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Nutrient removal by crops growing in the dry zone of Sri Lanka

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WITH the harvest of every crop a certain amount of nutrients is removed from the soil. With the current availability of high yielding varieties and with the development of irrigation facilities which permit cultivation of several crops a year on the same land it can be expected that more nutrients will be removed from the soil than before. This focusses attention on the necessity of maintaining the fertility of soils so that high crop yields can continue to be obtained. In this respect it will be useful to know the amounts of nutrients removed by different crops. Such information is scarce for crops grown in tropical countries. de Geus (1973) provides useful information on nutrient removal by several crops. However, this is a compilation of data for crops that have been grown on different soils and climates. Since crop growth and nutrient removal may depend on the soil and climate where the crops are grown a comparison of nutrient removal capacities of crops would be more valid if they were grown at the same location.

Most studies on nutrient removal have reported removal of nutrients at harvest by the entire crop. In order to get a better idea of net removal of nutrients from the soil and for estimating fertilizer needs for the succeeding crop it will be more useful to report nutrient removal for plant parts which are to be removed from the field distinct from other plant parts which may go back to the field. This point is taken into consideration in this paper which reports on the nutrients removed by crops grown at the same location.

MATERIALS AND METHODS

All crops included in this study were grown at Agriculture Research Station, Maha Illuppallama in the Dry Zone of Sri Lanka. The soils here are Alfisols. The current levels of fertilizer recommended by the Department of Agriculture were used on the crops. For a few crops where no fertilizer recommendations are available fertilizer was used at rates expected to bring maximum profit per unit area of cultivated land. The plant materials were removed from the field at the time of usual harvest, brought to the laboratory and the fresh weights determined. The samples were immersed in tap water for a few minutes to remove extraneous material, rinsed with distilled water and dried to constant weight at 65°C and then ground to a fine powder. This was used for the chemical analysis. Wet digestion with nitric, perchloric and sulphuric acids

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was employed. Nitrogen was determined by Kjeldahl method, phosphorus by colorimetry, potassium by flame photometry and calcium and magnesium by titration with EDTA. Sulphur was determined turbidimetrically.

RESULTS AND DISCUSSION

The amount of nutrients removed by the crops are given in Table. 1 The concentration of a particular nutrient in plant tissue at harvest is not a constant for a given crop but may vary depending on yield, soil, season of cultivation and management. Therefore, the amounts of nutrients removed by a crop at indicated yields in Table 1 cannot be considered unique. There is data (de Geus 1973 ; Comhaire 1965) to indicate that the nutrients removed at another yield can be estimated approximately by multiplying the nutrient removal by the ratio of the second yield to the first yield. On this basis if a 5,000 kg/ha paddy crop removes 100 kgN/ha, a 6,000 kg/ha crop will remove approximately 120 kgN/ha. Since both the tissue concentration of a nutrient as well as the grain to straw to husk ratio may vary from one yield to another, the approximate nature of such estimates must be remembered.

Except for legumes and agro industrial crops in this study it is seen from Table 1 that crops remove more potassium than nitrogen. Crops remove relatively small quantities of phosphorus. Rice-growing soils (Panabokke and Nagarajah, 1964) and upland soils in the Dry Zone of Sri Lanka* contain less potassium than calcium or magnesium in exchangeable form. Irrigation water also contains less potassium than calcium or magnesium (Amarasiri 1973). But crops remove more potassium than calcium and magnesium combined illustrating the preferential absorption of potassium by them.

Table 1 shows that crops remove very widely differing amounts of nutrients. For the legumes some of the N removed would have come from the atmosphere. Table 2 gives the amounts of nitrogen, phosphorus and potassium removed per day by the crops at the yield levels given in Table. 1 On this basis sweet potato, cassava and maize remove large amounts of nutrients whereas chilli mung and dhal remove relatively small amounts.

Although adequate sunshine is often available throughout the year for plant growth in the tropics a vast majority of areas has been cultivating only one or two crops a year owing to limitations of water. With development of large irrigation facilities it is expected that cropping intensity will be increased and that even round the year cropping will be possible in some localities. The ability of the soil to supply nutrients for such round the year cropping in order to sustain high yields for long periods has not been carefully evaluatedin most tropical areas.

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*Mahaweli Ganga Irrigation and Hydro-power Survey. Volume III. Soils. Food And Agriculture Organization Of The United Nations and Irrigation Department of Ceylon. Colombo 1968.

Nitrogen, phosphorus and potassium are only three of the thirteen essential elements for plant growth that must be supplied by the soil. These three are used most commonly in fertilizer only because they are the most limiting in soil and not because they are more important than the other ten. However, with every harvest all thirteen nutrients are removed. There is no evidence to prove that soils will be able to provide these other ten nutrients in sufficient amounts to maintain high yields indefinitely. Therefore, certain precautions are necessary to ensure that the nutrient status of the soil is kept at an adequate level.

One way of maintaining soil fertility is to return crop residues to the field. In several crops only a portion of the plants is commercially disposed of. From Table 1 it is clear that residues from some crops contain large amounts of nutrients. Rice straw, maize stubble and sweet potato vines contain large amounts of potassium. These residues should not be wasted but put back to the fields in the raw form, as ash or as compost, or fed to animals and their waste matter returned to the field. If crop residues are sold as for example, rice straw to the paper industry, the farmer must recognise that valuable nutrients from his field are being taken off and he would be ill advised to repeat this sale season after season. Contrary to common belief residues from grain legume crops are not particularly rich in nutrients.

The amounts of nutrients removed by a particular crop at a particular yield cannot be equated to the amounts of nutrients to be supplied as fertilzer to realize this yield or cannot be considered to be identical to the amount of nutrients required to be added in order to maintain the fertility of the soil in the original condition. This is because several other factors determine the net gain or loss of nutrients by the soil system. Some of these are weathering of soil and release of nutrients, supply of nutrients by irrigation water, synthesis of nitrogen by bacteria and algae, losses by leaching, erosion, volatilization, denitrification, precipitation and complex compound formation. Further, nutrient content during growth of some crops exceed that at harvest. This would be so for plants which return nutrients to the soil through the roots before they are mature or for plants such as soybean which shed their leaves before the crop is ready for harvest.

Even if a relationship is established between the amounts of NPK removed by crops and the amounts to be added as fertilizer to attain this yield it is likely that each nutrient will bear a different numerical relationship to the yield as the reactions determining the concentration of a nutrient in soil solution, the nature of movement within the soil and the manner of absorption by plants are not identical for the three nutrients. Further such a relationship if estab lished may be different for each crop.

Yet a useful approach to P fertilization can be considered by examining the amount of P removed by crops. As most areas of the dry zone of Sri Lanka are low in phosphorus initial application r.tes of about 20 to 40 kgP/ha for several crops are reasonable. However, if this rate is repeatedly applied for several years accumulation of P in soil can occur to a point where application of P in such amounts can be uneconomic. For example, the current general recommendation of phosphorus fertilizer for chilli cultivation is about 30 kgP/ha. A 2000 kg/ha chilli crop removes only about 6 kgP/ha. Assuming no P gains or losses by other factors a net gain of 24 kgP/ha by the soil per season occurs. If this is repeated for five years the net gain will be 120 kgP/ha. At such level of accumulation a response to P addition can hardly be expected. The above figures are indeed approximate owing to the numerous assumptions made in the calculations but serve to show how nutrient removal data can help to assess P fertilizer needs when the farmer has no ready access to soil or tissue testing or when the relationships between such tests and yield responses have not been satisfactorily evaluated.

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TABLE I.—Nutrients Removed by Crops

Crop	Variety	Duration of Crop Days	Yield kg/ha	Plant Part	kg/ha N	P	K	Ca	Mg	S
Industrial Crops										
Cotton Gossypium hirsutum	HC—101	150	1,900*a*	Seed Cotton	40	6	7	6	5	2
				Other	37	8	61	28	16	17
				Total	77	14	68	34	21	19
Gingelly Sesamum indicum	MI—3	75	1,000*a*	Seed	39	3	4	7	2	2
				Other	12	1	32	12	6	2
				Total	51	4	36	19	8	4
Sun Flower Helianthus annus	Turkey 170430	100	2,200*a*	Seed	54	7	18	7	5	3
				Other	15	2	48	17	5	2
				Total	69	9	66	24	10	5
Cereals										
Maize Zea mays	Thai—Composite	105	4,000*a*	Grain	64	7	13	2	2	6
				Other	54	4	142	30	23	7
				Total	118	11	155	32	25	13

TABLE I.—Nutrients Removed by Crops—*Contd.*

Crop	*Variety*	*Duration of Crops Days*	*Yield kg/ha*	*Pland Part*	*kg/ha*					
					N	*P*	*K*	*Ca*	*Mg*	*S*
Cereals										
Rice	BG.11—11	130	5,000*a*	Grain	58	12	10	2	7	3
Oryza sativa				Straw	37	5	135	24	15	5
				Husk	5	1	6	1	1	1
				TOTAL	100	18	151	27	23	9
Sorghum	IS—2941	100	4,000*a*	Grain	68	8	16	3	6	2
Sorghum vulgare				Other	33	5	92	14	8	3
				TOTAL	101	13	108	17	14	5
Vegetables										
Beet root	Crimson	100	13,000*b*	Root	42	5	60	4	6	2
Beta vulgaris				Other	21	2	36	5	10	2
				TOTAL	63	7	96	9	16	4
Carrot	Nantes	90	6,000*b*	Root	17	4	30	3	2	2
Daucus carota				Other	14	2	22	4	2	2
				TOTAL	31	6	52	7	4	4
Cassava	MU—10	180	45,000*b*	Tuber	62	10	164	12	22	3
Manihot utilissima				Other	140	22	122	119	86	12
				TOTAL	202	32	286	131	108	15

Chilli Capsicum annum	MI—1	180	2,000*a*	Pod (Dry)	41	4	55	3	3	3
				Other	23	2	29	7	6	2
				TOTAL	64	6	84	10	9	5
Chilli Capsicum annum	Santaka	130	1,500*a*	Pod (Dry)	33	3	55	2	3	3
				Other	11	1	20	3	2	1
				TOTAL	44	4	75	5	5	4
Egg Plant Solanum melongena	SM—164	150	39,000*b*	Fruit	38	8	96	6	5	4
				Other	25	3	48	21	8	3
				TOTAL	63	11	144	27	13	7
Knol Khol Brassica caulorapa	Early White Vienna	120	8,000*b*	Bulb	18	3	33	4	2	3
				Other	24	2	34	8	3	6
				TOTAL	42	5	67	12	5	9
Okra Hibiscus esculentus	MI—5	150	19,000*b*	Pod	46	8	52	11	10	3
				Other	13	3	18	17	10	4
				TOTAL	59	11	70	28	20	7

TABLE I.—Nutrients Removed by Crops—(*Contd.*)

Crop	*Variety*	*Duration of Crop Days*	*Yield kg/ha*	*Plant Part*	*kg/ha* *N*	*P*	*K*	*Ca*	*Mg*	*S*
Vegeitable										
Sweet Potato Ipomoea batatas	Jewel	100	15,000*b*	Tuber	31	6	51	10	4	3
				Vine	58	11	136	34	22	11
				TOTAL	89	17	187	44	26	14
Pulses										
Black Gram Phaseolus mungo	MI—I	90	1,500*a*	Grain	55	4	17	1	3	2
				Other	16	1	26	15	5	2
				TOTAL	71	5	43	16	8	4
Cow Pea Vigna catiang	Arlington	90	1,500*a*	Grain	50	4	19	3	2	2
				Other	10	1	17	8	4	2
				TOTAL	60	5	36	11	6	4
Cow Pea Vigna catiang	MI—35	75	1,200*a*	Grain	42	3	15	1	3	1
				Other	6	1	17	6	4	1
				TOTAL	48	4	32	7	7	2
Dhal Cajanus cajan	MI—10	135	1,500*a*	Grain	47	4	23	2	2	2
				Other	24	1	21	15	4	2
				TOTAL	71	5	44	17	6	4

Pulses										
Ground Nut Arachis hypogea	Red Spanish	100	1,800*a*	Grain	88	5	12	1	3	2
				Other	13	1	22	11	5	2
				TOTAL	101	6	34	12	8	4
Mung Phaseolus aureus	MI—1	90	1,200*a*	Grain	45	2	13	1	1	2
				Other	9	1	13	9	4	1
				TOTAL	54	3	26	10	5	3
Soy Bean Glycine max	TK—5	90	1,800*a*	Grain	103	10	34	6	4	3
				Other *c*	15	1	13	10	5	2
				TOTAL	118	11	47	16	9	5
Grasses										
Setaria Setaria sphacelata	—	365	45,000*b*	—	111	22	208	28	19	10
Signal Grass Brachiaria brizantha	—	365	45,000*b*	—	187	50	307	52	46	17
Pangola Digitaria decumbens	—	365	45,000*b*	—	153	46	223	58	26	17
Paspalum Paspalum plicatulum	—	365	50,000*b*	—	129	17	280	70	51	26

Notes.—*a*—Air dry weight; *b*—Fresh weight *c*—Leaves not included.

Duration of the crop is stated approximately.

Under the column PLANT PART, OTHER means all above-ground portions of plant for root crops such as cassava.

For non root crops OTHER means all above-ground plant parts except the part for which nutrient removal is given specifically against each crop.

TABLE 2.—Relative nutrient removal by crops

Crop	*N+P+K Removed kg/ha/day*
Sweet Potato	2.93
Cassava	2.89
Maize	2.68
Sorghum	2.22
Rice	2.07
Soy bean	1.84
Beet	1.66
Signal Grass	1.49
Eggplant	1.45
Sunflower	1.44
Groundnut	1.41
Blackgram	1.33
Gingelly	1.21
Paspalum	1.17
Pangola	1.16
Cowpea (Arlington)	1.13
Cowpea (MI 35)	1.12
Cotton	1.05
Carrot	0.99
Chilli (Santaka)	0.95
Knol Khol	0.95
Okra	0.93
Setaria	0.93
Mung	0.92
Dhal	0.90
Chilli (MI 1)	0.86

Studies on iron and manganese relations in rice*

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SUMMARY

Foliar symptoms and other growth characteristics resulting from deficiency or excess iron and manganese on rice were studied in nutrient culture solutions.

Iron deficient plants developed a chlorisis of young leaves which in extreme cases caused a bleaching. Plant growth and development were retarded as measured by plant height and tiller numbers. Excess iron, on the other hand, caused intraveinal yellowing which led to browning from tip downwards in old leaves and retarded plant growth as measured by plant height and tillering.

Manganese deficiency caused an intraveinal yellowing in young leaves which developed into brown colouration. These plants were also stunted in growth. Toxicity of manganese was characterised by brown discolourations and necrotic patches in the older leaves. With time, the tips dried and the margins rolled inwards in old leaves while the young leaves remained unopened and rolled up.

INTRODUCTION

IRON and manganese are two of the four micro-nutrient heavy metals essential to plants and other forms of life. These are two elements which are most sensitive and are liable to undergo a change in valance in the soil. While iron can exist in the di-and tri-valent forms manganese exists in the di-, tri- and tetra-valent forms. The availability of both these nutrient elements tend to decrease as their oxidation states increase. In most rice soils the concentrations of iron and manganese could reach toxic proportions under certain conditions because traditionally rice is grown in submerged soils where reducing conditions prevail.

It was believed by some that iron and manganese probably interfere with each other's functions in plant matabolism, and a possible inter-relationship between iron and manganese in plant nutrition has been studied by several investigators. Shive (12), and Somers and Shive (14) studied the interrelationship

*Paper presented at the 29th Annual Session of the Ceylon Association for the Advancement of Science (Section B), on 18th December, 1973.

between these two elements in soya bean and interepreted this relationship in terms of the roles they play in plant metobolism. They reported that the symptoms of iron deficiency were similar to those of manganese toxicity and concluded that the Fe : Mn. ratio of healthy plants fluctuated within a relatively narrow range of two. They believed that a value greater than two produced chlorisis due to iron toxicity or manganese deficiency ; and that a value of less than two produced symptoms due to the iron deficiency or manganese toxicity.

Working with Lespedesa, cowpea and some legumes, Morris and Pierre (8, 9) found that increase of iron up to a point distinctly reduced the toxicity for a given concentration of manganese. They also found no evidence to support the hypothesis that the Fe: Mn ratio of the nutrient solution was a significant factor in the growth of Lespedza. On the other hand, Sideris and Young who worked with pineapple found evidence for an optimum ratio between iron and manganese in the nutrient solution for best plant growth (13).

In a critical study of the iron-manganese relation with a variety of plants and using a number of different techniques Hewitt (3, 4, 5) found no evidence for a reciprocal relationship between these two elements. He also noted the symptoms of deficiency and toxicity for each of the two elements were quite different and distinct. The independent nature of the action of these two elements was quite evident from his observation of the existence of iron and manganese dificiency in the same plant at the sametime.

In the rice plant iron toxicity has been considered to be the factor responsible for physiological disorders such as "Bronzing" which is prevelent in this country (10, 11), and "Akagare" which is reported from Japan (2).

This report embodies the results of a green house experiment with rice grown in a modified Hoagland's solution over ranges of iron and manganese concentrations to study the effects of these elements on foliar symptoms and other growth characteristics resulting from deficiency or excess of the two elements.

MATERIALS AND METHODS

Stock solutions of reagent-grade chemicals were made in demineralized water and stored in glass bottles. Nutrient solutions were made out of these stock solutions and transferred to procelain pots of 2-litre capacity.

Three, 21 day old rice seedlings of *Murungakayan* 302 were planted in each pot. The nutrient solutions were changed every two weeks with the exception of iron which was added weekly in the form of freshly prepared $FeSO_4$ solution.

The experiement consisted of eleven treatments which were replicated 4 times. The levels of iron and manganese in the solution were varied according to the following :

Treatment No.		*Level of iron (ppm)*
1	..	0
2	..	2.5
3	..	20.0
4	..	40.0
5	..	80.0

Treatment No.		*Level of manganese (ppm)*
6	..	0.0
7	..	2.5
8	..	5.0
9	..	20.0
10	..	40.0
11	..	80.0

The other essential nutrients were supplied at levels given below :—

Element			*ppm.*	*Element*			*ppm.*
Nitrogen	..	..	56	Boron	..	..	0.25
Phosphorus	..	..	14	Chlorine	..	..	5.00
Potassium	..	..	23	Copper	..	..	0.02
Calcium	..	..	10	Molybdenum	..	..	0.01
Manganese	..	..	48	Zinc	..	..	0.25
Sulphur	..	..	80				

The first 5 treatments which received varying levels of iron were supplied with 0.5 ppm manganese while the last 6 treatments, which received varying levels of manganese, were supplied with 2.00 ppm. iron.

The experiment was harvested when plants were 4 months and 2 weeks old. Weights of roots and tops were recorded.

RESULTS AND DISCUSSION

Foliar Symptoms

As expected, foliar symptoms of deficiency and toxicity of iron and manganese were observed in plants grown in the low and the relatively high level solutions of the two elements. The variety of rice used in this experiment, *Murungakayan* 302, is susceptible to the physiological disease "bronzing," and one objective of this investigation was to observe if the symptoms of deficiency or toxicity of iron and manganese resembled those of bronzing.

Iron deficient plants developed a chlorosis of young levaes which in extremes cases caused bleaching. Further, plants growing in the low iron containing solutions were retarded in growth and development. Deficiency of iron aslo retarded plant height, root development and growth of tops as seen when those in the zero ppm control treatment are compared with those receiving 2.5 ppm. of the element (Table 1). The symptoms of iron deficiency on rice were similar to those described by other workers (7, 15).

Plants growing in solutions containing excess iron, i.e. in solutions containing 20 ppm. of the element ($Fe^{\dagger\dagger}$) or more, developed an interveinal yellowing which gradually developed into browning of leaves from the tip down wards in the old leaves, which finally developed into a necrosis. Excess iron also had a retarding effect on plant height and tillering (Table 1).

The symptoms of manganese toxicity were evident within the first five days of the treatments when the tips of the young leaves of seedlings in solutions containing 20, 30 and 40 ppm of the element turned light brownish-yellow. At this stage approximately a third of the leaf from tip downwards was affected, and within the next two days the discolouration spread to about two-thirds the length of the leaf. No chlorosis was observed in plants growning in the high manganese solutions, an observation which is in agreement with those of Vlamis and Williams (16). As seen in Table 11 there was significant retardation of plant hieght at 20 and 80 ppm manganese relative to those receiving 2.5 ppm of the element.

Excessive amounts of the heavy metal micronutrients, specially iron and manganese which occur in rice soils in water soluble forms can cause damage to rice crops. As mentioned already iron toxicity is considered to be the factor responsible for physiological disorders such as "Bronzing" in rice which is prevalent in this country (10, 11) and "Akagara" in Japan (2, 17). Manganese toxicity is quite common on acid soils. These symptoms are often confused with those of calcium deficiency or with the direct effects of high acidity. Except in extreme cases, acidity itself is not directly a serious problem as it relates to plant growth (1). However, high concentrations of hydrogen ions favour the increased solubility of elements such as iron and manganese (in addition to others like alumimum, lead, arsenic and zinc) which can be toxic to plants and animals. It should be added that, even if the concentrations of these elements are not ethal they nevertheless could suppress normal plant growth.

Growth Characteristics

The effects of the levels of iron and manganese in the nutrient solution on plant height, tillering, and weight of roots and tops is seen Table 1 and II.

Plant height

Iron and manganese levels in the nutrient solutions had highly significant effects on plant height. With both elements the optimum concentration in the nutrient medium was 2.5 ppm of the elements. While dificiency of both iron and manganese retarded plant height, concentrations higher than 40 ppm. iron and 80 ppm. manganese had adverse effects on this parameter of growth.

Number of Tillers

The level of iron in the solution had highly significant effect on the number of tillers. The optimum level for maximum tillering was 2.5 ppm. while at the zero level and at 20 ppm iron the number of tillers was significantly reduced. The level of manganese in the solution had no significant effect on the number of tillers per plant, under the conditions of this experiment. However Karim and Vlamis (6) found manganese deficiency restricted tiller formation in rice.

Weight of roots

Root development as indicated by weight was influenced by iron at the 1 per cent level of probability. Here too the optimum concentration of iron in the growth medium was 2.5 ppm. Increasing concentrations of iron had a very pronounced retarding effect on root development.

Manganese concentration had no apparent effect on root development under the conditions of this experiment. These results are not in agreement with those of Karim and Vlamis (6) who found root development was completely restricted in respect of its length and volume.

Weight of tops

The level iron in the nutrient solution had a highly significant effect on the weight of tops. The concentration of 2.5 ppm. of the element in the nutrient solution gave the highest weight while higher concentrations and absence of this element in the nutrient medium depressed yield of tops.

The level of manganese in the nutrient solution had a highly significant influence on the weight of plant tops. The most marked effect was due to deficiency of this element, and as seen from the data in Table II the difference between this level and the 2.5 ppm level was highly significant.

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TABLE I.—Growth Characteristic of Rice Plants Grown in Solutions with Iron as a Variable

Fe in solution, ppm	*Plant Height (cm)*	*Number of tillers per plant*	*Weight of roots (gm)*	*Weight of tops (gm)*
0.0	86.8	4.3	4.81	20.79
2.5	91.4	5.2	6.03	22.21
20.0	86.1	4.3	4.15	19.91
40.0	80.3	4.1	3.11	15.34
80.0	59.2	3.1	1.50	9.07
C.V.%	5.62	11.7	14.10	15.0
L.S.D. 5%	7.00	0.8	0.85	4.04
L.S.D. 1%	9.82	1.1	1.19	5.66

TABLE II.—Growth Characteristics of Rice Plants Grown in Solutions with Manganese as a Variable

Mn. in solution, ppm	*Plant height (cm)*	*Number of tillers per plant*	*Weight of roots (gm)*	*Weight of tops (gm)*
0.0	81.0	5.9	5.29	17.81
2.5	96.0	4.5	5.65	21.13
5.0	90.4	4.5	5.27	20.38
20.0	88.4	5.6	6.11	13.67
40.0	91.3	4.6	5.51	22.64
80.0	77.4	4.8	5.10	25.06
C.V.%	4.98	18.84	15.0	8.60
L.S.D. 5%	6.57	N.S.	N.S.	2.82
L.S.D. 1%	9.09	N.S.	N.S.	3.90

Production efficiency of settlement farmers in Sri Lanka

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ABSTRACT

The question of how efficiently farmers use resources is of considerable importance to those concerned with bringing about change and development. Output per unit could be increased in a relatively costless way by improving the efficiency with which existing inputs are allocated. In this study the allocative efficiency of resources are examined in a sample of settlement farmers in Sri Lanka using Production Function Analysis and Linear Programming. The analysis is based on data collected on weekly visits to farmers throughout the cropping year 1971/72 at the Minipe Colonisation Scheme. The results of the study indicate the potential that exists for increasing farm production and income on settlement farms. Production Function Analysis clearly demonstrates the underutilisation of land and family labour resources. Linear Programming recasting of the problem confirms the results of the production function analysis and demonstrates the production possibilities available given the present resource endowment situation and levels of technology on these peasant farms. The implications of the findings are that policy makers should attempt to maximise the efficiency of abundantly available resources on settlement farms rather than be preoccupied with modernising farming. The results of this analysis are also of interest since they are at varience with the commonly held view that peasant producers are efficient but poor.

INTRODUCTION

THE question of how efficiently farmers use resources in peasant agriculture is of considerable importance to all those concerned with bringing about change and development. Given the production function, i.e., ruling aside technological change, output per unit may be increased by improving the efficiency with which the existing inputs are allocated. If such reshuffling of resources is possible, achieving allocative efficiency represents a relatively costless way of obtaining growth. It then becomes relevant to ask how widespread is the misallocation of resources, and if it exists what are the reasons for such misallocation. This problem is of topical interest to the less developed countries (LDCR),where shortages of essential inputs following the energy crisis threatens to thwart economic development. Moreover, the question of how efficiently farm resources are used in peasant agriculture has been a topic of substantial academic interest to economists, who have established that peasant farmers are generally efficient, given the state of technology (3,9,12,14,15,17,18).

The purpose of this paper is to examine the allocative efficiency of resource use on settlement farms in Sri Lanka. In view of the large expenditure in the past and the extensive proposals for future land settlement and development in the country*, it is considered expedient to identify any disequilibria that may exist in the utilisation of the existing factors of production, with the given techniques and methods of organisation, and the potential for maximising the use of such resources. Both production function analysis (PF) and linear programming (LP) are employed in the study.

THE DATA

The analysis is based on data collected by the writer at the Minipe Colonisation Scheme in Sri Lanka, on weekly visits to farmers throughout the cropping year September, 1971 to October, 1972. Although the analysis is confined to one scheme, it is felt that this would not vitiate valid generalizations being made in respect of others, due to the similarities in the production and institutional backdrop of the major settlement schemes in Sri Lanka (1). Farm records covering all aspects of the farm business were maintained for forty farmers. A small sample was considered desirable for several reasons, viz., accuracy of data which necessitated the measurement of some inputs and outputs, the assurance of co-operation by the farmers to participate in the study for a full year and the availability of limited funds to undertake an intensive examination of a large sample. Since the farming conditions on settlement schemes do not vary widely, a small sample cannot be considered too objectionable. In fact, the advantages of having a small group of farmers from whom data could be collected personally were substantial. Besides the quality and accuracy of the data, it was possible to study the behavioural aspects of farmers, which would not have been possible if attention had been concentrated on the administrative and computational problems of a large sample survey.

THE MODELS

(i) *Production Function Model*

A whole farm (multiple enterprise) production function is estimated from cross-section data collected from a group of settlement farmers. The dependent variable specified is the gross farm income, which includes the value of all crops raised, both main products and by-products estimated on the baiss of

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*Approximately 650,000 acres had been developed under settlement schemes in Sri Lanka by 1968. Compared with this development over a 30-year period, the potential physical capacity of the Island's land and water resources for settlement is estimated to be more than twice that extent (1).

harvest prices. A value rather than a physical measure of output is chosen due to the diversity of the agricultural products which precludes simple aggregation in physical terms.

The independent variables considered could be broadly classified into the conventional variables land, labour, capital and institutional variables such as management. Cultivated land and not the physical area per settlement farm enter the production function in physical units as acres. In principle land should be represented by a vector of non-homogeneous areas, in order to recognise the qualitative differences that exist between the land grades. Such complete specification is difficult and we have therefore considered only the two types of land which are qualitatively significantly different, namely the lowland (irrigated) and highland (unirrigated). They are also aggregated into a single land variable, to evaluate the aggregate importance of land and its ability to improve the statistical significance of the models. Aggregation in this instance is not considered too objectionable since high value food crops could be cultivated on the highland and would not cause significant differences in the potential productivity of the different grades of land. Different categories of labour and their productive capacities were explicitly recognised in the data collection and processing phases (1). Conversion to standard man-days was based upon coefficients derived with reference to sex, age and task differences between the different categories of labour. Labour entered the model as a flow rather than a stock concept and is quantified as the actual man-days involved in farming. The improtance of family, hired and exchange labour are separately evaluated and also considered aggregatively as total labour.

With regard to capital, both fixed and working capital are considered. The fixed capital variable included all farm machinery, hand-tools and equipment valued at current market rates. A gross concept of fixed capital which includes both maintenance and depreciation expenditure is used. Working capital or production expenditure expressed in value terms has also been considered. In fact, under the farming conditions prevailing on settlement farms, production expenditure is more important than fixed capital. This variable included the cost of inputs, marketing and transporting of all farm produce. The importance of farm credit is also examined.

Management, although a crucial factor of production is very elusive and difficult to submit to quantification. The number of years of education of the farmers is used as a proxy for management, in the form of a dumy variable. Farmers with a post-primary (above sixth grade) education being designated unitary values, while the others are assigned zero values.

The functional form could be represented as follows :

$$Y = a + \sum B_i X_i + e$$

Where, Y = gross farm income expressed in natural or logarithemic terms.

a = intercept or constant term

X_i = farm inputs (land, labour, production expenditure, etc., expressed in natural or logarithemic terms)

B_i = production coefficients

e = random error term

(ii) *Linear Programming Model*

Before proceeding to use LP, the farmers in the sample have been grouped on the basis of their resource endowments into seven groups. A land-labour ratio is used since they involve the major factors of production (table A1).

(*a*) *Objective Function :* It is well known that the peasant farmers objective function is not just money income. The peasant in Sri Lanka operates in a multi-goal environment which can however be accomodated within the LP framework. Basically a peasant has four common goals of production : increased land productivity, expanded family security, maximising farm incomes and congenial community involvement (2). In this multi-goal production environment, it is not possible *a priori* to decide on the relative importance of each of these goals in influencing the ultimate production decision. However, field observations revealed that increasing land productivity, maximising incomes and ensuring family security are the more important goals of farm production (1). For the purpose of this analysis, which is primarily concerned with examining the allocative efficiency of farm reusources on settlement farms, it is assumed that the appropriate objective function would be the maximisation of output valued at the prevailing market prices.

(*b*) *Constraints :* The land available for farming on the settlement schemes in Sri Lanka can be classified into two types, the lowland (irrigable) and highland (unirrigable). Land holdings have been classified according to the average operational size of holding for each of the seven groups. Besides the division of land into lowland and highland, the availability of land during the two cropping seasons are also incorporated into the LP model since production possibilities for the Maha* and Yala* seasons differ.

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*The *Maha* season corresponds to the North-East monsoon and represents the period September-March. While the *Yala* season corresponds to the South-West monsoon and represents the period April-August.

Three types of labour are incorporated into the model: family, hired and exchange labour expressed in man-days. Labour supply assumed is the average amount of labour reported as employed during the cropping year 1971/72 for the seven groups. In specifying the labour restrictions, seasonality becomes an important consideration. In some earlier studies of peasant agriculture, monthly time periods have been used (4, 13). While others have adopted labour periods based on peak requirements (5, 8). A monthly time period is not considered too restrictive in the present study as the farmers agree to abide by a cultivation calender drawn up at the commencement of each season. An advantage of using monthly time periods is the computational manageability of the problem in view of the large number of production alternatives examined.

A simplifying assumption that there is no difference in the levels of efficiency of family, hired and exchange labour is made in this analysis. The available hired and exchange labour constraints in the model are the actual levels of these resources employed by the farmers in the respective groups during the cropping year 1971/72.

The need for working capital has become overtly clear with the adoption of the modern farm technology. Fixed capital is not considered restrictive. This is a reasonable assumption, since there is no apparent shortage of simple farm implements such as mammoties (hoes), sickles and so on. The capital availability for production is assumed to be the actual production expenditure incurred by farmers in the respective groups during the cropping year 1971/72. This is considered more useful than the borrowing capacity of the farmer. Farmers generally borrow for the cultivation of paddy only, which is the main farm enterprise. Although institutional credit is available for the production of other crops, farmers rarely avail themselves of the facilities available. Moreover, the livestock enterprises do not come within the purview of the credit scheme at all. Further, using the amount borrowed as a measure of capital availability would complicate the consideration of production expenditure from savings. It is therefore felt that an aggregate of all cash and kind expenditure incurred in farming is a better measure of the availability of capital for farming.

Consumption (subsistence) requirements enter the production model as a 'minimum bundle of goods' requred per settler family during a cropping year. This not only ensures a minimum production of food crops required for domestic consumption but also includes the non-food requirements of the farm family. It is felt that this broader notion of subsistence has a more important bearing on economic behaviour than the mere production of family food requirements under semi-commercialised farming conditions. Nutritional requirements *per se* are not considered critical, since earlier studies have indicated no serious problems of malnutrition (10). In a given specified time period, it is postulated that a farm family has certain target levels of food, shelter, clothing and so on, with which it provides itself. This is defined as the " minimum standard of living" and is an amalgam of physiological, socio-economic and cultural elements. In order to compute this variable, special records were maintained during the field sutdy (1). It was observed that only rice and vegetables were produced for domestic use, while other requirements of food and non-food items were purchased. The need for money clearly exists as the subsistence production *per se* is limited. The money income necessary to satisfy the non-food requirement in the main and also some food items are expressed as a minium constraint in the model. A minimum paddy acreage, sufficient to satisfy the consumption needs of each farm group has been computed (table A2).

Irrigation water is generally an important constraint determining the success of farming in the Dry Zone* of Sri Lanka, where the preponderance of settlement schemes are located. The feasibility of cultivating in the *Yala* season depends upon the water stored in the tanks during the *Maha* season. At Minipe the source of irrigation water is the Mahaveli river which has been diverted via an anicut and is a perennial source. The water supply is confined to paddy production as the gravity flow is inaccessible to the highlands which could be cultivated essentially by rainfall. Since the water is available only for paddy production, no alternative possibilities of using this water are examined in the study.

No technical constraints such as rotational husbandry practices are incorporated in the model. Peasant farmers in Sri Lanka have practiced a system of continuous cropping of paddy on the lowlands since time immemorial, while on the highlands, cultivation has not been systematised. In fact, cultivation on non-irrigated lands has been traditionally by *chena* (slash and burn system) where the rotation of the land rather than crops is practiced. Moreover, due to the lack of a systematic livestock industry, a pastoral fallow is not customery.

Draught power is supplied by hired or owned tractors and buffaloes. Mammoty (hoe) tillage for the cultivation of paddy is virtually non-existent. However, for highland farming, which is generally practiced on a small scale, cultivation using hand tools is common.D raught power is not considered too restrictive due to the availability of adequate tractors and buffaloes in the area. In times of shortages, government tractors are commissioned to help and do not pose a serious limitation to farming at the present time. The adequacy of production capital is the determining factor, since draught power could always be hired.

(*c*) *Alternative Activities:* The production alternatives considered are those observed on settlement farms. These farm activities fall into three major groups : paddy, highland crops and livestock. In the case of paddy, many processess are identified and considered as separate activities. Paddy

*Defined as an area which receives less than 75 inches of rainfall per annum. The period May-September is dry, since, precipitation is during the other months coinciding with the North-East monsoon.

'activities' are identified on the basis of the age of maturation of the crop, i.e., long aged (4–4½ months) or short aged (3–3½ months); the method of planting, i.e., whether broadcast-sown or transplanted; and the degree of mechanisation, i.e., whether the lands are ploughed and threshed by buffaloes or tractors. Further, they are grouped as high yielding or traditional varieties. On this basis, ten activities in the *Maha* and a similar number in the *Yala* season are examined. All these activities are assumed to be under irrigable conditions.

In the case of the highland crops, both annual and perennial crops cultivated under rainfed conditions have been considered. In the *Maha* season, forty-seven crop activities have been examined, while in the *Yala* season twenty-five crop activities have been included in the model. The crop activities appear in the form of pure stands as well as mixtures (Table A3).

Four livestock activities : buffaloes, dairy cows, goats and poultry have also been examined as production alternatives.

(*d*) *Input-Output Coefficients:* The technical matrix is computed from a field study conducted by the writer (1). The technical coefficients showed little variation between farms. This is probably due to the similarity in the ecological conditions and level of technology in the area. In order that some operational significance be had and to facilitate comparative analysis, mean coefficients have been computed in respect of all activities and are used in the analysis for all farm groups. The capital input coefficients are the requirements of production capital for the purchase of seeds, fertilizers, agrochemicals and tillage.

The general analytical LP model could be expressed mathematically as follows :—

$$\text{Maximize : } Z = P_1X_1 + P_2X_2 + \ldots\ldots\ldots\ldots + P_nX_n$$

$$\text{Subject to : } A_i^I \geqslant a_{i1}X_1 + a_{i2}X_2 + \ldots\ldots\ldots\ldots + a_{i1}X_n$$

$$A_i^V \geqslant a_{i1}X_1 + a_{i2}X_2 + \ldots\ldots\ldots\ldots + a_{i1}X_n$$

$$L_i^F \geqslant a_{i1}X_1 + a_{i2}X_2 + \ldots\ldots\ldots\ldots + a_{i1}X_n - L_i^M - L_i^E$$

$$L_i^H \geqslant a_{i1}X_1 + a_{i2}X_2 + \ldots\ldots\ldots\ldots + a_{i1}X_n$$

$$L_i^E \geqslant a_{i1}X_1 + a_{i2}X_2 + \ldots\ldots\ldots\ldots + a_{i1}X_n$$

$$C_i \geqslant a_{i1}X_1 + a_{i2}X_2 + \ldots\ldots\ldots\ldots + a_{i1}X_n$$

$$F_i \leqslant a_{ij}X_j$$

$$M_i \leqslant a_{i1}X_1 + a_{i2}X_2 + \ldots\ldots\ldots\ldots + a_{i1}X_n$$

$$X_i \geqslant o \text{ for all } j$$

Where, Z is the total net returns to the fixed resources of the farm.

P_i is the net returns per unit of real activity.

A^I is the available irrigated area per farm.

A^V is the available unirrigated area per farm.

L^F, L^H, L^E are the available family, hired and exchange labour respectively per farm on a monthly basis.

C is the available working capital per farm

F is the minimum supply of rice which should be supplied per farm.

M is the minimum level of income required per farm above minimum food requirements for the well being of farm family.

X_j is the crop and livestock activities of the farm.

a_{ij} is the input-output coefficients of the i th resource and j th activity.

The negative L^H_i and L^E_i indicates the possibilities of transferring resources and thereby adding to the supply of resources.

METHOD OF ANALYSIS

The main question to which this paper is addressed is to ascertain the efficiency of resouce use. We shall concentrate on the orthodox static concept of allocative efficiency, i.e. attempt to identify any disequilibria that may exit in the utilisation of the existing factors of production, with the given techniques and methods of organisation. This is examined initially by means of production function analysis, using cross-section data collected from the farmers in the sample. Under the assumptions of perfect competition and constant returns to scale or that decreasing returns to scale eventually prevail, maximum efficiency in resource use occurs when the value of the marginal product from the use of one or more resource units is equal to the cost of an additional unit. A significant difference between the marginal value product (MVP) of each factor of production and factors opportunity cost (MFC) is accepted as evidence of inefficient resource utilisation (18). On the other hand, correspondence between each factors marginal product and its opportunity cost is accepted as evidence of efficient resource use. These relationships would indicate the efficiency of resource use with respect to the 'average' farm. To analyse the problem further with the object of identifying resource use inefficiencies at a more disaggregated level and also exploring alternative production possibilities, LP is employed. The observed resource use and farm incomes of the farmers in the seven groups identified are compared with the optimal solutions generated by LP. A significant difference would indicate the degree of inefficiency that prevails, assuming a profit maximising objective, since, economic efficiency requires that resources must be combined in such a manner that they cannot be rearranged to either give a greater physical product with the same collection of resources or the same physical product with less of one or more resources (6).

THE RESULTS

Both Linear and Curvilinear (Cobb-Douglas) production functions were estimated using the Ordinary Least squares procedure. The latter functions gave a better fit to the data. Of the variables tested it is evident that the low-land acreage cultivated, family labour employed and production expenditure are the most important in determinig farm income (Table 1). The management variable which was tested by using the number of years of education as a proxy for management was not statistically significant. Moreover, the inclusion of this variable did not improve the explanatory power of the model very much. Since paddy production has been a traditional occupation, it is perhaps likely that education *per se* did not account for any substantial improvement in the skills of farmers which could influence levels of productivity in any tangible way. On the basis of the different production relationships examined, regression equations R1 and R2 were found to be the most satisfactory on statistical grounds as well as *a priori* expectations. The coefficients of the estimated variables in the production functions R1 and R2 are significant at the 5 percent level.

The explanatory power of the functions are also high, with at least 86 per cent of the dependent variable being explained by the vriables specified in both models. Model R1 is however selected for futher analysis as the total labour variable and production expenditure variable in Model R2 exhibit some degree of multi-collinearity, which is indicated by the correlation matrix. In the computation of the total labour variable, hired labour constituted an important element. The cost of hiring labour is again included in the production expenditure variable and therefore leads to the problem of collinearity between variables.

The production coefficients of the Cobb-Douglas function are interpreted as the elasticities of production and are constant over the entire range of inputs (7). The production elasticities indicate, for each input the expected percentage increase (or decrease) in the gross value of output if the amount of that input increased (or decreased) by one per cent, other inputs being held constant. Considering Model R1, the production elasticity of the land cultivated (X_3) indicates that a 1 per cent increase in the land acreage would increase gross farm income by 0.36 per cent. The production expenditure variable (X_6) has the largest elasticity and like the land variable is significant at the 1 per cent level. The value of the expenditure elasticity indicates that a further 1 per cent cash outlay on production would increase gross farm income by 0.45 per cent. Family labour employed has the lowest production elasticity (0.22) and is significant only at the 5 per cent level of probability. Under the assumption of perfect competition, the production coefficients show the proportion of the total output that goes as a return to the repective factors of production (19). According to the results of this analysis, the largest proportion of the gross farm income is explained by production expenditure (0.45), followed by the total land cultivated (0.36) and family labour (0.22). These three

TABLE I.—Production Functions and Related Statistics of Settlement Farms

Regression	*Constant Term*	*Independent Variables*						*R*	*R^2*
	**	**	**	**					
R1	0.33	$0.36X_3$	$0.45X_6$	$0.22X_8$	—	—	—	0.87	0.86
	(0.61)	(0.14)	(0.10)	(0.09)					
	**	**	*	**					
R2	3.64	$0.44X_3$	$0.22X_{13}$	$0.37X_6$	—	—	—	0.86	0.85
	(0.61)	(0.13)	(0.14)	(0.14)					
	**	**	*	**					
R3	3.33	$0.36X_3$	$0.22X_8$	$0.45X_6$	$-0.00012X_{17}$	—	—	0.87	0.85
	(0.62)	(0.14)	(0.10)	(0.11)	(0.05)				
	**	*	*	*		—			
R4	3.25	$0.36X_3$	$0.23X_8$	$0.48X_6$	$0.003X_{17}$	$-0.03X_{12}$	—	0.87	0.85
	(0.72)	(0.15)	(0.11)	(0.15)	(0.05)	(0.12)			
	**	*	*	**	**				
R5	3.49	$0.27X_1$	$0.05X_2$	$0.24X_8$	$0.48X_6$	$0.01X_{17}$	$-0.05X_{12}$	0.87	0.84
	(0.83)	(0.12)	(0.08)	(0.11)	(0.16)	(0.05)	(0.12)		
	**					*			
R6	3.98	$0.33X_1$	$0.06X_2$	$0.20X_{10}$	$0.03X_{14}$	$0.34X_6$	;$0.02X_{17}$	0.86	0.83
	(0.99)	(0.17)	(0.08)	(0.17)	(0.04)	(0.15)	(0.06)		
	**	**	**						
R7	3.65	$0.44X_3$	$0.37X_6$	$0.22X_{13}$	$-0.02X_{17}$	—	—	0.86	0.85
	(0.62)	(0.14)	(0.14)	(0.14)	(0.05)				
	**	**	*	**					
R8	3.33	$0.36X_3$	$0.22X_8$	$0.45X_6$	$0.002X_{17}$	$0.005X_{16}$	—	0.87	0.86
	(0.63)	(0.14)	(0.10)	(0.12)	(0.05)	(0.15)			
	**	*	*	**					
R9	3.57	$0.26X_1$	$0.24X_8$	$0.44X_8$	—	—	—	0.87	0.85
	(0.73)	(0.11)	(0.09)	(0.11)					
	**	*	*	**					
R10	3.30	$0.26X_1$	$0.23X_8$	$0.54X_6$	$-0.09X_9$	—	—	0.87	0.85
	(0.78)	(0.11)	(0.09)	(0.15)	(0.08)				

*Note.***—indicates significance at 1 per cent level.
*indicates significance at 5 per cent level Standard errors appear in parentheses

X_1=Lowland acreage cultivated per farm ;

X_2=Highland acreage cultivated per farm ;

X_3=Total land cultivated in acres per farm ;

X_4=Family labour used for paddy cultivation in man-days per farm ;

X_5=Hired labour used for paddy cultivation in man-days per farm ;

X_6=Total production expenditure in Rs. per farm ;

X_7=Total credit used for production in Rs. per farm ;

X_8=Total family labour used in man-days per farm ;

X_9=Total hired labour used in farming in man-days per farm ;

X_{10}=Total labour used in paddy cultivation in man-days per farm ;

X_{11}=Family labour used for subsidiary food cropping in man-days per farm ;

X_{12}=Total hired and exchange labour used for farming in man-days per farm ;

X_{13}=Total labour used for all farming activities in man-days per farm ;

X_{14}=Total labour used for subsidiary food crops in man-days per farm ;

X_{15}=Total hired labour used for subsidiary food crops in man-days ;

X_{16}=Value of fixed capital per farm in Rs. ;

X_{17}=Dummy variable representing management.

The dependent variable considered in all the production functions was gross farm income.

variables explain 87 per cent of the variation in the dependent variable, gross farm income. The sum of the production elasticities obtained indicate constant returns to scale in farm production.

To ascertain the efficiency of resources use, efficiency indexes have been computed (table 2). The marginal value productivity values have been calculated at the geometric mean of output and inputs. The figures used for marginal factor costs in the computation of the efficiency index are the market prices that prevailed over the period. The market price of land taken is the annual cost of renting an acre, since we are interested in land services rather than the land available for cultivation. In the case of the Settlement Schemes, the rent payable is Rs. 10 per acre of land. Additionally, Rs. 6 per acre for irrigation is charged for the lowland. However, it is interesting to note that during the cropping year in which this study was conducted, only two settlers paid any land rents and six, their irrigation dues. In computing the MPC for land, a weighted measure based on the share of the lowland and highland in the total land variable is used. This amounts, to Rs. 16 per acre. In the case of the opportunity cost of labour, the average wage rate paid to hired labour is used. This is based on the tacit assumption that the opportunity cost of family labour is equivalent to the wages paid to hired labour. Current wage rates have also been used in earlier studies (3, 17, 18). In the case of production capital, the marginal factor cost was computed as the average interest rate plus a unit of production capital. The marginal factor cost of an additional rupee spent on production is therfore Rs. 1.09.

Within the levels of statistical reliability the efficiency indexes reported (table 2), indicate that too little of the total land and family labour resources are employed at present. On the other hand, an efficienct use of production expenditure is indicated, since the ratio MVP/MFC is not significantly different from 1. The results clearly show that the two major resources land and labour which account for 58 per cent of production could be more intensively utilised as there is potential for earning higher incomes within the present farming system. It is clear that an unit increase in land area cultivated *ceteris paribus* would give rise to a further increase in income of Rs. 286.86, while, an additional unit of family labour would give rise to an income of Rs. 7.75. It is imperative to note that the opportunity costs of these resources are virtually zero at the present time as the settlers have more or less ceased to pay rents for the land and the absence of alternative employment opportunities for labour. In the analysis of the survey data it was clear that the land use intensity was 74.8 per unit, while the family labour use intensity was only 30.4 per cent. Therefore, the high MVPs obtained clearly point to the substantial economic opportunities foregone as a result of the underutilisation of the available farm resources. It was observed that production expenditure is efficiently utilised. However the large proportion of hired labour in the aggregate production expenditure variable, when family labour resource capacity is underutilised clearly leaves room for doubt regarding the acceptance of the result. A plausible explanation might be the counteracting influences of the different inputs in the aggregate production expenditure variable which has led to a satisfactory average outcome. For instance it is likely that the decreasing returns to hired labour is more than offset by the increasing returns to inputs such as fertilizers, agrochemicals and so on. The implication is that production expenditure could be more profitability utilised, and that the efficiency indicated in production capital has got to be accepted with reservations.

TABLE 2.—Efficiency Indexes of Resource Use and Related Information

Inputs	*Geometric Mean*	*Marginal Value Products in Rs**	*Marginal Factor Costs in Rs.*	*Efficiency Index***
Land Cultivated in Acres ..	8.58 ..	286.86 ..	16.00 ..	17.92
Total Family Labour Utilised for Farming in Man-days ..	191.10 ..	7.75 ..	4.50 ..	1.72
Total Production Expenditure in Rupees	2,727.00 ..	1.12 ..	1.09 ..	1.02

*Marginal value products have been calculated at the geometric means of the inputs and output.

**The efficiency index is defined as the ratio of the marginal value product to factor cost.

In sum, subject to the assumptions of the model, specification and data limitations of the foregoing analysis, it is clear that there is further scope for the profitable use of land and labour resources, while productional capital is apparently efficiently utilised *ceteris paribus*. The results of this study into allocative efficiency, it should be stressed, is based on an average relationship and does not imply that all farmers are inefficient in the use of farm resources. Nevertheless, having found that " on the aveiage " they are inefficient, we may assign a high probability value to the extent that they are inefficient, which is the normal interpretaion given to stochastic relationships(16).

To analyse the problem of allocative efficiency further with, the object of identifying any misallocation of resources as well as exploring the possibilities of optimising their use, LP is used. As far as the present problem is concerned, the difference between optimum income by reorganising product combinations to maximise farm incomes, given present resource endowments and state of technology and the observed incomes of the farmers should indicate the level of allocative efficiency *ceteris paribus*. The optimal farm incomes generated by LP for the seven groups are compared with the observed farm incomes. The results of this anaylsis are summarised in table 3. The information on solution by-products such as shadow prices (MVPs) and the sensitivity analysis relating to price stability of the models are unreported due to the lack of space. The results indicate that farm incomes could be improved given the present resource endowment situation and state of technology. According to the convention definition of economoic efficiency this finding indicates inefficient resource use. It is evident that the net revenues of all farm groups could be considerably improved without an additional outlay of resources. In fact, on average a 23 per cent. increase in net revenue is possible with a much lower level of resource use and confirms the findings of the earlier anaylsis which identified a misallocation of resources. On average, the optimal farm plans show a decrease in the use of lowland (17.59 per cent.), family labour (17.84 per cent.), hired and exchange labour (60.96 per cent.) and production expenditure (44.37 per cent.). On the other hand the only resource which is utilised more intensity is highland, which shows an increase of 120 per cent. (table 4).

Looking at the activities in the optimal plans, the results are quite consistent with the general farming systems followed at the present time. A rice dominant farming system with a few other crop enterprises emerges in the optimal plans. It is interesting to note that the high yielding varieties of rice figure prominently in the plans. A significant feature is the absence of livestock in the plans due to their low levels of profitability due to limitations in management. Crops other than paddy which were found to be important were murunga (Moringa pterygosperma), chillies and tobacco.

In the above analysis the farm was assumed to be a pure firm. In reality the farm business is closely integrated with household activities. To make the production model realistic it was considered expedient to incorporate a consumption constraint into the model. However, it was not found necessary to re-run the model as the minimum paddy acreage and ' level of living ' constraints were already satisfied by the optimal profit maximising solutions. This indicates that the object of profit maximisation given the present resource endowments and level of technology, does not conflict with the consumption needs of settlement farmers and the optimal solutions are congruent with farmers needs.

In sum, the LP recasting of the static allocative efficiency problem indicates considerable economic opportunities for better utilisation of farm resources and incomes by merely reallocating available farm resources and altering the product mix. These findings are consistent with those of the production function analysis.

TABLE 3.—Optimal Farm Plans with given Resources and State of Technology

	FARM GROUPS						
	A	B	C	D	E	F	G
1. NET REVENUES (in Rs.)	3,802.02	4,487.09	4,884.92	3,503.49	3,199.41	3,325.70	2,282.42
2. LOWLAND UTILISED (in Ac.)							
Maha Season	2.50	3.18	4.00	2.63	1.64	2.0	2.0
Yala Season	2.50	3.57	3.80	2.46	2.69	2.0	1.43
TOTAL	5.00	6.75	7.80	5.09	4.33	4.0	3.43
Intensity of Use (%)	100.0	71.80	97.50	61.62	54.12	100.0	85.75
3. HIGHLAND UTILISED (in Ac.)							
Maha Season	2.75	2.50	2.78	2.38	3.0	1.30	1.37
Yala Season	2.33	2.50	2.78	2.38	3.0	0.02	1.27
TOTAL	5.08	5.00	5.59	4.76	6.0	1.32	2.64
Intensity of Use (%)	92.36	100.00	100.0	100.00	100.0	49.62	96.35
4. FAMILY LABOUR USED (in m.d.)	177.56	232.78	220.39	159.13	176.17	215.11	102.70
Intensity of Use (%)	83.48	83.94	87.92	81.76	71.02	84.65	90.07
5. SURPLUS FAMILY LABOUR (in m.d.)	35.13	44.52	32.09	35.48	71.82	39.0	11.31
5. HIRED & EXCHANGE LABOUR USED (in m.d.)	106.29	117.89	175.26	102.36	33.86	113.20	87.59
Intensity of Use (%)	54.61	38.10	53.80	41.30	10.50	40.78	43.33
7. SURPLUS HIRED & EXCHANGE LABOUR (in m.d.)	66.76	191.51	30.28	145.46	288.41	164.32	114.54

3—17294 (10/75)

TABLE 3.—Optimal Farm Plans with given Resources and State of Technology

	FARM GROUPS						
	A	B	C	D	E	F	G
8. ACTIVITIES IN OPTIMAL PLANS (in Ac.)							
HYVL Rice (BTM)	1.26	2.15	2.58	1.44	—	—	1.42
HYVL Rice (TTM)	0.47	0.32	—	0.48	—	2.00	—
HYVL Rice (TBM)	0.77	—	0.62	0.27	—	—	—
HYVL Rice (BBM)	—	0.71	0.71	—	—	—	—
HYVS Rice (BBM)	—	—	0.09	0.44	0.96	—	—
HYVS Rice (TTM)	—	—	—	—	—	—	5.08
TV Rice (BBM)	—	—	—	—	0.68	—	—
HYVL Rice (TBY)	0.69	—	—	1.09	1.69	—	0.03
HYVL Rice (BTY)	—	—	—	—	—	0.03	—
HYVS Rice (TBY)	1.53	—	—	1.37	1.00	0.72	1.07
HYVS Rice (BBY)	0.28	—	—	—	—	1.25	0.33
Murunga	2.33	2.50	2.78	2.38	3.00	—	1.27
Tobacco (Maha)	0.35	—	—	—	—	1.30	0.10
Crop MX B (Maha)	0.07	—	—	—	—	—	—
Chillies (Yala)	—	—	—	—	—	0.02	—
9. CAPITAL REQUIRED (in Rs.)	1,513.13	1,810.61	2.320.32	1,415.09	980.47	2,247.98	1,074.99
10. SURPLUS CAPITAL (in Rs.)	723.14	1,908.54	1,020.23	1,263.14	2,490.70	1,738.58	1,283.36

Note.—The letters HYV and TV signify high yielding varieties and traditional varieties respectively. The next letter indicates the age, S and L for short-aged and long-aged respectively, followed by B and T which indicate buffalao and tractor ploughing respectively and the penultimate letters B and T refer to broadcast sowing and transplanting. The suffix M and Y indicate Maha and Yala seasons.

TABLE 4.—Resource use and Farm Incomes under Observed and Optional Farm Plans

Farm Group	Observed Farm income in Rs.	Optimal Farm income in Rs.	Lowland use		Highland Use		Family Labour Use		Hired & Exchange lab. use in m.d.		Capital Use	
			Observed in Ac.	Optimal in Ac.	Observed in Ac.	Optimal in Ac.	Observed in m.d.	Optimal in m.d.	Observed	Optimal	Observed in Rs.	Optimal in Rs.
A ..	2,244.91..	3,802.02..	4.91..	5.00..	1.89..	5.08..	212.69..	177.56..	200.91..	106.29..	2,236.27..	1,513.13
B ..	3,270.88..	4,487.09..	9.20..	6.75..	1.86..	5.00..	277.12..	232.78..	309.40..	117.89..	3,789.85..	1,810.61
C ..	4,322.69..	4,884.92..	8.00..	7.80..	2.13..	5.56..	252.48..	220.39..	326.05..	175.26..	3,340.55..	2,320.32
D ..	3,246.02..	3,503.49..	6.75..	5.09..	2.32..	4.76..	213.09..	159.13..	247.82..	102.36..	2,678.23..	1,415.09
E ..	2,857.84..	3,199.41..	7.80..	4.33..	1.80..	6.0 ..	247.99..	176.17..	322.77..	33.86 ..	3,471.17..	980.47
F ..	3,284.16..	3,325.70..	4.00..	4.00..	2.22..	1.32..	245.32..	215.11..	277.52..	113.20..	2,700.14..	2,247.98
G ..	1,477.16..	2,282.42..	3.50..	3.43..	1.54..	2.64..	114.01..	102.70..	202.13..	87.59..	2,209.68..	1,074.99
MEAN ..	2,957.66	3,640.72	6.31	5.20	1.96	4.33	223.24	183.40	269.51	105.21	2,917.98	1,623.22

CONCLUSIONS

The findings of this study based on production function analysis and LP indicate the potential that exists for increasing farm production and incomes on settlement farms, given the present levels of resources and technology. In the PF analysis, the efficiency indexes computed demonstrate the underutilisation of land and family labour resources. Though, the expenditure on production appears to be efficient, it was observed that this result had to be accepted with reservations, as hired labour, the major element in the aggregate production expenditure variable had been apparently overutilised. The LP recasting of the allocative efficiency problem confirmed the existence of inefficiencies in resource use and indicated possibilities for their better utilisation. It was evident that higher farm incomes were possible with a smaller outlay on resources. These results are of significance to settlement planners in Sri Lanka as they shed light on the possibilities for maximising returns from the settlement schemes in a relatively costless way. The implications of these findings are that policy makers should attempt to maximise the efficiency of abundantly available resources on the farms by education and encouragement and by the provision of adequate incentives to motivate farmers, rather than be pre-occupied with modernising farming. This does not mean that policy makers should stop looking for opportunities to transform traditional agriculture. On the contrary, a correct balance in the programmes for agricultural development and modernising with maximum emphasis on the efficiency of resource use of under-utilised capacities cannot be overemphasised. Although, economic efficiency *per se* may not be of significance to peasant producers, it is of fundamental importance to governments of developing countries, particularly when vast sums have been invested in projects involving peasant producers such as the Settlement Schemes in Sri Lanka. This problem has been further amplified by the current world shortages of essential farm inputs for production.

The results of this analysis are also of wider interest since they are at variance with the commonly held view that peasant producers are efficient (3, 9, 12, 14, 15, 17, 18). The "efficient but poor" hypothesis propounded by Schultz (15) and proved consistent by others within, the production function framework remains unproven in this study. These results, in fact, support the view expressed by Joy (11) that, not only are individual farmers inefficient but in many cases the environment has changed so much that traditional systems are no longer efficient. With rapid changes taking place in technology and their diffusion into peasant farming, the notion of a long-run equilibrium seems difficult to accept. Moreover, the costliness of modern farm inputs and also the risk involved in their use tend to act counter to the realisation of a long-run equilibrium.

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TABLE A1 .— Classification of settlement Farms

Farm Group	*Average Acreage*	*Average No. of Adult Equivalents*	*Lands Labour Ratio*	*No. of Farms*
A ..	5.25 ..	4.08 ..	1. 1—1.5 ..	6
B ..	7.20 ..	4.10 ..	1.51—2.0 ..	5
C ..	6.78 ..	2.93 ..	2.01—2.5 ..	7
D ..	6.51 ..	2.33 ..	2.51—3.0 ..	6
E ..	7.0 ..	2.30 ..	3.01—3.5 ..	5
F ..	3.33 ..	3.75 ..	0.5 —1.0 ..	5
G ..	3.37 ..	1. 5 ..	3.01—3.5 ..	6

Note.—Men and Women were given equal weighting in computing the total number of adult equivalents. While children (those below 15 years of age) were considered only half as efficient. Part-time wo.kers were given a weightage of 0.5.

TABLE A 2. – Same basic data used in the LP models

Constraint	*Farm Groups*						
	A	B	C	D	E	F	G
Poduction Capital in Rs. ..	2,236.27	3,789.85	3,340.55	2,678.23	3,471.17	2,700.14	1,964.20
Minimum Paddy Acreage ..	3.0	3.0	3.0	3.0	3.0	3.0	2.0
Paddy Requirement in bushels	74.95	78.19	82.06	71.45	69.39	76.70	54.96
Level of living in Rs. ..	1,973.30	2,530.63	2,520.85	2,730.10	2,936.85	1,881.88	1,401.40

Notes.—Ten rice activities were identified on the basis of yield, age draught power used for ploughing and method of sowing. The letters HYV and TV signify high-yielding varieties and traditional varieties respectively. The next letter indicates the age, S and L for short-aged and long-aged respectively, followed by B and T which indicate buffalo and tractor ploughing respectively and the last letters B and T refer to broadcast sowing and transplanting. Also a suffix of M was used for the Maha Season, and Y for the Yala season.

In the case of the crop mixtures, the lettrs A-O are used in the models for convenience in the Maha season. And crop mixtures A and B for the Yala. Suffixes M or Y after an activity refer to the Maha and Yala seasons respectively.

Mix A=Maize and Manioc Mix I =Maizeand Turmeric
Mix B=Chillies and Manioc Mix J=Manico, Brinjal and Maize
Mix C=Chillies and Brinjals Mix K=Cucumber,Cowpea and Pumpkin
Mix D=Manioc and Okra Mix L=Chillies,Maize and Cowpea
Mix E=Kurakkan and Cowpea Mix M=Brinjals, Tomatoes, Maize and Manioc
Mix F=Kurakkan and Maize Mix N=Chillies, Tomatoes, Brinjals and Beet
Mix G=Manioc and Turmeric Mix O=Chillies, Brinjals and Kiri-ala
Mix H=Chillies and Manioc

See Table A 3 (pp 97—109)

TABLE A 3(pp97—109)

MAHA CROPS

	B	HYVS BTM	HYVS BBM	HYVS TTM	HYVS TBM	HYVL BTM	HYVL BBM	HYVL TTM
Units		Acre	Acre	Acre	Acre	Acre	Acre	Acre
Net Revenue in Rs.		629.14	542.82	593.80	498.24	706.90	587.30	677.35
Maha Lowland Ac.	≤	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Maha Highland Ac.	≤							
Yala Lowland Ac.	≤							
Yala Highland Ac.	≤							
Oct. Lab. Days	≤							
Nov. Lab. Days	≤	0.32	0.32	0.32	0.32	0.34	0.34	0.32
Dec. Lab. Days	≤	12.86	12.52	8.53	8.03	13.07	13.96	8.55
Jan. Lab. Days	≤	20.15	9.10	14.85	2.57	17.60	4.55	17.63
Feb. Lab. Days	≤	6.75	2.15	6.32	6.53	5.47	5.70	6.53
Mar. Lab. Days	≤	20.93	20.50	19.54	19.10	3.0	4.20	4.30
Apr. Lab. Days	≤	1.58	1.59	1.58	1.59	20.89	19.26	18.90
May Lab. Days	≤					1.59	1.59	1.59
Jun. Lab. Days	≤							
Jul. Lab. Days	≤							
Aug. Lab. Days	≤							
Sept. Lab. Days	≤							
Hired Lab.								
Oct. Lab. Days	≤							
Nov. Lab. Days	≤							
Dec. Lab. Days	≤							
Jan. Lab. Days	≤							
Feb. Lab. Days	≤							
Mar. Lab. Days	≤							
Apr. Lab. Days	≤							
May Lab. Days	≤							
Jun. Lab. Days	≤							
Jul. Lab. Days	≤							
Aug. Lab. Days	≤							
Sep. Lab. Days	≤							
Exchange Lab.								
Oct. Lab. Days	≤							
Nov. Lab. Days	≤							
Dec. Lab. Days	≤							
Jan. Lab. Days	≤							
Feb. Lab. Days	≤							
Mar. Lab. Days	≤							
Apr. Lab. Days	≤							
May Lab. Days	≤							
Jun. Lab. Days	≤							
Jul. Lab. Days	≤							
Aug. Lab. Days	≤							
Sep. Lab. Days	≤							
Capital Rs.	≤	180.10	171.11	210.10	201.11	183.00	182.70	213.00
Min. Paddy Ac.	≥	1.0	1.0	1.0	1.0	1.0	1.0	1.0

Note.—This model matrix was used for all sown groups, with only the B Column varied according to the resource endowment situation in each group.

TABLE A 3

MAHA CROPS

	B	HYVL TBM	TV BBM	TV TBM	Upland Paddy	Maize	Chillies	Onions
Units		Acre	Acre	Acre	Acre	Acre	Acre	Acre
Net Revenue in Rs.		539.93	323.12	265.99	118.06	105.92	713.62	380.25
Maha Lowland Ac.	≤	1.0	1.0	1.0				
Maha Highland Ac.	≤				1.0	1.0	1.0	1.0
Yala Lowland Ac.	≤							
Yala Highland Ac.	≤							
Oct. Lab. Days	≤					12.43	18.22	
Nov. Lab. Days	≤	0.33	0.30	0.32	13.30	2.75	19.56	
Dec. Lab. Days	≤	8.69	10.16	8.42	2.15	0.40	5.84	9.75
Jan. Lab. Days	≤	5.28	6.57	5.64	1.10	0.39	9.34	16.38
Feb. Lab. Days	≤	3.50	1.96	1.96	0.51	8.19	4.89	28.75
Mar. Lab. Days	≤	4.20	2.06	2.06	7.20	4.04	4.04	18.25
Apr. Lab. Days	≤	18.87	18.25	17.12	1.67		4.41	2.50
May. Lab. Days	≤	1.59	1.55	1.55				
Jun. Lab. Days	≤							
Jul. Lab. Days	≤							
Aug. Lab. Days	≤							
Sept. Lab. Days	≤							
Hired Lab.								
Oct. Lab. Days	≤							
Nov. Lab. Days	≤							
Dec. Lab. Days	≤							
Jan. Lab. Days	≤							
Feb. Lab. Days	≤							
Mar. Lab. Days	≤							
Apr. Lab. Days	≤							
May Lab. Days	≤							
Jun. Lab. Days	≤							
Jul. Lab. Days	≤							
Aug. Lab. Days	≤							
Sep. Lab. Days	≤							
Exchange Lab.								
Oct. Lab. Days	≤							
Nov. Lab. Days	≤							
Dec. Lab. Days	≤							
Jan. Lab. Days	≤							
Feb. Lab. Days	≤							
Mar. Lab. Days	≤							
Apr. Lab. Days	≤							
May Lab. Days	≤							
Jun. Lab. Days	≤							
Jul. Lab. Days	≤							
Aug. Lab. Days	≤							
Sep. Lab. Days	≤							
Capital Rs.	≤	212.70	162.00	192.00	18.00	15.00	80.00	680.00
Min. Paddy Ac.	≤	1.0	1.0	1.0	1.0			

Note.—This model matrix was used for all sown groups only the B Column varied according to the resource endowment situation in each group.

TABLE A 3

MAHA CROPS

	B	Manioc	Kurak-kan	Banana	Tobac-co	Murun-ga	Limes	Mango
Units		Acre	Acre	Acre	Acre	Acre	Acre	Acre
Net Revenue in Rs.	..	135.00	40.05	149.02	1,070.00	393.73	104.16	10.00
Maha Lowland Ac.	≤							
Maha Highland Ac.	≤	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Yala Lowland Ac.	≤							
Yala Highland Ac.	≤					1.0	1.0	1.0
Oct. Lab. Days	≤	11.31	12.84	1.67		0.47	0.43	
Nov. Lab. Days	≤	1.50	12.0	2.67	14.84	0.47	0.21	1.50
Dec. Lab. Days	≤	0.23		0.89	10.66	0.44	0.21	6.25
Jan. Lab. Days	≤	0.49		2.78	11.13			
Feb. Lab. Days	≤	0.42	4.80	1.44	17.73		0.14	
Mar. Lab. Days	≤	0.49		1.28	16.35		0.21	
Apr. Lab. Days	≤	0.23		0.39	23.19	0.49	1.21	
May Lab. Days	≤	0.19		0.17			1.29	
Jun. Lab. Days	≤			0.32		1.20		
Jul. Lab. Days	≤			3.42		1.10	1.20	
Aug. Lab. Days	≤			0.42		1.11	1.0	
Sept. Lab. Days	≤			3.22		0.79		
Hired Lab.								
Oct. Lab. Days	≤							
Nov. Lab. Days	≤							
Dec. Lab. Days	≤							
Jan. Lab. Days	≤							
Feb. Lab. Days	≤							
Mar. Lab. Days	≤							
Apr. Lab. Days	≤							
May Lab. Days	≤							
Jun. Lab. Days	≤							
Jul. Lab. Days	≤							
Aug. Lab. Days	≤							
Sep. Lab. Days	≤							
Exchange Lab.								
Oct. Lab. Days	≤							
Nov. Lab. Days	≤							
Dec. Lab. Days	≤							
Jan. Lab. Days	≤							
Feb. Lab. Days	≤							
Mar. Lab. Days	≤							
Apr. Lab. Days	≤							
May Lab. Days	≤							
Jun. Lab. Days	≤							
July Lab. Days	≤							
Aug. Lab. Days	≤							
Sep. Lab. Days	≤							
Capital Rs.	≤	15.00	8.00	100.00	130.00	5.00	80.00	100.00
Min. Paddy Ac.	≤							

Note.—This model matrix was used for all swon groups, with only the B Column varied according to the resource endowment situation in each group.

TABLE A 3

MAHA CROPS

	B	Coconut	S. Gourd	Mix A	Mix B	Mix C	Mix D	Mix E
Units		Acre	Acre	Acre	Acre	Acre	Acre	Acre
Net Revenue in Rs.		91.01	360.40	88.65	739.96	286.65	268.00	205.30
Maha Lowland Ac.	≥							
Maha Highland Ac.	≥	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Yala Lowland Ac.	≥							
Yala Highland Ac.	≥	1.0					-	
Oct. Lab. Days	≥	0.91		6.24	11.19	16.86		5.84
Nov. Lab. Days	≥	1 38		0.24	5.42	5.54	4.00	2.00
Dec. Lab. Days	≥	1.24	13.00	0.40	0.77	3.48	0.34	
Jan. Lab. Days	≥	1.65	18.00	0.92	0.77	1.76	0.86	0.57
Feb. Lab. Days	≥	0.41	14.00	1.08	2.20	1.56	0.32	0.76
Mar. Lab. Days	≥	0.71	2.00	3.24	3.24	1.20	1.34	2.40
Apr. Lab. Days	≥	0.18	15.00	1.23	0.23		0.26	
May Lab. Days	≥	1.56	8.00					
Jun. Lab. Days	≥	0.61						
Jul. Lab. Days	≥	0.29						
Aug. Lab. Days	≥	0.58						
Sept. Lab. Days	≥	0.81						
Hired Lab.								
Oct. Lab. Days	≥							
Nov. Lab. Days	≥							
Dec. Lab. Days	≥							
Jan. Lab. Days	≥							
Feb. Lab. Days	≥							
Mar. Lab. Days	≥							
Apr. Lab. Days	≥							
May Lab. Days	≥							
Jun. Lab. Days	≥							
Jul. Lab. Days	≥							
Aug. Lab. Days	≥							
Sep. Lab. Days	≥							
Exchange Lab.								
Oct Lab. Days	≥							
Nov. Lab. Days	≥							
Dec. Lab. Days	≥							
Jan. Lab. Days	≥							
Feb. Lab. Days	≥							
Mar. Lab. Days	≥							
Apr. Lab. Days	≥							
May Lab. Days	≥							
Jun. Lab. Days	≥							
Jul. Lab. Days	≥							
Aug. Lab. Days	≥							
Sep. Lab. Days	≥							
Capital Rs.	≥	90.00	150.00	20.00	80.00	80.00	25.00	20.00
Min. Paddy Ac.	≥							

Note.—This model matrix was used for all sown groups, with only the B Column varied according to the resource endowment situation in each group.

TABLE A 3

MAHA CROPS

	B	Mix F	Mix G	Mix H	Mix I	Mix J	Mix K	Mix L
Units		Acre	Acre	Acre	Acre	Acre	Acre	Acre
Net Revenue in Rs.		130.28	179.60	250.30	112.00	97.76	195.28	589.80
Maha Lowland Ac.	≥							
Maha Highland Ac.	≥	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Yala Lowland Ac.	≥							
Yala Highland Ac.	≥							
Oct. Lab. Days	≥		5.48	11.08			8.72	8.52
Nov. Lab. Days	≥	9.29	1.52	4.84	10.50	10.50		18.20
Dec. Lab. Days	≥		1.24	1.64	2.20	2.20	0.24	0.77
Jan. Lab. Days	≥		0.24	0.52	0.52	0.52	1.0	1.12
Feb. Lab. Days	≥	0.15	0.42	2.0	0.32	0.32	0.28	2.20
Mar. Lab. Days	≥	2.80	0.42	2.48	3.24	3.24	1.80	3.24
Apr. Lab. Days	≥		0.23		1.23	1.23	1.40	1.23
May Lab. Days	≥		0.87					
Jun. Lab. Days	≥		0.32					
Jul. Lab. Days	≥		0.40					
Aug. Lab. Days	≥		0.48	12.64				
Sep. Labt. Days	≥							
Hired Lab.								
Oct. Lab. Days	≥							
Nov. Lab. Days	≥							
Dec. Lab. Days	≥							
Jan. Lab. Days	≥							
Feb. Lab. Days	≥							
Mar. Lab. Days	≥							
Apr. Lab. Days	≥							
May Lab. Days	≥							
Jun. Lab. Days	≥							
Jul. Lab. Days	≥							
Aug. Lab. Days	≥							
Sep. Lab. Days	≥							
Exchange Lab.								
Oct. Lab. Days								
Nov. Lab. Days	≥							
Dec. Lab. Days	≥							
Jan. Lab. Days	≥							
Feb. Lab. Days	≥							
Mar. Lab. Days	≥							
Apr. Lab. Days	≥							
May Lab. Days	≥							
Jun. Lab. Days	≥							
Jul. Lab. Days	≥							
Aug. Lab. Days	≥							
Sep. Lab. Days	≥							
Capital Rs.	≥	15.00	25.00	70.00	30.00	25.00	25.00	75.00
Min. Paddy Ac.	≥							

Note.—This model matrix was used for all sown groups, with only the B Column varied according to the resource endowment situation in each group.

TABLE A 3

MAHA—YALA CROPS

	B	Mix M	Mix N	Mix O	HYVS BTY	HYVS BBY	HYVS TTY	HYVS TBY
Units		Acre	Acre	Acre	Acre	Acre	Acre	Acre
Net Revenue in Rs.		346.40	68.31	305.00	629.14	542.82	593.80	498.24
Maha Lowland Ac.	≥							
Maha Highland Ac.	≥	1.0	1.0	1.0				
Yala Lowland Ac.	≥				1.0	1.0	1.0	1.0
Yala Highland Ac.	≥							
Oct. Lab. Days	≥	16.52	13.34	17.20	20.93	20.50	19.54	19.10
Nov. Lab. Days ..	≥	2.0	3.24	2.24	1.58	1.59	1.58	1.59
Dec. Lab. Days	≥	2.48	1.38	2.12				
Jan. Lab. Days	≥	2.48	3.69	4.84				
Feb. Lab. Days	≥	1.23	21.00	8.24				
Mar. Lab. Days	≥	2.20	9.69	9.28				
Apr. Lab. Days	≥	0.20	6.69					
May Lab. Days	≥							
Jun. Lab. Days	≥				0.32	0.32	0.32	0.32
Jul. Lab. Days	≥				12.86	12.52	8.53	8.03
Aug. Lab. Days	≥				20.15	9.10	14.85	2.57
Sept. Lab. Days	≥				6.75	2.15	6.32	6.53
Hired Lab.								
Oct. Lab. Days	≥							
Nov. Lab. Days	≥							
Dec. Lab. Days	≥							
Jan. Lab. Days	≥							
Feb. Lab. Days	≥							
Mar. Lab. Days	≥							
Apr. Lab. Days	≥							
May Lab. Days	≥							
Jun. Lab. Days	≥							
Jul. Lab. Days	≥							
Aug. Lab. Days	≥							
Sep. Lab. Days	≥							
Exchange Lab.								
Oct. Lab. Days	≥							
Nov. Lab. Days	≥							
Dec. Lab. Days	≥							
Jan. Lab. Days	≥							
Feb. Lab. Days	≥							
Mar. Lab. Days	≥							
Apr. Lab. Days	≥							
May Lab. Days	≥							
Jun. Lab. Days	≥							
Jul. Lab. Days	≥							
Aug. Lab. Days	≥							
Sep. Lab. Days	≥							
Capital Rs.	≥	75.00	80.00	80.00	180.10	171.11	210.10	201.11
Min. Paddy Ac.	≥				1.0	1.0	1.0	1.0

Note.—This model matrix was used for all sown groups, with only the B Column varied according to the resource endowment situation in each group.

TABLE A 3

YALA CROPS

	B	HYVL BTY	HYVL BBY	HYVL TTY	HYVL TBY	TV BBY	TV TBY	Chillies
Units		Acre	Acre	Acre	Acre	Acre	Acre	Acre
Net Revenue in Rs.		706.90	587.30	677.35	539.93	323.12	265.99	424.07
Maha Lowland Ac.	≥							
Maha Highand Ac.	≥							
Yala Lowland Ac.	≥	1.0	1.0	1.0	1.0	1.0	1.0	
Yala Highland Ac.	≥							1.0
Oct. Lab. Days	≥	3.0	4.20	4.30	4.20	2.06	2.06	21.09
Nov. Lab. Days	≥	20.89	19.26	18.90	18.87	18.25	17.12	
Dec. Lab. Days	≥	1.59	1.59	1.59	1.59	1.55	1.55	
Jan. Lab. Days	≥							
Feb. Lab. Days	≥							
Mar. Lab. Days	≥							
Apr. Lab. Days	≥							
May Lab. Days	≥							10.34
Jun. Lab. Days	≥	0.34	0.34	0.32	0.33	0.30	0.32	14.20
Jul. Lab. Days	≥	13.07	13.96	8.55	8.69	10.16	8.42	11.28
Aug. Lab. Days	≥	17.60	4.55	17.63	5.28	6.57	5.64	10.62
Sept. Lab. Days	≥	5.47	5.70	6.53	3.50	1.96	1.96	20.50
Hired Lab.								
Oct. Lab. Days	≥							
Nov. Lab. Days	≥							
Dec. Lab. Days	≥							
Jan. Lab. Days	≥							
Feb. Lab. Days	≥							
Mar Lab. Days	≥							
Apr. Lab. Days	≥							
May Lab. Days	≥							
Jun. Lab. Days	≥							
Jul. Lab. Days	≥							
Aug. Lab. Days	≥							
Sep. Lab. Days	≥							
Exchange Lab.								
Oct. Lab. Days	≥							
Nov. Lab. Days	≥							
Dec. Lab. Days	≥							
Jan. Lab. Days	≥							
Feb. Lab. Days	≥							
Mar. Lab. Days	≥							
Apr. Lab. Days	≥							
May Lab. Days	≥							
Jun. Lab. Days	≥							
Jul. Lab. Days	≥							
Aug. Lab. Days	≥							
Sep. Lab. Days	≥							
Capital Rs.	≥	183.00	182.70	213.00	212.70	162.00	192.00	80.00
Min. Paddy Ac.	≥	1.0	1.0	1.0	1.0	1.0	1.0	

Note.—This model matrix was used for all swon groups, with only the B Column varied according to the resource endowment situation in each group.

TABLE A 3

YALA CROPS

	B	Gram	Tomato	S. Gourd	Knol Khol	Mix A	Mix B
Units		Acre	Acre	Acre	Acre	Acre	Acre
Net Revenue in Rs.		108.00	74.00	211.00	215.00	198.93	383.20
Maha Lowland Ac.	≤						
Maha Highland Ac.	≤						
Yala Lowland Ac.	≤						
Yala Highland Ac.	≤	1.0	1.0	1.0	1.0	1.0	1.0
Oct. Lab. Days	≤		10.20	5.13	10.12		
Nov. Lab. Days	≤						
Dec. Lab. Days	≤						
Jan. Lab. Days	≤						
Feb. Lab. Days	≤						
Mar. Lab. Days	≤						
Apr. Lab. Days	≤						
May Lab. Days	≤			5.89			
Jun. Lab. Days	≤	13.60		3.63			26.32
Jul. Lab. Days	≤	11.0	17.0	19.76	24.0	35.04	35.52
Aug. Lab. Days	≤	8.0	10.0	24.50	28.0	35.64	15.52
Sept. Lab. Days	≤	6.0	9.32	10.50	20.0	28.20	22.0
Hired Lab.	≤						
Oct. Lab. Days	≤						
Nov. Lab. Days	≤						
Dec. Lab. Days	≤						
Jan. Lab. Days	≤						
Feb. Lab. Days							
Mar. Lab. Days	≤						
Apr. Lab. Days	≤						
May Lab. Days	≤						
Jun. Lab. Days	≤						
Jul. Lab. Days							
Aug. Lab. Days	≤						
Sep. Lab. Days	≤						
Exchange Lab.							
Oct. Lab. Days	≤						
Nov. Lab. Days	≤						
Dec. Lab. Days	≤						
Jan. Lab. Days	≤						
Feb. Lab. Days	≤						
Mar. Lab. Days	≤						
Apr. Lab. Days	≤						
May Lab. Days	≤						
Jun. Lab. Days	≤						
Jul. Lab. Days	≤						
Aug. Lab. Days	≤						
Sep. Lab. Days	≤						
Capital Rs.	≤	20.00	110.00	150.00	40.00	50.00	75.00
Mi . Paddy Ac.	≤						

Note.—This model matrix was used for all swon groups, with only the B Column varied according to the resource endowment situation in each group.

TABLE A 3

LIVESTOCK

	B	Milk Cows	Poultry
Units		A. U.	A. U.
Net Revenue in Rs.		36.65	294.33
Maha Lowland Ac.	≥		
Maha Highland Ac.	≥		
Yala Lowland Ac.	≥		
Yala Highland Ac.	≥		
Oct. Lab. Days	≥	7.09	11.29
Nov. Lab. Days	≥	5.97	12.51
Dec. Lab. Days	≥	5.89	12.51
Jan. Lab. Days	≥	4.66	11.86
Feb. Lab. Days	≥	3.64	11.01
Mar. Lab. Days	≥	3.49	8.43
Apr. Lab. Days	≥	2.02	8.62
May Lab. Days	≥	2.24	8.06
Jun. Lab. Days	≥	2.82	10.56
Jul. Lab. Days	≥	4.59	11.64
Aug. Lab. Days	≥	4.24	12.84
Sept. Lab. Days	≥	4.34	10.64
Hired Lab.			
Oct. Lab. Days	≥		
Nov. Lab. Days	≥		
Dec. Lab. Days	≥		
Jan. Lab. Days	≥		
Feb. Lab. Days	≥		
Mar. Lab. Days	≥		
Apr. Lab. Days	≥		
May Lab. Days	≥		
Jun. Lab. Days	≥		
Jul. Lab. Days	≥		
Aug. Lab. Days	≥		
Sep. Lab. Days	≥		
Exchange Lab.			
Oct. Lab. Days	≥		
Nov. Lab. Days	≥		
Dec. Lab. Days	≥		
Jan. Lab. Days	≥		
Feb. Lab. Days	≥		
Mar. Lab. Days	≥		
Apr. Lab. Days	≥		
May Lab. Days	≥		
Jun. Lab. Days	≥		
Jul. Lab. Days	≥		
Aug. Lab. Days	≥		
Sep. Lab. Days	≥		
Capital Rs.	≥	250.00	300.00
Min. Paddy Ac.	≥		

Note.—This model matrix was used for all swon groups, with only the B Column varied according to the resource endowment situation in each group.

TABLE A 3

HIRED LABOUR

	B	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
Units		MDAY	MDAY	MDAY	MDAY	MDAY	MDAY
Net Revenue in Rs.		—4.50	—4 50	—4.50	—4.50	—4.50	—4.50
Maha Lowland Ac.							
Maha Highland Ac.	≥						
Yala Lowland Ac.	≥						
Yala Highland Ac.	≥						
Oct. Lab. Days	≥	—1.0					
Nov. Lab. Days	≥		—1.0				
Dec. Lab. Days	≥			—1.0			
Jan. Lab. Days	≥				—1.0		
Feb. Lab. Days	≥					—1.0	
Mar. Lab. Days	≥						—1.0
Apr. Lab. Days	≥						
May Lab. Days	≥						
Jun. Lab. Days	≥						
Jul. Lab. Days	≥						
Aug. Lab. Days	≥						
Sept. Lab. Days	≥						
Hired Lab.							
Oct. Lab. Days	≥	1.0					
Nov. Lab. Days	≥		1.0				
Dec. Lab. Days	≥			1.0			
Jan. Lab. Days	≥				1.0		
Feb. Lab. Days	≥					1.0	
Mar. Lab. Days	≥						1.0
Apr. Lab. Days	≥						
May Lab. Days	≥						
Jun. Lab. Days	≥						
Jul. Lab. Days	≥						
Aug. Lab. Days	≥						
Sep. Lab. Days	≥						
Exchange Lab.							
Oct. Lab. Days	≥						
Nov. Lab. Days	≥						
Dec. Lab. Days	≥						
Jan. Lab. Days	≥						
Feb. Lab. Days	≥						
Mar. Lab. Days	≥						
Apr. Lab. Days	≥						
May Lab. Days	≥						
Jun. Lab. Days	≥						
Jul. Lab. Days	≥						
Aug. Lab. Days	≥						
Sep. Lab. Days	≥						
Capital Rs.	≥	4.50	4.50	4.50	4.50	4.50	4.50
Min. Paddy Ac.	≥						

Note.—This model matrix was used for all swon groups, with only the B Column varied according to the resource endowment situation in each group.

TABLE A 3

HIRED LABOUR

	B	Apr.	May	Jun.	Jul.	Aug.	Sep.
Units		MDAY	MDAY	MDAY	MDAY	MDAY	MDAY
Net Revenue in Rs.		—4.50	—4.50	—4.50	—4.50	—4.50	—4.50
Maha Lowland Ac.	≤						
Maha Highland Ac.	≤						
Yala Lowland Ac.	≤						
Yala Highland Ac.	≤						
Oct. Lab. Days	≤						
Nov. Lab. Days	≤						
Dec. Lab. Days	≤						
Jan. Lab. Days	≤						
Feb. Lab. Days	≤						
Mar. Lab. Days	≤						
Apr. Lab. Days	≤	—1.0					
May Lab. Days	≤		—1.0				
Jun. Lab. Days	≤			—1.0			
Jul. Lab. Days	≤				—1.0		
Aug. Lab. Days	≤					—1.0	
Sept. Lab. Days	≤						—1.0
Hired Lab.							
Oct. Lab. Days	≤						
Nov. Lab. Days	≤						
Dec. Lab. Days	≤						
Jan. Lab. Days	≤						
Feb. Lab. Days	≤						
Mar. Lab. Days	≤						
Apr. Lab. Days	≤	1.0					
May Lab. Days	≤		1.0				
Jun. Lab. Days	≤			1.0			
Jul. Lab. Days	≤				1.0		
Aug. Lab. Days	≤					1.0	
Sep. Lab. Days	≤						1.0
Exchange Lab.							
Oct. Lab. Days	≤						
Nov. Lab. Days	≤						
Dec. Lab. Days	≤						
Jan. Lab. Days	≤						
Feb. Lab. Days	≤						
Mar. Lab. Days	≤						
Apr. Lab. Days	≤						
May Lab. Days	≤						
Jun. Lab. Days	≤						
Jul. Lab. Days	≤						
Aug. Lab. Days	≤						
Sep. Lab. Days	≤						
Capital Rs.	≤	4.50	4.50	4.50	4.50	4.50	4.50
Min. Paddy Ac.	≤						

Note.—This model matrix was used for all sown groups, with only the B Column varied according to the resource endowment situation in each group.

TABLE A 3

EXCHANGE LABOUR

	B	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
Units		MDAY	MDAY	MDAY	MDAY	MDAY	MDAY
Net Revenue in Rs.		—3.00	—3.00	—3.00	—3.00	—3.00	—3.00
Maha Lowland Ac.	≤						
Maha Highland Ac.	≤						
Yala Lowland Ac.	≤						
Yala Highland Ac.	≤						
Oct. Lab. Days	≤	—1.0					
Nov. Lab. Days	≤		—1.0				
Dec. Lab. Days	≤			—1.0			
Jan. Lab. Days	≤				—1.0		
Feb. Lab. Days	≤					—1.0	
Mar. Lab. Days	≤						—1.0
Apr. Lab. Days	≤						
May Lab. Days	≤						
Jun. Lab. Days	≤						
Jul. Lab. Days	≤						
Aug. Lab. Days	≤						
Sept. Lab. Days	≤						
Hired Lab.							
Oct. Lab. Days	≤						
Nov. Lab. Days	≤						
Dec. Lab. Days	≤						
Jan. Lab. Days	≤						
Feb. Lab. Days	≤						
Mar. Lab. Days	≤						
Apr. Lab. Days	≤						
May Lab. Days	≤						
Jun. Lab. Days	≤						
Jul. Lab. Days	≤						
Aug. Lab. Days	≤						
Sep. Lab. Days	≤						
Exchange Lab.							
Oct. Lab. Days	≤	1.0					
Nov. Lab. Days	≤		1.0				
Dec. Lab. Days	≤			1.0			
Jan. Lab. Days	≤				1.0		
Feb. Lab. Days	≤					1.0	
Mar. Lab. Days	≤						1.0
Apr. Lab. Days	≤						
May Lab. Days	≤						
Jun. Lab. Days	≤						
Jul. Lab. Days	≤						
Aug. Lab. Days	≤						
Sep. Lab. Days	≤						
Capital Rs.	≤	3.00	3.00	3.00	3.00	3.00	3.00
Min. Paddy Ac.	≤						

Note.—This model matrix was used for all sown groups, with only the B Column varied according to the resource endwment situation in each group.

TABLE A 3

EXCHANGE LABOUR

	B	Apr.	May	Jun.	Jul.	Aug.	Sep.
Units		MDAY	MDAY	MDAY	MDAY	MDAY	MDAY
Net Revenue in Rs.		—3.00	—3.00	—3.00	—3.00	—3.00	—3.00
Maha Lowland Ac.	≥						
Maha Highland Ac.	≥						
Yala Lowland Ac.	≥						
Yala Highland Ac.	≥						
Oct. Lab. Days	≥						
Nov. Lab. Days	≥						
Dec. Lab. Days	≥						
Jan. Lab. Days	≥						
Feb. Lab. Days	≥						
Mar. Lab. Days	≥						
Apr. Lab. Days	≥	—1.0					
May Lab. Days	≥		—1.0				
Jun. Lab. Days	≥			—1.0			
Jul. Lab. Days	≥				—1.0		
Aug. Lab. Days	≥					—1.0	
Sept. Lab. Days	≥						—1.0
Hired Lab.							
Oct. Lab. Days	≥						
Nov. Lab. Days	≥						
Dec. Lab. Days	≥						
Jan. Lab. Days	≥						
Feb. Lab. Days	≥						
Mar. Lab. Days	≥						
Apr. Lab. Days	≥						
May Lab. Days	≥						
Jun. Lab. Days	≥						
Jul. Lab. Days	≥						
Aug. Lab. Days	≥						
Sep. Lab. Days	≥						
Exchange Lab.	≥						
Oct. Lab. Days	≥						
Nov. Lab. Days	≥						
Dec. Lab. Days	≥						
Jan. Lab. Days	≥						
Feb. Lab. Days	≥						
Mar. Lab. Days	≥						
Apr. Lab. Days	≥	1.0					
May Lab. Days	≥		1.0				
Jun. Lab. Days	≥			1.0			
Jul. Lab. Days	≥				1.0		
Aug. Lab. Days	≥					1.0	
Sep. Lab. Days	≥						1.0
Capital Rs.	≥	3.00	3.00	3.00	3.00	3.00	3.00
Min. Paddy Ac.	≥						

Note.—This model matrix was used for all sown groups, with only the B Column varied according to the resource endowment situation in each group.

TABLE A 4 (PP 110–116)

MAHA CROPS

	B	HYVS TBM	HYVL TTM	HYVL TBM	TV TBM	Upland Paddy	Maize
Units :		Acre	Acre	Acre	Acre	Acre	Acre
Net Revenue in Rs.		698.00	1,183.00	819.00	285.00	220.00	223.05
Maha Lowland	—	1.0	1.0	1.0	1.0		
Yala Lowland	—					1.0	1.0
Maha Highland	—						
Yala Highland	—						
Oct. Lab. Days	—					2.0	2.0
Nov. Lab. Days	—	0.32	0.32	0.33	0.32	2.15	2.75
Dec. Lab. Days	—	8.03	8.55	8.69	8.42	1.0	0.50
Jan. Lab. Days	—	11.10	18.60	6.28	5.64	1.5	0.25
Feb. Lab. Days	—	6.0	7.47	11.50	2.96	10.0	15.0
Mar. Lab. Days	—	21.20	5.30	5.50	2.06		
Apr. Lab. Days	—	2.59	25.20	20.80	18.12		
May Lab. Days	—		2.60	2.59	1.55		
June Lab. Days	—						
July Lab. Days	—						
Aug. Lab. Days	—						
Sep. Lab. Days	—						
Hired Labour							
Oct. Lab. Days	—						
Nov. Lab. Days	—						
Dec. Lab. Days	—						
Jan. Lab. Days	—						
Feb. Lab. Days	—						
Mar. Lab. Days	—						
Apr. Lab. Days	—						
May Lab .Days	—						
June Lab. Days	—						
July Lab. Days	—						
Aug. Lab. Days	—						
Sep. Lab. Days	—						
Capital Rs.	—	225.00	245.00	240.00	192.00	245.00	221.00
Min. Paddy Ac.	—	1.0	1.0	1.0	1.0	1.0	

Note.—This model matrix was used for all sown groups, with only the B Column varied according to the resource endowment situation in each group.

TABLE A 4

MAHA CROPS

	B	Dried Chillie	Manioc	Kurak-kan	Tobacco	Cowpea	Green Gram
Units :		Acre	Acre	Acre	Acre	Acre	Acre
Net Revenue in Rs.	—	1,279.00	185.00	77.00	1,100.00	142.10	170.00
Maha Lowland	—						
Yala Lowland	—						
Maha Highland	—	1.0	1.0	1.0	1.0	1.0	1.0
Yala Highland	—						
Oct. Lab. Days	—	3.0	1.0	1.0			
Nov. Lab. Days	—	14.0	2.5	11.5	5.0	2.0	2.0
Dec. Lab. Days	—	20.0	1.0	2.5	12.66	10.0	2.0
Jan. Lab. Days	—	25.0	0.25		11.13	1.0	7.0
Feb. Lab. Days	—	25.0	0.25	5.5	17.73	15.0	10.0
Mar. Lab. Days	—		12.5		18.35		
Apr. Lab. Days	—		5.0		25.19		
May Lab. Days	—						
June Lab. Days	—						
July Lab. Days	—						
Aug. Lab. Days	—						
Sep. Lab. Days	—						
Hired Labour							
Oct. Lab. Days	—						
Nov. Lab. Days	—						
Dec. Lab. Days	—						
Jan. Lab. Days	—						
Feb. Lab. Days	—						
Mar. Lab. Days	—						
Apr. Lab. Days	—						
May Lab. Days	—						
June Lab. Days	—						
July Lab. Days	—						
Aug. Lab. Days	—						
Sep. Lab. Days	—						
Capital Rs.	—	565.00	185.00	115.00	440.00	180.00	160.00
Min. Paddy Ac.	—						

Note.—This model matrix was used for all sown groups, with only the B Column varied according to the resource endowment situation in each group.

TABLE A 4

MAHA CROPS

	B	Mix. A	Mix. B	Veg. Mix. A	Veg. Mix. B	Sorghum	Green Chillie
Units :		Acre	Acre	Acre	Acre	Acre	Acre
Net Revenue in Rs.		209.00	732.00	170.00	100.00	35.50	1,236.00
Maha Lowland	—						
Yala Lowland	—						
Maha Highland	—	1.0	1.0	1.0	1.0	1.0	1.0
Yala Highland	—						
Oct. Lab. Days	—						
Nov. Lab. Days	—	2.0	1.0	1.0	1.0	3.0	3.0
Dec. Lab. Days	—	2.5	14.0	1.5	13.34	3.0	14.0
Jan. Lab. Days	—	1.0	13.5	1.0	5.24	1.0	18.0
Feb. Lab. Days	—	0.25	14.0	0.5	3.38		18.0
Mar. Lab. Days	—	10.0	15.0	2.0	4.6	11.0	18.0
Apr. Lab. Days	—	9.5	12.5	2.0	21.0		5.0
May Lab. Days	—	2.5	5.0		9.54		
June Lab. Days	—						
July Lab. Days	—						
Aug. Lab. Days	—						
Sep. Lab. Days	—						
Hired Labour							
Oct. Lab. Days	—						
Nov. Lab. Days	—						
Dec. Lab. Days	—						
Jan. Lab. Days	—						
Feb. Lab. Days	—						
Mar. Lab. Days	—						
Apr. Lab. Days	—						
May Lab. Days	—						
June Lab. Days	—						
July Lab. Days	—						
Aug. Lab. Days	—						
Sep. Lab. Days	—						
Capital Rs.	—	125.00	375.00	170.00	210.00	252.50	565.00
Min. Paddy Ac.	—						

Note.—This model matrix was used for all sowo groups, with only the B Column varied according to the resource endowment situation in each group.

TABLE A 4

YALA CROPS

	B	HYVS TBM	HYVL TTM	HYVL TBY	TV TBY	Dried Chillie	Green Gram
Units:		Acre	Acre	Acre	Acre	Acre	Acre
Net Revenue in Rs.		698.00	1183.00	819.00	285.00	731.00	170.00
Maha Lowland	—						
Yala Lowland	—	1.0	1.0	1.0	1.0		
Maha Highland	—						
Yala Highland	—					1.0	1.0
Oct. Lab. Days	—	21.2	5.3	5.5	2.06		
Nov. Lab. Days	—	2.59	25.2	20.8	18.12		
Dec. Lab. Days	—		2.6	2.59	1.55		
Jan. Lab. Days	—						
Feb. Lab. Days	—						
Mar. Lab. Days	—						
Apr. Lab. Days	—					3.34	2.0
May Lab. Days	—					14.2	2.0
June Lab. Days	—	0.32	0.32	0.33	0.32	11.28	7.0
July Lab. Days	—	8.03	8.55	8.69	8.42	12.62	10.0
Aug. Lab. Days	—	11.10	8.6	6.28	5.64	20.5	
Sep. Lab. Days	—	6.0	7.47	4.5	2.96	21.09	
Hired Labour							
Oct. Lab. Days	—						
Nov. Lab. Days	—						
Dec. Lab. Days	—						
Jan. Lab. Days	—						
Feb. Lab. Days	—						
Mar. Lab. Days	—						
Apr. Lab. Days	—						
May Lab. Days	—						
June Lab. Days	—						
July Lab. Days	—						
Aug. Lab. Days	—						
Sep. Lab. Days	—						
Capital Rs.	—	225.00	245.00	240.00	192.00	565.00	160.00
Min. Paddy Ac.	—	1.0	1.0	1.0	1.0		

Note.—This model matrix was used for all sown groups, with only the B Column varied according to the resouce endowment situation in each group.

TABLE A 4

YALA CROPS

	B	Cowpea	Snake-gourd	Veg. Mix. A	Gin-gelly	Green Chillie
Units:		Acre	Acre	Acre	Acre	Acre
Net Revenue in Rs.		142.10	121.00	170.00	166.50	632.57
Maha Lowland	—					
Yala Lowland	—					
Maha Highland	—					
Yala Highland	—	1.0	1.0	1.0	1.0	1.0
Oct. Lab. Days	—					
Nov. Lab. Days	—					
Dec. Lab. Days	—					
Jan. Lab. Days	—					
Feb. Lab. Days	—					
Mar. Lab. Days	—	2.0			1.0	
Apr. Lab. Days	—	10.0			5.0	3.34
May Lab. Days	—	1.0	2.0		3.0	14.2
June Lab. Days	—	15.0	18.0	1.0	10.0	1 0
July Lab. Days	—		14.0	1.5		18.0
Aug. Lab. Days	—		3.0	1.0		15.0
Sep. Lab. Days	—		15.0	1.5		5.0
Hired Labour						
Oct. Lab. Days	—					
Nov. Lab. Days	—					
Dec. Lab. Days	—					
Jan. Lab. Days	—					
Feb. Lab. Days	—					
Mar. Lab. Days	—					
Apr. Lab. Days	—					
May Lab. Days	—					
June Lab. Days	—					
July Lab. Days	—					
Aug. Lab. Days	—					
Sep. Lab. Days	—					
Capital Rs.	—	180.00	240.00	170.00	155.00	565.00
Min. Paddy Ac.	—					

Note.—This model matrix was used for all sown groups, with only the B Column varied according to the resource endowment situation in each group.

TABLE A 4

HIRED LABOUR

	B	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
Units:		M.Day	M.Day	M.Day	M.Day	M.Day	M.Day
Net Revenue in Rs.		-4.50	-4.50	-4.50	-4.50	-4.50	-4.50
Maha Lowland	—						
Yala Lowland	—						
Maha Highland	—						
Yala Highland	—						
Oct. Lab. Days	—	-1.0					
Nov. Lab. Days	—		-1.0				
Dec. Lab. Days	—			-1.0			
Jan. Lab. Days	—				-1.0		
Feb. Lab. Days	—					-1.0	
Mar. Lab. Days	—						-1.0
Apr. Lab. Days	—						
May Lab. Days	—						
June Lab. Days	—						
July Lab. Days	—						
Aug. Lab. Days	—						
Sep. Lab. Days	—						
Hired Labour							
Oct. Lab. Days	—	1.0					
Nov. Lab. Days	—		1.0				
Dec. Lab. Days	—			1.0			
Jan. Lab. Days	—				1.0		
Feb. Lab. Days	—					1.0	
Mar. Lab. Days	—						1.0
Apr. Lab. Days	—						
May Lab. Days	—						
June Lab. Days	—						
July Lab. Days	—						
Aug. Lab. Days	—						
Sep. Lab. Days	—						
Capital Rs.	—	4.50	4.50	4.50	4.50	4.50	4.50
Min. Paddy Ac.	—						

Note.—This model matrix was used for all sown groups, with only the B Column varied according to the resource endowment situation in each group.

TABLE A 4

HIRED LABOUR

	B	Apr.	May	June	July	Aug.	Sep.
Units:		M.Day	M.Day	M.Day	M.Day	M.Day	M.Day
Net Revenue in Rs.		−4.50	−4.50	−4.50	−4.50	−4.50	−4.50
Maha Lowland	—						
Yala Lowland	—						
Maha Highland	—						
Yala Highland	—						
Oct. Lab. Days	—	−1.0					
Nov. Lab. Days	—		−1.0				
Dec. Lab. Days	—			−1.0			
Jan. Lab. Days	—				−1.0		
Feb. Lab. Days	—					−1.0	
Mar. Lab. Days	—						
Apr. Lab. Days	—	−1.0					
May Lab. Days	—		−1.0				
June Lab. Days	—			−1.0			
July Lab. Days	—				−1.0		
Aug. Lab. Days	—					−1.0	
Sep. Lab. Days	—						−1.0
Hired Labour							
Oct. Lab. Days	—						
Nov. Lab. Days	—						
Dec. Lab. Days	—						
Jan. Lab. Days	—						
Feb. Lab. Days	—						
Mar. Lab. Days	—						
Apr. Lab. Days	—	1.0					
May Lab. Days	—		1.0				
June Lab. Days	—			1.0			
July Lab. Days	—				1.0		
Aug. Lab. Days	—					1.0	
Sep. Lab. Days	—						1.0
Capital Rs.	—	4.50	4.50	4.50	4.50	4.50	4.50
Min. Paddy Ac.	—						

Note.—This Model matrix was used for all sown Groups, with only the B column varied according to the resource endovment in each Group.

TABLE A 5 (PP 117–125)

IRRIGATED MAHA CROPS

	B	HYVS TBM	HYVL TTM	HYVL TBM	TV TBM	Upland Paddy	Maize
Units :		Acre	Acre	Acre	Acre	Acre	Acre
Net Revenues in Rs.		698.00	1,183.00	819.00	285.00	220.00	223.05
Maha Lowland	—	1.0	1.0	1.0	1.0		
Yala Lowland	—						
Maha Highland	—					1.0	1.0
Yala Highland	—						
Oct. Lab. Days	—					2.0	2.0
Nov. Lab. Days	—	0.32	0.32	0.33	0.32	2.15	2.75
Dec. Lab. Days	—	8.03	8.55	8.69	8.42	1.0	0.5
Jan. Lab. Days	—	11.10	18.6	6.28	5.64	1.5	0.25
Feb. Lab. Days	—	6.0	7.47	4.5	2.96	10.0	0.25
Mar. Lab. Days	—	21.15	5.3	5.5	2.06		15.0
Apr. Lab. Days	—	2.59	25.2	20.8	18.12		
May Lab. Days	—		2.6	2.59	1.55		
June Lab. Days	—						
July Lab. Days	—						
Aug. Lab. Days	—						
Sep. Lab. Days	—						
Hired Labour							
Oct. Lab. Days	—						
Nov. Lab. Days	—						
Dec. Lab. Days	—						
Jan. Lab. Days	—						
Feb. Lab. Days	—						
Mar. Lab. Days	—						
Apr. Lab. Days	—						
May Lab. Days	—						
June Lab. Days	—						
July Lab. Days	—						
Aug. Lab. Days	—						
Sep. Lab. Days	—						
Irr. Water A.Ft.	—						
Capital Rs.	—	225.00	245.00	240.00	192.00	245.00	221.00
Min. Paddy Ac.	—	1.0	1.0	1.0	1.0	1.0	

TABLE A 5

MAHA CROPS

B		Dried Chillie	Manioc	Kurak-kan	Tobacco	Cowpea	Green Gram
Units :		Acre	Acre	Acre	Acre	Acre	Acre
Net Revenues in Rs.		1,279.00	185.00	77.00	1,100.00	142.10	170.00
Maha Lowland	—						
Yala Lowland	—						
Maha Highland	—	1.0	1.0	1.0	1.0	1.0	1.0
Yala Highland	—						
Oct. Lab. Days	—	3.0	1.0	1.0			
Nov. Lab. Days	—	14.0	2.5	11.5	5.0	2.0	2.0
Dec. Lab. Days	—	20.0	1.0	2.5	12.66	10.0	2.0
Jan. Lab. Days	—	25.0	0.25		11.13	1.0	7.0
Feb. Lab. Days	—	25.0	0.25	5.5	17.73	15.0	10.0
Mar. Lab. Days	—		12.5		18.35		
Apr. Lab. Days	—		5.0		25.19		
May Lab. Days	—						
June Lab. Days	—						
July Lab. bays	—						
Aug. Lab. Days	—						
Sep. Lab. Days	—						
Hired Labour							
Oct. Lab. Days	—						
Nov. Lab. Days	—						
Dec. Lab. Days	—						
Jan. Lab. Days	—						
Feb. Lab. Days	—						
Mar. Lab. Days	—						
Apr. Lab. Daus	—						
May Lab. Days	—						
June Lab. Days	—						
July Lab. Days	—						
Aug. Lab. Days	—						
Sep. Lab. Days	—						
Irr. Water A. Ft.	—						
Capital Rs.	—	565.00	185.00	115.00	440.00	180.00	160.00
Min. Paddy Ac.	—						

TABLE A 5

MAHA CROPS

	B	Mix. A	Mix. B	Veg. Mix. A	Veg. Mix. B	Sor-ghum	Green Chillie
Units :		Acre	Acre	Acre	Acre	Acre	Acre
Net Revenues in Rs.		209.00	732.00	170.00	100.00	35.50	1.236.00
Maha Lowland	—						
Yala Lowland	—						
Maha Highland	—	1.0	1.0	1.0	1.0	1.0	1.0
Yala Highland	—						
Oct. Lab. Days	—						
Nov. Lab. Days	—	2.0	1.0	1.0	1.0	3.0	3.0
Dec. Lab. Days	—	2. 5	14.0	1.5	13.34	3.0	14.0
Jan. Lab. Days	—	1. 0	13.5	1.0	5.24	1.0	18.0
Feb. Lab. Days	—	0.25	14.0	0.5	3.38		18.0
Mar. Lab. Days	—	10.0	15.0	2.0	4.6	11.0	18.0
Apr. Lab. Days	—	9.5	12.5	2.0	21.0		5.0
May Lab. Days	—	2.5	5.0		9.54		
June Lab. Days	—						
July Lab. Days	—						
Aug. Lab. Days	—						
Sep. Lab. Days	—						
Hired Labour							
Oct. Lab. Days	—						
Nov. Lab. Days	—						
Dec. Lab. Days	—						
Jan. Lab. Days	—						
Feb. Lab. Days	—						
Mar. Lab. Days	—						
Apr. Lab. Days	—						
May Lab. Days	—						
June. Lab. Days	—						
July Lab. Days	—						
Aug. Lab. Days	—						
Sep. Lab. Days	—						
Irr. Water A. Ft.	—						
Capital Rs.	—	125.00	375.00	170.00	210.00	252.50	565
Min. Paddy Ac.							

TABLE A 5

YALA CROPS

		Irrigated				Rain Fed	
	B	HYVS TBY	HYVL TTY	HYVL TBY	TV TBY	Dried Chillie	Green Gram
Units :	—	Acre	Acre	Acre	Acre	Acre	Acre
Net Revenues in Rs.		698.00	1,183.00	819.00	285.00	731.00	170.00
Maha Lowland	—						
Yala Lowland	—	1.0	1.0	1.0	1.0		
Maha Highland	—						
Yala Highland	—					1.0	1.0
Oct. Lab. Days	—	21.15	5.3	5.5	2.6		
Nov. Lab. Days	—	2.59	25.2	20.8	18.12		
Dec. Lab. Days	—		2.6	2.59	1.55		
Jan. Lab. Days	—						
Feb. Lab. Days	—						
Mar. Lab. Days	—						
Apr. Lab. Days	—					3.34	2.0
May Lab. Days	—					14.2	2.0
June Lab. Days	—	0.32	0.32	0.33	0.32	11.28	7.0
July Lab. Days	—	8.03	8.55	8.69	8.42	12.62	10.0
Aug. Lab. Days	—	11.10	18.6	6.28	5.64	20.5	
Sep. Lab. Days	—	6.0	7.47	4.5	2.96	21.9	
Hired Labour	—						
Oct. Lab. Days	—						
Nov. Lab. Days	—						
Dec. Lab. Days	—						
Jan. Lab. Days	—						
Feb. Lab. Days	—						
Mar. Lab. Days	—						
Apr. Lab. Days	—						
May Lab. Days	—						
June Lab. Days	—						
July Lab. Days	—						
Aug. Lab. Days	—						
Sep. Lab. Days	—						
Irr. Water A. Ft.	—	4.0	5.0	5.0	5.0		
Capital Rs.	—	225.00	245.00	240.00	192.00	565.00	160.00
Min. Paddy Ac.	—	1.0	1.0	1.0	1.0		

TABLE A 5

YALA CROPS

		Rain Fed				
	B	Cowpea	Snake-gourd	Veg. Mix. A	Gingelly	Green Chillie
Units :		Acre	Acre	Acre	Acre	Acre
Net Revenues in Rs.		142.10	121.0	170.00	166.50	632.57
Maha Lowland	—					
Yala Lowland	—					
Maha Highland	—					
Yala Highland	—	1.0	1.0	1.0	1.0	1.0
Oct. Lab. Days	—					
Nov. Lab. Days	—					
Dec. Lab. Days	—					
Jan. Lab. Days	—					
Feb. Lab. Days	—					
Mar. Lab. Days	—	2.0			1.0	
Apr. Lab. Days	—	10.0			5.0	3.34
May Lab. Days	—	1.0	2.0		3.0	14.2
June Lab. Days	—	15.0	18.0	1.0	10.0	18.0
July Lab. Days	—		14.0	1.5		18.0
Aug. Lab. Days	—		3.0	1.0		15.0
Sep. Lab. Days	—		15.0	1.5		5.0
Hired Labour						
Oct. Lab. Days	—					
Nov. Lab. Days	—					
Dec. Lab. Days	—					
Jan. Lab. Days	—					
Feb. Lab. Days	—					
Mar. Lab. Days	—					
Apr. Lab. Days	—					
May Lab. Days	—					
June Lab. Days	—					
July Lab. Days	—					
Aug. Lab. Days	—					
Sep. Lab. Days	—					
Irr. Water A. Ft.	—					
Capital Rs.	—	180.00	240.00	170.00	155.00	565.00
Min. Paddy Ac.	—					

TABLE A 5

YALA CROPS

	B	Irrigate Maize	Ground Nut	Dried Chillie	Bombay Onions	Red Onions
Units : Net Revenues in Rs.		Acre 570.60	Acre 960.00	Acre 3,214.00	Acre 2,492.00	Acre 2,026.00
Maha Lowland	—					
Yala Lowland	—	1.0	1.0	1.0	1.0	1.0
Maha Highland	—					
Yala Highland	—					
Oct. Lab. Days	—					
Nov. Lab. Days	—					
Dec. Lab. Days	—					
Jan. Lab. Days	—					
Feb. Lab. Days	—					
Mar. Lab. Days	—			1.0	1.0	
Apr. Lab. Days	—	2.0	9.0	35.0	50.0	25.0
May Lab. Days	—	8.0	15.0	25.0	35.0	25.0
June Lab. Days	—	4.0	6.0	35.0	12.0	15.0
July Lab. Days	—	7.0	17.0	37.0	60.0	60.0
Aug. Lab. Days	—	20.0				
Sep. Lab. Days	—					
Hired Labour						
Oct. Lab. Days	—					
Nov. Lab. Days	—					
Dec. Lab. Days	—					
Jan. Lab. Days	—					
Feb. Lab. Days	—					
Mar. Lab. Days	—					
Apr. Lab. Days	—					
May Lab. Days	—					
June Lab. Days	—					
July Lab. Days	—					
Aug. Lab. Days	—					
Sep. Lab. Days	—					
Irr. Water A. Ft.	—	3.3	2.3	4.0	2.0	2.0
Capital Rs.	—	272.25	252.00	690.00	656.00	830.00
Min. Paddy Ac.	—					

TABLE A 5

YALA CROPS

		Irrigated				
	B	Soya	Tomato	Okra	Green Gram	Tobacco
Units :		Acre	Acre	Acre	Acre	Acre
Net Revenues in Rs.		460.00	2,810.00	560.00	362.00	1,510.00
Maha Lowland	—					
Yala Lowland	—	1.0	1.0	1.0	1.0	1.0
Maha Highland	—					
Yala Highland	—					
Oct. Lab. Days	—					
Nov. Lab. Days	—					
Dec. Lab. Days	—					
Jan. Lab. Days	—					
Feb. Lab. Days	—					
Mar. Lab. Days	—		5.0			
Apr. Lab. Days	—	7.0	25.0	25.0	5.0	5.0
May Lab. Days	—	11.0	20.0	8.0	5.0	12.66
June Lab. Days	—	1.0	20.0	12.0	10.0	13.40
July Lab. Days	—	1.0	15.0	10.0	15.0	18.73
Aug. Lab. Days	—	15.0	5.0	5.0		19.35
Sep. Lab. Days	—					28.2
Hired Labour						
Oct. Lab. Days	—					
Nov. Lab. Days	—					
Dec. Lab. Days	—					
Jan. Lab. Days	—					
Feb. Lab. Days	—					
Mar. Lab. Days	—					
Apr. Lab. Days	—					
May Lab. Days	—					
June Lab. Days						
July Lab. Days	—					
Aug. Lab. Days	—					
Sep. Lab. Days	—					
Irr. Water A. Ft.	—	2.33	2.33	2.33	2.33	2.33
Capital Rs.	—	231.50	732.00	492.00	180.00	490.00
Min. Paddy Ac.	—					

4—A 17294 (10/75)

TABLE A 5

HIRED LABOUR

	B	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
Units : Net Revenues in Rs.		Man-Day -4.50	Man-Day -4.50	Man-Day -4.50	Man-Day -4.50	Man-Day -4.50	Man-Day -4.50
Maha Lowland	—						
Yala Lowland	—						
Maha Highland	—						
Yala Highland	—						
Oct. Lab. Days	—	-1.0					
Nov. Lab. Days	—		-1.0				
Dec. Lab. Days	—			-1.0			
Jan. Lab. Days	—				-1.0		
Feb. Lab. Days	—					-1.0	
Mar. Lab. Days	—						-1.0
Apr. Lab. Days	—						
May Lab. Days	—						
June Lab. Days	—						
July Lab. Days	—						
Aug. Lab. Days	—						
Sep. Lab. Days	—						
Hired Labour							
Oct. Lab. Days	—	1.0					
Nov. Lab. Days	—		1.0				
Dec. Lab. Days	—			1.0			
Jan. Lab. Days	—				1.0		
Feb. Lab. Days	—					1.0	
Mar. Lab. Days	—						1.0
Apr. Lab. Days	—						
May Lab. Days	—						
June Lab. Days	—						
July Lab. Days	—						
Aug. Lab. Days	—						
Sep. Lab. Days	—						
Irr. Water A. Ft.	—						
Capital Rs.	—	4.50	4.50	4.50	4.50	4.50	4.50
Min. Paddy Ac.	—						

TABLE A 5

HIRED LABOUR

B	Apr.	May	June	July	Aug.	Sep.
Units : Net Revenues in Rs.	Man- Day -4.50	Man- Day -4.50	Man- Day -4.50	Man- Day -4.50	Man- Day -4.50	Man- Day -4.50
Maha Lowland —						
Yala Lowland —						
Maha Highland —						
Yala Highland —						
Oct. Lab. Days —						
Nov. Lab. Days —						
Dec. Lab. Days —						
Jan. Lab. Days —						
Feb. Lab. Days —						
Mar. Lab. Days —						
Apr. Lab. Days —	-1.0					
May Lab. Days —		-1.0				
June Lab. Days —			-1.0			
July Lab. Days —				-1.0		
Aug. Lab. Days —					-1.0	
Sep. Lab. Days —						-1.0
Hired Labour :						
Oct. Lab. Days —						
Nov. Lab. Days —						
Dec. Lab. Days —						
Jan. Lab. Days —						
Feb. Lab. Days —						
Mar. Lab. Days —						
Apr. Lab. Days —	1.0					
May Lab. Days —		1.0				
June Lab. Days —			1.0			
July Lab. Days —				1.0		
Aug. Lab. Days —					1.0	
Sep. Lab. Days —						1.0
Irr. Water A. Ft. —						
Capital Rs. —	4.50	4.50	4.50	4.50	4.50	4.50
Min. Paddy Ac. —						

Response of long-aged rice variety Bg 3-5 to fertilizer in four coastal drainage and reclamation schemes

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INTRODUCTION

THE task of draining and reclaiming 13,000 acres of ill-drained lowlands above +1 M.S.L. of the south-west coastal region of Sri Lanka, in order to increase rice production in this relatively over-populated area, has engaged the attention of the Irrigation Department for some years. A report on the soils of these drainage and reclamation schemes has been prepared by the Land Use Division of the Irrigation Department (4). The responsibility of finding suitable varieties of rice and management practices to ensure increased production rests on the Department of Agriculture. To this end the Field Trials Division of the Department of Agriculture has been engaged in adaptive research in a few of these Drainage and Reclamation Schemes. This report contains results of such a research endeavour in four of these schemes, *viz.*, Kiralakelle (Matara), Bentota Left Bank, Bolgoda and Irranavillu (Mandampe, Chilaw) where the responses to fertilizer of the new, improved plant type, long-aged variety of rice Bg 3–5 was studied.

In these low-lying, ill-drained lands where flood hazards loom large, farmers traditionally grow long-aged photosensitive local varieties of rice during the Maha season These varieties are sown well in advance of the rains in order to ensure that plants will be sufficiently well established and tall enough to withstand floods during the period of high rainfall. Further, crops are sown at times that enable them to be harvested in dry weather. However, the yields obtained with these varieties are relatively low even with a reasonable quantity of added fertilizer. Also it is well known that yields cannot be continually increased by use of fertilizer in all varieties, for application of high levels of nitrogen to the traditional tall varieties usually results in complete lodging of the crop which would negate the benefits from the use of fertilizers. Hence the need to test the performance of new improved varieties with high yield potential which are known to respond to fertilizer.

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The new high-yielding varieties of rice like Bg 3-5 bred at the Central Rice Beeding Station, Bathalagoda offer hope of increasing yield of rice in these areas. However the full yield potential of a variety may not be achieved in these areas due to various limiting factors, and many problems will have to be overcome before the full promise of the new varieties can be realized.

Improved agricultural techniques including, in particular, the efficient use of fertilizer, can profitably be used to spearhead agricultural development and productivity on the problem soils that are common in these low-lying ill-drained areas.

MATERIALS AND METHODS

During the Maha season 1973-74 investigations, on the fertilizer response of the long-aged ($5\frac{1}{2}$-$6\frac{1}{2}$ months), photoperiod sensitive variety of rice Bg 3-5, were carried out in farmers' fields in three Drainage and Reclamation Schemes of the West Zone, i.e. Kiralakelle (Matara), Bentota Left Bank and Bolgoda and in one Scheme in the Intermediate Zone, i.e. Irranavillu (Chilaw), The long-aged local village variety of rice which is normally sown in these areas by the farmers was included in the investigations and grown at the level of fertilizer recommended by the Department of Agriculture for such varieties in the area.

There were six treatments distributed at random at each location or site, and several sites were selected in each scheme. For statistical analysis each location or site was considered a replicate. The treatments at Kiralakelle (Matara), Bentota Left Bank, and Bolgoda were as follows :—

No.

1. No Fertilizer Control

2. (i) 2 cwt. of 5 : 15 : 15 Compound Pelletized Fertilizer/ac.—At sowing
(ii) 56 lb. Urea/ac — 4 weeks after sowing.
(iii) 84 lb. TDM-2 Mixture/ac — Just prior to primordia initiation.

This is the recommendation of the Department of Agriculture for new improved varieties in the area.

Total Nutrients—62.8 N, 33.6 P_2O_5 and 50.4 K_2O lb/ac

3. (i) 2 cwt. of 5:15:15 Compound Pelletized Fertilizer/ac — At sowing
(ii) 28 lb. Urea/ac — 2 weeks after sowing.
(iii) 28 lb. Urea /ac — 4 weeks after sowing.
(iv) 84 lb. TDM-2 Mixture/ac — Just prior to primordia initiation.

Total Nutrients—62.8 N, 33.6 P_2O_5 and 50.4 K_2O lb/ac

4. (i) 2 cwt. of 5:15:15 Compound Pelletized Fertilizer and 17 lb. Urea/ac — At sowing.
(ii) 47.5 lb. Urea/ac — 4 weeks after sowing.
(iii) 47.5 lb. Urea and 28 lb. of Muriate of Potash/ac — Just prior to primordia initiation.

Total Nutrients—62.8 N, 33.6 P_2O_5 and 50.4 K_2O lb./ac

5. (i) 2 cwt. of 5:15:15 Compound Pelletized Fertilizer and 17 lb. of Urea/ac. — At sowing.
(ii) 33.3 lb. of Urea/ac — 2 weeks after sowing.
(iii) 33.3 lb. of Urea/ac — 4 weeks after sowing.
(iv) 66.6 lb. of Urea and 28 lb. or Muriate of Potash/ac — Just prior to primordia initiation.

Total Nutrients—80 lb. N, 33.6 P_2O_5 and 50.4 K_2O lb./ac

6. (i) 2 cwt. 5:15:15 Compound Pelletized Fertilizer/ac — At sowing.
(ii) 28 lb. of Urea/ac — 4 weeks after sowing.
(iii) 56 lb. of TDM$_3$ Mixture/ac — Just prior to primordia initiation.

This is the recommendation of the Department of Agriculture for local varieties in the area.

Total Nutrients—37 N, 33.6. P_2O_5 and 50.4 K_2O lb./ac

The treatments at Irrauavillu were as follows :

1. (i) No Fertilizer Control

2. (i) 1½ cwt. V-2 Mixture/ac — At sowing.
(ii) 28 lb. Urea/ac — 2 weeks after sowing.
(iii) 56 lb. Urea/ac — 6 weeks after sowing.
(iv) 1 cwt. TDM-1 Mixture/ac — 16 weeks after sowing.

This is the recommendation of the Department of Agriculture for new improved 5-6 months varieties in the area.

Total Nutrients—81.6 N, 28.6 P_2O_5 and 38.4 K_2O lb./ac

3. (i) 1½ cwt. V-2 Mixture and 12 lb. Urea/ac — At sowing.
(ii) 44.4 lb. Urea/ac — 2 weeks after sowing.
(iii) 56 lb. Urea/ac — 6 weeks after sowing.
(iv) 56 lb. Urea and 28 lb. Muriate of Potash/ac — 16 weeks after sowing.

Total Nutrieuts—81.6 N, 28.6 P_2O_5 and 38.4 K_2O lb./ac

4. (i) 13.2 lb. Urea, 16.6 lb. Conc. Super-Phosphate and 46.7 lb. Muriate of Potash/ac — At sowing.
(ii) 35 lb. Urea /ac — 2 weeks after sowing.
(iii) 70 lb. Urea/ac — 6 weeks after sowing.
(iv) 104.4 lb. Urea and 58.3 lb. Muriate of Potash/ac — 16 weeks after sowing.

Total Nutrients—100 N, 50-P_2O_5 and 50 K_2O lb./ac

5. (i) 10 lb. Urea, 186.4 lb. Conc. Super Phosphate and 75.0 lb. Muriate of Potash/ac — At sowing.
(ii) 28 lb. Urea/ac — 2 weeks after sowing.
(iii) 56 lb. Urea/ac — 6 weeks after sowing.
(iv) 84 lb. Urea and 58.3 lb. Muriate of Potash/ac — 16 weeks after sowing.

Total Nutrients—81.8 N, 80 P_2O_5 and 80 K_2O lb./ac

6. (i) $1\frac{1}{2}$ cwt. V-2 Mixture/ac — At sowing.
(ii) $\frac{1}{4}$ cwt. Urea/ac — 2 weeks after sowing.
(iii) 1 cwt. TDM-1 Mixture/ac — 16 weeks after sowing.

This is the recommendation of the Department of Agriculture for local 5-6 months varieties in the area.

Total Nutrients—56.1 N, 28.6 P_2O_5 and 38.4 K_2O lb./ac

Treatments 1 to 5 had the variety Bg 3-5 while treatment 6 was with the village variety. The plots were broadcast sown at all locations at a rate of 2 bushels of sprouted grain per acre.

Bg 3-5 is a long-aged variety with white, medium-sized grain which has been released from the Central Rice Breeding Station, Bathalagoda. It has originated from the cross, Engatek X 63–1583 ; the latter being a selection of a cross between *Panduru Wee* and Mas. The variety Bg 3-5 is shorter in height than Ptb–16 and other long-aged varieties but tillers profusely, and has responded well to fertilizers at Bathalagoda. One disadvantage of this variety is that it is susceptible to "bronzing", and is markedly susceptible to bacterial leaf blight. It is however resistant to blast. It has a dormancy period of 7 weeks (9).

The gross size of each treatment plot was 5 by 8 metres ($16\frac{1}{2} \times 26\frac{1}{4}$ ft.),i.e., 1/100 acre. When harvesting a 1 metre (i.e, 3′4″) boarder was left out all round the plot so that the nett area harvested was 3 by 6 metres which is approximately 1/225 acre.

Weed control was carried out as recommended by the Department of Agriculture while pests and deseases were controlled whenever necessary.

At Kiralakelle, Bentota Left Bank and Bolgoda Schemes (i.e., S. W. Sector Schemes) where long-aged varieties are usually confined to the lowest elevations, the sites were located at + 1′ to +2′ MSL and even below +1′ MSL, on Half-Bog and Bog Soils. At Irrauvilau, where the long-aged varieties dominate in the Maha season and are grown from below +1′ MSL to above +3′ MSL, the trial sites were between +1′ to +2 MSL, +2′ to 3′ MSL and above +3′ MSL on Gleic Alluvial Soil.

Trial sites were located with the aid of the soil maps provide by the Land Use Division of the Irrigation Department (4).

RESULTS AND DISCUSSION

1. *Bg* 3-5 *Versus Local Varieties*

Comparison of the performance of the new high-yielding,long aged variety Bg 3-5 with the currently popular long aged, local varieties at Kiralakelle, Bentota Left Bank, Bolgoda and Irranvillu schemes is possible when yields of treatments 2 and 6 are comapred in tables 1, 2, 3 and 4 respectively.

Kiralakelle

The popular local varieties tested against Bg 3-5 in the Kiralakelle Scheme were *Dikwee* and *Mawee*. Comparison of treatments 2 and 6 in Table 1 show clearly that the variety Bg 3 - 5 performed better than the local varieties, at the rates of fertilizer application recommended by the Department of Agriculture for the two types of varieties. The yield difference was significant at the 1% level of probability. The yields in plots of Bg 3 - 5 that received no fertilizer (Treatment 1) were not significantly different from those of local varieties that received the recommended dose of fertilizer (37.0N ; 33.6 $P_2 0_5$; 50.4 K_2O, lb. per acre), although the yields of the former were lower. The variety Bg 3 -5 appeared to perform reasonably well in the absence of fertilizer in this scheme during this season.

Bentota Left Bank

The local variety tested at all sites in this scheme was *Mudali Wee*. As seen in table 2, like at Kiralakelle Scheme, the difference in yields between plots of Bg 3 - 5 that received no fertilizer and those of the local variety which received fertilizer according to recommendations of the Department of Agrciulture were not significantly different. These results show the ability of this new improved variety Bg 3 - 5 to perform reasonably well without fertilizer. In fact, in this area Bg 3 - 5 slightly out-yielded the local varieties which was fertilizerd, though the increase was not statistically different. When fertilized, this new improved variety out-yielded the local varieties by approximately 44 bushels per acre which difference was highly significant.

Bolgoda

At the Bolgoda Scheme, unlike in the Kiralakelle and Bentota Schemes, the local varieties of rice out-yielded Bg 3 - 5 at the +1′ to +2 MSL elevation, when no fertilizer was applied, the difference being significant at the 5% level of probability (Table 3). At four sites situated below+1 MSL the difference in yield between treatments 1 and 6 were not significant. The varieties of rice used in this scheme were the *Hathiyal*, *Ratuwee* and Ptb- 16. The results of the +1′—2 MSL elevations are reflected in the over-all yield where the local varieties out-yielded the non-fertilized Bg 3 - 5 plots.

Irranvillu

The local variety of rice used at all locations in the Irranvillu Scheme was *Mawee*. In this scheme, the performance of the local variety with fertilizer was superior to Bg 3 - 5 without fertilizer at the +2′ to 3′ MSL and above +3′ elevations the difference being highly significant. At the +1′ to +2′ elevation, however, the difference in yield between Bg 3 - 5 and the local variety was not significantly different although the latter out-yielded the former. This result was similar to that obtained at Kiralakelle and Bentota Left Bank Schemes.

Long-aged varieties have a significant role in rice production in Sri Lanka. Although it is known that the easiest way to achieve increased rice production in the tropics is by using early maturing, moderately tillering, lodging resistant short-statured varieties that are reasonably resistant to disease (3, 5, 6, 8), in certain areas of the island long-aged varieties are a necessity.(7)

The variety Bg 3 - 5 was introduced by the Research Division of the Department of Agriculture to replace varieties like H 9 and Ptb-16, *Podiwi* a - 8, and other village varieties which are traditionally grown in an area of over 80,000 acres spread out in the Matara, Galle, Kalutara and Colombo districts of the Wet Zone and in the Irranavillu (Madampe-Chilaw) area of the Intermediate Zone. Farmers grow these long-aged varieties in ill-drained rice fields that are likely to remain inundated during most of the growing season depending on the characteristic rainfall pattern of the areas. In such areas farmers usually crop their lands only one season with a 5 to 6 months, photo-sensitive long aged variety, i.e., usually in the Maha season. If such suitable photo-insensitive varieties are available farmers in the Bolgoda and Bentota Left Bank areas may occasionally crop their lands during the Yala season too.

Because most of the 5—6 months varieties are photoperiod sensitive, they are broadcast sown in July or August to ensure they mature at the same time in February, the driest month of the year, irrespective of date of sowing. The actual sowing to harvest period of these varieties may vary from 5 to 7 months.

Even the variety H 9, which was released by the Department of Agriculture a few years ago, was not sufficiently photosensitive. The variety Bg 3–5 is on the other hand, photo-period sensitive. Further, it is superior to the tall varieties like Ptb–16 and H 9 in being resistant to lodging ; and to varieties *Podiwi* a–8 Ptb–16 in giving higher yields.

2. *Response of Bg 3—5 to Fertilizers*

The positive effect of fertilizers on the grain yield of the new improved long aged variety, Bg 3–5 is seen if the yields of the No-fertilizer, Control treatments are compared with those of treatments 2 in tables 1, 2, 3 and 4. It is clear that in all schemes and at all elevations tested that the variety Bg 3–5 responded well to fertilizer application.

There were highly significant responses (1 percent level of probability) in grain yield to application of fertilizer as recommended by the Department of Agriculture at Kiralakelle, Bentota Left Bank and Irranavillu. In the Bolgoda scheme however the results were the same except at four locations which were below + 1′ MSL and where differences were significant only at the 5 percent level of probability.

The lowest response to fertilizer was at the Irranavillu Scheme where the difference in overall yields was 18.3 bushels per acre which was highly significant. The highest response was at the Bentota Left Bank Scheme where the difference was a very highly significant 50.8 bushels per acre. The fertilizer recommendation for Irranavillu area calculated to cost Rs. 289.55 per acre would give a profit of Rs. 314.35 to the farmer. On the basis of the results from Bentota Left Bank, the profit would be more than twice the value.

3. *Effect of split applying and advancing the first top dressing of nitrogen fertilizer—Wet Zone*

The effect of applying half the quantity of nitrogen usually given at the first top dressing earlier, at two weeks after sowing (Treatment 3) gave no significant yield increases at the Bentota Left Bank and Bolgoda schemes showing no benefit in supplying a portion of the nitrogen usually given at four weeks at two weeks from sowing. At Kiralakelle scheme, however, there was a significant yield increase of 9.4 bushels per acre at sites located on the less than 1 ft. MSL elevation, but not at the higher elevation (Table 1). The low lying areas where long-aged varieties are grown are usually below + 2′ MSL. These lands are very quickly flooded and could remain under undrainable water for long periods. Further, it is impossible to predict when these low lying lands would be inundated with undrainable water. Therefore, in order to ensure that the first top dressing of nitrogen is not unduly delayed and since treatment 3 was not inferior to treatment 2 at any scheme, in practice it may be desirable to apply a portion of the first top dressing at 2 weeks after sowing.

4. *Increasing the quantity of nitrogen at sowing (Basal)*

At Kiralakelle, Bentota Left Bank and Bolgoda Scheme, (i.e., Wet Zone) treatment 4 was designed to supply additional nitrogen at sowing by including 17 lb per acre of Urea from the total quantity of 1 cwt which was supplied in treatment 2 and 3. These 17 lb. Urea (7.9 lb. N) together with the 11.2 lb nitrogen from 2 cwt. of 5 : 15 : 15 pelletized fertilizer would have supplied a total of 19.1 lb nitrogen which could have enhanced better development growth and vigour of seedling.

As seen in Table 1, this treatment had a highly significant effect in increasing grain yield at both elevations at Kiralakelle. At Bentota Left Bank, there was a slight non-significant depression in yield (Table 2), while at Bolgoda there was a slight non-significant increase in yield over the current recommendation of the Department of Agriculture—(Table 3).

At the Irranavillu Scheme, (Intermediate Zone) the effect of increasing the quantity of nitrogen at planting by including 12 lb urea per acre with the basal application of fertilizer (Treatment 3, Table 4) is seen by comparing yields in treatments 2 and 3 in table 4 (where a very highly significant overall yield increase of 24.4 bushels per acre was obtained.). At all elevations increasing the quantity of nitrogen at planting from 4.5 to 10 lb N/ac, gave a highly significant yield increase. The overall increase in yield was 24.3 bushels per acre and significant at the 1% level of probability.

Alles and Balasuriya (1) obtained significant yield increases with the variety Bg 3–5 (and Bg 11–11) when a portion of the total quantity of 80 lb nitrogen per acre was supplied at planting, in contrast to treatments where all the nitrogen was supplied as top-dressing, in trials conducted in the Diya Ella Basin, a tributory in the Attanagalu Oya which flows through the Mirigama, Pallewela and Veyangoda areas. This response was noted when as much as 40 lb per acre of nitrogen was supplied at planting.

Balasuriya *at el.* (2) found that increasing the quantity of nitrogen applied at sowing from 4.5 to 10 lb. per acre gave very substantial and highly significant increases in grain yield at Irranavillu during the *Yala* season of 1973 using the short-aged variety Bg 34–8.

5. *Effect of additional nitrogen fertilization in Wet Zone Scheme areas*

At Kiralakelle, Bentota Left Bank and Bolgoda treatment 5 was designed to study the effect of increased nitrogen fertilization on yield of the variety Bg 3–5. Plants in this treatment received an additional 17.2 lb nitrogen per acre given in the form of Urea over those in treatment 4. This treatment also supplied nitrogen to plants at two weeks compared to those in treatment 4 that received no nitrogen at this stage of growth, in addition to supplying an extra quantity of nitrogen in the final top dressing just prior to primorida initiation. As seen from data presented in Table 1, 2, and 3, there were no significant differences in yields between treatments 5 and 4 at these three schemes. Hence, no benefit was obtained from increasing fertilizer nitrogen from the recommended quantity of nitrogen per acre.

6. *Production Potential of Bg* 3 - 5

In the Drainage and Reclamation Schemes the target yield for the elevation +1′ to +2′ MSL, after improvement to the drainage, is 35 bu per acre. This target yield was exceeded by Bg 3 - 5 at all Schemes (Tables 1, 2, 3 and 4).

At Irranavillu where long aged varieties are grown even above +2′ MSL the target yield for the elevations +1′ to +2′ MSL and above +3′ MSL, i.e., 80 bu. per acre was exceeded with treatments T_4, T_5, and T (Table 4) At Bolgoda, Bentota Left Bank and Kiralakelle schemes where there are considerable extents of land below +1′ MSL within scheme areas, the yields obtained with Bg 3 - 5 were very promising.

At Kiralakelle and Irranavillu Schemes yields of over 100 bu per acre were obtained. At the lower yielding Bentota and Bolgoda schemes, with the Departmental Fertilizer Recommendation, the yield increases of Bg 3 - 5 over local vari ties was over 100% and 60% respectively, i.e., 44.1 bu per acre and 21.3 bu per acre respectively.

When Bg 3 - 5 was sown in the period mid-July to the end of August it was sufficiently photo-sensitive for heading (flowering) to occur in the period end of December to early January. This enables to crop to ripen and be harvested in the period January-February when dry weather usually prevails. Bg 3 - 5 had good lodging resistance too.

The high yields obtained with Bg 3 - 5 in the reclaimed areas of the four Drainage and Reclamation Schemes, with the Departmental fertilizer recommendation, and adequate management has opened the prospect of substantial yield increases in the low lying areas in the Maha season and also better utilisation of these low-lving lands.

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TABLE I—Effect of fertilizer treatments on yield of paddy in the Kiralakele Scheme duing Maha 1973–74 (Bushels per acre)

Treatments		*Elevation M. S. L. (Ft.)*		
		Less than +1′	*+1–+2*	*Overall*
1. No fertilizer, control treatment	..	72.0	57.0	63.0
2. 22 cwt./ac N : $P0_5$: K O—5 : 15 : 15 Compound Pelletized Fertilizer at sowing ; ½ cwt./ac Urea 4 weeks After sowing and ¾ cwt./ac of TDM–2 Mixture just prior to primoridia initiation (Mid-November)	..	102.0	93.5	97.0
3. 2 cwt./ac N : P 0 : K O—5 : 15 : 15 Compound Pelletized Fertilizer at sowing ; ¼ cwt./ac Urea each at 2 weeks and 4 weeks after sowing ; and ¾ cwt./ac TDM-2 Mixture just prior to primoridia unitiation (Mid-November)	..	111.4	101.3	105.4
4. 2 cwt./ac N : P 0 : K O—5 : 15 : 15 Compound Pelletized Fertilizer and 17 lb./ac Urea at sowing ; 47.5 lb. Urea/ac 4 weeks after sowing ; and a mixture of 47.5 lbs. urea and ¼ cwt./ac Muriate of Potash just prior to promoridia initiation (Mid-November)	..	117.5	115.7	116.4
5. 2 cwt./ac N : P 0 : K O—5 : 15 : 15 Compound Pelletized Fertilizer and 17 lbs./ac Urea at sowing ; 33.2 lb./ac Urea 2 weeks after sowing ; 33.3 lb./ac Urea 4 weeks after sowing ; and a mixture of 66.6 lb. Urea and ¼ cwt./ac Muriate of Potash just prior to primoridia initiation (Mid November)	..	121.6	96.0	107.9
6. *Local varieties.*—2 cwt./ac of N : P_2O_5 : K_2O—5 : 15 : 15 Compound Pelletized Fertilizer at sowing ; ¼ cwt./ac Urea 4 weeks after sowing ; and ½ cwt./ac TDM—3 Mixture just prior to primoridia initiation (Mid-November)	..	80.1	63.9	70.4
L. S. D. 5%	..	8.7	16.1	10.4
L. S. D. %	..	11.7	21.4	13.7
C. V. %	..	8.5	22.3	17.7
Number of Sites	..	8	12	20

Treatment 2 is the Fertilizer Recommendation of the Department of Agriculture for the area. TDM-2 contains 34.5 lb. N and 22.2 lb K_2O per cwt. TDM-3 contains 25.76 lb. N and 33.6 lb. K_2O per cwt.

TABLE 2.—Effect of fertilizer treatment on yield of paddy in the Bentota Left Bank Scheme during Maha 1973-74 (Bushels per acre)

Treatments	Elevation M. S. L. (Ft.) Less than +1′	+1–+2	Overall
1. No fertilizer, control treatment	35.0	28.5	29.6
2. 2 cwt./ac N : P O : K O—5 : 15 : 15 Compound Pelletized Fertilizer at sowing ; ½ cwt./ac Urea 4 weeks after sowing and ¾ cwt./ac of TDM-2 just prior to primoridia initiation (Mid-November)	65.0	71.5	70.4
3. 2 cwt./ac N : P_2O_5 : K O—5 : 15 : 15 Compound Pelletized Fertilizer at sowing ; ¼ cwt./ac Urea each at 2 weeks and 4 weeks after sowing ; and ¾ cwt./ac TDM-2 Mixture just prior to primoridia initiation (Mid-November)	75.0	73.5	72.7
4. 2 cwt./ac N : P_2O_5 : K O—5 : 15 : 15 Compound Pelletized Fertilizer and 17 lb./ac Urea at sowing ; 47.5 lb. Urea/ac 4 weeks after sowing ; and a mixture of 47.5 lbs. urea and ¼ cwt./ac Muriate of Potash just prior to primoridia initiation (Mid-November	62.5	61.0	61.3
5. 2 cwt./ac N : P_2O_5 : K_2O—5 : 15 : 15 Compound Pelletized Fertilizer and 17 lb./ac Urea at sowing ; 33.2 lb./ac. Urea 2 weeks after sowing ; 33.3 lb./ac Urea 4 weeks after sowing ; and a mixture of 66.6 lb. Urea and ¼ cwt./ac Muriat of Potash just prior to pr.moridia initiation (Mid-November)	57.5	69.0	67.6
6. *Local varieties.*—2 cwt./ac of N : P_2O_5 : K O—5 : 15 : 15 Compound Pelletized Fertilizer a sowing ; ¼ cwt./ac urea 4 weeks after sowing ; and ½ cwt./ac TDM-3 Mixture just prior to primoridia initiation (Mid-November)	22.5	27.0	26.3
L. S. D 5%	—	10.4	9.6
L. S. D. 1%	—	14.2	12.3
C.V. %	—	14.2	13.9
Number of sites	1	5	6

Treatment 2 is the Fertilizer Recommendation of the Department of Agriculture for the area. TDM-2 contains 34.5 lb. N and 22.2 lb. K_2O per cwt. TDM-3 contains 25.76 and 33.6 lb. K_2O per cwt.

TABLE 3.—Effect of fertilizer treatments on yield of paddy in the Bolgoda Scheme during Maha 1973-74 (Bushels per acre)

	Treatments	Elevation M. S. L. (Ft.) Less than +1′	+1 – +2	Overall
1.	No fertilizer, control treatment	23.4	21.2	21.8
2.	2 cwt./ac N : P O, : K O—5 : 15 : 15 Compound Pelletized Fertilizer at sowing ; ½ cwt./ac Urea 4 weeks after sowing and ¾ cwt./ac of TDM–2 just prior to primoridian initiation (Mid-November)	49.5	56.5	54.5
3.	2 cwt./ac N ; P O, : K_2O—5 : 15 : 15 Compound Pelletized Fertilizer at sowing ; ¼ cwt./ac Urea cach at 2 weeks and 4 weeks after sowing ; and a mixture of 47.5 lbs. urea and ¼ cwt./ac Muriate of Potash just prior to primoridia initiation (Mid-November)	61.9	57.5	58.6
4.	2 cwt./ac N ; P O : K O—5 : 15 : 15 Compound Pelletized Fertilizer and 17 lb./ac Urea at sowing ; 47.5 lb. Urea/ac 4 weeks after sowing, and a mixture of 44.5 lbs . urea and ¼ cwt./ac Muriate of Potash just prior to primoridia initiation (Mid-Novvember)	57.8	61.1	60.2
5.	2 cwt./ac N : P O_5 : K O—5 : 15 : 15 Compound Pelletized Fertilizer and 17 lb./ac Urea at sowing ; 33.2 lb./ac Urea 2 weeks after sowing ; 33.3 lb./ac Urea 4 weeks after sowing ; and a mixture of 66.6 lb. Urea amd ¼ cwt./ac Muriate of Potash just prior to primoridia initiation (Mid-November)	64.7	54.8	57.4
6.	*Local varieties*—2 cwt./ac of N : P_2O_5 : K O—5 : 15 : 15 Compound Pelletized Fertilizer at sowing ; ¼ cwt./ac urea 4 weeks after sowing ; and ½ cwt./ac TDM–3 Mixture just prior to primoridia initiation (Mid-November)	28.2	35.0	33.2
	L. S. D. 5%	19.6	11.3	9.4
	L. S.fD. 1%	27.1	15.0	12.4
	C. V.%	27.4	26.8	26.4
	Number of Sites	4	11	15

Treatment 2 is the Fertilizer Recommendation of the Department of Agriculture for the area. TDM-2 contains 34.5 lb. N and 22.2 lb. K_2O per cwt. TDM–3 contains 25.76 and 33.6 lb. K_2O per cwt.

TABLE 4.—Effect of fertilizer treatments on yield of paddy in the Iranavillu Scheme during Maha 1973-74 (Bushels per acre)

Treatments	Elevation M. S. L. (Ft.) +1-+2	+2—+3	*above* +3	*overall*
1. No Fertilizer, control treatment	54.4.	55.8	53.3	55.0
2. 1½ cwt./ac V-2 Mixture at sowing ; ¼ cwt./ac Urea 2 weeks after sowing ; ½ cwt./ac Urea 6 weeks after sowing and 1 cwt./ac of TDM-1 Mixture 16 weeks after sowing	74.4	71.6	76.6	73.3
3. 1½ cwt. V-2 Mixture plus 12 lb. Urea/ac at sowing ; 44.4 lb./ac Urea 2 weeks afer sowing ; ½ cwt./ac Urea 6 weeks after sowing ; ½ cwt./ac Urea plus ¼ cwt. Muriate of Potash 1/60% grade) 16 weeks after sowing	98.9	97.0	96.6	97.7
4. A mixture of 13.3 lb./ac Urea 116 lb./ac Conc. Superphosbhate and 46.7 lb./ac Muriate of Potash at sowing ; 35 lb./ac Urea 2 weeks after sowing ; 70 lb./ac Urea 6 weeks after sowing ; and a mixture of 82.5 lb. Urea and 36.5 lb. Muriate of Potash 16 weeks after sowing	92.8	87.1	96.6	90.4
5. A mixture of 10 lb./ac Urea, 186.4 lb./ac Conc. Superphosphate and 75.0 lb./ac Muriate of Potash at sowing ; 28 lb./ac Urea 2 weeks after sowing ; 56 lb./ac Urea 6 weeks after sowing ; and a mix. ture of 84.0 lb./ac Urea and 58.3 lb./ac Muriate of Potash 16 weeks after sowing	101.1	98.7	105.0	100.4
6. *Local varieties*—1½ cwt./ac of V-2 Mixture at sowing ; ¼ cwt./ac Urea 2 weeks after sowing and 1 cwt./ac TDM-1 Mixture 16 weeks after sowing	60.0	67.1	75.0	65.4
L. S. D. 5%	7.8	6.4	11.7	4.5
L. S. D. 1%	10.5	8.5	16.6	06.
C. V. %	10.2	9.8	7.7	9.9
No of Sites	9	12	3	24

Treatment 2 is the Fertilizer Recommendation of the Department of Agriculture for the area. V-2 Mixture contain 3.0. lb. N, 20.44 lb. P_2O_5 and 14.4 lb. K_2O per cwt. and TDM-1 contains 38.64 N and 16.8 lb. K_2O per cwt.

Fertilizer experiment with shallot (red onion) at Kundasale

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SUMMARY

THE results of two fertilizer experiments with shallot are discussed. The first which was a 3^3N.P.K. factorial experiment revealed that there was a significant response of over 5 cwt. onion per acre to the application of 30 lb. nitrogen per acre. There were no beneficial effects of phosphorus or potassium fertilizer on yield. None of the interactions was significant.

The second experiment showed a highly significant response to nitrogen and as in the first experiment there were no responses to phosphorus and pottassium.

The lack of response to phosphorus and potassium is probably due to the high availability of these nutrients in the soil.

INTRODUCTION

Shallot or red onion (*Allium ascalonium* L.) as it is popularly called, is an important condiment in the preparation of almost all meat, fish and vegetable dishes in Sri Lanka. Shallots are also frequently consumed fresh in salads. The fresh, young bulbs and green leaves of shallots (Spring Onion) are also cooked as a curry and the mature bulbs are used for pickles.

In the year 1970 a sum of Rs. 26 million was spent on the importation of onions to the country (6). The importation of onions has now been banned due to the worsening foreign exchange situation, and encouragement is given to grow this commodity in the country. It is best grown in the dry-zone under irrigated conditions. Those grown in the wet-zone were mostly consumed fresh as Spring Onion until recently, because this crop cannot be grown satisfactorily if rainfall is heavy during the growth period. However, when demand for onion increased due to the restriction of imports attempts were made to produce red onion in the wet-zone wherever possible. The extent

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under shallot or red onion has been increasing steadily during the last few years. This is clear from the fact that the acreage has increased from 6,070 to 13,068 in 1968-69 (5).

MATERIALS AND METHODS

The results of two fertilizer experiments conducted at the School Farm Kundasale to determine the optimum combination of nitrogen, phosphorus and potassium for shallot are reported here. These results were presented and discussed at the Proceedings of the Ceylon Association for the Advancement of Science earlier (7).

Experiment 1. The first investigation, a 3^3 factorial experiment with 3 levels each of nitrogen, phosphorus and potassium, was conducted between February and April, 1971 on a soil whose characteristics were as follows :—

Texture	Sandy clay loam
pH (1 : 10—soil : water)	6.2
Organic matter	3.27 per cent.
Total nitrogen	0.15 per cent.
Available phosphorus (Olsen's)	170.8 lbs. $P_2 0_5$ per acre
Exchangeable potassium	0.76 m.e. per 100 gm. soil

The levels of nutrient elements tested were as follows :—

Nitrogen	:	0, 30, 60 lb. N per acre,
Phosphorus	:	0, 40, 80 lb. $P_2 0_5$ per acre,
Potassium	:	0, 20, 40 lb. $K_2 0$ per acre.

Nitrogen, phosphorus and potassium were applied as ammonium sulphate, concentrated superphosphate and muriate of potash (50 per cent $K_2 0$ grade) respectively. The 27 treatments were distributed in 3 blocks of 9 plots each with some of the second order interactions confounded in the blocks. There were 3 replicates. Each experimental plot consisted of two raised beds of size 10 ft. by 3 ft. with a 1 foot space between the beds. The total area occupied by a plot was 10 ft. by 7 ft. Seed onion was planted in rows at a spacing of 3 ins. in the row and 4 ins. between rows.

A basal dressing of phosphorus, potassium and two-thirds of the total quantity of nitrogen was applied to the plots before planting. The balance one-third of the nitrogen was applied three weeks after planting.

The bulbs were harvested when mature and dried in the shade for two weeks, cleaned free of adhering soil and plant tops before final yeilds were recorded.

Experiment II. The second investigation was conducted between July and September 1971 to test the effects of seven different combinations of nitrogen, phosphorus and potassium fertilizers and a no fertilizer control treatment on the growth and yield of shallot. The treatments were as follows :—

No.	Fertilizer Treatments *N* (lbs. per acre)	*P_2O*	*K_2O*
1	0	0	0
2	30	40	20
3	30	60	20
4	30	40	0
5	45	40	20
6	45	60	20
7	60	40	20
8	60	60	20

The treatments were replicated four times. Nitrogen, phosphorus and potassium were applied as ammonium sulphate, concentrated superphosphate and muriate of potash (50 per cent. K_2O grade) respectively.

Seed onion was planted at a spacing of 4 ins. within the row and 4 ins. between rows on raised beds of 10 ft. by 3 ft. There were two beds to an experimental plot and the area of each plot was 10 ft. by 7 ft. which allowed a space of 1 foot between the beds in each plot.

Fertilizer phosphorus, potassium and two-thirds of the total quantity of nitrogen were applied as a basal dressing. The balance quantity of nitrogen was applied as a top-dressing three weeks after planting.

The soil in which this experiments was conducted had the following characteristics :—

Texture	Sandy clay loam
pH (1 : 10—soil : water)	6.7
Organic matter	2.67 per cent.
Total nitrogen	0.19 per cent.
Available phosphorus (Olsen's)	694.8 lb. P_2O_5 per acre
Exchangeable potassium	1.35 m.e. K_2O per 100 gm. soil.

After harvesting, the bulbs were dried in the shade for two weeks and cleaned of plant residues and adhering soil particles before final yields were recorded.

RESULTS AND DISCUSSION

The mean yield data of the first experiment are presented in Table 1. None of the 3 factor interactions was significant.

There was a significant response of over 5 cwt. onion per acre to the application of 30 lbs. nitrogen per acre. At the higher level of nitrogen fertilization, at 60 lb. N per acre, there was a slight but non-sginificant depression in yield of bulbs compared to the 30 lb. N per acre level. Therefore, from the results of this experiment it appears that 30 lb. N per acre is about optimum for onion in this soil.

TABLE I

Mean yields of Onions due to Nitrogen, Phosphorus and Potassium Fertilization at Kundasale, February—April, 1971

(Dry weight in cwt. per acre)

Levels of Fertilizer	*N*	P_2O_5	K_2O
1	36.57	40.17	37.71
2	42.10	43.50	41.39
3	40.87	35.96	40.52
L.S.D. (0.01)	5.44	5.44	N.S.
L.S.D. (0.05)	4.03	4.03	N.S.
C.V.% (18.65)			

Higher levels of nitrogen encourage the crop to increase leaf tissue at the expense of bulb formation. The results of fertilizer experiments reported from earlier investigations in the dry zone confirm these findings. The results of an experiment reported in 1950 (1) show that while 20 lb N per acre gave 26 percent increase in yield over the control treatment, there was no further yield increase at the 40 lb N per acre level. Similarly, an experiment conducted during Maha 1955-56 at Tinnavely, Jaffna, showed that nitrogen significantly depressed yeild of bulbs (2). In an investigation reported in 1957 (3) it was found that N at the rate of 40 lb per acre gave a yield increase of 18.6 percent over the control and that higher levels of nitrogen made the crop run into leaf and depressed yields. In 1960 (4) it was found that 20 lb N per acre was the optimum in an investigation conducted at Vavuniya. These results confirmed the earlier findings that excess nitrogen depresses yield of shallot.

The data in Table 1 also indicate that there was no beneficial effect on yield due to phosphorus fertilization at the rate of 40 lb. P_2O_5 per acre. On the other hand increasing the rate of fertilization to 80 lb. P_2O_5 per acre significantly depressed yield. One reason for this may be the fact that the soil in which this investigation was carried out was relatively rich in available phosphorus, as shown by chemical analysis. In this investigation it was found that potassium fertilization had no effect on yield, probably because the content of exchangeable potassium in the soil in which this investigation was conducted was adequate for the crop.

In the second experiment, the yield data of which is presented in Table II there was a highly significant response to nitrogen fertilization. On the other hand, like in the first experiment, there were no responses to phosphorus and potassium fertilization. Treatment No. 4 which received 30 lb. N and 40 lb. P_2O_5 per acre (and no potassium) out-yielded the control treatment by 37.86 cwt per. acre which difference was significant at the 1 per cent level of probability. Although the yeild in treatment No. 7 which received additional amounts of nitrogen and potassium was higher than that in teatment No. 4, the difference was not significant. The yield in treatment No. 8 which received more phosphorus than treatment No. 7 was the highest, but here too the differences in yields compared to those in treatments No. 4 and No. 7 were not significant. Therefore it could be concluded that treatment No. 4 which was the most economical as far as cost of fertilizer was concerned is the best treatment for this soil. Apparently the fertility status of this soil does not require a fertilizer mixture containing more than 30 lb. N and 40 lb. P_2O_5 per acre.

TABLE II

Effect of Fertilizers on yields of Onion at Kundasale, July—September, 1971

(Dry weight in cwt. per acre)

No.	Fertilizer Treatments N	P_2O_5	K_2O	Yield
1	0	0	0	58.76
2	30	40	20	91.62
3	30	60	20	79.39
4	30	40	0	96.62
5	45	40	20	77.16
6	45	60	20	84.50
7	60	40	20	105.55
8	60	60	20	112.88
L.S.D. (0.01)	—	—	—	35.63
L.S.D. (0.05)	—	—	—	26.16
C.V.%	—	—	—	20.10

The data of mean yield of onions due to N, P and K fertilization in the second experiment shown in Table III indicate a significant response up to 60 lb. N per acre. As in the first experiment there was no response to either phosphorus or potassium.

TABLE III

Mean yield of onions due to nitrogen, phosphorus and potassium fertilization at Kundasale, July-September 1971

(Dry weight in Cwt. per acre)

Levels of Fertilization	*N*	P_2O_5	K_2O
1	89.21 ..	91.44 ..	96.62
2	80.86 ..	92.28 ..	91.62
3	109.21 ..	— ..	—

Effect of N

L.S.D. to compare means of—
30 lb versus 45 lb N per acre
and 30 lb versus 60 lb N per acre
(0.01) = 25.71
(0.05) = 18.92

L.S.D. to compare means of—

45 lb versus 60 lb N per acre
(0.01) = 28.10
(0.05) = 20.71

A critical examination of the data of the first experiment shows that yields obtained were much lower than those attainable in the dry zone under irrigated conditions where 100 to 120 cwt. per acre are possible. The reasons for this may be—

(i) delay in harvesting the experiment due to civil disturbances and the State of Emergency that prevailed in the country in April 1971. Due to this delay the crop which was ready for harvest was affected by rain, and the bulbs started to grow again in the experimental plots.

(ii) The entire crop was subject to tip-drying in the initial stages of the experiment.

(iii) The sandy clay loam texture of the soil may not have been conducive to bulb formation and development.

The first reason appears to be most plausible for the relatively low yields obtained. When the bulbs germinated on exposure to rain it is likely that there was a loss in weight of the mature bulbs consequent to physiological processes associated with germination. The ideal type of soil for onion are mucks, loams and silt loams which have high water holding capacities. In this respect the sandy clay loam on which this experiment was conducted was not the best for growing onion.

In the second experiment the yields obtained were relatively higher than those obtained in the first experiment. One reason is the better climatic conditions that prevailed at Kundasale during this experiment.

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METEOROLOGICAL REPORT

SUMMARY—OCTOBER, 1973 TO MAY, 1975

OCTOBER, 1973.—A low pressure area in the Bay of Bengal deepened into a depression on the 7th and intensifying further crossed the east Indian coast on the 12th. Under its influence winds over the Island were westerly and light scattered showers were experienced in the southwest quarter. Thereafter winds became light and variable and from the 14th to the end of the month, fairly widespread thunderstorms were experienced daily, and the I.T.C. (Inter Tropical Confluence) was lying across the Island. On the 19th, five stations recorded over 125 mm.

The larger monthly totals (totals over 500 mm.) were experienced over a large area in the Kalutara District and in parts of Kegalla, Ratnapura, Galle, Matara and Badulla Districts. Elsewhere in the southwest quarter and in parts of Badulla, Puttalam, Trincomalee and Jaffna Districts rainfall ranged from 300 to 500 mm. Over the rest of the Island rainfall was below 300 mm. The highest monthly totals were 878 mm. at Kalutara, 675 mm. at Pelawatta and 666 mm. at Koslanda (Lemostota Estate).

Rainfall was below normal in the Kandy, Matale and Kegalla Districts, in the N.C.P. and in parts of Colombo, Kurunegala, Mannar and Vavuniya Districts. Elsewhere rainfall was above normal. The highest excesses were 486 mm. at Kalutara, 304 mm. at Haputale (Blackwood Estate) and 297 mm. at Koslanda (Lemastota Estate). The biggest deficits were 445 mm. at Yatiyantota (Weweltalawa Division, Halgolla Group), 319 mm. at Ginigathena (Blackwater and Kenilworth Estates), and 315 mm. at Padupola.

There were thirteen daily falls of over 125 mm. the highest being 163 mm. at Kadawata (Ranmutugala Estate) on the 19th. No station reported nil rainfall.

Temperatures were above normal The highest temperature recorded was 36·1°C. at Batticaloa on the 10th. The lowest at a coastal station was 22·0°C at Katunayake on the 17th and again at Ratmalana on the 29th, and for the whole island 10·2°C at Nuwara Eliya on the 15th. Day humidity ranged from 65 to 85% and night humidity from 80 to 95%. Cloud amounts were above normal, while mean air pressures were below normal. Wind mileages were below normal and the direction variable in the East and South-westerly elsewhere.

November, 1973.—Thundershowers were experienced over the Island during the first four days of the month, and there was widespread rain on the 5th and 6th due to a cyclonic storm in the Bay of Bengal. The storm moved away on a northerly track and there was practically no rain from the 7th to the 14th due to dry northerly upper winds from the Indian sub-continent. The I. T. C. (Inter Tropical Confluence) was over the Island on the 15th and there were thundershowers from the 15th to the 19th. With its movement southwards on the 19th there was practically no rain from the 20th to the 23rd. Rainfall was fairly widespread from the 24th to the end of the month. The first signs of the North-east Monsoon were apparent on the 27th when steady north-east winds were established up to 6 kilometres.

The largei monthly tctals (totals over 500 mm.) were experienced over a few isolated areas in the Colombo, Kalutara, Kegalla and Kandy Districts. Elsewhere in the southwest quarter (excluding Southern Province) and in parts of Matale, Nuwara Eliya, Badulla and Monaragala Districts rainfall ranged from 300 to 500 mm. Over the rest of the Island rainfall was below 300 mm. The highest monthly totals were 654 mm. at Oruwela, 639 mm. at Talangama (St. Thomas' Estate), and 624 mm. at Dolosbage (Kellie Group).

Rainfall was above normal in the western coastal areas, a few isolated areas in the central hill country and in parts of Batticaloa and Mannar Districts. Elsewhere rainfall was below normal. The highest excesses were 212 mm. at Negombo (Western Seaton Farm), 200 mm. at Uduwahinna (Iddumekelle Estate) and 189 mm. at Dolosbage (Kellie Group). The biggest deficits were 349 mm. at Vaddukkodai (Jaffna College), 300 mm. at Trincomalee, and 286 mm. at Andankulam.

There were twenty-nine daily falls of over 125 mm., the highest being 281 mm. at Talangama (St. Thomas' Estate) on the 4th. No station reported nil rainfall.

Day temperatures were a little above normal and night temperatures about normal. The highest temperature recorded was 34·4°C at Ratnapura on the 12th and again on the 14th. The lowest at a coastal station 19·3°C at Katunayake on the 24th and for the whole Island 6·2°C at Nuwara Eliya on the 24th. Day humidity ranged from 70 to 80% and night humidity ranged from 80 to 95%. Cloud amounts and mean air pressures were a little below normal. Wind mileages were below normal and the direction northeasterly in the North and variable elsewhere.

December, 1973.—There was fairly widespread rain during the first six days of the month. Dry northerly winds gave a spell of fair weather from the 7th to the 11th. A low developed in South Andaman Sea on the 11th which concentrated into a depression and crossed North Sri Lanka on the 14th. Another low in South East Bay of Bengal deepened into a depression and crossed the Island from Batticaloa to Puttalam on the 27th. There was moderate to heavy widespread rain from the 12th to the 21st and again from the 23rd to the end of the month. Paranthan recorded 269 mm. on the 12th and 132 mm. on the 13th.

The larger monthly totals (total over 500 mm.) were experienced over parts of Eastern, North-Central, Central and Uva Provinces and in parts of Jaffna, Vavuniya and Kegalla Districts. Elsewhere rainfall ranged from 100 to 500 mm. The highest monthly totals were 1,036 mm. at Hingurakdamana, 965 mm. at Gammaduwa (Mousakande Estate), and 935 mm. at Gammaduwa (Dooro-omadella Estate, Factory).

Rainfall was below normal over parts of Colombo, Kalutara, Ratnapura and Galle Districts. Elsewhere rainfall was above normal. The highest excesses were 568 mm. at Pinnawala (Detanagalla Estate), 516 mm. at Nawalapitiya (Theydon Bois Group), and 489 mm. at Paranthan. The biggest deficits were 128 mm. at Neboda (Gikiyanakande), 89 mm. at Ingiriya (Halwatura Estate), and 86 mm. at Baddegama. There were forty-nine daily falls over 125 mm., the highest being 269 mm. at Paranthan on the 12th. No station reported nil rainfall.

Day temperatures were below normal while night temperatures were mostly above normal. The highest temperatures recorded was 53·4°C at Ratnapura on the 11th. The lowest at a coastal station was 19·4°C at Katunayake on the 8th and also at Puttalam on the 11th, and for the whole Island 5·8°C at Nuwara-Eliya on the 12th.

Day humidity ranged from 70 to 85% and night humidity from 85 to 96%. Cloud amounts were well above normal and mean air pressure below normal. Wind mileages were above normal in the North and below normal elsewhere and the direction mainly north-northeasterly.

January, 1974.—Except for a few isolated showers on the 1st and 2nd and from the 7th to the 10th, dry weather and drought conditions prevailed over most of the Island. There were several days when no rain was reported from any station.

The larger monthly totals (totals over 50 mm.) were experienced at six solated stations in the Jaffna, Trincomalee and Badulla Districts. Elsewhere rainfall was below 50 mm. The highest monthly totals were 69 mm. at Mada-wachchi, 67 mm. at Kayts and 62 mm. at Moolai.

Except at Kayts (an excess of 2 mm.) rainfall was below normal. The biggest deficits were 626 mm. at Madugoda (Iddumekelle Estate), 559 mm. at Urugala (Kobonella Estate) and 514 mm. at Mathurata (Kurundu Oya Estate. Out of a total of 288 rainfall reports received, 172 reported nil rainfall.

Day temperatures were about normal and night temperatures were well below normal. The highest temperatures recorded was 35.0°C at Ratnapura on the 27th. The lowest at a coastal station was 17·6°C at Puttalam on the 15th and for the whole island 1·3°C at Nuwara Eliya also on the 15th. Nuwara Eliya reported ground frost on 13th, 14th, 15th, 16th, 17th. Day humidity ranged from 55 to 70% and night humidity from 80 to 95%. Wind mileages were below normal and the direction mainly north-northeasterly.

February, 1974.—Except for a few isolated light falls on 3rd, 4th and 5th, fair weather prevailed till the 10th. Light to moderate thundershowers were experienced on the 12th and 13th, while there were a few light showers on the 11th and 14th. Dry weather conditions prevailed from the 15th to the 22nd. Intermonsoon conditions prevailed thereafter and from the 25th onwards moderate to fairly heavy rainfall was widespread.

The larger monthly totals (totals over 500 mm.) were experienced at six isolated stations in the central hill country. Elsewhere in the hill country and in most parts of the southwest quarter rainfall ranged from 50 to 300 mm. Over the rest of the island rainfall was below 50 mm. The highest monthly totals were 385 mm. at Dolosbage (Kellie Estate), 554 mm. at Ekiriyankumbura and 338 mm. at Halgranoya (Maha Uva Estate).

Rainfall was above normal over most parts of the hill country, parts of Western and Northwestern provinces and in a few isolated places in the Northern and North-central Provinces. Elsewhere rainfall was below normal. The highest excesses were 272 mm. at Dolosbage, 198 mm. at Polgahawela, and 183 mm. at Aranayaka. The biggest deficits were 174 mm. at Manalputty Aar, 163 mm. at Gammaduwa (Dooroomadella Estate, Factory), and 157 mm. at Thumpankani Tank.

There were thirteen daily falls over 125 mm., the highest being 180 mm. at Namunukula on the 27th. Two stations reported nil rainfall.

Day temperatures were above normal and night temperatures were below normal. The highest temperature recorded was 37·2°C at Katunayake on the 20th. The lowest at a coastal station was 17·1°C at Kankesanturai on the 7th, and for the whole island 3·9°C at Nuwara Eliya on the 10th. Day humidity ranged from 55 to 75% and night humidity from 80 to 95%. Cloud amounts were above normal and mean air pressure below normal. Wind mileages were about normal and the direction mainly north-northeasterly.

March, 1974.—Fairly widespread thundershowers were experienced during the first two days of the month. From the 3rd to the 23rd, evening thundershowers were confined mainly to parts of the southwest quarter. From the 24th thundershowers were more widely experienced.

The larger monthly totals (totals over 300 mm.) were experienced at a few stations in Kalutara, Galle, Colombo and Kegalla Districts. Elsewhere over most of the southwest quarter and a few isolated areas in the Puttalam and Badulla Districts rainfall ranged from 100 to 300 mm. Over the rest of the

Island rainfall was below 100 mm. The highest monthly totals were 451 mm. at Pelawatte, 429 mm. at Avissawella (Hospital), and 408 mm. at Yatiyantota (Weweltalawa Division).

Rainfall was above normal over a few isolated areas in the Galle, Kalutara, Kegalla, Kandy and Nuwara Eliya Districts. Elsewhere rainfall was below normal. The highest excesses were 160 mm. at Avissawella (Hospital), 148 mm. at Baddegama, and 143 mm. at Nanuoya. The biggest deficits were 221 mm. at Ohiya, 193 mm. at Padupola and 186 mm. at Haputale.

There were two daily falls over 125 mm., the higher being 134 mm. at Polgahahena. Twenty-one stations reported nil rainfall.

Day temperatures were above normal and night temperatures about normal. The highest temperature recorded was 36·5°C at Ratnapura on the 25th. The lowest at a coastal station was 19·7°C at Kankesanturai on the 10th and for the whole Island 4·8°C at Nuwara Eliya on the 6th. Day humidity ranged from 60 to 75% and night humidity from 80—95%. Cloud amounts were well below normal and mean air pressure about normal. Wind mileages were below normal and the direction northeasterly in the North and East and variable elsewhere.

April, 1974.—Except on the last day of the month there wasdaily thunder-activity, and on several days it was particularlyintense. The month started with moderate thundershowers inland and in the southwest. Thundershowers were widespread on the 4th, 5th and 9th and only isolated from the 18th to the 20th. From the 21st to the 27th moderate to heavy rain was experienced in the Southwest. Weather improved considerably from the 28 th and there was practically no rain on the 30th.

The larger monthly totals (totals over 400 mm.) were experienced over most parts of the southwest low country and the western slopes of the central hills. Elsewhere in the hill country and parts of Hambantota, Badulla, Puttalam, Kurunegala and Anuradhapura Districts rain fall ranged from 200 to 400 mm. Over the rest of the island rainfall was below 200 mm. The highest monthly totals were 1180 mm. at Nawalapitiya (Theydon Bois Group), 954 mm. at Pelawatte, and 947 mm. at Matugama (Sirikandura Estate).

Rainfall was below normal over the Southeast quarter and parts of Ratnapura, Matale and Anuradhapura Districts and most of Northern Province. Elsewhere rainfall was above normal. The highest excesses were 901 mm. at Nawalapitiya, 599 mm. at Kalutara, and 557 mm. at Matugama. The biggest deficits were 174 mm. at Demodera (Gourakelle Estate), 143 mm. at Sudupanawela, and 134 mm. at Deniyaya (Panilkanda Estate).

There were forty-three daily falls of over 125 mm, the highest being 247 mm. at Paiyagala (Eladuwa Estate) on the 26th. No station reported nil rainfall.

Temperatures were a little below normal. The highest temperature recorded was 37·3°C at Kankesanturai on the 18th. The lowest at a coastal station was 20·1°C at Ratmalana again on the 18th and for the whole Island 7·8°C at Nuwara Eliya on the 2nd. Day humidity ranged from 65 to 80% and night humidity ranged from 80 to95%.Cloud amounts were well above normal and mean air pressures well below normal. Wind mileages were about normal and the direction variable.

May, 1974.—Thunderstorms were confined to the southwest quarter up to the 9th and were fairly widespread from the 10th to the 15th. From the 16th to the 21st scattered thunderstorms were experieneed only in the south-west quarter. Under the influence of a low in South Bay of Bengal westerlies were established over the Island up to 20,000 feet onthe 22nd, indicating the advance of the south-west monsoon. From the 22nd a steep southwesterly pressure gradient persisted till the end of the month. There were twenty two falls over 125 mm. on the 9th.

The larger monthly totals (totals over 600mm) were experienced over parts of Kandy, Kegalla, Ratnapura, Kalutara and Colombo Districts. Elsewhere in the southwest quarter reinfall ranged from 200 to 600 mm. Over the west of the Island rainfall was below 200 mm. The highest monthly totals were 1,627 mm. at Nawalapitiya (Theydon Bois Group), 1,125 mm. at Gilimale (Gilimalay Estate) and 1,109 mm. at Kitulgala (Ingoya Estate).

Rainfall was above normal over parts of Kandy, Matale, Kegalle, Ratnapura, Colombo, and Galle Districts and parts of Uva and Eastern Provinces. Elsewhere rainfall was below normal. The highest excesses were 966 mm.at Nawalapitiya, 419 mm. at Kitulgala and 307 mm at Colombo (Ellie House). The biggest deficits were 159 mm at Balangoda, 158 mm.at Rakwana and 156 mm. at Deniyaya.

There were forty two daily falls of over 125 mm. the highest being 310 mm. at Keegahatenne (Kumbaduwa Estate). Only one station reported nil rainfall.

Temperatures were about normal. The highest temperature recorded was 35.6°C at Batticaloa on the 18th and again on the 31st, also at Trincomalee on the 1st. The lowest at a coastal station was 20.4°C at Galle on the 10th and for the whole Island 9.6ºC at Nuwara Eliya on the 3rd. Day humidity ranged from 70 to 85% and night humidity ranged from 60 to 95 per cent . Cloud amounts were well above normal and mean air pressures above normal. Wind mileages were about normal and the direction south-westerly.

June, 1974.—Fairly active south-west monsoon conditions prevailed during the month. The pressure gradient was moderate to steep south-westerly and upper winds were westerly up to a height of 4½ km. On the 2nd, 3rd, 4th, 7th, and 9th thunderstorms developed over the hills and drifted to parts of the Eastern Province. The monsoon advanced rapidly over India during the latter half of the month.

The larger monthly totals (totals over 400 mm.) were experienced over the windward slopes of the central hills and in the Kalutara District. Elsewhere in south-west quarter and over a small area in the Badulla District rainfall ranged from 100 to 400 mm. Over the rest of the Island rainfall was below 100 mm. The highest monthly totals were 1,108 mm. at Ginigathena (Arslena Estate), 891 mm. at Watawala, and 861 mm. at Norton Bridge.

Rainfall was above normal over most parts of the south-west quarter and over part of Hambantota, Badulla and Jaffna Districts. Elsewhere rainfall was below normal. The highest excesses were 243 mm at Kalutara (P. W. D.) 187 mm. at Elpitiya (St. Leonard's Estate) and 129 mm. at Badulla (Wewesse Group). The biggest deficits were 160 mm. at Ramboda (Labookelle Estate), 144 mm. at Pundulu Oya (Dunsinsne Estate) and 138 mm. at Dickoya (South Wanarajah Estate).

There were ten daily falls of over 125 mm. the highest being 169 mm. at Govinna (Frocestor Group) on the 21st. Thirtythree stations reported nil rainfall.

Temperatures were about normal. The heighest temperature recordeed was 36·7°C at Batticaloa on the 17th. The lowest at a coastal station was 21·9°Cat Ratmalana on the 30th and for the whole Island 11·4°C at Nuwara-Eliya on the 25th. Day humidity ranged from 60 to 70 per cent on the eastern half of the Island and 70 to 80 per cent elsewhere. Night humitity ranged from 80 to 90 per cent. Could amounts were about normal and mean air pressures were a little below normal. Wind mileages were above normal in Jaffna and Hamabantota and below normal elsewhere and the direction mainly southwesterly.

July, 1974.—A moderate to steep south-westerly pressure gradient and fresh westerly upper winds persisted throughout the month. During the first eighteen days rainfall was light and scattered in the southwest quarter. Rainfall increased on the 19th and 20th. Due to a cyclonic circulation from the 21st over east Sri Lanka exceptionally heavy falls continued inland during the next few days and ended with the very heavy falls on the 26th and 27th. There were light to moderate showers in the southwest quarter during the last four days of the month. On the 26th and 27th alone, there were thirty four daily falls of over 125 mm. Watawala recorded a total of 730 mm. for these two days.

The larger monthly totals (totals over 800 mm.) were confined to a small area in the Kegalla, Kandy and Nuwara Eliya Districts. Elsewhere in the south-west inland area rainfall ranged from 400—800 mm. In the southwest coastal areas and over parts of Badulla District rainfall ranged from 100 to

400 mm. Over the rest of the Island, rainfall was below 100 mm. The highest monthly totals were 1,551 mm. at Watawala, 1,499 mm. at Ginigathena (Arslena Estate) and 1,409 mm. at Maskeliya.

Rain was well above normal over the western slopes of the central hills. Elsewhere in the south-west quarter and in a few isolated areas rainfall was above normal. Rainfall was a little below normal over the rest of the Island. The highest excesses were 848 mm. at Kitulgala (Ingoya Estate), 838 mm. at Watawala and 777 mm at Maskeliya (Luccombe Estate). The biggest deficits were 57 mm. at Rakwana (Depedena Group), 46 mm. at Battulu Oya and 42 mm. at Madulsima (Mahadeva Estate).

There were fifty seven daily falls of over 125 mm, the highest being 368 a Watawala on the 26th. Fifteen stations reported nil rainfall.

Temperatures were about normal. The highest temperature recorded was 36·4°C at Trincomalee on the 17th. The lowest at a coastal station was 21·6°C at Galle on the 2nd, and for the whole Island 10·4°C at Nuwara Eliya on the 17th. Day humidity ranged from 60 to 70 per cent on the eastern half of the Island and 70 to 80 per cent elsewhere. Night humidity ranged from 80 to 90 per cent. Cloud amounts were above normal and mean air pressures below normal. Wind mileages were above normal in Jaffna and Hambantota and below normal elsewhere and the direction mainly south-westerly.

August, 1974.—During the first six days of August normal monsoon weather prevailed with a few light falls in the south-west quarter of the Island. There was practically no rain on the 7th and 8th and only scattered showers on the 9th and 10th. Due to a trough of low pressure off the south Indian coast fairly active monsoon conditions were experienced over the south-west quarter from the 11th to the 21st. There were only isolated light falls from the 22nd to the 26th and during the last five days of the month evening thunderstorms developed inland and in the East.

The larger monthly totals (totals over 300 mm.) were experienced over parts of Ratnapura, Kegalla, Kandy and Nuwara Eliya Districts. Elsewhere in the southwest quarter, except parts of Colombo District, rainfall ranged from 100-300 mm. Over the rest of the Island, rainfall was below 100 mm. The heighest monthly totals were 720 mm. at Ginigathena (Arslena Estate), 634 mm, at Norton Bridge and 622 mm. at Kotmale (Ocnoogaloya Estate).

Rainfall was above normal in parts of Kandy, Nuwara Eliya, Matale, Hambantota and Vavuniya Districts and a few isolated areas in the Puttalam and Batticaloa Districts. Elsewhere rainfall was below normal. The heighest excesses were 274 mm. at Nuwara Eliya (Westward Ho Estate), 243 mm. at Ramboda (Labookelle Estate) and 197 mm. at Kotmale. The biggest deficits were 170 mm. at Yatiyantota (Weweltalawa Division), 164 mm. at Rakwana (Depedene Group) and 153 mm. at Ingiriya (Rayigam).

There were seven daily falls of over 125 mm, the highest being 170 mm. at Kotmale on the 18th. Twenty six stations reported nil rainfall.

Temperatures were about normal. The highest temperature recorded was 37·7°C at Batticaloa on the 8th. The lowest at a coastal station was 21·4°C at Galle and Ratmalana on the 16th, and for the whole Island 10.2°C at Nuwara-Eliya on the 27th. Day humidity ranged from 60 to 70 per cent on the eastern half of the Island and 70 to 80 per cent elsewhere. Night humidity ranged from 80 to 95 per cent. Cloud amounts were about normal and mean air pressures below normal. Wind mileages were above normal in Jaffna and Hambantota and below normal elsewhere and the direction mainly south-westerly.

September, 1974.—South-west monsoon conditions prevailed over Sri Lanka throughout the month. There was isolated thund eractivity inland and in parts of Eastern Province during the first four days. From the 5th to the 11th, and again from 17th to the 20th there were scattered light to moderate monsoon showens in the south-west, while from the 12th to the 16th there was widespread rain, with thunder activity over most parts of Sri Lanka. A low in the Bay of Bengal deepened into a depression by the 21st and active monsoon conditions prevailed over the Island. There was fairly widespread rain with thunder activity from the 21st to the 25th. From the 26th to the 29th scattered light showers were experienced in the south-west only. On the 30th, a trough of low pressure gave widespread rain, with some very heavy falls in the south-west and thundershowers inland and in the east. Ten stations in the south-west recorded over 125 mm. on this day (30th.)

The larger monthly totals of rainfall (totals over 600 mm.) were experienced over parts of Kandy, Kegalla, Ratnapura, Kalutara and Galle Districts. Elsewhere in the southwest quarter rainfall ranged from 200-600 mm. Over the rest of the Island rainfall was below 200 mm. The highest monthly totals were 1,108 mm. at Ginigathena (Kenilworth Estate), 1,073 mm. at Yatiyantota (Weweltalawa Division) and 1,006 mm. at Kitulgala (Ingoya Estate).

Rainfall was below normal over parts of Jaffna, Mannar, Anuradhapura Puttalam and Badulla Districts. Elsewhere rainfall was above normal and appreciably so in parts of Kandy, Kegalla and Ratnapura Districts. The highest excesses were 587 mm. at Yatiyantota, 538 mm. at Ginigathena and 529 mm at Kitulgala. The biggest deficits were 36 mm at Galinda (Ledgerwatte Group), 34 mm at Mullaitivu and also at Nachchikkali Saltern.

There were fourteen daily falls of over 125 mm, the highest being, 218 mm. at Kitulgala on the 30th. Two stations in the Mannar District recorded nil rainfall.

Day temperatures were well below normal and night temperatures about normal. The highest temperature recorded was 36.0°C at Batticaloa on the 8th. The lowest at a coastal station was 21·6°C at Ratmalana on the 6th, and

5—A 17294 (10/75)

for the whole Island 9·6°C at Nuwara Eliya on the 2nd. Day humidity ranged from 65 to 70 per cent on the eastern half of the Island and 70 to 85 percent elsewhere. Night humidity ranged from 85 to 95 per cent. Cloud amounts were well above normal and mean air pressures below normal. Wind mileages were a little above normal in Jaffna and Hambartota and below normal elsewhere, and the direction mainly southwesterly.

October, 1974.—A special feature of the weather was that rainfall over the Island was appreciably below normal. Several stations reported the lowest on record.

Windspread rain that was experienced on 30th September continued during the first two days of October, with some heavy falls and moderate thunderactivity. Five stations in the Kegalla and Kurunegala Districts recorded over 125 mm. on the 1st. A low pressure area in Central Bay of Bengal strengthened the westerly stream and from the third to the tenth there were light showers in the south-west and occasionally elsewhere. During the next four days there were only a few isolated showers in the south-west with a little thunder in the North and East. From the fifteenth the windstream aloft was dry and northerly. This gave a spell of dry weather over Sri Lanka till the twenty-third. Thereafter the south-westerly pressure gradient weakened and widespread intermonsoon thundershowers were experienced on the 25th and 26th. It was less extensive during the next three days. There were a few isolated showers in the south-west on the 30th. Weather was fair on the 31st.

The larger monthly totals of rainfall (totals over 200 mm.) were experienced over parts of Kalutara, Kegalla, Ratnapura, Kandy, Nuwara Eliya, Matale and Badulla Districts. Over the rest of the Island rainfall was below 200 mm. The highest monthly totals were 542 mm. at Ginigathena (Arslena Estate) 490mm. at Yatiyantota (Weweltalawa Division) and 451 mm. at Ginigathena (Kenilworth Estate).

Rainfall was below normal over parts of Badulla and Nuwara Eliya Districts and appreciably below normal elsewhere. The biggest deficits were 438 mm. at Katunayake, 434 mm. at Matugama (Sirikandura Estate) and 431 mm. at Eheliyagoda (Sunderland Estate). The only excess was 39 mm. at Dimbulla. Among the main Meteorological stations Galle, Puttalam and Trincomalee recorded 45 mm, 3 mm, and 26 mm. respectively, which are the lowest since observations commenced in 1869. Anuradhapura recorded 65 mm. and Mannar 22 mm, which are the 2nd lowest on record. On the whole, Sri Lanka received less than 50 per cent of the normal rainfall for the month.

There were six daily falls of over 125 mm, the highest being 185 mm at Ambepussa on the 1st. Six stations in the Mannar, Anuradhapura, Puttalam and Jaffna Districts received nil rainfall.

Temperatures were mostly above normal. The highest temperature recorded was 35·2°C at Maha Illuppallama on the 25th. The lowest at a coastal station was 19·4°C at Puttalam on the 31st, and for the whole Island 8·3°C at Nuwara Eliya on the 19th and 23rd. Day humidity ranged from 60-70 per cent on the eastern half of the Island and 70-80 per cent elsewhere. Night humidity ranged from 80-95 per cent. Cloud amounts were about normal and mean air pressures well below normal. Wind mileages were mostly a little above normal and the direction variable in the East and westerly elsewhere.

November, 1974.—A special feature of the weather was that rainfall over the Island for November was appreciably below normal.

There was no rain during the first three days of the month. Rain with thunder was experienced inland on the 4th, 5th and 6th and was fairly widespread on the 7th and 8th. From the 9th to the 13th there were scattered thundershowers over the southern half of the Island and on the 14th and 15th thundershowers were fairly widespread. Weather was mainly fair from the 16th to the 21st. A depression formed in the Bay on the 22nd and there was widespread rain from the 22nd to the 24th, and during the last six days there were isolated evening thundershowers.

The larger monthly totals of rainfall (totals over 200 mm.) were experienced over parts of Southern Province, and parts of Badulla, Ratnapura, Nuwara-Eliya and Kandy Districts, and at a few isolated stations. Over the rest of the Island rainfall was below 200 mm. The highest monthly totals were 484 mm. at Haputale (Balckwood Estate), 395 mm. at Okkampitiya and 329 mm. at Sudupanawaia.

Rainfall was below normal over parts of Badulla, Nuwara Eliya, Kandy and Hambantota Districts and appreciably below normal elsewhere. The biggest deficits were 390 mm. at Dehiowita (Digalla Estate) 379 mm. at Eheliyagoda (Sunderland Estate) and 365 mm. at Avissawella (Avissawella Estate). The only excess was 9 mm. at Kirama. Among the main Meteorological stations Ratnapura recorded 66 mm, which is the lowest since observations commenced in 1869. On the whole, Sri Lanka received less than 50 per cent of the normal rainfall for the month.

There were only two daily falls of over 125 mm, the higher being 151 mm. at Haputale (Blackwood Estate) on the 11th. Four stations received nil rainfal

Day temperatures were mostly above normal and night temperatures about normal. The highest temperature recorded was 35·0°C at Ratnapura on the 28th and 30th. The lowest at a coastal station was 18·3°C at Puttalam on the 2nd, and for the whole Island 4·9°C at Nuwara Eliya on the 4th. Day humidity ranged from 60-75 per cent and night humidity ranged from 80 to 95 percent. Cloud amounts were well below normal and mean air pressures below normal Wind mileages were mostly a little below normal and the direction mainly northeasterly.

December, 1974.—During the first three days there were a few light showers in the North and East. From the 4th to the 7th there was light to moderate rain in the North and East with scattered evening thundershowers in the South-west and over the hills. A well marked low pressure area developed in the Bay of Bengal on the 8th and rainfall was fairly heavy and widespread till the 12th. There were light and isolated showers from the 13th to the 16th and from the 19th to the 22nd and a few moderate to heavy showers on the 18th and 19th. Rainfall was fairly heavy and widespread from the 23rd to the 29th and a few light showers were experienced on the 30th and 31st.

The larger monthly totals of rainfall (totals over 400 mm) were experienced over parts of Ratnapura, Polonnaruwa, Matale, Kandy, Nuwara Eliya, Badulla Moneragala, Amparai and Batticaloa Districts. Rainfall was below 100 mm over parts of Mannar, Puttalam and Kurunegala Districts. Elsewhere rain-fall ranged from 100 to 400 mm. The highest monthly totals were 1059 mm. at Maturata (Kurundu Oya Estate), 906 mm at Halgranoya (Maha Uva Estate) and 809 mm at Badulla (Ledgerwatta Estate).

Rainfall was above normal over parts of Eastern Province and parts of Anuradhapura, Matale, Kandy, Nuwara Eliya and Badulla Districts and parts of the southwest quarter excluding Southern Province. Elsewhere rainfall was below normal. The highest excesses were 490 mm at Maturata (Kurundu Oya Estate), 364 mm at Halgranoya (Liddesdale Estate) and 319 mm at Pulu-kunavi Tank. The biggest deficits were 218 mm at Deniyaya (Panilkande Estate), 196 mm at Mullaitivu and 190 mm at Iranaimadu Tank.

There were twenty-five daily falls of over 125 mm, the highest being 225 mm at Manalputty on the 29th. No station reported nil rainfall.

Day temperatures were a little above normal and night temperatures were about normal. The highest temperature recorded was 34·8°C at Ratnapura on the 3rd. The lowest at a coastal station was 18·9°C at Katunayake on the 1st and for the whole Island 5·3°C at Nuwara Eliya on the 15th. Day humidity ranged from 70 to 85 per cent and night humidity from 80 to 95 per cent. Cloud amounts and mean air pressures were above normal. Wind mileages were a little above normal and the direction northeasterly.

January, 1975.—Due to a weak low which moved across the Island, there was light scattered rain over the Southern half of the Island during the first four days, with little evening thunderactivity on the west coast on the 2nd. A well marked low in the Andaman Sea deepened into a depression on the 6th and moved in a northerly direction and thereby the wind stream originating from the Himalayan range, and flowing over Sri Lanka was northerly, cool and dry. From the 5th to the 13th there was practically no rain anywhere and night temperatures were considerably (about 4°C) below normal. Nuwara Eliya had ground frost on the mornings of 7th, 9th and 14th. Moist easter-lies were established again when the depression filled up and from the 14th there was light rain in the east and over the hills. Rainfall became fairly widespread from 18th to 20th when a low from the Bay of Bengal moved across the Island and again from the 23rd to the 26th when a trough of low formed off East Sri Lanka. Rather unusually, there were daily evening thunderstorms in the southwest from the 20th to the 26th. There was practically no rain during the last five days of the month.

The larger monthly totals of rainfall (totals over 300 mm) were confined to a small area in the Nuwara Eliya and Badulla Districts. At a few isolated stations in the Badulla, Nuwara Eliya, Kandy, Ratnapura, Kalutara and Polonnaruwa Districts rainfall ranged from 200 to 300 mm. Elsewhere rainfall was below 200 mm. The highest monthly totals were 460 mm at Kandapola (Kurundu Oya), 428 mm at Badulla (Keenakelle Estate) and 365 at Badulla (Narangalla Estate).

Rain was a little above normal at a few isolated stations in the Badulla Moneragala, Kalutara and Galle Districts and at Kayts. Elsewhere rainfall was below normal. The highest excesses were 17 mm at Ingiriya (Halwatura Estate), 9 mm at Koslanda (Lemastate Estate) and 8 mm at Baddegama, The biggest deficits were 226 mm at Unichchai Tank, 194 mm at Madulsima (Mahadova Estate) and 186 mm at Manalputty Aar.

There were no daily falls of over 125 mm and only one station namely Veppankulam reported nil rainfall.

Day temperatures were a little below normal and night temperatures appreciably below normal. The highest temperature recorded was 35.1°C at Ratnapura on the 30th. The lowest at a coastal station was 15.6°C at Katunayake on the 13th and for the whole Island 3.4°C at Nuwara Eliya on the 14th. Day humidity ranged from 65 to 80 per cent. and night humidity ranged from 75 to 90 per cent. Cloud amounts were above normal and mean air pressures a little above normal. Wind mileages were monthly above normal and the direction northeasterly.

February, 1975.—There was isolated light rain in the East on the 1st. From the 2nd to the 6th troughs of low pressure developed in South Bay of Bengal and light to moderate rain was fairly widespread from the 2nd to the 5th, with scattered evening thundershowers in the southwest quarter. On the 6th showers were confined only to the southwest quarter. With the filling up of the troughs, weather was mainly fair from the 7th to the 20th. There were however a few isolated showers in the southwest on the 14th and 17th. From the 21st, moist easterly upper winds prevailed and there was light rain in the East and over the hill country, with evening thundershowers in the southwest, almost daily till the end of the month.

6—A 17294 (10/75)

The larger monthly totals of rainfall (totals over 200 mm) were experienced over parts of Kalutara, Ratnapura, Matara and Kandy Districts, and at a few isolated stations. Over the rest of the Island fainfall was below 200 mm. The highest monthly totals were 314 mm at Deniyaya (Anningkande Estate), 296 mm at Pelawatte and 275 mm at Latpandura (Usk Valley Estate).

Rainfall was above normal over parts of Kalutara, Ratnapura, Hambantota, Kandy, Matale, Kegalle, Kurunegala, Puttalam and Chilaw Districts. Elsewhere over the Isaland rainfall was below normal. The highest excesses weie 120 mm at Wariapola, 116 mm at Kamburupitiya (Mawanella Estate) and 103 mm at Deniyaya (Anningkande Estate). The biggest deficits were 130 mm at Unichchai, 113 mm at Koslande (Meeriyabedda Estate) and 105 mm at Badulla (Gourakele Estate).

There were no daily falls of over 125 mm and seventeen stations, mainly from the Northern Province, reported nil rainfall.

Temperatures were above normal. The highest temperature recorded was 36.0°C at Ratnapura on the 21st. The lowest at a coastal station was 18.9°C at Kankesanturai on the 12th and for the whole Island 4.2°C at Nuwara Eliya on the 12th. Day humidity ranged from 60 to 75 per cent. and night humidity from 80 to 95 per cent. Cloud amounts were below normal and mean air pressures were about normal. Wind mileages were mostly below average and the direction mainly northeasterly.

March, 1975.—During the first week of the month upper winds were light and easterly and there was fairly widespread rain over the Island, with evening thunderstorms in the southwest quarter. Showers were mainly confined to the hill country and the southwest quarter during the second week with light rain in the east on the 10th and 12th. Due to large scale subsidence there was fair weather from the 15th to the 18th. From the 19th till the end of the month there a few evening showers with occasional thunderactivity mainly in the southwest quartei.

The larger monthly totals of rainfall (totals over 300 mm) were experienced over parts of Kalutara, Ratnapura, Matara and Colombo Districts and at a few isolated stations. Over the rest of the Island rainfall was below 300 mm. The highest monthly totals were 565 mm at Eheliyagoda (Sunderland Estate), 480 mm at Horagoda Estate in Latpandura and 460 mm at Usk Valley Estate in Latpandura.

Rainfall was below normal over parts of the hill country and Kurunegala District, and at a few isolated stations. Elsewhere rainfall was above normal. The highest excesses were 205 mm at Neboda (Gikiyanakande Estate), 174 at Uduwila and 170 mm at Tissamaharama. The biggest deficits were 210 mm at Rakwana (Dependene Group), 126 mm at Yatiyantota (Weweltalawa Div.) and 113 at Avissawella (Hospital).

There were eight daily falls of over 125 mm. the highest being 177 mm at Maha Lewaya. No station reported nil rainfall.

Day temperatures were mostly below normal and night temperatures were about normal. The highest temperature recorded was 36.3°C at Kurunegala on the 27th. The lowest at a coastal station was 20.4°C at Kankesanturai on the 10th, and for the whole Island 8.1°C at Nuwara Eliya on the 25th. Day humidity ranged from 65 to 75 per cent. and night humidity ranged from 85 to 95 per cent. Cloud amounts were above normal and mean air pressures were below normal. Wind mileages were mostly below normal and the direction variable.

April, 1975.—During the first sixteen days and again from the 23rd till the end of the month, afternoon or evening thunderstorms were fairly widely experienced, except in the East of the Island. From the 17th to the 19th light rain was reported from a few isolated stations in the southwest quarter. On the 20th there was light rain at several stations, and on the 21st and 22nd there was light to moderate rain due to thunderstorms. The north limit of the Inter Tropical Confluence was lying across the Island on most days of the month. Upper winds were generally light. However on the last two days due to the formation of a depression west of the Island, the wind stream became westerly upto a height of 3,000 metres.

The larger monthly totals of rainfall (totals over 400 mm) were experienced over parts of Kalutara, Colombo, Galle, Kegalla, Kandy, Ratnapura and Badulla Districts. Rainfall was below 100 mm. in the Eastern Province, Jaffna District and parts of Matale District. Elsewhere over the Island rainfall ranged from 100-400 mm. The highest monthly totals were 671 mm. at Deraniyagala (Liniyagala Estate), 664 mm. at Pelawatte and 661 mm. at Tawalama.

Rainfall was below normal over Eastern Province and over most parts of Northern Province and parts of Hambantota, Ratnapura, Kandy, Matale and Anuradhapura Districts. Elsewhere rainfall was above normal. The highest excesses were 255 mm at Badulla (Debedde Estate), 253 mm at Puvakpitiya (Avissawella Estate) and 251 mm at Ratmalana. The biggest deficits were 145 mm at Matale, 142 mm at Godakawela, and 123 mm at Elkaduwa.

There were six daily falls of over 125 mm, the highest being 145 mm at Puvakpitiya (Avissawella Estate) on the 2nd. Five stations, all from the Northern Province reported nil rainfall.

Temperatures were mostly a little above normal. The highest temperature recorded was 36.8°C at Vavuniya on the 7th. The lowest at a coastal station was 21.6°C on the 3rd at Katunayake and Ratmalana, and for the whole Island 7.3°C at Nuwara Eliya on the 22nd. Day humidity ranged from 70 to

80 per cent. and night himidity ranged from 85 to 95 per cent. Cloud amounts were above normal and mean air pressures well below normal. Wind mileages were below normal and the direction variable.

May, 1975.—The depression, that formed on 29th April in the Arabian Sea concentrated into a cyclonic storm at the beginning of the month and there was light to moderate rain during the first two days over the western half of the Island. Fair weather prevailed on the 3rd and 4th. From the 5th to the 7th rain was experienced over the southern half of the Island. On the 6th the rain was exceptionally heavy and twenty-three stations mainly in the Hambantota, Matara and Ratnapura Districts recorded falls over 125 mm. From the 8th to the 18th the southwest quarter experienced a few isolated showers. From the 19th the southwest monsoon advanced gradually and was established over the Island by the 22nd. During the period 19th to the 23rd there was moderate to heavy rain in the southwest quarter with sixteen daily falls over 125 mm on the 22nd and 23rd. On the 24th heavy rain was widespread and eighteen stations, including a few stations in the Anuradhapura and Kurunegala Districts, recorded falls over 125 mm. This widespread rain broke a three-week spell of dry weather over most parts in the northern half of the country. The level of the Kelani River at Colombo was above minor flood level (five feet) from the 25th to the 27th and reached a maximum of 6 feet 7 inches on the 26th evening. During the rest of the month rainfall was light and scattered and mainly in the southwest quarter.

The larger monthly totals of rainfall (totals over 400 mm) were experienced in the low country inland areas of the southwest quarter and on the western slopes of the central hills. Elsewhere over most of the southwest quarter rainfall ranged from 200-400 mm. Over the rest of the Island, rainfall was below 200 mm. The highest monthly totals were 964 mm at Polgahahena, 942 mm at Dehiowita (Yogana Estate) and 923 mm at Yatiyantota (Weweltalawa-Halgolla Estate).

Rainfall was above normal over parts of Kegalla, Kalutara, Ratnapura, Hambantota, Matara, Kurunegala, Batticaloa, Badulla and Anuradhapura Districts and parts of Northern Province. Elsewhere rainfall was below normal. The highest excesses were 289 mm at Eheliyagoda (Sunderland Estate), 245 mm at Ingiriya (Helwatura Estate) and 244 mm at Dehiowita (Digalla Estate). The biggest deficits were 279 mm at Norton Bridge, 269 mm at Dickoya (South Wanarajah Estate) and 253 mm at Baddegama.

There were sixty-three daily falls of over 125 mm, the highest being 296 mm at Dehiowita (Yogana Estate) on the 23rd. No station has reported nil rainfall.

Day temperatures were about normal and night temperatures mostly a little above normal. The highest temperature recorded was 36.7°C Trincomalee on the 17th. The lowest at a coastal station was 21.1°C at Ratmalana on the 24th and for the whole country 8.7°C at Nuwara Eliya on the 9th. Day humidity ranged from 70 to 80 per cent. and night humidity from 80 to 95 per cent. Cloud amounts were about normal and mean air pressures were below normal Wind mileages were above normal and the direction mainly southwesterly.

G. S. Jayamaha,
Director.

Dept. of Meteorology,
Colombo 7, June 25 1975.

METEOROLOGICAL REPORT

October, 1973

Station	Temperature °C Mean Max.	Temperature °C Departure	Temperature °C Mean Min.	Temperature °C Departure	Humidity % Day	Humidity % Night	Cloud Amount	Rainfall Amount mm.	Rainfall Departure	Rainfall Rain days	Rainfall Departure	Daily Mean Sunshine hours
Anuradhapura	32.4	+0.6	23.7	+0.6	72	95	5.4	111.5	-121.4	16	0	—
Badulla	28.7	+0.3	18.8	+0.1	69	89	6.2	182.1	-34.1	17	0	—
Batticaloa	30.9	+0.3	24.4	+0.3	74	86	5.9	235.5	+57.4	14	0	6.8
Colombo	30.0	+0.6	24.3	+0.5	80	91	6.6	416.3	+62.2	27	+6	5.8
Diyatalawa	24.3	-0.4	16.1	+0.2	77	91	5.9	321.3	+73.1	20	+1	—
Galle	28.9	+0.6	23.9	-0.3	84	93	6.3	422.4	+66.3	29	+8	—
Hambantota	30.2	+0.1	24.4	+0.2	82	86	6.0	189.7	+64.0	16	+3	6.5
Jaffna	29.8	-0.1	25.9	+0.5	78	84	6.2	199.6	-44.0	14	+1	—
Kandy	28.9	+0.5	20.4	+0.4	68	87	6.6	189.7	-68.9	19	+2	5.8
Kankesanturai	30.9	—	25.2	—	78	89	5.9	328.2	+106.5	14	+3	7.1
Katunayake	31.1	—	23.6	—	67	81	6.2	398.5	—	23	—	—
Kurunegala	31.4	+0.7	23.6	+0.7	73	93	6.2	203.4	-126.5	21	+1	—
Maha Illuppallama	32.2	—	23.4	—	65	84	6.0	232.4	—	19	—	6.2
Mannar	30.5	+0.2	25.7	+0.5	78	86	6.1	115.3	-52.3	11	0	—
Nuwara Eliya	20.2	+0.4	12.4	+1.1	84	91	6.6	187.4	-34.8	21	0	—
Puttalam	31.2	+0.9	24.6	+0.3	76	91	6.0	323.1	+149.4	18	+5	—
Ratmalana	30.0	—	23.7	—	70	84	6.8	381.8	—	27	—	—
Ratnapura	31.4	+0.7	23.0	+0.3	78	95	6.9	323.3	-175.0	27	+4	—
Trincomalee	31.8	+0.5	24.8	+0.5	68	82	6.0	435.4	-200.7	18	+2	7.3
Vavuniya	32.2	—	23.3	—	66	90	6.6	200.4	-22.6	15	0	—

November, 1973

Station	Mean Max.	Departure	Mean Min.	Departure	Day	Night	Cloud Amount	Amount mm.	Departure	Rain days	Departure	Daily Mean Sunshine hours
Anuradhapura	30.6	+0.7	22.1	+0.2	73	93	5 0	140.2	-108.2	13	-6	—
Badulla	26.9	+0.6	18.3	-0.3	70	91	5.4	231.6	-35.6	16	-4	—
Batticaloa	29.2	+0.2	23.7	+0.2	76	90	4.9	269.2	-16.0	12	-6	7.0
Colombo	29.6	—	23.2	+0.3	77	93	5.3	411.0	+86.6	16	-3	6.8
Diyatalawa	23.5	-0.1	15.0	-0.4	78	97	5.6	173.7	-104.2	15	-7	—
Galle	29.2	+0.5	23.0	-0.4	80	95	5.2	196.6	-125.7	15	-4	—
Hambantota	30.1	+0.4	23.6	+0.2	75	88	6.0	153.9	-33.6	11	-4	6.0

Jaffna	29.3	+0.4	23.9	+0.1	73	86	5.0	183.9	-227.3	14	-4	—
Kandy	28.4	+0.2	19.5	-0.2	68	87	5.4	290.1	+40.4	18	+1	6.0
Kankesanturai	29.4	—	23.5	—	77	88	4.7	150.6	-257.8	17	+1	7.1
Katunayake	30.9	—	22 5	—	63	81	4.6	270.3	—	12	—	—
Kurunegala	31.2	+0.8	22.3	+0.2	72	95	5.2	148.6	-132.8	13	-6	—
Maha Illuppallama	30.8	—	21.4	—	68	87	5.7	74.4	—	15	—	6.0
Mannar	29.7	+0.6	24.6	+0.3	74	84	5.0	262.6	+19.8	12	-5	—
Nuwara Eliya	19.2	-0.7	11.4	+0.6	80	88	5.8	180.3	—28.2	16	-5	—
Puttalam	30.3	+0.4	22.8	-0.1	74	90	5.1	91.2	-163.8	15	-3	—
Ratmalana	30.1	—	22.5	—	66	85	5.4	474.7	—	14	—	—
Ratnapura	31.9	+0.9	21.9	-0.4	73	95	6.2	230.4	-123.2	17	-4	—
Trincomalee	29.1	+0.4	24.2	+0.4	73	82	5.3	54.6	-300.5	13	-6	6.6
Vavuniya	30.2	—	21.7	—	70	90	5.4	110.1	-173.3	10	-8	—

December 1973

Anuradhapura	28.0	-0.5	21.6	+0.3	83	95	5.6	342.4	+100.1	22	+5	—
Badulla	25.1	+0.3	18.4	+0.2	80	92	7.1	469.9	+195.1	26	+6	—
Batticaloa	27.4	-0.4	23.3	+0.1	83	93	6.8	55.4	+120.6	23	+3	4.0
Colombo	29.4	-0.4	22.8	+0.4	78	90	6.5	244.4	+69.6	17	+5	5.5
Diyatalawa	21.7	-0.6	15.4	+0.5	86	94	6.8	298.7	+95.2	25	+5	—
Galle	28.6	-0.1	22.7	-0.3	79	95	6.4	113.8	-71.9	11	-3	—
Hambantota	29.1	-0.2	22.9	—	80	90	6.6	192.5	+71.6	20	+8	5.7
Jaffna	27.5	-0.6	23.4	—	78	86	7.0	382.3	+116.6	20	+6	—
Kandy	26.6	-1.0	19.6	+0.8	73	87	6.8	309.1	+98.5	23	+10	4.1
Kankesanturai	27.8	—	23.6	—	82	88	6.7	366.3	+105.9	19	+6	4.2
Katunayake	30.3	—	22.1	—	68	81	5.8	214.9	—	14	—	—
Kurunegala	29.1	-0.7	22.2	+0.6	78	93	6.6	267.4	+88.9	22	+8	—
Maha Illuppallama	23.4	—	21.2	—	76	87	6.9	382.8	—	21	—	4.2
Mannar	27.8	-0.3	23.6	-0.3	81	88	6.6	393.4	+191.0	21	+8	—
Nuwara Eliya	18.7	-1.1	11.3	-1.6	85	86	6.6	237.7	+47.7	24	+7	—
Puttalam	28.8	-0.6	22.0	+0.1	81	95	6.6	411.0	-257.6	19	+6	—
Ratmalana	29.7	—	22.1	—	68	85	6.6	352.6	—	18	—	—
Ratnapure	31.0	-0.2	21.9	-0.2	77	95	7.2	255.0	+41.4	19	+3	—
Trincomalee	27.3	0	23.4	-0.6	80	86	6.8	683.8	+309.9	23	+5	4.3
Vavuniya												

METEOROLOGICAL REPORT

January. 1974

Station	Temp. -C				Humidity %		Cloud Amount	Rainfall				
	Mean Max.	Depar-ture	Mean Min.	Depar-ture	Day	Night		Amount mm	Depar-ture	Rain days	Depar-ture	Daily Mean Sunshine hour
Anuradhapura	29.2	+0.6	18.9	-1.8	67	92	2.8	3.6	-119.6	3	-9	—
Badulla	26.1	+0.5	15.6	-2.2	68	88	4.8	3.3	-225.8	3	-14	—
Batticaloa	27.1	-0.4	21.8	-1.4	73	88	4.4	3.8	-275.3	4	-12	8.4
Colombo	30.4	+0.1	21.2	-1.0	65	85	4.0	0	-87.9	0	-8	9.4
Diyatalawa	22.2	+0.1	11.5	-2.7	71	90	4.4	8.1	-144.3	1	-16	—
Galle	28.4	-0.4	21.7	-1.1	75	90	4.3	.5	-112.5	1	-10	—
Hambantota	29.9	+0.5	21.4	-1.3	68	85	4.2	0	-100.8	0	-9	8.7
Jaffna	28.3	-0.1	20.9	-1.4	66	87	4.0	34.5	-62.0	4	-4	—
Kandy	27.8	-0.1	15.9	-2.4	58	83	3.2	0	-118.4	0	-8	8.7
Kankesanturai	27.8	—	22.2	—	71	81	3.4	39.6	—	3	—	9.2
Katunayake	31.7	—	19.8	—	50	74	3.2	0	—	0	—	—
Kurunegala	30.6	+0.3	19.3	-1.7	61	92	3.4	0	-58.0	0	-9	—
Maha Illuppallama	29.3	—	18.1	—	61	86	3.7	.5	—	1	—	8.9
Mannar	28.3	-0.1	22.7	-0.9	69	81	4.0	5.1	-82.3	3	-5	—
Nuwara Eliya	20.7	+0.8	6.0	-2.7	66	70	4.0	0	-145.0	0	-13	—
Puttalam	29.9	+0.1	19.3	-1.9	67	95	3.5	0	-73.2	0	-9	—
Ratmalana	30.6	—	20.3	—	55	79	3.9	0	—	0	—	—
Ratnapuaa	33.2	+1.3	19.8	-2.0	62	95	5.6	1.3	-150.1	1	-12	—
Trincomalee	26.6	-0.4	23.5	-0.7	69	72	4.5	11.7	-198.9	3	-10	8.8
Vavuniya	28.7	—	18.2	—	72	97	3.8	.2	—	1	—	—
February, 1974												
Anuradhapura	31.1	+0.4	20.2	-0.5	64	92	3.1	58.9	+5.3	4	-2	—
Badulla	26.2	+0.1	16.8	-0.6	69	89	5.0	101.3	-19.3	8	-2	—
Batticaloa	27.7	-0.5	23.1	-0.1	75	88	5.2	47.5	-130.8	7	-3	7.6
Colombo	31.3	+0.7	22.1	-0.2	67	85	4.3	148.6	+52.6	4	-3	8.9
Diyatalawa	23.4	-0.5	13.4	-0.6	73	85	5.1	155.4	+69.8	8	-2	—
Galle	29.2	-0.3	22.6	-0.6	76	90	4.5	73.2	-42.6	7	-2	—
Hambantota	30.7	+0.8	22.1	-0.7	69	85	4.9	17.3	-41.1	3	-2	7.1
Jaffna	30.0	+0.2	21.6	-0.8	63	87	4.0	23.6	-13.2	4	+1	—

Kandy	29.5	-0.1	17.8	-0.1	62	89	4.0	123.7	+40.6	7	+2	8.0
Kankesanturai	29.1	—	22.6	—	70	83	4.2	54.9	—	3	—	9.4
Katunayake	33.3	—	20.8	—	51	72	3.5	30.0	—	4	—	—
Kurunegala	32.8	+0.6	20.3	-0.6	58	90	4.4	224.0	+164.3	8	+2	—
Maha Illuppallama	31.6	—	19.8	—	56	85	4.4	97.8	—	4	—	8.8
Mannar	29.9	0	22.9	-0.4	68	84	4.3	28.4	-5.1	3	0	—
Nuwara Eliya	21.2	+0.3	9.6	+1.9	68	68	3.0	135.1	+59.2	7	-2	—
Puttalam	31.9	+0.6	20.1	-1.2	63	95	3.7	35.3	-10.4	7	+2	—
Ratmalana	31.1	—	21.2	—	58	77	4.2	120.4	—	5	—	—
Ratnapura	34.0	+0.9	20.9	-0.9	64	95	5.5	107.7	-72.9	11	-1	—
Trincomalee	27.9	-0.2	24.5	+0.2	69	73	5.0	64.0	-31.2	5	-1	8.5
Vavuniya	30.4	—	19.2	—	69	97	4.2	20.8	-32.8	5	+1	—
March 1974												
Anuradhapura	33.7	+0.5	22.6	+0.7	63	93	2.0	35.3	-63.5	7	0	—
Badulla	29.3	+1.2	17.3	-0.6	62	86	3.0	64.5	-45.5	7	-4	—
Batticaloa	29.8	+0.1	24.0	+0.1	77	93	3.1	17.5	-67.3	4	-4	9.8
Colombo	31.2	+0.2	23.6	+0.3	73	90	3.3	62.5	-55.1	9	-2	10.1
Diyatalawa	25.4	-0.1	13.5	-1.1	66	88	3.4	90.2	-31.2	8	-4	—
Galle	30.6	+0.4	23.4	-0.5	75	90	3.6	54.4	-62.2	10	-1	—
Hambantota	31.4	+0.8	23.4	-0.2	72	90	3.0	17.5	-48.8	2	-5	9.5
Jaffna	31.8	+0.2	24.6	+0.3	62	82	1.6	1.5	-28.5	1	-2	—
Kandy	31.1	0	19.1	-0.3	65	97	3.2	31.5	-88.6	8	0	8.7
Kankesanturai	31.5	—	22.9	—	71	95	1.4	1.0	-23.6	2	0	10.3
Katunayake	32.7	—	22.7	—	58	78	2.4	117.9	—	9	—	—
Kurunegala	34.2	+0.4	22.2	0	61	93	2.8	76.4	-93.8	7	-3	—
Maha Illuppallama	33.6	—	21.6	—	58	85	2.6	38.1	—	7	—	9.8
Mannar	31.8	+0.1	24.1	0	70	91	1.5	24.4	-20.0	1	-3	—
Nuwara Eliya	22.7	+0.9	9.8	+1.9	64	77	3.4	31.0	-65.5	7	-4	—
Puttalam	33.3	+1.0	22.7	-0.1	68	93	2.1	21.8	-54.1	4	-3	—
Ratmalana	31.4	—	22.8	—	63	84	3.2	64.8	—	12	—	—
Ratnapura	34.4	+1.0	22.2	-0.3	66	93	5.4	120.9	-122.7	15	-3	—
Trincomalee	30.4	+0.5	24.9	+0.1	70	84	2.2	6.4	-41.9	2	-3	10.2
Vavuniya	33.7	—	21.9	—	65	98	2.8	17.0	-45.5	5	0	—

METEOROLOGICAL ERPORT

April, 1974

Station	Temp. C Mean Max.	Depar-ture	Mean Min.	Depar-ture	Humidity% Day	Night	Cloud Amount	Rainfall Amount mm	Depar-ture	Rain days	Depar-rure	Daily Mean Sunshine hour
Anuradhapura	32.9	- 0.4	23.8	+ 0.2	73	90	5.3	275.6	+ 88.7	16	+ 3	—
Badulla	29.8	+ 0.7	18.9	- 0.2	70	89	5.8	249.4	+ 52.8	15	- 2	—
Batticaloa	31.1	0	25.2	+ 0.3	74	89	4.8	79.5	+ 7.1	6	- 1	8.9
Colombo	30.9	- 0.2	24.1	- 0.2	80	91	6.6	562.1	+ 302.3	21	+ 3	5.9
Diyatalawa	25.6	- 0.1	15.6	- 0.3	78	97	6.1	201.9	- 8.2	18	0	—
Galle	29.7	- 0.4	24.1	- 0.7	82	91	6.0	408.2	+ 155.7	24	+ 8	—
Hambantota	30.9	0	24.6	- 0.1	79	91	5.8	115.8	+ 6.8	12	+ 2	7.9
Jaffna	32.7	+ 0.6	27.1	+ 0.3	71	80	5.4	27.2	- 42.9	7	0	—
Kandy	30.1	- 0.8	20.9	- 0.2	80	97	6.5	250.4	+ 62.2	20	+ 8	6.8
Kankesanturai	33.3	—	25.7	—	73	93	5.3	25.9	- 28.2	4	0	8.6
Katunayake	31.5	—	23.7	—	66	76	6.4	391.9	—	20	—	—
Kurunegala	32.5	- 0.3	23.8	+ 0.1	75	93	6.4	229.1	- 34.0	21	+ 5	—
Maha Illuppallama	33.2	—	23.3	—	68	86	5.7	264.9	—	13	—	8.6
Mannar	32.2	- 0.1	25.4	- 0.2	74	86	6.1	114.0	+ 25.6	9	+ 1	—
Nuwara Eliy	22.3	+ 0.4	11.6	+ 1.6	79	94	6.6	100.1	- 53.6	17	+ 1	—
Puttalam	32.0	+ 0.1	24.1	- 0.4	76	91	6.3	281.7	+ 144.0	21	+ 11	—
Ratmalana	31.0	—	23.3	—	70	84	6.8	680.0	—	21	—	—
Ratnapura	32.3	- 0.6	22.9	- 0.3	81	95	7.2	571.0	+ 230.4	25	+ 4	—
Trincomalee	32.6	+ 0.6	25.5	+ 0.1	68	84	5.3	87. 1	+ 10.4	9	+ 2	9.1
Vavuniya	33.6	—	23.7	—	74	98	5.8	132.1	- 11.2	13	+ 2	—

May, 1974

Station	Temp. C Mean Max.	Depar-ture	Mean Min.	Depar-ture	Humidity% Day	Night	Cloud Amount	Rainfall Amount mm	Depar-ture	Rain days	Depar-rure	Daily Mean Sunshine hour
Anuradhapura	32.0	- 0.7	24.6	-	72	91	5.7	62.0	- 37.6	8	0	—
Badulla	30.0	+ 0.2	19.4	+ 0.2	67	87	5.4	163.8	+ 49.5	11	0	—
Batticaloa	32-6	+ 0.2	25.3	- 0.2	70	86	5.6	25 1	- 6.1	3	2	8.4
Colombo	30.3	- 0.3	25.5	+ 0.2	80	89	6.2	487.9	+ 136.3	19	4	6.8
Diyatalawa	25.4	- 0.5	16.5	- 0.4	78	89	5.8	154.7	+ 11.7	17	+ 3	—
Galle	29.2	- 0.2	25.1	- 0.5	84	89	6.0	393 4	+ 91.1	19	2	—
Hambantota	30.8	+ 0.2	26.2	- 0.2	80	89	5 4	24.6	- 96.3	7	8	—
Jaffna	31.4	+ 0.1	27.1	- 0.5	76	82	5.4	30.5	- 32.3	7	+ 8	—
Kandy	28.8	- 1.0	21.7	+ 0.3	79	95	6.2	314.1	+ 24.1	19	+ 3	6.3
Kankesanturai	33.0	—	26 7	—	74	89	5.0	43.9	3.3	6	2	8.7

Katunayake	30.8	—	24.7	—	67	77	6.1	259.6	—	23	—	—
Kurunegala	31.3	-0.4	24.6	+0.1	76	91	6.6	201.2	+4.6	21	+5	—
Mahailluppallama	31.6	—	24.3	—	75	91	5.8	95.2	—	—	—	8.1
Mannar	31.8	-0.1	26.9	-0.2	74	82	6.0	5.1	-44.2	3	—1	—
Nuwara Eliya	20.2	-1.1	12.7	+0.6	84	94	6.4	205.0	-31.7	23	+6	—
Puttalam	31.6	+0.2	25.7	-0.3	76	89	6.1	86.1	-12.7	15	+5	—
Ratmalana	30.5	—	25.0	—	69	80	6.4	268.2	—	21	—	—
Ratnapura	31.2	-0.5	23.6	-0.2	78	95	6.9	466.1	-28.2	25	+1	—
Trincomalee	33.0	-0.6	25.8	-0.3	66	80	5.0	96.5	+28.7	10	+4	7.8
Vavuniya	32.7	—	24.4	—	74	98	6.1	125.0	+14.0	12	+5	—

June, 1974

Anuradhapura	32.0	-0.2	24.8	+0.1	64	88	5.1	1.8	-11.7	2	-2	—
Badulla	30.5	+0.7	18.2	-0.4	60	86	5.0	60.4	+36.3	9	+3	—
Batticaloa	34.2	+0.6	25.3	-0.1	62	78	5.6	14.7	-3.8	3	0	8.5
Colombo	30.3	+0.7	25.6	+0.4	80	86	6.4	270.8	+59.2	24	+2	—
Diyatalawa	25.9	+0.6	16.7	-0.7	67	81	5.6	46.5	+0.3	6	—2	—
Galle	28.9	+0.3	24.8	-0.3	84	88	5.7	193.8	-26.4	28	+6	—
Hambantota	29.8	-0.4	24.7	-0.3	80	88	5.0	86.4	+31.3	12	0	—
Jaffna	30.3	-0.1	27.0	-0.2	78	82	5.9	30.0	+13.7	3	+2	—
Kandy	27.6	-0.2	21.6	+0.2	78	90	6.7	116.8	-67.9	21	+3	6.3
Kankesanturai	32.7	—	26.7	—	72	85	5.4	105.9	+91.7	4	+3	9.0
Katunayake	30.5	—	25.1	—	66	74	6.2	141.7	—	21	—	—
Kurunegala	30.4	+0.1	24.4	+0.1	76	91	6.7	141.7	-21.6	22	+1	—
Maha Illuppallama	31.9	—	24.6	—	70	91	6.0	0.8	—	1	—	8.9
Mannar	30.7	-0.4	27.1	0	76	82	6.4	0	-4.8	0	-1	—
Nuwara Eliya	18.5	-0.2	13.2	-0.1	87	91	6.7	139.7	-126.5	23	-1	—
Puttalam	31.1	+0.7	26.2	-0.1	76	85	6.0	11.2	-11.9	5	-1	—
Ratmalana	30.3	—	25.1	—	70	78	6.6	249.7	—	22	—	—
Ratnapura	30.8	+0.4	23.6	-0.2	80	95	6.6	481.8	+19.3	28	+2	—
Trincomalee	34.3	+0.6	26.4	+0.2	54	72	5.8	0	-18.5	0	-2	9.0
Vavuniya	33.3	—	24.6	—	66	93	6.0	0	-11.9	0	-1	—

METEOROLOGICAL REPORT

Station	Temp. C Mean Max.	Temp. C Departure	Temp. C Mean Min.	Temp. C Departure	Humidity Day	Humidity Night	Cloud Amount	Rainfall Amount mm	Rainfall Departure	Rain days	Rain days Departure	Daily Mean Sunshine hours
July 1974												
Anuradhapura	32.6	-0.1	24.4	+0.1	62	86	5.0	4.1	-27.7	1	-2	—
Badulla	28.1	-2.1	18.8	+0.8	62	89	5.8	32.0	-17.3	10	-3	—
Batticaloa	33.2	0	25.3	+0.3	65	80	5.6	26.2	-11.6	4	0	8.3
Colombo	29.7	+0.4	24.8	-0.1	80	88	6.4	193.5	+53.8	25	+10	—
Diyatalawa	25.7	+0.2	16.4	-0.6	70	89	6.4	91.9	+33.2	13	+4	—
Galle	28.5	+0.3	24.1	-0.7	83	91	6.2	365.5	+194.8	29	+10	—
Hambantota	30.7	-	24.6	-0.1	72	86	5.5	38.0	-10.2	13	-6	—
Jaffna	30.3	+0.2	26.7	+0.1	78	85	6.2	3.3	-13.2	2	0	—
Kandy	27.3	+0.1	21.2	+0.2	80	92	6.6	236.7	+82.3	29	+13	5.4
Kankesanturai	31.8	— ..	26.2	—	75	87	5.8	47.0	+28.5	4	+2	7.5
Katunayake	29.9	—	24.5	—	67	75	6.5	51.0	—	24	—	—
Kurunegala	29.9	-0.3	24.0	0	78	91	6.2	201.7	+89.9	28	+11	—
Maha Illuppallama	32.6	—	24.3	—	67	91	6.0	8.9	7.1	4	—	8.3
Mannar	30.6	0	26.7	+0.5	75	80	6.6	0	—	0	-1	—
Nuwara Eliya	18.1	-0.4	13.2	+0.4	90	94	7.2	354.6	+129.1	28	+6	—
Puttalam	31.2	+1.0	25.8	+0.1	76	86	6.0	19.0	+2.0	5	+2	—
Ratmalana	29.8	—	24.1	—	69	79	6.7	211.3	-	27	+5	—
Ratnapura	29.9	—0.4	23.1	-0.4	82	95	6.6	618.2	+311.6	29	-2	-
Trincomalee	34.4	+0.7	25.9	+0.3	56	74	5.6	51.0	-3.1	2	-1	7.9
Vavuniya	34.2	—	24.3	—	63	91	6.4	15.7	-11.2	2		
August 1974												
Anuradhapura	32.9	-0.1	24.5	+0.3	60	84	6.0	11.2	-35.5	4	-1	—
Badulla	31.3	+1.2	18.3	+0.1	57	86	5.6	31.0	-65.0	8	-1	—
Batticaloa	34.0	+1.5	25.0	+0.2	63	78	5.6	44.2	-17.5	6	0	8.5
Colombo	29.6	+0.2	24.9	-0.1	78	86	6.2	108.0	-15.7	10	-5	6.7
Diyatalawa	25.4	-0.1	16.5	-0.1	64	84	5.3	37.8	-51.6	9	-1	—
Galle	27.9	-0.1	24.4	-0.5	84	91	5.8	140.7	-38.1	18	-1	—
Hambantota	29.7	-0.8	24.3	-0.3	80	88	5.2	59.9	+17.7	10	+2	6.6
Jaffna	30.3	+0.2	26.6	+0.3	76	82	5.3	13.2	-18.3	3	-1	—
Kandy	27.5	+0.3	20.7	+0.3	77	92	6.3	151.6	+9.6	17	+3	6.4
Kankesanturai	32.6	—	26.4	—	70	85	5.0	0	-37.1	0	-3	8.4

August 1974

Station	Temperature C° Mean Max.	Departure	Mean Min.	Departure	Humidity % Day	Night	Cloud Amount	Rainfall Amount mm	Departure	Rain days	Departure	Daily Mean Sun shing Hours
Katunayake	30.2	—	24.4	—	64	73	5.8	92.0	—	9	—	—
Kurunegala	30.2	+0.2	23.9	0	74	88	6.3	102.1	-13.0	15	-1	—
Maha Illuppallame	—	—	—	—	—	—	—	—	—	—	—	—
Mannar	30.4	-0..2	26.2	+0.3	75	82	6.0	0.5	-15.5	1	-1	—
Nuwara Eliya	18.4	-0.6	12.6	0	86	91	6.6	293.4	+113.8	21	-1	—
Puttalam	30.9	+0.5	25.4	-0.2	73	86	6.0	47.8	+26.5	4	0	—
Ratmalana	29.7	—	24.3	—	66	77	6.2	95.5	—	10	—	—
Ratnapura	30.7	+0.3	23.1	-0.3	76	95	6.4	244.6	-83.1	20	-4	—
Trincomalee	34.2	+0.7	25.7	+0.4	57	74	5.2	51.8	-51.1	5	-2	8.6
Vavuniya	34.4	—	24.3	—	63	91	6.3	91.4	+23.1	4	-2	—
Correction — 1974 July, Hambantota								33.0	-10.2			
Jaffna								3.3				

September 1974

Station	Mean Max.	Departure	Mean Min.	Departure	Day	Night	Cloud Amount	Amount mm	Departure	Rain days	Departure	Daily Mean Sun shing Hours
Anuradhapura	32.0	-1.4	24.1	+0.1	65	86	6.2	43.7	-25.9	9	+4	—
Badulla	29.7	-0.2	18.7	+0.7	69	89	6.6	173.5	+80.8	14	+5	—
Batticaloa	32.0	-0.1	24.8	+0.2	70	84	6.0	75.7	+27.9	7	+2	7.2
Colombo	29.2	-0.4	24.4	+0.3	82	—	7.0	210.3	+56.9	22	+5	5.0
Diyatalawa	24.3	-1.1	16.1	0	76	89	6.8	135.6	+41.1	22	+11	—
Galle	27.6	-0.6	23.8	-1.1	86	90	6.4	394.2	+214.9	25	+6	—
Hambantota	29.3	-0.9	23.9	-0.7	80	90	4.5	82.0	+36.5	17	+9	5.9
Jaffna	30.0	-0.2	26.0	-0.4	79	84	6.0	42.9	-4.6	6	+3	—
Kandy	27.0	-0.8	20.6	+0.9	80	95	7.2	225.0	+102.8	23	+11	4.2
Kankesanturai	31.8	—	25.4	—	75	89	5.4	95.2	+44.9	9	+5	7.3
Katunayake	29.8	—	23.9	—	68	77	6.4	324.4	—	16	—	—
Kurunegala	29.7	-1.3	23.6	0	78	90	6.9	234.4	+125.2	26	+12	—
Maha Illuppallama	31.8	—	23.8	—	67	88	5.9	204.2	—	11	—	6.7
Mannar	30.3	-0.5	25.9	-0.2	78	84	6.6	5.3	-18.3	4	+2	—
Nuwara Eliya	18.1	-1.3	12.3	+0.4	90	94	7.3	260.1	+95.0	28	+8	—
Puttalam	30.6	-0.1	25.2	-0.4	75	86	6.5	33.3	-2.0	7	+3	—

METEOROLOGICAL REPORT

Station	Temperature, C° Mean Max.	Depar-ture	Mean Min.	Depar-ture	Humidity % Day	Night	Cloud Amount	Rainfall Amount mm	Depar-ture	Rain days	Depar-ture	Daily Mean Sunushine hours
September 1974												
Ratmalana	29.2	—	23.8	—	70	78	6.9	268.2	—	20	—	—
Ratnapura	29.6	-1.1	22.8	-0.3	84	95	7.3	728.2	+413.2	26	+4	—
Trincomalee	32.8	-0.7	24.7	-0.4	62	77	5.7	210.6	+121.7	10	+4	7.5
Vavuniya	32.1	—	23.4	—	71	93	6.9	223.0	+144.0	11	+5	—
October 1974												
Anuradhapura	32.5	+0.7	23.5	+0.4	62	88	5.4	65.0	-167.9	4	-12	—
Badulla	29.7	+0.7	17.4	-1.3	62	86	5.3	75.4	-140.8	11	-6	—
Batticaloa	31.4	+0.8	24.3	+0.2	70	84	5.2	53.6	-124.5	7	-7	8.2
Colombo	29.4	0	23.7	-0.1	77	—	5.8	127.2	-226.9	9	-12	8.1
Diyatalawa	24.9	+0.2	14.7	-1.2	68	88	5.2	86.9	-161.3	9	-10	—
Galle	28.0	-0.3	24.3	+0.1	82	91	4.8	45.2	-310.9	13	-8	—
Hambantota	31.0	+0.9	24.1	-0.1	72	86	4.1	38.1	-87.6	4	-9	8.6
Jaffna	29.6	-0.3	25.8	+0.4	76	84	5.1	55.9	-187.7	7	-6	—
Kandy	27.9	-0.5	19.4	-0.6	74	95	5.4	138.4	-120.2	14	-3	7.2
Kankesanturai	31.1	—	25.1	—	74	89	5.0	133.4	-88.3	6	-5	7.7
Katunayake	30.2	—	23.3	—	62	74	4.8	69.8	—	11	—	—
Kurunegala	30.4	-0.3	22.9	0	73	90	5.6	177.0	-152.9	11	-9	—
Maha Illuppallama	32.2	—	23.0	—	62	86	4.8	29.0	—	4	—	7.6
Mannar	30.4	+0.1	25.5	+0.5	75	84	6.0	21.6	-146.0	2	-9	—
Nuwara Eliya	19.1	-0.7	11.4	+0.1	80	88	5.8	118.9	-103.3	16	-5	—
Puttalam	30.9	+0.6	24.3	0	72	88	5.2	3.0	-170.7	2	-19	—
Ratmalana	29.5	—	23.4	—	66	78	5.7	175.5	—	13	—	—
Ratnapura	31.5	+0.8	22.3	+0.4	75	95	6.0	215.1	-283.2	14	-9	—
Trincomalee	32.2	+0.9	24.7	+0.4	61	75	5.2	26.2	-208.5	5	-11	8.0
Vavuniya	32.2	—	22.7	—	67	93	6.0	85.3	-137.7	7	-8	—
November 1974												
Anuradhapura	31.9	+2.0	22.0	+0.1	66	93	4.0	73.7	-174.7	-7	-12	—

Badulla	28.1	+1.8	18.5	-0.1	68	89	5.5	110.5	-156.7	11	-09	—
Batticaloa	29.6	+0.6	23.7	+0.2	77	93	4.2	196.1	-89.1	9	-09	8.6
Colombo	30.3	+0.7	22.7	-0.2	72	—	4.4	158.5	-165.9	8	-11	8.1
Diyatalawa	23.9	+0.3	14.6	-0.8	76	97	5.5	189.5	-88.4	16	-06	—
Galle	29.3	+0.6	23.6	+0.2	76	90	4.4	208.0	-114.3	14	-05	—
Hambantota	30.2	+0.5	23.7	+0.3	74	88	4.2	105.7	-81.8	10	-05	8.2
Jaffna	30.1	+1.2	23.6	-0.2	68	84	4,6	80.3	-330.9	7	-11	—
Kandy	29.0	+0.8	19.4	-0.3	72	95	4.4	88.9	-160.8	9	-08	7.4
Kankesanturai	29.8	—	23.9	—	71	84	4.0	62.8	-345.6	7	-09	7.5
Katunayake	32.2	—	21.9	—	56	76	3.6	154.2	—	8	—	—
Kurunegala	31.7	+1.3	21.9	-0.2	69	95	4.2	177.8	-103.8	9	-10	—
Maha Illuppallama	32.2	—	21.3	—	63	90	4.0	99.3	—	10	—	8.0
Mannar	30.2	+1.1	24.4	+0.1	70	84	4.8	196.1	-46.7	5	-12	—
Nuwara Eliya	19.8	-0.1	10.6	-0.2	77	88	5.1	151.9	-56.6	10	-11	—
Puttalam	31.6	+1.7	22.3	-0.6	67	90	4.2	108.0	-147.0	7	-11	—
Ratmalana	30.4	—	22.4	—	61	81	4.6	138.9	—	9	—	—
Ratnapura	33.4	+2.4	22.0	-0.3	67	93	5.4	65.8	-287.8	8	-13	—
Trincomalee	29.0	-0.3	23.9	+0.1	70	84	3.9	113.3	-241.8	9	-10	8.1
Vavuniya	31.1	—	20.8	—	71	97	5.0	139.2	-154.2	11	-07	—
December 1974												
Anuradhapura	28.6	+0.1	21.3	0	76	93	4.7	228.6	-13.7	15	-2	—
Badulla	24.6	+0.2	17.9	-0.3	80	89	6.4	482.1	-207.3	22	+2	—
Batticaloa	27.3	+0.5	23.2	0	78	84	6.2	525.8	+96.0	24	+4	4.3
Colombo	30.6	+0.8	22.3	-0.1	70	—	4.4	189.5	-14.7	11	+1	7.3
Diyatalawa	21.2	-1.1	14.8	-0.1	87	94	6.5	230.6	-27.1	20	0	—
Galle	28.8	+0.1	22.9	-0.1	77	93	4.6	121.4	-64.3	18	+4	—
Hambantota	29.8	+0.5	22.9	0	75	88	5.2	173.0	+52.1	16	+4	—
Jaffna	28.2	+0.1	22.9	0	72	84	5.0	231.4	-35.3	13	-1	—
Kandy	27.7	+0.1	18.9	-0.1	76	95	5.1	165.1	-45.5	17	+4	5.0
Kankesanturai	28.3	—	24.3	—	76	77	5.2	204.0	-56.5	14	+1	6.1
Katunayake	31.6	—	22.1	—	54	71	4.0	181.6	—	9	—	—
Kurunegala	30.0	+0.2	21.9	+0.3	72	90	5.2	113.0	-63.5	12	+2	—
Maha Illuppallama	28.7	—	21.0	—	75	90	5.2	174.2	—	15	—	5.1
Mannar	28.6	+0.5	24.0	-0.1	75	84	5.0	110.7	-91.7	9	-4	—
Nuwara Eliya	18.7	-1.1	10.8	+1.1	86	88	5.8	377.7	+187.7	18	+1	—
Puttalam	30.3	+0.9	21.6	-0.3	71	93	5.2	84.6	-68.8	10	-3	—

METEOROLOGICAL REPORT

Station	Temperature C° Mean Max.	Depar- ture	Mean Min.	Depar- ture	Humidity % Day	Night	Cloud Amount	Rainfall Amount mm	Depar- ture	Rain days	Depar- ture	Daily Mean Sunshine hours
December 1974												
Ratmalana	30.8	—	21.8	—	60	78	4.6	137.4	—	10	—	—
Ratnapura	32.2	+1.0	21.7	-0.4	72	95	6.4	284.0	+70.4	19	+3	—
Trincomalee	27.4	+0.1	24.4	+0.4	74	77	5.4	395.2	+21.3	15	-3	5.0
Vavuniya	28.6	—	20.6	—	76	97	5.0	181.9	-95.5	16	0	—
January 1975												
Anuradhapura	28.9	+0.3	20.2	-0.5	71	92	4.4	53.1	-70.1	5	-7	—
Badulla	24.6	0	16.9	-0.9	74	89	6.0	171.2	-57.9	15	-2	—
Batticaloa	27.3	-0.2	23.1	-0.1	78	88	5.7	112.3	-166.8	17	+1	6.5
Colombo	30.7	+0.4	21.3	-0.9	66	—	5.0	20.3	-67.6	6	-2	7.4
Diyatalawa	21.2	-0.9	13.5	-0.7	80	94	6.0	143.0	-9.6	12	-5	—
Galle	28.8	0	22.1	-0.7	76	90	4.8	88.9	-24.1	10	-1	—
Hambantota	29.4	0	21.8	-0.9	72	88	5.0	98.6	-2.2	8	-1	—
Jaffna	28.3	-0.1	22.2	-0.1	70	88	4.5	88.9	-7.6	5	-3	—
Kandy	27.4	-0.5	17.4	-0.9	73	94	5.4	41.2	-77.2	7	-1	6.5
Kankesanturai	28.1	—	23.6	—	71	76	4.3	49.8	-31.7	3	-3	8.7
Katunayake	31.7	—	20.7	—	52	72	4.2	8.6	—	6	—	—
Kurunegala	30.2	-0.1	20.4	-0.6	66	92	5.3	29.5	-68.5	9	0	—
Maha Illuppallama	28.9	—	19.6	—	69	90	4.9	60.4	—	10	—	7.0
Mannar	28.7	+0.3	23.2	-0.4	72	86	5.3	11.9	-75.5	6	-2	—
Nuwara Eliya	18.7	-1.2	9.7	+1.0	80	84	6.0	104.4	-40.6	12	-1	—
Puttalam	30.5	+0.7	20.7	-0.5	69	93	4.8	48.0	-25.2	7	-2	—
Ratmalana	30.8	—	20.6	—	56	77	4.8	30.5	—	6	—	—
Ratnapura	32.4	+0.5	20.4	-1.4	66	95	5.8	77.2	-74.2	11	-2	—
Trincomalee	26.9	-0.1	23.7	-0.5	71	74	5.4	96.5	-114.1	8	-5	6.7
Vavuniya	28.9	—	19.3	—	72	97	5.2	62.5	-75.9	7	-3	—

February, 1975

Anuradhapura	32.2	+1.5	21.2	+0.5	64	90	3.1	6.9	−46.7	3	−3	—
Badulla	27.5	+1.4	16.8	−0.6	68	89	3.8	77.7	−42.9	9	−1	—
Batticaloa	28.6	+0.4	23.4	+0.2	77	90	4.4	114.6	−63.7	9	−1	9.0
Colombo	31.3	+0.7	22.5	+0.2	70	—	4.2	29.2	−66.8	4	−3	9.3
Diyatalawa	24.0	+0.1	13.1	+0.9	68	91	4.8	35.8	−49.8	9	−1	—
Galle	29.6	+0.1	22.9	−0.3	74	90	4.4	85.3	−30.5	7	−2	—
Hambantota	29.9	0	22.6	−0.2	74	88	4.0	71.9	+13.5	4	−1	8.9
Jaffna	30.4	+0.6	23.4	+1.0	70	88	3.1	14.0	−22.8	3	0	—
Kandy	29.9	+0.3	18.4	+0.5	67	95	3.8	81.3	−1.8	8	+3	8.4
Kankesanturai	30.2	—	23.0	—	71	86	3.1	2.3	−31.7	2	0	9.9
Katunayake	32.9	—	21.9	—	65	88	3.2	83.8	—	5	—	—
Kurunegala	33.0	+0.8	21.3	+0.4	62	93	3.4	147.1	+87.4	7	+1	—
Maha Illuppallama	32.4	—	20.4	—	63	90	3.4	26.4	—	5	—	9.4
Mannar	31.0	+1.1	23.6	+0.3	71	88	3.6	46.5	+13.0	3	0	—
Nuwara Eliya	20.9	0	9.2	+1.5	71	76	4.7	49.3	−26.6	9	0	—
Puttalam	32.2	+0.9	21.9	+0.6	71	98	3.5	62.2	+16.5	7	+2	—
Ratmalana	31.1	—	21.9	—	60	81	4.4	48.8	—	6	—	—
Ratnapura	33.7	+0.6	21.7	−0.1	70	95	5.6	269.2	+88.6	12	0	—
Trincomalee	28.9	+0.8	24.4	+0.1	68	79	3.6	61.7	−33.5	6	0	9.3
Vavuniya	31.8	—	20.2	—	66	97	3.4	29.7	−23.9	5	+1	—

March, 1975

Anuradhapura	33.0	−0.2	22.5	+0.6	66	90	3.7	91.9	−6.9	9	−2	—
Badulla	28.3	+0.2	17.7	−0.2	71	94	4.2	142.5	+32.5	11	0	—
Batticaloa	29.6	−0.1	24.2	+0.3	79	93	4.7	114.0	+29.2	8	0	8.5
Colombo	31.0	0	23.3	0	75	—	4.4	151.1	+33.5	13	+2	8.5
Diyatalawa	24.3	−1.2	14.3	−0.3	73	91	5.1	192.3	+70.9	15	+3	—
Galle	30.0	−0.2	23.7	−0.2	75	90	4.4	156.7	+40.1	11	0	—
Hambantota	30.1	−0.5	23.6	0	73	86	4.3	200.9	+134.6	8	+1	8.3
Jaffna	32.1	+0.5	24.8	+0.5	72	88	3.4	25.9	−4.1	4	+1	—
Kandy	30.6	−0.5	19.4	0	69	95	4.8	116.3	−3.8	10	−2	7.5
Kankesanturai	31.6	—	23.7	—	71	90	3.2	35.8	+11.2	5	+3	9.4
Katunayake	32.7	—	23.2	—	73	93	4.1	87.6	—	9	—	—
Kurunegala	33.6	−0.2	22.6	+0.4	65	95	4.4	116.3	−53.9	15	+5	—
Maha Illuppallama	33.0	—	21.7	—	65	93	4.0	118.4	—	10	—	8.6
Mannar	31.7	0	24.2	+0.1	74	91	4.4	131.3	+86.9	5	+1	—
Nuwara Eliya	21.8	0	11.3	+3.4	70	75	5.2	118.9	+22.4	11	0	—
Puttalam	32.5	+0.2	23.2	+0.4	74	98	3.6	130.0	+54.1	9	+2	—

METEOROLOGICAL REPORT

March, 1975

Station	Temperature Co. Mean Max.	Depar-ture	Mean Min.	Depar-ture	Humidity% Day	Night	Cloud Amount	Rainfall Amount mm.	Depar-ture	Rain days	Depar-ture	Daily Mean Sunshine hours
Ratmalana	31.1	—	22.9	—	64	84	4.8	193.8	—	15	—	—
Ratnapura	33.0	-0.4	22.3	-0.2	72	95	6.0	225.8	-17.8	17	-1	—
Trincomalee	30.3	+0.4	24.7	-0.1	71	84	3.6	46.5	-1.8	9	+4	9.1
Vavuniya	32.8	—	21.7	—	69	98	4.0	165.9	+103.4	9	+4	—
April, 1975												
Anuradhapura	33.6	+0.3	23.9	+0.3	70	91	5.4	125.5	-61.4	17	+4	—
Badulla	29.2	+0.1	19.5	+0.4	77	95	5.5	216.2	+19.6	19	+2	—
Batticaloa	31.4	+0.3	25.2	+0.3	76	91	5.0	46.2	-26.2	6	-1	8.5
Colombo	31.2	+0.1	23.8	-0.5	79	95	6.1	490.7	+230.9	23	+5	7.3
Diyatalawa	24.9	—0.8	15.9	0	80	97	5.7	251.1	+5.0	23	+5	—
Galle	30.2	+0.1	24.3	-0.5	78	91	6.0	342.1	+89.6	20	+4	—
Hambantota	30.7	-0.2	24 7	0	74	84	5.8	128.8	+19.8	12	+2	7.3
Jaffna	32.9	+0.8	27.3	+0.5	73	85	5.4	36.1	-34.0	9	+2	—
Kandy	30.5	-0.4	21.3	+0.2	77	97	6.2	236.7	+48.5	17	+5	6.8
Kankesanturai	33.6	—	25.9	—	68	89	5.2	28.4	-25.7	7	+3	8.7
Katunayake	32.4	—	23.8	—	76	93	5.8	265.7	—	23	—	—
Kurunegala	32.9	+0.1	23.7	0	73	95	5.8	322.8	+59.7	18	+2	—
Maha Illuppallama	33.5	—	23.2	—	71	93	5.2	264.7	—	16	—	8.4
Mannar	32.3	0	25.3	-0.3	77	91	5.9	116.8	+28.4	15	+7	—
Nuwara Eliya	22.4	+0.5	11.8	+1.8	81	91	6.5	150.4	-3.3	20	+4	—
Puttalam	32.3	+0.4	24.2	-0.3	78	95	5.6	251.5	+113.8	17	+7	—
Ratmalana	31.4	—	23.4	—	67	84	6.3	517.6	—	20	—	—
Ratnapura	33.0	+0.1	23.3	+0.1	80	95	6.3	461.3	+120.7	27	+6	—
Trincomalee	32.7	-0.7	25.9	+0.5	67	80	4.3	18.3	-58.4	4	-3	9.1
Vavuniya	34.1	—	23.6	—	72	98	6.0	166.1	+22.8	14	+3	—

May 1975

Anuradhapura	32.8	+0.1	24.8	+0.2	67	91	5.4	163.3	+63.7	5	-3	—
Badulla	30.6	+0.8	19.2	0	67	92	4.2	22.9	-91.4	7	-4	—
Batticaloa	33.1	+0.7	25.6	+0.1	69	84	5.0	6.9	+24.3	5	0	8.4
Colombo	30.8	+0.2	25.3	0	82	—	6.1	291.8	-54.4	22	-1	6.3
Diyatalawa	26.2	+0.3	16.3	+0.6	73	89	5.3	154.9	+11.9	16	+2	—
Galle	29.6	+0.2	25.9	+0.3	80	86	5.6	180.6	-121.7	20	-1	—
Hambantota	29.7	-0.9	25.4	0	78	84	4.9	318.5	+197.6	7	-5	7.0
Jaffna	31.1	-0.2	27.6	0	79	83	4.4	33.8	-28.9	3	-1	—
Kandy	29.3	-0.5	21.4	0	76	95	5.8	100.6	-89.4	12	+1	7.1
Kankesanturai	33.2	—	27.4	—	70	81	4.6	70.6	-23.4	2	-2	9.5
Katunayake	31.3	—	25.3	—	80	89	6.0	256.8		21	—	—
Kurunegala	31.1	-0.6	24.6	+0.1	75	91	5.6	122.2	-74.4	16	0	—
Maha Illuppallama	32.3	—	24.7	—	72	91	4.8	132.3	—	3	—	9.0
Mannar	31.6	-0.3	27.4	+0.3	78	83	5.4	27.9	-21.4	4	0	—
Nuwara Eliya	20.9	-0.4	13.0	+0.9	83	91	6.2	168.1	-68.6	14	-3	—
Puttalam	31.6	+.2	26.4	+0.4	78	87	5.8	61.0	-37 8	8	-2	—
Ratmalana	30.8	—	25.2	—	69	76	6.2	263.9	—	20	—	—
Ratnapura	31.5	-0.2	23.9	+0.1	79	95	6.6	654.3	160.0	23	-1	—
Trincomalee	35.2	+1.6	26.4	+0.3	58	76	4.4	36.8	-31.0	4	-2	8.7
Vavuniya	33.7	—	24.6	—	68	95	5.7	104.4	-6.6	4	+3	—

ERRATA

The following three diagrams relate to article entitled " Studies on mineralization in some high organic matter content montane soils of the wet zone " by M. W. Thenabadu, F.S.C.P. Kalpage and J. Handawela, which appeared in *Tropical Agriculturist* Vol. cxxx, Nos. 3,4, 1975. These articles were inadvertently omitted in the original publication.

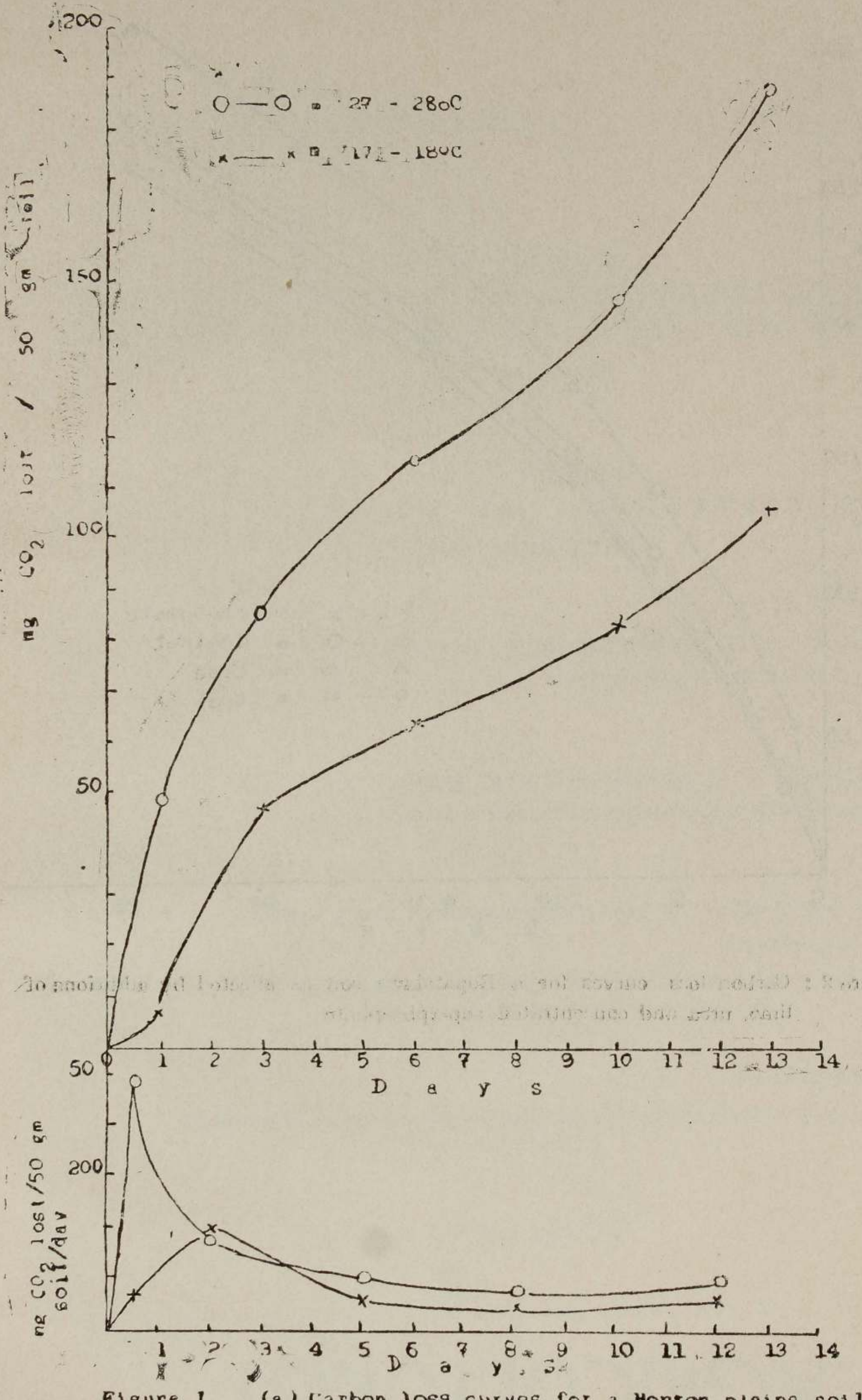

Figure I (a) Carbon loss curves for a Horton plains soil at two temperatures

(b) Rate curves of carbon loss for a Horton plains soil at two temperatures

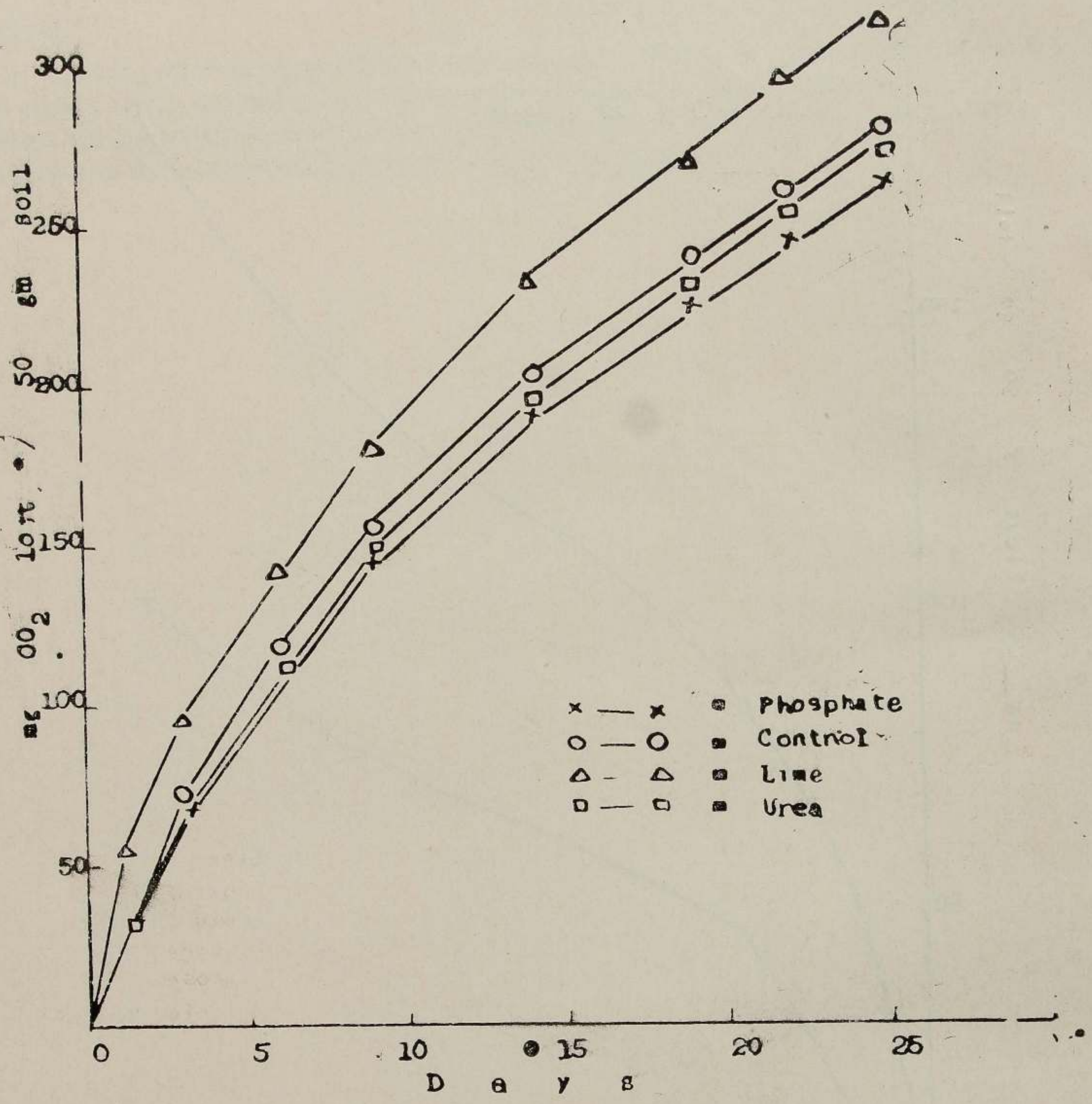

Figure 2 : Carbon loss curves for a Bopatalawa soil as affected by additions of lime, urea and concentrated superphosphate

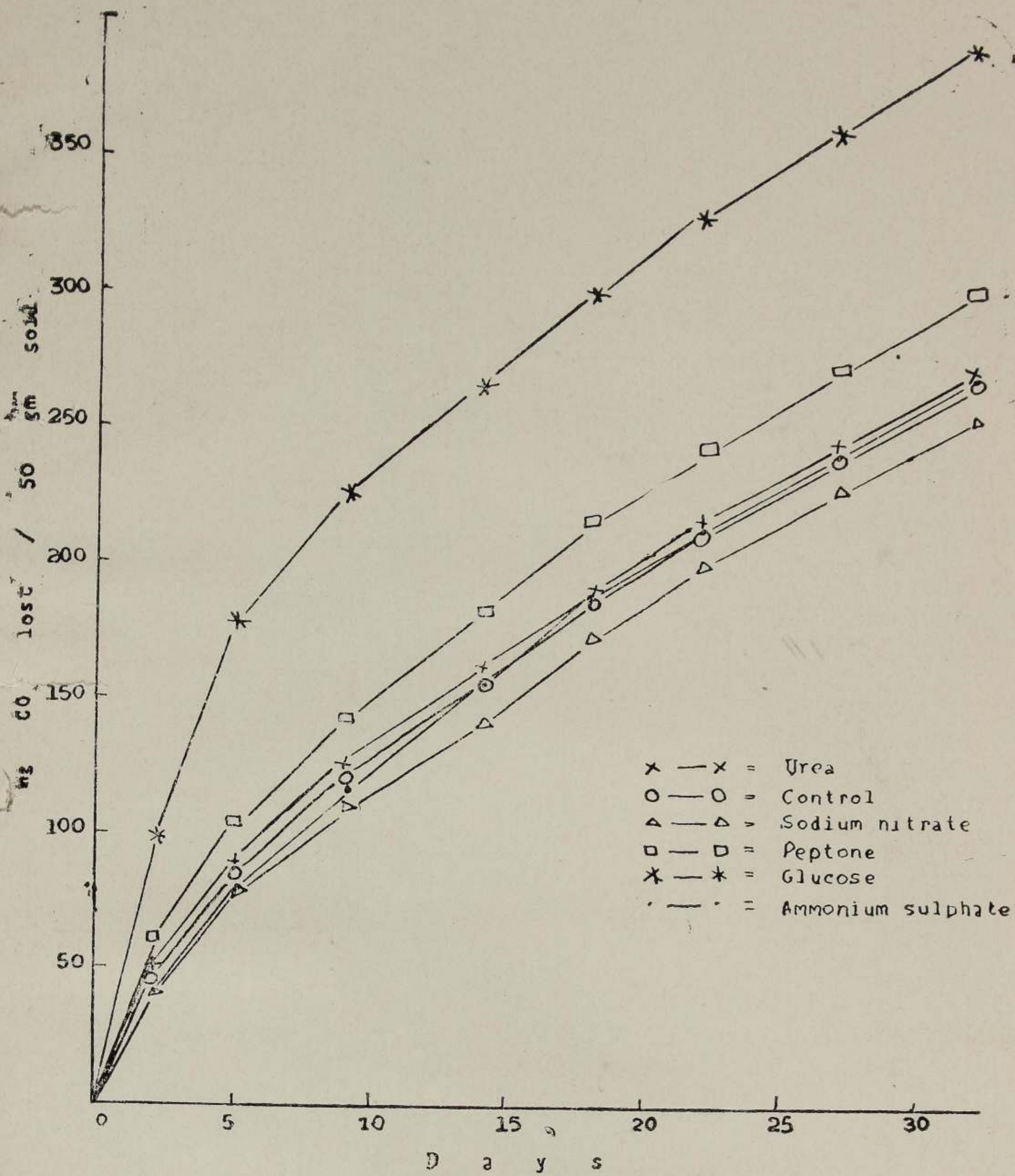

Figure 3 : Carbon loss curves for a Bopatalawa soil as affected by additions of glucose, peptone, urea, ammonium sulphate and sodium nitrate.