

The Impact of High Yielding Varieties of Rice on a Settlement Scheme in Ceylon*

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1. Introduction

Following the discovery of the high yielding varieties (HYV) of foodgrains and their commercial application, a transformation in productive technology has been set in train in a vital area of agriculture. The increase in productivity generated by this technological breakthrough has led to the rapid diffusion of the new practices in certain areas. These changes have opened out the exciting prospect of making substantial profits in farming and the equally significant possibility of converting hitherto non-viable farms into viable ones. The new varieties of traditional foodgrains in particular have touched off a transformation in the growing of crops, and this development could be considered to be the basic factor underlying the so called "green revolution". The "green revolution" has attracted the universal interest of all those concerned, and helped to dispel the conventional wisdom with regard to change and development among farmers of the Third World. Strategies involving high yielding varieties of seeds for agricultural development have been adopted or are under active consideration by governments the world over. This paper examines the concerted efforts by the Government of Sri Lanka towards adopting such a strategy in order to bring about rapid changes in the levels of productivity in the island in general and in settlement schemes in particular. Settlement Schemes¹ have been in existence for over four decades and have had a special significance in the history of alienation and development of crown land in Ceylon, (Ref. 4). At present there are 80 major colonisation schemes covering an area of 304,355 acres of irrigable and unirrigable land (Ref. 2). The average size of holding of paddy (rice) land is 3 acres while that of unirrigable highland is 1.8 acres (Ref. 7). Colonisation schemes have been under constant criticism due to their poor levels of performance. Following the recommendations of the I.B.R.D. in 1966 (Ref. 8), which was particularly critical of the colonisation schemes, a number of remedial measures were suggested. These recommendations which included methods for increasing productivity and economies in the use of irrigation water were introduced on a pilot basis in 1967 within one major colonisation scheme. Encouraged by the success of the pilot project, nine other colonisation schemes

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A short bibliography of references has been listed at the end of this article and citations are embodied in bracketed sections by reference to numbered items in the bibliography.

1. The terms Colonisation Schemes and Settlement Schemes are used synonymously, and refer to government sponsored settlement on crown land in an area away from settlers traditional villages.

were designated "Special Projects"² in the following year. At present there are such projects. The objectives of the "Special Projects" were fundamentally to increase the yield of paddy which is the mainstay of the farming system, encourage the cultivation of other field crops, promote the adoption of improved farm practices and the development of farmer organizations (Ref. 9).

In this study an attempt is made to examine the impact of the agricultural modernization programme on a selected "special project". In this programme high yielding varieties of rice (HYV) formed a vital facet. The economic and social consequences of the improved type of farming using HYV will be identified and analysed on the basis of a comparison of the organization of production and the living standards in the different socio-economic sectors, prior to and after the initiation of the project.

2. Methodology

Any claim to identify changes affecting the production and livelihood of a rural population must be based on situations anterior to the initiation of the project, i.e. introducing HYV. Further, cognizance of the imminent socio-economic changes which had brought about changes in the locality even in the absence of government effort to induce technical advance should be taken into consideration. We are to realistically appraise the impact of HYV. The methodological approach clearly has to be positive and not normative as we are attempting to examine the situation anterior and posterior to the introduction of HYV. The problem of data availability is paramount in such an investigation. A production function approach is limited by the lack of suitable time series data relevant to such an analysis. The period involved is too short to permit the consideration of many variables. The analysis being confined to a few variables defined independently would not be a study in depth of the shifts in the condition and the conduct of rural production. The influence of the alteration of their economies and technological systems on the community life within the matrix of which conditions change and decisions are made could only be achieved through a close scrutiny of the many dimensions of community life. Therefore, the method of investigation had to be shifted to the conventional management survey approach of interviewing a sample of farmers. To obtain information on the impact of HYV on other members of the community a similar survey based on personal interviews was resorted to.

The choice of a "Special Project" for the study was largely determined by several factors, viz., representativeness and the availability of antecedent data. One of the Minipe Colonisation Scheme was selected. A random sample of 55 farmers and also seven non-farmers who resided in the community and derived their livelihood from the farming community was selected for study.

The relevant antecedent information was obtained from official records, interviews with old residents of the locality and the farmers in the sample community. Another very valuable source of antecedent data was the benchmark survey conducted in the locality prior to the establishment of a "Special Project".

2. This concept is analogous to the Intensive Agricultural Development Programme in India which was on a district basis.

(Ref. 5). Detailed questionnaires eliciting information on land holdings, tenure, production technology, expenditure, production, income, labour utilization, marketing, motivations and attitudes, diffusion and adoption of modern technological elements, credit and so on, were administered to the farmers in the sample. The information covered the period 1966/67 to 1970/71.

Great reliance was placed on the ability of farmers to recall the relevant information. However, this would not vitiate the credibility of the data as it concerned paddy cultivation which is the main source of livelihood of the farmers and it would be reasonable to assume that farmers would have a vivid recollection of the operations involved. Every effort was made to minimise the possible sampling and non-sampling errors of the investigation. In this regard the investigating groups familiarity with the locality enabled any inaccuracies to be easily detected and rectified.

3. Factors of Change

Some changes in the levels of production and livelihood of the community had taken place since the inception of the colony in 1941. Some of the more important variables which may have influenced the lives and the livelihoods of the farmers in the colony are, the declining land-man ratios, increasing capital-land ratios, improvements in general communications and the development of farmer organisations such as the co-operatives and cultivation committees. Another important influence was the extension service which existed in the colony from its inception. The milieu of socio-economic and political factors which had existed had not brought about any substantial development of the colony. It was reported in the socio-economic survey conducted in 1967/68 (Ref. 5), that the level of production was 37 bushels per acre, which was below the national average reported (Ref. 3).

The main reorganisation effected in the colonisation schemes designated as "Special Projects" were the intensification of the extension services and the appointment of a resident project manager whose duties were to co-ordinate the activities of the various government departments to ensure a better supply of the required inputs in time and form. A greater effort was made to encourage farmers to innovate. Awareness of the modern farm technology was achieved by demonstrations on farmers fields, distribution of mini-kits³ to farmers, and greater inter-personal communications between farmers and extension agents.

4. Impact on Production

The central feature of the economic change which may be anticipated by the successful introduction of HYV is a jump in productivity. But this could only be achieved and given permanence by radical changes in the organisation of the farm both in terms of resource use and husbandry practices. In this section an attempt is made to examine the changes, if any, which have taken place in the technological elements of production, cultivation techniques, farm reorganization and the levels of production as a consequence of the introduction of HYV of rice.

3. Mini-kits are small bags containing a few HYV of rice with the required complementary inputs. This enabled farmers to grow, observe and select varieties of their own liking.

(a) Changes in the Technological Elements and Cultivation Techniques

The intensification of the extension activity and the methods referred to in creating awareness amongst farmers have indeed had salutary effects. All the farmers in the sample reported having tried out the new HYV (Ref. 1, p. 74). It would be evident from table A1 that the initial resistance shown by farmers towards adopting the new varieties has been circumvented. For instance, while an intermediate HYV, H4, took four years before peak adoption was reported, the adoption of new HYV has exhibited a much shorter time lag. This behaviour of farmers could be attributed to the confidence placed in the new varieties based on past experiences and also to the confidence reposed in the recommendations of the extension personnel. More than 80 per cent of the area under paddy is now cultivated with HYV (Ref. 1, p. 71). A striking feature about the adoption of the new varieties is the large number of new seed varieties that are put to use. It is commonplace to find farmers growing more than one variety on their fields. This has been observed as a method adopted by farmers to hedge against the risk of adopting HYV. This divisibility of risk is indeed a very effective way of spreading a farmer's risk and screening the virtues of the different varieties. Another noteworthy feature was the small extents of traditional varieties which were continued to be grown despite a high level of adoption of HYV. This was to produce rice for domestic consumption since the coarse nature of most of the new varieties make them less desirable. Some farmers had given up the use of certain HYV due to problems of pests and disease (IR-8), poor threshability (Taichung Native-1), and lower yield potential (H-4). It would therefore be clear that farmers go through an informal process of continuous assessment of seed varieties and discriminately select those with preferred characteristics.

With the increase in adoption of HYV there has also been a concomitant increase in the use of complementary inputs and the adoption of improved cultivation techniques. It will be evident from table A2 that an increasing number of farmers have fertilized their crops at the recommended rates, transplanted, used weedicides and pesticides and other innovations after the introduction of the new varieties. It would be evident that a radical reorganisation of farm resources and husbandry practices have taken place in the post HYV period. In fact, 91 per cent of the farmers reported the need for the reorganisation of production (Ref. 1, p. 98).

A greater mechanization of farm operations was also observed (see table A3), in particular, in the ploughing and threshing operations and the usage of sprayers. It may therefore be postulated that there has been a definite shift towards capital intensive technology following the introduction of HYV.

(b) Labour Utilization

The adoption of HYV of rice has not only been capital intensive but also labour intensive. The labour requirements between the ante and post—HYV periods have changed from 51.34 to 68.44 man days (see table A4), which indicates a 31.3 per cent increase in labour use. A new feature of the post-HYV period has been the trimodal pattern in labour requirements vis-a-vis bimodal pattern observed in the pre-HYV period. In the pre-HYV period the peak labour demands were for preparatory tillage (42%) and harvesting (44%), while presently they account for 29 and 39 per cent respectively. A new dimension which has been introduced into the labour utilization

pattern has been the transplanting operation which accounts for approximately 17 per cent of the labour required.

A change in the type of labour employed has also been observed. More family and hired labour and less exchange labour are now employed. A more than 100 per cent increase in the use of hired labour and a 40 per cent decrease in the use of exchange labour has been noted between the ante and post HYV periods. The preference for hired labour vis-a-vis exchange labour may be an attempt to ensure greater punctuality in the operational schedule and to be more self-reliant. Such a development of attitudes could be largely attributed to the greater commercialization of production consequent to the introduction of HYV.

(c) Levels of Production

A significant jump in productivity has been observed after the introduction of HYV. The average yield per acre for the Maha season has increased by 59.8⁴ per cent and the Yala season by 58.8 per cent during the period 1966/67 to 1970/71. This yield increase may be considered phenomenal as the increase in yield observed over the 25 year period 1941-65 was approximately 52 per cent (Ref. 1, p. 113). Yields of less than 30 bushels per acre which were common in the pre-HYV period are virtually non-existent at the present time (see table A5). Further, more than 45 per cent of the farmers report yields greater than 70 bushels per acre at the present time, yields which were non-existent prior to the introduction of HYV. However, the impact of HYV on the levels of production have not been uniform and have exhibited a distribution pattern that one might consider normal, i.e. with a wide range of variation as in the older seed varieties.

Another significant feature was the land augmenting nature of the 'new' technology. Although, the area sown had declined by 18 per cent due to the fragmentation of holdings, the total production and gross returns per farm have increased by 56.49 and 60.13 per cent respectively during the period 1966/67 to 1970/71 (see table A6).

5. Impact on Livelihood

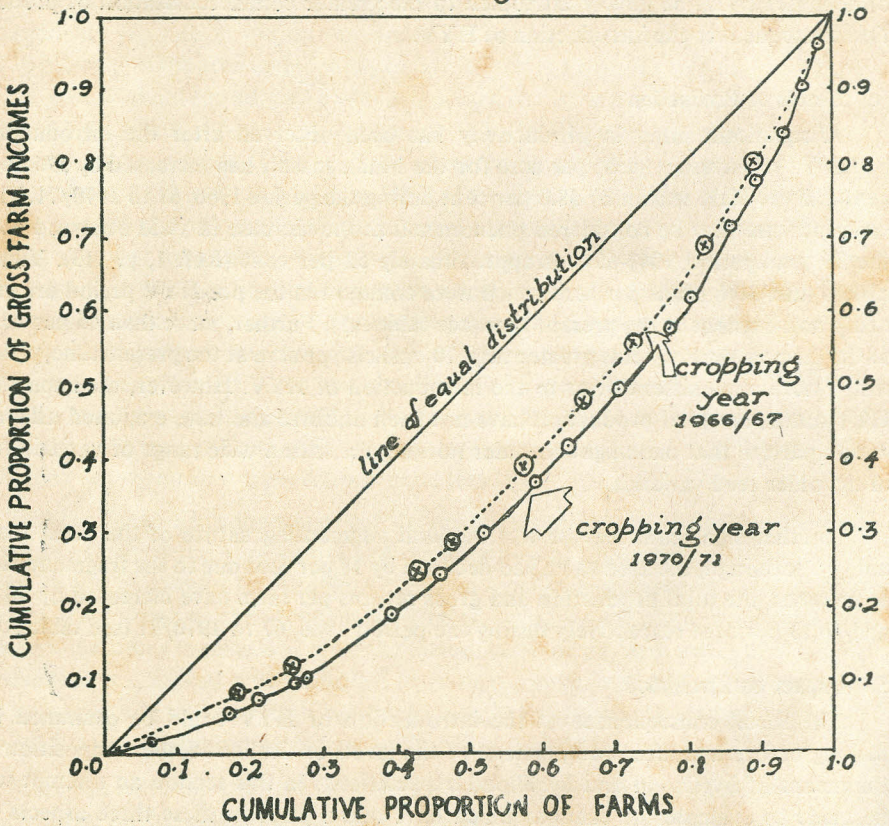
The social consequences of the introduction of HYV could be examined by making before and after comparisons of the levels of livelihood, the composition of the means of livelihood and livelihood expectations. In this section an attempt will be made to evaluate the changes which have taken place in these three aspects of livelihood.

(a) Levels of Livelihood

It may be anticipated that a productivity jump would make the average level of livelihood rise but the effects on different sectors, defined by their form of participation in the productive or distributive process, are bound to show discrepancies, with some groups being more advantageously placed. It will be clear from table A7 that the distribution of gross incomes has widened after the introduction of HYV. The scale of incomes range between a lower limit of Rs. 1001-1500 and an upper limit of

4. These values are 91.9% and 84.6% for the Maha and Yala seasons respectively if the yield figures from the Socio-Economic survey of 1967/68 are used.

Fig. 1 LORENZ CURVE showing distribution of Farm Incomes



Rs. 16,001-16,500. It is evident that in the ante-HYV period the incomes were more clustered and the upper limit was Rs. 11,501-12,000. The benefits of the new varieties have been inequitably distributed with the gap between the rich and poor farmers growing wider. In the ante-HYV period, 26 per cent of the farmers operated below the poverty line,⁵ (Ref. 6), while in the post HYV period this number has been reduced to 16 per cent. A significant feature is the emergence of a 'new elite' amongst the farmers who have achieved an income level much higher than the maximum obtained in the ante-HYV period. This category amounts to as much as 33 per cent of the sample population. These farmers have clearly benefited most by the HYV. The Lorenz Curve depicted in Figure 1 also demonstrates the widening inequality of the income levels. Another noteworthy feature is that farmers with the smallest acreages seem to have benefited least from the "green revolution". No conclusive evidence was available as to the intensity of cultivation between the different land holdings. Considering the high cost of production, it is postulated that the economic position of farmers is decisive for the adoption of the modern farm technology and consequently farmers with very small holdings will not be able to derive the maximum benefits of HYV.

In general 96.4 per cent of the farmers reported that they were better off while none reported being worse off, although 3.64 per cent reported no change. The net income per farm and per acre for the Maha season in the post-HYV period amounts to Rs. 1826.34 and Rs. 512.63 respectively (see table A8). The corresponding figures were Rs. 1269.50 and Rs. 116 in 1967/68 (Ref. 5). Between these two periods the cost of production had increased from Rs. 181.00⁶ to Rs. 482.00. Thus, net income per acre had increased by more than four fold despite the fact that the cost of production had increased appreciably.

The production levels on lands rented were much below those on owner operated farms (see table A9). However, even on these lands the levels of production were significantly better than those reported in the pre-HYV period. Further, the levels of production on lands which were rented on a share-cropping basis were less than those on a fixed rental. This clearly indicates the greater disincentive effect of a share-crop tenurial arrangement. Landlords now provide both seed and fertilizer, while only seed was provided in the pre-HYV period. Despite the additional contributions made by landlords in the post-HYV period, their share of the net income has increased more than proportionately to that of the tenants (see table A10). The net incomes to landlords have increased by 94.4 per cent while that of tenants by 80 per cent between the periods under consideration. Landlords have therefore benefited more than the tenants by the 'new' technology.

Other members of the community such as traders, tractor hire and repair agents etc., have also benefited by the improved technology. An increase in business turnover was reported by them, particularly during the harvesting and immediate post harvest periods. Agricultural labourers also reported more work days and higher wages.

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5. Defined by an income of Rs. 2400 per annum.

6. Figure derived from the socio-economic survey of the Minipe Colonisation Scheme 1967/68. (5).

(b) Means of Livelihood

Paddy cultivation forms the main source of livelihood (see table A11) and constitutes approximately 70 per cent of the farm income. The cultivation of all other crops accounts for only 13.7 per cent, livestock production for 4.77 per cent and off-farm incomes for 12.2 per cent of the average gross income. The means of livelihood shows a slight change under the impact of HYV of rice. In the 1967/68 socio-economic survey (Ref. 5), paddy accounted for 52.5 per cent of the total gross income, other crops 2.7 per cent, livestock production less than 1 per cent and off-farm income 19.8 per cent. It would therefore be clear that the contribution of farm production to total gross farm income has increased in the post-HYV period. A decline in the off-farm income component reflects the ability of farms to be self sustaining under the influence of the new farm technology, particularly the HYV of rice.

It would be evident from table A12 that the marketable surplus of paddy has increased approximately 76 per cent during the period 1966/67 to 1970/71. This increased commercialization of paddy production brought about by the HYV seems to have had spill over effects on other farming activities. The farmers are now more market oriented and have shown an increasing trend towards the diversification of production.

Changes in the consumption of other cereals and the extent to which these cereals were cultivated were also observed. Food crops other than paddy are almost entirely cultivated for domestic consumption and the declining trend observed clearly reflects a change in consumer preference from coarse grains to rice. It is also likely that farmers now prefer to specialize in the production of rice at the expense of the other cereals due to the enhanced opportunities offered by the HYV.

(c) Livelihood Expectations

Livelihood expectations could be affected both by the visible productivity jump and by the increased opportunities brought into view by contact with the ampler ways of life. It will be clear from tables A13 and A14 that, since 1968, there has been an improvement in farm and domestic technology. It may be surmised that the livelihood expectations of farmers have been influenced by the HYV of rice. Impressionistic observation from the data presented in the tabular appendices supported the implications of the statistical data in indicating that the purchase of durable consumer goods such as radios, bicycles, sewing machines etc., have increased in the post-HYV period. This reflects both an improvement in the financial position of farmers as well as their expectations to improve their quality of life.

The farmers were apparently content with their ways of life and were desirous of improving their lot through farming (Ref. 1, p. 146). A noteworthy feature was that the majority of farmers' sons (65.4%) aspired to take to farming with only 14.5 per cent indicating their preference for white collar jobs. This may be attributed to the satisfactory levels of living prevailing in the colony at the present time.

Conclusions

Many changes in the lives and livelihoods of the farmers in the settlement scheme have taken place since the initiation of the agricultural intensification programme in 1968. It would be dubious to attempt to quantify the contribution made by the

different components of the programme using the analytical framework employed. However, it may not be unreasonable to attribute these changes in the main to the HYV of rice, since the other variables influencing production had existed prior to the introduction of the new varieties without influencing production in any tangible way.

A reorganization of production with greater commercialization of both the demand and supply aspects was noted. More capital inputs are used and also some of the traditional husbandry practices have been replaced. The new technology has not only been capital intensive but also labour intensive.

A more than 50 per cent increase in productivity was observed but the benefits were inequitably distributed. Although, the cost of production had increased more than twofold the returns had increased more than proportionately. It is postulated that the economic position of farmers was a decisive factor in determining the scale of benefits that could be derived from the modern farm technology and that the farmers with the smallest acreages have benefited least. The new technology was also found to be land augmenting in nature.

The landlords have benefited more than tenants as a consequence of the improved technology. Other members of the community deriving their livelihood indirectly from farming have also benefited. Less reliance on off-farm incomes and a greater specialization in rice production were observed. Improvements in farm and domestic technology and livelihood expectations in general have also taken place.

We may therefore conclude that HYV of rice have had important economic and social consequences on the community under study. However, the benefits have been inequitably distributed and it is imperative to introduce some policy measures to ensure a better distribution and minimize such disparities in order to avoid the social tensions that could arise as a result of such polarization.

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TABLE A1: Farmers in sample reporting adoption of HYV of Rice

VARIETY	YEAR OF ADOPTION												
	Before		1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
	1960	1960											
Patchaperumal ..	11	3				1							
H4 (1959) ..	2	11	1	16	1	4	5	2	1	1	1		
H8 (1962) ..					1	4	2	14	3	2	1	2	
Taiwan (1966) ..								1	5	2	3	2	1
IR-8 (1968/69) ..										16	12	13	4
IR-262 (1969) ..											2	3	1
BG-11-11 (1970/71) ..												1	32
LD-66 (1970/71) ..													11
MI-273 (1971) ..													3

Note: The years in parentheses represent the year of introduction of the variety.

TABLE A2: The Adoption of Modern Technology in Paddy Cultivation

INNOVATION	YEAR OF ADOPTION										Total No. reporting	Level of Adoption per cent
	1955 and before	1956 to 1960	1961 to 1965	1966	1967	1968	1969	1970 and after				
Tractor Ploughing ..	22	18	8	1		1	2			52	94.5	
Use of Iron Ploughs for Buffalo ploughing ..						2	3	5		11	20.0	
Seed disinfection ..						1				1	1.82	
Row seeding ..							1			1	1.82	
Ordinary Transplanting ..		2	7	6	5	16	5	12		53	96.36	
Row Transplanting ..				1	2	3	1	4		11	20.0	
Use of Recommended Fertilizer Rates ..	1	1	7	2	4	17	8	12		52	94.5	
Use of Irrigation Pump ..					2		1	2		5	9.09	
Row weeders ..					1	1	3	1		3	5.45	
Chemical Weed Control ..			9	2	2	7	8	7		30	54.55	
Use of Insecticides and Fungicides ..		2	10	4	6	16	5	5		51	92.73	
Use of Winnowing Fan ..		4	5	3	3	4	1	1		25	45.45	
Tractor Threshing ..	9	16	9	3	1	6	1	1		45	81.92	
Tractor Transport ..		8	4	2		1		1		17	30.10	
Rice milling ..	16	36	2							54	98.18	

TABLE A3: Use of Agricultural Machinery*

		Farmers No.	Reporting Per cent	Av. No. of days per Reporting Farm per season	Av. Price Per Acre in Rs.	Av. Total Cost per Reporting Farm per season in Rs.	
After HYV	4-Wheel Tractor	..	31	56.36	1.64	50	165
	First Ploughing	..	10	18.18	1.25	35	165.50
	Second Ploughing and Puddling Threshing	..	39	70.91	1.5	30	97.58
Before HYV	4-Wheel Tractor	..	29	52.73	1.30	35	108.30
	First Ploughing	..	9	16.36	1.22	25	87.46
	Second Ploughing and Puddling Threshing	..	34	61.82	1.5	15	69.43
	Use of 2-Wheel Tractors after HYV	..	3	5.45	1.68	50	145
	Use of 2-Wheel Tractors before HYV	..	1	1.82	1	30	30
	Use of Sprayers after HYV	..	40	72.73	2.30	2	11.50
	Use of Sprayers before HYV	..	16	29.09	1.33	1	2.63

*Compiled from data reported for Maha 1970/71.

TABLE A4: Labour Requirements for Paddy Production in man days per acre in pre-HYV and post-HYV Times*

	OPERATION	Family Labour		Hired Labour		Exchange Labour		Total Man Days	
		Pre HYV	Post HYV	Pre HYV	Post HYV	Pre HYV	Post HYV	Pre HYV	Post HYV
Preparatory Tillage	(a) Preparation of bunds & cleaning channels	3.48	3.87	1.51	2.37	1.79	1.83	6.78	8.07
	(b) 1st Ploughing	2.98	3.04	1.60	1.23	1.55	0.72	6.14	5.00
	(c) 2nd Ploughing	2.78	2.27	0.81	0.85	0.75	0.39	4.34	3.51
	(d) Puddling & Levelling	2.60	2.28	0.81	0.91	0.71	0.26	4.12	3.45
	(e) Other	0.31	0.32	—	—	—	—	0.31	0.32
	Sowing	0.78	0.19	—	—	—	—	0.78	0.19
Transplanting	(a) Nursery Prepara- tion	0.01	0.71	—	0.01	—	—	0.01	0.71
	(b) Removal from Nursery	0.08	1.92	—	2.08	—	0.24	0.08	4.24
	(c) Planting Out	0.15	1.31	—	4.51	—	0.37	0.15	6.19
Cultural Operations	Weed Control	1.87	2.96	1.33	3.64	0.57	0.54	3.77	7.14
	Fertilizer Application	0.40	1.18	—	—	—	—	0.40	1.18
	Spraying and Dusting	0.15	0.48	—	0.41	—	—	0.15	0.89
	Irrigation	2.18	2.71	—	—	—	—	2.18	2.70
Harvest & Post Har- vest Operations	Harvesting and Collection	6.27	7.55	2.96	3.83	2.67	1.69	11.91	13.07
	Preparation of Threshing Floor	0.72	0.81	—	—	—	—	0.82	0.81
	Threshing	3.49	4.32	1.26	1.46	0.98	0.59	5.75	6.36
	Winnowing and Bagging	1.94	2.24	0.68	1.11	0.22	0.12	2.84	3.47
	Transport	0.73	0.92	0.08	0.22	—	—	0.81	1.14
	TOTAL	31.03	39.06	11.05	22.63	9.25	6.75	51.34	68.44

*Calculated for the Maha Season 1970/71.

TABLE A5: Paddy Yields per acre 1966/67 to 1970/71

YEAR	DISTRIBUTION OF YIELDS IN BUSHELS PER ACRE									
	Average Yield Bu. per acre	<30	31-40	41-50	51-60	61-70	71-80	81-90	91-100	> 100
1966/67										
Maha ..	44.10*	7.41%	40.74%	31.48%	18.52%	1.85%	—	—	—	—
Yala ..	33.45*	33.33%	61.11%	5.56%	—	—	—	—	—	—
1967/68										
Maha ..	50.92 (14.38%)	1.85%	22.22%	31.48%	29.64%	11.11%	3.70%	—	—	—
Yala ..	36.18 (9.18%)	18.52%	61.11%	16.67%	3.70%	—	—	—	—	—
1968/69										
Maha ..	60.32 (34.42%)	—	14.81%	18.52%	18.52%	27.78%	16.67%	—	1.85%	1.85%
Yala ..	41.38 (23.76%)	9.26%	50.0%	11.11%	11.11%	1.85%	1.85%	—	—	—
1969/70										
Maha*	68.24 (53.42%)	—	5.56%	18.52%	18.52%	18.52%	24.07%	11.11%	5.56%	1.85%
Yala ..	48.37 (43.46%)	3.70%	35.19%	16.67%	16.67%	5.56%	9.26%	—	—	—
1970/71										
Maha ..	70.96 (59.03%)	—	3.70%	12.96%	12.96%	24.07%	27.78%	12.96%	5.56%	—
Yala ..	55.42 (58.84%)	3.70%	24.07%	25.93%	25.93%	14.81%	7.40%	1.85%	1.85%	—

*Indicates the base year on which the percentages have been calculated.

TABLE A6: Total Lowland Paddy Production 1966/67 to 1970/71

	1966/67 (Pre-HYV)		1967/68		1968/69		1969/70		1970/71 (Post-HYV)	
	Maha	Yala	Maha	Yala	Maha	Yala	Maha	Yala	Maha	Yala
Area Sown in Acres	3.60	3.53	3.60	3.56	3.50	3.42	3.46	3.42	3.46	3.38
Amount of Seed used in bushels	7.17	7.06	6.50	6.98	5.07	6.54	4.06	5.89	3.85	5.03
Av. Production per farm in bushels	158.50	118.15	183.87	128.83	210.85	141.57	235.98	165.50	245.51	187.52
Gross Returns in Rs.	2193.52	1655.65	2516.52	1801.37	2914.43	2151.70	3313.19	2294.83	3442.56	2721.30

TABLE A7: Income Strata of Lowland Paddy Cultivators

Income Group in '000 Rs.	Pre-HYV (Cropping Year 1966/67)		Post-HYV (Cropping Year 1970/71)		Acreage
	No.	Percent	No.	Percent	
1,001 — 1,500	3	5.65	1	1.85	1.0
1,501 — 2,000	7	12.96	2	3.70	2.75
2,001 — 2,500	4	7.41	6	11.11	2.0
2,501 — 3,000	9	16.67	2	3.70	1.75
3,001 — 3,500	3	5.56	3	5.56	2.17
3,501 — 4,000	5	9.26	1	1.85	2.50
4,001 — 4,500	4	7.41	6	11.11	2.67
4,501 — 5,000	4	7.41	4	7.41	2.88
5,001 — 5,500	5	9.26	3	5.56	2.67
5,501 — 6,000	4	7.41	4	7.41	3.38
6,001 — 6,500	4	7.41	2	3.70	3.50
6,501 — 7,000	1	1.85	2	3.70	4.00
7,001 — 7,500					
7,501 — 8,000			2	3.70	4.5
8,001 — 8,500			3	5.56	5.0
8,501 — 9,000			2	3.70	4.5
9,501 — 10,000			2	3.70	5.0
10,001 — 10,500			1	1.85	5.0
10,501 — 11,000			2	3.70	5.0
11,001 — 11,500			2	3.70	5.0
11,501 — 12,000	1	1.85	2	3.70	5.0
12,001 — 12,500					
12,501 — 13,000			1	1.85	5.5
" "					
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" "					
16,001 — 16,500			1	1.85	10.0

TABLE A8: Income from Paddy Cultivation—Maha 1970/71

		Value per Farm in Rs.	Value per Acre in Rs.
1.	Gross Income	3,442.55	994.96
2.	(a) Cost of Production (Without imputing a value for family labour)	1,616.21	482.03
	(b) Cost of Production (With imputed cost of family labour)	2,065.52	596.97
3.	Net income under condition (a)	1,826.34	512.93
	Net income under condition (b)	1,281.41	397.99
4.	Net income from a bushel of paddy under condition (a)	Rs. 7.22	
	Net income from a bushel of paddy under condition (b)	Rs. 5.60	

Note: Cost of Production includes only purchased inputs.

TABLE A9: Production on Lands Rented/Leased/Mortgaged 1970/71

			MAHA 1970/71	YALA 1971
1.	Area sown in acres per reporting farm	.. ..	1.94*	2.03*
			2.75†	2.75†
2.	Amount of seed used in bushels per reporting farm	.. ..	2.42*	4.14*
			3.63†	4.75†
3.	Production in bushels per reporting farm	.. ..	108.39*	88.50*
			158.75†	122.50†
4.	Average Yield in Bushels per acre	.. ..	55.87*	43.60*
			57.73†	44.55†
Disposal of Produce				
5.	Seed for next cropping year in bushels	.. ..	4.87*	4.29*
			4.17†	5.00†
6.	Sales per reporting farm in bushels	.. ..	49.83*	38.75*
			156.25†	120.0†
7.	Share to landlord in bushels	.. ..	52.50*	42.39*
	Share to landlord in cash	.. ..	Rs. 225.00†	Rs. 241.67†

Note : * indicates lands rented on a share-cropping basis.

† indicates lands leased or mortgaged.

TABLE A10: Share of Incomes to Landlords/Tenants per acre in Rupees

			Pre-HYV 1966/67	Post-HYV 1970/71
Gross Income	.. ..	..	853.23	1392.10
Tenants Share	.. ..	..	429.11	671.29
Value of Seed Paddy @ Rs. 16/bu.	.. ..	..	68.83	53.01
Value of Fertilizer provided by landlord	.. ..	..	—	19.24
Other charges paid by landlord	.. ..	..	57.57	71.54
NET INCOME TO LANDLORD	.. ..	..	306.72	596.34
NET INCOME TO TENANT*	.. ..	..	125.72	225.99

* The cost of production in the two periods has been assumed to be Rs. 181.00 and Rs. 512.93 respectively in the Pre-HYV and Post-HYV periods.

TABLE A11: Composition of the means of Livelihood for an average Farm—Maha 1970/71

Source of Livelihood	Activities or Enterprises	Av. Gross Income in Rs.	Percentage Share of Total Incomes
1. Crop Production			
Paddy	(a) Lowland Paddy (Ownland)	3442.56	69.29
	(b) Highland Paddy (Chena and Ownland)	213.05	4.29
	Rent Income as a tenant	97.29	1.96
	(Income as a landlord)	24.24	0.49
Other Cereals	Maize and Kurakkan	20.69	0.42
Important			
Subsidiary Crops	Green chillies, Dry chillies, B.onions, R.onions	99.78	2.01
Root Crops	Manioc, Sweet Potatoes and Yams	8.00	0.16
Legumes	Gingelly, Cowpea, Groudnut, Green gram	16.52	0.33
Vegetable Crops	All types	53.45	1.08
Cash Crops	Tobacco	38.18	0.77
Permanent Crops	Murunga, Bannana, Coconut, Mango, Orange	112.05	2.26
2. Livestock Production			
	(a) Egg production	57.28	1.16
	(b) Milk production	79.25	1.60
	(c) Sales of Animals (Neat Cattle, Buffaloes and Poultry)	99.80	2.01
3. Off-Farm Income			
	(a) Transport	52.73	1.06
	(b) Trade	145.45	2.93
	(c) Hiring	238.09	4.79
	(d) Activities involving capital investment	92.73	1.87
	(e) Other occupations	77.27	1.56
Total Average Gross Income		4968.41	100.00

TABLE A12: Disposal of Farm Produced Paddy 1966/67-1970/71

	1966/67		1967/68		1968/69		1969/70		1970/71	
	Maha	Yala	Maha	Yala	Maha	Yala	Maha	Yala	Maha	Yala
Seed for next season in bushels	9.82	9.61	9.91	9.89	9.41	9.30	9.19	8.94	9.26	8.96
Sales in bushels	108.9	72.07	131.57	84.28	157.91	97.26	134.65	111.00	185.04	133.06
Subsistence Requirements in bushels	37.78	35.57	38.69	37.43	41.67	38.49	44.24	41.15	46.07	43.59
Given to Friends and Relatives	—	—	—	—	5.00	—	4.00	4.00	2.00	—

TABLE A13: Changes in Fixed Capital in Farming

Type of Fixed Capital	Purchased or Constructed	Percent of Reporting Farms	Average of All Farms	Before 1960	1961-63	Percent Purchased		1970 and after
						1964-66	1967-69	
Draught Power	Purchased	40.00	2.49	21.82	7.27	5.46	9.09	7.27
	Shared	5.96						
	Inherited	7.27						
Mammoties	Constructed	9.00	3.69	100.0	1.82	1.82	5.46	89.09
	Purchased	80.00						
Wooden Ploughs	Constructed	53.36	1.51	100.0	—	—	27.27	45.46
	Purchased	9.09						
Metal Ploughs	Constructed	5.46	0.51	—	1.82	—	12.73	20.0
	Purchased	27.27						
Disc Harrows	Purchased	7.27	0.07	—	—	1.82	1.82	3.64
Carts	Constructed	5.46	0.09	1.82	1.82	1.82	3.64	—
	Purchased	3.64						
2-Wheel Tractor	Purchased	10.91	0.11	—	—	—	3.64	7.27
4-Wheel Tractor	Purchased	5.46	0.06	—	1.82	—	3.64	—
Crop Sprayers	Purchased	5.46	0.06	—	—	1.82	1.82	1.82
Weeders	Purchased	7.27	0.07	—	—	1.82	5.46	—
Seeders	Purchased	1.82	0.02	—	—	—	1.82	—
Gunny Bags	Purchased	98.18	54.55	PURCHASED ANNUALLY				
Winnowing Fan	Purchased	14.55	14.55	—	—	1.82	9.09	3.64
Irrigation Wells	Constructed	54.55	0.58	34.5	3.64	9.19	9.09	1.82

TABLE A14: Domestic Technology

<i>Item</i>	<i>Percent Reporting at Present</i>	<i>Before 1950 Percent Reporting</i>	<i>1951-60 Percent Reporting</i>	<i>1961-63 Percent Reporting</i>	<i>1964-66 Percent Reporting</i>	<i>1967-69 Percent Reporting</i>	<i>1970 and after Percent Reporting</i>
Sewing Machine	43.64	1.82	18.18	—	7.27	7.27	9.09
Radio	41.82	—	7.27	—	10.91	7.27	16.36
Petrol Lamp	80.00	—	18.18	16.36	23.64	18.18	3.64
Kerosene Cooker	1.82	—	—	—	1.82	—	—
Lanterns	85.66	—	—	—	7.27	20.00	58.18
Wrist Watch or Wall Clock	78.18	1.82	12.73	7.27	16.36	29.09	10.91
Bicycle	34.55	—	—	1.82	10.91	9.09	12.73
Coal or Electric Iron	32.73	—	7.27	5.46	3.64	10.91	5.46
Hand Pump	1.82	—	—	—	—	—	1.82
Automobile	1.82	—	—	—	1.82	—	—

