rates as well. This is because of family tie.

ii) where the owner may allow his/her son(s)/ daughter(s) to operate a demarcated share of the lot.

These two types irrespective of the size of the lot are classified under "Family Relationship". In addition this classification would also take into consideration the relative(s) and friend(s)' types of relationship. Such a consideration is adopted because of the very rare (except in the case of Lot No. 2845 Block P where the owner allows her son-in-law to operate the land) occurence of the latter.

Under this heading also it is proposed to discuss that state of affairs known as "Co-operation".

Analogous to the situation of co-ownership in respect of ownership, is the situation of "Co-operation" in respect of operation of a padi lot, or in some cases, in respect of a farm. The situation of Co-operation in farming arises when two or more operators operate a lot each having his/her demarcated share of the lot.

Co-operation has arisen out of either one of the following situations:

i) where the owner may decide to give a certain portion of the lot usually as a gift, to one or more of his/her children, for example, in the case of Lot No. 2487 in Block E where the owner gives about 1½ acres to his son to operate and the son gets all the produce from this 1½ acres without having to pay for even the water or land rates.

ii) it may arise out of the fact that some co-owners are landless in respect of the land other than their sub-lots. Co-operating these sub-lots is thus perhaps the only source of employment open to them and perhaps the only source of income.

iii) it may arise from the tenancy system and this is a tenancy of two types; the first of which is where the the owner rents out part of the land and operates the other half or part himself as in the case of Lot No. 2274 in Block U and the second of which is where the owner may rent out to two or more separate tenants, for example, in Lot No. 2725 in Block S, where the owner Haji Mahfood Bin Haji Ali rents out 2 acres to Kasan bin Haji Ali and about 1 acre to Abu bin Senun.

The tenant system of operation will now be discussed in greater detail.

Land Tenure: The Tenant System and Effects on Yield

This topic on land tenure and variability in yield will be discussed under two main headings:

a) Land Tenure - its definition, systems/forms of tenant operation on the basis of number of tenants in a lot and the systems/kinds of rent payment;

b) Effects of land tenure on Yield

a) Land Tenure: Definition

Land tenure systems are indeed very complex and the problems associated with it have invaded into the fields of Agricultural Economics, Sociology, Political Science, Law, Psychology and Ethnology.

What is land tenure? Land tenure denotes or specifies the relationship between the operator and the land. The operator can be the owner or the tenant but in this case the operator is the tenant (hence Land Tenancy) and he has to make a payment, either in kind or cash to the owner for the use of the land for a specified period of time. This payment is called rent and it will be discussed later. The tenant can either be a leasehold or a share tenant.

In the surveyed area, the first one is the most common and it can be divided into those who pay in cash and those who pay in kind.

From Table 3:1 it will be observed that only 10 lots out of 58 lots were under the tenant system of operation. When this was compared to the single owner-operator system, there is a marked difference of 16 lots. The main conclusion to be drawn from this is that the tenant system of operation does not seem to be so popular in the area.

The most probable reason that can be forwarded for such a pattern is the fact that the farmers as a whole, (with the exception of a few who may have lots elsewhere or who may be in other occupations) look upon their padi lots as their only source of income. Consequently, they cannot afford to rent out their padi lots.

The observation that the lots which were rented out (with the exception of two lots, Lot No.2274 in Block U and Lot No. 2733 in Block

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The observations that the lots which were rented out (with the exception of two lots, Lot No.2274 in Block U and Lot No. 2733 in Block W where

the owners rent out 1½ acres each and work the other 1½ acres each themselves) were lots where the owners stay elsewhere, either in one of the Blocks or in one of the nearby kampongs, serve to reinforce the notion that farmers do not rent out their padi lots, particularly true of those who stay on the lot itself.

The tenant system of operation can be studied under two different aspects and they are

i) the number of tenants in each lot and

ii) the systems of payment.

Number of Tenant (s) in each Lot

In the course of the survey, it was found out that there are three main forms of tenant operation. The lot can be rented out to one tenant operator or to two or more tenant operators. In the single or one tenant operator system, only one tenant operates the rented lot. The tenant operator can pay his rent either in cash or in kind. Under the two tenant operators system of operation, the lot is rented out to two tenants who operate their own demarcated portion. In the three tenant operators system of operation, the lots have been "divided" and rented out to three tenants where each of them operate their own demarcated rented portion.

The distribution of the three forms of tenant operation can be seen in Table 3:2

TABLE 3:2

DISTRIBUTION OF LOTS UNDER THE VARIOUS FORMS OF TENANT OPERATION

Forms of Tenant Operation	No. of Lots	Percentage of Total No. of Lots
Single Tenant Operators	3	30.0
Two Tenant Operators	6	60.0
Three Tenant Operators	1	10.0
Total	10	100.0

It is seen from Table 3:2 that there are only 10 lots under the tenant system of operation. Out of the 10 lots 3 lots which constitute 30% of the total number of lots are under the single tenant operators, 6 lots which constitute 60% of the total under the two tenant operaters and only 1 lot which constitutes 10% under the three tenant operators forms of operation.

The two tenant operators system seems to be the most common practice. In all the 6 lots, each tenant operator rents ½ the lots, usually 1½acres and in most cases, the tenants pay different rents in terms of cash payment.

Different Systems of Rent Payment

Regardless of whether the tenant is the sole tenant or one of the two or three tenants, he still has to pay a rent and rent is defined as "all payments made in cash, kind or labour services in return for the use of the land for the cultivation of padi".[1]

According to the definition, rent then can take either one or both of the three forms.

Strictly speaking there are three forms of rent payment in the sampled lots:

i) Cash rent usually paid in advance

ii) Bagi Dua - payable after harvest and usually in kind

iii) Service Rent - where the farmer operates on the owner's lot and in return receives for his/her labour say one bunch or gemal of padi out of every ten bunches he harvested.

Cash Rent

This type of rent is usually paid in advance. There are four cases of this type of rent. This is seen in Table 3:3.

From this Table it was observed that in the first 3 lots, the padi lots were rented out on the two tenant operators system of operation and in each case the lot was divided equally into two parts. But in Lot No. 2303 in Block U, the lot is very small, only 1.57 acres and so it was rented out to one tenant only.

[1] T.B. Wilson, The Economics of Padi Production in North Malaya, Part 1 Ch. 3, pg. 20.

TABLE 3:3

CASH RENT IN ADVANCE

Block	Lot Nos.	Owners	Tenants	Approximate Acreage Rented (Acres)	Rent Charged
B	3056	Adnan bin Japri	1) Tasarip bin Kasidi	1½	$35.00
			2) Abdul Rahman bin Saburi	1½	$40.00
F	2101	Khussain bin Tasman	1) Sarnam bin Jubiro	1½	$15.00
			2) Bakri bin Satiman	1½	$25.00
K	2992	Ibrahim bin Jamaluddin	1) Lebai Kassim bin Mohamed	1½	$50.00
			2) Karim bin Noor	1½	$50.00
U	2303	Abu Bakar bin Hussain	Hj. Yuseff bin Mat Sulaiman	1.57	$100.00

Although the area rented by each of the tenant operators in the first 3 lots were of equal size, yet the rent they paid (with the exception of Lot No. 2992 Block K where each of the tenants pay equal amount of rent, i.e. $50 each) were not the same. The difference in the amount of rent within the same lot can be attributed to any of the reasons such as closer family or friend ties, financial difficulties or even the fact that owners stay too far away.

It was observed from Table 3:3 that the rent paid varies between $15 to $100. Looking at it closely, it will be found that low rents are charged for those lots within Row 1 as shown in Block Map 1:1 where the land is comparatively less fertile, but the rent increases as we move away from the main canal. There is also a case where the rent is paid after harvest. This is the situation in Lot No. 2254 in Block U, where the tenant paid in cash after the padi was sold.

Payment in Kind - Especially Bagi Dua

In some lots, payments of rent are made in kind. With the exception of Lot No. 2097 Block F where the tenant pays 1/3 of the produce to the owner, most of the payments in kind are done on the Bagi Dua system.

In the Bagi Dua system, the produce is divided into two equal portions, and the owner takes one portion while the tenant operator takes another portion. This rent system is considered very high because the owner who does not put in any work in producing and harvesting the crop gets half of the share of the harvested crop.

As seen from Table 3:4, there are 4 lots under this category of rent payment. One lot is in Block E, one in Block S, one in Block U and one in Block W.

In the case of Lot No. 2518 in Block E, Lot No. 2274 in Block U and Lot No. 2733 in Block W, the tenants do not pay for the water and lant rents. They only have to give ½ the crop to the owner. But in the case of Lot No. 2725 in Block S, the tenants have to pay for the water and land rates in addition to half the produce. The first tenant, Kassim bin Hj. Ali who rented about 2 acres has to pay $14.70 for water and land rates besides ½ the produce while the second tenant Abu bin Semun has to pay $7 for land and water rates besides sharing the crop equally with the owner for the acre of land rented.

TABLE 3:4

BAGI DUA RENT SYSTEM

Block	Lot Nos.	Operator	Owner	Approximate Acreage (Ares)
R	2518	Salleh b. Hj. Sijek	Hj. Taib	3
S	2725	1) Kassim b.Hj. Ali	Hj. Mahfood bin Hj. Ali	2
		2) Abu bin Semun	~~Hj. Mahfood bin Hj. Ali~~	1
U	2274	Sinatmin	Basiran bin A. Sinari	1½
W	2733	Siran	Saim bin Taib	1½

In this case i.e. Lot No. 2725, Block S, the rent is very high but then Block S is comparatively a very rich Block as will be seen in Table 4:1 in Chapter IV.

b) Effects of Land Tenure on Yield

It has been generally recognised that the tenant system of operation on the whole gives a lower yield as compared to other systems particularly that of the single owner-operator system. Such a situation may be the result of one or a combination of such factors as the low incentive for tenants to improve theland due to short-term leases, annual shifting of land assigned, and the lack of provision for compensating tenants who make permanent land improvement and/or the low incentives for landlords which may be the result of the lack of provision for compensating the landlord for his additional contributions or extra investment etc.

Thus when a comparison is made of the padi yield of those lots operated under the tenant system with those of any other systems, it will be observed that the yield of the farmer is very much lower. Such a situation was depicted in Table 3:1. From this Table it was observed that a lot under the tenant operator system gives a yield of only 175 gantangs per acre as compared to that of the single owner operator system which yielded 248 gantangs per acre.

The tenant system of operation therefore exerts an influential effect on yield.

Other Factors that are Responsible for Yield Variations

a) Soil

In Agriculture, the types and fertility of the soil is one of the main determinants of yield. Though padi is tolerant of considerable variation in the soils reaction, it was found that good padi soils are almost invariably acidic in reaction, the P value usually varying from about 4 to 6, the nitrogen content from 0.1 to 0.6% and the phosphoric acid from 0.04 to 0.17%[2].

A survey carried out in 1962 in the North West Selangor Swamp region revealed that the soil of Sawah Sempadan composes of peat, organic clay-muck association, Selangor series, Tinggi series and the Kranji series. The arrangement and extent of these different types of soils are shown in the Soil Map 3:1, which was extracted from the "Reconnaissance Soil Map, North West Selangor."

Although no detailed information was available for the particular type of soils in each Block in Sawah Sempadan, it is possible that, by superimposing the twenty-three Blocks that made up Sawah Sempadan on to the Soil Map, and approximation can be made as to the types of soil underlying each Row.

On this basis it will be found that Row 1 lies mainly on the area marked "Peat" and partly on the "Organic Clay Much Association", while the remaining three Rows, namely Row 2, 3 and 4 will fall mainly on to the area marked the "Selangor Soil Series".

Peat consists of dark reddish brown to black, loose partly decomposed leaves, timber, and roots containing less than 35% mineral material. It was found as a result of deposition of plant remains in water-logged environment and the under material invariably is clay, either grey or greenish in colour and sometimes with a sulphurous odour.

Although padi plants can grow quite well on peat soil, the yields of the grains are very poor as the root system is poorly developed - in fact, peat soil of 2' to 5' deep overlying clay are only considered of marginal agricultural suitability. As a result of this it is clear as to why the padi yield per acre of Row 1 is so poor, only 123 gantangs per acre (as shall be seen in Table 4:1 in Chapter IV).

Organic clay is defined as a soil which is predominantly clay but in which there is a fair proportion of decayed organic matter. It is a soil with more than 65% but less than 80% mineral matter, and is black to dark brown in colour.

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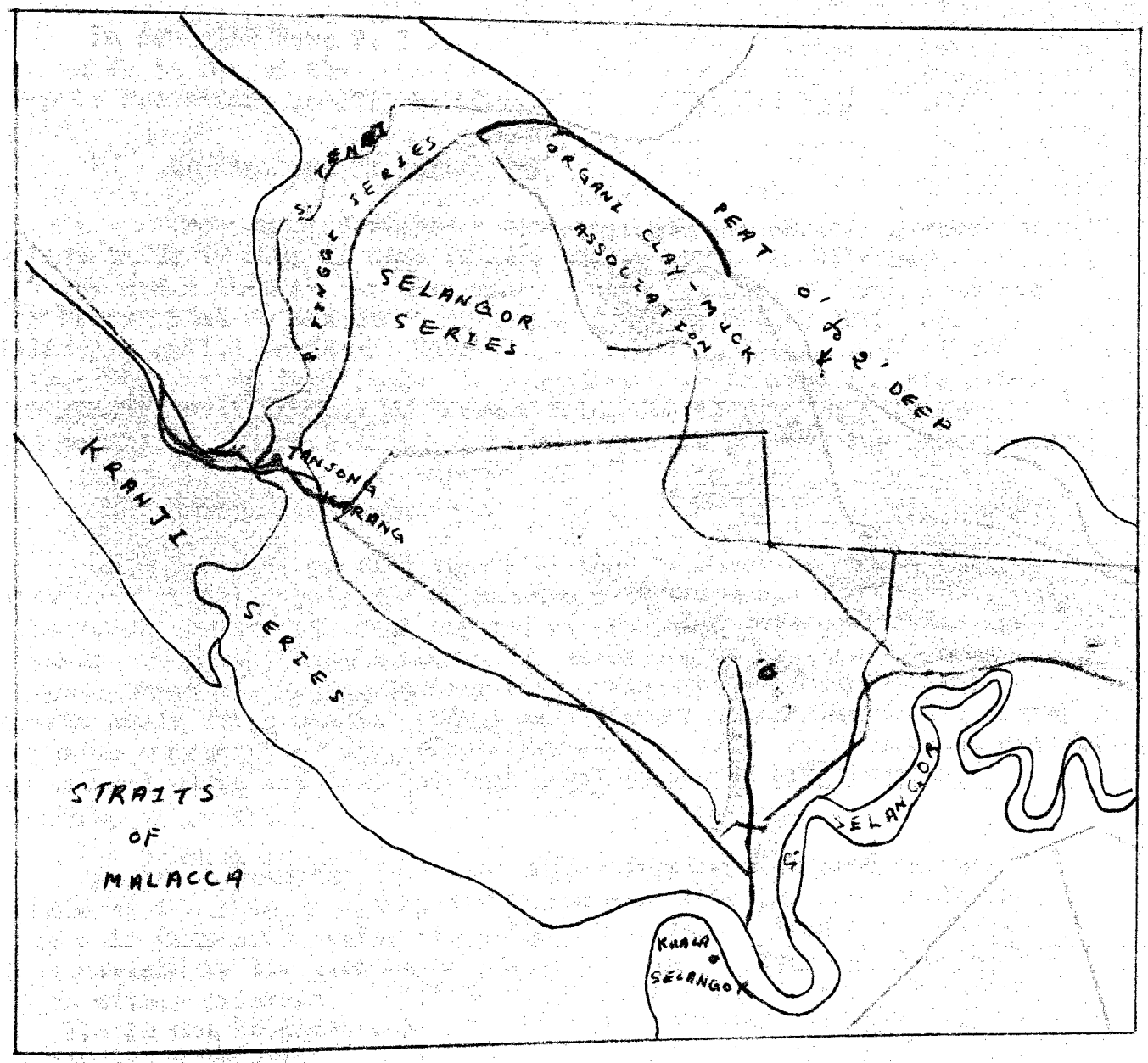
[2] D.H. Grist "Rice" Longmans, Green and Co., London, New York, First Published in 1953, Ch. II.

MAP 3:1

MAP SHOWING THE SOIL TYPES OF SAWAH SEMPADAN



Scale: 1:126,720 or two statute miles to 1 inch

Source: Reconnaissance Soil Map Northwest Selangor. Published by the Director of Agriculture, using base maps supplied by the Surveyor-General, Federation of Malaya.

Muck clay differs basically from the above only in the nature of the topsoil and the depth at which the clay sub-soil horizon occurs. In this case, the topsoil consists of muck which is dark reddish brown to black, highly decomposed organic material possessing between 35% to 65% mineral matter. On the whole these two types of soil are good for padi cultivation provided they are properly irrigated. But then, this type of soil is distributed only in a very small portion in Row 1.

In contrast Rows 2, 3 and 4 lie mainly on the Selangor Soil Series which is one of the most fertile soils in Malaya as far as plant reserve is concerned, as will be discussed in detail in Chapter IV.

b) Application of Fertilizer

The use of fertilizer to rejuvenate the soil is a very important thing to keep in mind if good yields are to be obtained. But it was found that in the area under study, the use of fertilizer can almost be regarded as non-existent. Only 2 out of the 58 lots have fertilizers applied to them. These 2 lots constitute only 3.4% of the 58 lots. The use of fertilizers is therefore very limited in this area. The extremely small numbers of farmers using fertilizers in this area is due mainly to the fact that the farmers are too poor to buy fertilizers.

c) Water Conditions

In a wet padi growing area like that of Sawah Sempadan, the conditions of water supply are of paramount importance. The right amount and the right phasing of water are two of the basic pre-requisities for high yield. The term "right phasing"of water supply is taken to mean that water comes at the appropriate time during the different stages of growth while "right amount" refers to different quantities needed during the various stages of growth. For example, more water is needed immediately after transplanting and less and less water is needed as harvesting approaches.

In Sawah Sempadan the water supply is always ensured because the whole of the area is a complicated network of irrigation canals as described in Chapter II under the title "Drainage and Irrigation" What is less certain is the phasing of the water; thus there were lots suffering from either excessive or insufficient water supply. Water supply in the Blocks can be discussed uner three main headings as seen in Table 3:5 and they are:

i) Sufficient water supply

ii) Insufficient water supply and

iii) Excessive water supply

From Table 3:5, it will be seen that out of the 58 lots, 62.1% of the lots experience sufficient water, 19.0% have insufficient water and 19.0% have excessive water supply. Here each of the 36 lots having sufficient water supply gives on the average, a yield of 253 gantangs per acre which is the highest yield.

TABLE 3:5

CONDITIONS OF WATER SUPPLY AND YIELD OF PADI

Water Conditions	Number of Lots	Percentage of Total Lots	Average Yield per Acre (Gantangs)
Sufficient	36	62.1	253
Insufficient	11	19.0	174
Excessive	11	19.0	211
Total	58	100.1	213

d) Cultural Practices with Regard to Dates for Sowing, Transplanting and Harvesting.

The dates for sowing, transplanting and to some extent harvesting, are also of importance in the discussion of factors responsible for yield variations. This is so because the dates for the above are related to the water conditions particularly so in the Sawah Sempadan where such dates are laid down by Gazette notification. These dates are fixed in relation to the probable availability of water, so it is necessary to adhere to the gazetted dates if full advantage is to be taken of the irrigation system. It was to be found that the farmers interviewed were, in many cases, unable to keep to these dates for one reason or another. These dates differed slightly in different Rows because of the elevation of the land. Due to the inability of many farmers to keep to the dates and also because of other reasons, such as the retentive power of the soil, the elevation of the land, etc, many farmers suffer from either excessive or insufficient water supply.

The importance of the dates for sowing and transplanting will be discussed in relevant places in Chapters IV and V.

e) Methods of Harvesting

In connection with the analysis of the importance of the sowing, transplanting and to some extent, harvesting dates, it is interesting to bring another factor which though not an important factor, does to a small extent determines the yield of padi.

In the area under study, as well as for the whole of Sawah Sempadan, two main methods of harvesting are observed. The first is the tuai where the farmer uses an instrument which has a sharp blade attached to a handle and with this the farmer cuts the padi stalks about 6 to 8 inches below the ears of ripened padi. This instrument is small, compared to the scythe-like thing used by farmers who use the sabit method.

In the sabit method, the padi stalks are cut about 6 to 8 inches above the ground. Here, unlike the tuai method where only the ripened padi stalks are cut (selective cutting), the padi are cut in bunches and in each bunch there may be some unripe padi. Consequently there is a reduction in yield because the unripe padi have to be thrown away. The advantage of the tuai over the sabit method is obvious, but as said earlier, this factor is not so important as compared to the other factors because it was found in Table 3:6 that most of the farmers use the tuai method. But nevertheless it will be brought out in the relevant places in Chapters IV and V.

The distribution of lots by method of harvesting is shown in Table 3:6.

TABLE 3:6

DISTRIBUTION OF LOTS BY METHODS OF HARVESTING

Methods of Harvesting	No. of Lots	Percentage of Total Lots
Tuai	28	46.3
Sabit	7	12.1
Both	23	39.6
Total	58	98.0

From the above Table, it will be observed that the farmers of 46.3% of the total number of lots used the tuai method, while only the farmers of 12.1% made use of the sabit.

f) Crop Rotation or Off-Season Land-Use

It was commonly held that continuous cropping of the land results in poor yield. The main reason forward for this is that the plants continuously use up the nutrients of the soil and the soil has no time to replenish itself.

Crop rotation or off-season land use in the surveyed lots takes principally two main forms, namely that of the cultivation of padi followed by

i) the cultivation of maize and/or other crops like sweet potatoes or tapioca and

ii) leaving the land fallow during the off-season.

These two forms of crop rotation or off-season land-use have different effects on the yield. It was observed that leaving the land fallow results in lower yield, while the cultivation of maize and/or other crops, but particularly the cultivation of maize alone, results in higher yield.

This is illustrated in Table 3:7.

TABLE 3:7

LOTS DISTRIBUTION UNDER DIFFERENT FORMS OF CROP ROTATION/OFF SEASON LAND USE AND THE RESULTANT YIELD

Form of Crop Rotation/ Off-season Land Use	Number of Lots	Percentage of Total Lots	Average Yield Per Acre (Gantangs)
Fallow	18	31.1	163
Maize	11	18.9	314
*Mixed Crops	15	29.3	263
+Others	14	20.7	216
Total	58	100.0	230

Of the 58 lots, 18 lots were left fallow during the off-season. The average yield of a lot with this system of crop rotation is only 163 gantangs per acre.

Comparing this to that of the lots where maize was cultivated during the off-season, it will be found that there is a difference of 151 gantangs per acre. The average yield of the latter is ~~3 or 4~~ 314 gantangs per acre. There are 11 such lots and these 11 lots constitute 18.9% of the total number of lots.

Ranging second to the highest yielding types of lots are those lots which were cultivated with mixed crops during the off-season. In such lots of which there are 15 lots or 29.3% out of 58 lots, maize and crops like sweet potatoes and/or tapioca were cultivated during the off-season. On an average, a lot under this category gives a yield of 263 gantangs per acre.

Then there are 14 lots or 20.7% of the 58 lots which were partly left fallow and partly cultivated with maize and/or other crops during the off-season.

The average yield for a lot under this category is 216 gantangs per acre. Lots under this type of crop rotation, although it was a

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*Includes maize and other crops like sweet potatoes and/or tapioca.

+Here the lot is partly fallow and partly cultivated with maize and/or other crops.

partial practice of the cultivation of maize and/or other crops, do have an advantage over those lots which were left totally fallow during the off-season.

From Table 3:7 two conclusions can be drawn. The first is that, padi lots which were cultivated with maize and/or other crops, tend to give a comparatively higher yield than those which were left fallow during the off-season. The cause of higher yield is that such land is subject to more, if not, better ploughing and also to the possibility that maize and/or other crops must have contributed some nutrients back to the soil which are beneficial for padi growth. As far as more ploughing or deeper ploughing is concerned, the land must be ploughed for maize and/or other crops cultivation and this procedure greatly facilated or improved the permeability of the soil.

The second conclusion that can be drawn from Table 3:7 is that, even partial cultivation of maize and/or other crops while leaving part of the lot fallow also has an effect on yield, in that the yield is higher than those lots which were left wholly fallow during the off-season. The reason is the same as that for conclusion one.

e) Varieties of Padi Cultivated

From the information collected it was found that at least eleven varieties of padi were cultivated in the Blocks under survey and these eleven varieties are:

i) Radin Puteh

ii) Radin China

iii) Radin Kuning

iv) Radin Pahang

v) Sri Raja

vi) Semayang Pandan

vii) Semyang

viii) Siam Kedah

ix) Mayang Rambai

x) Serayap

xi) Pulut

Among these eleven varieties, Radin Puteh takes the lead. However, since there is no hard and fast rule for the grouping of padi into certain groups, we will for this study, group all the Radin varieties under Radin, and all the varieties of Pulut under Pulut. On this basis a Table can be drawn to show their distribution of lots.

TABLE 3:8

DISTRIBUTION OF LOTS AND THEIR YIELD UNDER DIFFERENT VARIETIES OF PADI

Varieties of Padi Cultivated	Number of Lots	Percentage of Total No. of Lots	Average Yield Per Acre (Gantangs)
Radin	32	55.2	233
Sri Raya	1	1.7	392
Semayang Pandan	1	1.7	223
Siam	1	1.7	55
Mayang Rambai	1	1.7	127
Mixed	21	36.2	237
Others	1	1.7	149
Total	58	99.9	202

As seen in Table 3:8 there are clearly ~~six~~ five separate varieties. The ~~seventh~~ sixth category is under "mixed" variety where Radin is one of the varieties. The "mixed" variety category may be a combination of two or more of the stated varieties but of which Radin is one of the varieties. The ~~eight~~ seventh category under "Others" is a combination of any varieties except Radin.

It appears from the Table that Radin tops the list in the total number of lots cultivated and this is followed by the "mixed" category. Radin was cultivated in 32 out of 58 lots. The average yield of the Radin variety which is 233 gantangs per acre is second only to that of Sri Raya which is 392 gantangs per acre. This need not lead us to conclude that Sri Raya is a higher yielding variety for two main reasons. The first being that, there is only 1 lot having such a variety and this particular lot (Lot No. 2779) is in Block V.

The second reason as to why we cannot conclude and say that Sri Raya is a higher yielding variety compared to Radin is that the variety of padi cultivated is not the sole determinant of yield. Other factors have also to be taken into consideration.

h) Pests and Diseases

Pests and diseases pose a very serious problem to padi cultivation in the area. In enumerating the factors affecting the productivity of the Blocks and/or lots, attention must be given to these for they are certainly an important factor responsible for the low yields of certain lots. It was discovered that all the 58 lots were affected by pests and diseases in some way or another.

It was found during the course of the survey that two major types of pests are prevalent in these lots:

i) insect pests which include all the various types of worms or what is called in Malay, Ulat and the various types of locust and

ii) rats

Insect Pests

Among the insect pests, the most common and damaging is the stem borers. They cause considerable damage to the crop because they multiply very quickly. Such insect pests known as Ulat Batang in Malay, damage the plant by feeding on the leaf-sheath. The damaged stems either die or produce little or no crop or empty "white ears".

There are four species of stem-borers of major importance in Malaya as a whole.[3] These four species are:

i) Chilotraea polychrysa Meyr (Kupu$_2$ pasak hitam)

ii) Chilo suppressalis Walk (Kupu$_2$ pasak perang)

iii) Schoenobius incertulas Walk (Kupu$_2$ gading) and

iv) Sesamina inferens Walk (Kupu$_2$ pasak Samat)

Besides these there are several species of sucking bugs which cause damage to the padi plants. Then there are other types of leaf-eating caterpillars that can cause considerable damage to padi crops.

Rats

Rats constitute one of the most serious and widespread menaces to padi production not only in this area but also throughout the padi growing areas in Malaya. They do not only destroy the growing crop by gnawing the stems and eating the developing grains but given the opportunity they also feed on stored padi and rice.

Besides being attached by the various types of pests, the padi plants in the surveyed lots were also damaged by various types of diseases, the most common being "Brown Spot" and "Blast" which were commonly referred to as Penyakit Merah in Malay. "Penyakit Merah" is a phrase used to describe a variety of conditions in padi all of which are characterized by stunting of the whole plant and the discoloration

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[3] Ministry of Agriculture, Padi (Agriculture Leaflet No. 42) 1962, pg. 17.

and dying back of the outer leaves"[4] while P.G. Coleman, Ag. Director of Agriculture, Federation of Malaya, said Penyakit Merah is used to describe a wide range of physiological disorders affecting rice plants in Malaya, the only common symptoms of which is the rednessof the leaves, hence the name Penyakit Merah, a red sickness."[5]

Brown Spot is caused by a fungus and occurs to a great or lesser extent every year. It is mainly a disease of the leaves and occurs most commonly in the nursery stage. The disease also affects the grains causing the formation of small oval spots on the glums and in the case of more severe attacks complete blackening of the whole grain.

Blast on the other hand is a common disease and it occurs as a seedling leaf spot where it appears as large elongated spots pointed at both ends, uniformly brown at first but later developing a light greenish grey or grey centre.

The loss of crops which can be directly attributed to the effects of Penyakit Merah is difficult to estimate and it varies from season to season.

Another common crop "destroyer" is the wind. This is most prevalent in Blocks P, V and W.

All the above described types of pests and diseases prevail - some to a greater extent and some to a smaller extent in the surveyed lots.

It can be seen at the outset (see Table 3:9) that out of a total of 58 lots, 22 lots are affected by pests alone. In contrast, only 1 lot was affected by disease. Rats and wind by themselves each "claimed" 2 lots. Pests and rats combined affected 27.6% of the total no. of lots while wind and rats combined affected 12.1% of the total no. of lots. The Table therefore shows that there is no lot which is not affected by any one of the above, and that pests head the lists of all the lots affected by diseases, pests, rats, wind or a combination of any of them.

Although pests and diseases form a principal factor affecting the yield, it's importance as a factor affecting the padi yield variations of both Inter and Intra-Blocks is quite difficult to assess because all the lots are affected in some form or other. It depends more on the extent of their prevalence rather than on the total absence of them. Nevertheless, their working in conjunction with other factors do pose as a factor responsible for the yield variations of some of the lots and Blocks as shall be seen in Chapters IV and V.

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[4]Ibid, Padi, pg. 23.

[5]P.G. Coleman, Foreword, R.G. Lockard, Mineral Nutrition of the Rice Plant in Malaya, Ministry of Agriculture, Federation of Malaya, December, 1959.

TABLE 3:9

DISTRIBUTION OF LOTS BY PESTS, DISEASES, RATS AND WIND

Types of Pests and Diseases	No. of Lots	Percentage of Total No. of Lots
Pests	22	37.7
Diseases	1	1.7
Rats	2	3.4
Wind	2	3.4
Pests + Rats	16	27.6
Wind + Rats	7	12.1
Wind + Pests	7	12.1
Pests + Rats + Wind	1	1.7
Total	58	99.7

i) Remedial Actions taken against Pests and Diseases

The control of pests and diseases is a very important step to take if increased yield is to be obtained. In the area under study, remedial actions took principally two forms:

i) Spraying and

ii) The application of rat poison.

Sometimes a combination of both is used.

Table 3:10 shows the distribution of lots by the above two methods of remedial actions taken against pests and diseases.

It is clear from the Table that only in 56.9% of the total number of lots remedial actions were taken against pests, diseases and rats. Out of these 13.8% made use of spraying to destroy the worms, locusts, caterpillars etc. Spraying in most cases, was done by a man sent round from the Department of Agriculture, Tanjong Karang and the pest killer or destroyer used, was in most cases, insecticides, such as diedrin. Although these will not destroy the pests completely, they will no doubt lessen the attacks considerably. However, in 25 lots which constitute 43.1% of the total number of lots, no actions against pests and diseases were undertaken. It was found that the farmers were too poor to buy the necessary insecticides. The advantages in the form of a higher yield in lots where remedial actions were taken against pests and diseases over those where no actions were taken will become clear in Chapters IV and V.

TABLE 3:10

NUMBER OF LOTS APPLYING SPRAYING AND RATS POISON

Methods of Remedial Actions	Number of Lots	Percentage of Total Lots
Spraying	8	13.8
Rats Poison	20	34.5
Both	5	8.6
No Actions taken	25	43.1
Total	58	100.0

It is clear from all that have been said that several factors and not one alone are responsible for the yield of padi or of any other crop. Depending on the circumstances and the extent or degree of their influence, the yield of padi in each lot and in the Block as a whole is determined.

The conclusion to be drawn from such a trend is that as stated very often, yield is not a function of one factor alone but of many factors and it is the extent or degree of their influence and not the total absence or presence so much, that is responsible for the yield variations, and it is on this basis that the analysis of Chapter IV and V will be based.

CHAPTER IV

INTER-BLOCK YIELD VARIATIONS

Yield of any crop varies from place to place and from time to time. It must be pointed out that yield is not the function of one but of many factors.

With this in mind, the writer now proposes to analyse in detail the Inter-Block yield variations in the 12 Blocks as mentioned in Chapter I (Table 1.1). This Chapter intends to find out, the pattern or trend and the extent of the Inter-Block Yield Variations and to investigate into the various factors responsible for the variations. However, it must be pointed out that in the investigation of the factors possible for the yield variations, only the main ones will be discussed in great detail while the common factors will only be mentioned.

Three Approaches

The analysis on the Inter-Block Yield Variation will be studied from three approaches and they are as follows:-

i) The Row Approach, whereby the analysis will be made on the basis of grouping the Blocks on a horizontal basis into Rows,

ii) The Sectional Approach, whereby the analysis will be made on the vertical grouping the Blocks into Sections, and

iii) The Individual Block Approach, which is actually the study of the Blocks within the Row and the Section.

Before setting out to examine the above from the three approaches, it is necessary to be specific about the usage of each of the two terms, namely "Production" and "Yield"

Definition - Production and Yield

The two terms, "production" and "Yield" are, broadly speaking, synonymous, and have been and are still often used interchangeably by different authorities. Both of them as often defined, is taken to mean the quantity that is produced from a specific unit, of, say, one lot of padi land. In other words, it is the output of that specific unit.

In this Exercise however, it is proposed that the term "production" be taken to mean the total quantity or the total output of

padi from one padi lot which may be of any size, thus if one lot produces 600 gantangs of padi, then the production of that particular lot is 600 gantangs. In other words, it is the output of that lot.

"Yield" on the other hand, is here taken to mean the production or output per acre. The emphasis is on one acre. Thus if the production or output of a 3 acre lot is 600 gantangs, then the yield of padi of that lot is 200 gantangs. Thus, whenever the term "yield" is used subsequently, it refers to a per acre basis, that is, so many gantangs per acre. Consequently, all yield variations, both for Inter and Intra-Blocks (which form the essence of this study), are variations in terms of so many gantangs per acre.

Another point which needs to be specified is that the unit of comparison is in terms of gantangs per acre.

Row Approach - Analysis of Inter-Block Yield Variations

Under the Row Approach analysis, the Blocks are horizontally grouped into four rows, each row consisting of those Blocks on the same row as shown in Block Map, 1:1. The following shows the composition of each Row:

Row 1 comprising of Blocks D, E and F
Row 2 comprising of Blocks K, Q, and R
Row 3 comprising of Blocks P, S, T and U
Row 4 comprising of Blocks V and W.

This approach aims to analyse the inter-block yield variations from two different angles, namely.

i) to compare the yield variations of the four rows with each other and then to compare the yield variations of each of the four rows with the (average) yield of the total area that is, the (average) yield of the 4 rows, and

ii) Inter-block yields variations within each Row

From Table 4:1 two very striking things are observed:

i) that on the whole the yield of padi is very low, only 228 gantangs as compared to that of Sekinchan which was between 500 to 600 gantangs or to that of Sawah Sempadan which was 412 gantangs last year as shown in Table 4:2 and,

ii) that there is quite a great variation in the yield among the Rows (and Blocks).

Table 4:1 shows that the total cultivated area of 165.38 acres of the four Rows gives a total production/output of 37,733 gantangs, thus giving a yield of 228 gantangs. Allowing for some provisions, that this 228 gantangs is derived on the basis of half of Sawah Sempadan, that ~~in~~ 12 Blocks out of 23 Blocks (though the provisions are not very significant because it was found that the (average) yield of padi for the

TABLE 4:1

ACREAGE, PRODUCTION AND YIELD BY BLOCKS AND BY ROWS

Rows	Total acreage under padi	Production/ output in gantangs	Yield (Per Acre)		*Percent of the area yield
			in gantangs	Percent of Row Yield	
1					
Block D	13.84	1,655	120	97.6	52.6
Block E	11.60	1,510	130	105.7	57.0
Block F	11.80	1,400	119	96.7	52.2
Total	37.24	4,565	123	100.0	53.9
2					
Block K	15.57	3,202	206	97.2	90.3
Block Q	14.40	2,783	193	91.1	84.7
Block R	14.71	3,502	238	112.3	104.4
Total	44.68	9,487	212	100.0	93.0
3					
Block P	15.79	4,287	271	95.4	118.9
Block S	14.43	5,015	347	122.2	152.2
Block T	14.16	4,330	306	107.7	134.2
Block U	12.14	2,440	201	70.8	88.2
Total	56.52	16,072	284	100.0	124.6
4					
Block V	12.97	3,876	299	106.0	131.1
Block W	13.97	3,733	267	94.7	117.1
Total	26.94	7,609	282	100.0	123.7
**Total for Whole Area	165.38	37,733	228	100.0	100.0

*These percentages are calculated on the basis of the yield for the whole area (all the 12 Blocks) that is to say, on the basis of 228 gantangs = 100%.

**Whole area here means all the 12 Blocks.

other Blocks of Sawah Sempadan, not mentioned here, was about 250 gantangs (per acre) for this year) it can still be said that the above figure of 228 gantangs depicts a very low yield compared to last year's (average) yield of 412 gantangs (per acre).

In a survey undertaken on a random basis by the Department of Agriculture, Tanjong Karang, it was found that the (average) yield for the whole of Sawah Sempadan was approximately 412 gantangs as shown in Table 4.2.

TABLE 4.2

AVERAGE YIELD OF PADI IN SAWAH SEMPADAN FOR THE YEARS 1948-1964

Year	Average Yield (Gts. per acre)
1948-1949	350
1949-1950	250
1950-1951	350
1951-1952	268
1952-1953	325
1953-1954	366
1954-1955	302
1955-1956	445
1956-1957	391
1957-1958	446
1958-1959	446
1959-1960	460
1960-1961	382
1961-1962	413
1962-1963	391
1963-1964	412

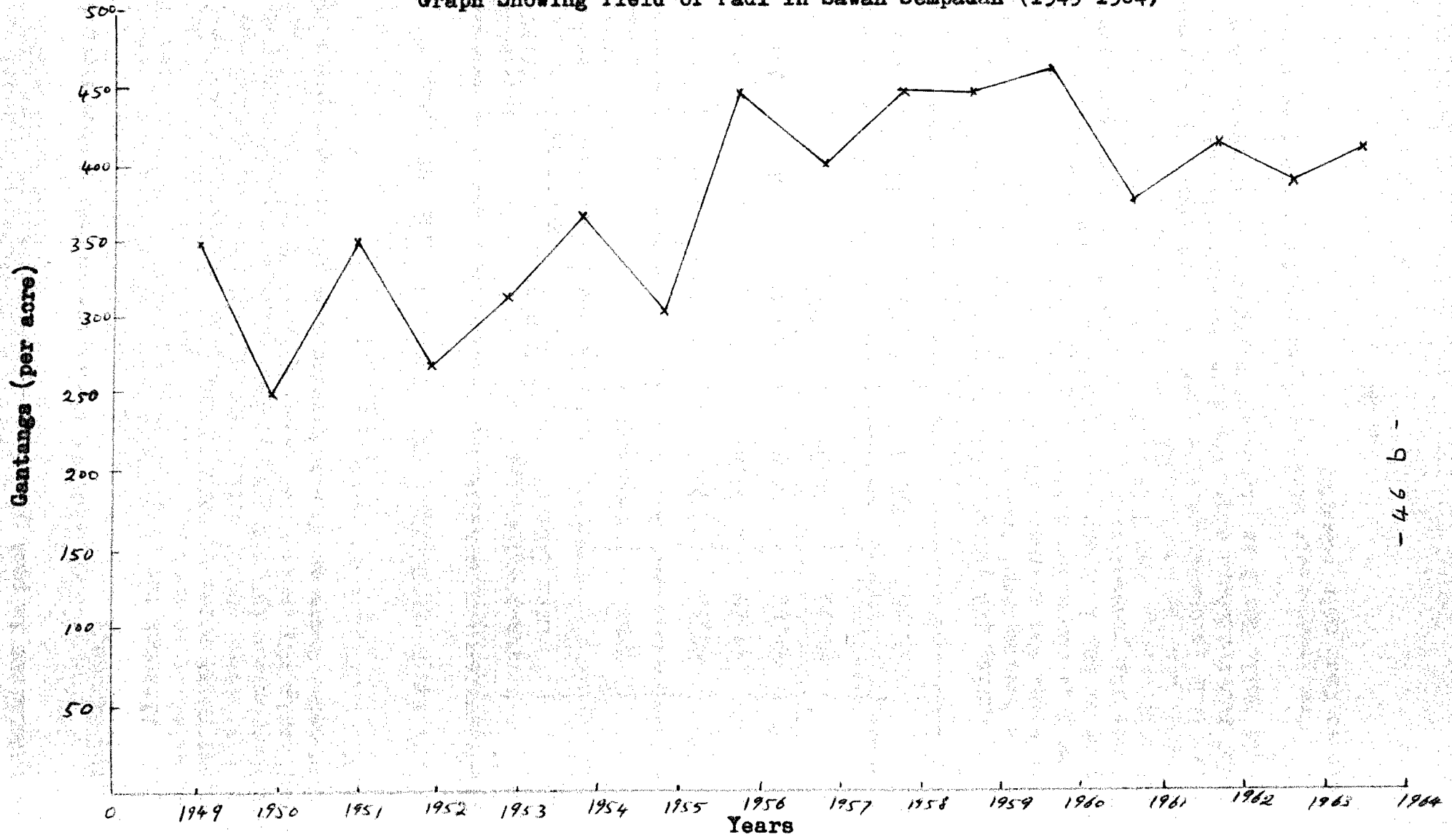
The Table shows that Sawah Sempadan has a unique pattern of production, this being characterized by one year of comparatively high yield to be followed by a year of low yield. This is clearly seen in Graph 4:1

Taking the yield pattern as characteristic of Sawah Sempadan, it is not surprising that this year should be one of low yield. This comparatively low yield can be attributed to at least two main reasons, the first of which is that there is a depletion in the fertility of the land, the result of the almost non-application of fertilizer as a whole and secondly the comparatively low yield was due to the greater prevalence of diseases and pests.

Other subsidiary factors such as those of insufficiency or excessiveness of water supply, tenancy system, the variation in the sowing and transplanting dates from those gazetted in the Notification

Graph 4:1

Graph Showing Yield of Padi in Sawah Sempadan (1949-1964)



Scale: Horizontal .5" = 1 year
Vertical .5" = 50 gantangs

etc., will together with the above two main reasons be discussed in the analysis of intra-blocks yield variations.

The second striking feature as revealed by Table 4:1 is the great variations in padi yields among the four Rows (and Blocks).

Table 4:1shows thgreat variations in padi yields among the Rows (and Blocks).

Although the yield of padi varies among the four rows, the yield variation is most significant between Row 1 and Row 3. Row 1 which has 37.24 acres or 22.5% of the total acreage (165.38 acres) under cultivation and an output of 4,565 gantangs or 12.1% of the total production/output (37,733 gantangs) is the lowest yielding row with a yield of only 123 gantangs as compared to Row 3 (284 gantangs) as seen in Table 4:3. There is thus a difference of 161 gantangs (per acre).

TABLE 4:3

TOTAL PRODUCTION AND YIELD OF PADI BY ROWS

Row	Total cultivated area (Acres)		Production in Gantangs	Yield in Gantangs	Percentage of Yield in terms of average yield for the 4 rows
	Area	Percentage			
1	37.24	22.5	4,565	123	53.9
2	44.68	27.0	9,487	212	93.0
3	56.92	34.2	16,072	284	124.6
4	26.94	16.3	7,609	282	123.9
Total	165.38	100.0	37,733	228	100.0

Taking 228 gantangs as the (average) yield for the whole area, and on the "assumption" that it is equal to 100%, then it will be found that Row 1 is below the average productivity (that is 228 gantangs (per acre)) while Row 3 is above the average productivity of the area. The percentage yield of Row 1 in terms of the yield for the whole area, is only 53.9%, thus its productivity is 46.1% below the average productivity for the whole area. Row 3 is producing above the average productivity of the whole area by about 24.6%. The variations in the yields between these two rows is therefore very great, 161 gantangs. On the basis of the yield for the whole area, Row 3 can be classified as an area of high yield while Row 1 is classified as an area of extremely poor yield.

The great yield variations between these two rows is due probably to four main reasons:

i) the difference in the soil
ii) the practice of crop rotation (cultivation of maize or/and other crops) or leaving the land fallow during the off-season
iii) the greater prevalence of pests and diseases in Row 1 and yet the less remedial actions taken against them as compared to Row 3 and
iv) more complaints of either insufficient or excessive supply of water in Row 1.

The differences in the soil is certainly the main reason for the great yield variation between Row 1 and Row 3. The soil of Row 1 is composed mainly of peat which is responsible for the very poor yield of this area. This is because the roots system of the padi plants are poorly developed. Peat consists of dark reddish brown to black, loose, partly decomposed leaves, timber and roots containing less than 35% mineral material. Although padi can grow quite well on peat, the yields of the grains are very poor because the root system is poorly developed. On the other hand, Row 3 lies on the Selangor Soil Series which is one of the most fertile soils in Malaya as far as plant reserve is concerned. It is a clay texture soil of marine origin, has a well developed granular medium nuts structure occuring in the topsoil and is dark brown to dark greyish brown in its surface soil, the latter varying in depth from 1 to 6 inches. Being of marine origin, this soil is well stocked with exchangeable bases such as calcium, magnesium and potassium and with its high content of clay, it has the capacity to retain these elements for plant use. For this reason it is especially suited to padi production under irrigation. Thus it is responsible for the comparatively high yields of this Row.

Soil is therefore the most important factor responsible for the yield variation of these two rows.

Another factor contributing towards the yield variation of these two rows lies in the fact that most of the farmers in Row 1 left the land fallow compared to those of Row 3. As seen in Table 4:4 in Row 1, the farmers of 12 out of 13 lots or 92.7% left the land fallow during the off-season as compared to the farmers of Row 3 where the farmers of only 7½ lots out of 20 lots, or 37½% of the farmers left the land fallow. In Row 3, most of the farmers, that is 62½% of them cultivate the land with maize, or maize/and sweet potatoes, while in Row 1 only 7.6% of the farmers cultivate their land with maize or other crops, during the off-season. Such a distribution is shown in Table 4:4.

Not only are the above two factors working to the disadvantage of Row 1, but also the fact that more farmers in Row 1, complain of the inefficiency of water supply compared to those of Row 3. In Row 1, as seen in Table 4:5, 46.2% of the farmers did not have any complaint about water, while 46.2% complained of insufficient water at the time of transplanting and 7.6% complained of too much water. Compared to Row 1, 60% of the farmers in Row 3 do not suffer from either insufficient nor excessive water supply, while only 20% each complained of insufficient and excessive water respectively. Insufficiency or excessiveness of water do reduce yields.

TABLE 4:4

DISTRIBUTION OF LOTS ACCORDING TO OFF-SEASON LAND-USE BY ROWS

Row	Total No. of Lots	Fallow		Maize		Mixed	
		Frequency of Lots	Percentage	Frequency of Lots	Percentage	Frequency of Lots	Percentage
1	13	12	92.7	½	3.8	½	3.8
2	15	6	40.0	4½	30.0	4½	30.0
3	20	7½	37.5	3½	17.5	9	45.0
4	10	2½	25.0	7½	75.0	-	-

TABLE 4:5

DISTRIBUTION OF LOTS ACCORDING TO CONDITIONS OF WATER SUPPLY BY ROWS

Row	Total No. of Lots	Sufficient		Insufficient		Excessive	
		Frequency of Lots	Percentage	Frequency of lots	Percentage	Frequency of Lots	Percentage
1	13	6	46.2	6	46.2	1	7.6
2	15	10	66.6	-	-	5	33.3
3	20	12	60.0	4	20.0	4	20.0
4	10	8	80.0	1	10.0	1	10.0

Equally important is the fact that Row 1 suffers heavily from diseases and pests as compared to those in Row 3.

In Row 1, as shown in Table 4:6, 92.7% of the padi lots are affected by diseases and pests. Here the padi is either destroyed by insects and stem borers (both usually called ulat in Malay) or by rats. Here we have classified diseases like brown spot, and pests like stem borers, insect etc. and rats under the category of diseases and pests. These diseases and pests are to a great extent responsible for the poor yield of this row. This is because insects and stem borers of all types usually attack the plant from as early as immediately after transplanting and in some cases during the nursery stage, and causing low yield either by destroying the padi or by killing the plant.

TABLE 4:6

DISTRIBUTION OF LOTS BY PESTS AND DISEASES

Row	Total No. of Lots	Diseases and Pests		Wind		Both		Unaffected	
		No.	%	No.	%	No.	%	No.	%
1	13	12	92.7	-	-	-	-	1	7.4
2	15	12	80.0	-	-	3	20.0	-	-
3	20	13	65.0	-	-	2	10.0	5	25.0
4	10	7	70.0	-	-	3	30.0	-	-

TABLE 4:7

DISTRIBUTION OF LOTS BY REMEDIAL ACTIONS TAKEN AGAINST PESTS AND DISEASES

Row	Total No. of Lots	Spraying		Rat Poison		Both		No Action	
		No.	%	No.	%	No.	%	No.	%
1	13	3	23.1	1	7.6	3	23.1	7	53.8
2	15	3	20.0	7	46.7	2	13.3	3	20.0
3	20	1	5.0	7	35.0	-	-	12	60.0
4	10	2	20.0	2	20.0	-	-	6	40.0

Rats too constitute a great menace for they gnawed at the developing plants, causing it to fall off and die.

The difference in the yield between Row 1 and Row 3 can also be attributed to the fact that Row 1 has 4 lots or 30.8% out of the 13 lots under the tenant system of operation, compared to Row 3 where 4 lots or 20% out of the 20*randomised lots are under this system of operation. It is possible that tenants may not take such a great interest in the land compared to the owners/operators, because of many factors as discussed in Chapter III. All these are shown in Table 4:8.

Not only does the yield of padi of Row 1 varies from that of Row 3 but it also varies when compared to that of Row 2, the latter giving a yield of 212 gantangs. However, the yield variation between these two Rows is much smaller.

*The word "randomised" is here taken to be synonymous with the word, "sampled" or "surveyed".

The comparatively higher yield of Row 2 is due most probably to the fact that Row 2 lies mainly in the Selangor Soil Series and part of it is in the Clay Organic Muck Association series. Muck clay soils differ basically from organic clay, the latter a soil with more than 65 but less than 80% of mineral matter, only in the nature of the top-soil. It consists of muck as its topsoil. It is dark reddish brown to black made up of highly decomposed organic material possessing between 35% to 65% mineral matter. Provided they are probably irrigated, they are good for padi cultivation thus it constitutes one of the factors responsible for slightly higher yield of Row 2 compared to that of Row 1.

It's comparatively higher yield as compared to that of Row 1 is also accounted for by the fact that 30% of the lots of this Row (Row 2) are cultivated with maize while 30% have mixed crops as compared to only 7.6% of the lots in Row 1 that were cultivated with maize and/other crops during the off-season,(Table 4.4). Compared to Row 1 which has 92.7% of its land being fallow, it has only 40% of its land being left in this state.

The higher yield of Row 2 as compared to that of Row 1 can also be attributed to the fact that Row 2 has less number of lots under the tenant system of operation as compared to Row 1. In Row 2, only 2 lots or 13.4% out of the 15 randomised lots is under the tenant system of operation as compared to 4 lots or 30.8% out of the 13 randomised lots in Row 1 (as seen from Table 4:8).

So also the percentage of padi lots having insufficient or excessive water is less than that of Row 1, only 33.3% compared to 53.8% of Row 1. (Table 4:5).

Besides as seen in Table 4:7, 80% of the lots here take actions in the form of spraying and rat poison against diseases and pests as compared to only 53.8% in Row 1.

The above three are the main reasons for the yield variation between Row 1 and Row 2. The yield variation between Row 1 and Row 4 is higher as compared to that of Row 1 and Row 2. Here the comparatively high yield of Row 4, which is 282 gantangs, widens the gap between the yield of Row 1 and that of its own, by 159 gantangs.

Here again the main reason for the yield variation is the soil. Unlike Row 1 which is situated mainly on the peat, Row 4 is situated mainly on the Selangor Soil Series, and has therefore already one advantage over Row 1.

Not only does it enjoy the advantage of soil, but it also enjoys the advantage of having 80% of its padi lots enjoying sufficient water supply at the time of transplanting compared to the 46.2% of Row 1 (Table 4:5).

Tenant system of operation can also be put forward as one of the important factors responsible for the yield variation of these two rows. As seen in Table 4:8 Row 1 has 4 lots or 30.8% of its 15 lots under the tenant system of operation as compared to Row 4, where there are no lots fully rented out except for one lot, when the owner rents

TABLE 4:8

DISTRIBUTION OF LOTS ACCORDING TO SYSTEMS OF OWNERSHIP AND OPERATION BY ROWS

System of Operation	Rows								Total	
	1		2		3		4			
	No. of Lots	Percentage of Total No. of Lots in row	No. of Lots	Percentage of Total No. of Lots in row	No. of Lots	Percentage of Total No. of Lots in row	No. of Lots	Percentage of Total No. of Lots in row	No.	Percentage
Single Owner-Operator	6	46.2	10	66.7	8	40.0	3	30.0	27	47.4
Joint Owner - Operator	-	-	3	20.0	5	25.0	4	40.0	12	21.0
Family & Friend Relationship	3	23.2	-	-	3	15.0	2	20.0	8	14.3
*One Owner and one Tenant	-	-	-	-	-	-	1	10.0	1	1.7
One Tenant Operator	2	15.4	-	-	2	10.0	-	-	4	7.0
Two Tenant Operators	2	15.4	1	6.7	2	10.0	-	-	5	8.4
Three Tenant Operators	-	-	1	6.7	-	-	-	-	-	-
Total	13	100.2	15	100.1	20	100.0	10	100.0	57	99.8

*Here the owner-operator operates 1½ acres and rent out 1½ acres to one tenant.

out 1½ acres and operates the other 1½ acres himself.

Then unlike Row 1 which has 92.7% of its padi lots left fallow during the offseason, Row 4 has only 25% of its padi lots left fallow during the offseason. Rather the farmers here prefer to plant maize or other crops and it has in fact the largest number of lots among the 4 rows cultivated with maize as an offseason crop. (Table 4.4)

Individual Block Approach: Analysis of Inter-Block Yield Variations on the Basis of the Blocks within each Row

By breaking up the rows into their component Blocks for further study, it will be found that there is great variation between yields of some Blocks with that of their neighbours. The difference in the yield variation ranges from as low as a difference of 1 gantang between Block D and Block F to as high as 146 gantangs in the case of Block S and Block U. The variation in the yields among the Blocks follow an irregular pattern as shown in Table 4:1.

The slightly better yield of Block E over Block D is due most probably to the fact that Block E suffers less from inadequate water supply as seen in Table 4:9.

TABLE 4:9

DISTRIBUTION OF LOTS ACCORDING TO CONDITIONS OF WATER SUPPLY BY BLOCKS

Blocks	Total No. of Lots	Sufficient		Insufficient		Excessive	
		No. of Lots	Percentage	No. of Lots	Percentage	No. of Lots	Percentage
D	5	1	20.0	4	80.0	-	-
E	4	2	50.0	1	25.0	1	25.0
F	4	3	75.0	1	25.0	-	-

Block F has the lowest yield in the whole area producing at 3.3% below the average productivity of this row and 47.8% below that of the whole area. Its extremely poor yield is due to many factors, of which soil, the general practice of leaving the land fallow during the offseason, the widespread of diseases and pests and the greater prevalence of tenant system are the most prominent. All the lots in Block F were left fallow during offseason as can be seen in Table 4:10.

The greater prevalence of the owner/tenant operator type of operation contributes towards the lower yield of Block F. This is seen in Table 4:11.

TABLE 4:10

DISTRIBUTION OF LOTS ACCORDING TO OFF-SEASON LAND-USE BY BLOCKS

Block	Total No. of Randomised Lots	Fallow		Maize		Mixed Crops	
		Lots	%	Lots	%	Lots	%
D	5	4½	90.0	½	10.0	-	-
E	4	3½	87.5	-	-	½	12.5
F	4	4	100.0	-	-	-	-

TABLE 4:11

DISTRIBUTION OF LOTS ACCORDING TO SYSTEM OF OWNERSHIP AND OPERATION BY BLOCKS D, E & F

Block	Total No. of Randomised Lots	Owner/Operator		Family Relationship		Owner/Tenant Operator	
D	5	4	80.0	-	-	1	20.0
E	4	1	25.0	2	50.0	1	25.0
F	4	1	25.0	1	25.0	2	50.0

It shows that Block F has 2 out of the four lots or 50% of the lots are under the owner/tenant operation type of relationship while Block E has only one lot out of the five lots under such a system of operation.

In Row 2, the lowest yielding Block is Block Q which gives a yield of 193 gantangs. The highest yield is in Block R which produced 238 gantangs (per acre). One possible reason for high yield is 100% land-use in the off-season in Block R as is seen Table 4:12.

There are other subsidiary factors such as the greater degree of remedial actions taken by the farmers of Block R against diseases and pests as compared to that of Block Q; it is due also to the more ideal water-supply condition in Block R.

In Row 3, the greatest inter-block variation is in Block S and Block U (Table 4:1). Block U has a yield of 201 gantangs as compared to that of Block S which has 347 gantangs. It's high

TABLE 4:12

DISTRIBUTION OF LOTS ACCORDING TO OFF-SEASON LAND USE

Block	Total No. of Randomised Lots	Fallow		Maize		Mixed	
		No. of Lots	Percentage	No. of Lots	Percentage	No. of Lots	Percentage
K	5	3	60.0	1	25.0	1	25.0
Q	5	3	60.0	2	40.0	-	-
R	5	-	-	1½	30.0	3½	70.0

productivity can be accounted for mainly by the fact that most of the farmers here grow the Radin group, which is on the whole, of the higher yielding variety compared to the other varieties grown here such as pulut of various types, Sri Raya etc. Here four out of the 5 lots were cultivated with Radin padi as seen in Table 4:13. Another factor which has contributed to high yields in Block S is the existence of owner-operators in 4 out of 5 lots. See Table 4:14.

TABLE 4:13

DISTRIBUTION OF LOTS ACCORDING TO VARIETIES OF PADI SOWN

Block	Total No. of Lots	Varieties of Padi		
		Radin	Mayong Rambai	Mixed
P	5	5	-	-
S	5	4	-	1
T	5	2	-	3
U	5	3	1	1
Total	20	14	1	5

The higher yield of Block T can be attributed to the larger number of owner/operator lots and also to the fact that one out of the five lots has fertilizer applied before transplanting began. It was in fact one of the two lots out of the fifty eight lots where fertilizer is used. The other is in Block R.

Besides the above advantage, Block T also enjoys the advantages derived from the cultivation of maize during the off-season as seen in Table 4:15.

TABLE 4:14

DISTRIBUTION OF LOTS ACCORDING TO SYSTEMS OF OWNERSHIP AND OPERATION

Block	Total	Types of Ownership and Operation		
		Owners/ Operators	Family Relationship	Owners/Tenants
P	5	3	2	-
S	5	4	-	1
T	5	4	1	-
U	5	2	-	3
Total	20	13	3	4

TABLE 4:15

DISTRIBUTION OF LOTS BY OFF-SEASON LAND USE

Block	Total No. of Randomised Lots	Off-season Practices		
		Fallow	Maize	Mixed Crops
P	5	3½	1½	-
S	5	2	1	2
T	5	-	1	4
U	5	2	-	3
Total	20	7½	3½	9

Of course there are other subsidiary factors responsible for the comparatively higher yield of Block T. These will be discussed in Chapter V

In Row 4, which only contains 2 Blocks (Table 4:1) the variation in the yield is quite significant; there is a difference of 32 gantangs.

Both the Blocks are producing above the average productivity for the whole area, Block V by 31.1% and Block W by 17.1%. But if their productivity were compared to that for the row, it will be found

that Block W is producing below the general average productivity by 5.3% while Block V's productivity will be higher by 6.0%. Though there is a difference of 32 gantangs in the yield of these two Blocks both of them if compared to those of Row 1 and Row 2 are definitely much higher.

The analysis by way of the Row Approach denotes as a whole that yield variations among the Blocks are mainly due to three factors; soil, the practice of either leaving the land fallow or cultivated with maize, and/or mixed crops and water-supply conditions. Soil is not so important as a factor when a comparison is made of adjoining Blocks in the same row. Other factors responsible for the yield variations are diseases and pests and to some extent remedial actions taken for these. This analysis reveals that yield(per acre)is the highest in Row 3 and the lowest in Row 1 which is adjacent to the main canal.

Sectional Approach: Inter Block Yield Variations

The Section Approach will now be used to analyse the extent of inter-block yield variations together with a discussion of the factors responsible for the same. The arrangement or grouping of the Blocks in Section for the analysis of Inter-Block Yield Variation is seen in Table 4:16.

This Table shows that the Blocks are grouped into 4 vertical sections. With the exception of Section 1 and Section 2, which has four Blocks each, Section 3 and Section 4 have three and one Block respectively. The following schedule shows the components of each Section. Please see map of the area on page ~~59~~ 4.

Section 1	consists	of	Blocks	D, K, P and V
Section 2	"	"	"	E, Q, S and W
Section 3	"	"	"	F, R and T
Section 4	"	"	"	U.

From Table 4:16, it will be seen that a different pattern of yield variations is obtained as distinct from that on the basis of Row Approach. Unlike the great yield variations among the Rows, the yield variations among the Sections in this approach, is comparatively very small, only a difference of 39 gantangs (per acre) between the highest yielding Section, that is Section 2, and the lowest yielding Section, that is, Section 4, as compared to the difference of 161 gantangs between Row 1 and Row 3 in the Row Approach.

The different pattern of yield variation among the Blocks grouped into Rows and into Sections is seen clearly in the Graph on page 59 .

It will be seen from the Graph that the line joining the points of the different yields of the Rows rises very sharply, almost a straight line. Unlike it, the line joining the yields of each Sections rises gradually and then falls gradually too.

It is necessary that the crucial factor responsible for the rather slight yield variations among the Sections be brought out. This is due to the more even spreading out of the disadvantages which

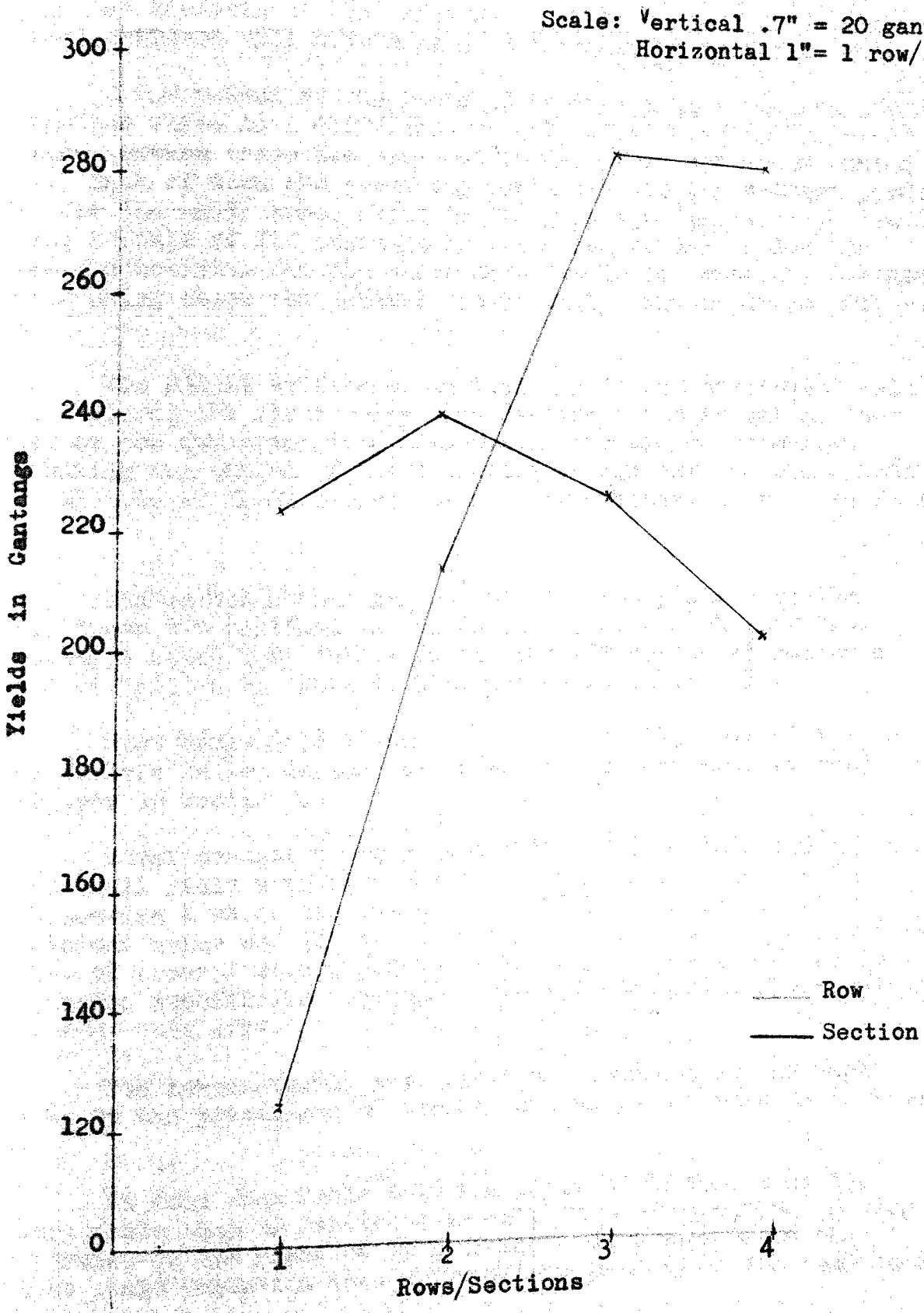
TABLE 4:16

ACREAGE, PRODUCTION AND YIELD OF PADI BY SECTIONS AND BY BLOCKS

Section	Total Acreage Under Padi	Production/ Output in Gantangs	Yield in Gantangs	Percentage of Sectional Yield	Percentage of Area Yield
1					
Block D	13.84	1,655	120	53.6	52.6
Block K	15.57	3,202	206	92.0	90.3
Block P	15.79	4,287	271	121.0	118.9
Block V	12.97	3,876	299	133.5	131.1
Total	58.17	13,020	224	100.0	98.2
2					
Block E	11.60	1,510	130	54.2	57.0
Block Q	14.40	2,783	193	80.4	84.6
Block S	14.43	5,015	347	144.6	152.2
Block W	13.97	3,733	267	111.3	117.1
Total	54.40	13,041	240	100.0	105.3
3					
Block F	11.80	1,400	119	52.4	52.2
Block R	14.71	3,502	238	104.8	104.4
Block T	14.16	4,330	306	134.8	134.2
Total	40.67	9,232	227	100.0	99.6
4					
Block U	12.14	2,440	201	100.0	88.1
Total for whole 4 Sections	165.38	37,733	228	100.0	100.0

GRAPH 4:3

COMPARISON OF YIELDS WITHIN AND BETWEEN SECTIONS OF CULTIVATORS



characterise certain Blocks especially those of Row 1 in Table 4:1 and the advantages of the more fertile Blocks, that is Row 3 and Row 4 in Table 4:1. In grouping the Blocks on a Sectional Basis, it is evident that each Section now has at least one very poor Block. There is thus what is called the Equalising Effect or the compensation variation, a factor entirely absent in the classification of the Blocks under the Row Approach.

An analysis of the Inter-Block Yield Variation on the Sectional Approach will now be made with reference to Table 4:16.

A comparison of the yield of Section 1 with that of Section 2 shows that there is a difference of only 16 gantangs. The yield variation between these two sections is therefore not great comparatively. Both of them are producing quite near to the average productivity for the whole area, which is 228 gantangs (per acre). Section 1 giving a yield of 224 gantangs is producing by 1.8% below the average productivity for the whole area, while in contrast, Section 2 is producing above the general productivity for the whole area by 1.8%.

The slight difference in their yields is attributed mainly to two factors, the first being that Section 1 has 10 out of the 20 lots or 50% suffering from either insufficient or excessive water during the period of transplanting as compared to the 6 lots out of 19 lots or 31.6% having the same experience, as seen in Table 4:17.

The second factor responsible for the yield variation between these two sections is due to the greater number of lots in Section 1 being left fallow during the off-season as compared to that of Section 2. This is illustrated in Table 4:18.

From Table 4:18 it can be seen that 62.5% out of the 20 lots were left fallow during the off-season as compared to 52.6% out of the 19 lots in Section 2.

Water condition was also one of the factors responsible for the small yield variation between Section 1 and Section 3. Unlike Section 1 which has 30.0% out of 19 lots experiencing insufficient water and 20% experiencing excessive water supply during the time of transplanting, Section 3 has only 21.4% and 7.1% out of 14 lots experiencing insufficient and excessive water supply respectively. Please see Table 4:17.

The comparatively poor yield of Section 4 is due most probably to the prevalence of tenancy system as can be seen in Table 4:19.

As seen from Table 4:16 the yield of Section 2 is 240 gantangs while that of Section 4 is only 201 gantangs, thus giving a difference in the yield of 39 gantangs. This represents the greatest yield variation when a comparison is made of the four Sections.

TABLE 4:17

DISTRIBUTION OF LOTS ACCORDING TO [illegible] CONDITIONS OF WATER SUPPLY BY SECTION

Conditions of Water Supply	Total No. of Lots	Section 1		Section 2		Section 3		Section 4	
		No. of Lots	%	No. of Lots	%	No. of Lots	%	No. of Lots	%
Sufficient	36	10	50.0	13	68.4	10	71.4	3	60.0
Insufficient	11	6	30.0	1	5.3	3	21.4	1	20.0
Excessive	11	4	20.0	5	26.3	1	7.1	1	20.0
Total	58	20	100.0	19	100.0	14	99.9	5	100.0

TABLE 4:18

DISTRIBUTION OF LOTS ACCORDING TO CROP ROTATION BY SECTIONS

Crop Rotation	Total No. of Lots	Section 1		Section 2		Section 3		Section 4	
		No. of Lots	%	No. of Lots	%	No. of Lots	%	No. of Lots	%
Fallow	28	12½	62.5	9½	50.0	4	28.6	2	40.0
Maize	19	6½	32.5	7	36.8	2½	17.5	-	-
Mixed Crop	16	1	5.0	2½	13.2	7½	53.6	3	60.0
Total	58	20	100.0	19	100.0	14	99.7	5	100.0

The most probable reason for this variation in the yields between these two Sections can be attributed mainly to the systems of operation. As seen from Table 4:19, Section 2 has only 21.2% of its 19 lots under the tenant system of operation as compared to Section 4 where 60% of its 5 lots are under the tenant system of operation.

It is very probable that the comparatively high yield of Section 2 is due mainly to the high yield of Block S which has a yield of 347 gunfangs. Block S has the advantage of having nearly all its lots, 4 out of the 5 lots operated by the owners themselves, together with that of having 3 lots cultivated with maize and/or

TABLE 4:19

DISTRIBUTION OF LOTS ACCORDING TO THE SYSTEM OF OWNERSHIP AND OPERATION BY SECTIONS

System of Operation	Section 1		Section 2		Section 3		Section 4	
	No. of Lots	Percentage	No. of Lots	Percentage	No. of Lots	Percentage	No. of Lots	Percentage
Single Owner/Operator	8	40.0	9	47.4	9	64.3	1	20.0
Joint Owner/Co-operator	6	30.0	4	21.1	1	7.1	1	20.0
Family Relationship	4	20.0	2	10.5	2	14.3	-	-
One Owner One Tenant	-	-	1	5.3	-	-	-	-
One Tenant Operator	-	-	1	5.3	1	7.1	2	40.0
Two Tenant Operators	2	10.0	1	5.3	1	7.1	1	20.0
Three Tenant Operators	-	-	1	5.3	-	-	-	-
Total	20	100.0	19	100.3	14	99.9	5	100.0

other mixed crops during the off-season. Besides, 4 out of the 5 randomised lots were planted with Radin, the comparatively higher yielding variety. All these factors together with other less important ones are responsible for the higher yield of Block S, and therefore for the Section (Section 2) as a whole.

Farmers in Section 3 made use of remedial measures to combat disease and pest attack as can be seen in Table 4:20.

TABLE 4:20

DISTRIBUTION OF LOTS ACCORDING TO DIFFERENT TYPES OF REMEDIAL ACTIONS TAKEN, —, SECTIONS 3 AND 4

Sections	Total No. of Randomised Lots	Spraying		Rat Poison		Both		Total	
		No.	%	No.	%	No.	%	No.	%
3	14	1	7.1	6	42.9	4	28.6	11	78.6
4	5	-	-	2	40.0	-	-	-	40.0

Individual Block Approach: Analysis of Inter-Block Yield Variations By Blocks within each Section

The pattern of comparatively small yield variations among the section changes when the Sections are broken up into their component Blocks for analyzing the Inter-Block Yield Variations. Here the range in the yield variations tend to be comparatively bigger especially when a comparison is made of the highest and the lowest yielding Blocks. The analysis will be made with reference to Table 4:16.

Within Section 1 which gives a yield of 224 gantangs, the highest yield Block that is, Block V gives a yield of 299 gantangs or 33.4% of the total yield for this section, while the lowest yielding Block that is, Block D gives a yield of only 120 gantangs or 13.4% of the total yield of this Section. There is therefore a difference of 79 gantangs. The variation can also be seen by comparing the yield of each Block with that of the yield for the section as well as with that for the whole area. In terms of percentage on the basis of the yield for the whole section, it will be seen that Block D is producing below the average productivity for the whole section by 46.4% while Block V is producing above the above-mentioned by 33.5%. On the basis of the percentage yield in terms of the yield for the whole area, Block D is producing below it by as much as 47.4% as contrasted with Block V which is producing

above the average productivity for the whole area by 31.1%.

As for Blocks K and P, the variation in their yields, as compared between themselves or each one with Blocks D and V respectively, are no doubt quite great but not as great as that between Block D and Block V. Block K and Block P appear to occupy the intermediary position in the comparison of the yields of Block V and Block D, Block K having a yield of 205 gantangs and Block P having a yield of 271 gantangs. Block K is producing below the average productivity for the section by 8% and by 9.7% below the average productivity for the whole area. Block P which has a higher yield of 65 gantangs when compared to Block K is producing above the average productivity of both in terms of the average productivity for the whole section, and in terms of the average productivity for the whole area by 21% and 18.9% respectively.

The reasons for the variations in the yield among the Blocks within Section 1 especially that of Block D and Block V are probably that of the management of the soil i.e. the system of crop rotation during the off-season and that of water supply.

As far as land-use is concerned it will be seen from Table 4:21 that the highest yielding Block, that is Block V, has only 1½ lots out of the 5 lots being left fallow, and 3½ lots cultivated with maize as compared to Block D, the poorest yielding Block, which has 4½ lots out of the 5 lots being left fallow and ½ lot under maize.

TABLE 4:21

DISTRIBUTION OF LOTS ACCORDING TO OFF-SEASON LAND-USE BY BLOCKS

Crop Rotation	Section 1			
	Block D	Block K	Block P	Block V
Fallow	4½	3	3½	1½
Maize	½	1	1½	3½
Mixed	-	1	-	-
Total	5	5	5	5

The second most important factor which probably accounts for the yield variations among the Blocks within Section 1 is that of water supply. The distribution of the conditions of water supply during the off-season is seen in Table 4:22.

TABLE 4:22

DISTRIBUTION OF LOTS ACCORDING TO CONDITIONS OF WATER SUPPLY BY BLOCKS

Conditions of Water Supply	Section 1			
	Block D	Block K	Block P	Block V
Sufficient	1	3	3	3
Insufficient	4	-	1	1
Excessive	-	2	1	1
Total	5	5	5	5

Block D the lowest yielding Block has only one lot with sufficient water during transplanting and four with insufficient water as compared to Block V, which has three lots experiencing sufficient water, one lot with insufficient water and one lot with excessive water.

The most probable reason for the insufficiency of water suffered by farmers in Block D as a whole, is because of the peaty nature of the soil as well as the undulating nature of the land. The land slopes from the main canal downwards, hence all the water will flow down to Blocks away from those along the main canal. The Inter-Block yield variations within Section 2 are very wide. Here a comparison between the lowest yielding Block E, and the highest yielding Block which is also the highest yielding Block in the whole area, Block S, shows that the yield varies by as much as 217 gantangs.

The comparatively very high productivity of Block S is probably due to:

i) the nature of the soil

ii) the system of operation

iii) the variety of padi planted and

iv) the soil management during the off-season.

Block S lies mainly on the Selangor Soil Series and this indeed is probably one of the most important factor responsible for its comparatively very high yield, as contrasted with Block E which lies on the peat area.

Table 4:23 shows the system of ownership and operation practised in Section 2. Block S, the highest yielding block among all the 12 Blocks, has 4 out of 5 lots under the owner/operator type of operation

TABLE 4:23

DISTRIBUTION OF BLOCKS IN SECTION 2 BY SYSTEMS OF OWNERSHIP AND OPERATION

Systems of Operation	Section 2			
	Block E	Block Q	Block S	Block W
Owner/Operator	1	3	4	1
Co-owner/Co-operator	-	1	-	3
Family Relationship	2	-	-	-
One Owner One Tenant	-	-	-	-
Tenant Operator	1	-	-	1
Two Tenant Operaters	-	-	1	-
Three Tenant Operators	-	1	-	-
Total	4	5	5	5

and 1 lot under the two-tenant type of operation as compared to Block which has only 1 lot under the Owner/operator, 2 lots under the Family Relationship and 1 under the Tenant operator type of operation.

The third most probable factor responsible for the yield variations within Section 2, particularly between Block S and Block E is the variety of padi planted.

TABLE 4:24

DISTRIBUTION OF LOTS ACCORDING TO VARIETIES OF PADI CULTIVATED

Varieties of Padi	Section 2			
	Block E	Block Q	Block S	Block W
Radin	2	1	4	3
Mayang Rambai	-	-	1	-
Radin + Pulut	1	-	-	-
Radin + Padi Burong	-	-	-	-
Radin + Mayang Rambai	-	1	-	1
Mixed	1	3	-	1
Total	4	5	5	5

It is clear from Table 4:24 that Block S has 4 out of the 5 lots under Medin, as compared to Block E which has only 2 out of 5 lots under this variety.

Working in union with the above two factors to "cause" the yield variations among the four Blocks within this Section is the factor of soil management. Like all the previous cases high yields are found in those Blocks which are cultivated with maize and/or mixed crops during the off-season. As seen from Table 4:25, Block ~~which~~ has 1 lot under maize, 2 under mixed crops and 2 out of the 5 lots left fallow during the off-season. So also Block W which has the second highest yield within this Row, has 4 lots out of the 5 randomised lots under maize. In fact Block W has the highest number of lots under maize as compared to all the 12 Blocks under study.

TABLE 4:25

DISTRIBUTION OF LOTS ACCORDING TO CROP ROTATION IN SECTION 2

Crop Rotation	Block E	Block Q	Block S	Block W
Fallow	3½	3	2	1
Maize	-	2	1	4
Mixed	½	-	2	-
Total	4	5	5	5

Other factors such as the degree of remedial action taken against pests and diseases by farmers of each Block, and method of harvesting certainly have an influence on the yield causing the yield variation but these are only of minor importance in the discussion of the variation just mentioned above.

Finally we come to Section 3. In this Section the yield variation among the three Blocks are comparatively very great. This Section embodies the lowest yielding Block F and also the second highest yielding Block T.

The main cause of the extremely poor yield of Block F is the peaty nature of the soil. As discussed in the Row Approach, Block F lies in the peat region.

From the information collected, it seems that soil management during the off-season is a very important factor responsible for this yield variation as seen in Table 4:26.

As discussed earlier, the cultivation of maize and/or mixed crops has a marked improvement in the yield. From Table 4:26, it was found that Block F, the poorest yielding Blocks has all 4 lots being left fallow during the off-season.

TABLE 4:26

DISTRIBUTION OF LOTS ACCORDING TO CROP ROTATION IN SECTION 3

Crop Rotation	Section 3		
	Block F	Block R	Block T
Fallow	4	-	-
Maize	-	1½	1
Mixed	-	3½	4
Total	4	5	5

The extremely poor yield of Block F can also be due to the fact that most of its lots are under the tenant system of operation as can be seen Table 4:27.

Block F has only 1 lot under Owner/operator out of 4 lots. In contrast, Block R and Block T have 5 and 3 lots respectively under owner-operation out of 5 lots in each case.

TABLE 4:27

DISTRIBUTION OF LOTS ACCORDING TO SYSTEMS OF OWNERSHIP AND OPERATION IN SECTION 3

Blocks	Total No.of Randomised Lots	Yield (Gantangs)	Systems of Ownership and Operation				
			Owner/ Operator	Co-owners/ Co-operators	Giftee/ Family Relationship	Tenant/ Operator	2 Tenant Operator
F	4	119	1	-	1	1	1
R	5	238	5	-	-	-	-
T	5	306	3	1	1	-	-
Total	14	663	9	1	2	1	1

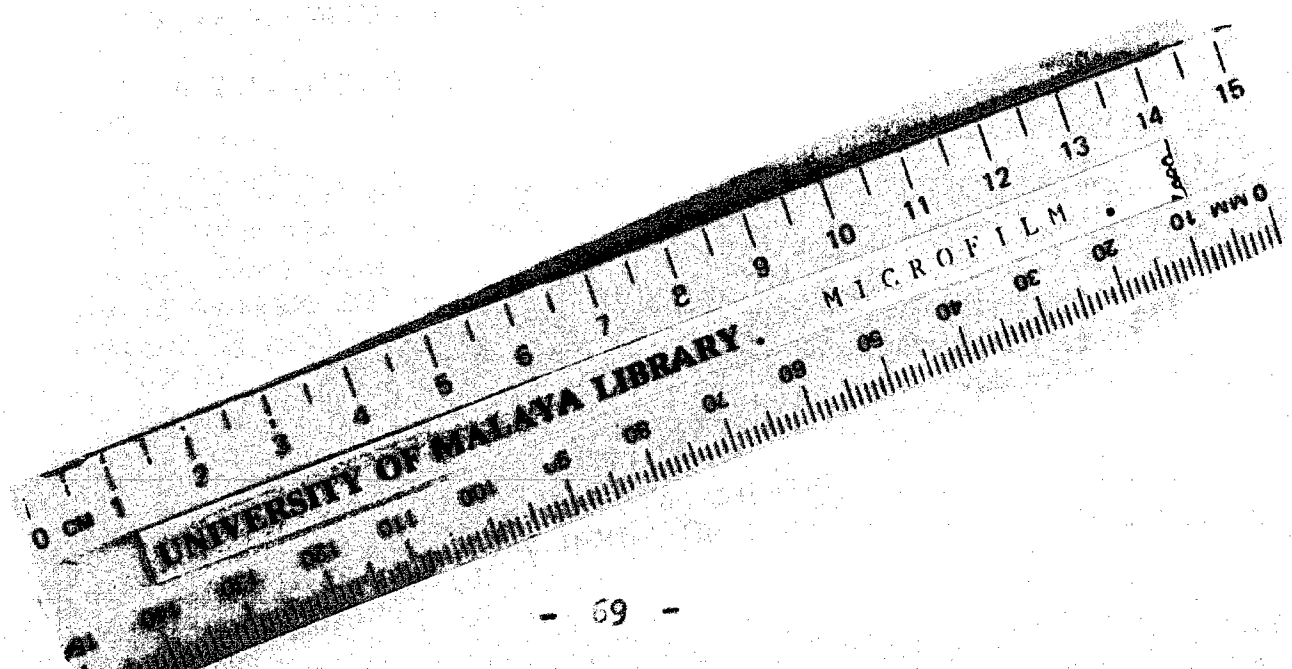
The analysis on Inter-Block Yield variation by both approaches reveal many things which broadly classified are:

i) the yield of padi for the whole area is very low, only 228 gantangs.

ii) that the yield varies from Block to Block, Row to Row and from Section to Section but the yield variations is most pronounced among the Rows and among the individual Blocks.

iii) that altogether at least seven main factors are cited for causing the yield variations but it does not mean that all the seven factors acted simultaneously to the same degree in one Block, Row or Section to cause the yield variations; rather, it is some combination of these factors which is responsible for the yield variations.

The combined analysis on the Inter-Block Yield Variations therefore give a very clear picture of the yield pattern among the Blocks and of the factors responsible for their yield variations.



CHAPTER V

INTRA-BLOCK YIELD VARIATIONS

The variations in the yields of padi are not only confined to the Blocks alone but also to the lots within the Blocks, that is to say, there are yield variations both Inter and Intra-Blocks. The analysis on the yield variations among the lots within a Block gives a more detailed and specific "account of the yields and of the factors responsible for their "behaviour," for Intra-Block yield variation goes very much deeper into the subject.

Sixty lots have been randomly selected but information was not available for two lots - Lot No. 2456 in Block E and Lot No. 2056 in Block F.

Analysis of Intra-Block Variations

The Intra-Block Yield Variations analysis has been confined to six blocks - Blocks F, D, E, V, T and S arranged in order of ascending yield. Blocks F, D and E had the lowest yield while Blocks V, T and S the highest in the whole of the area. The idea behind selecting these six Blocks out of the total of twelve is to compare these two categories for factors that are responsible for such wide yield variations within each Block. The relevant Tables for the rest of the Blocks are, however, given at the end of this Chapter for comparison sake. It is to be noted that the yields of all the lots within their respective Blocks have been arranged in descending order of yield.

Block F

Block F is the lowest yielding Block among the twelve Blocks under study as discussed in Chapter IV. It's yield is only 119 gantangs.

The Intra-Block Yield Variations in this Block are shown in Table 5:1.

Table 5:1 shows the sampled lots arranged in descending order of yields. With the exception of Lot No. 2096 where the yield is only 55 gantangs, the yields of the remaining three lots fall within the category of between 100 and 200 gantangs. The yields of the four lots vary between 55 gantangs and 173 gantangs. The highest yielding lot, namely, Lot No. 2097 produces above the average productivity of the Block by 45.5% while the lowest yielding Lot, Lot No. 2096 produces below the average productivity of the Block by 53.8%.

Here three factors stand out as important to account for the yield variations among the four lots. The first of the three outstanding

TABLE 5:1

ACREAGE, PRODUCTION AND YIELD VARIATIONS IN BLOCK F

Lot Nos.	Total Acreage Under Padi	Production (Gantangs)	Yield (Gantangs)	Percentage of Block Yield
2097	2.84	490	173	145.5
2108	2.94	390	133	111.8
2101	2.98	352	118	99.2
2096	3.04	168	55	46.2
*2056	-	-	-	-
Total	11.80	1,400	119	100.0

TABLE 5:2

EFFECTS OF NUMBER OF LOTS OWNED AND/OR OPERATED ON YIELD OF THE SAMPLED LOTS IN BLOCK F

Lot No.	Yield (Gantangs)	Lots Owned		Lots Operated		Members in Family Who Are:	
		No.(s) of Lot	Block	No.(s) of Lot	Block	Owner(s)	Operator(s)
2097	173	-	-	-	-	-	-
2108	133	-	-	-	-	-	-
2101	118	1	R	1	R	-	-
2096	55	-	-	2	F	2	1
2056	-	-	-	-	-	-	-

factors is the size of the holdings and/or farms owned and/or operated by the farmers concerned. This is seen in Table 5:2

The number of lots owned and/or operated appears to be the most outstanding factor responsible for the yield variations among the lots, particularly that of Lot Nos. 2096 and 2101. The farmer of Lot No. 2096 where the yield is lowest, operates two other lots in Block F.

*This lot was totally uncultivated.

The low yield may be due to the fact that labour is divided, for they tend to operate more than one lot and, with the exception of the farmer of Lot No. 2096 who has another person to help him, the farmer of Lot No. 2101 has to cultivate the two lots all by himself. Then the farmers concerned as a whole cannot devote so much time to one lot, with the result that yield was low. In contrast, the farmers of Lot Nos. 2097 and 2108 can devote the whole of their time to the sampled lots alone.

The second striking factor responsible for the Intra-Block Yield Variations of this Block can be attributed to the different varieties of padi sown by the farmers in the different lots, as shown in Table 5:3.

TABLE 5:3

YIELD VARIATION AND PADI VARIETIES IN BLOCK F

Lot No.	Yield (Cantangs)	Variety of Padi Cultivated		
		Radin	Siam	Pulut
2097	175	2½* acres	-	½ acre
2108	133	+§	-	-
2101	118	§	-	-
2096	55	-	§	-
2056	-	-	-	-

It is clear from the above Table that lots cultivated with Radin have the higher yield, for example, Lot Nos. 2097 and 2108 and even Lot No. 2101, while the lot cultivated with padi Siam has the lowest yield and this is the case with Lot No. 2096. Padi Radin then, on the whole, can be said to be of a higher yielding variety.

Interacting with the above two factors which are responsible for the inter-lot yield variations in this Block is the third factor that of the conditions of water supply

*All these and subsequent accreages are approximations.

+This "§" sign here denotes that the whole lot is under that particular variety of padi; otherwise "§" sign denotes throughout, the presence of that factor in the lot concerned.

TABLE 5:4

YIELD VARIATION AND CONDITIONS OF WATER SUPPLY IN BLOCK F

Lot No.	Yield (Gantan	Condition of Water Supply		
		Sufficient	Insufficient	Excessive
2097	173	§	-	-
2108	133	§	-	-
2101	188	§	-	-
2096	55	-	§	-
2056	-	-	-	-

Insufficiency of water is in reality one of the many factors responsible for low yield and the finding is attested in Table 5:4. Here the Lot with insufficient water, namely Lot No. 2096 has the poorest yield compared to the other lots whose yields are comparatively much higher, and these lots have sufficient water supply.

Three other factors responsible for the yield variations of this Block but more for the poor yield of this Block as a whole, are,

i) the peaty nature of the soil

ii) the wide prevalence of pests and diseases (in addition in Lot Nos: 2108, 2101 and 2096 the damage caused by rats - this probably is quite an effective factor responsible for the lower yield of these three lots compared to Lot No. 2097 which is not affected by rats) and

iii) the fact that the whole area of each of the four lots were left fallow during the off-season.

Though these factors are to some extent responsible for the yield variation among the lots, they are not so significant compared to the three already discussed, because they prevailed in all the lots; their "only" effect is the degree of their influence.

Block D

Block D with a yield of 120 gantangs is the second lowest yielding Block of the twelve Blocks. The yield variation of the lots are shown in Table 5:5.

TABLE 5:5

ACREAGE, PRODUCTION AND YIELD VARIATIONS IN BLOCK D

Lot No.	Total Acreage Under Padi	Production (Gantangs)	Yield (Gantangs)	Percentage of Block Yield
3096	2.76	420	152	126.7
3052	2.82	421	149	124.2
3056	2.86	362	127	105.8
3040	2.63	243	92	76.7
3011	2.77	209	75	62.5
Total	13.84	1,655	120	100.0

As depicted in Table 5:5, the yield of the Block is 120 gantangs. The Table also revealed the fact that the yields of the five lots vary from 75 gantangs to 152 gantangs, the former being the yield of Lot No. 3011 and the latter, the yield of Lot No. 3039.

Although four main factors, namely,

i) conditions of water supply during the time of transplanting,

ii) variations in the period of sowing, transplanting and harvesting (i.e. the cultural practices)

iii) the prevalence of pests anddiseases and

iv) the lack of remedial measures taken against pests and diseases,

are together responsible for the generally very poor yield for the Block as a whole, and for the variations in the yield among the lots, the two most prominent factors are the first two.

With regard to the conditions of water supply, the significance of this factor is seen in Table 5:6.

As can be seen from the Table, Lot Nos.3011 and 3040 have insufficient water supply, thus explaining their low yields. In contrast, Lot No. 3056 which has a comparatively higher yield has sufficient water supply. No doubt it is true that both Lot Nos. 3039 and 3052, the two highest yielding lots suffered from insufficient water supply, but it must be remembered that variations in the water supply is only one of the factors and yield is not dependent on one factor alone.

TABLE 5:6

YIELD VARIATION AND CONDITIONS OF WATER SUPPLY IN BLOCK D

Lot No.	Yield (Gantangs)	Condition of Water Supply		
		Sufficient	Insufficient	Excessive
3039	152	-	§	-
3052	149	-	§	-
3056	127	§	-	-
3040	92	-	§	-
3011	75	-	§	-

The periods for sowing, transplanting and harvesting constitute most probably, the other important factor for the Intra-Block Yield Variation of this Block. The effect of this factor on the yields of the five lots in this Block is shown in Table 5:7.

TABLE 5:7

EFFECT OF CULTURAL PRACTICES ON YIELD IN BLOCK D

Lot No.	Yield (Gantangs)	Approximate Date of		
		Sowing	Transplanting	Harvesting
3039	152	1w/9/'64	2w/10/'64	3w/3/'65
3052	149	4w/9/'64	2w/10/'64	4w/3/'65
3056	127	4w/8/'64	1w/10/'64	2w/4/'65
3040	92	1w/9/'64	2w/10/'64	3w/3/'65
3011	75	2w/10/'64	3w/11/'64	1w/4/'65

*"w" here denotes the week, while the figure after the strokes denote the month and year respectively. Thus 2w/10/'64 means 2nd. week of October, 1964.

From the above Table, it can beseen that the higher yields of Lot Nos. 3039, 3052 and 3056 may be due to the fact that the farmers of these lots started sowing and transplanting earlier as compared to the farmers of Lot No. 3011. The farmer of Lot No. 3056 started sowing as early as the fourth week of August, while the farmers of Lot No. 3011 started sowing as late as the second week of October. Owing to the late sowing, other farm operations were also delayed. Thus the farmers who started sowing earlier were able to take fuller advantage of the water supply.

Block E

Block E which represents the last of the three lowest yielding blocks has a yield of 130 gantangs. The yield variation is certainly of a very high order in this Block as can be seen from the Table below.

TABLE 5:8

ACREAGE, PRODUCTION AND YIELD VARIATIONS IN BLOCK E

Lot No.	Total Acreage Under Padi Cultivation	Production (Gantangs)	Yield	
			Gantangs	Percentage of Block Yield
2518	2.97	645	217	166.9
2487	2.89	426	147	113.1
2460	2.97	383	129	99.2
2444	2.77	56	20	15.4
2456*	-	-	-	-
Total	11.60	1,510	130	100.0

As noted from Table 5:8 above, the yield varies from as low as 20 gantangs to as high as 217 gantangs. These two extreme yields come from Lot Nos. 2444 and 2518 respectively. The yield variation is therefore one of extreme, a difference of 197 gantangs.

What then are the main factors responsible for this extremity in the yields? Two factors stand out more prominently as being responsible for this pattern. The first of the two main factors is that of the varieties of padi cultivated.

*No information was available for this Lot.

From Table 5:9, it can be seen that all the comparatively high yielding lots, namely, Lot Nos. 2518 and 2487 were cultivated with Padi Radin while the poorest yielding lot, that is, Lot No. 2444 was cultivated with both Padi Radin and Pulut - about 1½ acres of each.

The second important factor, that of the conditions of water supply also interacted with the other factors to cause the yield variations among the lots. Table 5:10 is drawn up to show the effect of this factor on the yields of the lots in this Block.

TABLE 5:9

YIELD VARIATION AND PADI VARIETIES IN BLOCK E

Lot No.	Yield (Gantangs)	Variety of Padi Cultivated		
		Radin	Siam	Pulut
2518	217	§	-	-
2487	147	§	-	-
2460	129	-	§	-
2444	20	1½ acres	-	1½ acres
2456	-	-	-	-

TABLE 5:10

YIELD VARIATION AND CONDITIONS OF WATER SUPPLY IN BLOCK E

Lot No.	Yield (Gantangs)	Condition of Water Supply		
		Sufficient	Insufficient	Excessive
2518	217	-	-	§
2487	147	§	-	-
2460	129	§	-	-
2444	20	-	§	-
2456	-	-	-	-

As seen from the above Table, although the highest yielding lot, has excessive water supply, Lot Nos. 2487 and 2460, the second and third highest yielding lots respectively, have sufficient water supply, while the poorest yielding lot (Lot No.2444) has insufficient water supply. Such a finding serves to denote the fact that condition of water

supply from one of the main factors responsible for the Intra-Block Yield variation of this Block.

Other factors like the peaty nature of the soil, the prevalence of pests and diseases (all the lots were affected by pests and diseases), the lack of remedial actions taken against pests and diseases, and the practice of leaving the land fallow during the off-season (here 3 out of the 4 lots were left fallow, the only exception being Lot No. 2487, where 1.5 acres was planted with tapioca) are together with the two already discussed, responsible for the comparatively poor yield of 3 out of the 4 lots and for the yield variation among the lots in this Block.

We will now proceed to examine the Intra-Block Yield Variation of the three highest yielding Blocks, namely, Blocks V, T and S arranged in ascending order of yield. The Block yield of these 3 Blocks are over 290 gantangs each.

Block V

Block V represents the lowest yielding Block of the three highest yielding Blocks. The yield for this Block as a whole, is 299 gantangs. One very striking feature of this Block besides the yield variation is that, the padi yields of 4 out of the 5 lots (only exception being Lot No. 2761) cluster around the 300 gantangs mark. This is seen in Table 5:11.

TABLE 5:11

ACREAGE, PRODUCTION AND YIELD VARIATIONS IN BLOCK V

Lot No.	Total Acreage Under Padi	Production (Gantangs)	Yield (Gantangs)	Percentage of Block Yield
2779	2.96	1,160	392	131.1
2781	2.63	1,014	385	128.8
2764	2.93	924	315	105.3
2786	.91	275	302	101.0
2761	3.54	503	142	47.5
Total	12.97	3,876	299	100.0

From the above Table, it was noted that a total cultivated area of 12.97 acres gives a total production of 3,876 gantangs, thus giving a yield of 299 gantangs.

Taking this 299 gantangs as the yield for this Block, then Lot No. 2779, the highest yielding lot, is producing above the average productivity of this Block by 31.1% while the poorest yielding lot,

Lot No. 2761 with a yield of 142 gantangs is producing below the average productivity of the Block by 52.5%. The yields of the five lots as seen, vary between 142 gantangs and 392 gantangs.

The yield variation among the lots are attributed to the interaction of three main factors, namely,

i) the system of ownership and operation

ii) the conditions of water supply and

iii) the extent of pests, diseases and wind destruction

The effect of the different systems of ownership and operation on yield is clearly depicted in this Block as shown in Table 5:12.

TABLE 5:12

YIELD VARIATION AND TYPES OF OWNERSHIP AND OPERATION IN BLOCK V

Lot No.	Yield (Gantangs)	Type of Ownership and Operation			
		Single owner-operators	Multiple/Joint Ownership		Family Relation-ship
			Two owner-operators	Three owner-operators	
2779	392	§	-	-	-
2781	385	§	-	-	-
2764	315	-	-	-	§
2786	302	-	-	-	§
2761	142	-	§	-	-

In the highest two yielding lots, namely, Lot No. 2779 and 2781, there is only one owner each and the owner operates the land himself, whereas in the case of Lot No. 2761 where the yield was the lowest, it was a case of multiple/joint ownership and operation. This lot is divided between two owners, one owner having about 1½ acres and the other having about 2 acres. These two co-owners operate the land themselves. The low yield of this lot, (beside other factors) may, in all probability, has arisen out of the fact that the co-owner-operators do not have sufficient land to work on.

Not only do the high yielding lots benefit from the advantages of single owner-operation but they also benefit from sufficient water supply.

TABLE 5:13

YIELD VARIATION AND CONDITIONS OF WATER SUPPLY IN BLOCK V

Lot No.	Yield (Gantangs)	Condition of Water Supply		
		Sufficient	Insufficient	Excessive
2779	392	§	-	-
2781	385	§	-	-
2764	315	-	§	-
2786	302	-	-	§
2761	142	§	-	-

In this Block 3 cut of the 5 lots experiences sufficient water supply and out of these three lots, two (Lot Nos. 2779 and 2781) have comparatively very high yield. The two lots experiencing insufficient and excessive water supply are the lots with comparatively lower yields. However, it is not surprising that the lowest yielding lot, Lot No. 2761, should have sufficient supply because condition of water supply is not the only factor responsible for yield, for yield, as said earlier, is a function of not one but many factors.

The influence of pests, diseases and wind constitutes the third main factor responsible for the variation in the yields of the five lots. This is illustrated in Table 5:14.

TABLE 5:14

YIELD VARIATION AND TYPES OF CROP DAMAGE IN BLOCK V

Lot No.	Yield (Gantangs)	Type of Crop Damage		
		Insect Pests	Rats	Wind
2779	392	-	-	§ (slight)
2781	385	-	-	§ (")
2764	315	§ (slight)	§	-
2786	302	§	§	-
2761	142	-	§	-

In this Block rats and wind appeared to play a much greater role than insect pests. Here only 2 out of the 5 lots suffer from insect pest attack and in the case of Lot No. 2764, it was only a slight one. The latter also suffer from rat attacks. In contrast, Lot Nos. 2779 and 2781 suffer from the effect of wind. The farmers who were interviewed reported that the wind or "Rebah" as they called it, in this Block, is very strong and it usually "flattens" the padi plants. This has an effect on the yield in that there is a reduction in the yield.

Another factor responsible for the yield variation in this Block is that of the different types of off-season land use practiced by the farmers. This is illustrated in Table 5:15.

TABLE 5:15

YIELD VARIATION AND OFF-SEASON LAND USE IN BLOCK V

Lot No.	Yield (Cantangs)	Type of Off-season Land Use	
		Fallow	Maize
2779	392	1½ acres	1½ acres
2781	385	-	§
2764	315	-	§
2786	302	-	§
2761	142	2½ acres	½ acre

As seen above, the farmers of Lot Nos. 2781, 2764 and 2786 cultivated the whole lot with maize during the off-season and this probably is one of the reasons as to why these three lots have comparatively very high yields. In contrast, Lot No. 2761, the poorest yielding ~~lot~~, has 2½ acres left fallow during the off-season.

Block T

Block T is certainly a Block where the yield variation among the lots are one of extremes. This can be clearly seen in Table 5:16

As seen from this Table, the total cultivated area of 14.16 acres under padi, gives a total production or output of 4,330 gantangs, thus giving a Block yield of 306 gantangs. As discussed in Chapter IV, this represents a comparatively a very high yield.

As seen from this Table also, the yield varies from as low as 161 gantangs to as high as 576 gantangs. Lot No. 2399 with a yield of 576 ~~gantangs~~ is, in fact, the highest yielding lot among the 58 lots. There is no doubt that this lot has an exceptionally high yield comparatively. Several factors have contributed to this as can be seen later.

TABLE 5:16

ACREAGE, PRODUCTION AND YIELD VARIATIONS IN BLOCK T

Lot No.	Total Acreage Under Padi	Production (Gantangs)	Yield (Gantangs)	Percentage of Block Yield
2399	3.04	1,750	576	188.2
2398	2.79	870	312	102.0
2378	2.85	800	281	91.8
2324	2.93	500	171	55.9
2392	2.55	410	161	52.6
Total	14.16	4,330	306	100.0

In between the two extremes, the yield variations of the remaining lots are very irregular. However, Lot No. 2378 appears to be the dividing line separating those lots with the very high yields - 576 gantangs and 312 gantangs of Lot Nos. 2399 and 2398 respectively - from those with the very low yields - 171 gantangs and 161 gantangs of Lot Nos. 2324 and 2392 respectively.

It was seen therefore that there are extreme variations in the yields among the lots; the variation being most pronounced when a comparison of the yields of the highest yielding lot (Lot No. 2399) and of the lowest yielding lot (Lot No. 2392) is made, for there is a difference of 415 gantangs.

The extremely high yield of Lot No. 2399 can be attributed mainly to three factors. In the first place, this lot was cultivated by the owner himself and enjoyed, therefore, the advantages of this system. In the second place, this lot was not left fallow during the off-season, but was instead wholly cultivated with maize and sweet potatoes. In the third place, the owner-operator of this lot was one of the two operators out of five operators who made use of rat poison to kill the rats that were damaging the crops.

Although it may be argued, that some of these factors, especially that of the different types of off-season land use, were operating in the other lots too and consequently these lots, particularly Lot Nos. 2324 and 2392, should have high yield too, this is not so because there are other factors whose influence are stronger than those mentioned above, and therefore responsible for the comparatively low yields of these lots as a whole.

We now proceed to examine two of the factors which work to the disadvantage of the lower yielding lots and which were therefore responsible for the variations in the yields as a whole. The first

of these is that of the importance of fertilizer, and this is illustrated in Table 5:17.

TABLE 5:17

YIELD VARIATION AND THE IMPORTANCE OF FERTILIZER IN BLOCK T

Lot No.	Yield (Gantangs)	Application of Fertilizer
2399	576	-
2398	312	-
2378	281	§
2324	171	-
2392	161	-

It is clear from the above table that the use of fertilizer is not a common practice, for it was only in 1 out of the 5 lots that fertilizer was used and in this particular lot, the yield is 281 gantangs, which is, compared to Lot Nos. 2324 and 2392, comparatively high.

The second main factor responsible for the yield variation in this Block is that pertaining to the size of the holdings and farms as illustrated in Table 5:18.

TABLE 5:18

YIELD VARIATION AND NUMBER OF LOTS OWNED AND/OR OPERATED IN BLOCK T

Lot No.	Yield (Gantangs)	Lots Owned			Lots Operated		
		No(s) of Lots	Block	Lot No.	No(s) of Lots	Block	Lot No.
2399	576	-	-	-	-	-	-
2398	312	-	-	-	-	-	-
2378	281	1	V	2304	-	-	-
2324	171	1	Q	-	1	Q	-
2392	161	-	-	-	1	T	2396

The size of holdings and/or farms as the case may be, certainly has an effect on the yield. From Table 5:13 it was seen that in the first two lots that is, the very high yielding lots, the farmers do not own and/or operate other lots, consequently, they can devote their whole attention to the sampled lots. On the other hand, the farmer of Lot No. 2324 not only owns another lot in Block Q but also operates that lot, and as Block Q is quite far away from Block T, it is possible that much time was lost in travelling from one Block to the other and this may have caused the reduction in the yield of this lot.

Similarly, this situation may have occured in the case of Lot No. 2392 where the farmer operates another lot in the same Block.

Block S

Block S has the highest yield in all the twelve Blocks. It is the most fertile Block as discussed in Chapter IV. Here the yield for the Block as a whole is 347 gantangs. As in the other Blocks, the yield variation of this Block is one of great irregularity. The yield pattern of this Block is laid out in Table 5:19.

TABLE 5:19

ACREAGE, PRODUCTION AND YIELD VARIATIONS IN BLOCK S

Lot No.	Total Acreage Under Padi	Production (Gantangs)	Yield (Gantangs)	Percentage of Block Yield
2731	2.54	1,313	517	149.0
2678	2.92	1,433	491	141.5
2696	3.00	893	298	85.9
2673	2.95	788	267	76.9
2725	3.02	588	195	56.2
Total	14.43	5,015	347	100.0

It will be observed from Table 5:19 that there are great variations in the yields of the five lots. The yield variation is most prominent when a comparison is made between the yield of Lot No. 2731 and that of Lot No. 2725. Here the difference is as great as 322 gantangs, - 517 gantangs of Lot No. 2731 and 195 gantangs of Lot No. 2725. The second highest yielding lot in this Block is Lot No. 2678 with a yield of 491 gantangs.

Although there are variations in the yields of the five lots, there is no doubt that Block S, as a whole, is a very fertile Block comparatively. The factors responsible for the high fertility of Block S has already been analysed in Chapter IV. Now we will look into the

factors responsible for the Intra-Block Yield Variation of this Block.

Of the five factors, namely,

i) the different systems of ownership and operation,

ii) the conditions of water supply

iii) the prevalence of pests and diseases

iv) the different types of off-season land use, and,

v) the different varieties of padi cultivated

the first four may be singled out as being mainly responsible for the very high and high yields of certain lots and the poor yield of at least one lot.

The different systems of ownership and operation play a very important role in determining the yield of padi in the lots of this Block. Such a situation is clearly illustrated in Table 5:20

TABLE 5:20

YIELD VARIATION AND SYSTEMS OF OWNERSHIP AND OPERATION IN BLOCK S

Lot No.	Yield (Gantangs)	System of Ownership and Operation	
		Single Owner-Operator	Tenant
2731	517	§	-
2678	491	§	-
2696	298	§	-
2673	267	§	-
2725	197	-	§

As illustrated in Table 5:20, the lot that has the lowest yield, that is, Lot No. 2725, is the one where the land was rented out. This lot was rented out not to one tenant but to two tenants; each operating 1½ acres. In comparison, the remaining four lots are under the single owner and operator system of operation and these lots have comparatively high yields, or comparatively very high yields in the case of Lot Nos. 2731 and 2678. The main conclusion to be drawn from such a situation is that of the advantages attach to the single owner - operator system of operation as explained in Chapter III.

The conditions of water supply pose as another factor responsible for the yield variations among the lots in this Block.

As seen from Table 5:21 the first three lots with high yield have sufficient water supply while the two low yielding lots experienced excessive water supply and this is a very likely cause of the low yields of these two lots.

The extent of the influence of pests and diseases is also responsible for the comparatively very low yield of Lot No. 2725, as seen in Table 5:22.

TABLE 5:21

YIELD VARIATION AND CONDITIONS OF WATER SUPPLY IN BLOCK S

Lot No.	Yield (Gantangs)	Condition of Water Supply		
		Sufficient	Insufficient	Excessive
2731	517	§	-	-
2678	491	§	-	-
2696	298	§	-	-
2673	267	-	-	§
2725	195	-	-	§

TABLE 5:22

YIELD VARIATION AND TYPES OF CROP DAMAGE IN BLOCK S

Lot No.	Yield (Gantangs)	Type of Crop Damage	
		Insect Pests	Rats
2731	517	§	-
2678	491	§	-
2696	298	§	-
2673	267	§	-
2725	195	§	§

As seen from Table 5:22, although all the lots were affected by insect pests and diseases, the lowest yielding lot was, in addition, affected by rats.

The last of the four main factors responsible for the yield variation of the lots in Block S is that of the pattern of off-season land use.

TABLE 5:23

YIELD VARIATION AND OFF-SEASON LAND USE IN BLOCK S

Lot No.	Yield (Gantangs)	Type of Off-Season Land Use		
		Fallow	Maize	Mixed Crops
2731	517	-	-	§
2678	491	1 acre	-	2 acres
2696	298	2 acres	-	½ acre
2673	267	-	-	§
2725	195	§	-	-

The importance of the cultivation of maize and/or other crops in influencing yield in the upward direction is clearly seen in Table 5:23. Those lots which were cultivated with maize and other crops have higher yields and this is especially true in the case of Lot Nos. 2731 and 2678. In contrast, Lot No. 2725 which has the lowest yield, has the whole area left fallow during the off-season.

The detailed analysis of the Intra-Block Yield Variations of six Blocks, three of very low yields and three of very high yields, has shown that great yield variations (especially in the case of the three high-yielding Blocks) exist among the lots within their respective Blocks and that these variations were due to the interaction or inter-play of many factors, some of which stand out more prominently in one Block than another.

We will now proceed to examine the Intra-Block Yield Variations of the remaining six Blocks, arranged in the order of ascending Block yield, mainly with the illustrations of Tables.

Block Q

First among these six Blocks is Block Q whose Block yield is 193 gantangs. As in the other Blocks the yield here varies from lot to lot and three main factors, namely, that of the different types of off-season landuse, that of the conditions of water supply and that of the extent of the influence of pests and diseases, were responsible for these yield variations. All these are depicted in the following

four Tables.

TABLE 5:24

ACREAGE, PRODUCTION AND YIELD VARIATIONS IN BLOCK Q

Lot No.	Total Acreage Under Padi	Production (Gantangs)	Yield (Gantangs)	Percentage of Block Yield
2567	2.76	1,180	430	222.8
2619	2.72	568	209	108.3
2604	2.98	400	134	69.4
2612	2.90	311	107	55.4
2544	3.04	316	104	53.9
Total	14.40	2,783	193	100.0

In this Block the yield varies between 104 gantangs and 430 gantangs.

TABLE 5:25

YIELD VARIATION AND TYPES OF OFF-SEASON LAND USE IN BLOCK Q

Lot No.	Yield (Gantangs)	Type of Off-season Land Use		
		Fallow	Maize	Mixed Crops
2567	430	-	1½ acres	½ acre
2619	209	-	§	-
2604	134	§	-	-
2612	107	1½ acres	1½ acres	-
2544	104	2½ acres	-	½ acre

It will be observed above that the lots with higher yields have been planted with maize and/or other crops during the off-season while lots with lower yields were mainly left fallow during the off-season.

TABLE 5:26

YIELD VARIATION AND CONDITIONS OF WATER SUPPLY IN BLOCK Q

Lot No.	Yield (Gantangs)	Condition of Water Supply		
		Sufficient	Insufficient	Excessive
2567	430	§	-	-
2619	209	§	-	-
2612	134	-	-	§
2604	107	-	-	§
2544	104	§	-	-

It is clear from Table 5:26 that the higher yielding lots as a whole have sufficient water supply, while the lower yielding lots as a whole have excessive water supply.

TABLE 5:27

YIELD VARIATION AND TYPES OF CROP DAMAGE IN BLOCK Q

Lot No.	Yield (Gantangs)	Type of Crop Damage		
		Insect Pests	Rats	Wind + Rats
2567	430	§	-	-
2619	209	§	-	-
2612	134	-	-	§
2604	107	-	-	§
2544	104	§	§	-

As seen from the above Table the extent of influence of pests and diseases, constitutes an important factor in determining yield and therefore is responsible for the yield variations among the lots.

Block U

Next comes Block U, with a Block yield of 201 gantangs. The Intra-Block yield variation of this Block and the factors responsible for their variations can be seen in the following Tables.

TABLE 5:28

ACREAGE, PRODUCTION AND YIELD VARIATIONS IN BLOCK U

Lot No.	Total Acreage Under Padi	Production (Gantangs)	Yield (Gantangs)	Percentage of Block Yield
2293	2.87	975	340	169.1
2254	1.97	546	277	137.8
2274	2.87	618	215	107.0
2303	1.57	200	127	63.2
2292	2.86	101	35	17.4
Total	12.14	2,440	201	100.0

The yields of the lots in this Block varies from as low as 35 gantangs to as high as 340 gantangs.

Three main factors are cited as being responsible for the yield variation, and these are laid out in the following Tables.

TABLE 5:29 (A)

YIELD VARIATION AND CULTURAL PRACTICES IN BLOCK U

Lot No.	Yield (Gantangs)	Approximate Dates of		
		Sowing	Transplanting	Harvesting
2293	340	August '64	November '64	April '65
2254	277	August '64	November '64	April '65
2274	215	October '64	December '64	April '65
2303	127	October '64	December '64	May '65
2292	35	October '64	November '64	April '65

From Table 5:29(A) it was seen that the farmers of the high yielding lots began sowing as early as August and so were able to enjoy the advantages of sufficient water supply as shown in Table 5:29 (B). In the low yielding lots, sowing was began later and so these lots experienced either insufficient or excessive water supply as seen in Table 5.29 (B).

TABLE 5:29 (B)

YIELD VARIATION AND CONDITIONS OF WATER SUPPLY IN BLOCK U

Lot No.	Yield (Gantangs)	Condition of Water Supply		
		Sufficient	Insufficient	Excessive
2293	340	§	-	-
2254	277	§	-	-
2274	215	-	-	§
2303	127	-	§	-
2292	35	-	-	§

The fact that some remedial actions were taken against pests and diseases by the farmers of the higher yielding lots can be put forward as one of the three main factors responsible for the yield variations of the lots in this Block as shown in Table 5:30.

TABLE 5:30

YIELD VARIATION AND REMEDIAL MEASURES TAKEN IN BLOCK U

Lot No.	Yield (Gantangs)	Type of Remedial Measures Taken	
		Spraying	Rat Poison
2293	340	§	-
2254	227	-	-
2274	215	-	§
2303	127	-	§
2292	35	-	-

Block K

Variation in the padi yields of the five sampled lots in Block K ranges between 137 gantangs and 336 gantangs. This can be seen in Table 5:31.

Two main factors stand out very prominently as being responsible for the yield variations among the lots in this Block. The first of these is the different systems of ownership and operation and the second

TABLE 5:31

ACREAGE, PRODUCTION AND YIELD VARIATIONS IN BLOCK K

Lot No.	Total Acreage Under Padi	Production (Gantangs)	Yield (Gantangs)	Percentage of Block Yield
2982	2.84	954	336	163.1
2920	2.65	592	223	108.2
2992	2.69	532	198	96.1
2926	2.79	492	176	85.4
2896	4.60	632	137	66.5
Total	15.57	3,202	206	100.0

TABLE 5:32

YIELD VARIATION AND SYSTEMS OF OWNERSHIP AND OPERATION IN BLOCK K

Lot No.	Yield (Gantangs)	System of Ownership and Operation			
		Single owner-operator	Multiple/Joint owner-Operator	Tenant	
				One Tenant	Two Tenants
2982	336	§	-	-	-
2920	223	§	-	-	-
2992	198	-	-	-	§
2926	176	-	§	-	-
2896	137	-	§	-	-

is the different types of off-season land use. Table 5:32 and Table 5:33 respectively bring out these points. It is clear from the above Table that the higher yielding lots (Lot Nos. 2982 and 2920) of this Block were operated on the single owner-operator basis, as compared to the low yielding lots (Lot Nos. 2926 and 2896) where the lots were operated on the Multiple/joint owner-operator basis.

TABLE 5:33

YIELD VARIATION AND OFF-SEASON LAND USE IN BLOCK K

Lot No.	Yield (Gantangs)	Type of Off-Season Land Use		
		Fallow	Maize	Mixed Crops
2982	336	-	§	-
2920	223	-	-	§
2992	198	§	-	-
2926	176	2 acres	-	½ acre
2996	137	§	-	-

The importance of the different types of land use practiced by the farmers during the off-season as a factor affecting yield is seen in Table 5:33.

Block R

The Intra-Block Yield Variations of Block R is illustrated in Table 5:34

TABLE 5:34

ACREAGE, PRODUCTION AND YIELD VARIATIONS IN BLOCK R

Lot No.	Total Acreage Under Padi	Production (Gantangs)	Yield (Gantangs)	Percentage of Block Yield
2225	2.97	1,100	370	155.4
2151	2.96	750	253	106.3
2217	2.98	567	190	79.8
2211	2.69	510	189	79.4
2149	3.11	575	185	77.7
Total	14.71	3,502	238	100.0

In this Block only one factor appears to be of great significance in being responsible for the yield variation of this Block. The influence of this factor is seen in Table 5:35.

TABLE 5:35

YIELD VARIATION AND IMPORTANCE OF FERTILIZER IN BLOCK R

Lot No.	Yield (Gantangs)	Fertilizer
2225	370	§
2151	253	-
2217	190	-
2211	189	-
2149	185	-

Here the highest yielding lot is the one where fertilizer had been used.

Block W

The yields of the five lots in this Block vary between 168 gantangs and 387 gantangs as seen in Table 5:36.

TABLE 5:36

ACREAGE, PRODUCTION AND YIELD VARIATIONS IN BLOCK W

Lot No.	Total Acreage Under Padi	Production (Gantangs)	Yield (Gantangs)	Percentage of Block Yield
2735	2.66	1,030	387	145.0
2743	2.91	870	299	112.0
2752	2.70	693	257	96.3
2736	2.88	665	231	86.5
2733	2.82	475	168	62.9
Total	13.97	3,733	267	100.0

As in Block R, only one striking factor can be cited as being responsible for the Intra-Block Yield Variations of this Block, and the influence of this factor is seen in Table 5:37.

TABLE 5:37

YIELD VARIATION AND TYPES OF CROP DAMAGE IN BLOCK W

Lot No.	Yield (Gantangs)	Type of Crop Damage		
		Insect Pests	Rats	Wind
2735	387	§	-	-
2743	299	§	-	-
2752	257	-	-	§
2736	231	-	§	§
2733	168	§	§	§

All the lots suffer from pests and diseases of one type or another but the lowest yielding lot is subject to all three types of crop damage.

Block P

The yield variation of the lots in this Block is not of such a great magnitude as in most of the Blocks that have been analysed. Rather, the yield varies only between 179 gantangs and 280 gantangs as seen in Table 5:38.

TABLE 5:38

ACREAGE, PRODUCTION AND YIELD VARIATIONS IN BLOCK P

Lot No.	Total Acreage Under Padi	Production (Gantangs)	Yield (Gantangs)	Percentage of Block Yield
2853	2.96	982	332	122.5
2854	3.00	974	325	119.9
2847	2.81	788	280	103.3
2845	2.96	818	276	101.8
2791	4.06	725	179	66.1
Total	15.79	4,287	271	100.0

In this Block, the conditions of water supply stand out very prominently, among other factors as being mainly responsible for the inter-lot yield variations in this Block. This is illustrated in Table 5:39.

TABLE 5:39

YIELD VARIATION AND CONDITION OF WATER SUPPLY IN BLOCK P

Lot No.	Yield (Gantangs)	Condition of Water Supply		
		Sufficient	Insufficient	Excessive
2853	332	§	-	-
2854	325	§	-	-
2847	280	§	-	-
2845	276	-	-	§
2791	179	-	§	-

Here it can be observed that the high yielding lots have sufficient water supply while the low yielding lots have insufficient or excessive water supply.

This Chapter on "Intra-Block Yield Variations" has shown the many aspects pertaining to the yield of each of the five sampled lots in each of the twelve Blocks (with more detailed discussion on the first six Blocks), and among the many findings at least four main ones stand out. These, broadly classified are:

i) in most cases, the presence of great yield variation among the lots in each Block,

ii) that these yield variations are the result of not one but of the interaction or interplay of many factors,

iii) that some factors are more influential in determining the yield of the lots in one Block than in another Block and

iv) that among the many factors there are at least five very important ones and they are

a) the conditions of water supply

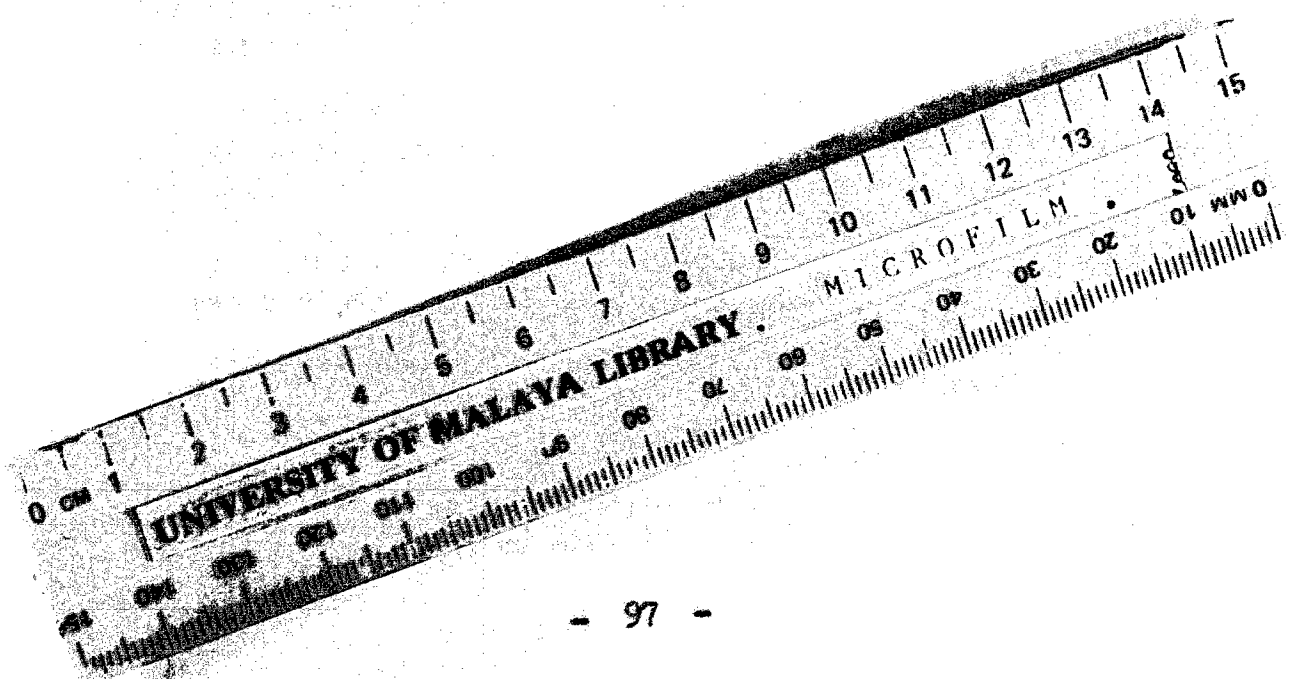
b) the different types of off-season land use

c) the different system of ownership and operation

d) the differing degree of pest and disease influences in the lots and

e) the different varieties of padi cultivated.

But before concluding this Chapter, it must be pointed out that all the factors thus discussed so far, operate in some degree or other, in most, if not all, the 58 lots and nearly in all cases it is not so much their total presence or absence that is purely responsible for the yield of each lot and hence the variation but rather, it is the extent or degree of their influence or effect working in combination with other factors that are mainly responsible for the yield of each lot and hence for the yield variations among the lots.



CHAPTER VI

SUGGESTIONS FOR INCREASING YIELD

Self Sufficiency is the Aim:

Self-sufficiency in padi production has posed as an issue for the Malayan Government for a very long time. The necessity and urgency to achieve self-sufficiency on the grounds of the needs to

i) meet unforeseen contingencies,

ii) to be less dependent on exporting countries,

iii) as a measure to relieve existing disguised unemployment in some padi growing areas in Malaya, and

iv) as a safeguard against natural calamities such as drought etc., in the surplus area, have been made more acute by the threats of a coming war brought about by the Indonesian Confrontation. Undoubtedly, the Malayan Government has achieved much in recent years but there is still a lot more to be done.

It is admitted that the environmental factor is dominant in determining the magnitude of production, but it is possible to assess the limitations to potential yield increases for any particular area, and conversely, to determine if the application of accepted methods to increase yield may be anticipated. Thus, while it must always be admitted that local influence need to be taken into account, these should not be a bar to the possibility of reducing the yield variability and to increase the yield of padi. This certainly is true for the area under study.

The analysis of Chapters IV and V in particular, has shown among many other things, three salient features, which broadly classified are,

i) that the yield of padi, especially in the year under study, is very low,

ii) that, on the whole, there exists wide variations in the padi yields, both Inter and Intra-Blocks and,

iii) that, at least eight major factors were responsible for the low yields, as well as for the wide yield variations of many lots and/or Blocks as a whole.

In view of all these then, a question automatically arises. What major steps should be taken to rectify and improve the existing conditions? This Chapter, therefore, proposes to do two things;

i) to suggest some methods for reducing the yield variations, and

ii) to suggest some methods for increasing the yield and hence production of padi with special reference to the surveyed area.

The analysis of Chapters IV and V has shown among many other things besides the above-mentioned, that there is much room for increasing padi production by increasing the yield. Comparison of this Year's yield of 228 gantangs for the twelve Blocks as a whole with that of last year's (412 gantangs), or with that of Sekinchan which has about the same soil structure as in Sawah Sempadan, but whose padi yield on an average, is 500-600 gantangs, gives a clear indication that the padi yield is not static, but can be pushed on the upward direction. Pushing up the yield is one question, and the extent to which it can be pushed up is another. Of course, certain factors especially those of a biological nature have to be taken into consideration, but on the face of such yield variations, for instance, that of Block F as a whole (119 gantangs) and that of Block S as a whole (347 gantangs), there appears to be good reasons to conclude that the level of production could be materially raised, not only in the lots and/or Blocks of low yields but also in the lots and/or Blocks where the yields are already comparatively high. It is possible that the possibilities of increasing the yields of padi in both the lots and Blocks where the yields are already exceptionally high (by which is meant a yield of between 500-600 gantangs) are limited, but since no such exceptionally high yields have been found in the Blocks, the possibility of such limitations can be over-ruled.

Nine main proposals or suggestions can be put forward to reduce the gap in the yield variations, both Inter and Intra-Blocks which will ultimately help to increase overall production in the area. Since most of the above suggestions are applicable as measures for reducing the yield variations and for increasing the padi yield and hence production as a whole, it is therefore proposed to study both together, in order to avoid much over-lapping. It is to be noted that the above suggestions are based mainly on the factors responsible for the low yield as well as for the yield variations.

These nine suggestions broadly classified are as follows:

i) Efficient soil management in the sense that the land should not be left fallow during the off-season and that fertilizer be applied,

ii) Stricter adherence to gazetted dates,

iii) Cultivation of improved varieties of padi,

iv) Better methods of production,

v) Increased remedial measures against pests and diseases,

vi) Co-operatives,

vii) Check further spread of land tenancy,

viii) Farm management research, and

ix) Education

Efficient Soil Management

The analysis of Chapters IV and V has revealed that one of the main causes for low yield lies in the poor management of the padi lots. It was found that on the whole, nearly all the lots which were not cultivated with maize but which were left fallow during the off-season, gave comparatively low yields, in contrast to those which were cultivated with maize and/or other crops. Similarly, in the two lots where fertilizers were applied, higher yields were obtained. The main conclusion to be drawn from all these is that, the cultivation of maize and/or other crops and the application of fertilizer have a great impact on padi yield.

On the basis of these then, steps towards efficient soil management should take principally two forms and they are

i) the cultivation of maize and/or other crops during the off-season and

ii) the application of fertilizer.

The advantages attached to the off-season cultivation of maize and/or other crops have already been discussed in Chapter III. These advantages should be pointed out to the farmers.

The importance of the use of fertilizers cannot be over-emphasied. Many authorities stress the importance of increased use of fertilizers if yields are to be increased and the Food and Agriculture Organization of the United Nations is insistent upon this point. But how much can be achieved has to be calculated in terms of income and cost. There is no doubt that additional income in terms of higher yield will outweigh the additional cost of the fertilizer.

In the lots and the Blocks as a whole, an economic response in terms of increased grain yield can be expected as a result, if there is a judicious use of fertilizers. For the soils of the Blocks, urea and sulphate of ammonia are found to be the most workable amongst the nitrogenous fertilizers. Urea is most suitable for application as a top dressing and the sulphate of ammonia for mixing into the basal mixture to be applied before transplanting. To obtain the maximum

iv) Better methods of production,

v) Increased remedial measures against pests and diseases,

vi) Co-operatives,

vii) Check further spread of land tenancy,

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utilization of nitrogenous fertilizers, they should be applied at the critical growing stages.

Although the application of fertilizers will be very beneficial, it must take into account the fact that the farmers are too poor to buy fertilizers. Two ways are suggested to remedy this situation. The first one to sell the fertilizers to the farmers at a greater discount than at the present discount of two to three cents per pound. If the farmers still cannot afford to buy the fertilizers, then they can be encouraged to make use of animal manure in some form or other, or green matter from off-season vegetation, like maize, sweet potatoes, tapioca etc. Either of the above organic manures are beneficial because they provide nutrients for the plants.

Stricter Adherence to Gazetted Dates

As part of the general plan and advice given to farmers with the main objectives of reducing the yield variations among the lots and/or Blocks and of increasing yield and production as a whole, there is the need to advice farmers of the necessity of conforming to the gazetted dates for sowing, transplanting and harvesting. This is very important in view of the fact that one of the main factors responsible for the low yield as well as for the yield variations, was the inability of some farmers to follow the gazetted dates because of some reasons or other, for example, the shortage of labour. Following the gazetted dates, which are fixed in relation to the probable availability of water, is very necessary if full advantage is to be taken of the water supply. The yield of padi is dependent to a great extent on the water level throughout the growing period and if water is too excessive or insufficient, there will be a considerable reduction in yield. Below is a guide for transplanting times taken from the Agricultural Leaflet No. 42 on "Padi".

TABLE 6:1

+GUIDE FOR TRANSPLANTING TIMES

Maturation Period (sowing to harvest)	Optimum Time for Transplanting
140 days or less	20-25 days after sowing
140 days to 180 days	25-35 days after sowing
180 days to 200 days	35-40 days after sowing
200 days or more	40-50 days after sowing

+Padi Ministry of Agriculture, Federation of Malaya, Agricultural Leaflet No. 42, pg. 8.

Adherence to the gazetted dates will also ensure, to some extent, that the padi will ripen at about the same time, thus minimising the loss through birds' destruction in any particular lot.

Cultivation of Improved Varieties of Padi

Improved varieties of padi take principally one or both of two forms, namely, higher yielding varieties and/or shorter term varieties. Many benefits are to be gained from the cultivation of high-yielding varieties and/or short term varieties. The benefits to be derived from the first type are obvious. It has been found that padi of the Radin group gives comparatively higher yield, and, as it is, until such time when a better yielding variety or varieties are found, farmers should be encouraged to cultivate padi of the Radin group.

Not only are high-yielding varieties to be encouraged but also short term varieties should be encouraged especially among farmers who want to do double-cropping of padi. It is gratifying to learn that the Agriculture Department had recently found at least one variety - Padi Malinja - which will not only give a high yield (about 600 gantangs per acre) but also takes a shorter time to mature. It is hoped that padi Malinja which takes between 4½ to 5 months to mature will help to solve some of the problems of padi cultivation. Not only will the yield increase but since the growing period is shorter, the farmers can practice triple cropping, that is, two crops of padi and one crop of, say, maize in between, within a year.

Better Methods of Cultivation

Better yielding varieties alone will not be very rewarding unless the methods of cultivation are also improved and gazetted dates adherred to as far as possible.

Better methods of cultivation are also often suggested as a means of improving yields; the traditional methods though wasteful of labour, in most cases, cannot be discarded and replaced by mechanisation because of at least three main reasons. First, the land is too soft for the operation of a machine. Here in Sawah Sempadan, other than the peaty soil, the other types of soil make mechanized cultivation unsatisfactory. Secondly, mechanized cultivation can only come about if farms are of a reasonably big size. This would demand consolidation of small fragmented lots and/or sub-lots so that the enlarged farms would make the tractor work more efficiently. Thirdly, mechanized farming involves more capital which is quite beyond the means of most of the farmers. But nevertheless, tractors are very useful for ploughing.

Besides the use of tractors as one of the methods of improved cultivation, farmers can also make use of Kabuta which has proved to be very useful.

The traditional methods of cultivation which still has to be retained need not necessary hinder improvement in the yield. Even with the traditional methods yield can still be increased if farmers are taught the correct procedures of cultivation, such as, the number of

seedlings to be put in each hole during transplanting, the depth of the hole, the spacing in between, the correct procedure of ploughing, and the need to conform to the gazetted dates for sowing and transplanting.

When transplanting only two or three seedlings should be transplanted per hole and to a depth of only one or two inches deep. If planting is deeper than this, growth is retarded and the number of tillers reduced. Spacing too is very important. The optimum planting distance varies according to the maturity period of the variety used, its tillering capacity and the fertility of the soil. Varieties of short maturation period should be planted more closely than the varieties of long maturation period. Planting distances should be closer on soils of low fertility than on soils of higher fertility. The Agricultural Leaflet No. 42 on "Padi" submits the following Table as a guide to the optimum planting distance.

TABLE 6:2

*GUIDE FOR OPTIMUM PLANTING DISTANCE

Soil Fertility	Maturation Period		
	Short	Medium	Long
Low	9" x 9"	12" x 12"	14" x 14"
Medium	12" x 12"	14" x 14"	16" x 16"
High	14" x 14"	16" x 16"	18" x 18"

Increased Remedial Measures Against Pests and Diseases

The destruction of padi due to pests and diseases not only in the surveyed area, but in most of the padi growing areas of Malaya, are well-known. In the surveyed area, the lots which were more pest and/or disease infested were the ones with the lower yield and not only were these lots more infected by pests and diseases, but on the whole, not much remedial measures were undertaken, consequently, the gap in the yield variations is enhanced.

In view of this then, a suggestion in the form of taking increasing and more intensive measures to "stamp out" pests and diseases should prove to be very beneficial. By taking more active measures such as by more frequent spraying of dieldrin or other insecticides, the use of rat poison and other methods, the farmers will be ensured of a better harvest.

*Ibid, Padi, pg. 10.

Co-operatives

Co-operatives of both types, single and multi-purpose co-operatives but especially the latter, will both directly and indirectly, help to increase agricultural productivity and so ultimately raise the standard of living of the farmers as a whole. In the Sawah Sempadan area co-operatives are playing and will continue to play an increasingly important role as seen from the farmers participation in the Co-operatives. From the information which were collected, it was found that the farmers of the twelve Blocks under study, generally sell their padi to any one of (but usually the nearest one) the three marketing Co-operatives in Sawah Sempadan. These three marketing co-operatives are usually known as Rice Milling Societies - one at Kujong Permatang, one at Kunchi Ayer Buang and one at Sawah Sempadan Tengah. The first two undertake the selling of padi for their members besides milling, while the last one is solely concerned with milling. The finding that farmers in the surveyed Blocks generally dispose of their padi through the co-operatives is illustrated in Table 6:3. Co-operatives should form one of the best ways of increasing yield and therefore production.

TABLE 6:3

DISPOSAL OF PADI ON SAMPLED LOTS

Way of Disposal	No. of Lots	Quantity Sold (Gantangs)	Percentage of Total Production
Co-operative Societies	34	6,749	17.9
Private Traders	2	149	0.4
Home Consumption	24	30,835	81.7
Total	58	37,733	100.0

From the above Table it was seen that out of a total production of 37,733 gantangs, 30,835 gantangs or 81.7% of the total production were kept back for home consumption, while only 6,898 gantangs were sold. This finding reveals a very significant point in that it proves to a great extent, that the farmers as a whole, depend on padi as their main, if not, the only source of income. They cannot afford to sell their padi - except, usually in those cases where the farmers concerned, operate more than one lot - as they have no money to buy rice later on in the year. With regard to the quantity which were sold, a total of 6,749 gantangs or 17.9% of the total production were sold to the co-operatives and this quantity came from 34 lots.

In contrast, only 2 lots sold a total of 149 gantangs or 0.4% of the total production to private traders.

Then there are some farmers who are members of the Persatuan Peladang or Farmers' Association in Sawah Sempadan. This society was inaugurated in 1963 and its membership is opened to all farmers who operate lots in the Blocks along Drain 3 of the Sawah Sempadan area. The many objectives of this Society include the provision of capital loans for members to buy land, equipment and the like, at reasonably low rates of interest, to act as the agent for the Department of Agriculture, and to provide better seeds and fertilizers at a reduced charge or on credit. It is also responsible for reporting to the Department of Agriculture as to the prevalence of pests and diseases so that effective measures can be undertaken.

Although the three Rice Milling Societies and the Persatuan Peladang are of great importance in this area, it will be noted that their individual activities especially those of the Rice Milling Societies, are not as widespread as those which a multi-purpose co-operative can perform.

In view of the prevailing conditions in Sawah Sempadan, a multi-purpose type of co-operative is on the whole more preferable. Such multi-purpose co-operatives should combine the roles of granting credit on loans to the farmers, marketing which embraces such functions as transporting, milling, processing and selling the padi for the farmers, "loaning" to the farmers at as low a charge as possible, the use of tractors or any other necessary farm equipment, and also playing the role of a consumer co-operative. Besides, such multi-purpose co-operatives should also undertake the functions of selling fertilizers to the farmer at as low a price as possible, and to try to pay the farmers immediately for the sale of their padi. The last one is important too because it must be borne in mind that the farmers are very poor and they need the money urgently.

Such multi-purpose co-operatives if successfully implemented, will solve many of the problems of padi production in this area, and in other padi growing areas of Malaya. Among the many advantages are that of a lower interest rate for loans, lower charges for the use of tractors, much more efficient marketing of padi, the assurance of a fair price both for their padi and for any goods they may buy from the Co-operatives, and in the case of buying from the Co-operatives, the promise of a rebate at the end of a certain period, usually a year. The ultimate benefit is a higher return in terms of production and therefore profit.

A single-purpose co-operative will no doubt have their own advantages but in this area, multi-purpose co-operatives are more beneficial because of three main reasons:

i) they will ensure that the farmers get all the above-mentioned functions perform efficiently,

ii) they will do away with too many single-purpose co-operatives, (one for each function) and conditions there do not ensure the establishments of so many

different types of single-purpose co-operatives, and

iii) the farmers can be members of only one Co-operative Society and not so many.

Thus if the farmers are able to enjoy all the above-mentioned advantages, they are given the increased incentive to try their level best to increase yield and hence production. Co-operation therefore is one of the best ways that can be used to increase agricultural productivity, and the over-all production.

Check Further Spread of Land Tenancy

The tenancy system as we have seen, is also one of the main factors responsible for the low yield, as well as for the wide yield variations, both Inter and Intra-Blocks. It was found that in most of the lots where the tenancy system operates, the yield is lower than that of those operated by the owners themselves. This is due to lesser interest among tenants and especially to the insecurity of tenure as discussed in Chapter III.

In view of all these then, if something can be done to discourage the tenancy system by such methods as giving land elsewhere to the tenants and/or by lending them money to start a farm in another area, the yield of the farms which they had left, would no doubt increase because now the farms would obviously be operated by the owners themselves, who on the whole, tend to have a deeper interest on their land.

Farm Management Research

In addition to all these, farm management research should be carried out. Such farm management research should cover as wide a range as possible; ranging from training farmers in the correct and best methods of managing a farm to the "establishment" better and better yielding varieties of padi.

In carrying out all these various projects, two very important considerations must be borne in mind; firstly, there is the consideration of comparative costs of production and secondly, the consideration of price outlook.

The notion of comparative costs here is mainly one in terms of additional improvements to the land, for example, through the application of fertilisers, and deeper and more efficient ploughing through the use of tractor, and in terms of more money spent on researches for higher yielding seeds and of finding the most profitable way to deal with the spread of pests and diseases. All these will no doubt be costly but rewards will come in the end.

Then there is the question of price outlook. Such questions like, what is the price of padi going to be like, will it be a favourable one or not, etc., will be taken into consideration. No doubt the question of price outlook is an integral part of any activity, especially economic

activities, but as far as padi production is concerned the future price of padi will mainly be one in the upward trend, in view of the existing circumstances especially that of the increasing demand for rice in Malaysia.

Education

The successful implementation of most of the suggestions would necessitate at least an elementary farmer education. It is no use telling the farmers to do this or to do that, unless they know the importance of what they were asked to do. To increase yield and hence production, it is very vital that farmers be given education, at least that connected with padi production.

No matter how immense a task this is, it should be undertaken if yields are to be increased.

All the above suggestions, if successfully carried out, will no doubt lead to an increase in yield and consequently production to a great extent. It must be pointed out that some of these measures have already been, and still are in the process of being carried out, but it is suggested that these be pursued to a greater extent, and more active steps should be taken to encourage more farmers to participate in them.

CHAPTER VII

CONCLUSION

The conclusion Chapter of this Exercise on "Inter and Intra-Blocks Yield Variations" in Blocks D, E, F, K, Q, R, P, S, T, U, V and W, will be discussed under three main headings and they are as follows:

i) A discussion of one topic which has not yet been touched on, namely, that on double cropping with emphasis on padi Malinja,

ii) A review of the preceeding Chapters with more emphasis on Chapters IV and V, and

iii) A discussion of the prospects of improving the economic situation in Sawah Sempadan as a whole.

Double-Cropping: With Emphasis on Padi Malinja

The topic on double-cropping[1] was first introduced into the Tanjong Karang area in 1962 when 2,000 acres were planted with a second crop of padi. At that time about 10,000 acres were under double-cropping. However, with the completion of the Sungei Bernam Headworks early this year, which made it possible to divert water at will into a twenty-five miles canal, it is possible to bring "another 30,000 acres within the reach of irrigation facilities for double-cropping, bringing the total acreage to 50,000."[2]

From the information collected, it was found that most of the farmers were quite unwilling to attempt once again double-cropping with padi Taiwan introduced in 1962, because the result was far from what was expected. The yields were extremely low. Thus for the years 1963 and 1964, only one crop of padi was cultivated. But with the introduction of padi Malinja and to some extent, padi Mahsuri, this year, the hopes of the farmers were raised very high. On the whole, the farmers showed great enthusiasm. On the basis of the information which was available, a Table can be drawn up to show the extent of enthusiasm shown by the farmers on the prospect of double-cropping with padi Malinja.

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[1] Double-cropping need not necessarily apply to padi alone. It can and often mean one crop of padi and one other crop of say, maize within a year. But for our purpose here, double-cropping is taken to mean two crops of padi within a year.

[2] See Tanjong Karang Irrigation Scheme Feature, The Straits Times, April 15th, 1965.

TABLE 7:1

DISTRIBUTION OF LOTS ACCORDING TO VIEWS ON PADI MALINJA

View on Padi Malinja	No. of Lots	Percentage of Total No. of Lots
Keen	29	48.3
Not Keen	2	3.3
No indication	2	3.3
No information	27	45.0
Total	60	99.9

TABLE 7:2

DISTRIBUTION OF LOTS ACCORDING TO VIEWS ON PADI MALINJA OF ONLY THOSE LOTS WHERE INFORMATION ARE AVAILABLE

View on Padi Malinja	No. of Lots	Percentage of Total No. of Lots
Keen	29	87.8
Not Keen	2	6.1
No indication	2	6.1
Total	33	100.0

From Table 7:1 it was discovered that out of the 60 lots, information was only available for 33 lots which constitute 54.9% of the total. Information was not available for 27 lots which constitute 45.0% of the total number of lots.

Table 7:2 which was extracted from Table 7:1 shows that out of the 33 lots where information was collected, the farmers of 29 lots which constitute 87.8% of these 33 lots, were very keen on the double-cropping of padi Malinja.

There were two lots which constitute 6.1% of the total, where the farmers were not so keen. In addition, there were two lots where the farmers did not indicate whether they were enthusiastic or not.

With the introduction of Padi Malinja and Padi Mahsuri, but especially of the farmer, it was hoped that at least 600 gantangs could be obtained from one acre of land, which under normal conditions, and, with the common varieties of padi, would yield about 400 gantangs per acre. On an average, it was expected that the yield would increase by at least 20%.

Padi Malinja is a short term variety whose growing period, from the time of sowing to the time of harvesting, takes about 4½ to 5 months and as such, it is possible that two crops of Padi Malinja with an intervening crop of, say, maize in between can be grown within a year.

The prospects of Padi Malinja is bright indeed.

A Review of the Preceeding Chapters with More Emphasis On Chapters IV and V

On this aspect, the writer wishes to examine what has already been analysed and discussed in the preceeding Chapters, especially that of Chapters IV and V, under three main headings. They are as follows:

a) To examine briefly the forms and degree of sub-division, fragmentation, ownership and operation in the twelve Blocks with reference to the yield;

b) to enumerate the extent of yield variations both Inter and Intra-Blocks and,

c) to enumerate as far as possible, in order of priority, the various factors responsible for the yield variations.

a) To Examine Briefly the Forms and Degree of Subdivision, Fragmentation, Ownership and Operation in the twelve Blocks

In the initial alienation of land to the farmers, it was clearly expressed in Condition 4 of the Approval of Application for Land* (Land Rule 5) that a lot can have only one owner. But with the passage of time, most of the lots were sub-divided either through inheritance, sale or gifts, or a combination of them, as seen in Chapter II.

Such processes lead to a complicated system of concealed sub-division and fragmentation, so much so, that it was quite impossible to state with certainty the extent or degree of sub-division and/or fragmentation with the information available for this aspect. All that one can say with some certainty is that, sub-division and fragmentation do prevail in the twelve Blocks, and they are, in the main, responsible

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*See Appendix II.

for the unique and complicated nature of landownership, control and operation in Sawah Sempadan as a whole.

It may be recalled that extreme subdivision does not appear to be of great occurence in the sampled lots for only three cases were reported where subdivision took the form of three sub-lots in one lot and four sub-lots in two cases.

So also will it be recalled that fragmentation which was of quite wide occurence in the sampled lots took principally two forms, that of the fragmentation of farms and that of the fragmentation of holdings. Farms and holdings are mainly of the one lot and/or sub-lot types of operation and ownership respectively. Such a pattern tends to fortify the fact that in most cases, farmers here are poor and cannot afford to operate and/or own more than one lot or even one sub-lot. But, nevertheless, frammentation of holdings does take the form where an owner does have a holding which consist of three lots and/or sub lots, or in the case of fragmentation of farms, there are four cases where each operator operates three lots and/or sub-lots but these are comparatively very rare cases.

Subdivision and fragmentation do play an important part in influencing the yield, but to what extent it is difficult to determine, because yield does not depend on the above two factors alone.

b) **To Enumerate the Extent of Yield Variations Both Inter and Intra-Blocks.**

From the analysis of Chapter IV on the "Inter Block Yield Variation" and of Chapter V on the "Intra-Block Yield Variation", two very striking features were unearthed.

In the first place, it was discovered that the yield for the 58 lots, was, on the whole, low, when compared to that of last year's yield or to that of Sekinchan. The yield for the twelve Blocks as a whole, was, on the average, only 228 gantangs as shown in Table 4:1 of Chapter IV. Such low yields are found especially in those Blocks near the main canal, that is, Row 1, in Table 4:1 and also for the three Blocks (Blocks K, Q and R) in Row 2. Of these six Blocks in the above-mentioned two Rows, five of them were producing a Block yield which was below the average yield for the whole twelve Blocks, as seen in Table 4:1.

The comparatively very poor yield of the Blocks in Row 1 is attributed mainly to the existence of the underlying layer of peat. Other important factors like the conditions of water supply, the different types of off-season land use, the different systems of ownership and operation, the extent of pests and diseases and the differences in cultural practices are also crucial to the low yield.

However, it would not be true to say that all the Blocks are low yielding. There is no doubt that some Blocks, particularly those Blocks in Row 3 with reference to Table 4:1 of Chapter IV, and to some extent, that of Row 4, in the same Table, do give a comparatively very high yield. Of these Blocks, three Blocks, namely Block S, Block T and Block V in order of descending Block yields stand out among these high yielding Blocks. All the Blocks in Row 3 and 4, with the exception of Block U, are producing above the average productivity for the whole twelve Blocks.

As seen in Chapter IV such high yields are also due to factors like the types of soil, the conditions of water supply, the different types of off-season land use, the different cultural practices (for example, the dates of sowing, transplanting and harvesting), the extent of pests and diseases and of the remedial measures taken.

The second striking feature as revealed by the analysis of Chapters IV and V is the existence of yield variations, both among the Blocks and among the lots. There is no doubt that variations in the yield certainly exist. It also reveals that there is no mode of variations, by mode of variations is meant, that there is no single or definite or even a standard range whereby the yield varies. The variation in the yield is very uneven; in some, the range is very big, especially true in the case of the higher yielding Blocks in most cases, and on the whole, in the case of the highest and the lowest yielding Blocks in each Row (from the Row Approach) and in each Section (from the Sectional Approach) in Chapter IV and between the highest and the lowest yielding lots within each Block with reference to Chapter V, while in a few cases, the range is comparatively small.

With reference to Table 4:1 in Chapter IV, it will be noticed that the variations in the yield among the Rows (Row Approach) are comparatively of a much wider range than the variations among the Sections (Sectional Approach - same Chapter). The reason is that every Section has within it some good yielding Blocks (those Blocks in Row 3 of Table 4:1) and some poor yielding Blocks (those Blocks in Row 1 of Table 4:1).

With reference to Table 4:1 and Table 4:16, it will be found that Block variations within the Rows and Sections respectively, are again very uneven. In some the* yield variations may be as great as a difference of 146 gantangs as between Block S and Block U in Row 3 of Table 4:1 or a difference of 217 gantangs as between Block E and Block S in Section 2 of Table 4:16, while in some, the yield variations may be so slight as to be hardly noticeable, for example a difference of only 1 gantang as between Block D and Block F in Row 1 in Table 4:1 of Chapter IV and a slightly bigger difference of 26 gantangs as between Block V and Block P in Section 1 of Table 4:16.

As in the case of Inter-Block Yield Variation, two striking features occur among the lots within a Block.

In the first place, it can be seen from the analysis of Chapter V on the "Intra-Block Yield Variation" that the yields of some lots are very high while some are very low. The highest yielding lot was Lot No. 2399 in Block T (Table 5:16) with a yield of 575 gantangs and this is followed by Lot No. 2731 in Block S (Table 5:19) with a yield of 517 gantangs. The lowest yielding lots were Lot No. 2444 in Block E (Table 5:8) with a yield of only 20 gantangs and Lot No. 2096 Block F (Table 5:1) with a yield of only 55 gantangs. The difference in the yields of the above is indeed very remarkable. But the above-mentioned is a comparison of lots not within the same Block. But on the whole, wide yield variations exist among the lots within a Block.

It was found in Chapter V also that in some Blocks, the yield of most of the lots tends to be somewhere around a certain mark, for example, in a Block, 3 or 4 out of the 5 lots may be around the 200 to 300 gantangs range. But then in some Blocks, the yield differences are one of extremes, for example, in Block E, the difference in the yields between the highest and lowest yielding lots (Lot Nos. 2518 and 2444) is as great as 197 gantangs as seen in Table 5:8) or a difference of 322 gantangs between Lot No. 2731 and 2725 in Block S with reference to Table 5:19.

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* As all along, all yield variations (as specified in Chapter IV) are in terms of gantang(s) per acre.

In contrast to these, there are also cases or instances, where the range in the yield variations is very small, sometimes just a difference of 4 gantangs as shown in the comparison of the yields of Lot Nos. 2211 and 2149 in Block R in Table 5:34 or a range of 3 gantangs between Lot Nos. 2612 and 2544 in Block Q in Table 5:24.

In conclusion it can be said that there is no fixed pattern followed by the yields, either on the basis of Inter-Blocks or on the basis of Intra-Blocks. The range is one of great irregularity.

c) <u>To Enumerate, as far as possible, in order of Priority the Various Factors responsible for the Yield Variations</u>

The writer now wishes to enumerate as far as possible, in order of priority, the various factors responsible for the yield variations.

In the case of "Inter-Block Yield Variations" where the Blocks are arranged into Rows as shown in Table 4:1 in Chapter IV, the leading factor is that of the types of soil, especially so in the case of Row 1 and the remaining three Rows. This factor becomes less important when Blocks are grouped into Sections as shown in Table 4:16 in the same Chapter.

Excluding this, but taking the whole situation into consideration, that is to say, irrespective of whether the Blocks are arranged into Rows, or into Sections, the most outstanding factor responsible for the yield variations is that of the different types of off-season land use practiced by the farmers. Some farmers leave the land fallow, some cultivate the land with maize and/or other crops, while some leave the land partly fallow and partly cultivate it with maize and/or other crops, during the off-season as cited from the analysis of both Chapters IV and V.

Next in the list comes the conditions of water supply. The fact that this factor was cited many times supports the above conclusion.

The forms of ownership and operation comes third in the list as one of the main factors responsible for the yield variations among the Blocks and/or lots.

Then comes the factor of varieties of padi cultivated. The varieties of padi cultivated does have an effect on the yield as we have seen, but it is not known to what extent.

Of lesser importance comparatively is the factor of the differences in the cultural practices (for example, the different dates for sowing, harvesting and transplanting, the methods of harvesting, weeding and hoeing) because all the Blocks are reported to be doing similar things.

Although pests and diseases are by themselves a very important factor influencing the yield of padi, their importance is somewhat lessened because of the fact that all the Blocks suffer from them. The influence of this factor is one mainly in terms of the extent of their influence rather than on their total absence or presence and this has already been pointed out in the earlier Chapters.

With reference now to Chapter V, although the different types of off-season land use still constitute the leading factor, there is a slight change in the classification. Instead of the conditions of water supply ranging in the second place alone, the different forms or systems of ownership and operation also rival for the same place. The effects of these two factors are well known.

The prevalence of pests and diseases plays a more important role here than in the case of Inter-Block Yield Variation. This is so because we are now dealing with individual lots and not with the averages. Thus the influence of the pests and diseases are easier to locate.

Similarly in the case of sowing, transplanting and harvesting dates, and the methods of harvesting - the latter is actually not an important factor because it is too common a factor, common in the sense that nearly all the farmers in the 58 lots use about the same method of harvesting.

The variety of padi sown has an important place as a factor responsible for the yield variations among the lots.

In conclusion it can be said that most,if not all, of the factors enumerated, are present to some degree in almost every lot, and/or Block and it is mainly therefore, the degree of their influence that is responsible for the yield variations both Inter and Intra - Blocks.

On the basis of all the analysis, it may be recalled, that nine major suggestions were put forward on how to increase yield and therefore the overall production as seen in Chapter VI.

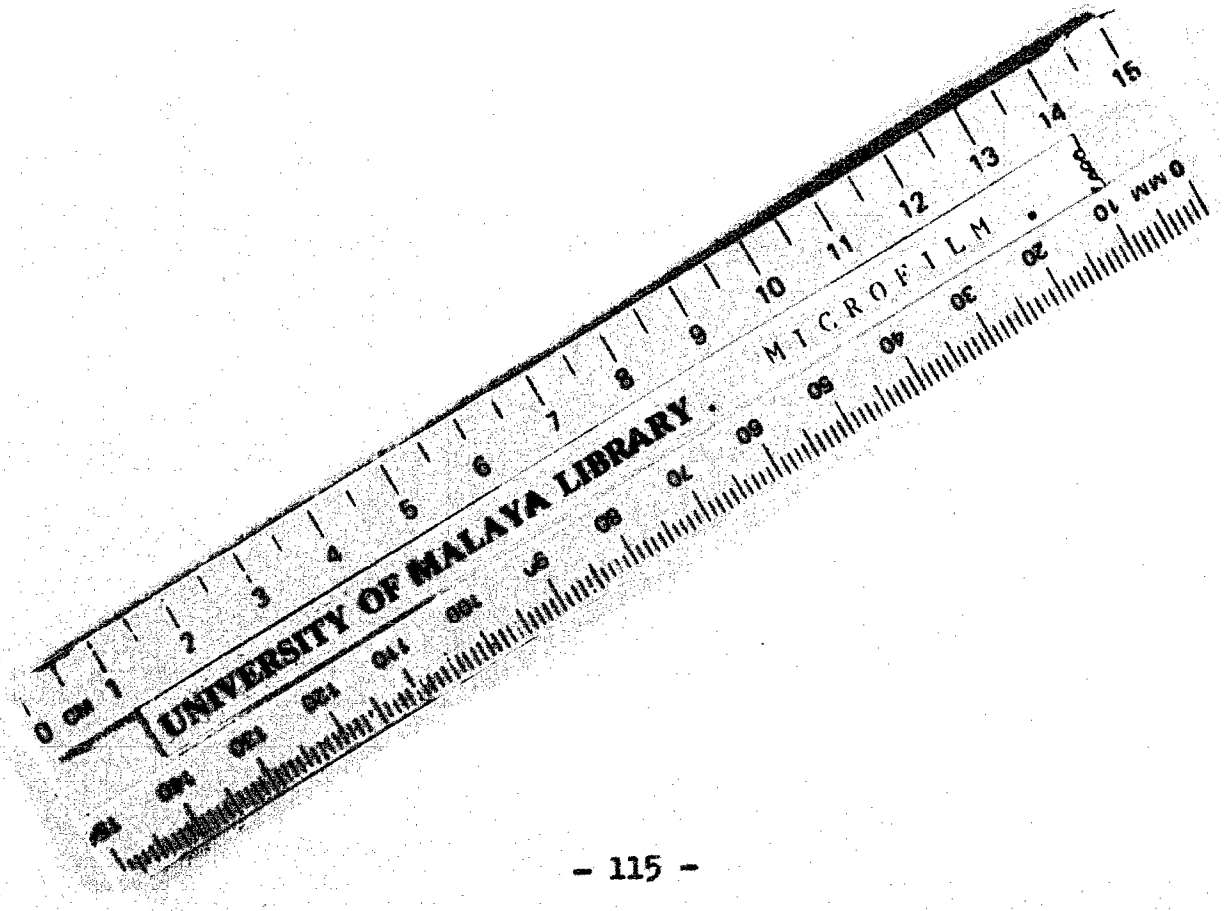
<u>The Prospects of Improving the Economic Situation of Sawah Sempadan as a Whole</u>.

In view of all that have been said so far, a question automatically arises. What then are the prospects of improving the economic situation of this area?

On the basis of all that have been discussed so far, it can be said that the prospects of improving the economic situation are, on the whole, very good. With all the enthusiasm shown by the farmers themselves, and with all the encouragement and assistance given, (and will increasingly be given), by the Government, there is not much doubt that the situation will improve. The question is not one so much in terms of the present (though the present is important too),

as of the immediate future. Development projects do not materialize immediately and most of these projects are established with the objective of realizing a fruitful result in the future. Of course, there are some projects such as the Irrigation and Drainage Scheme which do give immediate results.

In conclusion, it can be said that Sawah Sempadan as a whole will progress very far with all the developments that are going on but especially so, with the enterprising spirit of the residents themselves.



1. [ ] Sample No. [ ] Block [ ] Lot No. ____ Interviewee (Cap) ____ Place ____ Date ____ Time

2. Name of: [ ] Operator [ ] Owner [ ] Tenant

If tenant, conditions: tenant's share in produce _____

tenants' share in production expenses _____

3. Area of the lot [ ]: Area not under cultivation: Other uses [ ] Area [ ] Use [ ] Area [ ] Use

4. Crop sown before main season padi _____, date of harvesting this crop _____

Name and quantity of manures/fertilizers applied to that crop [ ] Name [ ] Quantity

5. Name(s) of variety(ies) of main padi crop sown _____, date of sowing nursery _____,

quantity of seed sown _____, source of seed _____, price _____, per _____

6. Date of transplanting _____, was the quantity of water not enough/enough/too much (at time of transplanting

7. Manure/fertilizer applied in main crop [ ] Date [ ] Name [ ] Quantity

8. Date/s and number of weeding and hoeing (if any) _____ _____

9. Date, name and quantity of spray used (if any) _____ _____ _____

10. Attack of disease or pest: name _____, description of damage _____,

extent _____, date of attack _____.

11. Other type of crop damage: description and extent _____ _____

12. Remedial measures taken for different types of crop damage _____

13. Date of harvesting _____, method of harvesting: ____ Tuai ____ Sabit ____ Both

14. Date of winnowing _____, place of winnowing _____ _____

15. Quantity of padi taken off this lot _____ bags or katis/gantangs _____

16. Date padi sold to co-operative society _____, quantity sold _____

17. Take a sample of one pound of padi in a plastic bag. Put a slip indicating sample no., lot and block no., and date of sampling.

Lot No.	Block No.	Kampong	Area

18. What other padi lots owned by this owner?

19. What other padi lots does this owner/ operator operate?

20. What other padi lots does this tenant/ operator rent in?

21. _____

22. Members in family who are owners ____, operators ____, rent in ____.

K.A. 481/48

APPENDIX II

APPROVAL OF APPLICATION FOR LAND
(Land Rule 5)

Kapada: .....

.....

Di-beri tahu yang permintaan tuan untok memileki tanah telah di-luluskan mengikut Sharat$_2$ dan bayaran saperti di-bawah.

1. Tanah .....
   Kawasan .....
   Luas-nya .....
   Tanah Kampong Lot No. .....
   Tanjong Karang
   Acre rod poles
2. Chukai $
3. Harga Tanah $
4. Harga Tanah Khas $
5. Jerus Surat Geran — Geran Tetap
6. Express Conditions:

1. The land hereby alienated shall not be subdivided as provided in Section 50 or Section 101 of the Land Code nor shall Lot No. ....(Bendang) be held by a separate entry in the Mukim Register from Lot No. .....(Kampong).

2. No plant or tree of the species Hevea Braziliensis or any other rubber-producing plants or trees shall be planted or cultivated or permitted to grow on the land hereby alienated.

3. i) Lot No. ..... (Bendang) hereby alienated shall be used solely for the cultivation of wet rice

ii) Lot No. .....(Kampong) hereby alienated shall be used solely as a site for one or more dwelling houses and for the cultivation of trees of economic value other than rubber trees.

7. Restriction in Interests

1. The land hereby alienated shall not be transferred or leased unless such transfer or lease is to a single individual person and relates to the whole of both Lot No. ( ) and Lot No. ( ).

2. Transfer shall mean and include a transfer between parties or by operation of Law or transmission by operation of Law.

3. The land hereby alienated shall not be transferred or charged or leased without the written consent of the Ruler in Council.

8. Bayaran yang di-kenakan

Harga Tanah	$10.00/12.50
Harga Tanah Khas	
Chukai 1963	5.00/6.30
Upah Sukat	12.50
Batu Penchang	8.00
Bayaran Pejabat	2.00
Chukai Longkong 1963	5.00/6.25
Chukai Ayer 1963	
Jumlah	_____

_____.

Pemungut Hasil Tanah,
Kuala Selangor.

APPENDIX III

LIST OF SAMPLED LOTS: ACREAGES, OWNERS AND OPERATORS

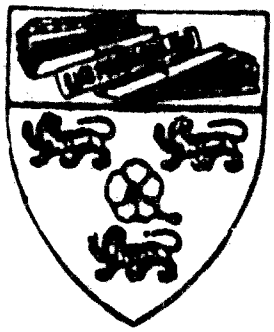
Serial No.	Block	Lot No.	Total Area (Acres)	Name of Owner	Name of Operator
1	D	3011	2.931	Osman bin Sirap	Osman bin Sirap
2	D	3039	2.950	Abdul Kadir b. Sidek	Abdul Kadir bin Sidek
3	D	3040	2.981	Abdullah bin Jantan	Abdullah bin Jantan
4	D	3052	3.000	Rajnah bte.Mohd.Amin	Rajnah bte Mohd. Amin
5	D	3056	3.012	Adnan bin Japu	1) Abdul Rahman bin Sahuri 2) Ta'Sarip bin Kasidi
6	E	2518	2.969	Haji Taib	Salleh bte Hj. Sidek
7	E	2487	2.969	1) Pandi Maduriat (de jure) 2) Rakjo (de facto)	1) Pardi Maduriat 2) Rakjo
8	E	2444	2.969	Ariffin bin Sardini	Sardmin Kassim
9	E	2456	2.969	-	-
10	E	2460	2.975	Nor Rahim	Nor Rahim
11	F	2056	3.037	-	-
12	F	2096	3.037	Yunalis bin Muda	Sulan Muda
13	F	2108	3.012	Harun bin Kasan	Harun bin Kasan
14	F	2097	3.000	1) Nasokan bin Sartam 2) Sareh	Khaikani
15	F	2101	3.000	Khussain bin Tasman	1) Bakri bin Satiman 2) Sarman bin Jubiro
16	K	2926	2.862	1) Hj. Ali bin Sinodikromo 2) Sakit bin Kasan 3) Samo'an bin Kasan 4) Hj. Saduan bin Mat Yunos	1) Hj. Ali bin Sinodikromo 2) Sakit bin Kasan 3) Samo'an bin Kasan 4) Hj. Saduan bin Mat Yunos
17	K	2982	2.837	Chomel bte. Awang	Chomel bte. Awang
18	K	2896	3.037	1) Ismail bin Rahim 2) Hj. Mohd. Lewan bin Sahudi	1) Ismail bin Rahim 2) Hj. Mohd. Lewan bin Sahudi 3) Ramli bin Ismail 4) Bainah bin Ismail
19	K	2920	3.044	Mat Jawab bin Kadil	Mat Jawab bin Kadil
20	K	2992	3.019	Ibrahim bin Jamaluddin	1) Karim bin Noor 2) Lebai Kassim bin Moham
21	Q	2567	2.875	Saikim Hj. Bakan	Saikam Hj. Bakan

APPENDIX III (CONT.)

Serial No.	Block	Lot No.	Total Area (Acres)	Name of Owner	Name of Operator
22	Q	2619	2.919	1) Iman 2) Hj. Basir Ngan-pan	1) Iman 2) Hj. Basir Ngampan
23	Q	2544	3.150	1) Menanti bin Karto 2) Tiran	1) Menanti bt. Karto
24	Q	2604	3.069	Abas Hj. Esan	Abas Hj. Esan
25	Q	2612	3.050	Kasiah bt. bin Karto	1) Said bte Poir 2) Said bte Karto 3) Sulaiman bin Burawi
26	R	2151	2.962	Mardekan bte. Mat Rahman	1) Mardekan bte. Mat Rahman
27	R	2211	2.925	Marsan bin Saman	Marsan bin Saman
28	R	2149	3.212	Tubinah bte. Haji Abdul Rahman	Tubinah bte. Haji Abdul Rahman
29	R	2217	3.000	Mat Rahan bin Krono	Mat Rahan bin Krono
30	R	2225	3.000	Mutiza bte. Abdul Rahim	Mutiza bte. Abdul Rahim
31	P	2845	2.962	1) Zainab Haji Noor 2) Joriah 3) Tokirang	1) Zainab Haji Noor 2) Joriah 3) Tokirang
32	P	2853	2.962	1) Lahuri Haji Maz-suka 2) Nahri bin Haji Sukor	1) Lahuri Haji Maz-suka 2) Nahri bin Haji Sukor
33	P	2854	3.000	Haji Suffian	1) Misoran bin Haji Suffian
34	P	2791	4.344	1) Maimunah bte. Enchu (de jure) 2) Senah bte. Taib (de facto) 3) Halijah bte. Taib (de facto) 4) Wasiah bte. Taib (de facto) 5) Ratnah bte. Sony (de facto)	1) Danah bte. Taib 2) Halijah bte. Taib 3) Wasiah bte. Taib 4) Ratnah bte. Sony
35	P	2847	2.962	1) Kordi 2) Haji Sidek Osman Sukor	1) Kordi 2) Haji Sidek Osman Sukor
36	S	2673	3.000	Haji Mahood bin Hj. Ali	1) Kasan bin Haji Ali 2) Abu bin Sanun
37	S	2725	3.019	Sahri Haji Tahir	Sahri Haji Tahir
38	S	2678	2.919	Jubri bin Osman	Jubri bin Osman
39	S	2731	2.925	Kaji San	Kaji San
40	S	2696	3.000		

APPENDIX III(CONT.)

Serial No.	Block	Lot No.	Total Area (Acres)	Name of Owner	Name of Operator
41	T	2399	3.037	Haji Riduan bin Deman	Haji Riduan bin Deman
42	T	2324	2.925	Haji Hamzah	Haji Hamzah
43	T	2392	2.950	Surachi bin Shefie	Surachi bin Shefie
44	T	2378	2.987	1) Haji Mokhtar 2) Mohseen	1) Haji Mohktar 2) Mohsein
45	T	2398	2.787	Ibrahim	Ibrahim
46	U	2292	2.987	Shahin bin Kroro	Shahin bin Kroro
47	U	2254	1.975	Dalhar bin Bahron	Sain bin Murji
48	U	2274	2.894	Basidan Haji Ashari	1) Basidan Haji Ashari 2) Suratmin
49	U	2293	2.900	Mohd. Nor bin Abdul Razak	Mohd. Nor bin Abdul Razak
50	U	2303	1.575	Abu Bakar bin Hussain	1) Haji Yussof bin Mat Sulaiman
51	V	2761	3.650	1) Hassan bin Haskat 2) Haji Abdul Aziz	1) Hasan bin Haskat 2) Haji Abdul Aziz
52	V	2764	2.962	Isman bin Ahmad	Masuli bin Isman
53	V	2786	.906	Padri bin Sarbin	Padri bin Sarbin
54	V	2779	2.962	Mohd. bin Yusof	Mohd. bin Yusof
55	V	2781	2.962	Musripa bte. Haji Tahil	Musripa bte. Haji Tahil
56	W	2733	3.025	Siam bte. Taib	Siam bte. Taib
57	W	2752	2.925	Muskam	Muskam
58	W	2735	2.925	1) Haji Ehsan 2) Haji Mahmud	1) Haji Ehsan 2) Haji Mahmud
59	W	2743	2.925	1) Haji Yaakub bin Posoin 2) Haji Noor	1) Haji Yaakup bin Posoin 2) Haji Noor
60	W	2736	3.000	1) Sadik 2) Musrifah	1) Sadik 2) Musrifah



TAMAT