

KRUSHI



VOL. 12 NO. 2, 3 & 4 1989 October 1990 June

**QUARTERLY TECHNICAL BULLETIN FOR RESEARCHERS,
EXTENSION WORKERS AND TRAINERS IN AGRICULTURE**

DEPARTMENT OF AGRICULTURE, PERADENIYA
Ministry of Agricultural Development and Research
Peradeniya.

KRUSHI



Vol. 12 No.2, 3 & 4 1989 October 1990 June

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DEPUTY DIRECTOR (EDUCATION & TRAINING)
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EFFECT OF FALLOWING ON SALINITY
BUILD-UP IN PADDY LANDS IN THE
DRY ZONE OF SRI LANKA.

B.V.R. PUNYAWARDENA, W.S.A. RANGANI AND
L.C. DHARMASIRI
AGRICULTURAL RESEARCH STATION
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Soil salinity has become a major constraint to agricultural production in several allotments of the Kirindi Oya Irrigation and Settlement Project Area (KOISPA). In this project, 4000 families have been recently settled, with an irrigable allotment of one hectare of land for each settler. Under the agro-ecological zone classification system in Sri Lanka this area has been categorized as low country dry zone (DLB) where annual evaporation exceeds the rainfall during the most parts of the year. Mean annual rainfall exceeds 500mm (table 01). Ground water in the poorly drained area usually contains high amounts of soluble salts. Electrical Conductivity of ground water range from 4 to 15 ds/m. Whenever the reservoir storage is not sufficient to provide irrigation for the whole project area, a part of the land has to be left

fallow.

The change in soil salinity at two physiographic positions in a fallowing land was monitored from November 1989 to April 1990. These positions were at mid slope in the catena. One spot was in a well to imperfectly drained section of the land, while the other was at a lower part, (poorly drained section of the field).

Table 2 shows the soil salinity distribution up to 30 cm depth. An increase in soil salinity was observed at each soil depth at both locations in the soil catena. Higher electrical conductivity in the saturation extract of soil was recognized at the surface of both locations. Initial salinity levels at each depth were very high in the poorly drained land area. Percentage increase was also very high at the lower part of the catena in the poorly drained soils.

Salinity build-up was observed at both locations. In one location in the mid slope area, a non-saline, soil had reached, saline levels. At the lower part of the catena, salinity levels had increased at each soil depth. According to these results, salinity problems may occur and increase due to fallowing of land in this area.

Table 1 - Rainfall and Pan Evaporation recorded at Agricultural Research Station, Weerawila.

	Monthly rainfall (mm)	Monthly Pan Evaporation (mm)
November 1989	87.1	118.9
December 1989	80.6	206.3
January 1990	106.1	262.4
February 1990	3.3	266.0
March 1990	102.0	256.7
April 1990	161.2	212.0
Total	490.3	1322.3

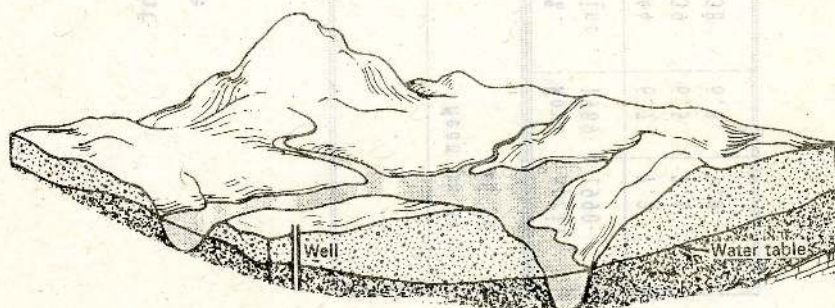


Table 02 - Change in soil salinity at two different drainage classes of rice fields in the Dry Zone of Sri Lanka.

Drainage Class	Imperfectly drained				Poorly drained			
SOIL DEPTH	Mean E.C.E (ds/m)		Mean pH at 28 °C		Mean E.C.E (ds/m)		Mean pH at 28 °C	
	Nov. 1990	April 1990	% Inc.	Nov. 1990	April 1990	% Inc.	Nov. 1989	April 1990
0-10cm	3.4	4.4	28	6.5	7.3	32.4	46.8	44
10-20cm	2.5	2.6	05	6.6	7.3	21.6	30.0	39
20-30cm	1.9	2.7	42	6.5	7.0	15.7	21.6	38
							6.8	7.0

BLOCK (GROUP) DEMONSTRATION PROGRAMME

IN SRI LANKA

BY

S.Emitiyagoda^{**}

In 1983, Block Demonstration Programme for rice Production was initiated in Sri Lanka by the Extension Division of the Department of Agriculture (DOA). This is not a completely new concept to Sri Lankan farming society as this has some features common with "YAYA ADARSANA" and "WALAGAMBAHUWA CONCEPT". This is a group Agricultural extension method coupled with credit and input supply. Block Demonstration (B.D) programme could also be viewed as a system where a number of farmers get together to form a group and cultivate in unison a contiguous block of land, adopting improved crop production technology and using inputs supplied by

* Paper presented at the DOA seminar held at Inservice Training Institute, Gannoruwa on the 30th of October 1990.

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different institutions such as Agricultural Extension and Agrarian Services. It was initially operated as a collectively managed credit scheme that eventually became self supporting with the savings of the farmer groups, leading to increased production that enabled the farmers to improve their living standards.

The primary objective of the Block Demonstration Programme is to raise the standard of living of the small farmers through efficient management of their agricultural resources with easy credit facilities arranged to obtain inputs such as seeds, fertilizer and agrochemicals.

Agricultural extension educators could view this programme as a method of extension education where farmers are educated in two major disciplines. Firstly, this had increased the farmer's resource management efficiency and secondly, improved the farmer's technological efficiency, for agricultural production (land, water, labour, capital, input and information are considered as resources for agricultural production) The satisfactory outcome of the initial programme resulted in the expansion of BD

throughout Sri Lanka. Today there are 110 blocks in operation, executed by the DOA in collaboration with the Department of Agrarian Services and Mahaweli Economic Agency, with assistance from the F.A.O. fertilizer project. (List of Block Demonstrations established from 1983 to 1990 is given in appendix 1)

1. Traditionally there are two types of Demonstrations;

(a) Method demonstrations

(b) Result demonstrations

B.D has some special features, and is a demonstration coupled with credit and input supply. This could be categorized as a third type of demonstrations, namely "group demonstration". In this programme, in addition to knowledge transfer (as in method and result demonstrations) a complete technology transfer has taken place.

2. "Group demonstration" concept is technically and socially compatible with peasant agricultural system in Sri Lanka. The technologies such as integrated pest management, water management, integrated

plant nutrient system, timely cultivation, and collective cultivation, cannot be practised by an individual small farmer independently. A collective approach is an essential component in present day agriculture in Sri Lanka.

3. In the Block Demonstration Programme while the farmers technological efficiency and their resource management skills increased, decision making abilities also improved. Farmers' leadership skills were also enhanced. This programme in addition to offering new technology, also prepares the farmers to accept these new technologies. Therefore, B.D programme is an excellent extension method in totality.
4. In the B.D programme, planning is not done in idea tight compartments. All disciplines are integrated and planning is done with the farmers participation.
5. Block Demonstration could also be used as an extension tool.
6. Block demonstration is a long term demonstration. Once the initial cost is

invested, no maintenance cost is required, season after season unlike in other demonstration programmes. The initial cost could be fully recovered after 5-6 seasons when Block Demonstration matures. This could be successfully implemented with financial assistance from local banks. People's participation for organization of "field days" and farmers training classes could be easily obtained through BD Programmes. Expenses for these programmes could be easily met by the funds of the BD.

7. In the adoption process, demonstrations are useful to create awareness and generate interest on the technologies among the farmers. But in the BD programme, farmers have opportunities to undergo all the five steps of adoption process (awareness, interest, evaluation, trial and adoption). This may be the reason why farmers show high adoption rates of new technologies, where they are involved in programmes.

8. Since block demonstration cover a large extent (normally 10-15 ha), clear, visible effects of the recommended practices, could

be seen by the clientele. Since a large number of farmers are involved in the demonstrations, positive attitudes are developed towards the recommended practices. Due to these reasons, the effectiveness of demonstration efforts of the BD programme are comparatively high.

9. Today individual methods of extension have to be restricted due to withdrawal of village level extension workers from the extension division. Therefore one has to rely more on group methods of extension and mass communication. Therefore BD as a group method has become a very important tool for extension.

Some facts to prove its success

It has been observed over the past 8 years, that almost all the Block Demonstrations conducted in the provinces have resulted in remarkable increases in rice yield. (Table 1).

As shown in Table 1, it is clearly visible that the recovery rate of loans given to farmers in 1986 is nearly 100% in the BD programme. In comparison the recovery rate of agricultural loans taken from commercial banks was about 60%

in the same year.

There is evidence to show that the farmers in BD programme are comparatively more involved in social activities in the village, than the other farmers. They participate frequently in social activities such as religious ceremonies, "shramadana" and cultural activities. Other government agencies such as Agrarian Services Committee, and marketing agencies also keep their links with the village through these farmer groups.

There are about 6 matured Block Demonstrations continuing their agricultural operations (Table 111). These farmer groups have donated their initial loan (revolving fund) to other groups and are now self reliant to sustain their agricultural activities.

These facts clearly indicate that extension is highly efficient when it goes with credit and input supply to the small farmers.

Some of the advantages mentioned earlier could be the reason that 2640 farmers of 112 groups in 15 districts are presently enjoying the facilities of the programme. This programme has utilized Rs.3.3 million. Every season the

revolving fund enable achieving an approximate output of about Rs.17.4 million worth of agricultural produce to the nation.

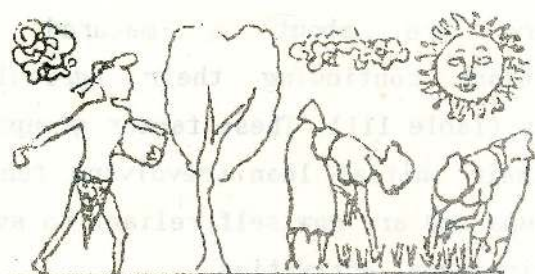


Table 1: Average Rice Yield Increases observed in BD Progress

Province	No. of BDD conducted from 1983-1990			Average Maha rice yield recorded prior to BD		Average Maha rice yield recorded in BD	
	No	Total extent (ha)	Number of farmers (No)	Bu/ Ac	MT/ Ka	Bu/ Ac	MT/ Ka
Western	19	120.95	480	46.5	2.3	78.5	3.9
Sabaragamuwa	12	156.00	275	50.0	2.5	80.0	4.0
Uva	7	55.40	81	50.0	2.5	75.0	3.7
Southern	10	142.50	252	41.0	2.05	82.5	4.1
Central	14	133.26	350	47.0	2.35	70.0	3.5
North West	13	83.95	275	40.0	2.0	85.0	4.25
North Central	11	136.50	257	50.0	2.5	95.0	4.75
North East	22	194.00	370	65.0	3.25	78.0	3.9

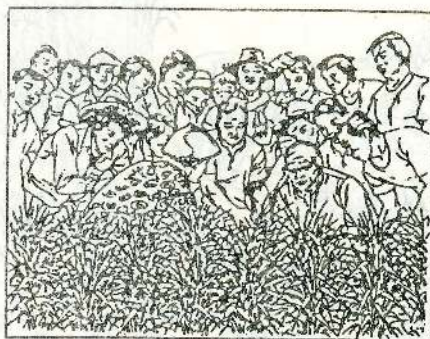


Table 2 - Recovery of loans taken by BD farmers
in 89/90 Maha Season

Amount invested at the beginning	Amount repaid at the end of the season		Amount in farmer's savings fund	
Rs.	Rs.	%	Rs.	%
1,150,392.20	1,103,923.50	95.96	137047.00	11.8

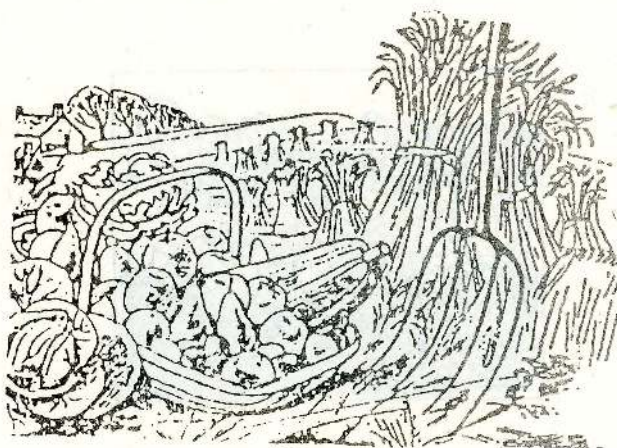


Table 3 - List of Matured Block Demonstrations

District	Name of BD	Season Started	Season Matured	No. of farmers	Extent ha.	Fund Rs.	Amount banked Rs.
Ampara	Mahanagapura	85 Yala	88/89M	15	6.1	23250	15000.00
Ampara	Dematamal Pelessa	84 Yala	86 Yala	16	12.2	23250	10000.00
Gampaha	Bonette	85/86M	88 Yala	43	8.5	19836	19836.00
Gampaha	Welligama	85 Yala	87 Yala	42	8.0	20263	20263.00
Kilinochchi	Kanthankulam	84/85M	86/87M	12	8.0	25600	25600.00
Matale	Mazahalhena Ukkuwala	86 Yala	89 Yala	20	8.0	14375	14234.00

SOIL APPLIED PACLOBUTRAZOL CAN INDUCE FLOWERING IN MANGO

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Peradeniya

Introduction

Mango is one of the most widely cultivated fruit crops in Sri Lanka and in the other South Asian countries. However, farmers very often complain about the low orchard efficiency. Low efficiency is a direct effect of the smaller number of trees that could be accompanied by a low productivity (yield) per tree. Erratic bearing habit together with biennial bearing tendency, low fruit set and high fruit drop, contribute to low productivity of individual trees. Although a large volume of knowledge regarding physiology of flowering has accumulated over the past, definite factors that trigger flowering are still unknown. It is said that mango requires a check in vegetative growth and a stress imposed at least for two months for flower bud initiation (Wolstenholme and Mullins 1982). Chacko (1968) extracted a Gibberellin like substance from shoots of "on" and "off" mango trees (cv. Dushehari).

But its concentration was much higher in "off" year trees compared to "on" year trees that flowered, Saidha and Rao (1980) also reported increased concentration of a growth inhibitor during the flowering season, in shoots of mango trees that flowered, and also in trees that did not flower. But the concentration was higher in shoots that carried flowers.

Farmers in The Philippines used to make a smoky fire under mango trees to force trees to flower. After the discovery that smoke contains Ethylene gas and that Ethylene cause flowering in trees, exogenous application of Ethrel, an Ethylene containing compound was used by Chacko et al. (1974) to induce flowering in "off" year mango trees. Filipino's use of Potassium Nitrate (KNO_3) is closely linked with Ethylene release. The nitrate causes the formation of nitrate reductase which stimulates the formation of amino acids. Amino acid methionine is a direct precursor of Ethylene.

The Problem

One of the three most popular mango varieties in Sri Lanka, "Karthi Colomban", performs very poorly in the wet zone. In the wet zone the main mango

flowering season is during January/February period and the fruits are harvested in May and June. A very small crop is produced at the end of the year. If the south west monsoon is heavy and continuous, production drops drastically. Karatha Colomban especially would yield either a small crop or stage a crop failure altogether.

Paclobutrazol (PPP 333) is a very potent plant growth regulator invented by ICI plant protection division at Jealott hill research station. (Couture, 1982).

It is effective on a wide range of crops. Its mode of action is the inhibition of Gibberellin biosynthesis. Paclobutrazol inhibits Gibberellin production by inhibiting the oxidation of Kaurene to Kaurenoic acid, a precursor of Gibberellic acid. Paclobutrazol blocks the enzyme binding site. This results in reduction of cell division for vegetative growth and diverts assimilates for reproductive growth, resulting in flower production and fruit growth. (DeLong et al., 1984, Marguard 1985, Quinlan and Webster 1982, Raese and Burts 1983, Reynolds 1988, Swietlik and Miller 1983).

Materials and method

An observation trial was conducted to find

whether Paclobutrazol can be used to induce flowering in Karatha Colomban variety of mango grown in the wet zone during the off season.

Karatha Colomban mango trees planted at Walpita Horticultural Farm were treated in June 1990 with Paclobutrazol.

Forty well grown trees were selected and Paclobutrazol was applied to 36 of them at random, on 1st June 1990. Four control trees were treated with 2 litres of water only. The rates of Paclobutrazol used are shown in the Table 1. A commercial formulation 'Cultar' containing Paclobutrazol was used.

'Cultar' was supplied as a suspension concentrate containing 250g Paclobutrazol per litre. Hence one gramme of Paclobutrazol is available in 4 cc of 'Cultar'. The amount of 'Cultar' to be used was dissolved in water, and applied as a soil drench.

To prepare a tree for Paclobutrazol application, a shallow channel about 6" wide was scraped around the base of the tree. The scooped soil was used to build a small bund bounding the channel to prevent run off of the mixture. The tree trunk was brushed up to 6cm height, remove the soil and bark debris. Diluted 'Cultar' solution was poured

into the channel and covered with soil. In the second and third treatments canopy size per tree was calculated based on the radius of the canopy shade at noon. After flowering ten panicles were selected and labelled. These panicles were measured to record their length.

Fertilizer application regime previously adopted was continued. Dithane was sprayed once, after the flowers appeared.

Results and Discussion

First flower panicle appeared in August, approximately two months after 'Cultar' application. Fruits were harvested in November.

Trial data (Table 1) indicate that 'Cultar' is effective in stimulating the mango trees to flower. Out of the rates of application tested, mango trees were most responsive to 0.5g a.i. 'Cultar' per square meter of the canopy shade area. Hence it appears to be the most suitable dose. However, more elaborate testing is needed before recommending the rate of application.

Continuous wet weather caused most of the panicles to be affected with anthracnose resulting in premature fruit drop. This mainly accounts for the poor fruit yields. This also indicates the necessity for correct timing of application and the need for protective spraying.

It was also observed that 'Cultar' caused some vegetative buds on the main stem to revert into flowering shoots (panicles). The induction of response to 'Cultar' treatment in young trees clearly indicates that flower initiation in mango is determined by the weather conditions of the season and not by the physiological maturity or stage of maturity of mango shoots.

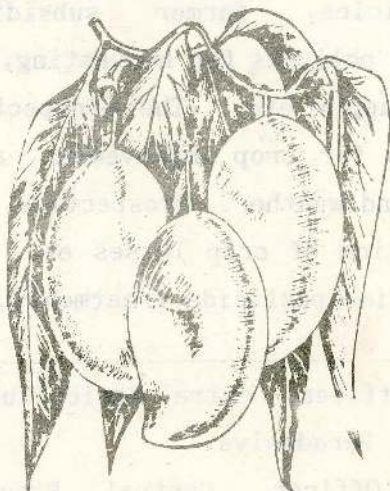
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TABLE 1 The effect of "Cultar" on flower
induction in mango

Rate of Application	Mean No. of panicles per tree	Mean length of panicle (cm)	Weight of fruits per tree (Kg)
01. 20 ml a.i./tree	70	14.6	19.0
02. 0.5 a.i. cultar/M ² of the canopy	95	17.5	23.5
03. 0.25 a.i. cultar/M ² of the canopy	46	15.41	11.8
04. None	-	-	-



A SIMPLE METHOD TO EVALUATE
YIELD LOSSES DUE TO RICE GALL-MIDGE,
ORSEOLIA ORYZAE WOOD MASON
C. KUDAGAMAGE^{*}, HEMA MANGALIKA^{**} AND
C.A. SANDANAYAKE¹¹

INTRODUCTION

Yield loss assessments are useful both retrospectively and prospectively, and also at the national and individual levels. The retrospective yield loss data is a record of past events. At the national level, the data can be used for crop production inventories, and to for formulate crop insurance policies, farmer subsidies after catastrophe, and policies for harvesting, transport, and pesticide supply etc. The prospective method uses information for crop improvement, and records harmful agents and weather. Prospective information leads to estimation of crop losses etc. This data can be used to time pesticide treatments, select

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emergency measures for large scale pest control; determine logistics of pesticide supply; and plan for harvesting, transportation, and storage etc.

Inspite of the practical importance of crop loss data, no systematic effort had been made to study the crop losses caused by insects and diseases. Therefore, the authors decided to study the yield losses caused by rice gall-midge (GM) on rice. Determination of crop losses due to the rice gall-midge, Orseolia oryzae was selected for this study because of its importance as a major pest of rice (Anonymous, 1986). The specific objectives of this study were:

1. To develop a simple method to determine yield losses caused by GM
2. To evaluate yield losses due to GM in the different rice cultivars.
3. To determine the economic injury level of the rice gall-midge.

MATERIALS & METHODS

Natural infestation of gall midge (Maha 87/88) in the rice breeders seed plots at the Central Rice Breeding Station, Batalagoda was used in this study. There were nine breeders plots of 0.25 ha each,

planted under nine cultivars. These cultivars belonged to four age classes, and were transplanted at different times depending on the age of the cultivar (Table 1). In the breeders seed plots, the planting pattern was different from that of the normal method followed by the farmers. The seed of each selected plant from the previous season, was planted in a separate plot. Each plot had three rows separated from the other 3-row plots with an unplanted border 50 cm. wide within each 3 row plots. Single seedlings of rice were transplanted at a spacing 20 X 15 cm between and within rows respectively. For each cultivar there were 100-150, 3-row plots. The fertilizer application and agronomic practices adopted were those recommended by the Department of Agriculture (DOA).

Before surveying the damage, an attempt was made to control gall-midge by the application of Carbofuran - the recommended insecticide. Preliminary investigation on the range of infestation indicated 0-100% infestation in the different cultivars.

The base of generating crop loss data was a single hill. The researchers randomly selected nearly 150 hills from the central rows of each of the 3-row plots of different breeder's seed cultivars.

In each hill the total number of tillers and the number of "silver shoots" (GM affected hills) were counted at the flowering stage. The percentage gall-midge incidence (GMI) was determined by dividing the number of silver shoots by the total number of tillers (IRRI, 1976). These hills were marked and the grain yields were recorded at harvest. After recording the GMI, each plot was treated with 0.71kg/ha a.i. of BPMC as a prophylactic treatment against possible brown planthopper infestation. Also, every plot was monitored weekly for the occurrence of pests other than GM. The researchers did not encounter any other insect or disease incidence.

For data analysis, hills that had an equal number of tillers were selected, to minimize the differences in the yield potential of the different hills. Then, the regression between yield per hill on the percentage gall-midge incidence (GMI) was calculated using the 'SAS-REG' procedure of SAS computer package (SAS INC, 1986). The dependent variable Y was the yield per hill, while the independent variable was the GMI. The significance of the regression coefficient(r) was tested using the F statistic. In addition to the simple linear

regression, a polynomial model $Y=f(x, x^2)$ was also fitted to see whether there was any improvement in the significance of r value. The percentage yield loss per unit area with increasing GM incidence was calculated by using the regression equation of the expected yield. The intercept of the equation gave the mean yield of the cultivar when the GMI was zero. The regression coefficient was the yield loss per unit increment of GMI. Therefore, % yield loss/unit % incidence of GM, was equal to

$$= \frac{\text{Regression (Coefficient)} \times 100}{\text{intercept.}}$$

RESULTS & DISCUSSION

The negative regression coefficient indicated that the grain yield was negatively correlated with GMI in all cultivars. In all the cultivars grain yield decreased with the increase of GMI. The regression coefficient(r) between the expected yield and GMI were significant in all the cultivars with the exception of a 3 1/2 month cultivar. The ' r ' value ranged from 0.24 to 0.65. Fitting a polynomial model did not increase the significance of the ' r ' value. The ' r ' value determines the proportion of the variability in yield that can be explained by the

GMI variable. In our study, only in two cultivars namely in Bg 379-2 and Bg 400-1, the 'r' value was higher than 0.5. According to Teng (1987) models that explain 80% of the variance in losses caused by a pest or disease variable is considered to have useful field application. In our study there was a higher variability in the grain yield caused by factors other than GM. Unlike in the other methods of yield loss assessments, single plant or hill technique allows for a quick determination of yield loss and provides a reasonable first estimate of the pest yield loss relationship. In this method the researchers relied on the natural infestation and did not use any chemical or other methods to manipulate pest population levels. Therefore, this method is simple enough to be used in the farmers fields.

In a pest management system, decisions are commonly based on the pest density or amount of damage and the crop yield, using economic threshold as a measure. Not all densities of pests or damage levels are harmful economically. There is a point where the ratio of benefit (B) to achieve a yield increase by resorting to pest control to the cost (C) of control being less than one. This is called the damage threshold or economic injury level (EIL). By

taking the cost of control of GM/ha as Rs. 506/= and value of the crop at Rs. 4/= per kg of grain, the researchers calculated EIL values for different cultivars (Table 3). In the different cultivars, the EIL differed and ranged from 2.0 to 8.3. In cultivars where the EIL is high, a higher damage can be tolerated without suffering an economic yield loss.

The values obtained in this study should be tested, adjusted, and its acceptance by farmers should be examined over several years. The perception of pest attack and the expectation of good harvest by the farmers require socio-economic studies. They may differ from the expectations of the research workers. Action by the farmers depend on their background, experience of local condition, and their attitudes towards risk. Information on those aspects will enable the optimum use of research findings by the farmers.

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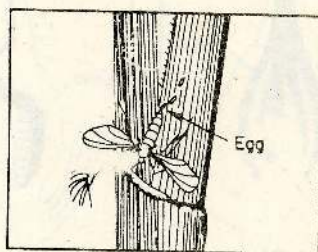
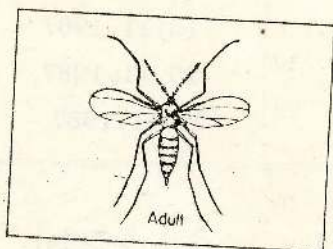


Table 1: The cultivars used in the study and time of transplanting 1987/88 Maha Season. Central Rice Breeding Station, Batalagoda.

Cultivar	Age class(M)	Time of Transplanting
Bg 3-5	5	30.09.1987
Bg 38	5-6	30.09.1987
Bg 400-1	4-4 1/2	19.10.1987
Bg 379-2	4-4 1/2	19.10.1987
Bg 34-6	3 1/2	10.11.1987
Bg 350	3 1/2	10.11.1987
Bg 94-1	3 1/2	15.11.1987
Bg 34-8	3	25.11.1987
Bg 276-5	3	25.11.1987

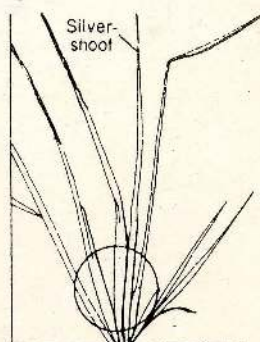
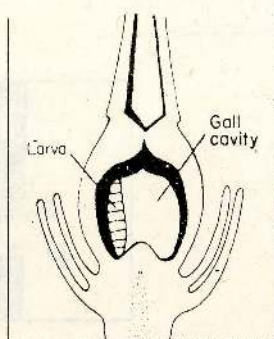
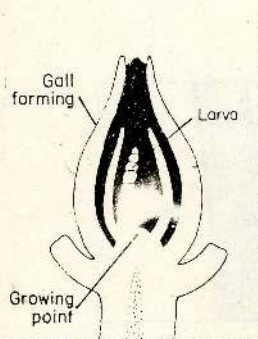


Table 2: Yield losses caused by rice gall-midge (RGM) *Oreseolia oryzae*, (Wood Mason) 1987/88 Maha Season, Central Rice Breeding Station, Batalagoda.

Cultivar	Regression equation expected yield	Regression 'r' value	% yield loss/unit % incidence
Bg 3-5	$Y=28.08-0.265 X$	0.49	0.92
Bg 38	$Y=20.88-0.11 X$	0.33	0.52
Bg 400-1	$Y=18.61-0.20 X$	0.65	1.07
Bg 379-2	$Y=26.76-0.23 X$	0.59	0.85
Bg 34-6	$Y=10.821-0.065 X$	0.43	0.60
Bg 350	$Y=7.18-0.056 X$	0.35	0.76
Bg 94-1	$Y=9.67-0.028 x$	0.24	0.29
Bg 34-8	$Y=15.87-0.14 x$	0.36	0.88
Bg 276-5	$Y=12.56-0.11 X$	0.42	0.89

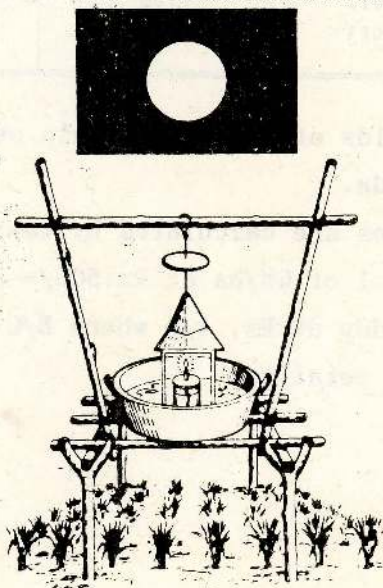


Table 3: Mean Yield, percentage loss in yield and economic injury level (EIL) of GM for different cultivars of rice 1987/88 Maha Season. Central Rice Breeding Station, Batalagoda.

Cultivar	Yield [*] (kg/ha)	% yield loss/unit % incidence	EIL ^{**} (% GMI)
Bg 3-5	5150	0.92	2.66
Bg 38	4783	0.52	5.11
Bg 400-1	5890	1.07	2.01
Bg 379-2	6484	0.85	2.30
Bg 34-6	4980	0.60	2.92
Bg 350	5560	0.78	4.25
Bg 94-1	5299	0.29	8.30
Bg 34-8	5015	0.88	2.88
Bg 276-5	4983	0.89	2.86

* Mean yields of 2 maha & 2 yala seasons at Batalagoda.

** EIL values are calculated by taking the cost of control of GM/ha at Rs.506/= and value of kg of paddy at Rs. 4/= where B/C = 1 (refer text for details).

A PRELIMINARY SURVEY ON PINEAPPLE CULTIVATION AND EXPORT FROM SRI LANKA

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Introduction

During the past decade the demand for fresh Mauritius pineapple fruits from the Middle Eastern countries have been steadily increasing. The farmers enthusiastically responded and they were very keen to satisfy the demand with their supplies. However, pineapple fruits are exported under sea-freight and as a result of poor storage facilities during shipping, pineapple fruits were affected by a physiological disorder known as internal browning and fruit core deterioration. Therefore, foreign buyers rejected the consignments sent under poor cold storage conditions.

Since 1983, this problem had been greatly affecting the pineapple exporters as well as the growers. Hence, the potential for economic marketing system of freshly harvested "Mauritius" (15,000-22,000 fruits/ha) to the Middle Eastern countries was

considerably influenced by this problem. Furthermore, well organized growers adopted progressive production technologies. One of them was the proper use of flowering hormones such as Alpha Naphthalene Acetic Acid, Ethrel (Ethephon) and Calcium Carbide. The farmers used the recommended fertilizer mixtures and improved cultural practices. As a result the farmers were able to harvest large uniform healthy fruits throughout the year, to meet the potential markets both in and out side Sri Lanka.

The causes under lying the decline of the export market for pineapple in Sri Lanka were identified as follows:

1. Internal browning disorder.
2. Poor cold storage facilities.
3. Improper post harvest handling.
4. Unorganized purchasing activities of intermediate suppliers and local buyers.
5. Lack of retail outlets for fertilizers and agro- chemicals at the village level, to boost production.
6. Lack of appropriate cultivars for canning industry, leading to the use of "dessert" varieties for canning.
7. Inadequate attention for research related

to problems of storage, packing and transport.

Varieties:

The number of pineapple varieties suitable for commercial production are relatively few in Sri Lanka. Basically two pineapple cultivars are popularly grown in the country. They are,

- (1) "Mauritius" (a dessert cultivar) and
- (2) "Kew" (a canning cultivar)

"Mauritius" differs from "Kew" in certain characteristics.

Mauritius fruits are

- (a) comparatively smaller in size .
- (b) conical in shape, with smaller single fruitlets.
- (c) low in translucence and ripened fruit flesh is yellow in colour.
- (d) likely to deteriorate rapidly after full ripening.
- (e) high in acid content and also have a high brix value, and
- (g) low in fibre content.

Usually a "Mauritius" fruit ranges from 0.5 kg

to 2.5 kg in weight, while a "Kew" fruit ranges from 0.5 kg to 3.5 kg in weight.

Adaptability

Pineapple crop is easy to grow. However for high returns per hectare, the crop needs proper management and the use of recommended inputs.

Pineapple crop can successfully survive drought as well as heavy rainy periods. With the use of appropriate technology, pineapple can be grown in a wide range of soil types with good drainage.

Pineapple can be grown from sea level, up to 600 metres elevation, although it performs best at medium elevations.

For large scale production and high profits, pineapple is more suitable for areas with rainfall evenly distributed throughout the year. Soil should be of medium fertility and the soil reaction should be from slight to neutral acidity. Sandy loam soils are very suitable for this crop.

Planting

The land should be thoroughly prepared. Pineapple takes 15 - 24 months from planting to harvest. Poor land preparation will result in high

weeding costs and fruits produced could be small in size due to competition from the weeds.

Pineapple growers prefer to use suckers for planting in Sri Lanka. In high production systems used by the pineapple growers, the total plant populations may range from 20,000 to 24,000 plants per hectare under coconut.

Weed Control:

Pineapple is a shallow rooted plant. Therefore a high weed population can have an adverse effect on pineapple, and as a result greatly reduce production by as much as 50 percent. Chemical weed control is a must if the grower can afford and if chemicals are available. Although cheap in terms of labour cost per day, hand weeding is more expensive and less effective in the early stages of the pineapple crop. When grassy weeds are present in the field, mulching with coir dust after weeding during the first few months of growth is very effective and economical.

Flower Induction:

For high fruit tonnage per hectare, pineapple should be induced to flower when the plants are 8 to 12 months old. The chemicals that can be used are

Calcium Carbide, Ethyphon and Alpha Naphthalene Acetic Acid (NAA). Chemicals can induce 90 to 99 percent flowering.

Harvesting:

5 - 5 1/2 months after application of flower inducers, the fruit starts ripening. Programming harvesting and marketing is therefore possible when flower inducers are used.

Harvest at Proper stage of Maturity:

For good flavour, it is important to harvest the fruits when they begin to change colour from green to greenish yellow.

Harvesting Method:

Farmers pick fruits along with a long fruit stalk and place them in a shaded area. They handle fruits very carefully and do not drop or throw the fruits.

Post-harvest Treatments:

To prevent infection with fungi, cut the fruit stalk (1 to 2 cm long) and dip the incised surface

immediately in Benomyl (1 g in a litre of water).

Packing:

For packing fruits between 1.2 and 1.6 kg, fibre corrugated cartons (370 mm X 350 mm X 220 mm) are used. Each carton contains six fruits packed upright. The box is divided internally into six compartments, by inter-locking strong fibre board dividers. These helps to protect the fruit and give stacking strength to the box.

Export of pineapple from Sri Lanka during the period 1978 to 1989

Year	Country	Tonnes
1978	*S.A.	776
1983	S.A.	775
1984	S.A.	1,470
1985	**U.A.E.	16,530
1986	S.A.	26,370
1987		—
1988	Middle East & Maldiv Island	4,158
1989	- do -	12,200

Source: Sri Lanka Customs Returns (Fruit)

* S.A. - Saudi Arabia.

** U.A.E - United Arab Emir

EVALUATION OF YIELD DIFFERENCES DUE TO
CONTINUOUS USE OF VINE CUTTINGS FOR
PROPAGATION OF SWEET POTATO (*Ipomoea batata*)

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Introduction

Sweet potato is a popular tuber crop in Sri Lanka. Its tubers, are an important source of food. They are usually eaten boiled or baked; also used for canning, dehydrating, flour manufacture and as a source of starch, glucose, syrup, and alcohol. After harvesting the crop vines can be used as a fodder for livestock.

The vegetative parts of the vine are usually used as planting materials. However, farmers have a common belief that the continuous use of the vegetative cuttings for propagation, leads to a reduction in tuber yields. Thus once in two to three seasons they tend to plant their field with tubers as the source of planting materials, which increase their nursery costs. Nevertheless it has not yet been established whether the physiological maturity of the

cuttings has a yield reduction effect. Therefore an experiment was conducted to verify the common belief of the farmers.

Materials and Methods

Three local cultivars, Wariyapola, Bentota-A and Divulapitiya were used in this experiment. Cuttings were planted on ridges (18 cm high) at a spacing of 60x24 cm. One cutting per hill, was vertically planted. The crop was fertilized with Urea, Concentrated Super Phosphate and Muriate of Potash at a rate of 120, 120, 180 Kg/ha (departmental recommendation) respectively.

Results and Discussion

Yield fluctuations observed in yala 1984 taking a variety of generations are shown in figure 1. Tuber yield data (figure 1) with respect to Wariyapola, Bentota-A and Divulapitiya cultivars show that the yield fluctuations observed, do not show any significant loss of yield with advancement of the generation.

Similar trends were also observed in Maha 84/85 and the yield data relevant to that season is given in figure 2. Subsequent observations during yala

1985, also were similar to those observations made during maha 1985/86 and they are given in figures 3 and 4.

Thus the general analysis of tuber yield data from four (04) seasons field experimentation with 3 cultivars do not confirm the general belief that sweet potato tuber yields decline when cuttings (vegetative) are used continuously in field planting. The crop was harvested at 3 1/2 months maturity. The generations tested did not show any significant difference in yield, upto the 7 th generation and no interaction between variety and the generation was observed.

Conclusion

Experimental findings show that the general belief on the continuous use of sweet potato vine cuttings in propagation of sweet potato to be including a reduction in tuber yields, is incorrect.

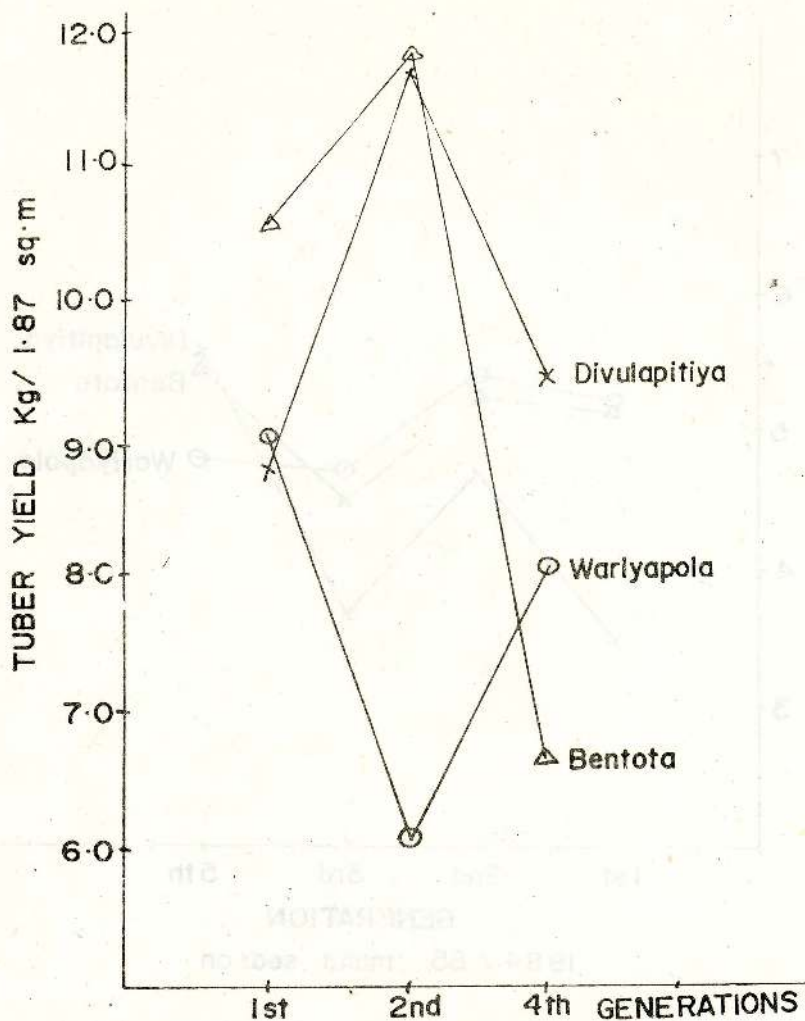


Fig.1: The fluctuation of Sweet Potato tuber Yields, over four cultivation seasons compared with 1984 Yala Season.

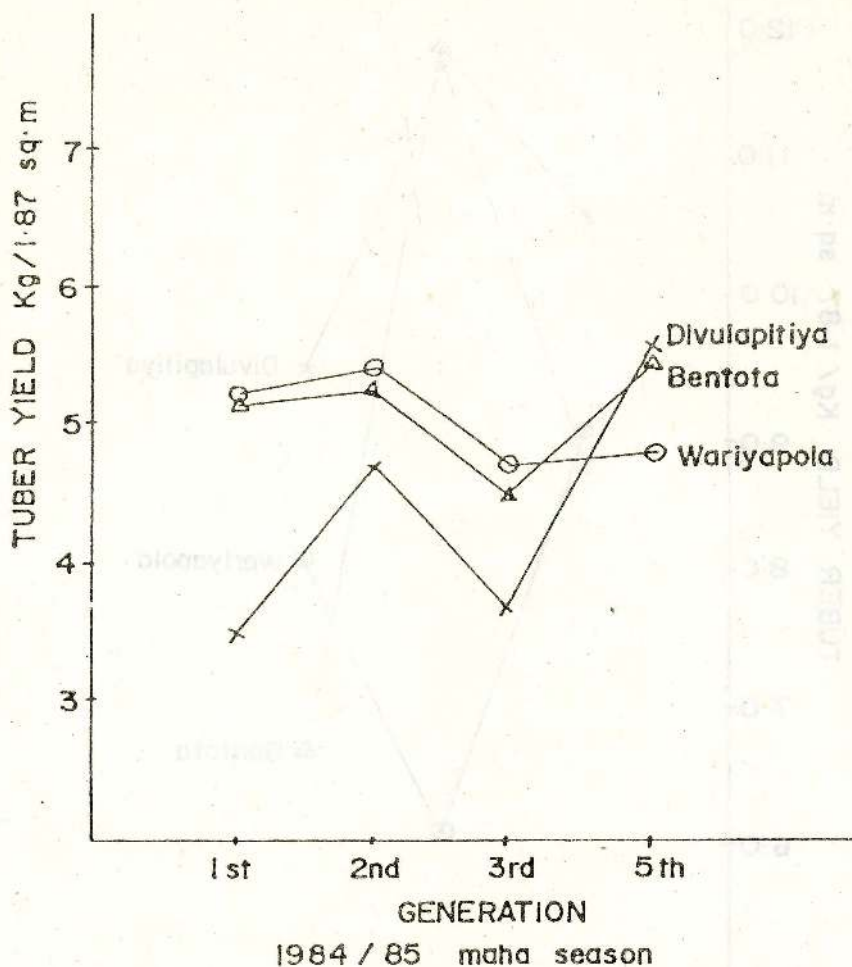


Fig. 2 The fluctuation of tuber yield of three sweet potato cultivars, when planting materials from four different generations were used (1984/85 Maha Season)

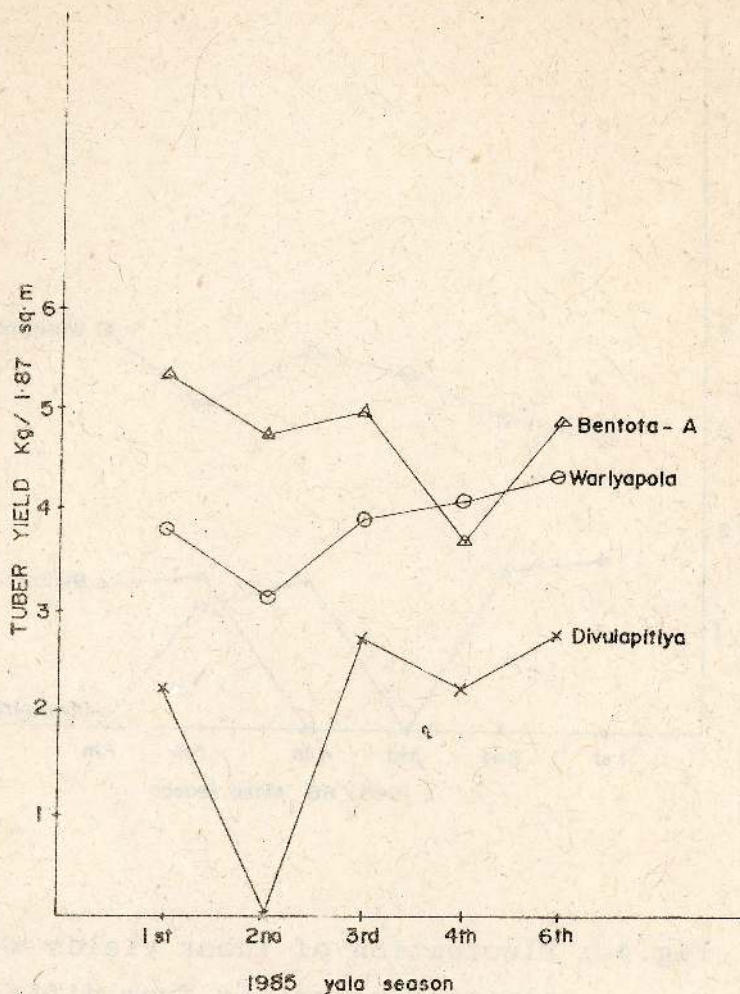


Fig.3 : Fluctuation of tuber yields in Sweet Potato, when Planting materials were used from different generations. (1985 Yala Season)

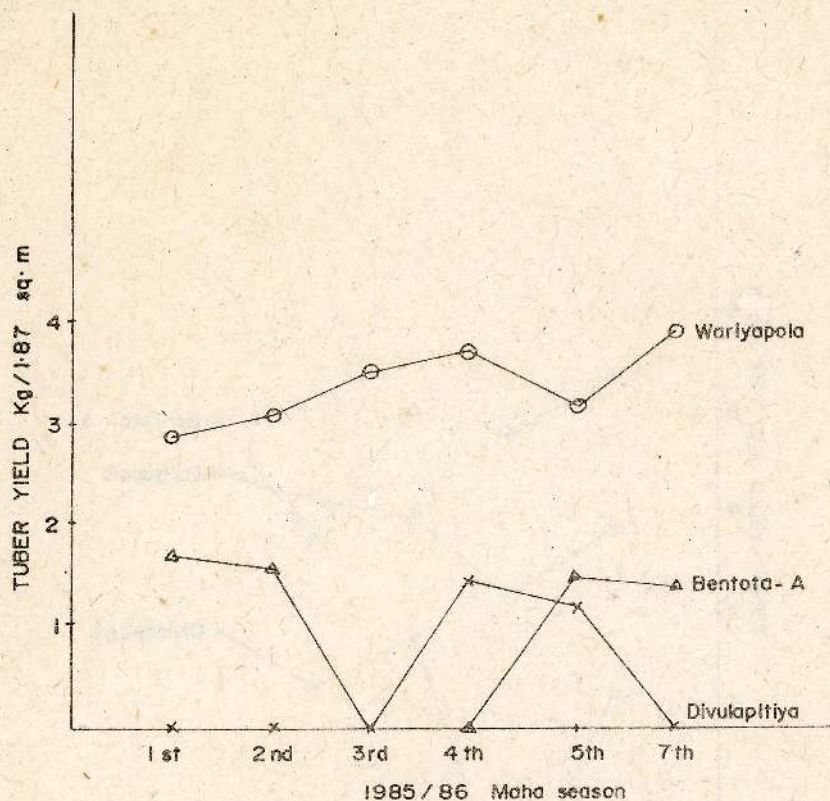


Fig.4 : Fluctuation of tuber yields when planting materials from different generations were used (1985/86 Maha Season)

THE PROFILE OF A KANDYAN RICE FARMER
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Summary

Optimum economic gains from agricultural production activities are possible when the farmers make rational and intelligent use of resources. Resource use is influenced by decisions made by the farmers. This study aimed to explore the perceptions of rice farmers regarding the factors that limit rice yields, obtained from their fields. The findings of this study suggested that while efficient farmers have a clearly definable behavioral pattern, the great majority of other farmers could not perceive correctly the factors limiting their rice yields.

Introduction

Two major constraints to profitability of

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rice farming are the increasing costs of inputs - and external factors such as drought, rain and damage to the crops from animals and pests. To harvest high yields and achieve better profits from rice farming, sound decision making is essential, to manage the crop so that it will give the highest possible production. To make the maximum profits, the farmers should know (correctly) the factors that influence yields and take steps to handle them by adjusting or modifying production practices. This ability depends on adequate technical knowledge and field problem solving skills.

The Study

A comprehensive investigation into factors related to rice yields was done among a random sample of rice farmers in Kandy district during 1986/87 Maha season. The rice fields cultivated by the respondents were visited to make observations before and during cultivation of the rice crop. After harvesting the rice crop, information was gathered from the respondents by using an open ended questionnaire. The broad objective of the study was to assess

the perceptions of rice farmers about the factors that tend to limit their rice yields. Some of the respondents appeared to be giving false information. Respondents who tried to give wrong information (such as under reporting) were rejected. The final number of farmer respondents was 20. The village level extension workers were asked to provide information about the factors they thought to be limiting yields and profits of their clients.

Perceived limiting factors

The factors perceived as limiting by the farmers and their extension workers were recorded. The results are presented in Table 1.

Significant conclusions to be derived from the above findings are :

1. While the extension workers perceived inadequate fertilizer use to be the most important factor limiting rice yields, the farmers mentioned high price of inputs and lack of capital to purchase them as the most important problem limiting their rice yields.
2. The extension workers perceived insect pest damage as the second most important factor

limiting rice yields, while the farmers expressed soil and climatic factors to be seriously limiting rice yields than insect pest damage.

Farmer efficiency

This study assumed that the ultimate measure of farming efficiency would be reflected by the farmers financial performance. Therefore, gross margin per hectare was used as the measurement criterion. Since gross margin incorporates the basic production data such as yield, prices and variable costs, it is a practical indicator of efficiency. However, prices of inputs fluctuate drastically from season to season and the economic data collected in this study may not be directly applicable in the future. While some farmers efficiently managed their farming activities, some farmers were making only negligible profits from rice production.

It is of practical interest to note that a very wide range of farming efficiencies prevailed in the study areas and it roughly approximated the "normal curve". The results demonstrated clearly that many farmers were performing below

the potential agronomic as well as economic performance.

Farming performance and field problems

Normally the soil should be kept saturated with water for at least 20 days after the first ploughing and before planting the crop. However, this period was limited to about 14 days and perhaps the seedlings suffered from organic acids and carbon dioxide generated during decomposition of organic matter incorporated during land preparation. The number of panicles per square meter observed was much below the optimum number for the varieties grown, thus indicating less than optimum conditions during the vegetative growth stage of the rice crop. Poor tillering of the rice crop was observed and this could have been due to poor initial inadequate nutrition of the growing crop.

The number of grains per panicle was less than the standard values reflecting inability of plants to produce standard size panicles. observations indicate that both the farmers and the extension workers had not carefully examined the factors limiting rice yields from the logical and

practical view point.

The profile of an efficient rice farmer

To identify the farmer's perceptions about rice cultivation, a pre-tested interview schedule was personally administered and the relationships involved were examined in depth. The findings were used to formulate the general profile observed, and it had the following characteristics.

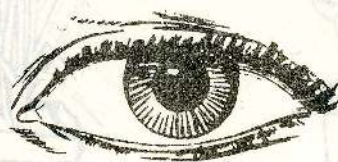
1. The efficient rice farmers indicated readiness to discuss agricultural matters. They actively and enthusiastically participated in the discussions.
2. Efficient farmers visit the field more regularly and do not hesitate to take remedial measures when a problem is spotted.
3. Age was not associated with farming efficiency.
4. Farming efficiency does not correlate with the level of formal education.
5. An efficient farmer does not necessarily participate in community work.
6. The efficient farmers do not own more land

or physical resources compared to the inefficient farmers.

7. An efficient farmer grows a better crop and is proud of it.

Table 1: Factors perceived to be limiting profits from rice farming by farmers and their extension workers.

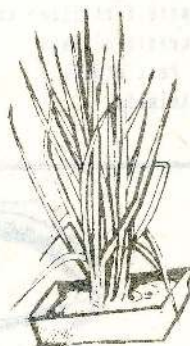
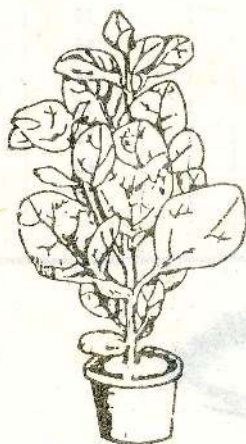
Limiting factor	Extension workers N = 16		Farmers N = 20	
	Percent	Rank	Percent	Rank
Inadequate weed control	56	3	20	6
Soil condition	50	4	70	2
Plant population	30	6	10	7
Land preparation	49	5	10	7
Lack of capital	43	7	80	1
High price of inputs	43	7	80	1
Inadequate fertilizer use	81	1	30	5
Unfavourable climate	24	8	70	2
Insect Pest attack	62	2	40	4
Stray Animals	13	9	50	3



Discussion

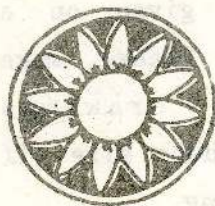
This study was primarily aimed as a first step to undertake a more comprehensive detailed study in the future. Those aspects that did not receive adequate emphasis during this study, and yet remain important for achieving a better insight into behaviour of rice farmers were identified and recorded for further study in the future.

Both the farmers and extension workers may benefit from making efforts to observe rice farming from a "yield components" view point. Such an approach demands the provision of appropriate orientation, training and guidance for the extension workers.

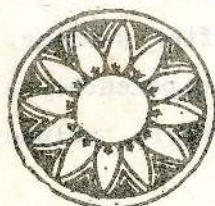


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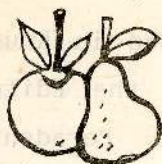


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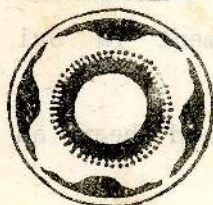
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