PROSPECTS FOR EXPANSION IN THE PRODUCTION OF COARSE GRAINS AND GRAIN LEGUMES

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AGRARIAN RESEARCH AND TRAINING INSTITUTE

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A Joint Study of the Agrarian Research and Training Institute and Department of Agriculture

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SRI LANKA

FOREWORD

The world food crisis in the early seventies, accompanied by the increase in oil prices, compelled the developing countries like Sri Lanka to adopt an intensive food drive in the context of which crops like coarse grains and grain legumes received a revived interest. This study on the production and marketing of coarse grains and grain legumes was, therefore, opportune when the ARTI and the Department of Agriculture launched on it as a joint research project in 1976.

A team of researchers from both Institutions worked closely together in the planning and conduct of the field studies. Due to pressures from commitment to other work and transfer of officers, especially among members of the Department of Agriculture, the preparation of the report was somewhat delayed. Ultimately, the report had to be written by the two ARTI members of the original research team: Miss T. Sanmugam, Research & Training Officer, who functioned as the Coordinator of the study, and Mr. S.M.P. Senanayake, Research & Training Officer, who was mainly responsible for the sections on marketing.

The findings of this study provide an understanding of the real situation with regard to the cultivation of these crops which have a potential for expanding production to meet existing demands. It highlights areas for creation of new demands and spells out strategies conducive to promoting further expansion in production.

It is hoped that this report will stimulate thinking on evolving suitable farming systems and in forward planning for production.

T.B. SUBASINGHE
DIRECTOR

22nd July 1982.

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THE AUTHORS

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Chapter One

STATUS OF COARSE GRAINS AND GRAIN LEGUME CROPS IN THE FOOD AND AGRICULTURE OF SRI LANKA

The people of Sri Lanka in ancient times, it is often claimed, consumed a wider range of cereals than at present. Kurakkan and Maize and other millets like meneri, thanahal[1] and sorghum were used as rice substitutes. Greengram and Blackgram and other pulses were also included in the diet. These crops were traditionally cultivated as rainfed chena crops by subsistence level farmers, mainly in the dry zone, and had not been of much importance in the agricultural economy. But gradually the consumption of coarse grains declined in favour of rice, which became the staple food of the people, when rice became freely available through unrestricted imports and increased domestic production.

The operation of the Rice Ration Scheme during the Second World War and thereafter, thus assuring the people of their minimum needs of cereals, and the unrestricted availability of wheat flour and pulses, reduced the need for production of coarse grains and grain legumes locally.

The increasing per capita incomes resulting from the favourable prices for the major exports, and the increased rate of urbanisation experienced during the early fifties also contributed to a shift in demand greatly favouring the softer grains; rice and wheat.

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1 Kurakkan - Finger millet - Eleusive Coracana
Meneri - Pearl millet - Panicum miliaceum
Thanahal - Setaria italica

The technological breakthroughs in rice production, and extension facilities and incentives offerred to paddy farmers over the years, promoted specialisation in paddy farming, as rice became the most familiar and profitable and hence most preferred crop among grains.

1.1 PROGRAMMES AND POLICIES

In the first decade after independence the Food Production Programme of Sri Lanka has mainly geared towards self-sufficiency in rice. All efforts were made to encourage the farmers to grow rice, and more rice. With the increases in rice production through *aseddumisation* of new land, the extent of land devoted for cultivation of other grains and grain legume crops declined.

Subsequent plans for food production programmes, while emphasising self-sufficiency in rice, also promoted and encouraged the production of subsidiary food crops with a view to drastically curtailing, if not eliminating food imports. This stemmed from the recognition of import substitution in subsidiary food crops too as a vital element in the strategy to conserve and utilise the country's meagre foreign exchange sources for development. However, in the choice of the subsidiary food crops for special programmes emphasis was placed on chillies, onions and potatoes till about the mid sixties, the rationale of such selection being, that these crops contributed to a greater proportion of the foreign exchange relating to food imports.

Efforts were however, made during this period to encourage the production of coarse grains and grain legume crops by introducing guaranteed price schemes. Neither these price incentives nor the research efforts towards the evolution of better varieties and better agronomic practice for cultivation produced the desired impact on the production of these crops.

A greater interest was evinced by the State in 1964 and determined efforts made towards the promotion of increased production of coarse grains and pulses. The farmers responded by adopting newer varieties and some improved agronomic practices.

The promotion of cultivation of pulses during *yala* on paddy land which is not normally cultivated during this season due to lack of sufficient water for paddy, was another strategy that was pursued since the late sixties to intensify the use of available land for food production.

The greatest impetus to cultivation of coarse grains and grain legume crops was provided by the drastic reduction of imports of pulses during 1972-1977 and the restriction of the import of wheat flour due to the worldwide wheat flour shortage in 1973 which triggered off the very concerted effort on production of coarse grains, pulses and yams. At this stage, the new improved varieties for maize and pulses that had been evolved by the Maha Illuppalama Research Station were available for use by the farmers.

Rice accounts for about 2/3 rds of the caloric intake in the form of cereals in the average diet of a person in Sri Lanka, while the remaining part is constituted mainly by wheat flour. Wheat flour has secured a stable position in the diet of the people. The consumer demand for wheat flour, apart from its preference due to dietary habits could be attributed to a great extent to the convenience of obtaining it in the form of bread, a convenient pre-cooked form. The restriction on availability of wheat flour in 1973 had its impact on the consumption habits of the people. Yams, kurakkan and sorghum were consumed as alternatives to wheat flour in preference to other grains. Increase in wheat supply through Food Aid and imports, in 1975, affected both consumption and production. The literal trade policies of 1977 further enhanced the local availability of wheat flour, and consumption behaviour reverted to favouring wheat flour.

Consumer habits vary between social groups;contrasts may be noticed between city and rural folks, farm households and other households, between areas and between ethnic groups. But, cereals other than rice wherever consumed in sizeable quantities by any social group (eg. farm households) could generally be considered as mainly a substitute for rice rather than for bread. It is only in the situation where wheat flour becomes scarce that other cereals or yams substitute mainly for

wheat flour, more so for bread, in the national context. *Thus, a programme for substitution for imported wheat flour by locally produced grains could be made effective, by adopting a strategy of substituting for wheat flour as far as permissible in the making of bread, the most widely consumed item, among the wheat flour based foods.*

The Ceylon Institute of Scientific and Industrial Research (CISIR) directed its research efforts towards finding a suitable formula for the problem of substitution for wheat flour in bread. The outcome of its research[1] lead to a decision to replace 10% of wheat flour by sorghum flour in the preparation of bread.

A programme to expand the production of sorghum initiated on an experimental basis in 1969 and expanded thereafter, faced problems connected with procurement of the harvest. Consequently, sorghum production declined and the 'new bread' did not eventually enter the market. Research presently being done at the Soya Food Research Centre at the Central Agricultural Research Institute, Gannoruwa, suggests a bread fortified with soya flour up to 12%, as an answer to partial substitution for wheat flour. Such a loaf of bread, being enriched in protein is likely to lead to improvements in nutritional status.

Pulses have been traditionally consumed and have been an important source of nutrients complementing rice in the diets of the people. They are rich in protein, containing twice as much as the cereals, and the amino acid composition of pulse protein makes a mixed diet of both pulses and cereals of greater nutritional value than a diet of either alone. Animal proteins are expensive and their cost makes it prohibitive to the low income level groups of the population. Pulses

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1 "We worked with a variety of flours, including manioc starch and flour, rice flour, sorghum flour and maize flour and were able to show that wheat flour could be safely substituted to a level of 10% with all the above flours, excluding only kurakkan which was tolerated to a level of 6%" - Ranjana Curtis and Rathy Ponnampalam on Composite Flours, page 95 - CISIR Contribution to Science & Industry - proceeding of the 21st Anniversary Seminar, May 4-6, 1976.

are a cheap source of protein. They have an additional advantage of being acceptable to both the vegetarian and non-vegetarian sections of the community.

Cowpea is an important pulse crop, as it played a revolutionary role in replacing *masoor dhal* [1] in the diets of the people. Its production increased when the imports of the masoor dhal were first restricted and later almost totally banned. The issue of masoor dhal on a ration scheme from 1977 had an impact on the production and consumption of cowpea. The people who had been gradually weaned away from the masoor dhal eating habit were reintroduced to this pulse which was very much liked by them; considered more palatable than cowpea and also because it lent itself to easy and fast cooking. The distribution through a ration scheme, the special feature of the provision of the commodity to the people, could have contributed more than 'availability per se' to its higher consumption and to adverse effects on the production of cowpea. Masoor dhal issues are now being adjusted both quantumwise and timewise to allow a free movement of cowpea in the open market and thereby protect the producer of this crop.

1.2 PROBLEMS OF EXPANSION OF PRODUCTION

Increases in the production of these crops over the years, even during the period of unprecedented expansion were essentially due to increases in cultivated extents. Shifts occur from one subsidiary crop to another between corresponding seasons from year to year on the unirrigated land, as well as on the irrigated lands growing subsidiary crops during *yala* although the fluctuations on irrigated land are unlikely to have much impact on total production.

Cereals and legumes continued to be grown at very low levels of management and the yields were generally poor. There was not much evidence of interest among farmers to produce more of these crops by improving their methods of cultivation, to realise the potential yields of the improved varieties.

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1 A variety of Lentil.

The apathy of the farmers towards intensified cultivation was generally attributed to the *unstable market for these crops.*[1] The major share of the produce was purchased by private traders, and both consumers and farmers were of the opinion that prices were being manipulated at the main wholesale markets and at the assembly markets in the producing areas. Such imperfections in the marketing system adversely affect production.

These grains were consumed as a food prepared direct from the raw produce after splitting the pods and dehusking. Consumption was restricted chiefly to the producing areas. It was presumed by policy makers that a demand for consumption could be created among the urban communities if these products were available in a processed form (eg. kurakkan flour) that would be convenient for preparation of food, and also if adequate knowledge be provided regarding the preparation of food from these products. Maize had a demand beyond the demand for consumption as human food. It was used in the preparation of animal feed.[2] Soya bean and sorghum have been used in the preparation of Thriposha.[3]

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1 Marketing problems were identified as a major constraint for increasing production.

N. Vignarajah - "Grain Legume Production and Research in Sri Lanka" - IAEA Technical Document No. 203 Page 56.

Sheldon W. Williams - "Sri Lanka Soyabean Development Programme Report" - No. 1 Page 2

2 Currently there is a demand for soyabean too in the preparation of animal feed.

3 Thriposha is a supplementary food composed of soyabean, sorghum and wheat/soya blend, which had been introduced through an intervention programme of the Department of Health with the sponsorship of CARE, for upgrading nutritional status of infants, pre-school children and pregnant women/lactating mothers. The composition of Thriposha had varied from time to time and at the time the study was undertaken it consisted of soyabean and sorghum as local cereal inputs, and a preprocessed wheat/soya blend which was imported. The current trend indicates an increasing use of locally grown soya in this programme.

Hence, *a low demand lack of knowledge of food preparations, and non availability of the grains in a form desired by consumers* could be constraints to expand production. Besides, there were other *problems of a technical nature.* Virus on green gram, parrot damage of sorghum, and weevil damage in storage of grain of most crops, were some of the identified problems.

How and to what extent did the known problems affect production and what other factors hindered the expansion of production were questions to which answers had to be sought in framing policies within the existing framework of the general policy of self sufficiency in food, to extend the production of these crops.

Chapter Two

THE STUDY - SCOPE, OBJECTIVES AND PLAN

The study was concerned with the expansion of production of coarse grains and grain legumes within the frame work of import substitution policies. The objectives of the study were to identify and examine major problems that hinder the expansion of domestic production of these crops. The study was undertaken with the following specific objectives in mind:

1 *To ascertain the past trends and present situations in respect of the demand and supply positions;*

2 *To ascertain the potential for expansion of production and identify the specific agronomic and socio-economic factors that promote or adversely affect production;*

3 *To study the processing facilities available at present, ascertain their efficiency of operation and examine their adequacy to meet future demands;*

4 *To study the available marketing channels with a view to evaluating their relative efficiency and the nature of the competition;*

5 *To suggest remedial measures for improvement in the spheres of production, processing and marketing.*

Three principal coarse grains - kurakkan, maize and sorghum and four grain legume crops green gram, blackgram, cowpea and toor dhal were covered by the study. Initially, it was decided to exclude soya bean from this study as detail studies in respect of this legume were to be undertaken under the special projects of the Soyabean

Development Programme[1] of the Ministry of Agriculture and Lands. At a later stage, when it was decided to include soya bean also in the study, the locations for the survey of farmers had been decided upon, and samples of farmers already been selected for the survey. It was therefore only possible to accommodate this crop in the study by including it in the list of crops in respect of which information was sought in the questionnaire.

An exploratory survey was conducted during October-November 1976 in Badulla, Hambantota and Moneragala districts to gather background information relating to the existing levels of production and problems faced by the farmers in the production and marketing of kurakkan, maize, sorghum, cowpea, greengram, blackgram and thanahal and the existing facilities for processing these crops. Using this information, questionnaires were prepared for the main study.

The study consisted of,

1 A survey of farmers in two locations each within the four districts and two locations within the Elahera Project Scheme[2]

2 A survey of traders, wholesalers and millers in the districts where the sample survey of farmers were conducted, and

3 A study of wholesale and retail traders in Colombo

2.1 SURVEY OF FARMERS

Detailed aspects of agronomic and economic factors influencing the stepping-up of production of these crops were examined in the field studies conducted in Hambantota, Anuradhapura, Vavuniya and Badulla districts during Feburary-March 1977. The choice of the districts was guided by the consideration that the district should be a main area for the production of one or more crops covered by the study. Anuradhapura,

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1 UNDP/FAO/INTSOY/Sri Lanka Soya Bean Production Marketing and Distribution Project - 1975
UNICEF/CARE/INTSOY/Sri Lanka Soya Bean Processing and Utilisation Project - 1975

2 See map location of study areas - page 32

a major producing area of kurakkan and cowpea, was also relatively important in the production of maize and sorghum. Badulla was selected as a main maize growing area. Kurakkan was the other crop of some importance in this district. Hambantota was chosen to represent mainly greengram, and also maize and kurakkan. Vavuniya, a predominantly blackgram area was the choice for studying this crop. Toor dhal was not grown on a very large scale at the national level. The studies in the dry zone district specially Anuradhapura were expected to cover this crop too.

The Agricultural Productivity Committee areas (APC)[1] were chosen within each of the four districts; the choice of the APC areas being determined by the relative importance of each in terms of their contribution to the production of the selected main crop in the district. One Krushikarma Viyapthi Sevaka (KVS) area each was chosen from the APC area selected for the survey. Here again, the choice was determined by the relative importance of the area to the production of the main crops.

In addition to the sample of KVS areas chosen according to the above procedure, the command areas of the Mahakanadarawa and Mahawilachchiya bank areas were also included as special domains of study within the Anuradhapura district. These tank areas were two of five schemes covered by the Tank Irrigation Modernisation Project financed by the World Bank. The programme envisaged a significant diversification of the well drained low lands into crops such as maize, sorghum and pulses with a view to optimise the use of the irrigation water as one of its objectives. The need for a study of the demand and marketing aspects of maize and sorghum was observed and it was suggested that ARTI undertake this study along with the Paddy Marketing Board.[2] As the ARTI had intended to conduct a study with a larger coverage of crops as well as areas it was decided to include these two areas in the study.

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1 The APC was the institution that existed at the time of the survey. The Agricultural Service Centre (ASC) is the current institution.

2 Sri Lanka:Appraisal of the Tank Irrigation Modernisation Project.

The Elahera Colonisation Scheme which had been selected as a special project for intensive development since 1967 and had therefore experience of growing field crops other than paddy in the lowlands during the *yala* seasons, was chosen for an extended study conducted during October-November 1977. The two KVS areas that were of relative importance in the cultivation of grain legumes were selected from the Project area for the survey.

Frames of farmers in the selected study areas were prepared by the respective KVSs. The frames provided information on extents of each crop grown by each farmer on lowland, developed highland and chena respectively. The farmers were stratified as growers and nongrowers, a grower being defined as one who grew at least one eighth of an acre of any of the seven crops originally selected for the study. Random samples of the growers were selected from within each KVS area. In the tank command areas random samples were selected independently from each of two strata; the left bank and right bank respectively. The sizes of the samples were determined on the following basis:

1 10% or 30 whichever is more for populations of 500 or a lesser number of growers.

2 50 + 5% of excess population above 500 for populations of more than 500 growers.

However, in the tank areas the maximum sample size for each bank was fixed at 50. The total number of farmers surveyed in some areas were slightly less than the total numbers selected. The selected sample sizes and the effective sample sizes were as follows:

District/ sub-region of district	Area	Selected sample size	Effective sample size
Anuradhapura	Palayakulama KVS area in Thirappane APC area	30	29
	Halmillakulama KVS area in Nochchiyagama APC area	45	43
	Mahakanadarawa Tank area	100	82
	Mahawilachchiya Tank area	86	79
Vavuniya	Chettikulam KVS area in Chettikulam APC area	35	35
	Pavatkulam KVS area in Ulukkulam APC area	30	30
Hambantota	Gonnoruwa KVS area in Weerawila APC area	39	38
	Magama KVS area in Yodakandiya APC area	30	30
Badulla	Mapakadawewa KVS area in Mahiyangana APC area	30	30
	Gemunupura/Tissapura KVS area in Ridimaliyadda APC area	65	65
Elahera Special Project -Polonnaruwa	Attanakadawela KVS	34	31
	Bakamuna KVS	30	27

The information sought in this survey related to,

1 General characteristics of the households
2 Farm structure
3 Crops grown
4 Cultivation practices
5 Preferences for crops
6 Production costs
7 Marketing - Disposal of products (channels, price, transport)
8 Storage
9 Credit
10 Food consumption
11 Income
12 Processing

Interviewing of farmers were done mainly by the Investigators of the ARTI with some assistance from Investigators recruited for this purpose. A special course of training of one weeks duration relating the technical aspects of crop production such as cultural practices, pest and diseases was provided to the Investigators at the Dry Zone Research Station, Maha Illuppalama. This training was in addition to the training of the interviewing, perfection of questionnaires, and other related work. The questionnaire was pretested before it was finalised for use in the study.

The field data collection was closely supervised by the members of the research team,[1] complemented by a few other researchers of the ARTI. The staff of the agricultural extension service in the study areas contributed to the conduct of the survey by identifying the selected respondents, soliciting their participation and in building rapport with them.

2.2 SURVEY OF TRADERS, WHOLESALERS AND MILLERS IN PRODUCING AREAS

Information on marketing and other trade aspects were obtained by interviewing 10-15 traders representing a cross section of traders engaged in marketing and milling activities[2] in each of the four districts in which the farmer surveys were conducted. The Economic Assistants of the Department of Agriculture selected the traders and conducted the interviews, obtaining the required information through a structured questionnaire.

2.3 STUDY OF WHOLESALE AND RETAIL TRADERS IN COLOMBO AND THE SUBURBS

Twenty wholesale and retail traders within Colombo and suburbs were contacted informally through the Secretary. All Ceylon Trade Chamber

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1 The team at the time of the farm survey consisted of 4 Research Officers of the ARTI, and 3 Senior Officers of the Department of Agriculture.

2 The processing equipment in the study locations, were few and they operated mainly on custom basis. The number of millers interviewed were insufficient to make a comprehensive analysis for studying the processing facilities in order to meet the objective No. 3. listed in page 9.

and information on marketing and milling activities obtained through interviews which entailed indepth probing of issues that emerged from the farm surveys, by a member of the research team.

2.4 LIMITATIONS OF THE STUDY

In the selection of study areas it was not possible to cover all the major producing districts in respect of each crop due to limitations of resources. Hence, districts like Monaragala, Kurunegala and Puttalam were excluded. The inclusion of these districts however, would not have altered the general picture in an appreciable manner except in that some crops like sugarcane and groundnut were not captured within the range of competing crops.

The field data of this study was collected on the verge of a general election in 1977. Since then, changes have been effected in trade policies and the domestic prices of commodities as well as the factors of production have varied. Thus the costs of production and incomes in particular, may have also been subject to changes. However, it is felt that the present work adequately represents the costs and income structure as the yields/acre of the commodities and the composition of the input levels of the cultivation have remained almost the same. Therefore, the absolute costs and benefits can be computed from the given data using suitable indices if required.

Chapter Three

CHARACTERISTICS OF THE PHYSICAL AND SOCIAL ENVIRONMENT, AND OF THE FARM HOUSEHOLDS

The main purpose of this chapter is to present profiles of the study areas in terms of some physical and socio-economic characteristics that could either have a direct impact on farm production or by influencing farmer behaviour and attitude have an indirect impact on it. The size and structure of the farm land holding, and other farm assets are discussed in the subsequent chapter.

3.1 AGRO-ECOLOGICAL CONDITIONS

The crops under study are mainly grown under rainfed conditions in the Dry Zone. Reddish Brown earths are the most suitable soils for these crops. Pulse crops could be grown on Low Humic Gley soils too if they are drained well. The land area of Sri Lanka has been classified under 24 different categories based on climatic, soil and topographical characteristics. The areas that are classed as DL_1, IL_2 & IL_3 in this classification have been recommended for the cultivation of these crops.[1] The major characteristics of these agro-ecological regions are indicated in Appendix 1. The study areas identified by their agro-ecological classes are given below:

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1 DL - Dry Low; IL - Intermediate Low; Suffixes denote sub classifications.

District/ Sub-region	Study area[1]	Agro-Ecological class
Anuradhapura	Palayakulama KVS - Thirappane APC	DL_1
	Halmillakulama KVS - Nochchiyagama APC	DL_1
	Mahakanadarawa Tank Command Area	DL_1
	Mahawilachchiya Tank Command Area	DL_1
Vavuniya	Chettikulam KVS - Chettikulam APC	DL_1
	Pavatkulam KVS - Ulukkulam APC	DL_1
Hambantota	Gonnoruwa KVS - Weerawila APC	DL_1, DL_5
	Magama KVS - Yodakandiya APC	DL_5
Badulla	Mapakadawewa KVS - Mahiyangana APC	IL_2
	Gemunupura/Tissapura KVS - Ridimaliyadda APC	IL_2
Elahera Special Project (within the Polonnaruwa district)	Attanakadawala KVS	DL_1
	Bakamuna KVS	DL_1

3.2 SETTLEMENT PATTERNS

The study areas could on the basis of the history of their settlement be classified as either settlements under colonisation schemes or *purana* villages. Apart from Mahakanadarawa, Mahawilachchiya and the Elahera Special Project colonisation schemes which were included in the study for special reasons, Pavatkulam and Gemunupura/Tissapura are also settlements under colonisation schemes. The Pavatkulam KVS area lies mainly within the Pavatkulam Tank Command area.[2] Gemunupura/Tissapura KVS is a settlement within the Nagadipa Colonisation Scheme. The other six study areas are traditional villages.

3.3 ETHNIC GROUPS

Ethnically, the populations of the samples of households from the study areas of Hambantota, the villages of Anuradhapura, the

1 Wherever a KVS area was chosen from within a selected APC area in the district, the APC area is also indicated.

2. 26 of the 30 farmers in the sample were from the Tank Command area.

Mahawilachchiya Tank Command area, and the Elahera Special Project area were entirely Sinhalese.

Mahakanadarawa is a predominantly Sinhalese settlement area, with a few Muslim and Tamil families concentrated in a few tracks. The sample of households from this area consisted of Sinhalese, Muslims and Tamils.[1] Of the two study areas in Vavuniya, Chettikulam was inhabited entirely by Tamils and Pavatkulam by Sinhalese.

3.4 SOCIO-ECONOMIC CHARACTERISTICS - Survey Findings

The discussions that follow are based on the findings from samples of households that cultivated one or more of the crops under study and would therefore relate to households of growers of the crops, and not necessarily to that of all farm households in the area.

Profiles of the study areas are presented in Table 3.1.

3.4.1 Household Size, Sex and Age Composition of the population

The average farm household size varied slightly around 6 persons per household from area to area. Slight deviations from this value were observed in Gonnoruwa where the average household comprised 5 persons and in Palayakulama, Mahakanadarawa, Gemunupura/Tissapura, Pavatkulam and Bakamuna where households were larger, with an average of 7 persons.

The sex ratio of males per 100 females was close to the national average of 106, in most areas. The notable exceptions were Gonnoruwa, Bakamuna and Attanakadawala with comparatively very high ratios of 138, 133 and 123 respectively followed by Mahawilachchiya and Chettikulam with ratios of 119 and 116, and Halmillakulama with a ratio of 98, where males and females were almost equal in number.

In most areas the age-wise distribution of the members of the farm households followed a similar pattern, with 30-40% aged less than 14

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1 75 Sinhalese, 6 Muslims and 1 Tamil.

years, around 21-25% between the ages of 14 and 20, 30-40% in the age group 21-50 years, 4-10% aged 51-65 and less than 4% aged over 65.[1]

The relative preponderence of children (less than 14 years) in Gonnoruwa and Gemunupura/Tissapura (43.4% and 47.8% respectively) with a depression in the youth population aged 14-20 years, and the comparatively smaller proportion of youth in Attanakadawala accompanied by a greater proportion of elders (51 years and over), present deviations from the general pattern.

The potential labour force, defined as the persons comprising the conventional working age group, 14-65 years, was low due to the high proportion of children, in both Gonnoruwa, and Gemunupura/Tissapura forming 56 & 52% respectively of the total population. In the other areas it ranged from 60-69%. (Appendix 2)

3.4.2 Educational background

The age of entry to primary school during the period 1975 to 1977 was 6 years. Hence, the formal educational attainments of the population aged 7 years and above have been considered for evaluating the educational background of the study areas. Those who had been to school and studied in the primary classes (Grades I-V) but were unable to read and write were classified along with those who had no schooling as 'illiterates' for this purpose.

The proportion of illiterates, proportion of persons with G.C.E.(OL) and higher educational qualifications and the peak concentrations in the distribution of the people by their educational qualifications were considered together, in assessing the educational status of the study areas which were broadly categorised as relatively very high, high, fair, low and very low in educational status. (Table 3.1)

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1 The distribution of the population of the Rural sector at the Census of Population 1971 was as follows: less than 15 years - 40.1%; 15-19 years - 10.7%; 20-49 years - 36.6%; 50-64 years - 8.2%; 65 & over - 4.4%.

Pavatkulam[1] and Chettikulam fall at one end of the scale being rated as very high and Mapakadawewa at the other end being classed as very low. The study areas of Elahera and Palayakulama in Anuradhapura could be categorised as high and the settlement schemes of Anuradhapura as low. The remaining areas were considered fair according to the classification.

The study areas, viewed from the educational level of their farmers, generally exhibit a pattern which correspond well with the classification based on the educational attainments of all persons in the household, except in that the farmers of Elahera Project area were at a lower level than the farmers of the area that had been classified as fair.

3.4.3 Activities of the Farm Households

An examination of the major activities of the members of the households indicate that those who were not primarily engaged in any activity that provided an income or profit either directly, or indirectly by contributing to the work of the household, farm or business enterprise, generally formed 35-45% of the population. This group considered as dependents, consisted of students, and the unemployed. In Gemunupura/ Tissapura with its high proportion of children, the dependent group was predominant (55%).

A non-working member deriving an income from any source other than employment would be classified as a dependent, since an activity criterion excluding use of any income criterion was the basis of the classification adopted. However, such instances were rarely observed in the sample. Housewives have been treated as being engaged in an activity that contributes an indirect income to the household and therefore classified as employed.

Students formed almost one third of the population of Gemunupura/ Tissapura. They contributed between 16% to 28% of the population of the

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1 The four households that were outside the colonisation area had a very high percentage of persons who had GCE(OL) or higher qualifications (40.7%). Excluding these households, the colonisation area still fitted the picture described above. Ref. Footnote 2 in Table 3.1.

other areas. The unemployed, who were either invalids or persons who were too young or too old to work, varied between 15-24% of the population from area to area.

The unemployed who were seeking employment were very few and constituted not more than 3% of the population in any area. The highest number of 10 and 6 were reported in Gemunupura/Tissapura and Magama respectively.

The available labour force defined as comprising of persons who were aged 10 and above,[1] and were either employed or studying or were fit and willing to work constituted about 65% of the populations of Gonnoruwa and Gemunupura/Tissapura; the areas with a high proportion of children, and 71-79% in the other areas. The use of a very low age of 10 years in the definition of the available labour force necessarily introduces a fairly large component of students into it. This component however, varied from 14-30% from area to area.

The main occupations of the employed were centred on the household and its farm. Farmers, Helpers in the farm, and Housewives constituted (17-29%), (16-34%) and 17-23%) respectively of the total available labour force. The first two groups comprised (41-58%) while all three groups formed (57-78%) of the population. Non-agricultural occupations were pursued as a main occupation by only a very few in each area. The largest number of white collar workers (8), forming 5% of the available labour force, was observed in Pavatkulam[2] confirming the relatively high educational level observed in the sample from the area. The unemployed seeking employment did not form more than 4% of the labour force in any area.

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1 The lower age limit for employment was taken as 10 years and not 14 years for this analysis as it is not uncommon for children between the ages of 10 and 14 in rural households to involve themselves in farm work or trade or other activities of the household. Four children below the age of 10 years of whom 2 were from Gemunupura/Tissapura were reported as mainly occupied in helping in the household farm and 25 such young children who were students helped in the household farm (11 from Gemunupura/Tissapura). An upper age limit was not specified as even persons aged above 65 years worked in the farm or trade. The too old to work age limit was therefore subjective.

2 Five of the 8 white collar workers were in three households falling outside the colonisation area.

A secondary activity was engaged in by about 40-75% of the available labour force in all areas except in Pavatkulam where the corresponding proportion was 29%. *Secondary activities were mainly household or farm based, in all areas.* A significant contribution as a helper in household work (24.1%) was reported in Chettikulam. As there was no evidence of many trade or other household business activities in this area, the activities mainly relate to the general household work. It is possible that such activities, could have been discounted in other areas and the non-uniformity in reporting had contributed to a seemingly different situation in Chettikulam.

A detailed analysis of the available labour force by both their major and secondary activities provide insights into aspects such as *how many and who of the household members hire out their labour for work in agriculture and likewise, participate in the work of the household farm.*

Supply of Hired Agricultural Labour

It is of interest to note that *very few if any, of the members of the farm households were mainly engaged as agricultural labourers.* The highest number of agricultural labourers reported was in Chettikulam where they formed about 5% of the available labour force.

The secondary activities however indicated that the households of Mapakadawewa, Mahakanadarawa and Mahawilachchiya had hired out a high proportion of their available labour force for work in farms outside their own. Chettikulam, Halmillakulama and Palayakulama too showed evidence of contribution, though of a lesser degree, to labour outside their own farms. It was mostly agricultural operators, and the household farm helpers, and to a lesser extent the housewives who hired their labour as a secondary occupation.

Thus, considering the proportion of persons engaged either mainly or secondarily as agricultural labourers as a crude indicator of the available supply of agricultural labour for work outside the household farm Mahakanadarawa, Mahawilachchiya and Mapakadawewa emerge as areas with a relatively high supply, Chettikulam, Halmillakulama and

and Palayakulama as areas with a lesser supply, Pavatkulam, Gemunupura/ Tissapura and the villages of Hambantota as poor supply areas and the Elahera Project as an area with no labour to spare for work outside the farm. (Table 3.1)

Household Farm Labour

Farmers

In most of the study areas, the total number of persons engaged in farming as a primary activity exceeded the total number of households. In these areas therefore, there were instances of more than one member of the household operating separate holdings constituting the household farm. In contrast, the operation of the farms of some households was dependent on farmers engaged in farming as a secondary activity in Halmillakulama, Chettikulam and Pavatkulam. Such farmers were mainly white collar workers.

More than 70% of the farmers who were primarily agricultural operators in the Elahera Project and the areas of Hambantota did not engage in any secondary activity. In Mahakanadarawa, Mahawilachchiya, Mapakadawewa and Chettikulam farmer participation in secondary activities was very high. In Chettikulam the highest percentage (20%) reported help in household activities as their secondary activity. Even if this activity is discounted, Chettikulam yet falls within the group of areas where farmers' participation in work outside the household farm is high.

Three of the four areas of this group emerged as farm labour surplus areas in a preceding analysis. The fourth area, Chettikulam, along with Halmillakulama and Palayakulama were also considered as surplus areas though with lesser availability of an agricultural labour for off farm work according to this analysis. An examination of the proportions of farmers primarily engaged in farming who hired out their labour in agriculture support the findings of the earlier analysis in that Mahakanadarawa, Mahawilachchiya and Mapakadawewa had surplus labour in their farms. Of the other areas only Halmillakulama indicated a similar availability of labour among farmers, for agricultural work outside their farms.

Farm Helpers

The majority (73-94%) of the farm helpers in the household farm, who regarded this activity as their main occupation did not engage in other activities, except in Mapakadawewa and Chettikulam. If help in household activities, a strong component in Chettikulam, is discounted, this area acquires a greater likeness to the other areas than to Mapakadawewa. *Hiring labour in agriculture outside the household farm was the secondary activity of most of the farm helpers who engage in a secondary activity.*

Additional help in the farm provided by those engaged in other occupations were mainly from housewives who formed 25-40% of the total number of persons helping in the farm. Housewives were almost invariably farm helpers too. 80-90% of those who considered household work as their primary work, were engaged in work in the household farm. In Chettikulam the corresponding proportion was slightly lower (72%).

Students' contribution to work in the farm was noteworthy in Gemunupura/Tissapura. The student farm helpers formed 31% of the total force of farm helpers from the household; 42% of those engaged in helping in the farm as a secondary activity; and 50% of the students in the available labour force.
The necessity for such participation of the very young in this area,[1] could be due to insufficiency of adults for farm work; children constituting almost half the population. The students of Pavatkulam reportedly had not worked in their household farms. Whether this reflects the cause or effect of high educational level of the area, or no need for such additional help or an investigational lapse, needs further examination. Among the other areas, Mapakadawewa, the Elahera Project areas, and Magama had more than 10% of the student labour force for assistance in the farm.

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1 The high participation of students below 10 years too in the household farm work in this area has been already mentioned.

Farm Work Force

The survey does not provide sufficient information to study the labour supply from the household to the farm, in relation to the total work force in the farm, and the demand of the farms at existing levels of management. The foregoing analysis is therefore summarised here focussing attention on some salient characteristics of the supply of labour to the farm from the household.

Farmers engaged in farming either as a main or secondary activity, farm helpers who consider their work as a main activity and housewives who work in the farm, could together be considered as the 'core farm workers' from the households. It was observed that this core group varied between 2.7 to 3.9 per household from area to area (Table 3.1) With additional help provided by other members of the household, the average labour force per household farm for the study areas ranged from 2.9 to 4.5.

Both the 'core group' and the 'total farm work force' were relatively high in the Elahera Special Project area; the colonisation areas with large holdings of lowland as well as other land, and in Magama. In the study areas of Vavuniya where the educational level was very high, the core groups included farmers who were primarily engaged in other occupations. While in Pavatkulam additional help from students and other members was negligible, in Chettikulam a substantial amount of help was drawn from others, with students also contributing. This may be because almost 30% of the housewives in Chettikulam were outside the core group. Students provided additional help in a substantial manner in Gemunupura/Tissapura as the proportion of the adults in the population was low.

The pattern of participation of household members in the work of their own farm therefore, suggests that 3 to 4 adult members of whom generally 2 were males and one a female were regular workers, and other members of the household were drawn in for assistance as and when the necessity arose. The number and category of persons providing help in farms varied from area to area depending on size, age structure of household, and educational and employment status of the individuals.

3.4.4 Household Income

Information on annual income obtained through single-interview surveys is generally considered to suffer from shortcomings due to the reliance on respondent recall and also sensitivity of the respondent to questions on income. In this survey, only the off-farm incomes and gross incomes from livestock were sought directly from the respondents. The gross incomes from each crop grown in the farm were computed, based on the production and average selling price reported by the household. When a farmer had not sold his produce, the average selling price of this crop in the area was used to compute the crop income. Errors due to recall lapses could have played a part in the reporting of information on production, specially when it related to the season prior to the season in which the survey was conducted and in instances where households cultivated many crops on their land holdings. A note on problems encountered in computation of incomes is given in Appendix 3.

Considering both the average annual gross incomes, of households,[1] and the distribution of these incomes the Elahera Project areas and Chettikulam emerged as relatively high income areas: The average incomes of these areas were around Rs. 17,000 to Rs. 19,000. 96.2%, 83.9% and 62.9% of the household of Bakamuna, Attanakadawela and Chettikulam respectively had annual incomes exceeding Rs. 7,000 and hardly any (3% or less) had incomes of Rs. 3,000 or less. Households with incomes of over Rs.20,000 comprised 23% to 38% of all households in these areas.

Gonnoruwa and Magama with average incomes of Rs. 10,000 and Rs.7,000 respectively and about 50-55% of the households having incomes above Rs. 7,000 and about 15% or less, having less than Rs.3,000 could be considered as high income areas. Palakulama with average incomes of about Rs.8,000 and about 45% having income of Rs. 7,000 and above, too would fall into this

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1 Annual Income refers to Income received during *Maha* 76/77 and *Yala* 76 for all study areas excepting the Elahera Project Study areas. For the Elahera Project the reference year covers *Maha* 76/77 and *Yala* 77.

Pavatkulam presented a problem in classification. The overall average income of the area was about Rs. 8,000 and 45% had incomes above Rs. 7,000 and 27% had incomes less than Rs. 3,000. On closer examination it was observed that all four households which fell outside the colonisation area had incomes of more than Rs. 7,000. Excluding these four households the average incomes of the households of the colonisation area was Rs. 6,400 and only 38% of them had incomes of more than Rs. 7,000. Of the other areas, Halmillakulama, Mahakanadarawa and Mahawilachchiya had average incomes of between Rs. 5,000 to Rs. 7,000, Mahawilachchiya differing from the other two with a lesser proportion (15.2%) of households having less than Rs. 3,000. This may partly be explained by the paddy incomes of each household being assigned a constant value; the average value of the area. (Ref. Appendix 3)

As the Pavatkulam KVS is mainly composed of the colonisation area, based on the income status of the colony this area could be classified along with Halmillakulama, Mahakanadarawa and Mahawilachchiya as relatively fair income areas. Gemunupura/Tissapura with an average income of around Rs. 4,000, 37% being less Rs. 3,000, and only 14% having an income more than Rs. 7,000 could be classed as a poor area.

Mapakadawewa would be considered as a very poor area, as the average income was only about Rs. 2,000 and 60% of the households had incomes below this level, 77% incomes less than Rs. 3,000 and only 3% had incomes of more than Rs. 7,000.

Sources of Income

In the three very high income areas, the three high income areas and also the poor income area of Gemunupura/Tissapura a very major share of the total gross income (82-90%) was derived from the household farm. In the colonisation areas of Anuradhapura and Vavuniya and also in Halmillakulama the contribution from the farm varied between 70-80%. Even 42% of the very low average income of Mapakadawewa had been derived from off-farm activities, pointing to low productivity of the farms, and the resulting dependence on off-farm activities for supplementing the low farm incomes.

Off-farm Incomes

The extent of involvement of farm households in non farm activities, (Table 3.1) and the incomes derived from them varied widely between areas.

In the very high income areas of the Elahera Project, only about 35% of the households had off-farm incomes. But the reporting households obtained average incomes of Rs. 8,446 and Rs. 4,611 in Bakamuna and Attanakadawela respectively. Gemming was engaged in by households in both areas and incomes of Rs. 10,000 and Rs. 30,000 from this activity were reported by single households in Attanakadawela and Bakamuna respectively. Hiring carts and tractors in Attanakadawela and hiring buffaloes in Bakamuna too brought in high incomes to the households engaged in these activities. 75-83% of the off-farm incomes in these areas were derived from such activities.

In contrast to these areas there was a greater involvement of households in off-farm activities (71%) in Chettikulam, the other high income area. The average off-farm income per such income earning household was much lower (about Rs. 2,700). Small incomes of less than Rs. 1,000, as well as larger incomes of Rs. 4,000, and above were almost equally frequent. Incomes were mainly derived from agricultural labour, and white collar work which accounted 40% & 24% of the household income respectively. The only income above Rs. 7,000 was reported from a business activity.

In Gonnoruwa a high income area, 42% of the households had incomes from off-farm activity. Such incomes ranged from Rs. 500 to over Rs. 10,000 with the highest concentration in incomes of less than Rs. 1,000 and the average income was Rs. 3,800. The contribution of white collar workers was almost half the total off-farm incomes in the area and households incomes from this source varied from Rs. 4,300 to Rs. 9,300. A pension of Rs. 10,800 was also reported. 63% and 76% of the households in Magama and Palayakulama respectively derived incomes from off-farm activities. The average incomes were around Rs. 1,800 and there was a heavy concentration of incomes of less than Rs. 1,000. Most households

in Magama derived incomes from agricultural labour but a few incomes from tractor hire contributed highly to the average income of the area. Though all major sources contributed equally to the income of Palayakulama there was also evidence of a large proportion of households deriving income from relief work.[1]

In all the four fair income areas a very high proportion of the households derived incomes from off-farm work. The low off-farm incomes of Halmillakulama, Mahakanadarawa and Mahawilachchiya were derived mainly from agricultural labour with non-agricultural labour including relief work also contributing a fair share. Incomes from white collar employment accounted for about one third of the off-farm income of the areas. Hiring carts and sprayers provided incomes ranging from about Rs. 150 to Rs. 1,200, for a few households in Mahakanadarawa and Mahawilachchiya. Though 100% of the households had derived incomes from off-farm activities in Pavatkulam the average off-farm incomes for the area was low; the high income derived from white collar employment accounted for almost half of the off-farm incomes of the area and the colony derived the off-farm income from relief work.

Among the poorer study areas, households with off-farm incomes of more than Rs. 3,000 hardly existed, and the majority of the off-farm income earning households had incomes of less than Rs. 1,000. Only about 45% of the households of Gemunupura/ Tissapura derived incomes from off-farm work. The average income per reporting household was very low and non-agricultural labour including relief work provided the largest share of off-farm income in this area.

Farm incomes

The farm incomes of the very high income areas varied very slightly

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1 Payments made in kind for work provided to farm households as a relief measure, specially during periods of poor cultivation due to climatic conditions. Relief work however was not reported specifically as a secondary activity by households.

from one another. Chettikulam had the highest income of Rs. 16,900 and Attanakadawela and Bakamuna Rs. 14,900 and Rs. 16,000 respectively. Among the high income areas, Gonnoruwa derived the highest average income of Rs. 9,000 from the household farms, and the incomes of the other areas varied between Rs. 5,600 to Rs. 6,400. The fair income areas maintained a similar relative position even in a grouping based only on farm incomes. (Table 3.1) An analysis of the farm incomes by crops is discussed in the next chapter on Farm Characteristics.

3.5 SUMMARY

The foregoing analysis presents a picture of the varied farmer communities cultivating these crops. At one end of the spectrum is a community characterised by very low levels of education, high availability of labour for work outside farm, low opportunity cost for labour and hence very low incomes from both farm, and off-farm work in Mapakadawewa. At the other extreme are the Elahera Project communities with relatively high levels of education earning high incomes from agriculture and also a high opportunity cost for labour in secondary activities such as gemming. Chettikulam lies close to the rich end of the spectrum, while Gemunupura/Tissapura is near the poorer end, and the other communities lie within shifting, locations slightly when viewed from different angles.

An analysis of the characteristics of the household farm in Chapter Four enlarges the picture of each area presenting the features of the agricultural environments in which the crops are cultivated. The behaviourial patterns of the farmers and problems encountered in the production and marketing of the crops are studied in the light of these variations.

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LOCATION OF STUDY AREAS

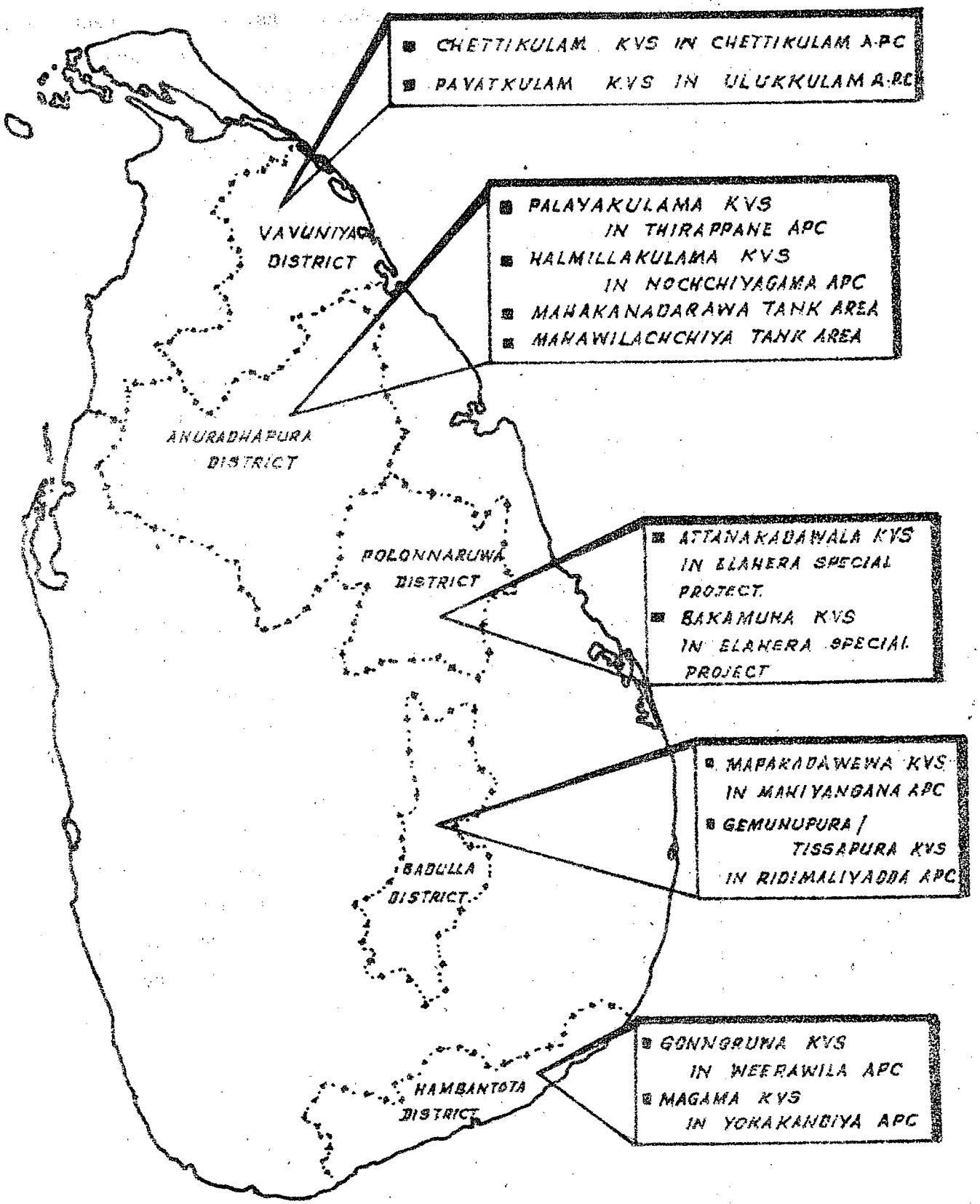

Table 3.1

PROFILES OF STUDY AREAS[1]

DISTRICT	STUDY AREA	SPECIAL GROUPS	DEMOGRAPHIC CHARACTERISTICS				HOUSEHOLD FARM - WORK FORCE FROM THE HOUSEHOLD						HOUSEHOLD ANNUAL GROSS INCOME			
													Farm Income		Off-farm Income	
		Pattern of Settlement	Ethnicity	Size of Household	M/F Ratio	Distribution[2] by age	Level of Education	Average number of workers/household: All Workers	Average number of workers/household: Core Workers	Core workers as a % available labour force	Other characteristics of farm farmers and farm helpers	Supply of Agri.labour for work outside H/h farm	Income status based on average incomes and distribution of income	Percentage of total income	Level of average	Percentage of household deriving income	Main activities contributing to the income
Anuradhapura	Palayakulama	Purana village	Sinhalese	6.9	109	A	Fair	3.8	3.3	65	Household farms operated by full-time farmers, about 40% of whom engaged in secondary activities, student participation in farm work was high.	Fair	High	81	High	66	Agricultural and agricultural labour
	Halmillakulama	Purana village	Sinhalese	5.7	98	A	Fair	3.3	2.9	67	5% of the farms are managed by part-time farmers; full-time farmers only about 1/3 participated in other activities; students involved in farm work to a fair extent.	Fair	Fair	75	Fair	93	Agricultural and non-agricultural labour and relief work
	Mahakanadarawa	Settlement	Sinhalese[4] with a small proportion of Muslims and Tamils	6.6	103	A	Low	3.9	3.4	69	Full-time farmers' involvement in secondary occupations as agricultural or non-agricultural labour is high. Students help in the farm to a fair extent.	High	Fair	69	Poor	87	"
	Mahavilachchiya	Settlement	Sinhalese	6.4	119	A	Low	4.0	3.5	73	Only about a third of the full-time farmers involved in secondary occupations as labourers - students involvement in farming was fair.	High	Fair	80	Fair	92	"
Vavuniya	Chettikulam	Purana village	Tamil	5.9	116	A	Very high	3.5	2.7	59	15% farms managed by part-time farmers, high degree of engagement in secondary activity by the full-time farmers, high student involvement, housewives involvement less than in other areas.	Fair	Very high	90	Very high	71	Agricultural labour and white collar work
	Pavatkulam	Settlement includes a small part of a purana village	Sinhalese	6.7	103	A	Very high	3.6	3.5	70	Part-time farmers operated the farms in the purana villages and the farms in the colony were operated by full-time farmers. About 1/3rd of these farmers of the colony engaged in secondary activities. Students hardly involved in farm work. Many farm helpers are involved in other activities	Poor	Fair	69	Fair	100	Agricultural labour in colony white collar workers in village
Hambantota	Gonnoruwa	Purana village	Sinhalese	5.4	138	Preponderance of children with depression in youth population	Fair	2.9	2.7	77	No part-time farmers; farmers' involvement in secondary activities was low.(20% participated)	Poor	High	87	High	42	White collar work and pension
	Magama	Purana village	Sinhalese	6.1	106	A	Fair	4.4	3.7	77	All full-time farmers averaging 1.37 per household. About 30% had secondary occupation,- student participation was fair.	Poor	High	84	High	63	Agricultural labour
Badulla	Hapakadawewa	Purana village	Sinhalese	6.1	107	A	Very low	3.9	3.3	75	No part-time farmers. Full-time farmers' engagement in secondary occupation as agricultural or non-agricultural labour was very high.	Poor	Very poor	58	Very poor	93	Agricultural labour, non-agricultural labour and relief work
	Gemunupura/ Tissapura	Settlement	Sinhalese	7.0	110	Preponderance of children with depression in youth population	Fair	4.0	2.9	63	Full-time farmers, about 43% of whom engaged in secondary	Poor	Poor	89	Poor	45	Agricultural, non-agricultural labour and relief work
Elahera Project	Attanakadawala	Settlement	Sinhalese	6.2	123	Relatively small proportion of youth with a greater proportion of elders	High	4.2	3.6	74	All full-time farmers, about 1/3 of whom engaged in secondary activities. Students participation was fair.	Very poor	Very high	89	Very high	35	Gemming, Hiring of Carts
	Bakamuna	Settlement	Sinhalese	7.4	133	A	High	4.5	3.9	78	All full-time farmers, about 30% of whom engaged in secondary activities. Involvement of students high.	Very poor	Very high	84	Very high	37	Gemming, Hiring of buffaloes etc.

(1) Scales used are relatives based on the internal evidence of the survey in all instances.

(2) Average distribution: less than 14 yrs 30-40%; 14 to 20 yrs 21-25%; 21 to 50 yrs 30-40%; 51 to 65 yrs 4-10%; above 65 yrs 4%.

Chapter Four

THE FARM[1] - STRUCTURE, LAND USE, ASSETS AND INCOMES

The survey findings in respect of the size, composition, tenurial aspects and pattern of use of the land holdings, other farm assets and farm incomes are analysed in this chapter. The analysis was designed to provide additional dimensions such as land availability, access to farm machinery and implements, tenurial status of farmers, cropping patterns and farm income to the profiles of the study areas. Attention is focussed on farmer behaviour in the use of his land and an attempt made to understand the behaviour. A discussion of the crop preferences indicated by farmers is however deferred, to be considered along with the comparative advantages in growing these crops in Chapter Six. The discussions that follow have been summarised to present character sketches of the farms in the study areas, in Table 4.1.

4.1 COMPOSITION OF THE FARM BY TYPE OF LAND

4.1.1 Availability of lowland

Reflecting the land alienation policies of the colonisation schemes, almost all farmers in the samples[2] from the study areas of the colonisation schemes had access to lowland (Table 4.1). Lowland

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1 The farm relates to a household and not to an individual operator. The 'Household farm' has been defined as the agricultural land holding of the household; ie.all agricultural land owned by the household and land rented/leased in or encroached on by any member of the household for cultivation purposes. The term farmer too is used in this and the succeeding chapters in the sense of a one to one correspondence with the household farm.

2 Only 1 farmer in Mahakanadarawa, 2 in the colony of Pavatkulam and 1 in Gemunupura/Tissapura had no lowland.

formed about 60% of the total extent of the farm holdings of Elahera Project area and between 40 -50% in the other areas.

Among the *purana* villages, with the exception of Mapakadawewa and Gonnoruwa lowland formed 40 -45% of the total farm areas, being available however to a lesser proportion of farmers (70 -85%) in comparison to the areas of the colonisation schemes. Lowland was least available to the farmers of Mapakadawewa and Gonnoruwa, with only a little over 50% of the farmers in each of these areas having access to it, and forming about 30% and 15% respectively of the total farm area.

4.1.2 Unirrigated land[1] and its components

Unirrigated land comprises developed highland and land under *chena* cultivation. *Chena* land formed more than 50% of the operational unirrigated land holdings of farmers in the study areas of the Anuradhapura district (Table 4.1). Pavatkulam presented a similar situation. Chettikulam however differed from the above areas; in that developed highland was the dominant component which accounted for about 80% of the total unirrigated land area.

The importance of *chena* cultivation in the study areas of Hambantota district was indicated. About 75 -78% of the unirrigated land holdings was *chena* land. In Gonnoruwa where lowland was scarce, *chena* land was the predominant component (67%) of the total farm area, and in Magama it claimed a slightly higher share (43.8%) than lowland.

In the areas of the Badulla district, developed highland was more pronounced than *chena* land. The Elahera Special Project areas

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1 The term 'Unirrigated land' is used here in the sense of a contrast to lowland and therefore includes all highland and *chena*. As highland and *chena* are mainly cultivated under rainfed conditions, they have been referred to as unirrigated land. The survey included either whole or part of 8 highland holdings reported as normally cultivated under irrigated conditions, but during *maha* 76/77 part or whole of some of these holdings had been cultivated under rainfed conditions. Therefore, these 8 holdings have been included under 'Unirrigated land' in all the discussions.

stands out as an area where *chena* land formed a negligible component in terms of the total holdings, but formed about 15 -20% of the unirrigated land holdings.

4.2 AVERAGE SIZE OF LAND HOLDINGS

4.2.1 Total land holdings

The average farm sizes varied between 6-15 acres with a concentration around 8 acres among the study areas of the Dry Zone districts (Table 4.1). Chettikulam had the highest average of 15 acres followed by Pavatkulam and Gonnoruwa with 11 acres. The lowest average of 6 acres was recorded in Halmillakulama. In the other areas the holding sizes were about 7-9 acres. The lesser availability of agricultural land to the Intermediate Zone farmers is expressed in the lower average farm sizes of the study areas of Badulla district (Mapakadawewa 6 acres and Gemunupura/Tissapura 4 acres).

The average sizes of the lowland and highland components of the farms in four of the six settlement areas, conform or provide a near approximation to the pattern of allocation of land[1] to the settlers in these areas. While the farmers of Attanakadawela had an average holding which was smaller than the original allocation by 1/2 acre of lowland and 1/2 acre of highland,[2] the farmers of Mahakanadarawa and Pavatkulam[3] reported an average lowland holding with 1 acre more than the allotted holdings.

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1 Elahera Project - 5 acres lowland and 3 acres highland
Mahakanadarawa, Mahawilachchiya and Pavatkulam Tank areas - 3 acres lowland and 2 acres highland.
Nagadipa Colonisation Scheme (Gemunupura/Tissapura) - 2 acres lowland and 1 acre highland.

2 Fragmentation of holdings in Attanakadawela could have resulted from perhaps accommodating a second generation of farmers. Enlargements of lowland holdings in the Mahakanadarawa and Pavatkulam areas could have been achieved by unauthorised leasing arrangements and encroachments of the reservation areas. Though some Mahakanadarawa farmers had explicitly stated having gained control of land through private lease or encroachments, none in Pavatkulam reported such instances. However, as the mode of control of land had not been specified for about 7% of the total extent of lowland in this area, it is possible that this land could have been acquired through lease or encroachments.

3 Though the overall average size of lowland in Pavatkulam was 4.87 acres, the average for the farmers within the settlement area was 4.37 acres.

4.2.2 Unirrigated land holding

Gonnoruwa and Chettikulam in comparison to the other areas had very large unirrigated holdings (Table 4.1). In Gonnoruwa, the average size of the unirrigated holdings with its high *chena* component was 9.6 acres. 79% of the farm holdings were greater than 5 acres and 93% of the land was in these holdings (Table 4.2). 57% of the land was in holdings of more than 10 acres. The distribution of the land by size of holdings in Chettikulam presented a similar picture of concentration on land in large sized holdings, except in that the average size for Chettikulam was smaller being 8.2 acres and the holdings were slightly more dispersed. 52% of the holdings were greater than 5 acres and contained 79% of the total unirrigated land and 54% of the land was in holdings of more than 10 acres.

Though the average size holdings were around 4 to 5 acres in the study areas of Anuradhapura and in Magama, concentrations of holdings were observed in both smaller than average and larger than average size groups.

The holdings of Mapakadawewa showed a peak concentration in the size group of more than 3 to 4 acres, and the average farm size was 3.9 acres. In Gemunupura/Tissapura the holdings were small. 93% of the holdings were less than 3 acres, and about 1/3 were less than 1 acre. The average size of the farm was around 2 acres.

The Elahera Project area being a settlement area with hardly any access to *chena* land, the average unirrigated holding in the areas of this project as expected, centred around 3 acres; the uniform allocation of developed highland in the settlement.

On investigating whether farmers who cultivated only unirrigated land had access to larger extents of this land in comparison to lowland farmers, in order to compensate for lack of lowland, it was found that the converse was true in Chettikulam and Gonnoruwa and there was no appreciable difference between the two groups in the other villages (Table 4.3). The lowland farmers of Chettikulam had a distinct advantage over the others, even in their accessibility to unirrigated highland.

They had on the average 4 acres more than the other farmers. The farmers of pure unirrigated land formed 28.5% of all farmers. In Gonnoruwa too, where as high as 50% of the farmers were without lowland, the lowland farmers had larger holdings of unirrigated land with about 1 acre more than the pure unirrigated land cultivators.

4.3 TENURE OF LAND

The majority of farm households in the colonisation areas of Mahakanadarawa, Mahawilachchiya and the Elahera Special Project reported their land, both lowland and highland as allotments under the Land Development Ordinance. In Mahakanadarawa however, only 59% of the total lowland was reported as L.D.O. lands and 30% of the households with lowland holdings, owned lowland. In Pavatkulam, 67% of the lowland and 79% of the highland were reported as either under Crown lease or land granted under the LDO, and 27% of lowland was solely owned; a little more than half of the owned land being owned by the four households outside the colonisation area. The major share of lowland as well as highland in Gemunupura/Tissapura was under Crown lease.[1]

In the *purana* villages of Anuradhapura and Vavuniya, most of the lowland holdings included solely owned land. 76%, 70% and 68% in Chettikulam, Palayakulama and Halmillakulama respectively. Where highland was concerned, the tenurial pattern differed from one area to another. While Chettikulam exhibited a relatively high degree of ownership (52% of land was owned) around 1/3 of the highland in both Palayakulama and Halmillakulama were encroached land. Land obtained under Crown lease and the LDO schemes were of more importance in Palayakulama than in Halmillakulama. Sole ownership of 23% of land by

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1 A tendency to use the term LDO and Crown lease interchangeably have been observed in most surveys conducted by the ARTI. However, the marked difference observed in the categorisation by the Gemunupura/Tissapura farmers in favour of Crown lease as opposed to LDO in the other colonisation areas could indicate some difference in the conditions of allocation of land.

31% of cultivators was reported in Halmillakulama. Joint ownership was a feature which emerged in Halmillakulama.

A distinguishing feature of the tenurial aspects in the areas of the Hambantota district is the high prevalance of lease or renting of private land. Lowland under private lease or rent was a very significant component (64%) of all lowland in Magama and though less significant, yet formed the highest proportion (32%) in Gonnoruwa. In both these areas about 20% of the lowland was solely owned. Land under Crown lease and encroachment formed 26% and 11% of the land in Gonnoruwa.

Highland under private lease contributed about one fourth of the total highland in Magama. Slightly more than 1/3 of the highland was solely owned. In contrast encroached land was the major component (43%) of the highland followed by land under Crown lease (32%) in Gonnoruwa. Joint ownership of 15% of the highland was observed in Gonnoruwa. The only other area where joint ownership was reported was Halmillakulama.

The tenurial pattern of lowland in Mapakadawewa accentuates the low availability of lowland to highland farmers in the area. 36% of the total of 53.5 acres cultivated by 17 households (50% of the sample) was owned by 3 households. Encroached land cultivated by 6 of the 17 households contributed a fair proportion (23%) of the total lowland area. In highlands too, encroached land accounted for about 1/4th of the total land area. Land under Crown lease and LDO schemes were more prevalent forming 36% and 31% respectively of the land.

The entire *chena* land was reported as encroachments in all areas except Magama, where 23% of the *chena* land was reported as having been obtained land under Crown lease.

4.4 LAND USE

In all study areas, with the exception of the Elahera Project, the crops under study were grown only on highland and *chena*. As already indicated in Chapter Two, the Elahera Project area was selected mainly to study the cultivation of coarse grains and grain legume crops under irrigated conditions in lowland during *yala*. Information relating to

crops grown was collected in respect of *yala* '76 and *maha* 76/77 for the main study, and in respect of *maha* 76/77 and *yala* 77 for the main study, and in respect of *maha* 76/77 and *yala* 77 for the extended study in Elahera. Cultivation in the highlands and *chena* were almost entirely under rainfed conditions.[1]

4.4.1 Cropping of lowland

Lowland cultivation was mainly confined to the *maha* season in most of the study areas (Table 4.1). It was only in the Elahera Project area that the available lowland was cultivated extensively both in *maha* lowland was cultivated extensively both in *maha* 76/77 and *yala* 77. Among the other colonisation areas Gemunupura/Tissapura had a very high cropping intensity of 93% and Mahawilachchiya an intensity of 74.4% during *maha* 76/77. Cultivation was extremely poor in Pavatkulam during both *maha* and *yala*. (Cropping intensities of 6% and 5% respectively). The survey data in respect of Mahakanadarawa presented a picture of very poor levels of cultivation during both seasons. The situation may have been little better in *maha* 76/77 than what was depicted by the survey data.[2]

In Chettikulam where the lowland holdings were large in comparison to all areas and was mainly cultivated under rainfed conditions, there was a high degree of non-utilisation of land (63%) even during *maha*. There was hardly any cultivation in *yala*. Both in Gonnoruwa and Mapakadawewa the small extents available were utilised very highly during *maha*. In *yala*, there was a fair utilisation of the land in Mapakadawewa.

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1 Though 8 farmers (Mahawilachchiya 2, Pavatkulam 1, Chettikulam 1, Gemunupura/Tissapura 1, Attanakadawela 1 and Bakamuna 2) reported irrigated highland in their holdings, only 5 farmers reported cultivating either the whole or part of these lands under irrigation during *maha* 76/77. Of the others, the holding at Gemunupura/Tissapura was cultivated under rainfed conditions while the rest were not cultivated. During the *yala* season only two of these farmers reported cultivation under irrigated conditions.

2 Refer footnote 4 of Table 4.1.

4.4.2 Cropping of unirrigated land

During *maha* 76/77 with the exception of Elahera, 70-90% of the total available land had been cultivated with annual and seasonal crops.[1] The cropping intensity in Elahera was around 47% (Table 4.4). Around 1/4th of the total available land was cultivated during *yala* '76 in the study areas of Anuradhapura and Vavuniya but the percentage of farmers who cultivated during the season varied widely between 37% at Chettikulam to 74% in Halmillakulama (Appendix Table 21). There was very little cultivation in the Badulla and Hambantota districts during *yala* '76. The cultivated land in Gonnoruwa (11%) and Gemunupura/ Tissapura (7%) were shared by 50% and 22% of the farmers respectively. The situation in Elahera during *yala* '77 was similar to that of the areas of Badulla and Hambantota during *yala* '76. Cropping intensities in Attanakadawala and Bakamuna were 1.7% and 12.5% respectively.But 22% of the farmers in Bakamuna had cultivated during *yala*.

Developed Highland

The developed highland area was cropped extent-wise to an intensity of at least 75% of the available land only in Chettikulam, Mapakadawewa and Gemunupura/Tissapura, and that too only in *maha* (Table 4.1). Pavatkulam had the next highest cropping intensity of 64.5%, in *maha*.

In the study areas of Anuradhapura, Hambantota and the Elahera Project, developed highland was underutilised. Even in maha not more than 50% of the land area was cropped with annual or seasonal crops.[2] *A fact that is noteworthy for later discussion is the under utilisation of highland in the Mahakanadarawa, Mahawilachchiya and the Elahera Special Project areas, and to a lesser extent in Pavatkulam too; all settlement areas in which highland formed on integral part of the land alienated to settlers for development.*

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1 The cropping intensities and extents discussed under this section and the next, refer to cropping of annual and seasonal crops. Part of the developed highland could well be underperennial crops and therefore utilised.

2 There was no evidence of the entirety or even half the remaining area being under perennial crops.

Chena land

The *chena* form of cultivation is more prevalent and is dominantingly so in most areas is borne out by the fact that available *chena* land is utilised to a much greater extent than highland. Cropping intensities of *chena* land in *maha* is more than 90%,[1] (exception being Attanakadawela in the Elahera Project area). Even in *yala* when cultivation was at a low key there had generally been a greater utilisation of *chena* land in comparison to highland.

A comparison of the ratio of cultivated extents of *chena* land to highland, with the corresponding ratio of available land, indicates the relative importance of *chena* cultivation in each area (Table 4.4). It is once again evident that *chena* land plays a very prominent role in the cultivation of unirrigated lands in the Hambantota district and a role of a lesser prominance in Anuradhapura and in Pavatkulam. It is of interest to note that in areas where developed highland cultivation was dominant, the ratios were almost equal reflecting the stable nature of the highland cultivation in these areas.

4.4.3 Crops Grown

Mixed cultivation

A special feature of cultivation has to be considered, in studying the pattern of diversifying the use of unirrigated land. It is a *customary practice to grow more than one crop* on a plot of land, not necessarily in isolated portions, but *spread over the entire plot.* This practice has been long established specially in the cultivation of *chena* lands. It had been observed that maize was very rarely grown as a mono crop in some areas. The advantage of the height of the maize plant, facilitating harvesting operations and also providing shade for other crops which thrive better under shade, is exploited in this method of mixed cultivation. Chilli plants under maize, with other crops such as

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1 The reported extents of the available *chena* holdings, which are mostly encroachments, would relate closely to what the farmers usually cultivated or had planned to cultivate during *maha.* This partly explains the high cropping intensities on these lands.

kurakkan and vegetables grown on the same plot, was a common sight in Mahiyangana and other areas of the Badulla district.

This practice was not reported in Palayakulama, Pavatkulama and in Elahera Project areas (Table 4.1). Among the reported areas it was least prevalent among the farmers of the colonisation areas in the Dry Zone and also Halmillakulama, and Gonnoruwa. Though about 40-50% of the farmers in the other areas of Anuradhapura, Vavuniya and Hambantota engaged in this practice, the extents involved in comparison to the total extent cultivated was not very large. Mixed cultivation was of sufficient importance in the areas of the Intermediate Zone, where concentration was on maize cultivation.

Crop Adoption Indicators

Crop adoption or selectivity, indexes could be based on farmers growing the crops, and extents of land devoted to the crop. These crop adoption indicators would partially reflect the suitability of each crop to the physical environment and also the socio-economic levels of the farmers.

The phenomenon of mixed cultivation presented problems in ascertaining the extents of land devoted to each crop. The farmers were requested for information on the amount of seed used in respect of each crop on their mixed cropped holdings and the seed rates usually adopted by them.[1] Based on this information the hypothetical acreage for each crop grown on the mixed holding was computed, and the total physical area of the holding was apportioned in proportion to the hypothetical acreages.

The Crop Adoption Indicators, one based on proportions of farm households growing the crops, and the other on extents cultivated under each crop, exhibited a pattern specific to area, season and type of land.

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1 It was observed that a very few small holdings with more than two or three crops may also have been treated as mixed holdings whenever the farmer was unable to report the acreage under each crop.

The discussions that follow relate to the cropping patterns of the study areas during *maha* and *yala*, and have been summarised in Table 4.1, depicting crops grown by 30% or more of the farmers as the main crops of the area and ranking them according to their contribution to the total cultivated land area.

Maha season

In the *Anuradhapura District, cowpea was the* most widely grown crop in the *developed highland*, claiming about 20-50% of the cultivated extents in the study areas. It was cultivated in 75-80% of the highland holdings of the settlement areas, and about 40% of the holdings in the villages. Manioc too was grown as extensively as cowpea in Halmillakulama and Mahakanadarawa, by about 40% of the highland households. Chilli was equally important as cowpea in Palayakulama and manioc followed them. Maize followed either Chilli or Manioc in all these areas, but figured as the second most widely adopted crop in Mahawilachchiya. Kurakkan though of less importance than maize extentwise, was grown by 13-26% of the farmers in the different areas. Manioc which was grown widely during the period immediately following world flour shortage is not of much economic significance in the farms. Discounting this crop, *chilli appeared to be the major competitive crop of cowpea in the highlands.*

Kurakkan, chilli and maize were the main crops of the chena lands of this district with chilli having pride of place in Halmillakulama, the traditional area for chilli, kurakkan in Palayakulama and Mahakanadarawa, and maize in Mahawilachchiya. Cowpea came fourth in all areas and was cultivated by 52-60% of the *chena* households and covered 12-15% of the total cultivated area. Blackgram gained the attention of the *chena* cultivating households and claimed an equal amount of land as cowpea in Mahakanadarawa. 25% of the households in Mahawilachchiya grew vegetables.

The overall picture of crop adoption in Anuradhapura district was coloured more by the *chena* land utilisation pattern in Anuradhapura as this form of cultivation was more pronounced than cultivation on developed highland in this district. The *main crops of the unirrigated land in this district during maha were kurakkan, chilli, maize and cowpea;* chilli being dominant in Halmillakulama. A large percentage of households (more than 60%) cultivated each of the four crops in all areas.

The *Vavuniya district* stands out as an overwhelmingly *blackgram area.* All farm households in Chettikulam and 97% in Pavatkulam had grown blackgram during *maha* 1976/77; 80% and 74% of the total cultivated land respectively had been under this crop. *Blackgram was the most popular and widely grown crop both in the developed highlands and in chena.* The average crop holding was 6.0 acres ranging from 1-22 acres in Chettikulam and 4 acres ranging from 2.5 to 19 acres in Pavatkulam. Greengram was grown by about 45% of the farm households in Chettikulam and cowpea by 50-66%, in both areas. But these crops claimed extremely small proportions of the total land area. *Kurakkan* is another crop that was grown by more than 50% of the farmers in both areas, but its coverage of land *was noteworthy only in respect of the chena lands.*

Judging by the proportion of highland farmers growing the crop, *maize, greengram, and vegetables in both areas, cowpea in Gonnoruwa and chilli in Magama were the important crops in the developed highlands of Hambantota. Extentwise* however, *kurakkan and cotton in Gonnoruwa, greengram and chilli* and to a lesser degree vegetables, *in Magama emerged as the important crops in the developed highland.* Thus, greengram and chilli unequivocally were the important crops of the highlands of Magama and in Gonnoruwa, kurakkan, cotton were important areawise.

Almost *all chena households (91.7%) in Gonnoruwa cultivated cotton* on extents averaging around 3 acres per crop holding, *and cotton extentwise too was the predominant crop.* Chilli was grown by a fairly large proportion of the households in this area and ranked along with kurakkan as the second most important crop extentwise. *Chilli was the most widely adopted crop in the chena lands of Magama* with all *chena* farm households growing it in average holdings of 1.6 acres and the crop claiming nearly half the total cultivated land. *Kurakkan and greengram were the other widely grown crops in Magama.* Though maize and cowpea were also grown by a fairly large proportion of farmers in both areas, these crops did not contribute substantially to the total extents cultivated. A similar situation prevailed in respect of greengram in Gonnoruwa.

In Hambantota too as in Anuradhapura the overall picture is impressed by the *chena* land situation. Cotton and chilli emerged as the most important crops of Gonnoruwa and Magama respectively chilli and kurakkan in Gonnoruwa and greengram and kurakkan in Magama were also of sufficient importance.

Maize was the most popular and widely grown crop in both the highland and chena lands of the study areas in Badulla. Cowpea was next in importance to maize in the highlands of Gemunupura/Tissapura. Paddy occupied a fair extent of the highlands ranking next to maize in Mapakadawewa. Though manioc was grown by about 40% of the highland households in both areas, this crop did not figure as an important crop extentwise. Greengram and vegetables in both areas, and chillies in Gemunupura/Tissapura were also grown by a fair proportion of the farmers though here again their contribution to the total cultivated extent were small.

Next to maize, kurakkan was the most popular crop among the chena farmers of both areas and also claimed the next highest portion of land though to a very much lower extent. Greengram was popular with the farmers of Mapakadawewa, though large extents of land were not devoted to these crops. *Me*[1] was also grown by a fair proportion of *chena* farms in both areas. Highland being the dominant component of land in the study areas of Badulla the cropping patterns in these areas were influenced more by the patterns prevailing in the highlands. *Maize was outstandingly the main crop of the area.*

Chena farming was of not much significance in the *Elahera Project area* and did not warrant a separate analysis. *The highland cropping patterns indicate cowpea to be the most popular and widely grown crop in both study areas.* Maize, manioc and gingelly were also grown by a fair proportion of farms in both study areas; chilli in Attanakadawala and groundnuts in Bakamuna too were fairly popular. For the entire unirrigated land, cowpea stood out as the most popular and widely grown crop in both areas, though extentwise paddy was also equally important in Bakamuna. Chilli in Attanakadawela and gingelly in both areas also seemed fairly important among the crops grown.

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1 Lima bean.

The picture presented by the survey findings though not very similar to what is depicted by the available district level statistics on extents of land cultivated under each crop during *maha* 76/77, was in close agreement in respect of at least the most extensively grown crops of the different areas. The survey areas of Vavuniya however, did not reflect much cultivation of groundnut which according to the district statistics was the extensively grown crop next to Blackgram during the season.

Yala Season

Highland and *chena* cultivation during the *yala* season was very restricted in almost all areas, more so in Badulla and Hambantota (Table 4.4). Even those farmers who cultivated, concentrated only on a few crops.

Gingelly was the most important yala crop in all the study areas of the Anuradhapura district. This crop was slightly favoured in the highlands of Palayakulama. Cowpea was also grown by a few farm households in the other areas.

In Vavuniya, gingelly was the only crop grown in the chena land and almost exclusively the crop on highland. It is of interest to note that blackgram was not grown during *yala*.

Meneri was the crop of importance in the chena lands of Gonnoruwa. The number of farmers, and extents cultivated during *yala* in the highlands of Gonnoruwa, and in the unirrigated lands of Magama were far too small to base any observations regarding the relative importance of crops.

The extent of cultivation during *yala* in *Badulla* was extremely low so that the question of what was the main crop did not arise. However, the option of all or most of those who cultivated, was for gingelly.

In the Elahera Project area there was no cultivation on *chena* land and hardly any on highland during *yala*. Grain legumes and other field crops were cultivated along with paddy on the lowlands. *A noteworthy feature is that almost all farmers in both study areas cultivated paddy; devoting, about half the total lowland to this crop. This is of relevance to the policy of promoting the cultivation of subsidiary food crops, specially pulses in the paddy fields during yala. Among the subsidiary food crops, chilli was the crop mostly favoured by the farmers. It also occupied the largest portion of the land besides paddy, in both areas.*

The study areas of Anuradhapura and Elahera Project area reflect the pattern that prevailed at the district level.

4.4.4 Crops' Contribution to Farm Income

The gross incomes from each crop grown in the farm were obtained as indicated in Chapter Three,[1] and it may be recalled that paddy incomes of most households in Mahakanadarawa, Mahawilachchiya and the Elahera Project were imputed values based on the average of values reported for the area. However, this is not likely to seriously affect the magnitude of the averages.

Table 4.5 sets out the composition of the farm incomes, by paddy, coarse grains and grain legumes, other crops and livestock. The gross annual farm incomes during the relevant reference periods of the study areas varied between Rs. 1,215/- and Rs. 16,868/-.

The farm incomes of the areas categorised as very high income areas were also relatively very high, and varied slightly from one another.[2] The two areas of the Elahera Project derived 60% of its gross farm income from paddy and another 30% from crops other than coarse grains and grain legumes, mainly chilli. Coarse cereals and pulses,

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1 Household Income - page 27, and Appendix 3.

2 Chapter Three, Farm Incomes page 30.

mainly blackgram, contributed to half the income of the Chettikulam farms and paddy contributed about 37% of the income.

A very wide gap was observed between the group of very high income areas, and the next group, Gonnoruwa, Magama and Palayakulama - in the magnitudes of farm incomes. The latter group had incomes ranging from Rs. 6379/- to Rs. 8962/-. It was cotton, that mostly contributed to the gross farm incomes of Gonnoruwa. In Magama too, cotton provided a fair contribution being next to paddy which accounted for 46% of the farm incomes of the area. Palayakulama resembled the other areas in Anuradhapura, where paddy, coarse cereals, cowpea and chilli figured as important contributors to the farm income.

In Halmillakulama chilli emerged as a main contributor to the farm income blackgram provided the largest share of the incomes of Pavatkulam. Rice cultivation was of very poor coverage in this area during the reference period, and therefore contributed only about 1/5th of the total farm income.

Paddy provided the main share of the poor or very poor incomes of the farmers in the study areas of Badulla.

Thus paddy was either the main or a significant provider of the farm gross income in almost all areas, - Gonnoruwa and Pavatkulam providing the exceptions. In Pavatkulam cultivation of paddy was of very poor coverage during the reference period and in Gonnoruwa cotton accounted for about 60% of the farm income.

It is noteworthy that while average household incomes from coarse grains and grain legumes varied between about Rs. 900/- to Rs. 1,900/- in the areas of Anuradhpura and Hambantota in the Dry Zone and between Rs. 324/- to Rs. 475/- in the areas of Badulla, the farmers of Chettikulam and Pavatkulam gained very high incomes of Rs. 8,930/- and Rs. 3,847/- respectively from these crops mainly due to blackgram cultivation. The Elahera households derived only about Rs. 1,400 - Rs. 1,700 from the cultivation of these crops, mainly greengram .

A comparison of the average farm incomes of households having no control of lowland with households having control of lowland in the village areas, shows the importance of paddy in the village economy (Table 4.6). Households without paddy land are in a disadvantageous position in not being able to derive sufficient incomes from the cultivation of unirrigated land, even in areas like Chettikulam and Gonnoruwa where highland cultivation had yielded good incomes to the other households. In fact the widest gaps in incomes between the two groups were observed in these two areas. It may be recalled that in both Chettikulam and Gonnoruwa, farmers without control of lowland were a significantly large group in the farming community and had lesser access to even the rainfed land for cultivation than the paddy farmers.[1] In almost all areas, households without lowland derived a major or high share of their incomes from off-farm work. In Mapakadawewa where incomes were generally very poor the plight of such households was pathetic, with average income of about Rs.1,300 per annum 79% of which being derived from off-farm work. *Thus paddy land farming causes a cleavage in the agricultural society in lowland-scarce areas; the cultivators of only unirrigated land are virtually agricultural labourers and have an economically inferior status. Unless an economically efficient and stable rainfed farming system on highland which can stand on its own and even compete with a system including paddy land can be developed, the economic and social conditions of pure highland and chena cultivators will continue to be the same.*

4.5 FARM ASSETS

The pattern of ownership of machinery and implements and draught animals reflects the levels of affluence of farmers and also provides a crude indication of levels of cultivation in an area.

4.5.1 Machinery and Implements

Tractors were owned by at least one, but not more than four households in Palayakulama, Mahakanadarawa, Chettikulam, Gonnoruwa, Magama, Attanakadawala and Bakamuna. Two of the four-wheel tractors

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1 Chapter Four - page 38, para 1.

reported, (4 in all) were in Chettikulam. Attanakadawala reported ownership of another one, along with 3 two-wheel tractors. Two-wheel tractors were mostly reported in the study areas of Hambantota: Gonnoruwa(4) and Magama (3). Thus Chettikulam, Attanakadawala, Gonnoruwa and Magama exhibited a relatively high ownership of power driven equipment.

20% of the households in Chettikulam and 10% in Pavatkulam owned *water pumps*, while in all other areas the owning households if any, did not exceed 2 and, ranged from 0-7% of the total number of households. Ownership of water pumps could point to the *practics of lift irrigation* in these areas. But irrigation of highland was reported by only one farmer each in these areas. In Chettikulam, all lowland was reported as being cultivated under rainfed conditions and the water pumps if serviceable, may have found its use in the supplementary provision of water for the paddy crops.

Of the equipment used for seeding and in protection measures for crops, *seeders and dusters* were non-existent in almost all the areas. The only seeder and the two dusters reported by the surveyed households were in Attanakadawala.

Sprayers however, were found in large number in the Elahera Project area; nearly half and one third of the households in Attanakadawela and Bakamuna respectively owned them. Among the other areas, this equipment was reported by more than 10% of the households only in Chettikulam, Gonnoruwa, and Magama, (20%, 13% and 13% respectively). Whether the sprayers were power driven or manually operated was not ascertained in the survey.

The *mammoty* was the implement owned by almost all households in all the areas. The Elahera Project area was well equipped with *light iron ploughs* with 2 and 3 ploughs per owning household in Attanakadawala and Bakamuna respectively. The other areas where light iron ploughs seemed to be of some significance were Mapakadawewa and Gemunupura/ Tissapura where 23% and 10% of the households respectively owned this equipment. *Wooden ploughs* were owned by more than 40% of the

households in Mahawilachchiya, Palayakulama, Halmillakulama and Gemunupura/Tissapura (72%, 52%, 44%, and 43% respectively) and to a lesser extent in Chettikulam (25%) and Pavatkulam (10%).

4.5.2 Draught animals

A very high proportion of the farmers in Attanakadawala (87%) and Bakamuna (83%) owned draught animals, mainly working buffaloes. The next highest proportion obtained in the settlement schemes of Anuradhapura and Vavuniya (43 -63%). Though the villages in these districts had a lesser proportion of households owning animals (21 -31%) the average number of animals owned per reporting household was relatively high. In Gemunupura/Tissapura only 17% of the households owned draught animals, whereas the corresponding figure for Mapakadawewa, was 37%. Only a few households owned draught animals in Gonnoruwa and Magama, the villages of Hambantota. In Magama the average herd size was relatively very large compared to all other areas.

The type and quantity of farm assets in households would depend largely on their incomes and on the type of cultivation done in their farms. The Elahera Project farmers cultivated large extents of lowland under well assured water conditions in both *maha* and *yala* with resulting high incomes and the area had received concerted extension efforts over a long period of time. This could explain the very high rate of ownership of sprayers, iron ploughs and draught animals in the study areas under this project.

In the other colonisation areas too, the relatively high rate of ownership of wooden ploughs and or draught animals could be attributed to the prevalence of lowland cultivation as the major component of farming activities.

The pattern of ownership of implements observed in relation to the composition of the farms by type of land, suggest that highland and *chena* cultivation under rainfed conditions in most areas, may not be utilising draught or tractor power.

4.6 FARMER BEHAVIOUR IN THE USE OF HIS LAND

Three aspects of farmer behaviour in the use of his land, that merit attention and some discussion at this stage, relate to underutilisation of highland, choice of crops, and cultivation of subsidiary food crops in lowlands during *yala*.

4.6.1 Why underutilisation of highland?

Questions that have emerged from the pattern of extentwise land use are "*Why do cultivators in most areas, specially the settlement areas of the dry zone, underutilise their highland and, wherever forest land is available in the vicinity prefer to cultivate chena? If forest land was not available, would the farmers have made better use of their highland?*"

In order to understand the general phenomenon of underutilisation of highland, the varied farming conditions and systems have to be examined closely and analysed to identify the factors contributing to it.

The well assured supply of water under irrigation combined with large lowland holding of 5 acres, ensure stable paddy farming in the Elahera Project areas in both seasons and also facilitates cultivation of subsidiary food crops under irrigation during *yala*. It may be recalled that the average number of farm workers were large, and there was hardly any supply of agricultural labour for work outside the household farm in these areas, suggesting that the available family labour was utilised as far as possible for the family farm. The low use of highland could therefore be attributed to one or more of the following factors lack of need to maximise the use of highland, as the lowland provides the household requirements of rice for food and also good income from sales, as well as better facilities to cultivate subsidiary food crops; limitations on labour to cultivate large highland holdings of 3 acres, or possibly better returns for the scarce labour in other activities such as gemming in comparison to highland cultivation.

With the unstable water conditions in the tank areas of Mahakanadarawa, Mahawilachchiya and Pavatkulam, paddy lands lie fallow

even during some *maha* seasons, and farmers have necessarily evolved a system exploiting the environment to their advantage, and included *chena* as an integral component of the farming system. Of the available 2 acres of highland only about 2/3 to 1 acre in the Anuradhapura Tank areas and 1/3 acres in Pavatkulam were cultivated during the *maha* season. Use of unirrigated land was generally low during *yala*.

An answer to why farmers cultivate *chena* in preference to settled highland is preferred in a study of the Mahawilachchiya Tank area. "With regard to factors contributing to concentration of efforts on *chena* at the expense of highland allotments, agronomic and economic issues are seen to play a key role. Evidence gathered from the farmers indicate that among the important agronomic criteria favouring the *chena* cultivation are the difficulties associated with the maintenance of soil fertility and other desirable soil properties, along with the problems of controlling weed growth associated with regular highland cultivation in the dry zone."[1] The economic issues involving labour utilisation, incomes and costs connected with the use, are also discussed in this study and a concluding observation is "that the significance of *chena* cultivation in the economy of the project farmers cannot be under estimated. The common hypothesis that *chena* farming is a supplementary undertaking often distracting the settlers from intensive use of their allotted land does not hold good in this instance. In fact, *chena* is an integral part of the operational unit of all project farms and under the prevailing circumstances, this should not be surprising. The key determinants influencing the farmer in this regard are his poor liquidity position, subsistence level of production and lack of other alternative means of resource application overshadowed by a remarkably high rainfall uncertainty."[2]

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1 A Study of Five Settlement Schemes prior to Irrigation Modernisation, Vol. 1, Mahawilachchiya - p. 21.

2 Ibid. page 64.

The villages of the dry zone too, except Chettikulam and Gonnoruwa, exhibit similar farming conditions and systems as the tank areas in Anuradhapura.

The Chettikulam farmers who experience a high degree of uncertainty in paddy farming, had evolved a settled system of cultivating the large extents of highland available to them, during *maha*. There is very little *chena* cultivation in this area.

Scarcity of lowland in Gonnoruwa could be the factor that contributed to the high degree of utilisation of the available forest lands for *chena* cultivation and a fair use of the highlands in *maha*, though the availability of large extents of land for *chena* cultivation would also have had a negative effect on the use of settled highland.

Even among the areas of Badulla, the scarcity of paddy land in Mapakadawewa could have contributed to the greater utilisation of highland during *maha* and the non-availability of forest land and the small paddy holdings in Gemunupura/Tissapura could have induced more use of even the available small highland allotments during *maha*.

Thus, it could be tentatively concluded that in areas where farming is mainly based on family labour, the extent of cultivation of the unirrigated land is primarily dependent on the capacity for paddy production in the lowland, which in turn is determined by the assuredness of water and extent of availability of lowland, and that the extent to which regular highland cultivation receives attention in the total system for rainfed cultivation is conditioned by the availability of forest land, *chena* cultivation being generally favoured more than regular cultivation. The size of the highland holdings in relation to availability of labour for its cultivaion, and economic and other considerations relating to labour utilisation, and choice of crops too play a part in the decisions of farmers.

Before proceeding to comment on the choice of crops, it would be pertinent to mention the following observations. *Paddy cultivation in the lowlands is in a sense competitive with cultivation of other crops*

on unirrigated lands. A low paddy production capacity[1] situation provides a suitable environment for directing the attention of farmers to the production of high income crops under rainfed lands as in the case of Chettikulam and Gonnoruwa.

4.6.2 How is the use of the unirrigated land diversified?

The question, 'what factors determine the choice of the crops for cultivation by the farmer,' would be considered in detail in Chapter Six, in the context of the farmers' preferences for crops, as well as a comparison of cost returns and other monetary as well as non-monetary benefits, from the different crops. It would suffice at this juncture to mention that a common thread seems to run through the decisions or behaviour in the choice of crops in all the areas. *The behaviourial pattern suggests that 'food security' or in other words, 'self-sufficiency in basic food grains, specially cereals,' is one underlying motive in the farming system and hence that the status of the lowland paddy cultivation influences even the choice of crops for cultivation on unirrigated land in an area.*

Cultivation of paddy or another cereal on unirrigated land to supplement the lowland paddy crop if necessary, and at least one or more of other crops (food or other) of high cash value is observed to be a common feature of the farming systems. Concentration on one cash value crop, or a tendency to favour one or more from among the cash value crops grown in the area, was also noted. These observations indicate, that *profit motives along with the food security aspect play an important role in the choice of crops for a farming system.*

4.6.3 Is there a reluctance among farmers to grow other crops on their lowland holdings during *yala*?

It is not clear whether the evidence from the survey of the two study areas of the Elahera project, indicate a reluctance of traditional lowland farmers to grow other crops on their paddy lands even during

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1 Paddy production capacity is defined as a composite variable of both lowland and water availability constraints on one or the other or both the underlying variables are limitations to paddy production.

yala, or alternatively that a fair degree of success has been achieved in using their lands for growing other crops in *yala*. During *yala* 72 the cropping intensity of the Elahera Project area was 67.8% and only 17.8% of the cultivated lowland area was under crops other than paddy.[1] In the absence of comparable information for the project area over time, or as at a recent date, and also of information on the desired goals in terms of coverage of the area by field crops other than paddy, it is difficult to assess the increase in the intensity of cropping, and the extent of diversification of land for crops other than paddy. The study areas could by the nature of the selection procedure adopted be biased towards higher proportion of use of land for cultivation of crops under study.[2] Even so, taking the study area estimates as representative of the entire project area, it could be said that a cropping intensity of about 80-85% during *yala* had been achieved in 1977 with about half the cropped area devoted to subsidiary food crops; this achievement being reached, 10 years from the time the project area was brought under special extension efforts in 1967. This could be considered as an indication of a gradual removal of the reluctance to grow crops other than paddy on lowland. The concerted extension efforts could have resulted in this degree of success, perhaps, mainly because the lowland holdings were large, and large incomes from paddy were ensured during *maha*, due to stable supplies of water.

The cultivation during *yala* 76 was of very poor coverage in the tank areas of Anuradhpura and Vavuniya, and as such there is hardly any interval evidence from the study to compare the farmer behaviour in these area with that of the Elahera Project.

4.7 SUMMARY

The areas of Badulla which were at the low end of the spectrum in relation to the social and economic variables considered in Chapter Three

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1 Computed from figures reported on page VII-ARTI Research Study No.4, Production of other crops in paddy fields in *yala* 1972.

2 Chapter Two - page 12 para 2.

were also poor in their land resources, emphasising the low profiles of activity and wealth in these areas. Access to relatively large paddy holdings under well assured water supply conditions was a major reason for the relatively high affluence of the Elahera farming community. As a result of affluence and vice versa there was also a high degree of access to farm machinery and farm equipment such as sprayers and dusters implying a higher level of crop husbandry. Chettikulam the other high income area, though it had greater access to land, lowland as well as unirrigated, than the other areas, derived its high incomes from stabilised cultivation of the large holdings of highland, as the paddy lands cultivated under rainfed conditions were relatively poor income yielders. In the lowland scarce areas of Gonnoruwa, large annexations of *chena* land and highland through encroachments to the farms brought in a large share of farm incomes from cultivation of cotton. Though about 3-4 acres of paddy land was available to the farmers in the other areas, water was to some extent a limiting factor in paddy production and the farming systems which could be described as 'subsistence farming in cereals' had been developed with at least one cash crop being included in it.

The analysis of the farm characteristics has thus surfaced the importance of paddy cultivation in the farming communities. *Paddy cultivation can be considered as the pivot around which farming systems revolve, the paddy production capability in an area influencing to a great extent the nature of the farming systems adopted by the community, availability of forest land in the environs being another factor which plays a major role in determining the system adopted. Food security aspects and profit motives guide the choice of crops in the system.*

The three issues relating to *farmer behaviour regarding regular cropping on highland, choice of crops, and use of well drained soils of lowlands for cultivating of subsidiary food crops,* that have been discussed in this chapter are of relevance to policies and programmes relating to production of these crops, and *have a special bearing on aspects such as sizes of both paddy land and highland allotments in settlement areas, restriction on use of forest land for cultivation of annual and seasonal crops, development of farming systems suited*

to the environments, and promotion of cultivation of subsidiary food crops including soya bean in well drained lowlands in Yala, and would be considered again for discussions in the final chapter.

Table A.1

FARM CHARACTERISTICS

District	Study Area	Major Source of Water	Percentage of house-holds with lowland	Average size of holding (Acres)				Tenure of holding (2)(3)		Composition of average farm (%)				Unirrigated Land			Cropping Intensity						Mixed cropping Maha 76/77		Main Crops Grown (5)			Main crops contributing to farm income	Farm Assets (6)	(7)
		Lowland (1)		Total	Lowland	Highland	Chena	Lowland	Highland	Lowland	Highland	Chena		Average Size(Ac.)	% contribution Highland	% contribution Chena	Maha (4) L.L.	Maha H.L.	Maha C.L.	Yala L.L.	Yala H.L.	Yala C.L.	Farmers practicing (%)	Extent under (%)	Maha Highland	Maha Chena	Yala Highland	Yala Chena		Machinery and Equipment owned	Household owning draught animals
Anuradhapura	Palayakulama	Irrigated	79.3	7.99	3.58	1.59	2.82	Solely owned	(70%)	Crown lease 43% L.D.O. 29% Encroachments 32%	44.8	19.9	35.3	4.41	36.1	63.9	71.1	49.1	93.3	21.2	24.3	25.0	nil	nil	Cowpea Chilli Manioc*	Kurakkan Chilli Maize Cowpea	Cowpea	Gingelly	Paddy, Chilli and Cowpea	Mammoties Woodenploughs 52%	24
	Halmillakulama	Irrigated	86.0	6.07	2.32	1.44	2.31	Solely owned	68%	Solely owned 31% Crown lease 29% Encroachments 24%	38.2	23.7	38.1	3.75	38.4	61.6	48.5	53.1	90.4	1.8	15.4	55.1	46.5	21.5	Manioc Cowpea Maize	Chilli Maize Kurakkan Cowpea	Gingelly	Gingelly	Chilli, Paddy and Cowpea	Mammoties Woodenploughs 63%	21
	Mahakanadarawa	Irrigated	98.8	8.00	3.87	1.97	2.15	L.D.O.Allotments	83%	L.D.O.Allot-ments 84%	48.4	24.6	26.9	4.12	47.8	52.2	17.7*	45.8	94.1	0.3	11.1	29.1	13.4	6.8	Cowpea Chilli Maize Manioc	Kurakkan Cowpea Maize Chilli	Gingelly	Gingelly	Chilli, Cowpea Blackgram & Paddy	Mammoties 2 & 4 wheel tractors - (1)each 2 & 4 wheel trailers (1)each	43
	Mahavilachchiya	Irrigated	100.0	8.02	3.12	2.11	2.78	L.D.O.Allotments	78%	L.D.O.Allot-ments 76%	38.9	26.3	34.7	4.89	43.1	56.9	74.4	33.5	92.9	12.0	10.5	40.3	19.0	7.4	Cowpea Chilli Maize	Maize Kurakkan Cowpea Chilli	Gingelly Cowpea	Gingelly	Paddy, Chilli and Cowpea	Mammoties; woodenploughs 72%	49
Vavuniya	Chettikulam	Rain	71.4	14.76	6.57	6.46	1.24	Solely owned	(76%)	Solely owned 52% L.D.O. 44% Crown lease 44%	44.5	43.8	11.8	8.20	78.8	21.2	37.5	89.4	99.1	6.00	15.2	62.4	42.8	11.6	Blackgram Cowpea Greengram Kurakkan	Blackgram Kurakkan Maize Cowpea G.gram	Gingelly	Gingelly	Blackgram, Paddy	Mammoties; woodenploughs 25% Sprayers 20%; water pumps 20%	31
	Pavatkulam	Irrigated	93.3	10.90	4.87	2.59	3.43	L.D.O.Allotments Crown lease	46% (92%)	L.D.O. 55% Crown lease 45%	44.7	23.8	31.5	6.02	43.0	57.0	6.0	64.5	96.9	5.2	29.5	22.3	nil	nil	Blackgram Cowpea	Blackgram Kurakkan	Gingelly	Gingelly	Blackgram, Paddy	Mammoties	63
Hambantota	Gonnoruwa	Irrigated	52.6	11.24	1.61	2.05	7.58	Solely owned Private or rented in Crown lease	30% 35% 30%	Encroachments 40% Crown lease 27% Solely owned 30%	14.3	18.2	67.4	9.63	21.3	78.7	87.8	56.5	96.3	13.9	2.1	13.8	23.7	3.8	Maize Greengram Cowpea Vegetables Kurakkan	Cotton Chilli Kurakkan Maize Greengram Cowpea Paddy	—	Meneri	Cotton, Paddy	Mammoties; Sprayers 13%; tyne tiller (1) 2 wheel tractors(4) 2 wheel trailers(3)	16
	Magama	Irrigated	76.7	7.70	3.18	1.15	3.37	Private lease or rented in	61%	Solely owned 32% Crown lease 32%	41.3	14.9	43.8	4.52	25.4	74.6	91.9	21.1	93.3	61.5	2.2	5.9	40.0	4.5	Chilli Maize* Greengram Kurakkan Cowpea	—	—	Paddy, Cotton	Mammoties; sprayers 43%; 2 wheel tractors(3) 2 wheel trailers(3)	10
Badulla	Mapakadawewa	Rain	56.7	5.68	1.78	2.20	1.70	Private lease/ rented in Encroachments Crown lease	35% 35% 24%	Crown lease 45% L.D.O. 28% Encroachments 28%	31.3	38.7	29.9	3.90	56.4	43.6	88.8	75.6	93.5*	29.0	3.8	6.4	86.7	69.5	Maize Mē Banana	Maize Kurakkan Greengram Mē	—	—	Paddy	Mammoties Light iron ploughs 23%	37
	Gemunupura/ Tissapura	Irrigated	98.5	4.09	2.07	1.23	0.79	Crown lease	81%	Crown lease 78% Encroachments 20%	50.6	30.1	19.3	2.02	60.9	39.1	92.7	86.2	91.3	1.9	7.8	5.9	53.8	33.8	Maize Cowpea* Manioc*	Maize Kurakkan Mē	Gingelly Yala '77 (lowland)	Gingelly	Paddy	Mammoties Woodenploughs 43%	17
Elahera Project	Attanakadawala	Irrigated	100.0	7.30	4.40	2.52	0.39	L.D.O.	84%	L.D.O. 79% Encroachments 21%	60.3	34.5	5.3	2.91	86.6	13.4	88.8	45.3	62.6	86.7	1.9	0.0	nil	nil	Cowpea Chilli Maize Manioc & other yams	No. of cultivators are too small	—	Paddy, Chilli Cowpea, G.gram	Paddy, Chilli	Mammoties, light iron ploughs 96%, sprayers 52% 2 w. tractors (3) 4 w. tractors (1) 2 w. trailers (2)	87
	Bakamuna	Irrigated	100.0	8.29	4.89	2.70	0.70	L.D.O.	93%	L.D.O. 92% Encroachments 15%	59.0	32.6	8.4	3.40	79.4	20.6	94.7	32.8	97.4	78.1	15.8	0.0	nil	nil	Cowpea* Maize Groundnut* Manioc & other yams	Paddy Cowpea	Nil	Paddy, Chilli Cowpea* G.nuts	Paddy@ Chilli	Mammoties, light iron ploughs 96%, sprayers 33% 2 wheel tractors (1) 2 wheel trailers (1)	93

(1) Lowland - Based mainly on the reports for Maha 76/77.

(2) Holdings can have land under more than one type of tenure. The predominant types of tenure of holding is indicated. Figures evidence percentage of farms with land of the specified tenurial category.

(3) Chena lands are encroachments in all areas except in Magama, where 23% of chena land was reported as being offered under Crown lease.

(4) The Cropping Intensity during Maha 76/77 in the Mahakanadarawa Tank area was estimated as 45% according to estimates based on record keeping on a sample of farmers during the season - A study of Five Settlement Schemes prior to Irrigation Modernization Vol.II, page 24. As the Bethma system was adopted during the season, it is likely that extents cultivated under this system in lieu of their holdings may not have been reported by farmers in the survey as the cultivated land did not relate to their reported lowland holding.

(5) Crops grown by 30% or more of the farmers. * indicates that the average size of crop holding was less than 1.3 acre; @ denotes that only crops grown by more than 50% of the farmers are given as the total number of farmers are small (6-10); — indicates that total number of farms are too small (5 or less) to make observation regarding main crop.

(6) The mamoty is the only equipment that was owned by almost all households in all areas and the average number household varied between 3 and 4 from area to area. Among other items, only those owned by a relatively high number of households in any area is mentioned, indicating either the percentage of households owning them or the number of items within parenthesis.

(7) Mainly buffaloes.

Table 4.2 - Percentage Distribution of Unirrigated Land Holdings and Extents by Size of Holding

Size of holding		Anuradhapura				Vavuniya		Hambantota		Badulla		Elahera Project	
		Palaya kulama N=29 A=128.0	Halmilla-kulama N=43 A=161.0	Mahakana-darawa N=82 A=338.35	Mahawilach-chiya N=79 A=387.0	Chettikulam N=35 A=286.88	Pavatkulam N=30 A=180.75	Gonnoruwa N=38 A=365.93	Magama N=30 A=135.63	Mapakada-wewa N=30 A=117.0	Gemunupura/ Tissapura N=65 A=131.5	Attanakada-wala N=31 A=90.0	Bakamuna N=27 A=91.85
≤ 0.5	n (%)	-	-	-	-	-	-	-	-	-	1.5	3.5	-
	a (%)	-	-	-	-	-	-	-	-	-	0.2	0.6	-
0.5 ≤ 1.0	n (%)	3.4	4.7	4.9	-	-	-	-	3.3	-	32.3	6.5	7.4
	a (%)	0.8	1.2	1.2	-	-	-	-	0.6	-	16.0	1.9	1.9
1.0 ≤ 2.0	n (%)	10.4	23.3	17.1	16.5	2.9	13.3	5.3	20.0	20.0	36.9	12.9	22.2
	a (%)	4.1	10.6	8.1	6.7	0.7	3.9	1.0	7.6	9.8	33.5	8.6	11.4
2.0 ≤ 3.0	n (%)	13.8	18.6	25.6	10.1	17.1	13.3	2.6	23.3	20.0	21.5	67.7	37.0
	a (%)	8.2	13.8	17.4	5.9	6.1	6.6	0.6	14.0	14.3	29.5	68.9	32.1
3.0 ≤ 4.0	n (%)	20.7	18.6	12.2	21.5	17.1	10.0	7.9	10.0	26.7	6.2	3.2	-
	a (%)	17.6	19.4	10.7	10.7	16.0	7.8	6.1	3.0	7.7	26.9	11.8	3.9
4.0 ≤ 5.0	n (%)	20.7	11.6	15.9	13.9	11.4	16.7	5.3	6.7	13.3	-	3.2	7.4
	a (%)	21.7	14.0	18.5	13.9	6.7	12.4	2.7	7.0	16.7	-	5.6	11.9
5.0 ≤ 7.0	n (%)	20.7	20.9	14.6	26.6	17.1	16.7	26.3	23.3	16.7	-	-	11.1
	a (%)	29.7	33.7	21.5	34.8	12.9	16.5	17.3	33.7	25.9	-	-	18.6
7.0 ≤ 10.0	n (%)	10.4	-	7.3	10.1	11.4	16.7	21.1	6.7	3.3	-	3.2	11.1
	a (%)	18.0	-	14.6	17.9	11.7	25.2	18.2	11.8	6.4	-	10.6	25.0
Above 10.0	n (%)	-	2.3	2.4	1.3	22.9	13.3	31.6	6.7	-	1.5	-	-
	a (%)	-	7.3	8.1	4.9	54.6	29.3	57.2	17.6	-	9.1	-	-

N denotes the total number of holdings
A denotes the total extent of unirrigated land in acres
n denotes number of holdings
a denotes extents in acres

Table 4.3 - Average Extent of Unirrigated Land in Farms

Type of farm	Anuradhapura				Vavuniya		Hambantota		Badulla		Elahera Project	
	Palayakulama	Halmillakulama	Mahakanadarawa	Mahavilachchiya	Chettikulam	Pavatkulam	Gonnoruwa	Magama	Mapakadawewa	Gemunupura/ Tissapura	Attanakadawala	Bakamuna
	N=29 A=4.41	N=43 A=3.75	N=82 A=4.12	N=79 A=4.89	N=35 A=8.20	N=30 A=6.02	N=38 A=9.63	N=30 A=4.52	N=30 A=3.90	N=65 A=2.02	N=31 A=2.91	N=27 A=3.40
Farms with lowland	4.38 (23)	3.84 (37)	4.12 (82)	4.89 (79)	9.43 (25)	6.02 (30)	10.07 (20)	4.70 (23)	3.87 (17)	2.02 (65)	2.90 (31)	3.40 (27)
Farms without lowland	4.54 (6)	3.17 (6)	-	-	5.13 (10)	-	9.16 (18)	3.97 (7)	3.95 (13)	-	-	-

N denotes total number of unirrigated holdings
A denotes overall average extent of unirrigated holdings
Figures in parenthesis indicate the number of unirrigated holdings in each type of farm

Table 4.4 - Cropping Intensities - Unirrigated Land

Study Area		Ratio of available extents of chena land to highland	Ratio of cultivated extents of chena land to highland	Maha 76/77 Cropping Intensity (%)			Yala 76 Cropping Intensity ( )			
				Chena	Developed highland	Unirrigated land	Ratio of cultivated extent of chena land to highland	Chena	Highland	Unirrigated land
Anuradhapura	Palayakulama	1.78	3.37	93.3	49.1	77.4	1.83	25.0	24.3	24.0
	Halmillakulama	1.61	2.74	90.4	53.1	75.8	5.74	55.1	15.4	39.7
	Mahakanadarawa	1.10	2.24	94.1	45.8	70.6	2.86	29.1	11.1	20.4
	Mahavilachchiya	1.32	3.66	92.9	33.5	67.3	5.08	40.3	10.5	27.5
Vavuniya	Chettikulam	0.27	0.30	99.1	89.4	91.5	1.11	62.4	15.2	25.2
	Pavatkulam	1.33	2.02	96.9	64.5	82.6	1.02	22.3	29.5	25.2
Hambantota	Gonnoruwa	3.70	6.33	96.3	56.5	87.8	24.27	13.8	2.1	11.3
	Magama	2.93	13.03	93.3	21.1	75.4	8.00	5.9	2.2	5.0
Badulla	Mapakadawewa	0.78	1.01	98.5	75.6	85.6	1.30	6.4	3.8	4.9
	Gemunupura/ Tissapura	0.65	0.68	91.3	86.2	88.2	0.48	5.9	7.8	7.0
							Yala 1977			
Elahera Project	Attanakadawala	0.15	0.21	62.6	45.3	47.6	-	0.00	1.9	1.7
	Bakamuna	0.26	0.78	97.4	32.8	46.1	-	0.00	15.8	12.5

Table 4.5 - Composition of the average Household Farm Income - Year 76/77

Source of Income	Anuradhapura				Vavuniya		Hambantota		Badulla		Elahera Project	
	Palayakulama N=29	Halmillakulama N=43	Mahakanadarawa N=82	Mahavilachchiya N=79	Chettikulam N=35	Pavatkulam N=30	Gonnoruwa N=38	Magama N=30	Mapakadawewa N=30	Gemunupura/ Tissapura N=65	Attanakadawala N=31	Bakamuna N=27
Paddy-lowland (Rs)	2480 (38.9)	1355 (32.0)	895 (26.0)	2715 (53.1)	6306 (37.4)	1060 (19.1)	1770 (19.8)	2789 (46.1)	703 (57.9)	3027 (81.4)	8846 (59.3)	9627 (59.9)
Paddy highlands/ chena (Rs)	60 (0.9)	12 (0.3)	53 (1.5)	121 (2.4)	181 (1.1)	10 (0.2)	329 (3.7)	-	33 (2.7)	36 (1.0)	11 (0.1)	22 (0.1)
Coarse grains and grain legumes (Rs)	1902 (29.8)	928 (21.9)	1218 (35.4)	1091 (21.4)	8930 (52.9)	3847 (69.2)	1448 (16.2)	1123 (18.6)	324 (26.7)	474 (12.7)	1410 (9.5)	1681 (10.5)
Other crops (Rs)	1937 (30.4)	1939 (45.8)	1191 (34.6)	1144 (22.4)	1451 (8.6)	642 (11.5)	5346 (59.7)	2003 (33.1)	61 (5.0)	142 (3.8)	4601 (30.8)	4717 (29.3)
Livestock (Rs)	-	-	88 (2.6)	39 (0.8)	-	-	69 (0.8)	130 (2.2)	94 (7.7)	41 (1.1)	51 (0.3)	37 (0.2)
Total (Rs)	6379 (100.0)	4234 (100.0)	3445 (100.0)	5110 (100.0)	16868 (100.0)	5559 (100.0)	8962 (100.0)	6045 (100.0)	1215 (100.0)	3720 (100.0)	14919 (100.0)	16084 (100.0)

N denotes the total number of farms
Percentages are indicated within parenthesis

Table 4.6 - Composition of average Household Farm Income by Type of Farm - Year 76/77

Source of Income	Anuradhapura				Vavuniya		Hambantota				Badulla	
	Palayakulama		Halmillakulama		Chettikulam		Gonnoruwa		Magama		Mapakadawewa	
	Farms with low-land N=23	Farms without low-land N=6	Farms with low-land N=37	Farms without low-land N=6	Farms with low-land N=25	Farms without low-land N=10	Farms with low-land N=20	Farms without low-land N=18	Farms with low-land N=23	Farms without low-land N=7	Farms with low-land N=17	Farms without low-land N=13
Paddy-lowland (Rs)	3127 (44.9)	-	1575 (34.0)	-	8833 (39.1)	-	3363 (26.7)	-	3638 (52.0)	-	1241 (63.9)	-
Paddy-highland chena (Rs)		292 (7.1)	14 (0.3)	-	135 (0.6)	230 (9.4)	56 (0.4)	632 (12.8)	-	-	44 (2.3)	18 (6.8)
Coarse grains and grain legumes (Rs)	2052 (29.4)	1328 (32.2)	965 (20.8)	700 (39.4)	11735 (51.9)	1917 (78.3)	2012 (16.0)	821 (16.7)	1231 (17.6)	769 (26.4)	408 (21.0)	214 (80.8)
Other crops (Rs)	1790 (25.7)	2499 (60.7)	2079 (44.9)	1076 (60.6)	1911 (8.5)	301 (12.3)	7034 (55.9)	3470 (70.4)	1959 (28.0)	2149 (73.6)	82 (4.2)	33 (12.5)
Livestock (Rs)	-	-	-	-	-	-	125 (1.0)	7 (0.1)	170 (2.4)	-	166 (8.6)	-
Total (Rs)	6959 (100.0)	4119 (100.0)	4633 (100.0)	1776 (100.0)	22614 (100.0)	2448 (100.0)	12590 (100.0)	4930 (100.0)	6998 (100.0)	2918 (100.0)	1941 (100.0)	265 (100.0)

N denotes the total number of farms in each category
Percentages are indicated within parenthesis

Chapter Five

CROP CULTURE

This chapter is mainly devoted to a discussion of prevailing cultivation practices and problems, and also of the preferences and opinions of farmers on cultural aspects in relation to the existing knowledge regarding the crops[1] based on research and experience.

Crop-specific information was sought from the households in respect of the cultural operations studied excepting preparatory tillage. The method of preparatory tillage was ascertained separately for *chena* land, highland and lowland under rainfed as well as irrigated conditions. Use of fertiliser and adoption of weed control measures were the other aspects for which data was also obtained by type of land, in addition to a crop-wise report. Other information collected related to sowing times, awareness of improved varieties, preference of varieties, availability of preferred varieties and sources of seed, ability to obtain seed material in time, diseases, insect and other pests, problems of harvesting and method of threshing. In addition, the opinions of farmers were sought on effects of sowing times or incidence of diseases, soil enrichment as a result of growing pulses, and the impact of rains at the early stages of growth and at harvest, and of drought on these crops. The farmers were also requested to indicate their preferences of a plant type in terms of the age, height, no. of picks at harvest, and head type.

It was felt that it would be desirable to present the analysis and discussion relating to all aspects cropwise, rather than discuss

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1 Of the 8 crops studied, Toor dhal has been excluded as there was no cultivation of this crop in the study areas.

each aspect covering all crops under a separate heading, as the interest of readers would tend to be centred more on a crop, than on any particular cultural aspect of all crops, and also because such a presentation would facilitate the study of the culture of a crop in the light of the entirety of existing knowledge about it. However, the information on preparatory tillage practices, fertiliser use, and weed control, by type of land are discussed first, before proceeding to a cropwise analysis of all the cultural practices, problems, and preferences and opinions of farmers. The cropwise presentation has been set out with a brief introduction of the crop, its recommended crop establishment and care practices, yield potentials and other salient and relevant information[1] and followed by a discussion and analysis of the survey findings.

5.1 PREPARATORY TILLAGE

Almost all farmers in preparing their *chena* land for cultivation under rainfed conditions tilled it with mammoty (90 -100%). Only a few isolated instances of use of either draught animal or tractor power for tilling were reported.

With regard to highland cultivation under rainfed conditions, the situation was very similar to *chena* cultivation in the areas of Badulla and Hambantota and the villages of Anuradhpura. The picture was very different in the areas of the Elahera Project and Vavuniya district, where a heavy reliance on tractors (50 - 65%) was portrayed. Draught power usage was generally very much lower than mammotying in these areas except in Bakamuna. The settlement areas of Mahakanadarawa and Mahawilachchiya showed some utilisation of either tractor or draught power. (11% and 23% of household respectively in *maha*).

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1 Sources of information are, (i) Information Pamphlets of the Information Division of the Department of Agriculture, (ii) H.M.P. Gunasena - Kshestra Boga Nishpadanaya, 1974. (Sinhala publication), (iii) Handbook for the Ceylon Farmer by Agricola and (iv) notes provided by and discussions with Dr. N. Vignarajah, Research Officer, Department of Agriculture - a member of the study team.

Lowland cultivation under rainfed conditions was of sufficient importance only in Chettikulam and Mapakadawewa, both highland predominant areas. The Mapakadawewa farmers relied only on animal draught power and Chettikulam farmers on tractor mainly (75%) and animal draught power (20%) for tilling during *maha*. Even in the other study areas where a few households cultivated lowland under rainfed conditions, the land had been prepared with either the exclusive or main use of animals or tractors.

Cultivation of highland under irrigated conditions, was rare. Even the few farms that reported such cultivation practised the predominant method specific to the area as reflected by the rainfed cultivation practices. Chettikulam[1] and Mapakadawewa had hardly any irrigated lowland cultivation. Pavatkulam though a colonisation area, had not reported cultivation of lowland during *maha* 76/77. However, during *yala*, 77% of the households cultivated their lowland and almost all used tractors for land preparation. In the other study areas, tillage was mainly dependent on either draught or tractor power or both.

The above analysis indicates that *in most study areas, although land preparation of lowland, whether under rainfed or irrigated conditions, was dependent on either tractor or animal power, highland and chena were tilled with nammoty. Tractor usage was high for the preparation of highland only in Vavuniya and the Elahera Project area.*

5.2 USE OF FERTILISER

Generally it was observed that though the practice of fertiliser use was prevalent on lowland farming for paddy in all areas, highland and *chena* crops were denied application of the same input. The lowland paddy crops of *maha* 76/77 were fertilised by about 90% or more of the farmers in the Elahera Project area, Chettikulam, Gemunupura/Tissapura and Magama and by about 50-60% in Mahakanadarawa, Palayakulama and Gonnoruwa. Within the Mahawilachchiya Tank area, Halmillakulama and

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1 In Chettikulam the farmers classified their lowland as irrigated land, but during *maha* 76/77 the cultivation was stated to be under rainfed conditions.

Mapakadawewa, the proportion of lowland farms using fertiliser was low. Two of the 3 paddy holdings cultivated in Pavatkulam had applied fertiliser.

During *yala* 76, 35% of the 23 lowland holdings cultivated in Pavatkulam were fertilised. In Magama and Palayakulama the two other study areas where a fair proportion of holdings were cultivated during this season, 64% and 50% of the cultivated holdings were fertilised respectively. About 95% of the paddy holdings of the study areas of the Elahera Project were fertilised during *yala* 77.

Among the other crops cultivated in the lowlands of Elahera Project areas during *yala* 77, only chilli and soya bean had received some attention in the supply of nutrient for crop growth. About 85% of the chilli holdings and about half the growers of soya bean reported having fertilised their crops.

Generally, the highland and *chena* crop holdings were not fertilised. In the Elahera Project areas and also in Gemunupura/Tissapura there was evidence of the highland crops receiving fertiliser during *maha* 76/77, 25%, 36% and 19% respectively of highland holdings of these areas were fertilised. Chilli, cowpea and soya bean (considering the fact that only a few farmers grew this crop) seem to have been favoured. The isolated instances of use of fertiliser in the other areas was for the chilli crop. Chemical fertilisers were used in almost all instances where paddy or other crops, were fertilised.

The type and quantum of fertiliser used, and the times of application provides the added dimensions to evaluate the levels of fertiliser management of crops. The low rate of adoption of the practice of fertilising is in itself a sufficient indication of the very poor levels of fertiliser management ofthe coarse grain and pulse crops. However, in order to complete the picture, the details of the reported application were examined, and it was found that in most instances, chemical fertiliser were used as 'top dressings' except in Bakamuna where only basal application of mainly organic manure was reported by all respondents.

Farmers were asked whether they encountered difficulties in purchasing fertiliser during the *maha* and *yala* seasons of the reference period and also requested to state the nature of the difficulties experienced by them. In most areas only the farmers who had used fertiliser responded to this question and in the other areas, the non-users who responded were too few, to make any claim of evidence of a potential user group 75%, 64% and 56% of the users in Magama, Gemunupura/ Tissapura and Chettikulam in *maha* 76/77, and 62% and 54% of users in Attanakadawala and Bakamuna respectively in *yala* 77 reported difficulties in obtaining fertiliser. These areas have already been identified as having a high rate of adoption of application of fertiliser to lowlands. The major difficulty reported was that the fertiliser could not be obtained in time. Non-availability of fertiliser in time could not be a deciding factor in not fertilising the coarse grains and pulse crops under study.

The survey has shown that farmers were discriminative in the use of fertilisers. The paddy crop was given the fertiliser by choice, if available. The use of fertiliser on paddy was widespread even among the farmers of Chettikulam, who grew this crop mainly under rainfed conditions. *Generally there was no interest in fertilising subsidiary food crops; chilli however had merited some attention.* The three study areas (two Elahera Project areas, and Gemunupura/Tissapura) which showed a little evidence of extending the use of fertiliser to crops other than paddy are areas, where special extension efforts had been made to promote the growth of these crops; but results were not commensurate with the efforts.

Therefore, the logical question that arises is,"Why is there a lack of interest in fertilising the coarse grain and grain legume crops?"

No answer could be expected for this question at this stage, as fertiliser use is only one aspect of crop management and *the poor fertiliser usage could be component of the confounded poor levels of management.* An answer to the problem could emerge after analysing all aspects of crop culture, productivity and other comparative advantages of the crops grown in the farms.

One comment that is specific to fertiliser use, however needs mention. The tendency for using fertiliser for soya bean observed among the scanty coverage of growers of this crop by the survey could be attributed to the fact that this legume was unfamiliar to the farmers until its recent introduction in the mid seventies, and the innovators who grew this crop may have been provided the fertiliser along with the seeds in production kits or they may have heeded the advice given to them, specially because they had no knowledge about this crop. The latter interpretation supports a view that it could be easier to promote recommended practices with regard to exotic crops, than traditionally grown crops, once an interest is created in the crop, of course with other considerations playing their part in the motivation of interest. It could also simply be that soya has been promoted among the more progressive farmers who would be more inclined to use fertilisers.

5.3 WEED CONTROL

Most farmers in the study areas of the Elahera Project, Badulla, Hambantota and the Chettikulam claimed to have weeded their crop holdings during *maha* 76/77 irrespective of whether it was a lowland, highland or *chena* holding. In the study areas of Anuradhapura too, a fair majority, once again with no differentiation between type of land, claimed to have weeded their farms, though the extent to which this practice was adopted was less than in the seven areas, mentioned above. Pavatkulam reported a much lower adoption rate of 50% in both the highland and *chena* land.

During the *yala* seasons of the respective reference periods, weeding was reported in almost all the lowland farms in the study areas of the Elahera Project, Pavatkulam, Magama and Palayakulama, the areas where at least 50% of holdings were cultivated. Highland and *chena* cultivation were very poor during the *yala* season in most areas. However, considering the few cultivated holdings Chettikulam reported the highest rate of weeding. Pavatkulam reported a low rate as in *maha* 76/77.

The crops grown in the unirrigated lowlands during *yala* are not the same as in *maha*. Gingelly in most areas and Meneri in Gonnoruwa

emerged as the main crops of the *yala* season in these lands.[1] Attention will therefore be focussed only on the *maha* 76/77 data relating to the unirrigated lands and the *yala* 77 data in respect of the lowland of the Elahera Project, in the cropwise analysis of weeding practices.

5.4 CULTURAL DETAILS - CROPWISE ANALYSIS

It was observed that in responding to questions, specially where opinions or preferences were sought, the farmers were generally enthusiastic and more decisive in their answers in respect of the major crops of the area. Therefore, the survey findings will be studied for each crop only in respect of the study areas in which the crop was of some importance, and also information was adequate for analysis.

It is pertinent to indicate here the exact nature of some of the items of information that was sought, and the problems encountered in the analysis, in order to view the findings in their correct perspective.

Farmers were requested to name the varieties known to them, and the varieties they preferred to grow and also state the reasons for their preference. They were also asked whether they were able to obtain the seed material of the preferred varieties during the reference period, and the sources from which they obtained it. A classification of the named varieties by improved and local varieties presented problems. In naming varieties farmers at times mentioned only attributes of the varieties; eg. 3 months variety, short plant type etc. With some crops, the attributes clearly demarcate the classes, but not so with other crops. Whenever there was a doubt, the variety tended to get classified as a local rather than improved variety. Hence, it could be said that the classification could have been (biased) towards an underestimation familiarity with improved varieties.

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1 Chapter Four, pp 46, 47 & 48

The question in respect of sowing times did not relate to the survey reference period. It was related to normal behaviour during *maha* and *yala* seasons. For this question, and other similar questions which did not relate to any specific reference period,[1] the total responses formed the base population for comparative analysis. Survey findings relating to seed rates and average yields were reported in terms of bushels/acre by the farmers and the results are presented in the reported units.[2]

KURAKKAN

Background

Kurakkan, next to maize, is the most widely cultivated cereal, among those other than paddy. It is grown primarily in the *chenas* in the dry zone during the *maha* season and also in the steep slopes of the mid-country. Farmers also resort to kurakkan when they fail to establish a rainfed rice crop in time, or when they suspect drought conditions.

Anuradhapura and Hambantota districts contribute equally and together account for about 40% of the total production. Another 30% of the production emanates from the Badulla and Moneragala districts. The average yields vary between 4-8 cwt per acre in these districts. Farmers cultivate local varieties whose ages vary from 3-5½ months. However, two selections of age 3-4 months; MI 301 and MI 302 are available for cultivation.[3] The yields of these varieties under *chena* conditions are about 600-900 lbs/acre (5-8 cwt/acre). Under irrigated conditions in the Jaffna district, even yields of 2,500 lbs/acre have been reported for these varieties.

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1 A list of all questions of relevance to the discussion in this chapter is given in Appendix Four.

2 The conversion rates from volume measure to weight measure are given in Appendix Five.

3 Five promising kurakkan lines CCIO, RR 1091, HR 321-1, KMI, TAH 65-7 which have since been developed, were tested with a local variety as a check in farmers field in 10 districts during *maha* 80/81. Agricultural Newsletter No. 5, 1980. Release of the Agricultural Information Division, Dept. of Agriculture.

The seed is usually broadcast and requires about 6-8 lbs of seed/acre under mono-cropping. 4-6 lbs should suffice if the seed is dibbled in rows 6" apart. For mixed cropping with Greengram, 1½ lbs of kurakkan and 6 lbs of greengram are broadcast together, or 1 lb of kurakkan with 8 lbs of greengram used for dibbling. Kurakkan could also be transplanted in rows, under irrigated conditions and the seed requirements under these conditions would be about 2 lbs/acre.

Growth is slow in the early stages and a top dressing of 12.5 kgs per acre of nitrogen is recommended 14 days after sowing or transplanting to accelerate growth. Care must be also taken to weed the crop thoroughly in the early stages, within the first 35 days of growth.

In very wet weather "brown spot" (Helminthosporium species) can be a problem. Rusty spots on the leaves, leaf sheath and spikelets are the symptoms of the disease. This disease can be carried from season to season through the infested seed. Seed disinfection immediately after harvest and prior to re-sowing by dusting with Ceresan controls the disease. Though all varieties are susceptible to this disease, no severe damage has been reported in Sri Lanka due to it.[1]

Survey findings

The discussions relate to the cropping practices during *maha* in the study areas in Anuradhapura, Vavuniya, Hambantota and Badulla.

The average size of the crop holdings varied between 3/4th to about 1½ acres in the areas of Anuradhapura and Vavuniya. The holdings were larger and about 2 acres on the average in Gonnoruwa. In the study areas of Badulla the average extent of land occupied by the crop which is grown in mixed cropped holdings varied between 1/3rd to 1/2 acres.

The crops were mainly sown during September/October in all the study areas. But sowing also took place as early as July or as late as January. In Anuradhapura 15-25% of the farmers indicated that they normally sowed in August.

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1 Neck and earhead blast disease, and the stemborer pest too have now emerged as problems - Ibid.

Broadcasting the seed was the practice that was universally adopted in all study areas for establishing the crop; only one instance of row-sowing was reported in the survey, by a farmer in Mahawilachchiya.

In the study areas of Anuradhapura, about half the farmers (45-49%) used 5-7 lbs/acre and (73-86%) used 5-10 lbs/acre of seed for sowing. The Hambantota farmers had a tendency to use more seed; about 60% used 8-10 lbs/acre, and almost all the others used 11-18 lbs/acre. Chettikulam farmers used their seeds less sparingly; all farmers reported seed rates of 10 lbs or less and almost half stated that they used 5 lbs or less.

The use of 5-10 lbs/acre by the majority of farmers in the study areas of Badulla seems excessive for an area where this crop is grown mainly under mixed cultivation.

In naming varieties known to the respondents, a variety referred to as 'kiri-kurakkan' was mentioned by a fair number of farmers in all study areas 'pal-kurakkan' being the equivalent Tamil name mentioned in Chettikulam. For purposes of classification of the varieties mentioned by farmers kiri-kurakkan was considered as a local variety.[1] Farmers who were aware of improved varieties, varied from about 30-50% between the study areas. As is to be expected from groups which are not equally aware of both improved and local varieties, a clear preference was indicated for local varieties. Kiri-kurakkan was preferred by about almost half the respondents in all areas, excepting the study areas of Hambantota, and Mahawilachchiya where kurakkan was cultivated mainly in *chena* land.

Almost all farmers stated that they were able to get the seeds of the preferred variety during *maha* 76/77. The seed of the preferred

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1 It has been observed that "Kirikurahan" does not refer to any particular variety but to a stage in the growth of the plant at which harvesting is done to obtain a tender grain which is preferred because of its milky taste - verbal communication - A.O. Coarse grains and Pulses - Dept. of Agriculture.

variety was mainly the farmer's own or neighbour's seed. In Mahakanadarawa, Mahawilachchiya and Palayakulama and all the study areas of Vavuniya and Badulla, boutiques too were important sources of supply.

Weeding was claimed to have been practised by 50-60% of the kurakkan growers during *maha* 76/77 in Magama and in the study areas of Badulla. In the other areas there was not much evidence of interest in weeding. A claim of weeding does not in itself reflect the attention paid to the crop. All farmers who weeded in Gemunupura/Tissapura had removed the weeds by mammotying and this indicates that the level of management in weeding was low, as weeding cannot be effectively done by mammotying a thick growth of this crop grown under broadcast conditions, and in the other areas both hand weeding and mammotying had been adopted.

Among reports of diseases that affect this crop, 'Rust' was mentioned by name by 2-4 farmers in Halmillakulama, Mahakanadarawa, Mahawilachchiya and Pavatkulam and symptoms of Rust by 3 farmers in Mahakanadarawa and one in Mahawilachchiya. 'Blast' was indicated by name by 2 farmers in Chettikulam. Stemrot and collar rot were reported by one or two farmers in Mahakanadarawa and Magama. No curative measures had been used for any of these diseases. Most of the reports on diseases related to the leaf. Red coloration, white coloration, yellowing of leaves, or just 'leaf diseases' were the common responses in all areas. 'Leaf diseases' were mentioned by 10 farmers in Gonnoruwa and 2 in Magama, both areas in the Hambantota district. Whether these reports in common with the other reports relating to the leaf, are symptoms of deficiencies, or a disease referred to as *'Kola palu'* is not known. Endrex 20, Gamexene, and Malathion had been used by a few farmers for control of leaf disease or discoloration. Use of Polythion and Sulphur for controlling of yellowing of leaves too were mentioned by a few farmers in Chettikulam.

Insect pests as mentioned by farmers were the sandbug, aphid, flies, stemborer, pod borer, grasshopper, leaf worm, root worm and *'illweseeme'*. Sandbugs refer to aphids and under drought conditions aphids could cause major damage. Stemborer is known to be a major pest of kurakkan and this pest is also a pest of paddy. The catterpillar is a pest of kurakkan and crop get affected by swarms once in seven

years. Flies get attracted by the honey dew extrudates of the aphids and are not pests. Though pod borer and root worms were mentioned by farmers these are not pests of kurakkan. Malathion, Endrex 20 and DDT, had been used for the control of aphids and stemborers. A systemic insecticide such as B.H.C. granules is the recommended control measure for stemborers. 'Illuweseeme' was treated with the use of ash in Gemunupura/Tissapura.

The farmer opinions in all study areas support a view that kurakkan affected by rain at harvest, but not at its early stages of growth. Excessive rain was mentioned as a problem at harvest by most or a relatively fair number of farmers in almost all areas. The need for two picks at harvest due to uneven maturity could extend harvest time into the excess rain period and harvesting during rain could be difficult with a broadcast crop where the plants are not so easily accessible as when planted in rows. Labour shortage was also mentioned as a problem in harvesting this crop which again could be aggravated due to the fact that more than one harvest entails more labour use at harvest. Lodging of the stem, falling of seeds, mixing with weeds and excess height were also mentioned as problems by a very small number of farmers (one to four for each problem) in the areas of Anuradhapura.

Kurakkan is considered as a drought resistant crop, with an ability to withstand water stresses. Contrary to expectations this crop was voted as one that is least affected by drought by a large majority (62%) of farmers only in Palayakulama. Not more than about 1/3rd of the farmers in other areas excepting Mahakanadarawa (37%) mentioned kurakkan as a crop least affected by drought. Aphids could cause damage under drought conditions and it is not possible to ascertain from the available information whether experiences of hazards due to this pest could have had an impact on the farmer responses.

Threshing was done manually; only one case of animal threshing in Vavuniya was reflected in the survey. The average yields in the study areas within Anuradhapura and Vavuniya varied between 12.5 and 21.6 bushels/acre (6-10 cwt/acre). These yields compare favourably with the potential yields of MI 301 and MI 302 under *chena* conditions; and

either lie within the range or are even higher than the expected yields. The yields were very low in Badulla, with the majority of farmers in each area obtaining less than 4 bushels/acre. This crop is mostly grown under a mixed cropping system in this area, and under the low levels of management of the crops the yields of all or some crops under this system could be depressed more than in a mono-crop system due to competition among crops for even the very poor supply of nutrients.

The prototype of the plant mostly preferred by the farmers in all areas was one of age 2½-3 months, of height 2½-3 ft and one pick at harvest. A fair proportion of the Palayakulama farmers indicated a preference for varieties with a life span of 2 months or even lesser duration. At the other extreme preference for larger life spans of 3½-4 months also were indicated by farmers of Halmillakulama, Mahawilachchiya, Chettikulam, Gonnoruwa and Gemunupura/Tissapura. A preference for very short varieties not exceeding 2 ft was expressed as equally as for varieties of 2½-3 ft in the areas of Badulla. The interest evinced by the Badulla farmers in very short varieties, is prompted mainly by the farming system in the area. Kurakkan is grown mostly under maize, and probably short plants could be more easily managed with taller maize plants.

Relatively fewer farmers expressed an opinion about desired head types, and in most areas the responses referred to long and large heads, more grains, under-scoring a desire for more produce. The responses of Mahawilachchiya, Chettikulam, and Magama centred on an important aspect, namely the structure of the panicle. However, the expressed preferences in Mahawilachchiya and Magama were not decidely in favour of either a closed or an open type of panicle. The respondents of Chettikulam clearly voted for an open or loose panicle.

Crop improvement research on this crop has been minimal. Some areas in which research can be undertaken apart from breeding varieties of higher yields and short life span, are prevention of lodging of plants, and greater resistance to disease inducement of even maturity of seeds, and a loose panicle. Farmers should be educated to avoid using a mixture of seeds of different varieties for planting to reduce uneven maturity.

MAIZE

Background

Maize is cultivated mainly as a *maha* crop in the Dry Zone and Intermediate Zone districts. Badulla and Moneragala districts together contribute to about half the acreage and production of the commodity. Anuradhapura is the major producing area among the Dry Zone districts. This crop is mostly cultivated in the mixed cropping systems in *chena*. Yields are very low, about 10 cwt/acre because the varieties used are degenerate strains and the levels of management are poor.

The improved varieties recommended by the Department of Agriculture are Thai Composite, Cuprico Flint Compesto and T 48. These are yellow seeded fliat varieties which fetch a better price in the market. The potential yields of these varieties when correctly and adequately fertilised and managed well otherwise, is about 25-30 cwts/acre.

The recommended land preparation and planting operations are tractor ploughing and harrowing to a depth of 6"-9" with application of fertilisers at final harrowing during September-October, and dibbling of seeds after the onset of rains in October having wet the soil to a depth of about 9". The advocated spacings are 2½" between rows and 10" apart in rows, or 2" and 12" respectively, with 2-3 seeds at each point thinning out a fortnight later to allow one plant, at each point. Fifteen lb of seed are required to plant one acre if the recommended spacing and thinning operations are followed.

Most maize varieties take 105-110 days to mature. Application of a basal mixture of 50 kg (1 cwt) concentrated superphosphate, 25 kg (1½ cwt) muriate of potash and 18 kg (40 lbs) Urea per acre when land is being harrowed followed by a top dressing of 56 kg (of 1/8 cwt) Urea per acre about 40 days after ploughing is the recommended fertiliser practice.

A spray application of Simazine on wet soil immediately after planting before the germination of the seeds or tractor or manual weeding 2-3 weeks after planting, will effectively control weed growth.

The Stemborer is the only insect pest that has presented a problem in Sri Lanka, and severe damage by this pest can be prevented by spraying any of the following insecticides: Azodrin 60%, Bayrusil 25% X or Thiodan 35%, as soon as the first signs of damage are noticed. Birds also cause damage to the crop when the seeds in the developing ears are in the milky stage. Harvesting is done by snapping the cobs from the stalks by hand. The cobs are dried in the sun for a few days and thereafter husked and shelled. It is best stored as corn on the cob. A dusting with an insecticidal dust like 4% Malathion or 10% BHC commercialised dust is recommended for storing of planting material.

Survey findings

The findings relating to rainfed cultivation in *maha* in respect of only the study areas in Anuradhapura, Hambantota and Badulla are discussed.

Maize was grown in average holdings of about 1-1½ acres in Badulla and 1 acre in the areas of Anuradhapura. In Hambantota smaller extents of land were devoted to this crop, the average holding being about ½ acre in Magama and 2/5th of acre in Gonnoruwa.

The majority of the maize growers, in all the study areas sow either in September or October, with the dry zone farmers favouring sowing in October, and the Badulla farmers, specially those in Mapakadawewa, sowing earlier in September.

The seeds were dibbled by almost all farmers in the study areas of Badulla and Hambantota and in Halmillakulama and Mahawilachchiya. A fair proportion of farmers in Palayakulama and Mahakanadarawa adopted the traditional method of planting; germinating the seeds in a hole and then planting them in the field. The farmers in these areas were either relatively more tradition bound or have been less exposed to new knowledge.

Almost all farmers (79%) in the study areas of Anuradhapura, used less than 10 lbs of seed for establishing the crop; about 25-35% using even less than 5 lbs/acre in Halmillakulama, Mahakanadarawa and Mahawilachchiya. Between 70% and 80% of the farmers in the study areas of Hambantota, too used less than 10 lbs of seed per acre. In Badulla, though the modal

group was 5-10 lbs/acre only about 45-50% of farms were in this group and there was evidence of use of even more than the recommended 15 lbs/acre by about 15-20% of the farmers.

Farmers of the study areas of Badulla showed greater awareness of improved varieties; more than 90% were aware of both improved and local varieties. Among the other areas too awareness of improved varieties was high (71-88%), except in Mahakanadarawa where only about 50% were aware of improved varieties.

A clear preference for local varieties was indicated by the farmers in the study areas of Anuradhapura excepting Palayakulama. The farmers of the study areas of Badulla and Hambantota showed a slightly greater preference for local varieties.

The crops were generally not fertilised; only two farmers of Gemunupura/Tissapura and one in Bakamuna reported application of fertiliser.

More than 90% of the growers in Badulla during *maha* 76/77 claimed to have weeded their maize holdings. In Hambantota claims of weeding varied between 84% and 97% and the corresponding proportions in Anuradhapura were about 73% to 83%. Mammotying was the main method of weed control in the study areas.

Diseases were not positively identified by most farmers. Generally symptoms such as yellowing, white or red coloration of leaves, and curling of leaves which could be attributed to either diseases, pests or some physiological condition of the plant and also a few cases of a non-specific nature such as viral diseases, were reported. Among the responses were found isolated instances of reports of collar rot, stemrot and whitening of topmost part of plant. Very few, if any, adopted remedial measures and of those who did, most of them removed the affected plant. Only three farmers reported use of chemicals for arresting diseases, but the chemicals mentioned; Endrex 20, Penitrothin and Sumithion were insecticides.

Stemborers and pod borers were reported as the main insect pests of this crop. A few instances of leaf worms or root worms were also mentioned. Removal of the plants was the main remedial measure adopted for controlling the spread of stemborer attacks. A few farmers; not more than three in any area, mentioned the use of chemicals for controlling their pest. The chemicals used were Malathion; which is not an effective control for Stemborer, Azodrin 60, Endrex 20, Endrin and Sumithion. Reports of pod borer incidence were fewer and control by use of chemicals was mentioned by only a very few farmers. Removal of pods, or plants, were the most prevalent methods of controlling the insect. Picking of worms is another control measure that was adopted by some farmers. This is an effective method which is feasible and suitable under the conditions in which most of the farmers grow this crop at present.

Maize was considered as not prone to damage by rains at early stages of growth by a large majority of farmers (83 - 72%) of the study areas of Badulla, a fair majority of farmers in Hambantota, Halmillakulama and Mahawilachchiya, and about 48% and 42% of the farmers of Palayakulama and Mahakanadarawa respectively. It was also considered as least affected by rain at harvest by about 50 -60% of the farmers of Badulla. The Anuradhapura farmers however considered it to be affected by rains at harvest. The responses did not clearly emphasize drought resistance as a characteristic of this crop, though in both study areas of Badulla and three areas of Anuradhapura about 40 -50% considered the crop to be least affected by drought.

The crop was harvested manually in all areas.

The average yields during *maha* 76/77 were around 18-19 bushels/acre in the areas of Anuradhapura, and about 10-11 bushels/acre in Hambantota. Within Badulla, Mapakadawewa had an average yield of 8 bushels/acre and Gemunupura/Tissapura 15 bushels/acre. The highest average yields of 19 bushels/acre (10 cwts/acre) does not reach the lowest potential of 25 cwts/acre even halfway. 50 -70% of the farmers in the study areas of Hambantota and Badulla had yields of 10 bushels or less per acre (about 5 cwts/acre).

The farmers of Anuradhapura and Hambantota opted for short aged varieties of two to three months life span with the majority (35 -45%) preferring 3 months varieties. A preference for 4 months varieties was also indicated by about 30% of the farmers of Halmillakulama and Mahawilachchiya. The Badulla farmers were almost equally divided in their preference for varieties of 2-3 months duration and of varieties 3½ to 5 months life spans; 4 months varieties being the first choice of the Mapakadawewa farmers.

A plant,of height between 3½ to 5 ft was the choice of the majority of farmers in all areas except Halmillakulama and Mapakadawewa; but even within this group, the Anuradhapura and Badulla farmers favoured taller plants of about 5 ft while the Hambantota preferred shorter plants of about 4 ft. There was a clear indication that in Mapakadawewa and Halmillakulama the farmers had a liking for taller plants of height 6 to 7 ft or even more. In Mahakanadarawa, Mahawilachchiya, Gemunupura/ Tissapura and Gonnoruwa too a fair proportion of farmers expressed a liking for such tall plants. The preference for taller varieties which are unimproved local varieties could have been dictated by their traditional practice of cultivating tall maize plants in a mixed cropping systems. These varieties also have an advantage of easy harvesting and higher storage durability.

Crop research in breeding for varieties are mainly directed towards short varieties which are lodging resistant and suited for mono-culture on a commercial scale.

One pick at harvest was the desired characteristic in all study areas. A large and yellow seed emerged as the type of seed that is preferred for the market. The Badulla farmers indicated a greater preference for a flat seed in comparison to a round seed while the Anuradhapura farmers preferred a round seed.

SORGHUM

Background

Sorghum is generally grown in small plots in the home gardens. Sorghum which can be a ratoon crop has a decided advantage over single

crop cereals, as it involves considerable saving in establishment time, land preparation and planting costs. Ratoon crops however can be grown only in areas where rainfall is well distributed over the whole year. Thus, ratoon crops are possible under rainfed conditions only in the wet zone and certain parts of the intermediate zone. In the dry zone, under irrigated conditions, with assurance of water all the year round ratoon cropping is possible, but no ratoon can be taken under purely rainfed conditions.

A Thai variety IS 2941 was a recent introduction to Sri Lanka. In the Kurunegala district sorghum was encouraged during *yala* '60 on an experimental basis and yields of around 30-40 bushels/acre were obtained.

The recommended sowing times under rainfed conditions is, the first week of November for the *maha* crop and March/April for the *yala* crop. Spacing of 20" between rows and 4" apart within rows is good for ratoon crops. 2" x 6" is considered a good spacing for a single crop in dry zone. Two seeds are dibbled at a point and thinned later and 12-15 lbs of seed are required to plant one acre.

The recommended fertiliser applications are a basal dressing of Ammonium Sulphate, Super Phosphate and Muriate of Pottash with a top dressing of Amonium Sulphate, 30 days after planting and repeat application of only the top dressing for ratoon crops.

As weeds are very competitive with this plant at the early stages weeding need be adopted 15 and 30 days after planting. Pre-emergent application of Ramrod is also recommended. Once well established, the crop is capable of withstanding adverse extreme weather conditions.

"Smut" which is a seed borne disease of this cereal, can be controlled by ceresan dressing at planting.

Stemborer can be problem as in maize and the same control measures have been recommended. Wind and birds especially parrots, cause damage. However, wind is not a problem with IS 2941. Bird scaring has to be commenced about 70 days after planting, when the grains are in the milky stage, to reduce the damage by birds.

The first crop of IS 2941 is ready for harvest within 100-105 days from planting and the first ratoon crop 85-90 days after harvest of the first crop.

The stalks are harvested when they are still green and the earheads cut separately. The stalk is cut 1" above the ground level, for the ratoon crop. Threshing by tractor is recommended. Average yields of 2,500-3,000 lbs per acre could be obtained from the first crop of the local variety. With IS 2941 greater yields of 5,000 lbs/acre for the first crop, and 3,500 lbs each for two ratoon crops have been reported.

Weevils contribute to a big problem of storage. Seed material could be mixed with 4% Malathion and 10% BHC for storage. The grains meant for consumption can be stored using a safe agrochemical such as Actalic. In storing grain the moisture content should not exceed 14%. Processing of sorghum presents difficulties. Sorghum could replace upto 10% of wheat flour in bread. A white grain is preferred to yellow grains.

Survey findings

Only 28 farmers reported cultivation of sorghum during *maha* 76/77 and this crop was not cultivated at all during *yala* 76. The farmers while being interrogated about this crop, mentioned that sorghum cultivation had expanded in response to extension efforts during *maha* 74/75, and as the produce had not been bought as expected by the procuring agencies, the cultivation of this crop was abandoned by most growers in the succeeding seasons.

The discussions relate to mainly Anuradhapura and Badulla.

The growers normally dibble their crops in September/October. Most farmers used less than 5 lbs of seed material per acre. The majority of the respondents in both districts were aware of only local varieties and all were able to obtain the preferred variety of the seeds during the season, the seed being from their own stock.

The crops were not fertilised. Weeding was done by about 50% of the farmers of Anuradhapura and most of them mammotied their fields. In Badulla 7% of the farmers stated that they had weeded their fields, and here again more used the mammoty than hand weed.

Parrots were considered a major pest and scaring was the method adopted to reduce pest damage. In fact, farmers in the study areas of Anuradhapura and also in Gonnoruwa and Attanakadawala reported abandonment of cultivation of this crop due to damage by parrots and other birds.

Though sorghum is a drought resistant crop, the farmers of Mahakanadarawa, Mahavilachchiya and Gemunupura/Tissapura considered this crop as one that is affected by drought and the Gemunupura/Tissapura farmers stated that it was also affected by rains at the early and later stages of growth.

PULSES (Cowpea, Greengram, Blackgram)

The main thrust of research work and investigation in pulse development programmes had been on crop improvement, and insect and disease control. Weed control, irrigation economy, food technology and use of machinery in farm operation are other areas that had received a fair amount of attention in research investigations.

The improved varieties have been bred with the aim of providing higher yields in a short life span of the plant. To reap the benefits of the genetic potential of the improved varieties the cultivator has to raise his standards of management of higher levels than what he is accustomed to.

The improved varieties of pulses being fertiliser responsive, of short duration and low water requirements, the crop could be successfully included in cropping patterns in rotation with rice. Further, the feature of low water requirement, makes it a feasible proposition to cultivate pulses on the paddy lands that lie fallow during *yala*. The recommended establishment and management practices for the varieties recommended for growing in respect of cowpea, greengram and blackgram are as follows:

Crop	Age (months)	Seed Rate (per acre)	Spacing (2 seeds per point)
Cowpea			
Bombay	3	20 lb	18" x 6"
Arlington	3	20 lb	18" x 6"
MI - 35	2½	25 lb	12" x 6"
Greengram			
MI - 1	3	20 lb	12" x 6"
MI - 4	2½	20 lb	12" x 6"
Blackgram			
MI - 1	3	20 lb	12" x 6"
Type 9	2½	20 lb	12" x 6"

Both soil moisture and fertiliser content influence the age of the crop; excesses delay maturity, while inadequacies hasten maturity. Hence, in timing the planting of the crop, excessive irrigation or rainfall during the life of the crop should be avoided and the planting done so that ripening takes place in the dry period.

Under rainfed conditions in the dry zone, the 3 months varieties planted in mid to late November and the 2½ months varieties in late November in the *maha* season, and only 2½ months varieties during *yala* planted in late March to April, get into the desired moisture conditions. In the wet zone, the best times to plant are November and July. In the dry zone, under irrigation planting may be done at any time making allowance for the ripening periods to coincide with dry conditions. Land preparation in ridges and furrows, with planting in ridges and controlled issues of water let into the furrows are also recommended for cultivation under irrigation.

A basal fertiliser dressing comprising,

50 kg/1 cwt conc. superphosphate
25 kg/½ cwt muriate of potash
25 kg/½ cwt ammonium sulphate OR
12½kg/¼ cwt urea

With a top dressing with nitrogeneous fertiliser as a booster dose of (10 - 20 lbs of Nitrogen/acre) if plants exhibit signs of poor growth, is the recommended fertiliser management. Pulses, unlike most other crops, do not require much nitrogeneous fertiliser; in fact too much nitrogen is detrimental to the crop. It suppresses nodulation resulting in poor growth and yield.

Weeds must be eliminated, particularly during the first month if a successful harvest is expected. A pre-emergent application of either Lasso, or Ramrod 659, for greengram or blackgram, and Linuson 509 for cowpea two to three days after planting and before the seeds sprout above the ground, is considered effective for the control of weeds.

Since the Agromyza fly can cause damage to the plants when they are in the two-three leaf stage, it is advised to spray Azodrin 60% at this time as a preventive measure. Spraying with Azodrin 60% is also recommended if leaf eating caterpillars become a problem.

Blackgram could be harvested in one picking and in fact the whole plant is harvested and threshed. Greengram and cowpea however require three or more picks because the seeds shatter on maturity.

COWPEA

Background

Cowpea production increased over the period 1971-77 when the restriction was placed on import of masoor dhal. This crop is grown in both *maha* and *yala*, with 30% of the total production being in *yala*. Kurunegala is the major producing area. 43% of the area devoted to this crop and 35% of the total production, during *maha* 76/77 was from Kurunegala.

Cowpea is an imporatnt pulse crop, as it played a revolutionary role in replacing masoor dhal in the diets of the people. The crop has a higher yield potential than greengram, blackgram and toor dhal, than any other indigenous grain legume grown in Sri Lanka. The recommended varieties are Arlington and Bombay, both 3 months aged varieties and MI-35 a 2½ months variety. MI-35, popularly known as 'Lanka Parippu' is an excellent substitute for masoor dhal. MI-35 has a yield potential of 1000 lbs/acre under irrigated conditions and 400 lbs/acre under rainfed conditions while the corresponding yields of other varieties are 1500 lbs and 700 lbs respectively.

Survey findings

Cowpea was cultivated by a fair proportion of farmers in all the study areas during *maha* 76/77. Therefore the discussions would ralate to all the areas for *maha* , and the Elahera Project area for *yala*.

Cowpea was grown on an average extent of about 2/5th to 3/4th of an acre in the unirrigated lands of the study areas of Anuradhapura, Vavuniya and Hambantota and the Elahera Project during *maha*. The Badulla farmers' responses indicated that only about 1/5th acre of land was devoted to this crop on an average by the cultivating households. Under irrigated condition during *yala* 77 the average holding of Attanakadawala and Bakamuna were 1/3rd and 1/4th acres respectively.

Farmers cultivating under rainfed conditions in the dry zone districts of Anuradhapura, Vavuniya and Hambantota usually planted their crops during September to November with October being most favoured, though in some study areas planting as early as in August or later in December were also reported. In Badulla district, though, most planting was done during the months of September, October and November, a slightly higher preference for September was noted. Sowing time in Gemunupura/Tissapura, spanned August to Feburary. In the Elahera Project area, planting was usually done from September to February for the *maha*

crop, and peaks were observed in October/November and January. For cultivation of the *yala* crop under irrigated condition, planting commences in May and continues through August, May followed by June had been the mostly favoured months.

Dibbling was the method of planting adopted by a vast majority of farmers in all study areas, with the exception of Chettikulam where broadcasting was the most popular method. In Mahakanadarawa row sowing was also practised to a fair extent by the farmers.

The majority of farmers in all the study areas except in Mahakanadarawa and Mapakadawewa reported using 5-10 lbs of seed/acre for cultivation during the *maha* season. Even less than 5 lbs/seed per acre was the most common quantum of seed among the farmers of Mahakanadarawa and Mahawilachchiya. In the Elahera Project area most farmers used 5-10 lbs/acre for even the irrigated cultivation during *yala*. In the Anuradhapura, Hambantota, Badulla and Pavatkulam the majority of the farmers (75-100%) were aware of both local and improved varieties. The Chettikulam farmers (100%) were aware of only improved varieties. Their non-awareness of local varieties may be due to cowpea not being a traditional crop of this area. In the Elahera Project about 1/4 to 1/3rd of the farmers were aware of only improved varieties.

Among the cultivators of Mahakanadarawa, Mahawilachchiya, Gemunupura/ Tissapura and the Elahera Project area there was an almost equal preference, or greater preference as observed in Mahawilachchiya, for local varieties, while an over-riding preference for improved varieties was indicated in the other areas.

Almost all farmers were able to obtain seeds of the preferred varieties during *maha* 76/77. The majority of the farmers in all areas except Chettikulam used their own seeds. In Chettikulam boutiques were the main source of seeds. In Mahakanadarawa too a large proportion of farmers purchased their seeds from boutiques. The APC figured as the principal outside source for supply of seed to the farms in Gemunupura/ Tissapura and Bakamuna.

Poor level of fertiliser management were reflected in the survey. During the *maha* season, 8 farmers in Gemunupura/Tissapura one in Mahakanadarawa and 4 in the Elahera Project area reported application of fertiliser. Of these farmers, 2 in Gemunupura and all the farmers of Mahakanadarawa applied organic manure. Farmers who reported use of chemicals applied only top dressings of Urea. Even among the Elahera Project farmers who cultivated under irrigated condition during *yala*, only one had fertilised his crop and that too only with a top-dressing.

Almost all farmers reported weeding (85% farmers in the Elahera Project and 90 - 100% in the other areas). Mammotying was the method resorted to by almost all farmers, except in Chettikulam and Gemunupura/ Tissapura where the weeds were mainly picked by hand. In both these areas the most (prevalent) planting method was broadcasting of seeds and this explains why hand weeding was adopted in these areas. Use of chemicals *per se* or along with mammotying, was non existent or very rare.

Diseases as reported by farmers was in terms of physiological changes observed by them. Yellowing of leaves was the major symptom observed in all the study areas. Curling of leaves was another symptom mentioned by farmers in areas except Chettikulam. Whitening of leaves, red coloration of leaves, falling of leaves, appearance of spots on leaves, appearance of holes on leaves and damping of leaves were the other symptoms mentioned by farmers. Rotting or decay of roots were also mentioned. "Rust" was mentioned by name by a few farmers, though this crop is not susceptible to this disease. It is possible that the reference was to the disease known as "*Cercospora*". One farmer in Chettikulam mentioned 'Blast' for which Polythion was sprayed for control, and 3 stated that their crops had 'virus' diseases which were controlled by insecticides. Of those who reported diseases, 50 - 75% did not use any control measures. Among the others a fair proportion of farmers had used chemicals as control measures but the chemicals used (Malathion, Nyran, Azodrin 60, DDT, Trithion, Polithion, Endrex 20, BHC, Actelic, Gamexene) were all insecticides. The other farmers had eradicated their plants.

Aphids presented problems to the farmers in all study areas except in Vavuniya,[1] Hambantota, Mapakadawewa.[2] One farmer in Palayakulama stated that he abandoned the cultivation of cowpea due to aphids. Three farmers in Mahawilachchiya and one in Chettikulam too had stopped cultivating cowpea because of pests.

Leaf eating caterpillars emerged as the major pest in Chettikulam. In Hambantota pod borers were mentioned as the major pest.[3] The pod borer also being referred to as *"Illmessa"* or *"Illweseema"*, was mentioned by a large number of farmers (14) in Gemunupura/Tissapura. 'Flies', (in a few instances stated as 'pod flies') were also reported by a fair number of farmers in the study areas of Anuradhapura and Badulla districts. The other pests mentioned by small numbers of farmers in the study areas were worms, (leaf worm, root worm) stemborers, leaf roller, and godavella;[4] the last being mentioned by only the Chettikulam farmers.

Insecticides[5] had been used for the control of aphids by a very large proportion of the farmers. All 11 farmers of Chettikulam who mentioned leaf eating caterpillar as a pest had used insecticides to control it. Pod borers too had been controlled with the use of insecticides, except in Mapakadawewa and Gemunupura/Tissapura. In these two areas, use of agrochemicals for control of pests or diseases were relatively low. In the other study areas insecticides were used for the control of all pests, even the minor ones.

Cowpea was considered to be a crop that was least affected by rain at early stages of growth by the Gonnoruwa farmers. All study areas voted it as a crop affected by rains at harvest. The crop was

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1 No insect pests were reported in Pavatkulam.

2 The numbers reporting that this pest appreciably reduced yields were as follows: Palayakulama 15, Halmillakulama 27, Mahakanadarawa 35, Mahawilachchiya 55, Gemunupura/Tissapura 19, Bakamuna 23, Attanakadawala 21.

3 Gonnoruwa 25, and Magama 15.

4 Godavella - paddy swarming caterpillars.

5 Malathion, Nyran, Azodrin 60, Sumithion, Gamexene, Endrex 20, Endrin Hopsene, Folidol, Thiodan, Parathion, BHC., DDT.

considered drought resistant by about half or more of the farmers of Palayakulama, Halmillakulama and Mahakanadarawa and Attanakadawala.

Excessive rain and lack of labour were the main problems of harvesting the crop.

Except for one farmer in Mahakanadarawa who used a tractor for threshing all farmers threshed their crops manually.

The average yields during *maha* 76/77 varied from 3.9 to 10.4 bushels per acre among the study areas, with the areas of Anuradhapura and Vavuniya exhibiting the higher averages (Anuradhapura 6.6 - 10.4, Vavuniya 7.0 - 9.2). The yields of both Hambantota and Badulla districts were very low. What is worthy of note is that most farmers had an average yield of even 5 bushels or less or about 5-10 bushels/acre. The crops cultivated under irrigated conditions in the Elahera Project during *yala* 77 did not seem to have fared any better, the average yields for the study areas being around 8 and 9 bushels/acre, for Attanakadawala and Bakamuna respectively, and the majority of farmers had obtained 5-10 bushels/acre.

The farmers of Anuradhapura and Elahera Project desired plants with a life span of 1½ to 2 months. Though the majority of the Hambantota farmers preferred 2 months aged varieties, there was also a desire for longer age varieties of 2½-3 months expressed by half the sample farmers in this area. A similar trend in desire was observed in Pavatkulam.

A short plant, 1½ ft high, was the choice of the majority of farmers of Anuradhapura and Elahera Project and also of Gonnoruwa and Gemunupura/Tissapura though a desire for a 2 ft high plant was also manifest in the responses of the farmers of Mahawilachchiya and Bakamuna. The Chettikulam farmers clearly indicated a preference for a 2 high or even slightly taller plants.

It is of interest to note that in study areas of Anuradhapura, Vavuniya and Elahera Project a desire for 3 to 4 picks, and in some instances even more than 4 were voiced by a great majority of farmers. In the other areas there seemed to be a greater preference for one pick.

The majority of farmers of Elahera and Hambantota indicated that there was a greater market for small seeds. A white seed was considered to be of great market value: a round seed was considered desirable for the market by farmers of most study areas.

GREEN GRAM

Greengram has been traditionally grown in Sri Lanka. It is mostly grown in the districts of Kurunegala, Hambantota, Anuradhapura and Moneragala. The districts contributed 27%, 25%, 6% & 13% respectively to the total area devoted to this crop and 25%, 28%, 7% & 12% to the total production during *maha* 76/77. During *yala*, the crop mainly emanated from the irrigated paddy fields of Kurunegala, Polonnaruwa and Jaffna, and the rainfed highlands of Anuradhapura.

Of several varieties bred and released by the Maha Illuppallama research station, MI4 which has a good yield potential and large seed size is popular. The popularity of Type 51 which has the highest yield potential is limited, because of the smaller seed size.

The Mung bean Yellow Mosaic Virus (MYMV) and the Tobacco Ring Spot Virus (TRSV) are known to have drastically reduced greengram production. No source of resistance have been identified for the virus diseases and chemical control is either ineffective or uneconomical. The population of the white fly (Bemica tobacco) the vector that transmits MYMV has been noticed to be at a peak in December, January and Feburary. There has been indication of a minor peak in May-June. TRSV is seed borne and has been noticed to occur during the cooler months of the year (December to Feburary). Wild relatives of the greengram plant are being screened to find resistance to MYMV and any species showing resistance or tolerance to the disease are being used in Hybridization programmes in order to breed a disease resistant variety. There is no passage of the TRSV in blackgram. A large number of interspecies crosses (Greengram x blackgram) have been successfully effected and selections are being done with the objective of obtaining resistant varieties.

Survey findings

The survey responses indicated that only the study areas of the Hambantota and Badulla districts, Mahakanadarawa in Anuradhapura and Chettikulam in Vavuniya and the Elahera Project pay attention to this crop. Hence the discussion will relate to only these study areas in respect of *maha* and also the Elahera Project area in respect of *yala*.

The average crop holding was largest in Magama by about 4/5 acre. Gonnoruwa, Chettikulam and Mapakadawewa had average holdings of around 0.45 acre. The holdings were smaller in the other areas and ranged from 0.15 to 30 acres. The lowland crop holdings in the areas of Elahera Project too were around 1/4 and 1/3rd acres respectively.

Farmers of Mahakanadarawa planted/sowed mostly in October or November. In Chettikulam almost all farmers sowed their crop in November. In Hambantota, crop establishment was done early with a large majority attending to this activity during October in Gonnoruwa and during September/October in Magama. The majority of the farmers in the areas of Badulla established their crop during November/December with a very great tendency to do so in December. The Elahera farmers established their *maha* crops during October to January with most farmers planting in January. May was the most favoured month for planting the *yala* crop though this activity was extended through the period May to August.

The Chettikulam farmers invariably, and almost all (94% and 82%) in the areas of Badulla broadcast their seeds. The majority of the Gonnoruwa farmers (68%) and Elahera Project farmers (73 -95%) dibble the seeds for establishing the crop. In Mahakanadarawa and Magama both broadcasting and dibbling of seeds were practised almost equally and a few farmers reported row sowing in these areas.

A quanta of seed used per acre were very low; majority of farmers in Badulla and Mahakanadarawa used less than 5 lbs/acre. In Gonnoruwa and Magama, farmers varied greatly from one to another in the amount of seed used, ranging from less than 5 lbs/acre to more than 25 lbs. Most of the farmers of Chettikulam and the Elahera Project used between 5 and 10 lbs/acre.

A very great awareness of improved varieties was reflected among the farmers of Gonnoruwa. The high rate of adoption of dibbling in this area may be associated with this awareness. Magama the other study area in Hambantota too seems to have had a high exposure to new varieties. (50% claimed to be aware of improved varieties). At the other extreme were the study areas of Badulla where farmers were almost completely unaware of improved varieties, all farmers of Mapakadawewa and 85% of those in Gemunupura/Tissapura were aware of only local varieties. In the other areas too, with the exception of Bakamuna there was not much awareness of improved varieties; 57 -77% were aware of only local varieties.

Having had almost no exposure to improved varieties almost all the Badulla farmers preferred the local varieties. The improved varieties had a slight edge over the local varieties in the preferences of the Gonnoruwa farmers and a preference for local varieties was noticed among the farmers of other areas. Farmers experienced no difficulties in getting the seeds of varieties of their choice as the majority used their own seeds, with a few obtaining seeds from neighbours. In Mapakadawewa a relatively large proportion obtained seeds from boutiques and the agricultural extension centre had been a source of some importance in the Elahera Project area.

Use of fertiliser was almost non-existent for this crop.

Almost all farmers (80 - 100%) in the study areas of Badulla and also Chettikulam claimed to have weeded their holdings of this crop during *maha* 76/77. 62% of the Mahakanadarawa farmers too stated that they weeded. All farmers of Chettikulam did hand weeding. In the other areas except Gemunupura/Tissapura there was evidence of mammotying being the most prevalent method. In Gemunupura/Tissapura both methods were equally adopted.

Yellowing of leaves was considered a disease and reported by a large number of farmers in Hambantota , Badulla and Attanakadawala. Other diseases reported in these areas were curling of leaves, whitening of leaves and red coloration of leaves. 'Rust' was mentioned by name by one farmer in Mahakanadarawa and two in Gemunupura/Tissapura. There

was a direct mention of viral diseases by a farmer of Chettikulam and he had used insecticides to control it. Two farmers of Gonnoruwa referred to 'Nagawalli disease' - probably the mosaic virus. A farmer of Chettikulam and another at Attanakadawala also mentioned appearance of spots on leaves. Chettikulam farmers mentioned yellow spots. In Mapakadawewa no control measures were adopted for any of the diseases mentioned. In Gemunupura/Tissapura and the areas of Hambantota too, many instances of yellowing of leaves were left unattended. Agro chemicals were used for control of diseases, specially yellowing of leaves, the chemical used being insecticides. Diseases stated as yellow and red coloration of leaves, was the reason for abandoning cultivation of this crop by 3 farmers of Gemunupura/Tissapura.

The pod borer emerged as the main insect pest that causes damage to crops in the study areas of Hambantota and Gemunupura/Tissapura. This pest was either mentioned directly or indirectly as flies attacking pod or *'ilmessa'*. The leaf eating caterpillar was the main pest in Chettikulam, and aphids in Attanakadawala and Mahakanadarawa. Thrips emerged as a main pest in Bakamuna whether aphids were being referred to as thrips is not known.

Termites and *'Gadavella'* were pests mentioned by one and two farmers respectively in Chettikulam, and worms, leaf worm, root worm, by farmers of Mapakadawewa and Gemunupura/Tissapura. In all study areas excepting the areas of Badulla, control measures were adopted in almost all instances by application of chemicals. However, ineffective measures, such as use of DDT for pod borer, Gamexene, Malathion and BHC powder, Polythion and Endrex 20 for Termites were observed among the responses.

Wild boars presented a grave problem for the farmers of Hambantota. In fact four farmers of Yodakandiya had abandoned cultivation because of wild animals.

There was a clear pronouncement that greengram was least affected by rains at early stages by the Gonnoruwa farmers, while an agreement with this statement was seen among a fairly large proportion of farmers in Magama, Mapakadawewa and Chettikulam. This crop was not

elected as either not affected by rain at harvest or as a drought resistant crop in any area.

Labour shortage and excessive labour charges were the main problems faced by farmers of Chettikulam and Hambantota for harvesting their crops. Excessive rain too was mentioned by relatively large number of farmers in each area.

The average yields were low. In *maha* it varied between 1 bushel/acre in Mapakadawewa to about 10 bushels/acre in Mahakanadarawa. The *yala* yields in Elahera were, 5 bushels/acre in Attanakadawala and 7 bushels/acre in Bakamuna respectively. The majority of farmers in each study area produced 5 bushels or less per acre.

Threshing was done manually. Only one farmer in Mahakanadarawa and one in Magama had used a tractor for threshing.

Lack of marketing facilities, was considered a major constraint to production by the farmers of Mapakadawewa and Hambantota.

The Elahera Project farmers indicated a very strong preference for very short duration crops, specially 1½ months. The Badulla farmers and the Mahakanadarawa farmers had a liking for crops of a longer life span of mainly around 3 months. Plants with a life of 1½ - 2½ months with an average of 2 months was the choice of farmers in the other areas.

Short plants of height 1½ - 2 ft was the choice of most farmers in all study areas; the preference for the shorter plant of 1½ ft high was stronger among the Hambantota, Mahakanadarawa and Attanakadawala farmers, while a preference for 2 ft or slightly higher plants was marked among the Chettikulam and Badulla farmers.

More than one pick with a special liking for 3 picks, was the expressed preference of farmers of all areas except Magama and Gemunupura/Tissapura where farmers mostly desired only one pick at harvest.

Large green seeds were considered to be suited for the market by the farmers of all areas except Badulla. A better market for round seeds too surfaced from the opinion by the farmers.

BLACK GRAM

Blackgram, a traditional crop of Sri Lanka is mainly grown in the unirrigated lands of Vavuniya during *maha*. About 60 -70% of the land area devoted to this crop, as well as of production, during *maha*, is from this district. None of the other districts singly contribute more than 10% of the islandwide production. Only 10% of the total production during a year is obtained from the *yala* crop. The major contributors to *yala* production are Kurunegala, Puttalam and Jaffna districts.

The cultivation of blackgram expanded and production reached high levels during 1976 to 1978 when there was a total ban on imports of pulses. The price scheme introduced in 1975 was a further incentive to production.

Of the pulses grown in Sri Lanka, blackgram is attributed with the least risks in cultivation and storage, and gives good yields under low levels of management.

The disease of economic importance is 'Rust' (Uromyces phaseoli). None of the varieties grown in Sri Lanka including the recommended varieties possess resistance to this disease. The recommended improved varieties MI I and Type 9 aim at higher levels of management. These two varieties have a large seed size for which there is a better export market.

Three farmers of this area stated that they had abandoned cultivation of this crop due to pests.

Survey findings

Discussions relate to the study areas of Vavuniya and Badulla, and the Tank areas of Anuradhapura. Blackgram holdings in Vavuniya were large; the average size in Chettikulam was 6 acres, and in Pavatkulam about 3 3/4 acres. About 1/3 to 1/2 acre was the average size of

holdings in the tank areas of Anuradhapura. In Mapakadawewa the average size of the holding were around 1/2 acre, and the Gemunupura/Tissapura holdings were very small; the average holdings being about 1/5th of an acre.

October is the favoured month for sowing by the Vavuniya farmers. The farmers of the tank areas of Anuradhapura sowed both in September and October and most of the Badulla farmers sowed late in December. All farmers of Vavuniya and Badulla broadcast sowed their seeds, while dibbling was the most popular method of crop establishment in Mahawilachchiya, and dibbling was equally practiced as broadcasting in Mahakanadarawa.

The Vavuniya farmers used relatively high seed rates, all using more than 8 lbs per acre and the majority using 15 lbs/acre. The majority in Badulla used 5-10 lbs per acre and in Mahakanadarawa and Mahawilachchiya less than 5 lbs/acre.

All farmers of Chettikulam, and 90% of the Pavatkulam farmers were aware of both local and improved varieties. Farmers in the other areas too were well aware of improved varieties.

Farmers did not experience difficulties in getting the seeds of the preferred varieties. Though the majority of the farmers used their own seeds in all areas, about 30 -50% of the farmers of Mahakanadarawa, Mahawilachchiya, Pavatkulam and Mapakadawewa obtained their seeds from boutiques. The APC figures as a source of some importance in the supply of seeds to the Chettikulam and Mahawilachchiya farmers. Fertiliser applications were nil.

In all areas excepting Pavatkulam almost all farmers claimed to have weeded their crop holdings. In Pavatkulam only 10% had weeded their holdings. All the Chettikulam farmers had hand-weeded their plots, while almost all the Anuradhapura farmers weeded their plots with a mammoty. In Badulla both methods were practised equally by the farmers.

Yellowing of leaves, whitening of leaves and curling of leaves, stemrot and rust were the diseases reported by a few farmers in each study area. In most of such cases in Pavatkulam, the Badulla study areas and the Tank areas no measures had been adopted to control diseases. Use of Azodrin 60 was reported in Mahakanadarawa. In Chettikulam chemicals such as Folithion, Azodrin, Thiodan and Endrex were used. Agrozan a weedicide was also mentioned, as being used for arresting diseases.

Aphids, pod borers, stemborers, worms and flies were the pests reported by the farmers of the Tank areas and the Badulla study areas. Endrex, Lanate, Azodrin 60 etc., were used for controlling the pests by the Anuradhapura farmers; the Badulla farmers did not adopt any control measures. The pests for blackgram in Chettikulam were generally different from those of the areas in other districts. The leaf eating catterpillar was a major pest in Chettikulam - Insecticides had been used by all farmers except one who reported use of Agrozan (a weedicide) to control this pest. 'Gadavella', leaf rollers and termites, pod borers and weevils were the other pests reported in this area.

Though a large number of farmers reported pests, in Pavatkulam almost all had not specified the pests. Most farmers in this area did not use any control measures while the rest used insecticides.

Monkeys caused damage to the crop in both Chettikulam and Pavatkulam.

The Chettikulam farmers were of opinion that this crop was not affected by rain at early stages of growth though susceptible to damage by rain at harvest, and it was drought resistant. The Pavatkulam farmers and the Mahakanadarawa farmers too to a lesser extent agreed that this crop was drought resistant.

Excessive rain and lack of labour were very major problems of the Chettikulam farmers at harvest. Thirteen farmers of Pavatkulam mentioned falling of pods as a problem at harvest.

Threshing was done almost exclusively by tractors in both Chettikulam and Pavatkulam. In the Tank areas too there was evidence of little use of animal and tractors for threshing. In Badulla however, all threshing was done manually.

The average yields were very low (2 and 5 bushels/acre) in the study areas of Badulla, and varied between 8 and 12 among the other study areas. In Chettikulam and Pavatkulam most farmers produced about 10 and 7.5 bushels/acre respectively. In the other areas the majority of the farmers produced 5 bushels or less per acre.

Labour shortage was considered a very major constraint for cultivation by the farmers of the study areas of Vavuniya. Lack of marketing facilities was relatively a constraint for the farmers of Mahakanadarawa and study areas of Badulla.

A distinct preference for long duration crops of around 3 months of life span was evidenced among both the Chettikulam and Pavatkulam farmers. The Anuradhapura farmers preferred shorter lives of 1½ - 2 months.

A two feet high plant was the choice of the majority of farmers in Chettikulam and there was an indication of a liking for even shorter plants by the Pavatkulam and Mahakanadarawa farmers.

Vavuniya farmers were almost unanimous in their preference for only one pick at harvest. A desire for more than one pick, emerged from the responses of the Anuradhapura farmers.

Judging from the very few responses of the Badulla farmers, the choice of the Mapakadawewa farmers seem to be akin to that of the Chettikulam farmers (3 months duration, 2 ft high and 1 pick) and the preference of the Gemunupura/Tissapura farmers resemble those of the Anuradhapura farmers.

Most of the farmers who stated an opinion on the desired characteristics of seed for the market, voted for a large black seed.

SOYA BEAN

Background

Soya bean was introduced to Sri Lanka recently; early in the decade of the seventies. The value of this crop lies in its high protein content making it a cheap source of protein of special importance in the food and nutrition programmes in the country. The '*Thriposha*' programme was one major user of soya at the time this study was undertaken, and it continues to be so even now. The other major use is in the preparation of animal feed by the Oils and Fats Corporation. The greatest drawback in promoting the consumption of soya as human food, was mainly the lack of knowledge and the inconvenience of processing it. A break-through has now been made in providing soya foods to the people in convenient processed forms such as soya meat and soya milk. It is expected that with the interest currently evinced by food manufacturers in this crop, the commercial use of this product would demand a greater supply of it.

The dry zone is the most suitable environment for the cultivation of this crop. Planting around mid October to mid November in well drained highland or *chena* is recommended, so that the crop matures during the period between January and the end of February. In a normal rainy season no irrigation is necessary. For cultivation under irrigated conditions in well drained paddy fields during *yala*, planting is done between end of April and early May and ten irrigations are necessary.

The recommended varieties are:

Davis	90 days, fairly large dull cream seed;
Bossier	92 days, medium sized shiny dark cream seed;
Hardie	92 days, small dull dark cream seed;
Improved Pelican	91 days, large dull light cream seed;
SJ2	92 days, small shiny dark cream seed;
PBI	82 days, very small shiny dark cream seed.

The land has to be ploughed, harrowed and the soil worked to a fine tilth before planting. Planting is done on the flat under rainfed conditions or on ridges raised 4"-6" and 1½ ft apart so that the

furrows may be used for irrigation. The recommended spacings for planting are 1½ ft between rows and 2"-3" within rows and 60 lbs of seed/acre, would be required for such planting.

Application of a basal fertiliser mixture containing 50 kg of Urea, 150 kg of Superphosphate and 100 kg Muriate of Potash is recommended treatment of the seed with a commercially prepared nitrogen-fixing bacterial culture immediately before planting ensuring that the soil is moist at planting, eliminates the need for top dressings of Urea at later stages of the crop, as the bacterial nodules established in roots will absorb the Nitrogen from the air converting it into an assimable product in the plant, providing the nutrient for later development of the crop. If the seed is not inoculated, the crop needs the following top dressings of Urea.

25 kg 3 weeks after planting,
25 kg 6 weeks after planting, and
50 kg when 50% of the crop is in flower.

Weeding should be done prior to each application of fertiliser.

White flies and the yellow mosaic virus have been identified as causing problems, to this crop - Leaf eating caterpillars are currently causing considerable defoliation and the stink bug complex is a potential threat to the production of the crop.[1] Spraying with any of the following insecticides: Tamarone Seven, Monitor, Lebaycid, Trithion, Azodrin etc., have been recommended for control of all these insect pests.

The rabbit can cause damage to crops by eating up young plants to about fourth week. Plots can be enclosed with one row of cadjan barrier to prevent damage.

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1 M.E. Irwin - page 7, Second Interim Report of Progress - The Sri Lanka Soya Bean Project - October 1st 1976-Dec. 31st 1977. Submitted by International Soya Bean Project INTOSOY.

The crop can be harvested in 3-3½ months when the leaves yellow and drop off, and the pods turn Brown. Plants are cut with a sickle and dried on a threshing floor until the pods are brittle. Threshing can be done either by tractor or by putting the dried plants into a gunny bag and beating them with a stick.

Expected average yields range from 1000-2000 lbs/acre; the irrigation crop in *yala* usually giving higher yields than a rainfed *maha* crop.

Seed should be thoroughly dried in the sun and thereafter stored in a cool place to ensure viability. The viability is associated with seed size, smaller seeds which have a lesser fat content being more viable than the larger seeds. As viability deteriorates rapidly seeds properly stored as well as fresh seed obtained from the Department of Agriculture should be used. It is always desirable to do a germination test before sowing and adjust the seed rate accordingly.

Fortunately soya bean seeds are not readily attacked by storage pests. However, if farmers encounter damage by storage pests insecticides recommended for seed dressing could be used. Dusting the seeds with a BHC 10% commercial dust reduces damage by weevils.

Survey findings

As already mentioned in Chapter Two, the decision to include this crop in the study was made after the selection of the study areas and the samples of households for the survey. Only a few soya bean growers were netted in the study. Thirteen farmers had cultivated the crop during *maha* 76/77, 5 in the Elahera Project area, 4 in Gemunupura/ Tissapura, 2 in Gonnoruwa and one each in Mahakanadarawa and Pavatkulam. Eleven farmers in the Elahera Project cultivated during *yala* 77.

Farmers indicated that planting was usually done in October/ November, and mainly by dibbling. Row sowing too was practised by some farmers.

The Elahera farmers showed evidence of using mostly 30-60 lbs of seed per acre for planting. In the other areas, farmers used very small amounts of less than 7 lbs/acre.

As expected, reporting farmers from all areas stated that they were aware of only improved varieties. Hence, their preferences too were for only improved varieties. The agricultural extension centre figured as the main source of seed material.

Only one farmer in Gemunupura/Tissapura fertilised his *maha* crop and that too with only top dressing of Urea. Of the 11 *yala* cultivators in the Elahera Project, one in Bakamuna applied basal fertiliser, and 5 in Attanakadawala applied top dressings of Urea.

Almost all farmers claimed to have weeded their crop holdings by mammotying.

Yellowing of leaves was the common complaint of the farmers in reporting diseases that damage the crop. Aphids and worms were reported as pests of this crop by the Gemunupura/Tissapura and Attanakadawala farmers. One farmer in Attanakadawala mentioned the grasshopper as a pest that damages his crop. The rabbit was mentioned as causing damage to their crops by farmers in all reporting areas and 4 farmers had abandoned cultivation due to damage by rabbits.

Harvesting was done manually by most farmers. Tractor threshing and threshing with animals were also observed in the Elahera Project. Excessive rain was mentioned as a problem at harvest by Gemunupura and Attanakadawala farmers.

Yields under rainfed cultivation in *maha* were low, not exceeding 10 bushels/acre and mostly less than 5 bushels/acre. The *yala* yields under irrigated conditions were above 10 bushels/acre and yields of 24-46 bushels/acre too were also reported.

There seemed to be a general agreement that this crop is not affected by rain at its early stages of growth.

A common desire of the farmers, was for a plant with a life span of 2-3 months, 1-2 ft high, and with one pick at harvest.

5.5 SUMMARY

It could be said, that in general, the levels of management of cultivation of the coarse grains and grain legume crops studied have been very low.

Highland and *chena* were tilled by mammotying in most areas, though animal or tractor power was used in the preparation of lowland, the crops were hardly fertilised even when grown on a commercial scale, and though it was claimed that the holdings were weeded it is doubtful whether the practice was adopted in an effective manner.

Farmers seem to need education in identifying diseases and also in the use of the correct chemicals for control of diseases and pests.

Farming systems vary from area to area and the desires expressed regarding the life spans and heights of plants were prompted by the needs of the different systems. Research geared towards improvement of plant types should therefore recognise the differential needs of systems after establishing the suitability of the system for the area.

The yields realised per acre of land under the cultivators' levels of management were very low; the maximum average obtained was very much below the half way mark of potential yields.

Seed material for cultivation was mainly from the farmers own stock. Seed selection and upgrading of seeds have to be encouraged to prevent the degeneration of stocks.

The farmers also need advise in using the desirable quantum of seed, timing of planting to expect dry weather at harvests, and to arrest diseases wherever applicable.

As a first step in promoting intensive cultivation, should not research and extension efforts be pitched at lower levels of achievement and aim at providing a higher rate of return for a small incremental step towards a higher management level. Bridging the wide gap between practice and expectation becomes easier when the task is taken in stages.

Chapter Six

COMPARATIVE ADVANTAGES IN THE CULTIVATION OF THE CROPS

Cultivation of any particular crop is motivated by more than one consideration. High cash return/acre, low risks in cultivation, cash inflows at appropriate times to finance the cultivation of other crops in the farming system and non-monetary consideration such as food security and less effort, are some factors that play a significant part in the choice of crops from among those suited to the physical environment.

The farmer preferences in crops for cultivation during *maha* and *yala* and the reasons for such preferences as ascertained by the survey, would throw some light on the major considerations in the choice of crops. Therefore, this information will be discussed and analysed first in this chapter, followed by a comparative analysis of the costs of cultivation, returns, and labour requirements to discern the motivating factors in the choice of crops.

Information on resource use and costs were subject to the limitations on reliability due to recall in single interview surveys. The costs and returns were therefore computed only in respect of areas where a minimum of five farmers had provided reliable data.

6.1 FARMER PREFERENCES IN CROPS FOR CULTIVATION

The farmers were requested to mention the crops they would wish to cultivate during *maha* and *yala* in their order of preference and the reasons for their preferences. The question as posed was unconditional, and *the preferences were expected to be prompted by experiences of the farmers under the prevailing agro-ecological, social, cultural and economic*

conditions and their knowledge of the crops.[1] An average preference score was computed for each crop, scores being assigned to the farmer responses on a scale ranging from 0 to 4.[2]

6.1.1 Preferred crops for the farms during *maha*

The average preference scores and the distribution of first preferences for crops for cultivation during *maha* are given in Appendices 6 and 7.

Considering the first preferences alone, paddy emerged as the mostly preferred crop in all areas except Gonnoruwa, Mapakadawewa and Pavatkulam, in Gonnoruwa it was equally preferred as cotton or kurakkan, and in Mapakadawewa almost equally as maize. The relative rankings of crop in terms of average scores differed from that based only on first preferences in some instances; the features that determine the preferences are probably sharply focussed in the picture presented by the average scores, as it closely fits the pattern of farmer behaviour in crop selection.

Some noteworthy aspects of crop preference depicted by the average scores are,

1 The almost exclusive preference for paddy (scores of 3.5 & 3.7 out of a maximum of 4) in the Elahera Project area, with no interest in any other cereal;

2 No singular preference for paddy in the areas of Anuradhapura though it emerged as a first preference; kurakkan had an almost equal score as paddy in three of the study areas, and maize followed paddy with a high rating in Mahawilachchiya the fourth area;

3 Highest preference for paddy (3.5) in Gemunupura/Tissapura, accompanied by a high preference for maize;

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1 Accessibility to the different types of land influences the responses.

2 First preference - 4; Second preference - 3; Third preference - 2; Fourth and lesser order of preference - 1; crop not mentioned - 0.

4 Loss of position of paddy in the order of preferences among cereals to kurakkan in Gonnoruwa, and maize in Mapakadawewa;

5 Kurakkan being ranked next to paddy with a relatively high rating in Magama;

6 A marked preference for blackgram, which was rated higher than even cereals in the study areas of Vavuniya;

7 Highest preference for cotton, a non food crop, followed by preferences for kurakkan and chilli, a non-cereal crop, in Gonnoruwa;

8 A marked preference for at least one other crop besides a cereal, which perhaps had proven to have a comparative advantage over others in terms of cash inflow or net return, in all areas, except Mapakadawewa. The importance attached to blackgram in Chettikulam and Pavatkulam and cotton in Gonnoruwa have been already mentioned in 6 and 7 above. The preferred crops of the other areas were cowpea in Elahera, cowpea and chilli in Anuradhapura, cowpea, greengram and chilli in Magama, and cowpea in Gemunupura/Tissapura.

An examination of the reasons for the preference of paddy or any other cereal, indicated that in areas with low paddy production capacities[1] both paddy and other cereal crops were favoured, mainly because they provided food security (Appendix Eight). Reasons reflecting commercial concerns, such as high income and sales were also attributed to the preference for paddy by a fair proportion of the responses and the responses adducing consumption purposes as a reason were comparatively low (only around 50%) in Elahera.

These are pointers to the value placed on paddy as a market oriented crop too, in this area. The desire for growing maize was prompted by both food security and marketing concerns, in the areas of Anuradhapura and Badulla. Kurakkan emerged as a crop grown purely as a rice substitute.

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1 See foot note 1, page 57.

The over-riding motive for growing blackgram, chilli or cotton was for sale; even in Chettikulam where blackgram is traditionally consumed by the people, none of the farmers who had ranked this crop among their first three preferences mentioned consumption purposes as a reason for their preference. Cowpea and greengram seemed to be preferred for both motives of obtaining incomes from sales, and securing of food for the household.

In order to ascertain whether the response to the question was also conditioned by a farmer's specific situation in relation to availability of lowland, the average scores were computed separately for the two groups of farmers, (i) those with lowland and (ii) those without lowland for each of the *purana* villages (Appendix Nine).

The differential effect of this factor on the responses was very marked in all villages; the coarse cereal or the mostly preferred cash crop of the area were rated highly and ranked first by the farmers with no paddy land. Thus it could be seen that *the preference indicated, had been also been influenced by the individuals situation in relation to his land assets. The preference scores therefore, reflect the desires under the conditions circumscribed by the environments; including lowland availability as a factor of the environment.*

6.1.2 Preferred crops for the farm during *yala*

Appendices 10 and 11 provide the information relating to farmer preference for crops for cultivation during *yala* and Appendix 12 the reasons for the preferences. It may be observed that,

1 *Paddy did not emerge as the most preferred crop for yala.* It ranked first only in Chettikulam with an average score of 1.9 and being nominated as a first preference by 49% of the farmers. Even in Elahera a high paddy production capacity area, it had a much lower preference than chilli, and those who preferred paddy were motivated to grow it mainly for consumption purposes.

2 *Chilli unequivocally was the chosen crop of the Elahera farmers.* (Scores 3.1 and 3.3) as it yielded high incomes. In Chettikulam this crop had a relatively high score and ranked almost equally with gingelly.

3 *Gingelly was the most preferred crop in the study areas of Anuradhapura, and in Pavatkulam it was an almost exclusive preference (Score 3.5).* This crop was also favoured in *Chettikulam.* The reasons stated by the farmers for their preference in growing this crop did not indicate it to be a very high income yielding crop[1]; *it was grown mainly because it was the only possible crop that could be grown under drought conditions.*

4 *Meneri ranked first in the preferences of the Gonnoruwa farmers and was grown to meet cereal needs, as it was the suitable cereal for the season.*

5 *Groundnuts had a fairly high rating in Bakamuna* and some slight preference for it was indicated by the Gonnoruwa farmers; this crop was *considered as a high income crop by farmers* in both areas.

6 *Cowpea scored fairly highly in Attanakadawala and Mahakanadarawa,* and 16% of the responding farmers of Mahakanadarawa indicating it as a first preference. Some slight preferences were indicated in the other areas of Anuradhapura and Pavatkulam.

7 *The poor responses of the farmers of Magama, Mapakadawewa and Gemunupura/Tissapura clearly indicate a lack of interest due to the non-feasibility of yala cultivation.*

From the above findings, and those of the analysis of crops grown and their contributions to farm income[2] it is evident that *the rationale underlying the farmers' preferences and behaviour regarding crops for cultivation is to produce sufficient grain for the households' food,*

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1 Currently gingelly has entered the export market and its production is more market oriented.

2 Chapter Four, pages 49, 50 and 51.

while at the same time maximise farm income by growing at least one other crop food or non-food of high cash value. With these two primary motives, farmers have evolved systems to suit their environments. The economic implications of growing the different crops would have been examined next.

6.2 ECONOMICS OF PRODUCTION

The Numbers and extents of the *chena* and highland crop holdings on which costs of cultivation and returns were based are given in Appendices 13 and 14 respectively.[1] The data in respect of Mapakadawewa presented difficulties in computing costs, as the crops were grown mainly under a mixed cropping system and this area has therefore been excluded for this purpose. The costs of production on irrigated lowland during *yala* were computed for the study areas of the Elahera Project and the respective number of holdings and extents are indicated in Appendix Fifteen.

6.2.1 Cultivation under rainfed conditions

Cost of cultivation

The total cost/acre, total cost/acre by operations, cash cost/acre, cash costs as a percentage of total costs and labour inputs/acre, for each crop under *chena* cultivation and also separately for cultivation in highlands are given in the several pairs of Tables 6.1a and 6.1b, 6.2a and 6.2b, 6.3a and 6.3b, 6.4a and 6.4b, 6.5a and 6.5b, respectively.

In both *chena* and highland farming expenses on operations such as preparation of land, fencing, construction, weeding, bird scaring etc., which are generally incurred for the farm as a whole, and not in respect of separate crop holdings, were also not reported separately for each crop, except in instances where the farm land was devoted to only one or two crops and or crop holdings were large. For the purpose of this exercise of computing crop specific costs, the reported total costs were apportioned to each crop holding in proportion to the extent of each crop holding.

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1 See para 3 in the Introduction to Chapter Six, page 113. The areas of the Elahera Project have been excluded in the computation of costs of cultivation of *chena* and highland holdings.

The major findings of the analysis of costs and labour use are given below:

Total cost of production

1 Total costs varied about Rs. 300/- to Rs. 800/- per acre for cereals; Rs. 400/- to Rs. 1050/- for pulses and Rs. 800/- to Rs. 1010/- for chilli (Tables 6.11a and 6.11b).

2 Generally, Magama reflected very high costs and Gonnoruwa reflected low costs, in comparison to the other study areas.[1]

3 Cultivation of *pulses and chilli incurred* higher costs than cereals.

4 Cultivation of cowpea in *chena* seemed to have been costlier than cultivation in highland in all the *chena* dominant areas, probably because cultivation was concentrated in *chena* lands, and not particularly due to any differential effects of the two types of cultivation, as in Chettikulam and Gemunupura/Tissapura, both highland dominant areas, the costs though not very different, were greater for highland than for *chena* cultivation.

5 Labour costs including family labour was the major component in the total cost structures of production of all crops; it was the almost exclusive component in the production of cereals accounting for 95-99% of the total costs and formed about 80-95% of the production costs of pulses except in the case of blackgram in Chettikulam where due to the use of tractors, the contribution of labour costs was comparatively low (53.6%).

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1 Among the nine areas considered for analysis under this heading Magama had the largest and Gonnoruwa the smallest household work force, both areas had full time farmers and had less than 20-30% participating in secondary activities and poor supply of agricultural labour for work outside the household farm (See Chapter Three profile of study areas). As hired labour use can be reported more accurately than family labour use, errors in reporting family labour input and consequently total mandays and total costs would tend to get more exaggerated in predominantly family labour dependent areas than in areas with a great degree of dependence on hired labour. Therefore, differences in absolute costs or mandays and percentages, based on total costs or total mandays should be considered with caution in comparisons between areas. Comparisons of relative measures between areas would be less affected than that of absolute measures.

Operationwise costs

1 Land preparation consumed a high proportion of the cultivation costs ranging from about one fourth to half the total cost for cereal production and from about 1/5th to 1/3rd for pulses, and about 1/4th for chilli, the highest rates and costs being reflected in Gemunupura/Tissapura.

2 Costs of sowing and planting and harvesting costs excluding the processing of harvest were the other component costs that were generally of importance in the production process; these operations involved heavy use of labour. Harvesting, including processing costs, ranked equally or second to land preparation costs in almost all instances; it consistently exceeded land preparation costs by an appreciable amount in the cultivation of greengram in the areas of Hambantota and Chettikulam. Greengram requires 3 picks at harvest and this may explain why even the harvesting costs alone exceeded land preparation costs.

3 Weeding costs too were high in the cultivation of cowpea and maize, more so in the highlands than in *chena* also in the cultivation of chilli. It was seen to be of sufficient importance in the cultivation of greengram in the highlands of Chettikulam, and blackgram in the highlands of Mahakanadarawa.

Considering that weeding is an essential practice in the cultivation of pulses, it sounds out of tune that weeding costs were very low for blackgram cultivation in the areas of Vavuniya and of not much significance in greengram cultivation in the areas of Hambantota; the specialised areas for the respective crops. Blackgram being broadcast sown in Vavuniya while both dibbling and broadcast sowing were practised in Mahakanadarawa may explain the differences in weeding costs, and hence the attention paid to weeds. However, a similar explanation cannot be offered in the case of greengram, because Chettikulam farmers broadcast their seeds, while Magama and Gemunupura farmers practised dibbling more than broadcasting seeds.[1]

1 Chapter Five, page 98, para 4.

4 Costs incurred in fencing, construction of watch huts, and crop protection from wild animals, birds and thefts and transport, though of not a high magnitude, focusses attention on the fact that time and money are spent in such activities, mainly in the *chena* lands.

5 Tractor costs, formed about 4 -27% of the total costs varying between areas and between crops. The highest costs of tractor use was in respect of blackgram forming 27% of total cost in the highlands of Chettikulam. Tractor costs accounted for 9-11% of total costs in the cultivation of blackgram in the *chenas* of Mahakanadarawa, Pavatkulam and Chettikulam. Use of tractors was most prevalent in Chettikulam and costs varied from about 6% of total cost/acre for cowpea in highland to 27% for blackgram in highland. In the Hambantota district, tractor costs accounted for 3.5% of costs of cultivating greengram in *chena* and also 12.2% for cowpea in Gonnoruwa. Costs of hire and fuel for pumps were reported in a very few isolated instances in Chettikulam, Mahawilachchiya, Palayakulama and Gonnoruwa. In a well organised system of highland cultivation, irrigation costs could add in a substantial manner to the total cost of production.

Cash outlay[1]

1 Cash costs for cultivation of cereals were mostly in the region of Rs. 100/- to Rs. 250/-, while the cash requirements for pulses showed a tendency to exceed Rs. 250/- reflecting expenditure as high as Rs. 600/- to Rs. 800/-.

2 Cash investments were generally higher and also formed high proportions of total cultivation costs in the areas of Vavuniya and Hambantota; this was more evident in *chena* cultivation. The relatively high use of hired labour in both districts and tractor use in Vavuniya were the main reasons for the observed differences between these areas of the Dry Zone districts.

3 Labour costs accounted for almost all the cash spent in the cultivation of coarse cereals in all areas. In the cultivation

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1 Costs of all inputs other than family labour; (working capital) see definition of Cc in Appendix 18.

of pulses and chilli however, it varied between 55-80%, (ignoring the data for cowpea in the highlands of Anuradhapura where the small amounts spent were mainly for seed and other costs). (Table 6.6a and 6.6b)

4 Cash investments on blackgram in the range of Rs. 300/- to Rs. 600/- were high compared to other crops, in the areas where this crop was grown (Table 6.3a and 6.3b). Tractor use accounted for 31%, 18% and 15% of the cash costs for blackgram cultivation in Chettikulam, Pavatkulam and Mahakanadarawa respectively.

5 Cash investments made on chilli were of the same order as for cowpea in the areas of Anuradhapura except in Mahawilachchiya where expenditure on agro-chemicals were high and amounted to 24% of cash costs (Table 6.3a).

6 Greengram had the highest cash investment of Rs. 788/- in comparison to other crops in Magama, an area where this crop was important (Table 6.3a).

Labour use and wages

1 The total labour units reflected for cereal as well as pulse cultivation varied mostly between 50-100 cwts/acre. Chilli showed evidence of a much higher demand for labour the total units applied varying from 88 to 140 between the different groups of farms.

2 Cultivation in the study areas of Anuradhapura was very much based on family labour being dependent for only about almost 20% of its total requirements in the cultivation of kurakkan, maize, cowpea and blackgram (in Mahakanadarawa) and for about 10% of the requirements in the cultivation of chilli, (Mahawilachchiya *chena* provided an exception) on hired labour (Tables 6.5a and 6.5b). The data related to a *maha* season in which paddy cultivation was affected by a prolonged drought, specially in the tank areas. Whether this same picture relating to use of labour prevails in a normal paddy cultivation season too needs examination. A cursory examination of the study area profiles indicate that this picture fits into the general description of the household work force;

relief work is undertaken in lieu of no work in paddy lands during drought conditions.

3 The Vavuniya cultivator, though he used comparatively much less labour (mostly 40-60 units) seemed fairly heavily dependent on hired labour; about 30-70% of the total requirements for the crops cultivated were drawn from outside the family.

4 Gonnoruwa, like the study areas of Vavuniya, utilised less labour; (around 50-60 mandays of labour/acre) for the cultivation of the crops, and was also dependent to a fair extent on hired labour. It may be recalled that in this area the households and consequently the household workforce were small compared to all other areas. Magama reflected a very high use of labour (97-110 mandays) and was also dependent on hired labour for about 40% of the requirements.

5 Cultivation in Gemunupura/Tissapura was also family labour based and resembled Anuradhapura in total labour consumption.

6 Cash wage rates varied from area to area and was observed to be the highest in Vavuniya, specially in Chettikulam. But, in these areas labour wages were paid almost exclusively in cash; contracting of labour for almost all the main stages of cultivation and for transport was a common practice among Chettikulam farmers. In the other areas, labourers were also provided with food in most instances and the average labour cost/manday including food costs, indicate that the highest cost (in the range of Rs. 12-13/- were incurred per manday of labour in Magama, while costs varied mainly between Rs. 8/50/- to Rs. 11/-, in the other study areas of the Dry Zone (the very high cost of Rs. 12/- for blackgram in Chettikulam is an exception that needs mention) and between Rs. 7/- to Rs. 9/50 in Gemunupura/Tissapura. (Appendices 16a & 16b and 17a & 17b)

7 The higher cost per labour unit for blackgram in comparison to all other crops within Chettikulam, and a slight difference in favour of chilli and greengram within Magama, may prove to be instructive.

Returns from cultivation

The average yields per acre, and the average selling prices relating to the farms in *chena* lands and highland are given in tables

6.18a & 6.18b respectively. The average yields per acre were discussed in Chapter Five and farm prices will be discussed in the subsequent chapters on marketing. However, a few observations on the average yields and average prices relating to the farm units considered in the analysis of economic of production in this chapter need mention.

1 Average yields per acre based on the limited samples were generally higher than the corresponding figures based on the larger samples, given in Chapter Five, except in the case of kurakkan; this would mean that a greater proportion of farm units with relatively higher yields have been included in the sample considered for analysis in this chapter.

2 Prices received by Gemunupura/Tissapura farmers were generally low compared to those received by farmers in the Dry Zone areas.

profitability

Profits could be measured in terms of returns to the major factors of production; returns to land, family labour and cash are recognised as the indices to which a farmer would pay attention in making decisions regarding the choice of crops for cultivation. Such indices, computed as indicated in Appendix 18 are presented in tables 6.7a & 6.7b.

1 In general, the net returns/acre for all crops grown in Gemunupura/Tissapura were very low in comparison to other areas, and due to the heavy labour input reflected negative returns for both land and labour.

2 Both kurakkan and maize yielded poor returns in the *chena* lands of the Hambantota district in comparison to the other districts of the Dry Zone.

3 Kurakkan may be considered as an economically unprofitable crop in all the areas, both in *chena* land and highland; it consistently showed negative returns per acre in all areas when family labour was valued at hired labour rates, and showed either negative or nil return for family labour in Hambantota and Gemunupura/Tissapura, while reflecting returns amounting to about 1/4th to 1/2 the hired labour wage rates in Anuradhapura and Pavatkulam. In Chettikulam the returns to family labour was higher being about

4/5th the wage rates of hired labour. This crop is generally grown as a rice substitute and production is not market oriented. The opportunity cost for labour engaged in its cultivation seems extremely low as cultivation is resorted to mainly when the paddy crop is not promising and hence even a low return to labour may be considered satisfactory in such a situation, specially because the crop ensures food for the households.

4 Maize provided fairly high returns for family labour being about 4/5th or more of the hired wage rates in the area of Anuradhapura. Though the net return to land was negative in Gemunupura/Tissapura, where maize was a major crop, family labour derived half the wage rate of hired labour. Maize seemed to be an unprofitable vanture in the areas of Hambantota.

5 Pulses provided greater gross returns per acre than coarse cereals though their yields were comparatively much lower, mainly due to the relatively high prices. In terms of net return per acre, returns to family labour and return to cash, blackgram had a very high economic advantage over the cereals and the other pulses, in areas where such comparisons were possible. It is of interest to note, that both gross returns and net returns per acre for this crop in Mahakanadarawa exceeded those of the areas of Vavuniya where farmers specialised in its cultivation. Cowpea was more profitable than maize in most areas. Greengram provided high returns in Gonnoruwa and in Chettikulam.

6 Chilli generally provided the highest returns to land, labour and cash in the *chena* lands of Anuradhapura, the value being extremely high in comparison to even cowpea. The harvested crop is sold in the raw form as green chillies in Magama. Chilli thus provided lesser profits in Magama than in Anuradhapura, but within Magama it compared favourably with green gram, though cowpea seemed to have fared better than both these crops in this area.

Which index of return influences farmers' decision in the choice among subsidiary food crops?

The cultivation of all the subsidiary food crops under rainfed cultivation are being mainly done under poor levels of management with

low cash investment which relate mainly to hired labour. Hence, under these conditions the farmers' decision regarding the choice of a crop viewed from an economic angle is likely to be influenced more by the gross returns/acre. The gross returns to working capital and return to family labour would also be considered in the decision making process, the former being of more importance in a hired labour dependent situation and the latter in family labour dependent situations.

Gross returns/acre are dependent on output per acre of produce and price per unit of produce. An examination of the relative yields and relative prices per unit would indicate the comparative profit advantages of the crops. The yields/acre (in cwts) and price per cwt of produce as reflected in the survey findings of the major cultivation districts of each crop are given in Table 6.8. The average gross return/acre based on these yields and average prices and the Indices of price, quantity of production and value of production are also shown in this table.

Only blackgram among the pulses seems to be able to compete with chilli in providing gross returns of about Rs. 1,500/- per acre of land. Blackgram with an advantage in price of Rs. 100/- per cwt over cowpea could bring in at least Rs. 500/- more per acre, the yield levels of both crops being not very different from each other and being about 5 cwt/acre. Therefore, the more the land devoted to blackgram the greater is the gross profit advantage. Cowpea showed an advantage over maize.

Thus, it is seen that prices provided the incentive for the cultivation of chilli and blackgram and to a lesser extent for cultivation of cowpea and greengram. Yet the question why increase in production of pulses is brought about by extensive cultivation rather than by increasing productivity remains unanswered.

Cotton -Competitive crop

Cotton being a major crop in Hambantota the economics of production of this crop in this area was examined. Profitability indices based on information relating to a sample of cotton growers in Gonnoruwa surveyed

during *maha* 77/78 for a study on cotton are given below:

Table 6.9 - Costs and Returns from Cultivation of Cotton in Gonnoruwa - *maha* 77/78[1]

No. of farm units	36
Average size of holding (acres)	2.54
Average yield per acre (cwt)	2
Price (Rs./cwt)	315
Total input of labour (mandays)	63
Total input of family labour (mandays)	31
Average wage rate for labour (Rs.)	10.00
Cash costs (Rs.)	395.00*
Gross return/acre (Rs.)	630.00
Net return/acre (Rs.)	235.00
Return to family labour (Rs.)	7.58
Gross return per unit of cash (Rs.)	1.59

Cotton gets placed nearer cowpea and between cowpea and greengram, if ranked on the basis of the gross return to land, and return to family labour, respectively in Gonnoruwa. Thus, the price differential in favour of cotton, does not seem to confer any profit advantage to this crop, over the pulses as the yield of cotton was low.

6.2.2 Cultivation under irrigated conditions

Cost of cultivation

The total costs/acre, costs/acre by operation, cash costs/acre, cash costs as a percentage of total costs for cultivation and labour inputs/acre, for cultivation of cowpea, greengram and chilli under irrigated conditions in lowland, during *yala* '77 in the Elahera Project, are given in Tables 6.10, 6.11, 6.12, 6.13 and 6.14 respectively.

The total cost of cultivating cowpea and greengram in the Elahera Project area were not markedly different from cultivating them

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1 Computed from data reported in 'Cotton - the Economics of Expansion in Sri Lanka' - J. Farrington, Research Study 30, ARTI.

* Costs of purchased inputs, amounted to Rs. 75/-, and the balance cost was incurred for hired labour.

in the rainfed areas of Anuradhapura and Hambantota (Table 6.10, 6.1a & 6.1b). But, the structures of the costs indicate the differential treatments of these crops in the two situations. Generally, cash costs were of a high order in *yala* cultivation in Elahera (mostly about Rs. 500/- to Rs. 600/-) when compared to the rainfed *maha* cultivation in other areas (often less than Rs. 300/-) and the cash costs formed very high percentages; about half or more of total costs (Table 6.12 & 6.13). In Elahera, cash investments on fertiliser and agro-chemicals for crop protection were high, and formed about a quarter to one third of total cash costs. Such costs were very low in the rainfed areas due to the scant attention paid to these aspects of crop care.

Chilli cultivation costs under the irrigated conditions were in the region of Rs. 2050/- to Rs. 2150/- and more than double the costs incurred under rainfed conditions (Tables 6.10, 6.1a & 6.1b). Cash costs were around 80% of total costs, and about Rs. 900/- to Rs. 1200/- was spent on fertiliser and agro-chemicals in Elahera (Tables 6.11 & 6.13).

Labour inputs in Elahera too were high in comparison to the other areas for the cultivation of pulses and chilli (Tables 6.14, 6.5a & 6.5b). Between the two study areas in Elahera, Attanakadawala was more dependent on hired labour drawing about 50% of its requirement from outside the family while in Bakamuna only chilli cultivation utilised hired labour to the same extent, the cultivation of pulses being mainly dependent on family labour.

Provision of food with cash was the common practice in payment of wages for labour in Elahera. The wage rates both excluding and including food in *yala*'77 in Elahera, were lower than the average wage rates that prevailed in the other study areas during *maha*. (Appendices 19 , 14a & 14b and 15a & 15b)

Return from cultivation

1 The average yields reported for cowpea and greengram in the lowland of Elahera were very low being about 5-6 bushels/acre; the *chena*

and highland cultivation had generally yielded higher returns, mostly 8-9 bushels/acre for cowpea (Tables 6.15, 6.6a & 6.6b). The average yield of 5 cwts of chilli per acre in Elahera was high in comparison to the maximum reported average of about one cwt/acre in the *chena* lands of Anuradhapura, but even this relatively high yield was only about 1/3rd of the potential yield of this crop.

2 The prices realised by the Elahera farmers for thier *yala* pulse crops; Rs. 140/- per bushel for cowpea and Rs. 175/- per bushel for greengram were higher than what obtained during *maha* 76/77 in the other areas. (Tables 6.15, 6.6a & 6.6b)

Chilli fetched a lower price of Rs. 8.50 per lb during *yala*'77 in Elahera in comparison to the *maha* 76/77 price of Rs. 13/- per lb in the other study areas. The differences in prices could be attributed mainly to seasonal effects rather than effects of cultivation conditions and or locations.

3 The gross returns per acre from the cultivation of cowpea was around Rs. 700/- and though not as high as the returns from this crop in the rainfed lands of Anuradhapura, compared favourably with returns in the other areas of the Dry Zone (Tables 6.7a & 6.7b). Greengram cultivation in Elahera too provided returns which compared favourably with those of the Hambantota crop holdings. Though the yields were low, the high prices that prevailed during *yala*'77 provided the comparatively favourable gross returns to land. The returns to cash for both crops, were however comparatively low in Elahera due to the heavier cash expenses incurred. The return to family labour was generally equal to the cash payments for hired labour in the area.

4 Chilli provided a gross return of Rs. 4800/- to the Elahera farmers and was about four times the corresponding value in Anuradhapura, though the prices at which the produce was sold was about 35% less than the selling prices in Anuradhapura. Cash investments were heavy on this crop, but returns too were high to reflect adequate net returns of about 1.6 per unit of cash investment. The return to unit of family labour was again very

high being 3 or 4 times the hired labour wages in the area. Chilli has thus proven itself as a high income crop in Elahera. The economics of production of this crop in Chettikulam the other study area where it was highly preferred for cultivation on the rainfed lands during *yala*, cannot be ascertained, as no data was available in this regard, from this survey.

Cultivation of paddy - a comparison

These discussions would be incomplete unless the economics of production of paddy, the crop of first choice of farmers in most areas is also examined, and costs and profits from its cultivation be compared with that of the other different crops in each study area. No information relating to costs and returns from paddy was sought in this survey. Hence, a comparison is attempted with information from extraneous sources. Such information relating as far as possible to the specific season and areas of this survey, or else to corresponding districts and corresponding subsequent seasons are set out in Table 6.17.

It is pertinent to stress here that the comparisons for *maha* cultivation would necessarily be between paddy grown mainly under irrigated conditions, and other crops grown under rainfed conditions, while comparisons for *yala* in Elahera would be between all crops grown under irrigated conditions.

It is observed that :

1 Labour utilisation is low for paddy in comparison to labour applications for cultivation of the other crops, grown both under rainfed conditions on unirrigated land, and under irrigated

conditions on lowland.[1] (Tables 6.17, 6.5a, 6.5b and 6.14) Intensity of labour use for paddy seemed to be associated with the areas capacity for paddy production. There was also evidence of much higher proportions of hired labour being utilised for paddy than for other crops.[2] Heavy demands of labour within critical periods of short duration at different stages of cultivation would contribute to the higher degree of utilisation of hired labour for this crop. It is likely that the subsidiary crops are included in the cropping system utilising as far as possible the otherwise idle family labour.

2 Farmers invested more cash for their paddy crops, than for other crops; the cash costs for paddy cultivation were generally within the range of Rs. 550/- to Rs. 1640/- between the areas (Mahawilachchiya provided an exception with a low investment of Rs. 370/-). The variation of investments suggest a correlation between magnitudes of investments and paddy production capacities of the areas. Cash investments for cultivation of the subsidiary crops in unirrigated lands were generally seen to be of lower order of magnitude; the larger investments of more than Rs. 550/- being reported for greengram and chilli in Magama and Blackgram in Chettikulam.

3 Wage rates reflected in the studies on paddy in some areas were lower than the amounts reported by farmers for cultivation of

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1 Labour requirements for paddy were around 32-50 mandays in the areas where due to poor assurance of water, cultivation levels were low and mostly manual labour and draught power were utilised in cultivation. The requirements for subsidiary food crops in these areas ranged mostly between 70-115 mandays. For intensive cultivation of paddy in Polonnaruwa the requirement was about 92 mandays and cowpea, greengram and chilli in Elahera required about 95, 120 and 161 mandays respectively.

Similar observances regarding the relatively higher labour requirements for subsidiary food crops in comparison to paddy have been made by
(a) C.M. Wijeyaratne - Crop Diversification in the Mahaweli area -ARTI
(b) Research Study (unpublished)

2 About 66 -74% of the labour employed in paddy cultivation in Polonnaruwa, Hambantota and Vavuniya was hired labour. It was only in Elahera where cultivation of subsidiary food crops was under irrigated conditions and in Hambantota where overall use of labour was relatively low due to tractor use that about 50% of labour for cultivation of subsidiary food crops comprised of hired labour. In other areas hired labour formed about 6 -30% of total labour use.

other crops on unirrigated land. It is not possible to comment on whether the apparent differences, indicated actual differential wage rates or were due to response variations caused by differences in methods of inquiries, or sample variations.

4 The profitability indices of paddy (Table 6.17) showed high returns to family labour; much higher than prevailing wage rates in the area. Excepting Vavuniya returns to land varied between Rs. 600/- to Rs. 1700/- per acre and net returns to cash was about 1½ to 2½ times the cash outlay.

A general comparison between gross profits[1] from paddy with that of pulses and chilli on unirrigated land and chilli on paddy land at varied levels of production and price prevailing at the time of the survey is presented in Table 6.31.

It is instructive to note that at the time of the survey, blackgram and chilli with their price advantages over paddy, could when cultivated on unirrigated land even at the prevalent low levels of cultivation give greater gross returns/acre than a paddy cultivation where yields do not exceed 60 bushels/acre. Hence, in low paddy production capacity areas such as the areas of Anuradhapura and Vavuniya an acre of cowpea and greengram on unirrigated land could have provided gross returns of at least similar magnitudes as an acre of lowland paddy. In high paddy production capacity areas where on the average yields exceeded 60 bushels/acre, profits from paddy would be much higher than those of pulses and even chilli in most instances where the crops were grown as unirrigated land when chilli yields were more than 2 cwts/acre, chilli provided higher profits than paddy.

A comparison of profits from paddy with that of pulses and chilli grown on paddy fields under irrigated condition during *yala* is limited by the data available from this study and can be attempted only in

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1 Coarse cereals are not considered as they were distinctly of a lower order in terms of price advantages, and profits. Pulses and chillies are crops covered by the policy of promoting cultivation of subsidiary food crops instead of paddy in ill drained paddy fields during *yala*.

respect of Elahera a high production capacity area. Taking the paddy yields of this area to be generally above 60 bushels/acre, this crop provides much higher returns than cowpea or greengram. Chilli however with its price advantage, even at low average yield of about 5 cwts/acre and with a cash investment of about Rs. 600/- to Rs. 700/- more per acre than paddy, provided a gross return of about Rs. 2200/- more/acre. Net return/unit of cash too was very much higher for chilli (2.63) than paddy. (1.6)

Paddy, due to the relatively low labour requirements for its cultivation provides very high returns for the input of family labour in comparison to the subsidiary food crops. Whether these subsidiary crops be grown under rainfed conditions in unirrigated land or irrigated conditions in paddy land.

A study of the area designated as irrigation system 'H' in the Mahaweli Area with a view to understand the reluctance of farmers in undertaking the cultivation of subsidiary food crops in paddy fields in *yala*[1] had indicated that "*yala* paddy growers seem to be at an advantageous position when compared with the *yala* subsidiary food crop growers. Despite the fact that *most subsidiary food crops under consideration had given higher returns to a unit of water* (consumed by the respective crops) *the net returns to labour and other factors of production were lower than those from paddy*".

6.3 SUMMARY

The farmer preferences confirmed the earlier observation that the choice of crops in the evolvement of a cropping system were primarily determined by an environmental variable defined by accessibility and quality of land and water, and the desire to achieve as far as possible the twin objectives of providing sufficient cereals for the household, and maximising farm incomes.[2]

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1 C.M. Wijeyaratne - Crop Diversification in the Mahaweli Area - in print ARTI Research Study (unpublished).

2 Chapter Four - Farmers' Behaviour in use of land

Land and water resources permitting, paddy cultivation was the natural choice of any farmer because paddy apart from being a staple cereal, is also very profitable at high yields being competitive with cash crops in terms of returns to land, required less labour than subsidiary food crops for its cultivation, and enjoys a greater security due to an assured market for its produce. Its advantages for outweigh any slight economic disadvantages that occur in some production situations.

Farmers however, have not shield from growing crops other than paddy, and have rationally evolved cropping to systems to suit their environments. Coarse cereals, specially kurakkan which would be considered as an unprofitable crop from a purely economical point of view in terms of returns to land, have been also included in the system in situations where land and or water was limiting for a highly productive paddy cultivation. It could be even argued that kurakkan or maize is profitable under these conditions specially in the event of a paddy crop failure as it provides food and some returns to otherwise idle family labour which has no opportunity cost. In such situations, and also in high paddy production capacity situations farmers have cultivated pulses or chillies mainly as cash crops to increase their farm incomes.

The choice of crops from among pulses and other crops, was price responsive. But price, could not be the only consideration, as the Anuradhapura farmers preferred cowpea to blackgram though the latter was more profitable, probably because they lacked experience in growing blackgram and also because chilli, a crop which was equally or more profitable was included in the cropping system.

In taking advantage of favourable prices, farmers have increased their incomes by only expanding the extents of land devoted for the cultivation of the crop at their prevalent low levels of cultivation. There had been no evidence of increasing production through raising the levels of cultivation. This *lack of interest in increasing productivity could be due to a reluctance in investing on crops which demand too much effort and also face uncertainties in the market for their produce, due to the lack of continued support from pricing and procurement policies.*

Viewed against the background of these findings, it is evident that *a study of the profitability of the farm as a whole with the prevalent cropping system in an area, vis-a-vis proposed alternative systems would be more meaningful than comparisons between single crops, in understanding the farmer behaviour and in evolving suitable and more profitable cropping systems for the areas.* Comparisons between farming systems would recognise hidden advantages such as rational use of family labour, use of cash inflows from one or more crops to finance other crops in the system. The finding the farmers do not generally favour crops which demand heavy labour contribution is also noteworthy in recommending cropping systems.

Table 6.1(a) - Total Cost/Acre - Chena Land (Maha 76/77)

Crop	Anuradhapura				Vavuniya		Hambantota		Badulla	Elahera Project	
	Palayakulama	Halmillakulama	Mahakanadarawa	Mahavilachchiya	Chettikulam	Pavatkulam	Gonnoruwa	Magama	Gemunupura/ Tissapura	Attanakadawala	Bakamuna
Kurakkan	706 (99.2)	466 (96.6)	476 (98.2)	498 (97.3)	513 (87.6)	606 (98.8)	396 (97.6)	917 (97.3)	785 (98.7)		
Maize	620 (99.1)	616 (99.5)	494 (98.3)	500 (96.0)	430 (93.6)		329 (97.8)	776 (95.1)	543 (98.1)		
Cowpea	854 (92.8)	954 (94.4)	921 (91.7)	599 (94.2)	484 (92.6)		653 (93.1)	1058 (87.9)	522 (91.4)		
Greengram							408 (90.4)	1049 (85.6)			
Blackgram			769 (87.7)			568 (80.1)					
Chilli	808 (93.6)	909 (94.7)		805 (80.8)				1073 (90.8)			

Figures in parenthesis indicate percentage cost for labour.

Table 6.1(b) - Total Cost/Acre - Highland (Maha 76/77)

Crop	Anuradhapura				Vavuniya		Hambantota		Badulla
	Palayakulama	Halmillakulama	Mahakanadarawa	Mahavilachchiya	Chettikulam	Pavatkulam	Gonnoruwa	Magama	Gemunupura/ Tissapura
Kurakkan			520 (99.1)		430* (96.3)				724 (98.6)
Maize			768 (93.6)	578 (96.8)			316 (98.1)		653 (98.5)
Cowpea	629 (87.7)	866 (92.0)	730 (94.2)	536 (91.5)	536 (89.6)		372 (78.9)		546 (94.7)
Greengram					611 (96.6)				
Blackgram*			818 (87.3)		684 (53.6)	520 (76.3)			
Chilli				920 (92.7)					

Figures in parenthesis indicate percentage cost for labour.

* Tractor costs amounting to Rs 45/-, 186/- and 60/- formed 5%, 27.2% and 11.5% of the total cost in Mahakanadarawa, Chettikulam and Pavatkulam respectively.

Table 6.2 (a)

CULTIVATION COST/ACRE BY OPERATION - CHENA (maha 76/77)

Crop	Operation	Anuradhapura				Vavuniya		Hambantota		Badulla
		Palayakulama	Halmillakulama	Mahakanadarawa	Mahavilachchiya	Chettikulam	Pavatkulam	Gonnoruwa	Magama	Gemunupura/ Tissapura
Kurakkan	Land preparation	225 (31.8)	159 (34.1)	149 (31.3)	137 (27.5)	151 (29.4)	173 (28.6)	142 (35.8)	361 (39.4)	375 (47.8)
	Sowing/Planting	201 (28.5)	78 (16.7)	114 (24.0)	108 (21.7)	85 (16.6)	92 (15.2)	82 (20.7)	155 (16.9)	125 (15.5)
	Weeding			1 (0.2)		22 (4.3)		11 (2.8)	59 (6.4)	51 (6.5)
	Other crop husbandry practice	47 (6.7)	68 (14.6)	40 (8.4)	51 (10.2)	95 (18.5)	186 (30.7)	18 (4.6)	76 (8.3)	68 (8.6)
	Harvesting	142 (20.1)	80 (17.3)	101 (21.2)	128 (25.7)	77 (15.0)	84 (13.9)	88 (22.2)	147 (16.0)	80 (10.2)
	Processing	45 (6.5)	22 (10.7)	26 (5.5)	33 (6.6)	35 (6.4)	40 (10.0)	46 (12.5)	100 (11.6)	70 (9.9)
	Other	46 (6.5)	59 (12.6)	146 (9.5)	41 (8.2)	48 (9.4)	67 (11.0)	49 (12.4)	100 (11.6)	72 (9.2)
	Total	706 (100.0)	466 (100.0)	476 (100.0)	498 (100.0)	513 (100.0)	606 (100.0)	396 (100.0)	917 (100.0)	785 (100.0)
Maize	Land preparation	184 (29.6)	200 (32.5)	156 (31.6)	169 (33.8)	214 (49.7)	-	105 (31.9)	287 (37.0)	216 (39.8)
	Sowing/Planting	88 (14.2)	48 (7.8)	73 (14.8)	61 (12.2)	95 (22.0)	-	35 (10.6)	63 (8.1)	47 (8.7)
	Weeding	110 (17.7)	85 (13.8)	66 (13.4)	52 (10.4)	9 (2.1)	-	77 (23.4)	115 (14.8)	64 (11.8)
	After care	36 (5.8)	87 (14.1)	45 (9.1)	40 (8.0)	59 (13.7)	-	26 (7.9)	100 (12.9)	54 (9.9)
	Harvesting	99 (15.9)	75 (12.2)	64 (13.0)	74 (14.8)	38 (9.1)	-	50 (15.2)	82 (10.6)	65 (12.0)
	Processing	60 (9.7)	70 (11.3)	37 (7.5)	54 (10.8)	9 (2.1)	-	5 (1.5)	13 (1.7)	4 (0.7)
	Other	43 (7.1)	51 (8.3)	53 (10.7)	50 (10.0)	6 (1.4)	-	31 (9.4)	116 (14.9)	93 (17.1)
	Total	620 (100.0)	616 (100.0)	494 (100.0)	500 (100.0)	430 (100.0)	-	329 (100.0)	776 (100.0)	543 (100.0)
Cowpea	Land preparation	213 (24.9)	230 (24.1)	274 (29.5)	140 (26.0)	61 (12.6)	-	188 (28.8)	324 (30.6)	177 (33.9)
	Sowing/Planting	133 (15.6)	100 (10.5)	144 (15.6)	93 (17.2)	82 (16.9)	-	78 (11.9)	95 (9.0)	54 (10.3)
	Weeding	108 (12.8)	168 (17.6)	117 (12.7)	93 (17.2)	105 (21.7)	-	110 (16.9)	164 (15.5)	57 (10.9)
	After care	78 (9.1)	148 (15.5)	114 (12.4)	61 (11.3)	83 (17.2)	-	60 (9.2)	144 (13.6)	104 (19.9)
	Harvesting	142 (16.6)	163 (17.1)	156 (16.9)	89 (16.5)	126 (26.0)	-	159 (24.4)	147 (13.9)	73 (14.0)
	Processing	95 (11.1)	67 (7.0)	44 (4.8)	29 (5.4)	22 (4.5)	-	15 (2.3)	39 (3.7)	23 (4.4)
	Other	85 (9.9)	78 (8.2)	74 (8.0)	34 (6.3)	5 (1.0)	-	43 (6.6)	145 (13.7)	34 (6.5)
	Total	854 (100.0)	954 (100.0)	921 (100.0)	539 (100.0)	484 (100.0)	-	653 (100.0)	1058 (100.0)	522 (100.0)
Green gram	Land preparation	-	-	-	-	-	-	90 (22.1)	290 (27.7)	-
	Sowing/Planting	-	-	-	-	-	-	81 (19.9)	144 (13.7)	-
	Weeding	-	-	-	-	-	-	28 (6.9)	64 (6.1)	-
	After care	-	-	-	-	-	-	48 (11.8)	117 (11.1)	-
	Harvesting	-	-	-	-	-	-	96 (23.5)	325 (31.0)	-
	Processing	-	-	-	-	-	-	27 (6.6)	15 (1.4)	-
	Other	-	-	-	-	-	-	38 (9.3)	94 (9.0)	-
	Total	-	-	-	-	-	-	408 (100.0)	1049 (100.0)	-

contd.....

Table 6.2 (a) (Contd.,)

B	Land preparation	-	-	283 (36.8)	-	-	158 (27.8)	-	-	-
l	Sowing/Planting	-	-	127 (16.5)	-	-	111 (19.4)	-	-	-
a	Weeding	-	-	60 (7.8)	-	-	10 (1.8)	-	-	-
c	After care	-	-	39 (5.0)	-	-	93 (16.4)	-	-	-
k	Harvesting	-	-	152 (19.8)	-	-	124 (21.8)	-	-	-
g	Processing	-	-	32 (4.2)	-	-	42 (7.4)	-	-	-
r	Other	-	-	76 (9.9)	-	-	30 (5.3)	-	-	-
a	Total	-	-	769 (100.0)	-	-	568 (100.0)	-	-	-
m										
C	Land preparation	210 (26.1)	187 (20.6)	-	204 (25.3)	-	-	-	302 (28.1)	-
h	Sowing/Planting	215 (20.6)	165 (18.2)	-	147 (18.3)	-	-	-	220 (20.5)	-
i	Weeding	146 (18.0)	184 (20.2)	-	146 (18.1)	-	-	-	202 (18.8)	-
l	After care	48 (5.9)	86 (9.5)	-	137 (17.0)	-	-	-	98 (9.1)	-
i	Harvesting	126 (15.6)	130 (14.3)	-	105 (13.0)	-	-	-	184 (17.1)	-
	Processing	27 (3.3)	109 (12.0)	-	29 (3.6)	-	-	-	-	-
	Other	36 (4.4)	48 (5.3)	-	37 (4.6)	-	-	-	67 (6.2)	-
	Total	808 (100.0)	909 (100.0)	-	805 (100.0)	-	-	-	1073 (100.0)	-

(a) Other crop husbandry practice : Application for fertilizer and agrochemicals for control of pests and diseases and protection of crops by watching, scaring of birds and animals.

(b) Other : Fencing and construction of watch huts and transport.

Table 6.2 (b)

CULTIVATION COST/ACRE BY OPERATIONS

Highland - Maha 76/77

Crop	Operation	Anuradhapura				Vavuniya		H'tota	Badulla
		Palayakulama	Halmillakulama	Mahakanadarawa	Mahavilachchiya	Chettikulam	Pavatkulam	Gonnoruwa	Gemunupura/ Tissapura
Kurakkan	Land preparation	-	-	204 (39.2)	-	113 (26.1)	-	-	299 (41.3)
	Sowing/Planting	-	-	101 (19.4)	-	39 (9.1)	-	-	115 (15.9)
	Weeding	-	-	24 (4.6)	-	39 (9.1)	-	-	54 (7.5)
	After care	-	-	18 (3.4)	-	84 (19.6)	-	-	34 (4.7)
	Harvesting	-	-	111 (21.4)	-	91 (21.2)	-	-	167 (23.1)
	Processing	-	-	43 (8.3)	-	27 (6.3)	-	-	22 (3.0)
	Other	-	-	19 (3.7)	-	37 (8.6)	-	-	33 (4.6)
	Total	-	-	520 (100.0)	-	430 (100.0)	-	-	724 (100.0)
Maize	Land preparation	-	-	211 (27.5)	180 (31.1)	-	-	117 (37.0)	334 (51.2)
	Sowing/Planting	-	-	82 (10.7)	99 (17.1)	-	-	39 (12.3)	71 (10.9)
	Weeding	-	-	176 (22.9)	92 (15.9)	-	-	87 (27.5)	133 (20.4)
	After care	-	-	48 (6.2)	53 (9.2)	-	-	7 (2.2)	32 (4.9)
	Harvesting	-	-	102 (13.3)	60 (10.5)	-	-	34 (10.8)	55 (8.4)
	Processing	-	-	78 (10.2)	67 (11.6)	-	-	6 (1.9)	23 (3.5)
	Other	-	-	71 (9.2)	27 (4.7)	-	-	26 (8.2)	5 (0.8)
	Total	-	-	768 (100.0)	578 (100.0)	-	-	316 (100.0)	653 (100.0)
Cowpea	Land preparation	126 (20.0)	206 (23.8)	204 (27.9)	122 (22.8)	137 (25.5)	-	127 (34.1)	197 (36.1)
	Sowing/Planting	69 (11.0)	91 (10.5)	118 (16.2)	83 (15.5)	82 (15.3)	-	73 (19.6)	93 (17.0)
	Weeding	186 (29.6)	203 (23.4)	160 (21.9)	146 (27.2)	58 (10.8)	-	71 (19.1)	86 (16.1)
	After care	96 (15.3)	92 (10.6)	54 (7.4)	31 (5.8)	92 (17.1)	-	19 (5.1)	29 (5.3)
	Harvesting	119 (18.9)	172 (19.9)	124 (17.0)	103 (19.2)	106 (19.7)	-	52 (11.0)	96 (17.6)
	Processing	26 (4.0)	32 (3.7)	53 (7.3)	38 (7.1)	40 (7.6)	-	17 (4.6)	19 (3.5)
	Other	8 (1.3)	70 (8.1)	17 (2.3)	13 (2.4)	21 (3.9)	-	13 (3.5)	24 (4.4)
	Total	629 (100.0)	866 (100.0)	730 (100.0)	536 (100.0)	536 (100.0)	-	372 (100.0)	546 (100.0)
Greengram	Land preparation	-	-	-	-	143 (23.4)	-	-	-
	Sowing/Planting	-	-	-	-	65 (10.6)	-	-	-
	Weeding	-	-	-	-	90 (14.7)	-	-	-
	Other crop husbandry practice	-	-	-	-	128 (20.9)	-	-	-
	Harvesting	-	-	-	-	135 (22.1)	-	-	-
	Processing	-	-	-	-	43 (7.0)	-	-	-
	Other	-	-	-	-	7 (1.1)	-	-	-
	Total	-	-	-	-	611 (100.0)	-	-	-

contd....

Table 6.2 (b) (Contd.,)

BLACKGRAM	Land preparation	-	-	247 (30.2)	-	233 (34.1)	140 (26.9)	-	-
	Sowing/Planting	-	-	113 (13.8)	-	115 (16.8)	98 (18.8)	-	-
	Weeding	-	-	116 (14.2)	-	30 (4.4)	4 (0.8)	-	-
	After care	-	-	30 (3.7)	-	83 (12.1)	67 (12.9)	-	-
	Harvesting	-	-	139 (17.0)	-	101 (14.8)	130 (25.1)	-	-
	Processing	-	-	71 (8.7)	-	103 (15.1)	55 (10.6)	-	-
	Other	-	-	102 (12.5)	-	19 (2.8)	26 (5.0)	-	-
	Total	-	-	818 (100.0)	-	684 (100.0)	520 (100.0)	-	-

Table 6.3(a) - Cash Cost/Acre - Chena (Maha 76/77)

Crop	Anuradhapura				Vavuniya		Hambantota		Badulla
	Palayakulama	Halmillakulama	Mahakanadarawa	Mahavilachchiya	Chettikulam	Pavatkulam	Gonnoruwa	Magama	Gemunupura/ Tissapura
Kurakkan	132 (95.5)	124 (87.1)	86 (90.4)	139 (90.3)	313 (79.7)	246 (97.0)	252 (96.2)	471 (94.7)	242 (95.6)
Maize	117 (95.1)	62 (94.9)	75 (88.6)	108 (81.5)	253 (89.2)		107 (93.3)	423 (91.1)	129 (91.8)
Cowpea	213 (71.2)	145 (63.2)	262 (70.7)	145 (78.5)	149 (76.1)		340 (86.8)	568 (77.5)	245 (81.8)
Greengram							184 (78.7)	788 (80.9)	
Blackgram			263 (63.9)			411 (74.4)			
Chilli	116 (55.3)	158 (69.5)		495* (68.8)				612 (83.9)	

Figures in parenthesis indicate percentage cost for hired labour

* Cost of agrochemicals amounted to Rs 118/-, forming 23.7 of the cash cost

Table 6.3(b) - Cash Cost/Acre - Highland (Maha 76/77)

Crop	Anuradhapura				Vavuniya		Hambantota		Badulla
	Palayakulama	Halmillakulama	Mahakanadarawa	Mahavilachchiya	Chettikulam	Pavatkulam	Gonnoruwa	Magama	Gemunupura/ Tissapura
Kurakkan			82 (99.8)		215 (92.5)				224 (95.5)
Maize			70 (30.6)	69 (72.8)			111 (97.3)		77 (87.1)
Cowpea	105 (26.2)	70 (0.0)	43 (2.7)	154 (70.3)	157 (64.4)		191 (59.0)		74 (60.7)
Greengram					220 (56.4)				
Blackgram			310* (66.4)		605* (47.6)	329 (62.4)			
Chilli				196 (66.1)					

Figures in parenthesis indicate percentage cost for hired labour.

* Tractor cost amounting to Rs 45/-, 186/- and 60/- formed 14.5%, 30.7% and 18.2% of the cash cost in Mahakanadarawa, Chettikulam and Pavatkulam respectively.

Table 6.4(a) - Cash Cost as a Percentage of Total Costs - Chena (Maha 76/77)

Crop	Anuradhapura				Vavuniya		Hambantota		Badulla
	Palayakulama	Halmillakulama	Mahakanadarawa	Mahavilachchiya	Chettikulam	Pavatkulam	Gonnoruwa	Magama	Gemunupura/ Tissapura
Kurakkan	18.7	26.6	18.1	27.9	61.0	40.7	63.8	51.3	30.8
Maize	18.8	10.1	15.2	21.6	58.8	32.5	54.6	54.6	23.8
Cowpea	24.9	15.2	28.4	26.9	30.8	-	52.1	53.7	46.9
Greengram	-	-	-	-	-	-	45.1	74.5	-
Blackgram	-	-	34.2	-	-	77.8	-	-	-
Chilli	14.4	17.4	-	61.5	-	-	-	57.1	-

Table 6.4(b) - Cash Costs as a Percentage of Total Costs - Highland (Maha 76/77)

Crop	Anuradhapura				Vavuniya		Hambantota		Badulla
	Palayakulama	Halmillakulama	Mahakanadarawa	Mahavilachchiya	Chettikulam	Pavatkulam	Gonnoruwa	Magama	Gemunupura/ Tissapura
Kurakkan	-	-	15.9	-	49.8	-	-	-	30.9
Maize	-	-	9.1	11.9	-	-	35.2	-	11.7
Cowpea	16.7	8.0	8.0	28.7	29.3	-	51.3	-	13.6
Greengram	-	-	-	-	36.0		-	-	-
Blackgram	-	-	37.8	-	88.6	63.2	-	-	-
Chilli	-	-	-	21.3	-	-	-	-	-

Table 6.5(a) - Labour Input/Acre - Chena (Maha 76/77)

Crop	Anuradhapura				Vavuniya		Hambantota		Badulla
	Palayakulama	Halmillakulama	Mahakanadarawa	Mahavilachchiya	Chettikulam	Pavatkulam	Gonnoruwa	Magama	Gemunupura/ Tissapura
Kurakkan	25.8 (16.0)	53.3 (19.3)	71.9 (11.3)	74.5 (19.7)	42.0 (54.5)	59.7 (50.1)	53.4 (47.0)	110.0 (41.1)	108.8 (23.9)
Maize	74.5 (14.8)	76.0 (7.1)	79.2 (11.6)	75.5 (14.6)	31.3 (46.3)		55.4 (20.9)	82.4 (38.0)	98.8 (16.6)
Cowpea	98.9 (17.2)	108.6 (8.9)	128.4 (15.0)	79.4 (18.3)	45.2 (27.2)		89.9 (32.8)	105.7 (34.0)	69.4 (33.4)
Greengram							59.2 (25.3)	86.9 (57.2)	
Blackgram			101.2 (17.4)			46.3 (68.9)			
Chilli	93.1 (6.8)	104.3 (10.7)		87.8 (41.6)				105.2 (37.7)	

Figures in parenthesis indicate hired labour units as a percentage of total labour unit.

Table 6.5(b) - Labour Input/Acre - Highland (Maha 76/77)

Crop	Anuradhapura				Vavuniya		Hambantota		Badulla
	Palayakulama	Halmillakulama	Mahakanadarawa	Mahavilachchiya	Chettikulam	Pavatkulam	Gonnoruwa	Magama	Gemunupura/ Tissapura
Kurakkan			80.4 (10.4)		45.0 (49.1)				115.4 (20.3)
Maize			116.9 (1.7)	86.0 (3.5)			49.1 (17.1)		119.6 (6.8)
Cowpea	66.7 (1.8)	99.6 (0.0)	114.3 (0.1)	76.4 (16.6)	49.2 (22.0)		48.2 (25.3)		90.0 (6.4)
Greengram					58.3 (21.1)				
Blackgram			105.2 (20.7)		25.1 (73.7)	43.7 (47.6)			
Chilli				139.2 (10.9)					

Figures in parenthesis indicate hired labour units as a percentage of total labour units.

Table 6.6(a) - 1 Average Yield per Acre) Chena (Maha 76/77)
2 Average Selling Price)

Crop			Anuradhapura				Vavuniya		Hambantota		Badulla
			Palayakulama	Halmillakulama	Mahakanadarawa	Mahavilachchiya	Chettikulam	Pavatkulam	Gonnoruwa	Magama	Gemunupura/ Tissapura
Kurakkan	Average yield per acre	bu/Ac	19.48	8.74	16.95	10.90	18.50	17.47	12.02	12.50	6.14
	Average price	Rs/bu	26.00	28.00	23.00	28.00	25.50	21.00	21.00	23.00	22.00
Maize	Average yield per acre	bu/Ac	22.71	19.64	29.95	20.10	21.80		7.39	8.80	14.00
	Average price	Rs/bu	30.00	32.00	29.00	32.00	29.00		28.00	26.00	25.81
Cowpea	Average yield per acre	bu/Ac	9.41	9.17	9.22	5.63	8.90		8.19	15.80	6.03
	Average price	Rs/bu	106.00	109.00	118.00	93.00	85.00		85.00	110.00	68.16
Greengram	Average yield per acre	bu/Ac							6.25	6.97	
	Average price	Rs/bu							120.00	146.00	
Blackgram	Average yield per acre	bu/Ac			16.37			7.47			
	Average price	Rs/bu			123.00			155.00			
Chilli	Average yield per acre	bu/Ac	176.64	129.48		61.50				1092.20	
	Average price	Rs/bu	13.00	13.00		12.50				0.95	

Table 6.6(b) - 1 Average Yield per Acre) Highland (Maha 76/77)
2 Average Selling Price)

Crop			Anuradhapura				Vavuniya		Hambantota	Badulla
			Palayakulama	Halmillakulama	Mahakanadarawa	Mahavilachchiya	Chettikulam	Pavatkulam	Gonnoruwa	Gemunupura/ Tissapura
Kurakkan	Average yield per acre	bu/Ac			11.48		9.1			20.4
	Average price	Rs/bu			27.00		28.00			22.50
Maize	Average yield per acre	bu/Ac			11.69	11.47			12.78	14.14
	Average price	Ac/bu			30.00	31.00			29.00	24.60
Cowpea	Average yield per acre	bu/Ac	10.19	8.39	9.19	7.77	8.6		6.96	8.39
	Average price	Rs/bu	111.00	108.00	101.00	98.00	85.00		103.80	80.00
Greengram	Average yield per acre	bu/Ac					6.5			
	Average price	Rs/bu					168.00			
Blackgram	Average yield per acre	bu/Ac			13.23		9.9	8.63		
	Average price	Rs/bu			130.00		157.00	154.00		
Chilli	Average yield per acre	lbs/Ac				63.03				
	Average price	Rs/lb				13.40				

Table 6.7 (a) RETURNS FROM CROPS IN CHENA LANDS-MAHA 76/77[1]

CROP		Anuradhapura				Vavuniya		Hambantota		Badulla
		Pahayakulama	Halmillakulama	Mahakanadarawa	Mahavilachiya	Chettikulam	Pavatkulam	Gonnoruwa	Magama	Gemunupura/ Tissapura
Kurakkan	Gross return per Acre	499.00	243.00	392.00	304.00	471.00	372.00	253.00	291.00	135.00
	Net return per Acre(including family labour)	-207.00	-223.00	-82.00	-195.00	-42.00	-233.00	-142.00	-626.00	-650.00
	Net return per Acre(excluding cost of family labour)	367.00	119.00	306.00	165.00	158.00	125.00	1.00	-180.00	-108.00
	Net return per unit of family labour	5.09	2.77	4.80	2.76	8.27	4.19	0.04	-2.78	-1.30
	Net return per unit of cash investment	-0.57	-0.80	-0.05	-0.41	0.87	0.06	0.44	-0.33	-1.69
	Gross return per unit of cash investment	3.78	1.96	4.56	2.19	1.50	1.51	1.00	0.62	0.56
Maize	Gross return per Acre	672.00	625.00	608.00	636.00	631.00	-	207.00	232.00	361.00
	Net return per Acre(including family labour)	52.00	9.00	115.00	156.00	201.00	-	-122.00	-543.00	-181.00
	Net return per Acre(excluding cost of family labour)	555.00	564.00	533.00	527.00	328.00	-	101.00	-190.00	233.00
	Net return per unit of family labour	8.74	8.00	7.60	8.23	22.50	-	2.31	-3.72	2.82
	Net return per unit of cash investment	1.44	1.15	2.53	2.43	1.79	-	-0.15	-0.29	-0.41
	Gross return per unit of cash investment	5.74	10.25	8.11	5.83	2.49	-	1.95	0.55	2.81
Cowpea	Gross return per Acre	1000.00	999.00	1091.00	524.00	755.00	-	695.00	1742.00	411.00
	Net return per Acre(including family labour)	146.00	46.00	170.00	-15.00	271.00	-	42.00	684.00	-111.00
	Net return per Acre(excluding cost of family labour)	789.00	854.00	830.00	379.00	606.00	-	355.00	1174.00	166.00
	Net return per unit of family labour	9.72	8.63	7.61	5.84	18.42	-	5.88	16.82	3.60
	Net return per unit of cash investment	1.69	1.32	1.65	0.89	2.82	-	1.12	2.20	0.55
	Gross return per unit of cash investment	4.70	6.89	4.18	3.61	5.07	-	2.01	3.07	1.68
Green gram	Gross return per Acre	-	-	-	-	-	-	751.00	1018.00	-
	Net return per Acre(including family labour	-	7	-	-	-	-	343.00	-31.00	-
	Net return per Acre(excluding cost of family labour)	-	-	-	-	-	-	567.00	230.00	-
	Net return per unit of family labour	-	-	-	-	-	-	12.83	6.18	-
	Net return per unit of cash investment	-	-	-	-	-	-	2.86	0.96	-
	Gross return per unit of cash investment	-	-	-	-	-	-	4.08	1.29	-
Blackgram	Gross return per Acre	-	-	2012.00	-	-	1158.00	-	-	-
	Net return per Acre(including family labour)	-	-	1243.00	-	-	591.00	-	-	-
	Net return per Acre(excluding cost of family labour)	-	-	1749.00	-	-	718.00	-	-	-
	Net return per unit of family labour	-	-	20.92	-	-	49.86	-	-	-
	Net return per unit of cash investment	-	-	4.72	-	-	2.34	-	-	-
	Gross return per unit of cash investment	-	-	7.65	-	-	2.63	-	-	-
Chillies	Gross return per Acre	2378.00	1690.00	-	1162.00	-	-	-	1092.00	-
	Net return per Acre(including family labour)	1570.00	782.00	-	357.00	-	-	-	20.00	-
	Net retun per Acre(excluding cost of family labour)	2263.00	1532.00	-	667.00	-	-	-	480.00	-
	Net return per unit of family labour	26.10	16.50	-	13.00	-	-	-	7.33	-
	Net return per unit of cash investment	14.65	5.94	-	1.72	-	-	-	1.03	-
	Gross return per unit of cash investment	20.67	11.25	-	2.35	-	-	-	1.78	-

(1) See Appendix 18

Table 6.7 (b) RETURNS FROM CROPS IN HIGHLAND - MAHA 76/77

CROP			Anuradhapura				Vavuniya		Hambantota	Badulla
			Palayakulama	Halmillakulama	Mahakanadarawa	Mahavillachchiya	Chettikulam	Pavatkulam	Gonnoruwa	Gemunupura/ Tissapura
Kurakkan	Gross return per Ac.	Rs.	-	-	320.00	-	257.00	-	-	456.00
	Net return per Ac.(including family labour)	Rs.	-	-	-196.00	-	-175.00	-	-	-267.00
	Net return per Ac.(excluding cost of family labour)	Rs.	-	-	237.00	-	217.00	-	-	231.00
	Net return per unit of family labour	Rs.	-	-	3.29	-	9.48	-	-	2.52
	Net return per unit of cash investment	Rs.	-	-	-1.36	-	0.19	-	-	-0.19
	Gross return per unit of cash investment	Rs.	-	-	3.86	-	1.20	-	-	2.03
Maize	Gross return per Ac.	Rs.	-	-	281.00	392.00	-	-	335.00	347.00
	Net return per Ac.(including family labour)	Rs.	-	-	-487.00	-186.00	-	-	40.00	-307.00
	Net return per Ac.(excluding cost of family labour)	Rs.	-	-	210.00	324.00	-	-	244.00	270.00
	Net return per unit of family labour	Rs.	-	-	1.83	3.90	-	-	5.96	2.42
	Net return per unit of cash investment	Rs.	-	-	-5.86	-1.74	-	-	1.36	-2.98
	Gross return per unit of cash investment	Rs.	-	-	3.96	5.76	-	-	3.20	4.50
Cowpea	Gross return per Ac.	Rs.	1134.00	910.00	926.00	770.00	729.00	-	715.00	673.00
	Net return per Ac.(including family labour)	Rs.	505.00	44.00	197.00	234.00	193.00	-	343.00	127.00
	Net return per Ac.(excluding cost of family labour)	Rs.	1029.00	840.00	884.00	509.00	573.00	-	524.00	599.00
	Net return per unit of family labour	Rs.	15.71	8.44	7.74	8.00	14.92	-	14.56	7.11
	Net return per unit of cash investment	Rs.	5.81	1.63	5.69	1.90	2.24	-	2.80	2.71
	Gross return per unit of cash investment	Rs.	10.80	13.05	22.05	2.95	4.67	-	3.74	9.07
Greengram	Gross return per Ac.	Rs.	-	-	-	-	1092.00	-	-	-
	Net return per Ac.(including family labour)	Rs.	-	-	-	-	480.00	-	-	-
	Net return per Ac.(excluding family labour	Rs.	-	-	-	-	872.00	-	-	-
	Net return per unit of family labour	Rs.	-	-	-	-	18.96	-	-	-
	Net return per unit of cash investment	Rs.	-	-	-	-	3.19	-	-	-
	Gross return per unit of cash investment	Rs.	-	-	-	-	4.97	-	-	-
Blackgram	Gross return per Ac.	Rs.	-	-	1719.00	-	1555.00	1332.00	-	-
	Net return per Ac.(including family labour)	Rs.	-	-	901.00	-	872.00	812.00	-	-
	Net return per Ac.(excluding cost of family labour)	Rs.	-	-	1409.00	-	950.00	1003.00	-	-
	Net return per unit of family labour	Rs.	-	-	17.96	-	143.94	43.80	-	-
	Net return per unit of cash investment	Rs.	-	-	3.91	-	2.44	3.47	-	-
	Gross return per unit of cash investment	Rs.	-	-	5.55	-	2.57	4.05	-	-
Chillies	Gross return per Ac.	Rs.	-	-	-	844.00	-	-	-	-
	Net return per Ac.(including family labour)	Rs.	-	-	-	-76.00	-	-	-	-
	Net return per Ac.(excluding cost of family labour)	Rs.	-	-	-	647.00	-	-	-	-
	Net return per unit of family labour	Rs.	-	-	-	5.22	-	-	-	-
	Net return per unit of cash investment	Rs.	-	-	-	0.61	-	-	-	-
	Gross return per unit of cash investment	Rs.	-	-	-	4.28	-	-	-	-

Table 6.8 - Indices of Price, Quantity and Value of Production[1]

Crop	Price/ cwt (Rs)	Price Index	Yield/ acre (cwt)	Index of quantity of production 1 acre	Gross return per Ac. (Rs)	Index of value of production
Kurakkan	52.50	1.00	7.0	1.0	368.00	1.0
Maize	58.37	1.11	11.0	1.57	642.00	1.74
Cowpea	172.00	3.28	5.1	0.73	877.00	2.38
Greengram	266.00	5.07	3.3	0.47	878.00	2.39
Blackgram	276.00	5.26	4.9	0.70	1353.00	3.68
Chilli	1441.00	27.45	1.1	0.16	1585.00	4.31

1 The price, yield/acre and gross return/acre for Kurakkan forms the base figures for the computation of the Indices.

Table 6.10 - Total Cost/Acre - Lowland (Yala 77)

Crop	Elahera Project	
	Attanakadawala	Bakamuna
Cowpea	794 (76.3)	789 (76.7)
Greengram	915 (84.8)	1023 (84.4)
Chilli	2059 (49.5)	2148 (67.0)

Figures in parenthesis indicate percentage cost for labour.

Table 6.11 - Cultivation Cost/Acre by Operations (Lowland)

Crop	Operation	Elahera Project	
		Attanakadawala	Bakamuna
Cowpea	Land preparation	156 (19.6)	184 (23.3)
	Sowing/Planting	107 (13.5)	105 (13.3)
	Weeding	86 (10.8)	99 (12.5)
	Other crop husbandry practices	284 (35.8)	206 (26.1)
	Harvesting	109 (13.7)	131 (16.6)
	Processing	33 (4.2)	47 (6.0)
	Other	19 (2.4)	17 (2.2)
	Total	794 (100.0)	789 (100.0)
Greengram	Land preparation	282 (30.8)	269 (26.3)
	Sowing/Planting	143 (15.6)	112 (10.9)
	Weeding	92 (10.1)	94 (9.2)
	Other crop husbandry practices	201 (22.0)	274 (26.8)
	Harvesting	142 (15.5)	170 (16.6)
	Processing	46 (5.0)	56 (5.5)
	Other	9 (1.0)	48 (4.7)
	Total	915 (100.0)	1023 (100.0)
Chilli	Land preparation	197 (9.6)	424 (19.7)
	Sowing/Planting	174 (8.5)	277 (12.9)
	Weeding	196 (9.5)	303 (14.1)
	Other crop husbandry practices	1164 (56.5)	894 (41.6)
	Harvesting	234 (11.4)	212 (9.9)
	Processing	36 (1.7)	25 (1.2)
	Other	58 (2.8)	13 (0.6)
	Total	2059 (100.0)	2148 (100.0)

Table 6.12 - Cash Cost/Acre (Lowland)

Crop	Elahera Project	
	Attanakadawala	Bakamuna
Cowpea	587 (68.0)	356 (48.3)
Greengram	619 (77.5)	497 (67.8)
Chilli	1718 (39.4)	1661 (57.4)

Figures in parenthesis indicate percentage cost for hired labour

Table 6.13 - Cash Cost as a percentage of Total Cost - Yala 77

Crop	Elahera Project	
	Attanakadawala	Bakamuna
Cowpea	73.9	45.1
Greengram	67.7	48.6
Chilli	83.4	77.3

Table 6.14 - Labour Inputs/Acre (Mandays) Yala 1977

Crop	Elahera Project	
	Attanakadawala	Bakamuna
Cowpea	87.8 (53.2)	103.0 (18.4)
Greengram	106.1 (47.6)	132.7 (30.5)
Chilli	135.7 (52.1)	186.7 (51.7)

Figures in parenthesis indicate hired labour units as a percentage of total labour units.

Table 6.15 - Lowland Cultivation - Yala 77

Crop			Elahera Project	
			Attanakadawala	Bakamuna
Cowpea	Average yield per acre	bu/Ac	4.91	5.49
	Average price	Rs/bu	140.00	140.00
Greengram	Average yield per acre	bu/Ac	4.88	6.42
	Average price	Rs/bu	175.00	175.00
Chilli	Average yield per acre	lbs/Ac	560.00	588.00
	Average price	Rs/lb	8.50	8.25

Table 6.16 - Returns from Crops - Lowland - Yala

Crop			Elahera Project	
			Attanakadawala	Bakamuna
Cowpea	Gross return per acre	Rs	687.00	769.00
	Net return per acre (including family labour)	Rs	-106.00	-20.00
	Net return per acre (excluding cost of family labour)	Rs	100.00	413.00
	Net return per unit of family labour	Rs	2.43	4.92
	Net return per unit of cash investment	Rs	0.82	0.94
	Gross return per unit of cash investment	Rs	1.17	2.16
Greengram	Gross return per acre	Rs	854.00	1124.00
	Net return per acre (including family labour)	Rs	-61.00	100.00
	Net return per acre (excluding cost of family labour)	Rs	235.00	626.00
	Net return per unit of family labour	Rs	4.23	6.79
	Net return per unit of cash investment	Rs	0.90	1.20
	Gross return per unit of cash investment	Rs	1.38	2.26
Chilli	Gross return per acre	Rs	4760.00	4851.00
	Net return per acre (including family labour)	Rs	2701.00	2703.00
	Net return per acre (excluding cost of family labour)	Rs	3042.00	3190.00
	Net return per unit of family labour	Rs	46.80	35.36
	Net return per unit of cash investment	Rs	2.57	2.63
	Gross return per unit of cash investment	Rs	2.77	2.92

Table 6.17 - Profitability of Paddy[1]

	Mahakana-darawa	Mahavila-chchiya	Vavuniya	Pavat-kulam	Hamban-tota	Polonnaruwa	
	Maha 76/77	Maha 76/77	Maha 77/78	Maha 76/77	Maha 76/77	Maha 76/77	Yala 78
No. of farm units	n.a.	n.a.	32	n.a.	n.a.	n.a.	10
Average size of holding (Acres)	1.50	3.10	6.77	3.05	3.53	3.59	4.23
Average yield per acre (cwt)	15.7	14.8	9.5	17.7	23.1	31.1	27.6
Price Rs/cwt	97.00	70.00	97.00	90.00	80.00	80.00	97.00
Total input of labour/acre (mandays)	45.3	47.1	18.1	32.1	50.7	91.8	64.4
Total input of family labour/acre (mandays)	31.3	39.0	4.8	17.4	15.5	31.0	21.0
Average wage rate for labour Rs/manday	6.00	6.00	15.00	13.00	7.00	7.00	12.00
Cash costs/acre	551.00	369.00	750.00	871.00	1184.00	1639.00	1005.00
Gross return/acre (Rs)	1523.00	1036.00	922.00	1593.00	1848.00	2488.00	2677.00
Net return/acre (Rs)	972.00	667.00	172.00	722.00	664.00	749.00	1672.00
Return to family labour (Rs/manday)	31.05	17.10	35.83	41.49	42.84	24.16	79.62
Gross return per unit of cash (Rs)	2.76	2.81	1.23	1.83	1.56	1.52	2.66
Net return per unit of cash	2.42	2.17	1.13	1.57	1.47	1.39	2.41

1 (a) Source of information in respect of Mahavilachchiya, Mahakanadarawa and Pavatkulam - Five Settlement Schemes prior to Irrigation Modernisation, Vol. I, Vol. II & Vol. III respectively.

(b) Source of information in respect of Hambantota and Polonnaruwa Maha 76/77 - Profitability and Resource Characteristics of Paddy Farming - ARTI Research Study Series, No. 23.

(c) Computations in respect of Vavuniya (Maha 77/78) and Polonnaruwa (Yala 78) were based on the unpublished data from a National Agrarian Sample Survey - jointly conducted by the ARTI, Department of Census & Statistics and the Central Bank.

n.a. - not indicated in the source document.

Table 6.18 - Comparisons of Gross Return/Acre

1. Between paddy grown in lowland and pulse crops and chilli grown on unirrigated land during Maha
2 Paddy and chilli grown on paddy lands during Yala.

Crop	Price/Cost[1] (Rs)	Yield[2] (cwt/Ac)	Gross return (Rs)
Paddy	80.00[3]	12.3	984.00
		24.6	1968.00
		32.9	2632.00
Cowpea	172.00	(a) 5.1	877.00
		(b) 7.5	1290.00
Greengram	266.00	(a) 3.3	878.00
		(b) 6.0	1596.00
Blackgram	276.00	(a) 4.9	1352.00
		(b) 7.0	1932.00
Chilli	1441.00	(a) 1.1	1585.00
		(b) 2.1	3026.00

1 Prices obtaining at the time of the survey - 1976/77
2 Paddy yields given correspond to 30,60 and 80 bushels/acre. For other crops, (a) denotes average yield of the major producing area obtained from the survey and, (b) the corresponding district figures provided by the Ministry of Agriculture.
3 Computed at the G.P.S. price of Rs 33/- per bushel prevailing at the time of the survey.

Chilli grown on Lowland in Yala

Crop	Price/cwt(Rs)		Yield (cwt/Ac)	Return Profit/Ac(Rs)	
	Yala 77 Elahera area	Maha 76/77 overall average		At price obtained in Elahera during Yala 77	At average price obtained in other areas during Maha 76/77
Chilli	938	1441	(c) 5.1	4784	7349
			(d) 8.0	7504	11528

(c) denotes the average yield of Elahera Project area obtained from the survey;
(d) denotes the average yield for Yala '79 in Elahera provided by the Ministry of Agriculture.

Chapter Seven

CONSUMPTION AND PROCESSING OF PRODUCE AS FOOD FOR THE FARM HOUSEHOLDS

The use of the produce as human food in the farm households as ascertained by the survey, would be the main topic of discussion in this chapter. Awareness and use of 'Supplementary foods' constituted by coarse grains and grain legumes under study and the opinions and preferences relating to these foods, are also discussed.

7.1 CONSUMPTION OF THE FARM PRODUCE AS FOOD BY THE FARM HOUSEHOLDS

The percentage of farms that retained part of the produce for their home consumption until next harvest provides a rough indication of the popularity of the product as a food item among the producing households, while the percentage of total produce retained for consumption gives some indication of whether the production was more consumption oriented or market oriented. (Tables 7.1 and 7.2)

Information relating to the items of food consumed at the three main meals; breakfast, lunch and dinner, during the seven days preceding the date of the survey was sought from the farm households. In addition, the cereal or grain legume base of each food item was also ascertained from the respondent.

A composite score for consumption based on all three meals was computed in respect of each food item. These scores are presented in Table 7.3. The pattern of consumption during a period which closely followed the harvest of most of the crops cultivated in the farms may not be typical of what is consumed throughout the year. The farmers were therefore asked whether the consumption pattern was representative

of consumption patterns throughout the year. A tendency towards a stability of consumption patterns in the very high income areas, and in Gonnoruwa where the main income was from a non cereal crop providing an exception, was observed from the responses. In subsistence production economies, consumption at times of relative abundance would not be similar to that at times when the larders are almost empty; fewer meals or lesser quantities being consumed at such time. The consumption pattern during the reference week could nevertheless be an indication of habits which are dictates of preferences necessitated by the socio-economic environment of the farm households.

The contention that *kurakkan* is grown mainly as a substitute cereal for rice in the food of the farm household is supported by the observations that almost all the producing households in the study areas had retained most of their produce for consumption, (Tables 7.1 and 7.2) and food preparations from kurakkan were widely consumed in most households of the producing areas. *Kurakkan emerged as an important cereal and can be even considered as half as important as rice in providing the basic food of the farm households in Anuradhapura, Pavatkulam and Gonnoruwa,* if the composite score for all meals is the considered indicator (Table 7.3). In the study areas of Anuradhapura, and in Pavatkulam, kurakkan provided the most common meal at breakfast but had an almost equal rating as rice for lunch. Dinner is the only meal where rice had an almost exclusive place in these areas. In Gonnoruwa, the pattern was slightly varied with rice *bath*[1] and kurakkan food being consumed with almost equal frequency at breakfast and both cereals being consumed at the other main meals too, but with rice *bath* being consumed at relatively more occasions than kurakkan.

Rice understandably played a very dominant part in the food of the people in the Elahera Project area. In Chettikulam and Magama too, it figured as the dominant cereal though to a relatively lesser extent than in the Elahera Project area. Kurakkan was hardly consumed or

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1 *'Bath'* - Rice cooked by boiling in water.

grown in the Elahera Project area. Breakfast in this area, and in Magama consisted mainly of rice. Bread or wheat flour preparations were also consumed on many occasions. In Magama 'rice *bath*' was the main breakfast meal with manioc or bread also contributing to many meals. Breakfast was very varied in Chettikulam with rice *bath*, rice flour preparations, kurakkan, bread, wheat flour preparation and '*thosai*'[1] being consumed with almost equal frequencies. Rice *bath* was the predominant food at both lunch and dinner in all three areas. But in Chettikulam dinner was also slightly more varied, with rice flour preparation, wheat flour preparation and *thosai*.

Maize was almost as important as rice in the food of the farm households of Mapakadawewa. In Gemunupura/Tissapura, maize and kurakkan together provided about one third the meals. Maize was the main cereal consumed at breakfast in both areas. *Bath* and bread were also consumed on some occasions. Rice *bath* accounted for nearly half the lunch days and about 2/3 to 3/4 the dinner days in both areas. Maize was the major substitute for rice at both meals in Mapakadawewa, and kurakkan the main substitute in Gemunupura/Tissapura.

The majority of farmers who cultivated pulses used part of the production for consumption (Table 7.2). But, a large proportion of the quantities cultivated in the major producing areas were produced for the market. Pulses were consumed as basic food by the farm households mainly at breakfast. Cowpea contributed to about 7 -12% of the breakfast days in Anuradhapura, Pavatkulam and Gonnoruwa.

Green gram provided breakfast on about 8 -12% of the mornings to the Hambantota farmers. *Thosai* with blackgram as a main ingredient was consumed on as many as about 20% of the breakfast days by farmers of Chettikulam. This food was also consumed at dinner. Cowpea or green gram was consumed at breakfast on about 8 -11% of the occasions at Elahera Project. None of the three pulses were consumed much in

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1 *'Thosai'* - A food preparation in the form of a 'pancake' with blackgram as one main ingredient and rice or wheat flour as the other main ingredient.

Mapakawewa, though some cowpea breakfasts were mentioned. A few instances of Me' were reported in both areas of Badulla and manioc figured as the food item of equivalent importance to pulses in the other areas.

Some interesting features of the consumption habits are those (1) Rice was consumed almost exclusively in the form of '*bath*' in all areas except in Chettikulam where preparations of rice flour were also consumed in many instances, for breakfast as well as dinner. (2) Though blackgram was a major cash crop in both Chettikulam and Pavatkulam, the farm households of Pavatkulam hardly ate blackgram. This could be attributed to the ethnic differences between the people of these areas. The Tamil community in Chettikulam have traditionally grown blackgram and eaten the food preparations of this pulse. (3) The Pavatkulam farmers' food habits closely resemble those of the Anuradhapura farmers. (4) Though stability of consumption patterns were observed in the high income areas, variation in food items consumed at breakfast and dinner was observed only in Chettikulam.

7.1.1 Food value of coarse cereals in comparison to rice

The farmers were asked their opinion on whether each cereal had better or lesser food value than rice. Average scores were computed for each cereal assigning a score of 1 if the food value was considered better and -1 if considered lesser than of rice, and 0 if considered to be equal (Table 7.4). 90 -100% of the farmers in each study area responded in respect of kurakkan and maize. But, the response was poor for sorghum varying between 30 -72% among the study areas. The farmers concept of 'superior food value' was articulated as 'greater sakthi' i.e. literally more energy. Kurakkan was considered as superior to rice in almost all the dry zone areas. It scored very high in Halmillakulama and Chettikulam. It was considered very inferior to rice in Mapakadawewa and almost equated with rice by Gemunupura/Tissapura and Gonnoruwa farmers. Maize was considered superior to rice only by the Badulla farmers though the differences in score were not too large, and the Attanakadawela farmers almost equated it with rice. Sorghum was not considered superior to rice in any study area. In Chettikulam where about 70% of the farmers responded, sorghum was considered to be as almost equal to rice. In

Mapakadawewa too it was considered as equal to rice; This opinion however was based only on the responses of 40% of the farmers.

The composition of the cereals in terms of three basic principles - energy, protein and carbohydrates are given below:

	Parts per 100 gm of edible portion		
	Energy (calories)	Protein	Carbohydrates
Rice, parboiled home-pounded	349	8.5	79.4
Rice, lightly milled, raw	346	7.5	76.7
Rice, parboiled, highly milled	346	6.4	79.0
Rice, highly milled, raw	345	6.8	78.2
Kurakkan	328	7.3	72.0
Maize	363	10.0	71.0
Millet (Sorghum)	349	10.4	72.6

Rice contains more of all three principles than kurakkan, maize is richer in calories and proteins and has less of carbohydrates than rice. Sorghum contains more of protein, is of almost equal energy and has less of carbohydrates than rice. This comparison of course relates to equal weights of the different cereals. The quantities consumed however could vary with the cereal comprising the equivalent meals. As no information was sought on quantities consumed at meals, it is not possible to attempt to find out the basis of the evaluation of the farmers.

Some noteworthy features are that, in Anuradhapura where both kurakkan and maize are important crops in cultivation, and kurakkan was consumed very widely as a substitute for rice it was considered to be of a superior food value than rice, while maize was considered to be very inferior to rice. Even in areas like Chettikulam and the Elahera Project area where kurakkan consumption was low, this cereal was rated superior in food value to rice, in fact it was considered very superior in Chettikulam and almost equal in Bakamuna. Mapakadawewa, where maize figures as a main cereal in the diet of the people, was the only area in which kurakkan was considered inferior to rice. Here and in Gemunupura/Tissapura maize was considered superior to rice. But even in these areas the level of superiority indicated was not very high.

7.2 FOOD PREPARATIONS FROM COARSE GRAINS AND PULSES

7.2.1 Preparations done in the home

Kurakkan was consumed in the form of rotti, pittu, string hoppers and *'Thalapa'* - all preparation from the flour of the grain. Maize however was mainly consumed as a boiled grain. Pittu and rotti made with maize flour were also consumed frequently but string hopper preparations were less frequently reported. Sorghum lent itself more to the preparation of *'bath'* involving the use of the grain and the use of its flour wherever reported was again for preparation of *'bath'*. Though the use of coarse cereals in extending rice meals had been promoted by the agricultural extension services, such use was rarely observed in the responses.

Only cowpea and greengram among the pulses were consumed in the form of boiled grains or in a curried form. Blackgram was mainly used in the preparation of *'thosai'*. Use of the other two pulses in the preparation of this food item, was also mentioned by a few farm households, - indicating a possible substitution for blackgram in this item of food. Cowpea and maize were the only two grains that had been mentioned as being consumed in a fried form; either as a fried grain or in the form of *'vadai'* - a fried preparation with the grain as an ingredient. Sweet meats were also made from the flours of the different cereals and pulses.

7.2.2 Pre-processed food

'Thriposha' a supplementary food composed of soya bean and two cereals was introduced by the Department of Health as an intervention in upgrading the nutritional status of infants, pre-school children (1-6 years old) and pregnant women/lactating mothers. The composition of this food had varied from time to time and at the time of the survey it consisted of soya bean and sorghum as raw inputs and a pre-processed wheat/soya blend which was imported. Generally a fairly large proportion of farm households had heard of *'thriposha'*. The percentage of households that had consumed *'thriposha'* at one time or another however, was less, and ranged from 10% to 72%. When opinions were sought regarding the suitability of this food for infants, pre-school children and pregnant women/lactating mothers, a great degree of positiveness was expressed

regarding the suitability for mothers and pre-school children, and there were some reservations regarding it's suitability for infants. The majority of those who had heard of *'thriposha'* were unable to mention even one of the ingredients of this 'food'; the proportion varied from 53 -100% among the study areas except in Attanakadawala where only 29% were unable to mention any ingredient. This knowledge would normally reach the farmers apart from interest in the 'food itself', through the health intervention programmes or processing agencies of soya bean and sorghum or extension programmes for promotion of production of these crops. It has already been observed that none of the study areas showed evidence of interest in growing sorghum, or soya bean and hence it is not surprising that they had very little knowledge of the use of these grains in this subsidiary food.

After acquainting the farmer with the components of *'thriposha'*, they were asked whether they would prefer this food in a processed form or as an equally nutritious food prepared at home. The responses indicated a clear preference for food prepared at home, except in two areas where the rate of non-response was very high. Processing the produce was generally considered to be a major problem in promoting consumption and production of soya bean and sorghum. The farmers' responses cannot be considered to be an indication of a negation of this hypotheses as the survey had showed evidence of lack of experience and interest in growing these crops, and it is therefore reasonable to assume that they lacked knowledge and experience of processing too. They would be more an indication of a general preference for food prepared at home to a food brought from out of the home, or a freshly prepared food to a pre-processed food, rather than a preference based on considerations as to how food can be prepared from sorghum and soya bean.

7.3 SUMMARY

The above findings lead to a conclusion that kurakkan which is grown for and liked as a human food by the producer households, could be encouraged as a substitute in part for rice, as well as bread and wheat flour in the preparation of food. Kurakkan can be popularised for consumption among the non-producers if it can be made available as flour.

Maize unlike kurakkan is not a very popular substitute for rice, and could therefore be developed more as a market oriented crop for use in animal feed. Of the three cereals, sorghum has very little potential for direct substitution for rice or bread in food prepared at home. Among the pulses, cowpea and greengram can substitute for vegetables in preparation of curries, blackgram seems to have a limited but very special use in terms of the food items prepared from it; however, it serves as a provider of main meals to some sections of the population.

Table 7.1 - Percentage of Households that Retained Produce for Consumption[1]

	Anuradhapura				Vavuniya		Hambantota		Badulla		Elahera Project	
Crop	Palayakulama	Halmillakulama	Mahakanadarawa	Mahavilachchiya	Chettikulam	Pavatkulam	Gonnoruwa	Magama	Mapakadawewa	Gemunupura/ Tissapura	Attanakadawala	Bakamuna
Kurakkan	100	97	98	100	94	100	100	92	77	84	-	-
Maize	72	95	85	94	88	*	100	100	100	98	-	*
Sorghum	*	-	*	100	*	*	*	*	*	67	-	-
Cowpea	80	94	88	94	86	91	87	100	100	96	87	82
Greengram	*	*	85	*	100	-	71	84	75	100	87	86
Blackgram	60	*	62	67	69	46	*	-	70	82	-	*
Soyabean	-	-	*	-	-	*	*	-	-	*	67	-

1 Percentages are based on the number reporting productions and consumption relating to the period until next harvest.

* Percentages not computed as the base figure was less than five.

Table 7.2 - Percentage of Produce Retained for Consumption[1]

Crop	Anuradhapura				Vavuniya		Hambantota		Badulla		Elahera Project	
	Palayakulama	Halmillakulama	Mahakanadarawa	Mahavilachchiya	Chettikulam	Pavatkulam	Gonnoruwa	Magama	Mapakadawewa	Gemunupura/ Tissapura	Attanakadawala	Bakamuna
Kurakkan	89 (618)	89 (298)	91 (1350)	83 (510)	64 (312)	93 (287)	91 (792)	91 (104)	74 (16)	60 (57)	-	-
Maize	21 (358)	23 (536)	33 (463)	24 (1200)	82 (61)	-	92 (112)	85 (62)	75 (330)	59 (753)	-	-
Sorghum	-	-	-	88 (24)	-	-	-	-	-	*	-	-
Cowpea	19 (150)	32 (130)	39 (220)	31 (264)	53 (73)	48 (26)	47 (76)	21 (75)	*	68 (60)	47 (25)	48 (40)
Greengram	-	-	38 (21)	-	66 (30)	-	19 (97)	13 (102)	*	*	56 (22)	49 (23)
Blackgram	14 (16)		10 (221)	36 (27)	5 (1856)	5 (686)	-	-	*	*	-	-

1 Figures given relate only to instances where the number of growers exceed Five.
Figures in parenthesis denote total production in bushels.
* Percentages not computed as the total production was less than 10 bushels.

Table 7.3 - Consumption Pattern During the Week Preceding the Survey
(Composite score - based on all three meals)

	Anuradhapura				Vavuniya		Hambantota		Badulla		Elahera Project	
	Palayakulama	Halmillakulama	Mahakanadarawa	Mahavilachchiya	Chettikulam	Pavatkulam	Gonnoruwa	Magama	Mapakadawewa	Gemunupura/ Tissapura	Attanakadawala	Bakamuna
No. of meal days[1]	203	301	574	553	245	210	266	210	210	455	217	189
Food items												
Bath	54.4	50.4	42.8	52.0	52.7	48.7	49.9	62.8	42.9	51.1	76.5	80.1
Bath (mixed)	0.8	-	0.6	-	-	-	1.2	-	-	-	-	-
Rice flour	-	0.9	0.3	0.7	9.8	0.5	-	-	0.3	1.0	-	-
Kurakkan	29.6	18.9	38.3	21.6	10.3	34.1	26.3	10.0	5.7	14.9	0.8	2.1
Maize	0.8	5.2	2.0	5.5	1.3	1.3	6.6	8.2	34.7	15.2	0.3	0.7
Bread	6.9	5.4	5.7	9.2	5.6	7.3	2.4	7.8	5.1	5.3	10.5	7.7
Wheat flour	-	2.1	1.3	2.5	7.6	1.7	1.3	1.9	1.9	2.5	6.9	4.9
Cowpea	5.2	4.4	4.4	5.0	2.7	4.7	3.4	1.1	0.5	2.6	2.3	1.9
Greengram	0.5	-	0.2	-	0.4	-	2.8	4.0	-	-	2.2	1.6
Blackgram	-	-	-	-	-	1.0	-	0.2	-	-	-	-
Manioc	0.5	5.2	2.3	0.6	-	-	0.1	0.2	4.8	4.5	-	-
Others	-	-	0.3	0.2	8.2	0.7	0.4	1.7	1.4	1.7	-	-
Not satisfied	-	-	0.1	-	-	-	-	-	-	-	0.6	0.9
Not reported	1.3	7.5	1.8	2.6	1.5	-	5.7	2.1	2.7	1.2	-	-

1 Meal days - N x 7 where N is the total number of households.

Table 7.4 - Rating of the Cereals for Food Value in Comparison with Rice (Average Scores)

	Anuradhapura				Vavuniya		Hambantota		Badulla		Elahera Project	
Crop	Palayakulama	Halmillakulama	Mahakanadarawa	Mahavilachchiya	Chettikulam	Pavatkulam	Gonnoruwa	Magama	Mapakadawewa	Gemunupura/ Tissapura	Attanakadawala	Bakamuna
Kurakkan	+0.27 (100.0)	+0.78 (97.7)	+0.40 (96.3)	+0.21 (100.0)	+0.74 (100.0)	+0.50 (100.0)	+0.52 (94.7)	+0.40 (100.0)	-0.62 (96.7)	-0.01 (92.3)	+0.31 (93.5)	+0.04 (88.9)
Maize	-0.86 (100.0)	-0.52 (97.7)	-0.64 (93.9)	-0.55 (100.0)	-0.40 (100.0)	-0.60 (100.0)	-0.60 (89.5)	-0.28 (93.3)	+0.33 (100.0)	+0.49 (96.9)	-0.07 (90.3)	-0.44 (85.2)
Sorghum	-0.57 (72.4)	-0.57 (48.8)	-0.60 (62.2)	-0.73 (60.8)	-0.08 (68.6)	-0.48 (90.0)	-0.13 (39.5)	-0.55 (30.0)	0.00 (40.0)	-0.16 (66.1)	-0.35 (74.2)	-0.25 (29.6)

Figures in parenthesis indicate the percentage of farmers responded.

Chapter Eight

MARKETABLE SURPLUS OF PRODUCE

The term 'marketable surplus' in the context of agricultural produce denotes the quantities of products available for consumption by the non-farming population and also as raw materials for manufacturing and processing industries.

This concept helps to measure the extent of commercialisation of the production activities of a crop. While high proportions of marketable surpluses indicate greater market orientation of the producers lesser proportions of surpluses means that the producers are more subsistence oriented. The FAO has categorised, farmers into three different categories based on the marketable surplus as a percentage of the total production in the following manner.[1]

i) Subsistence farmers; marketable surplus under 25% of the total production.

ii) Transition farmers; marketable surplus ranging between 25 -50%.

iii) Commercial farmers; marketable share more than 50% of the total production.

An attempt was made in the study to ascertain the prevailing extent of commercialisation in respect of the individual crops, and also assess the impact of the major variables that determine the marketable surplus. The timing of sales and the underlying reasons for the emerging pattern were also analysed.

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1 FAO/ECA "Report of the FAO/ECA Expert Meeting on Government Measures to promote the transition from Subsistence to Market Agriculture in Africa". Rome, 1964.

8.1 EXTENT OF COMMERCIALISATION

It was assumed that the marketable surplus immediately after harvest dependent on five major variables and could be expressed by the following equation:

$$Q = (X + p) - (S + I + C)$$

where,

Q denotes the marketable surplus
X denotes stock at time of harvest
P denotes production
S denotes amount retained for seed
I denotes payment in kind
C denotes amount retained for consumption of the household

Post harvest waste or losses have not been taken into consideration in the computation of the marketable surplus available with the producers. Information on waste was not collected as this was outside the scope of the study.

Table 8.1 clearly indicates *the high degree of commercial orientation for grain legumes.* Blackgram, soyabean, greengram and cowpea yielded marketable surpluses of about 60%-85% of total production in their respective major producing areas. *Maize too exhibited a fair degree of market orientation in Anuradhapura,* with a marketable surplus of 60 -75% in the study areas of the district. In contrast generally about 10% of the total production of kurakkan is reported to have been sold.

Sorghum, which was encouraged as commercially oriented crop with the intention of utilising sorghum flour to partly substitute for wheat flour[1], however, did not reflect this tendency in the survey, because only a small number of farmers were engaged in its cultivation during the reference period. Inquiries made in the preliminary survey as well as

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1 The State Flour Milling Corporation announced a fixed price for sorghum in 1976, but it did not have a proper system of collecting the produce from farmers.

in the main survey revealed that, lack of proper marketing outlets and low prices have discouraged farmers from growing this crop.[1]

8.2 FACTORS AFFECTING THE MARKETABLE SURPLUS

Detailed analysis of the components of the marketable surplus are discussed below. The percentage of farmers reporting these components of the surpluses are presented in Table 8.2.

8.2.1 Stocks at the time of harvest

Stocks at harvest comprise the unconsumed and unsold parts of the produce that had been retained for consumption and or sale.

The percentage of farmers who reported having stocks of grains at the time of harvest were generally greater among growers of coarse cereal, specially kurakkan than among the growers of greengram, blackgram and cowpea.

The fact that around 1/10th to 1/3rd of the growers in the study areas had with them an average stock of about 2-5 bushels of kurakkan at time of harvest, support the observation *that kurakkan was stocked as a food security measure in the event of paddy crop failure. Maize was also stocked for food security in the areas where it was of sufficient importance in the diet of the people.*

Instances of residual stocks in respect of the grain legumes being relatively few in comparison to that of coarse cereals could among other reasons be due to the lesser importance of these crops than cereals for consumption. However, even the very few farmers who reported stocks of blackgram in Chettikulam and Pavatkulam had on the average 12 and 13 bushels respectively. Average stocks of about 1 bushel of

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1 The author was given an opportunity by the then G.A. Hambantota District to go through some records available at his office. There were large numbers of complaints received from farmers by him, regarding the lack of marketing arrangements for sorghum, and his communications with the Ministry of Agriculture and Lands and as well as with Marketing Department had brought only marginal benefits to farmers.

cowpea among farmers who had stocks in Palayakulam and Mahakanadarawa and correspondingly 2 bushels in Chettikulam were also reported. A fuller discussion of the practice of stocking grains will be made later in this chapter.

8.2.2 Retention for seed

The practice of retaining a portion of production to use as seeds in the subsequent season was widespread in all survey areas in respect of all the crops studied (Table 8.2).

A reason for this behaviour could be the fact that the price of seed materials rises to its peak at the time of planting[1] and it also may not be sufficiently available even at such high prices. *Use of own seed repeatedly over time would result in the degeneration of the quality of the seed material, and retards productivity.* This finding calls for remedial action by the Department of Agriculture.

1 It would be necessary to actively pursue a programme for distribution of foundation seeds with the appropriate frequencies.

2 If farmers are to be encouraged to keep their seeds for the subsequent seasons, advice and guidance on how to select good seeds and how to keep them in store with minimum quality deterioration have to be provided.

8.2.3 Payments in kind

Payments in kind were of no significance in relation to production, (Tables 8.2 & 8.3) and were incurred mainly for repayment of loans. The highest ratio reflected were for kurakkan, the highest being 4% in Gonnoruwa. The absence of payments in kind for hired labour in the cultivation of these crops is noteworthy. The high prices and market orientation of the pulse crops could have induced the farmers to make payments in cash for hired labour. Further the crop mixes in their

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1 Chapter Nine - Seasonal Variation of Prices

system would have ensured a steady cash floor enabling payment for way in cash.

8.2.4 Retention for home consumption until end of next cultivation year

The importance of the coarse cereals, specially kurakkan in the basic food of farm households, in most poor rice producing areas, and the comparative uses of the different pulses between the major producing areas, and other areas have been discussed in Chapter Seven.

Referring to Tables 7.1 and 7.2 it is seen that almost all households in the dry zone and about 80% in Badulla retained kurakkan for consumption and about 90% of the produce in the dry zone except in Chettikulam, and 60 -70% in Badulla was retained for this purpose, emphasising the highly subsistence nature of the cultivation of this crop. Maize cultivation assumes this character in Hambantota and Badulla.

Among the pulses, the mostly widely grown crop of any area was also widely consumed, by the farm households and at the same time relatively higher proportions of the relatively greater produce of this made available for sale.

8.2.5 Timing of sales

Since the farm survey of this study was timed to coincide with the period immediately after the harvest it was thought worthwhile to examine the pattern of timing of sales by the producers. This information was obtained with regard to, (i) sales already made (marketed surplus) at time of interview, (ii) retention of produce for future sales and also (iii) additional retention of produce for consumption beyond the next cultivation year.

The details of the manner of disposal and timing of the marketable surplus are presented in Table 8.4.

Generally, with the exception of kurakkan, more than almost 75% of the marketable surplus had been marketed immediately after harvest.[1]

Kurakkan, being grown mainly to supplement and also as a substitute for rice in times of uncertainty of the paddy crop and also because of its high storage quality tend to get stocked[2] rather than being disposed of immediately. A similar tendency was observed for maize when grown mainly for consumption as a substitute cereal. (Table 8.4 - Badulla)

As a result of sales immediately after the harvest the markets are usually flooded with excess supplies during the peak harvest season thus creating a very high demand for marketing services which is far in excess of what can be provided by the existing marketing facilities both in private and public sectors. This excess demand for services is more marked in the spheres of transport, storage space, and in financing sale activities. These factors ultimately result in low prices at wholesale and assembly levels. As such difficulties are more prominent at assembly (farm) level than at wholesale level the drop in prices at assembly level tend to be proportionately higher than the price drop at wholesale level. Monopolistic elements at wholesale and producer level could further worsen this situation. The only alternative action available to farmers under such circumstances is to postpone their sales until such time the prices begin to rise which is quite possible if they can form into effective producer associations. Cooperative action in grain marketing (other than paddy) in Sri Lanka seems to be minimal.

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1 This finding supports a general hypothesis that a major portion of the marketable surplus is sold immediately after harvest by the majority of farmers in most of the developing countries.

2 See section on Stocks at Time of Harvest (page 175).

An attempt was made to understand why farmers sell their produce immediately following harvest. For this purpose, only farmers who had sold 50% or more the produce marketed by them during the period from harvest to time of survey, were requested to state the reasons for doing so. The reason given by them have been summarised and presented in Table 8.5. The responses relate to only the major producing areas of each crop, as the number of respondents were sufficiently high for analysis only in these areas. Kurakkan was excluded from the analysis as it did not merit attention in this regard.

The main reasons for early sales was more for home needs either to repay loans obtained for home consumption or meet the day to day needs of the households. Sales effected by farmers to settle cultivation loans from producer buyers was not widespread the proportion of farmers selling for this reason did not generally exceed 20%. Blackgram sales in Chettikulam provided a noteworthy exception in that 75% of farmers sold for this reason. Hence, *the survey evidence suggests that the practice of bonding a crop for a loan did not prevail to any alarming degree in respect of these crops.* It is also interesting to note that at least a few farmers interviewed have sold their produce *in anticipation of a price drop in the near future.* Perhaps, harvesting of their crops may have ended long before the peak harvesting period, when prices drop to lowest level.

Farmers were asked whether they sold any produce set aside for consumption, or consumed produce set apart for sales during the 3 years preceding the date of the survey and reasons for such behaviour. The responses indicated that *farmers do sell produce set apart for household consumption, to meet urgent cash needs unforeseen at the time of harvest*[1], *or when prices became attractive in the market.*

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1 Ranatunga and Abeysekera - "Resource Use and Profitability in Paddy Products," ARTI, 1977.

Kurakkan has been thus sold for attractive prices during the periods of drought.[1]

The reverse situation in which *farmers had been compelled to consume some of the produce reserved for future sales due to circumstances beyond their control too had been evidenced.* Such situations were experienced during the mid 1970's due to frequent revisions of amounts and prices of rice and flour distributed on ration. Compelled by profit motives too, farmers had consumed more maize, cowpea, etc., far in excess of the normal levels, while selling their paddy under attractive prices.

This analysis therefore, helps us to conclude that if there are no violent fluctuations of the supply of the rice substitutes like coarse cereals and pulses or of their prices, the difference between the marketable surplus and actual quantities sold would be small and the estimation of quantities arriving at the markets can be made fairly accurately, thus enabling the better planning of investments in marketing facilities and services.

8.3 SUMMARY

The cultivation of coarse cereals, kurakkan specifically and maize to a lesser extent were consumer oriented. Grain legume cultivation was distinctively market oriented while maize too assumed this character in some areas.

Payment for hired labour in the cultivation of these crops were not incurred in kind. Farmers generally used their own seed for cultivation from season to season and therefore retained their seed requirements. The impact of this practice retards productively.

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1 Here it should be noted that such sales influence the shift of the supply curve. In this case the risk of future crop failures are being discounted against the very attractive prices at the time of the sale. This occur when by an unexpected short supply of the produce under consideration or of its' substitutes.

The majority of the farmers sold a major portion of the marketable surplus during the period immediately following harvest and were not able to benefit from higher off season prices. They were however not compelled to sell at harvest as a result of bondage of the crop to traders and thus were able to sell at the prevailing market prices. Reasons concerned with immediate cash requirements for household needs or with settlement of loan obtained for home consumption as well as cultivation forced early sales.

Farmers appeared to be price responsive and manupulated their stocks transferring stocks from consumption to sales or vice versa depending on the prevailing market conditions relating to the commodity or its close substitutes.

Table 8.1 - Extent of Market Orientation - Marketable Surplus as a Percentage of Total Production[1]

Crop	Anuradhapura				Vavuniya		Hambantota		Badulla		Elahera Project	
	Palayakulama	Halmillakulama	Mahakanadarawa	Mahavilachchiya	Chettikulam	Pavatkulam	Gonnoruwa	Magama	Mapakadawewa	Gemunupura/ Tissapura	Attanakadawala	Bakamuna
Kurakkan	6.6 (618.0)	4.1 (298.0)	10.6 (1350.0)	12.8 (510.0)	31.0 (312.0)	3.1 (287.0)	0.6 (729.0)	2.3 (104.0)	1.3 (16.0)	32.1 (57.0)	-	-
Maize	75.7 (358.0)	73.5 (536.0)	61.0 (463.0)	73.7 (1200.0)	15.5 (61.0)	23.1 (13.0)	1.1 (112.0)	8.8 (62.0)	19.6 (330.0)	32.5 (753.0)	-	*
Cowpea	77.0 (150.0)	61.5 (130.0)	55.0 (220.0)	63.8 (264.0)	40.3 (73.0)	38.5 (26.0)	46.9 (76.0)	73.8 (75.0)	*	24.5 (60.0)	45.4 (25.0)	44.5 (40.0)
Greengram	51.5 (12.0)	-	58.2 (21.0)	*	15.8 (30.0)	-	75.6 (97.0)	81.4 (102.0)	*	-	36.2 (22.0)	38.1 (23.0)
Blackgram	83.2 (16.0)	*	86.6 (221.0)	58.7 (27.0)	83.7 (1856.0)	84.7 (686.0)	99.5 (39.0)	-	*	*	-	*
Soyabean	-	-	*	-	-	-	-	-	-	*	84.3 (100.0)	100.0 (14.0)

1 Anuradhapura, Vavuniya, Hambantota and Badulla - relates to cultivation on unirrigated land during Maha 76/77. Elahera Project - relates to cultivation on paddy land during Yala '77

Figures in parenthesis indicate total production in bushels.

* Percentages not computed as the total production was less than 10 bushels.

Table 8.2 - Percentage of Farmers[1]

(i) with stocks at time of harvest
(ii) who made repayments of loans in kind
(iii) who retained part of produce as seed for next cultivation

	Anuradhapura				Vavuniya		Hambantota		Badulla		Elahera Project	
	Palayakulama	Halmillakulama	Mahakanadarawa	Mahavilachchiya	Chettikulam	Pavatkulam	Gonnoruwa	Magama	Mapakadawewa	Gemunupura/ Tissapura	Attanakadawala	Bakamuna
KURAKKAN	N=24	N=29	N=68	N=42	N=18	N=15	N=30	N=13	N=13	N=19	-	-
Stock at time of harvest	16.7	6.9	11.8	7.1	33.3	20.0	26.7	23.0	23.1	26.3	-	-
Repayment of loan in kind	4.2	3.4	4.4	2.4	5.6	-	20.0	15.4	-	-	-	-
Retention for seed	91.7	100.0	91.2	52.4	61.1	93.3	93.3	69.2	84.6	78.9	-	-
MAIZE	N=18	N=39	N=53	N=66	N=8	*	N=31	N=23	N=29	N=64	-	*
Stock at time of harvest	11.1	7.7	11.3	1.5	12.5		29.0	30.4	10.3	26.6	-	
Repayment of loan in kind	-	-	1.9	-	-		6.5	4.3	-	3.1	-	
Retention for seed	100.0	97.4	96.2	95.5	62.5		87.1	87.0	82.8	87.5	-	
SORGHUM	*	-	*	N=7	*	*	*	*	*	N=6	-	-
Stock at time of harvest		-		-						33.3	-	-
Repayment of loan in kind		-		-						-	-	-
Retention for seed		-		100.0						66.7	-	-
COWPEA	N=20	*	N=34	N=12	N=35	N=28	*	-	N=10	N=11	-	*
Stock at time of harvest	5.0		-	8.3	11.4	7.1		-	-	9.1	-	
Repayment of loan in kind	-		-	8.3	14.3	-		-	10.0	-	-	
Retention for seed	100.0		91.2	83.3	62.9	89.3		-	90.0	100.0	-	
GREENGRAM	*	N=32	N=64	N=63	N=21	N=11	N=30	N=16	N=8	N=49	N=15	N=17
Stock at time of harvest		6.3	6.3	1.6	4.8	9.1	10.0	6.3	-	14.3	6.7	-
Repayment of loan in kind		3.1	3.1	1.6	-	-	10.0	6.3	-	-	-	-
Retention for seed		93.8	84.4	88.9	61.9	90.9	76.7	81.3	100.0	81.6	66.7	70.6
BLACKGRAM	N=5	*	N=13	*	N=14	-	N=28	N=19	N=12	N=16	N=15	N=14
Stock at time of harvest	-		-		7.1	-	14.3	21.1	8.3	18.8	6.7	-
Repayment of loan in kind	-		-		-	-	7.1	10.5	-	-	-	-
Retention of seed	75.0		100.0		50.0	-	89.3	94.7	83.3	75.0	80.0	71.4
SOYABEAN	-	-	*	-	-	*	*	-	-	*	N=6	*
Stock at time of harvest	-	-		-	-			-	-		-	
Repayment of loan in kind	-	-		-	-			-	-		-	
Retention for seed	-	-		-	-			-	-		83.3	

See Footnote (1) - Table 8.1
1 relates to the reporting farmers

N denotes total number reporting production
* Percentage not computed as the no. of reporting farmers was less than 5

Table 8.3 - Percentage of Produce Utilized for (i) payment in kind, and (ii) retention for seed material

	Anuradhapura				Vavuniya		Hambantota		Badulla		Elahera Project	
	Palayakulama	Halmillakulama	Mahakanadarawa	Mahavilachchiya	Chettikulam	Pavatkulam	Gonnoruwa	Magama	Mapakadawewa	Gemunupura/ Tissapura	Attanakadawala	Bakamuna
KURAKKAN	P=618	P=298	P=1350	P=510	P=312	P=287	P=729	P=104	P=16	P=57	-	-
Payment of loan in kind	1.3	0.7	0.2	0.1	1.9	-	4.0	2.3	-	-	-	-
Retention for seed	3.1	6.2	4.2	4.3	2.9	4.1	4.6	4.0	21.4	7.5	-	-
MAIZE	P=358	P=536	P=463	P=1200	P=61	P=13	P=112	P=62	P=330	P=753	-	*
Payment of loan in kind	-	-	**	-	-	-	0.9	0.2	-	0.8	-	
Retention for seed	3.1	3.2	6.0	2.4	2.5	4.4	4.6	5.5	5.3	4.3	-	
SORGHUM	*	-	P=12	P=24	P=19	-	-	-	*	*	-	-
Payment of loan in kind		-	-	-	-	-	-	-			-	-
Retention for seed		-	4.2	5.5	2.6	-	-	-			-	-
COWPEA	P=150	P=130	P=220	P=264	P=73	P=26	P=76	P=75	*	P=60	P=25	P=40
Payment of loan in kind	-	0.4	0.5	0.1	-	-	0.5	0.1		-	-	-
Retention for seed	4.3	6.0	5.6	5.2	6.4	13.2	5.3	4.9		7.8	7.5	5.6
GREENGRAM	P=12	*	P=21	*	P=30	-	P=97	P=102	*	*	P=22	P=23
Payment of loan in kind	-		-		-	-	0.3	0.5			-	-
Retention for seed	4.3		2.4		14.1	-	5.6	5.1			8.3	8.3
BLACKGRAM	P=16	P=6	P=221	P=27	P=1856	P=686	P=39	-	-	-	-	*
Payment of loan in kind	-	-	-	0.7	7.2	-	-	-	-	-	-	
Retention for seed	3.2	13.3	3.6	4.6	4.1	10.8	0.3	-	22.2	17.9	-	
SOYABEAN	-	-	*	-	-	-	-	-	-	*	P=100	P=14
Payment of loan in kind	-	-		-	-	-	-	-	-		-	-
Retention for seed	-	-		-	-	-	-	-	-		10.7	-

See footnote (1) in Table 8.1

* percentages not computed as production was less than 10 bushels

P denotes the total production in bushels

** negligible

Table 8.4 - Disposal of the Marketable Surplus

	Anuradhapura				Vavuniya		Hambantota		Badulla		Elahera Project	
	Palayakulama	Halmillakulama	Mahakanadarawa	Mahavilachchiya	Chettikulam	Pavatkulam	Gonnoruwa	Magama	Mapakadawewa	Gemunupura/ Tissapura	Attanakadawala	Bakamuna
KURAKKAN	Q=63.5	Q=13.0	Q=143.7	Q=72.0	Q=116.9	Q=23.0	Q=32.9	Q=10.5	*	Q=23.7	-	-
S.M.	15.7	100.0	79.5	44.4	11.0	-	-	-		89.5	-	-
R.C.	68.5	-	0.7	-	-	-	-	3.8		-	-	-
R.S.	15.7	-	19.8	55.6	89.0	100.0	100.0	96.2		10.5	-	-
MAIZE	Q=271	Q=394.5	Q=295.7	Q=886.0	*	*	*	*	Q=69.7	Q=289.1	-	*
S.M.	100.0	100.0	97.7	100.0					69.9	49.2	-	
R.C.	-	-	-	-					-	8.4	-	
R.S.	-	-	2.3	-					30.1	42.5	-	
COWPEA	Q=116.4	Q=80.3	Q=124.9	Q=168.7	Q=31.7	Q=10.0	Q=36.3	Q=55.9	*	Q=15.6	Q=11.6	Q=17.9
S.M.	70.5	88.8	81.6	100.0	74.8	80.0	90.1	98.0		89.7	100.0	55.4
R.C.	4.6	-	-	-	-	-	-	0.2		-	-	1.4
R.S.	24.9	11.2	18.4	-	25.2	20.0	9.9	1.8		10.3	-	43.2
GREENGRAM	*	-	Q=12.1	*	*	-	Q=74.0	Q=83.7	*	-	*	*
S.M.		-	71.1			-	90.7	99.6		-		
R.C.		-	-			-	-	0.4		-		
R.S.		-	28.9			-	9.3	-		-		
BLACKGRAM	Q=12.9	*	Q=191.5	Q=17.0	Q=1607.5	Q=606.6	Q=38.9	-	*	*	-	*
S.M.	90.3		75.2	76.4	89.9	60.6	90.0	-			-	
R.C.	-		0.3	-	0.4	-	-	-			-	
R.S.	9.7		24.5	23.6	9.7	39.4	10.0	-			-	
SOYABEAN	-	-	*	-	-	-	-	-	-	*	Q=84.6	Q=14.0
S.M.	-	-		-	-	-	-	-	-		76.8	-
R.C.	-	-		-	-	-	-	-	-		-	-
R.S.	-	-		-	-	-	-	-	-		23.2	100.0

S.M. denotes sales made from date of harvest to date of survey
R.S. denotes retention for sale later
* Marketable surplus was less than 10 bushels

R.C. denotes retention for home consumption
See footnote (1) in Table 8.1
Q denotes the marketable surplus in bushels.

Table 8.5

Sale of 50% or more of the marketed surplus at the time of harvest

(Farmers reporting sales by reasons)

Crop	Area	Number of farmers reporting	REASONS FOR SELLING								
			To settle cultivation loans from produce buyers	To settle loans obtained for house consumption	To meet enhanced need of cash for festivities	To settle Bank loans	Need for ready cash	To obtain cash for home consumption	Inadequate storage facilities which had to damage of the produce	Lack of storage facilities	Difficulty in storing due to insects and pests	High price prevailing at the time
Maize	Palayakulama	14	6	10	-	1	-	2	1	1	-	-
		(100.0)	(42.9)	(71.4)	-	(7.1)	-	(14.3)	(7.1)	(7.1)	-	-
	Halmillakulama	34	4	10	3	-	4	15	6	4	-	-
		(100.0)	(11.8)	(29.4)	(8.8)	-	(11.8)	(44.1)	(17.6)	(11.8)	-	-
	Mahakanadarawa	25	9	12	2	-	2	5	3	5	-	1
		(100.0)	(8.0)	(48.0)	(8.0)	-	(8.0)	(20.0)	(12.0)	(20.0)	-	(4.0)
	Mahavilachchiya	55	6	18	3	-	5	22	8	6	2	1
		(100.0)	(10.9)	(32.7)	(5.5)	-	(9.1)	(40.0)	(14.5)	(10.9)	(3.6)	(1.8)
	Mapakadawewa	14	-	4	1	-	2	9	-	1	-	-
		(100.0)	-	(28.6)	(7.1)	-	(14.3)	(14.3)	-	(7.1)	-	-
	Gemunupura/Thissapura	23	-	9	2	-	4	13	-	1	-	-
		(100.0)	-	(39.1)	(8.7)	-	(17.4)	(56.5)	-	(4.3)	-	-
Cowpea	Palayakulama	12	5	6	-	1	-	2	3	-	-	-
		(100.0)	(41.7)	(50.0)	-	(8.3)	-	(16.7)	(25.0)	-	-	-
	Halmillakulama	16	3	6	1	-	1	7	4	4	-	-
		(100.0)	(18.8)	(37.5)	(6.3)	-	(6.3)	(43.8)	(25.0)	(25.0)	-	-
	Mahakanadarawa	24	4	11	1	-	3	6	3	2	-	1
		(100.0)	(16.7)	(45.8)	(4.2)	-	(12.5)	(25.0)	(12.5)	(8.3)	-	(4.2)
	Mahavilachchiya	30	1	11	-	-	5	14	4	1	4	1
		(100.0)	(3.3)	(36.7)	-	-	(16.7)	(46.7)	(13.3)	(3.3)	(13.3)	(3.3)
Green Gram	Gonnoruwa	15	-	2	3	-	12	-	-	3	-	2
		(100.0)	-	(13.3)	(20.0)	-	(80.0)	-	-	(20.0)	-	(13.3)
	Magama	8	-	1	-	-	5	1	6	-	-	-
		(100.0)		(12.5)	-	-	(62.5)	(12.5)	(75.0)	-	-	-
Black Gram	Chettikulam	28	21	9	-	-	9	-	-	-	-	-
		(100.0)	(75.0)	(32.1)	-	-	(32.1)	-	-	-	-	-
	Pavatkulam	20	2	3	-	-	20	1	-	-	-	-
		(100.0)	(10.0)	(15.0)	-	-	(100.0)	(5.0)	-	-	-	-

Chapter Nine

MARKETING PRACTICES AND FACILITIES AT FARM LEVEL

In viewing the marketing process it is said that there are two halves in marketing. "One half consists of buying, selling and title transfering activities which coordinate the series of events. The other half consists of physical handling of goods in this movement such as transportation, storage and sorting."[1] The functions included in the latter half are mainly performed by various marketing intermediaries but some of the functions have necessarily to be carried out by the growers themselves.

In the present study an attempt was made to collect information in relation to various marketing practices adopted by farmers under their existing knowledge and the nature and availability of physical facilities. This information is required to identify the main constraints faced at the farm level.

From the responses it was found that matters relating to transportation and on-farm storage of produce emerge as main problems at farm level whereas other functions involved in preparation of the produce for sale like grading, packing and weighing etc., were being considered as less important variables affecting prices and farm incomes under existing conditions.

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1 P.D. Converse "The Other Half of Marketing", in A.L. Seelye (ed.) Marketing in Transition, New York: Harper & Raw (1958), p. 14.

9.1 PREPARATION OF PRODUCE FOR SALE

Unlike with commodities such as vegetables and fruits, sorting and grading assumed little importance for crops studied in this report. All grains are normally of homogeneous quality except for varietal differences in size, shape and colour and quality differences caused by pest damage etc. Therefore, it was found that grading as a function of marketing was hardly adopted at farm level.

The packaging material used was mostly gunny bags of varying sizes. Most farmers were aware of the capacity of each gunny at sight. The popular sizes of gunnies used were of 2½ to 3 bushels capacity.

There was no processing involved in preparing the produce for sale by farmers. All products included in this study were offered for sale by producers in the form of whole grains. Separation of grains from the cobs and beans and winnowing (for cleaning) were therefore the only steps involved. These services were performed mainly by the female members of the family. The traditional methods used by farmers as they lack the know-how of modern storage methods, and also malpractices adopted by them to increase the volume of produce result in heavy post harvest losses.

9.2 TRANSPORTATION

Adequate and efficient transportation is a conerstone of modern marketing. Transportation is a cost to those who use it. Thus, the ways to reduce this cost are of great importance both to the individuals involved in the marketing system and the society as a whole. Usually transportation cost is one of the relatively fixed charges of the marketing margin, and therefore the behaviour of transportation costs influences the changes in the farmers share of the consumer price.

Generally three important factors influence the level of transport costs borne by the producers, namely the condition of the main and access roads, average distances from farm/house to sale point and mode of transport used. This information is summarised in Table 9.1, 9.2 and 9.3 respectively.

9.2.1 Road facilities

In this study the available road facilities from farm to house and from farm or house to sales points, were investigated. In all areas Chettikulam and Bakamuna providing the exception *access from farm to house was almost exclusively by cart track and/or foot-path.* In Chettikulam the farmers were accessible by all-weather motorable roads. Bulk-purchasing sales points being often located near motorable roads farmers who sell their produce at these points would have reported the availability of motorable roads facilities too as a part of the distance travelled. But, what is noteworthy is that many farmers travelled on cart tracks in the study areas of Anuradhapura, Hambantota and Badulla. All in the study areas of Vavuniya enjoyed all-weather motorable road facilities. Elahera Project farmers also had better road facilities than the remaining areas as a fair percentage of them reported access to sales point through motorable roads; all weather or fair-weather. In the case of Badulla and Hambantota the road facilities available were mainly fair-weather roads which became impassable during the rainy season.

9.2.2 Distance from the farm to the sales point

Most sales were effected within a four-mile radius more often even within 2 miles from farm or house in all study areas with the exception of Gonnoruwa and Magama in Hambantota. A fair proportion of respondents in Gonnoruwa had to travel more than 8 miles mainly because the *chena* lands were situated far away from the sales point.

9.2.3 Mode of transport

The bullock-cart was the principal mode of transport in all study areas, except in Badulla, where human porterage was used heavily. Poor road conditions, low levels of production and income could have contributed to this heavy reliance on human porterage. *Bicycles too were used extensively* in the areas of Anuradhapura and also in Magama. Use of the public transport (Buses) were reported by two third of the farmers in Gonnoruwa and a fair proportion of farmers in the tank areas of Mahakanadarawa and Mahawilachchiya. In spite of the good road facilities available to the Chettikulam and Pavatkulam farmers the public

transport was hardly used by them probably because the service was inadequate in frequency. However, *bulk transport by 4 wheel tractors and lorries seemed to be not very popular;* perhaps it was only the larger farmers who needed this mode of transport.

9.2.4 Transport charges

Discounting the extreme cases, generally the cost of transportation of 1 cwt of produce per mile varied between about 10 cts to around Rs. 2/- (Table 9.4). As is to be expected the public transport was the cheapest, averaging about 25-50 cts per cwt per mile. The main mode of transport, bullock-cart generally costed about 75 cts-Rs 1.50. *Human poterage was the costliest* touching Rs. 2/- per cwt/mile. *It is ironical that the poorest farmers used the more expensive and time consuming mode of transport.*

There are two possible explanations for the *variation in transport charges for the same mode of transport even with the same areas.*

1 All farms particularly *chena* within an area are not normally clustered together and conditions of the access roads too could differ from farm to farm thus causing different quotation of costs for transport.

2 Unequal availability and or concentrations of ownership relating to a mode of transport.

9.3 ON-FARM STORAGE

The second largest problem area with regard to marketing of coarse grains and grain legumes is that of storage. Information collected on on-farm storage included the methods used in storing the produce at farm-level, the causes of storage damage, control measures adopted and general problems encountered in storing the produce.

9.3.1 The methods of storage

The methods of storage used by farmers are in Table 9.5. *The most popular method of storage for both coarse grains and grain legumes was to put the produce into gunny bags and stack them on the floor.* Alternatively coarse grains were stored by hanging bags containing

the grain in space, or in an *Atuwa*[1] mainly in areas of Anuradhapura and Gonnoruwa in Hambantota and bags stored on wodden racks in Badulla. The use of the *'Bissa'*[2], the traditional type of storage for grains for generations in the country was popular only in Magama in Hambantota.

In the case of grain legumes storage in large earthenware pots was equally popular as stacking of grains in gunny bags. The *'Bissa'* was used widely for this purpose only in Gemunupura/Tissapura.

9.3.2 Causes of damage in storage and control measures

Farmers has experienced losses caused by fungus, insects and rodents. According to the survey (Table 9.6) weevils, flying insects, termites, worms, white ants, rats and squirrels were amongst the insects and rodents that caused damage to the produce in storage. The *weevil and rat damage stand out prominently* in all the areas in case of both coarse grains and grain legumes. Instances of damages due to flying insects were noteworthy in the areas of Gemunupura/Tissapura and Chettikulam and fungus in Chettikulam.

The protective measures used by farmers to avoid these losses are two-fold, chemical and other traditional treatments. Gamexene, Malathion, D.D.T. and Run Rat are the chemicals more popularly used for such purposes. *It is distressing to note that Malathion and D.D.T. which are not prescribed at present for treatments are being extensively used by farmers to protect their produce from storage damage.* Traditional methods used included, mixing the produce with ash, mixing it with ash plus lime leaves and mixing with margosa leaves. Regular drying particularly at fortnightly intervals which is a safe method involving least cash outlay is adopted by only a few farmers. It was also observed that protective measures were more widespread in storing grain legumes than that of coarse grains; number of producers who used protective measures to avoid storage losses were surprisingly low in the case of coarse grains.

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1 A storing place above the fire place.

2 A thatched storage bin.

9.4 OTHER PROBLEMS OF STORAGE

The greatest constraint for storing coarse grains and grain legumes at farm level *was the lack of facilities and space* (Table 9.7). It may be recalled that stacking in gunny bags was the most prevalent method of storage and this practice requires space set aside for this purpose. Farmers utilise even their living rooms for such storage. Such limitations could have compelled some farmers to sell a major portion of their produce immediately after harvest even if they preferred to store their produce to benefit from off-season price increases.[1] *This situation points to a need for constructing low cost, small scale on-farm warehouses ensuring suitable storage conditions and security.*

Scarcity of gunny bags was the second largest problem of storage for both coarse grains and grain legumes. There seemed to be a general shortage of the supply of gunny bags; not being enough to meet the increasing demands arising from shifting from traditional bulk storage methods to packing in gunny bags.[2]

Thefts of produce were also reported mostly by farmers in the areas of Anuradhapura, focussing attention on the need for ensuring security in storage.

Decrease of weight due to drying was the major problem of the Chettikulam farmers. Losses in weight in storage could reduce the effect of enhanced profit from timing of sales to take advantages of high prices, and make storing less worth its efforts.

Discolouration of seeds was also mentioned by a fair number of farmers, and figured next in importance to decrease of weight due to drying, in Chettikulam implying a quality deterioration which could again reduce expected profits.

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1 See also Chapter Eight - Timing of sales p. 177

2 The current price of gunny bags is very high (Rs. 17/-) in comparison to what obtained during the survey period; being almost 4 times, the previous price.

Farmers seem to need education in proper processing practices related to storage.

9.5 SUMMARY

The practices involved in preparing the grains for sale were non existent in respect of these commodities at the farm-level. The two major marketing practices that apparently have an adverse impact on farm incomes were transportation and storage. In most areas, access roads, specially those from house to farm were of poor condition being cart tracks or foot paths. Wherever motor roads were available for parts of journey to the sales points, they were either of not much use due to impassability during rainy seasons or non-availability of proper modes of transport. Distances travelled however were generally short, not exceeding 4 miles in most cases. Only in the *chena* areas did farmers travel more than 8 miles from farm to sales point.

Bullock carts and bicycles were generally the main modes of transport, human porterage was used heavily in situation where road conditions were poor and level of production and farm incomes were low.

Transport charges for the same mode of transport showed substantial variation even within the same area, probably due to variations in accessible condition to farms, and to the mode of transport. Bulk transport was not noticeable in any appreciable manner.

The produce was mostly stored in gunny bags stacked in the farmers houses; the traditional methods of bulk storage having given way to this practice. Lack of storage space and scarcity of gunny bags posed problems. Weevils and rats were the major causes of damage in storage to both coarse grains and grain legumes; the severity of damage reported being greater for the latter group. Control measures adopted by farmers varied from traditional methods of mixing with ash and selected types of leaves to dusting with chemicals. Farmers however, ignorantly used prohibited chemicals such as D.D.T and Malathion which are injurious to consumers. Thefts too posed problems in storing in some areas. Deterioration of quality and loss of weight have also been experienced by a group of farmers.

While some of the storage problems could be solved by intensifying farmer education programmes on better storage practices, the need for a well designed small scale low cost suitable on farm storage facility in underlined.

Table 9.1 - Road Facilities[1]

	Anuradhapura				Vavuniya		Hambantota		Badulla		Elahera Project	
	Palayakulama N=29	Halmillakulama N=43	Mahakanadarawa N=82	Mahavilachchiya N=79	Chettikulam N=35	Pavatkulam N=30	Gonnoruwa N=38	Magama N=30	Mapakadawewa N=30	Gemunupura/ Tissapura N=65	Attanakadawala N=31	Bakamuna N=27
From farm/house to sales point												
Motorable road-All weather	24	18	76	39	35	30	10	15	2	10	19	20
Fair weather	1	16	7	29	1	-	28	21	24	33	12	6
Cart track	16	33	43	47	-	9	18	18	11	24	10	9
Foot path	2	5	5	3	-	-	-	2	1	17	-	1
From farm to house												
Motorable road-All weather	2	5	12	8	25	9	2	5	-	-	5	10
Fair weather	0	3	3	2	3	-	6	10	1	4	6	5
Cart track	12	16	27	36	5	15	11	7	2	13	14	7
Foot path	6	8	17	11	-	6	16	3	5	25	3	4

1 A household may report two or more facilities and hence totals can exceed the total number of farmers.

N denotes total number of farmers.

Table 9.2 - Average Distance from either Farm or House to Sales Point[1]

Distance	Anuradhapura				Vavuniya		Hambantota		Badulla		Elahera Project	
	Palayakulama N=29	Halmillakulama N=43	Mahakanadarawa N=82	Mahavilachchiya N=79	Chettikulam N=35	Pavatkulam N=30	Gonnoruwa N=38	Magama N=30	Mapakadawewa N=30	Gemunupura/ Tissapura N=65	Attanakadawala N=31	Bakamuna N=27
Less than 2 miles	15	31	31	62	15	20	6	7	14	23	29	27
2-4 miles	8	18	36	23	7	14	5	1	11	21	3	2
4-6 miles	2	9	15	8	7	3	8	20	7	18	-	-
6-8 miles	2	1	4	4	1	3	8	8	4	6	-	-
More than 8 miles	8	3	4	10	3	4	16	6	2	1	4	1
Total number of responses	35	62	90	107	33	44	43	42	38	69	36	30

1 Total number of responses exceed the total number of farmers due to reporting of information for more than one sales point by a few households.

N denotes number of farmers.

Table 9.3 - Mode of Transport of Products from either the Farm or House to Sales Point[1]

Mode of Transport	Anuradhapura				Vavuniya		Hambantota		Badulla		Elahera Project	
	Palayakulama N=29	Halmillakulama N=43	Mahakanadarawa N=82	Mahavilachchiya N=79	Chettikulam N=35	Pavatkulam N=30	Gonnoruwa N=38	Magama N=30	Mapakadawewa N=30	Gemunupura/ Tissapura N=65	Attanakadawala N=31	Bakamuna N=27
Human porterage	3	8	27	21	-	1	3	2	27	47	4	7
Bullock cart	13	26	20	63	20	34	12	10	5	19	20	17
Two- wheeled tractor	-	2	1	3	2	-	3	8	2	-	5	-
Four-wheeled tractor	-	-	4	2	8	7	1	1	-	-	1	2
Bus	8	-	19	11	3	-	25	5	11	7	2	-
Bicycle	12	31	25	3	-	2	-	16	-	5	4	3
Lorry	-	-	-	2	-	-	-	-	-	-	-	1
Total number of responses[1]	58	90	115	129	34	45	46	60	47	82	38	32

1 Total number of responses exceed the total number of farmers due to reporting of information for more than one sales point by some household.

N denotes number of farmers.

Table 9.4 - Average Transport Charges from either Farm or House to Sales Point (Rs/cwt/mile)

Mode of Transport	Anuradhapura				Vavuniya		Hambantota		Badulla		Elahera Project	
	Palayakulama N=29	Halmillakulama N=43	Mahakanadarawa N=82	Mahavilachchiya N=79	Chettikulam N=35	Pavatkulam N=30	Gonnoruwa N=38	Magama N=30	Mapakadawewa N=30	Gemunupura/ Tissapura N=65	Attanakadawala N=31	Bakamuna N=27
Human porterage	2.22	-	1.88	1.00	-	-	1.45	3.50	1.77	1.22	-	2.00
Bullock cart	1.04	0.76	0.35	0.84	1.35	*	0.92	0.84	1.04	0.75	1.64	1.54
Two-wheeled tractor	-	-	0.13	-	-	-	0.36	1.05	0.45	-	4.18	-
Four-wheeled tractor	-	-	0.57	0.25	1.40	*	1.00	-	-	-	-	-
Bus	0.23	-	0.37	0.25	-	*	0.49	0.50	0.63	0.44	0.13	-
Bicycle	1.28	1.59	0.44	0.29	-	-	-	-	-	-	-	-
Lorry	-	-	-	0.60	-	-	-	-	-	-	-	-

* Not reported as information seemed unreliable.

Table 9.5 - Method of Storage of Harvested Grains

	Method of Storage	Anuradhapura				Vavuniya		Hambantota		Badulla		Elahera Project	
		Palayakulama	Halmillakulama	Mahakanadarawa	Mahavilachchiya	Chettikulam	Pavatkulam	Gonnoruwa	Magama	Mapakadawewa	Gemunupura/ Tissapura	Attanakadawala	Bakamuna
		N=29	N=43	N=82	N=79	N=35	N=30	N=38	N=30	N=30	N=65	N=31	N=27
COARSE GRAINS	Atuwa	19	13	34	9	-	2	20	4	4	9	-	2
	Hanging bags in space	15	21	23	37	-	5	23	2	-	-	5	3
	Storing gunny bags on the floor	22	45	72	79	26	26	21	16	17	42	4	6
	Pots	-	1	3	8	10	-	1	1	1	3	-	1
	Wooden racks	-	4	2	8	-	-	8	2	28	38	-	-
	Dried gourds	-	-	-	-	-	-	-	-	3	5	-	-
	Bissa	-	-	3	-	-	-	-	20	-	3	1	-
	Wooden boxes	-	-	-	-	-	-	2	-	-	5	-	1
	Palm leaf boxes	-	-	-	1	-	-	-	-	-	-	-	-
GRAIN LEGUMES	Atuwa	1	-	3	-	-	-	-	-	-	3	-	-
	Hanging bags in space	-	1	1	-	-	-	-	-	-	-	-	-
	Gunny bags	25	16	62	39	69	56	27	11	11	35	35	32
	Pots	17	26	60	56	21	4	14	21	9	35	7	17
	Wooden racks	-	1	1	-	-	-	10	4	4	4	-	-
	Dried gourds	-	-	-	-	-	-	2	-	10	-	10	-
	Bissa	-	-	4	-	-	-	5	-	5	20	2	-
	Wooden boxes	-	-	-	-	-	-	3	4	-	2	1	5
	Palm leaf boxes	-	-	-	2	-	1	-	-	-	-	-	-

Table 9.6 - Damage in Storage

	Cause of damage	Anuradhapura				Vavuniya		Hambantota		Badulla		Elahera Project	
		Palayakulama N=29	Halmillakulama N=42	Mahakanadarawa N=82	Mahavilachchiya N=79	Chettikulam N=35	Pavatkulam N=30	Gonnoruwa N=38	Magama N=30	Mapakadawewa N=30	Gemunupura/ Tissapura N=64	Attanakadawala N=31	Bakamuna N=27
COARSE GRAINS	Weevil	19	41	61	71	15	12	33	26	28	62	5	7
	Flying insects	2	-	2	6	12	-	2	3	-	20	-	1
	Rats	37	38	71	84	30	19	33	11	31	59	4	4
	Fungus	-	2	4	8	2	1	-	-	1	3	1	1
	Termites	-	-	2	4	-	-	2	-	2	-	-	-
	Worms	-	-	1	6	-	-	2	1	-	3	1	-
	Sqirrels	-	1	-	1	-	1	1	-	-	-	-	-
	White ants	4	7	-	-	-	-	-	-	-	-	-	-
GRAIN LEGUMES	Weevil	35	43	121	92	53	50	63	38	37	75	46	44
	Flying insects	2	3	10	3	37	-	5	5	2	16	2	4
	Rats	11	16	54	36	66	7	31	12	12	36	14	1
	Fungus	3	3	9	7	18	-	-	-	-	5	3	5
	Termites	-	-	-	3	-	-	-	-	-	-	-	-
	Worms	-	-	-	3	-	-	2	4	2	1	-	2
	Squirrels	-	-	-	-	-	-	-	-	-	-	-	-
	White ants	2	4	-	-	-	-	-	-	-	-	-	-

Table 9.7 - Problems in Storage

	Problems of storage	Anuradhapura				Vavuniya		Hambantota		Badulla		Elahera Project	
		Palayakulama N=29	Halmillakulama N=43	Mahakanadarawa N=82	Mahavilachchiya N=79	Chettikulam N=35	Pavatkulam N=30	Gonnoruwa N=38	Magama N=30	Mapakadawewa N=30	Gemunupura/ Tissapura N=65	Attanakadawala N=31	Bakamuna N=27
COARSE GRAINS	Scarcity of gunny bags	10	4	13	18	-	2	3	-	-	3	-	1
	Thefts	7	-	19	5	-	-	-	-	-	3	-	-
	Lack of storage facilities and space	11	5	20	22	2	-	10	6	1	11	-	2
	Decrease of weight due to drying	-	-	-	-	7	-	-	-	-	7	-	1
	Damage from insects/pests	-	-	4	3	-	-	-	1	2	3	-	-
	Discolouration of the seed	-	-	-	-	2	-	-	-	-	-	-	-
GRAIN LEGUMES	Scarcity of gunny bags	8	2	15	5	-	7	5	1	-	4	2	6
	Thefts	1	-	17	-	-	-	-	-	-	3	-	-
	Lack of storage facilities and space	5	2	16	12	-	+	11	5	-	10	4	2
	Decrease of weight due to drying	-	-	-	-	18	-	-	-	-	4	-	0
	Damage from insects/pests	-	-	1	3	-	-	3	2	1	2	-	2
	Discolouration of the seed	-	-	-	-	6	-	-	-	-	-	-	-

Chapter Ten

TEMPORAL AND SPATIAL VARIATION OF PRICES

The seasonal fluctuations of prices and the extent of integration of the main wholesale market with the producing areas are studied in this chapter. The analysis is based on time series price data collected from the Department of Census and Statistics as well as from the Department for Development of Marketing.

10.1 SEASONAL VARIATION OF PRICES

To examine the pattern of seasonal variation, monthly average wholesale prices collected by the Department for Development of Marketing were utilised. This data covers the period from January 1974 to February 1980, and hence include 74 observations. These prices were the wholesale prices that prevailed in Colombo market. Continuous price series were not available in respect of soya beans, and blackgram. The study therefore relate to only kurakkan, maize, sorghum, cowpea and greengram. In computing the seasonal variation in prices the aggregate method was used.

Table 10.1 shows the indices of seasonal variation in wholesale prices. The average prices for the period under reference were as follows: kurakkan - Rs. 59.50, maize - Rs. 49.40, sorghum - Rs. 87.85, cowpea - Rs. 181.30 and greengram - Rs. 223.00 per 1 cwt, respectively.

The seasonal wholesale price index for kurakkan exhibits three peaks and three troughs. The peak price months are December, May and August while March, June and October are low price months. The average prices for the high price months are, December - Rs. 65.17, May - Rs. 62.93 and August - Rs. 62.54. In the low price months the situations were as follows: March - Rs. 54.52, June - Rs. 55.25 and October Rs. 54.42.

However, *the wholesale prices of kurakkan have been relatively stable in comparison to other crops* as the difference between the highest and lowest seasonal indexes were lowest (18) for this crop. The main reason for this relative stability in prices of kurakkan could be emanating from the fact that it is grown mainly for home consumption and amounts offered for sale do not vary significantly from month to month except perhaps under abnormal circumstances. This is also substantiated by the fact that *the major portion of this crop is being retained at farm households to meet the consumption requirements of the family* in the event of a crop failure of paddy (rice) which is the main diet of the people. Interviews with the farmers as well as with the traders revealed that the farmers will tend to sell any available stocks of kurakkan from the previous harvest, only after the standing crop is harvested. According to traders, this has been the reason why the colour of kurakkan grains entering the market is usually reddish, whereas the colour of the fresh kurakkan grain is usually pale brown.

The highest wholesale price for maize was recorded in the months of November and December and a slightly lower peak was observed in May. Lowest price levels were recorded for July, the time at which *yala* harvests enter the market. *The amplitude of seasonal variations in respect of this crop was somewhat higher than kurakkan (30%).* (Table 10.2). This relatively greater seasonality of the price of maize can be attributed to several reasons.

a) Major portion of maize is consumed and sold during the harvesting period due to poor storability of the produce, relative to kurakkan.

b) Maize is one of the early maturing crops in the *chenas* and farmers tend to sell it just after harvest to meet their immediate cash requirements. It is worth noting that for financing paddy harvesting operations towards end of February and early March, farmers are in need of certain amount of ready cash.

Table 10.2 - Amplitude of seasonal variation indices of wholesale prices

Crop	Lowest Price Index (%)	Highest Price Index (%)	Amplitude in Index (%)
Kurakkan	91.42	109.47	18.05
Maize	87.86	117.05	29.19
Sorghum	85.94	122.76	36.82
Greengram	79.06	125.31	46.25
Cowpea	68.44	145.84	77.40

Based on Data collected from the Department for Development of Marketing.

The cultivation of sorghum had been given up by many farmers at the time of the survey, and it is of interest to note that no official price series was available for sorghum after 1976.

It was however thought worthwhile analysing the available price data on sorghum mainly to identify the price fluctuation patterns, in case there be a re-introduction of sorghum cultivation on a similar programme that is being launched for soya beans.

The highest prices for sorghum were reached in the months of February and March and the lowest prices recorded for the months of July to September. A second peak was usually reached in November and December with a consequent drop in price in January. Farmers could be selling almost all their produce immediately after harvest because of insect and other pest damages in storage which is relatively high for sorghum than the other two coarse grains and probably also because they are unaware of the types of foods that can be prepared with sorghum.

The amplitude of seasonal variation in prices of sorghum is higher (37%) than in case of other two types of coarse grains.

In general the seasonal variation of prices is higher in case of grain legumes such as greengram and cowpea than that of coarse grains (Table 10.2). In respect of greengram high prices were recorded in the months of October and November, with February and March being the low priced months. Prices tend to increase from April and the peak prices

are obtained in November. With the early harvest in December, prices start to decline and it reaches the bottom in February coinciding with the peak harvesting season.

The case of cowpea however, two sharp price drops are easily identified. In contrast to greengram the lowest prices for cowpea is for the month of June, at the peak harvesting period of the *yala* crop. The seasonal price index for June is 68, whereas that for February (peak harvesting period of the *maha* crop) it is 77. The highest price period for this crop is October and November. *Cowpea also stands as the crop which shows the highest amplitude of seasonal variation (78%) among the crops studied.* The main reason for this high variability is attributed to the fact that major portion of the production is sold during the two peak harvesting seasons.

10.2 REGIONAL VARIATION IN PRICES AND EXTENT OF MARKET INTEGRATION

In this study an analysis of regional variation in the prices was considered necessary, to investigate the extent of integration between the major producing areas and the terminal wholesale market, which is situated in Colombo, the capital city of the country. Weekly Wholesale Prices relating to the principal towns of the districts of Hambantota, Anuradhapura, Badulla, Vavuniya and Colombo, collected by the Department of Census and Statistics, were utilised for the analysis, the series commencing from January 1974 and ending in February 1980.

It was hypothesised that the principal town represent the primary market and that the majority of the producers in the surrounding areas sell their produce at these markets or to traders operating from these markets.

In this study, the degree of influence of prices in the market on price formation in other markets was estimated by obtaining the correlation coefficients, between the weekly wholesale prices of these markets in respect of four commodities.[1] In theory, if correlation coefficient of

1 The available data was inadequate for other crops.

price movements of a specific crop between any of the two markets is equal to 1.00, then it is understood that integration is perfect between the two markets. In other words, it implies the two markets under investigation are operating under the conditions of perfect competition. However, under real world conditions the degree of correlation is normally less than 1.00 because of heteorogeniety of the commodities, imperfect knowledge and poor transport facilities. (Imperfect Mobility)

In general, the values of the correlation coefficient showed large deviations from 1.0; ranging from 0.01 to 0.7 suggesting a relatively low level of integration between the markets studied. However, when it was examined whether these values were significantly different from 1.0 at a given probability the indication was somewhat different from the apparent situation.

The correlations were not statistically significant to suggest that there is sufficient integration between markets in respect of maize and kurakkan. The only significant correlation relating to the coarse grains was for kurakkan between Badulla and Hambantota, which were proximate markets among the others studied.

Highly significant integration were observed between the terminal markets in Colombo and the markets of Anuradhapura (the main producing area) and Vavuniya for cowpea, and Vavuniya and Hambantota for greengram. The very close integration between Vavuniya and Anuradhapura for both crops, and between Badulla and Hambantota for these crops, as well as kurakkan, are noteworthy.

Why was the correlation between price movements in the same set of markets too low in respect of coarse grains, when correlation was very high in the case of grain legumes? Perhaps the explanation could be found from the demand side. As was discussed earlier, kurakkan and maize were consumed or stored for later consumption more by the farming households themselves, and also may be even that portion of the production which enters the market did not reach the markets at distant places in significant proportions as there was a ready market among the consumers

in the nearby markets. In the case of cowpea and greengram however, the producers consumed only a marginal quantity out of their total production and the quantities held in on-farm storage also were minimal. Further the majority of the producers were compelled to sell 50% or more of their total marketable surpluses during the period immediately after harvest. Therefore it can be assumed that major portion of such marketable surpluses entered the terminal markets such as Colombo, and the markets in other distant areas..

Thus it is highly unlikely that low level of correlation found in case of coarse grains were due to such factors as transport bottlenecks, information dissemination, speculative activities of trader etc. In fact the evidences of high correlation of prices with respect to grain legumes show a fairly satisfactory level of efficiency in these spheres. The smallness of the country, non-existence of huge natural barriers, and the fairly widely distributed road and rail transport systems, together with reasonably efficient telecommunication facilities contribute to this fairly successful transfer of produce and price information.

10.3 SUMMARY

In general, the amplitude of seasonal variation in prices was larger in case of grain legumes when compared with coarse grains. In most cases prices hit the bottom during the period immediately after harvest, and reach their peaks during the main planting seasons of the respective crops in majority of the cases this season being *maha*. Though the lowest recorded prices seem to be adequate to cover the costs of production, there is enough scope for increasing farm incomes through effective pricing and procurement policies.

The regional variation in prices exhibited a similar pattern. The integration between markets was significantly higher for grain legumes than for coarse grains. This situation speaks out of a fairly effective transport system and of a reasonably efficient price-dissemination system.

Table 10.1 - Indices of Seasonal Variation in Wholesale Prices in Colombo Market[1]

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Kurakkan	104.99	102.59	91.58	97.13	105.71	92.81	95.58	105.06	99.55	91.42	104.03	109.47
Maize	110.20	102.04	96.20	90.98	100.45	93.08	97.86	92.19	90.94	102.06	116.91	117.05
Sorghum	93.61	122.76	113.25	92.67	98.32	94.97	85.94	89.85	67.34	98.83	111.17	111.30
Cowpea	994.64	77.43	96.80	78.05	77.58	68.44	79.15	104.20	131.89	137.29	145.84	108.73
Greengram	91.05	79.06	84.54	52.07	92.61	93.29	97.69	102.34	111.07	117.20	125.31	113.74

1 Indices computed on the monthly price data collected from the Department for Development of Marketing.

Monthly Index $= \frac{\text{Average price for the month during Feb. the reference period}}{\text{Average of the monthly averages for the reference period}} \times 10$

Reference period being the 62 months from Jan. 1974 - Feb. 1980.

Table 10.3(a) - Correlation of Wholesale Prices among Markets

Crop : Kurakkan Period Jan./1974 - Feb./1980

	Colombo	Hambantota	Badulla	Anuradhapura	Vavuniya
Colombo	(n=41) 1	(n=30) 0.0063	(n=18) 0.0050	(n=37) 0.1193	(n=14) 0.3458
Hambantota		(n=35) 1	(n=23) *** 0.7407	(n=32) 0.2596	(n=15) 0.3656
Badulla			(n=24) 1	(n=21) 0.3665	(n=15) 0.2446
Anuradhapura				(n=58) 1	(n=34) 0.o324
Vavuniya					1

* Significant at 5% level.
** Significant at 1% level.
*** Significant at 0.1% level.

Table 10.3(b) - Correlation of Wholesale Prices among Markets

Crop : Maize Period : Jan./1974 - Feb./1980

	Colombo	Hambantota	Badulla	Anuradhapura	Vavuniya
Colombo	(n=46) 1	(n=19) 0.0121	(n=38) 0.1250	(n=27) 0.3195	(n=10) 0.1113
Hambantota		(n=21) 1	(n=18) 0.1366	(n=11) 0.4328	(n=8) 0.0034
Badulla			(n=54) 1	(n=35) 0.2572	(n=23) 0.0279
Anuradhapura				(n=44) 1	(n=21) 0.0251
Vavuniya					(n=32) 1

* Significant at 5% level.
** Significant at 1% level.
*** Significant at 0.1% level.

Table 10.3(c) - Correlation of Wholesale Prices among Markets[1]

Crop : Cowpea Period : Jan./1974 - Feb./1980

	Colombo	Hamban-tota	Badulla	Anuradha-pura	Vavuniya
Colombo	(N=60) 1	(n=44) 0.0335	(n=51) 0.0007	(n=51) 0.3980**	(n=34) 0.6837***
Hambantota		(n=50) 1	(n=46) 0.5275***	(n=50) 0.4572**	(n=29) 0.5942**
Badulla			(n=60) 1	(n=59) 0.3350**	(n=31) 0.0725
Anuradhapura				(n=71) 1	(n=35) 0.8001
Vavuniya					(n=35) 1

1 Based on data collected by Department of Census & Statistics
* Significant at 5% level.
** Significant at 1% level
*** Significant at 0.1% level.
Figures in parenthesis indicate the number of observations

Table 10.3(d) - Correlation of Wholesale Prices among Markets

Crop : Greengram Period _ Jan./1974 - Feb./1980

	Colombo	Hamban-tota	Badulla	Anuradha-pura	Vavuniya
Colombo	(n=82) 1	(n=54) 0.3976**	(n=62) 0.2681*	(n=63) 0.5867	(n=49) 0.4946***
Hambantota		(n=54) 1	(n=50) 0.4272**	(n=52) 0.5092***	(n=39) 0.3031
Badulla			(n=65) 1	(n=60) 0.4387**	(n=48) 0.5752***
Anuradhapura				(n=68) 1	(n=49) 0.6897***
Vavuniya					(n=49) 1

* Significant at 5% level.
** Significant at 1% level
*** Significant at 0.1% level.

Chapter Eleven

MARKETING CHANNELS AND THE STRUCTURE OF WHOLESALE AND ASSEMBLY TRADE

The first hand marketing outlets for the produce comprises of both institutional and non-institutional channels. The institutional channels consist of the cooperatives, the regional depots of the Department for Development of Marketing and the Agricultural Service Committees. Non-institutional sources include village boutique-keepers, traders at the nearby town, the rural fairs and buyers who bring lorries from distant places. A few farmers, usually the larger ones were able to sell their produce directly through the commission agents who operate at the main wholesale markets, such as Colombo, Kandy and Chunnakam.

11.1 NON-INSTITUTIONAL MARKETING OUTLETS AT PRODUCER LEVEL

11.1.1 Village boutique-keeper[1]

In the four districts surveyed, the *village boutique-keeper is the most important buyer at the producer level.* The precentages of farmers utilising various marketing channels at farm level and percentages of the volumes of sales affected through each channel are given in the appendices 20(a), 20(b), 20(c), 20(d) and 20(e). The officers in competing government marketing agencies as well as the wholesale private traders agreed that this has been the case in almost other producing areas as well. *The activities of these traders are not confined to purchase of agricultural produce, but also embrace the supply of consumer goods. At times they may extend credit to reliable farmers and also supply agricultural requisities, such as agro-chemicals and simple tools.*

1 Here the 'village' is not a single village, but a small bazaar whose hinterland extends over 2-8 mile radius. The patronage of the bazaar depends usually on the modes of transport available to farmers.

The farmers bring their produce both in small lots as well as in full cart loads to the premises of the boutique-keeper. Many boutique-keepers interviewed, confirmed that they experienced peak arrivals at least on two-days a week. These two days would normally coincide with the day on which the rural fair is held, and the day on which the rationed consumer items are brought from the Cooperative stores by the farmers. *Spot cash is paid to the producer* on the basis of 'going bazaar price', and according to the quality of produce brought. *Since there are no standards or proper grades laid down, the determination of the quality is done mainly through a bargaining process between the producer and the boutique-keeper.* In this process, there are reasons to assume that a boutique-keeper is in a more advantageous position, for many reasons. Firstly, *the immediate need for cash from the part of the producer compels him to accept a lower price than initially bargained.* Secondly, *it is both tiresome and costly to take the produce back home.* Thirdly, *not many farmers are able to find a second buyer who will buy at a higher price and who also would readily extend credit facilities in the event of any emergency in the future.* This is because only the long patronage forms the basis of mutual confidence and trust between the farmer and the trader.

It is also not uncommon for *farmers to let their sales proceeds accumulate with the traders.* Many traders whose progress was to a great extent due to this type of saving habits of the producers were encountered during the conduct of the survey. This procedure allowed the trader to 'roll' the money which is kept at his disposal several times before the producer asked for it. This practice helps both parties in various ways. From the traders point of view, it is an interest free credit facility. No promisory notes or any other documentation is involved in the procedure. *It enhances the capital base of the small scale business for which at present credit facilities of the established Commercial Banks are poor.* It improves the bargaining position of the boutique-keeper as against the commission man or wholesale trader in the terminal market, because the former need not depend upon the latter for financial help, particularly during peak production periods. On the otherhand, because of the fact that *practice*

of savings with banks is not widespread in rural communities farmers are more happy with the security of their money being kept with the traders. They can withdraw any amount, even more than what was deposited, at their discretion at any given point of time. Unfortunately, not many producers confide in co-operatives or rural banks, those distant entities from which they are detached over time in the same manner.

Some village level boutique-keepers get telegrams or very rarely telephone messages, regarding the information on 'on going prices' of cereals and pulses in Colombo. However, all such traders do not have this direct link with the traders in Colombo, the main wholesale market. They get only *second hand information from their own bazaar'.* The speed at which the price information is transmitted to local traders depends mainly on the efficiency of the communication and transport network.

Some village level traders are fortunate to claim the ownership of one or two motor lorries, by which they could transport the produce they bought from farmers to the commission agents in Colombo. Some others may find space in a Colombo bound lorry (owned by primary co-operative society or by private individuals) at a rate ranging from Rs. 3.50-Rs. 4.50 (at the time of the survey) per 1 cwt of produce transported to Colombo. *Inadequacy of motor lorries for transport of produce and resulting lack of proper space for storage were, therefore, the main difficulties experienced by the traders at village level. A high level of storage losses, 4 -8% have been reported by many village level traders due to bad storage and inadequacy of proper bagging materials (Sacks, Gunny-bags)*

Some traders agreed that in the past they have *gained sufficiently from seasonal variations in prices* of many of these commodities. However, *there were others who complained that they experienced severe losses due to violent price fluctuations. Lack of proper market information has been quoted as the main reason for such situations. A few others have blamed the government for not adhering to a firm trade policy, a factor which, according to their view, contributes much to the irregularities of price changes.*

At village level it is difficult to categorise buyers of these products into the groups of wholesalers and retailers. This is because they all are doing the assembling function, only difference being the volume of produce bought by each trader. *Although, a few traders have long established contacts with the commission agents in the terminal markets such as Colombo and Kandy*[1], *many of them operate independently, and they are not agents of the commission men or of the farmers.* On the other hand, 17 traders interviewed by us had their own farms (6 in Badulla, 6 in Vavuniya and 5 in Hambantota) cultivated with the crops under the present investigation. *Two traders* (one each from Badulla and Vavuniya) *have had joint ownership in such farms.* In the latter case, the traders have been mainly responsible for financing the cultivation while the management of the farm was in the hands of the participating farmer. This information suggests that *vertical integration of the activities from farm level to wholesale level is possible* in the case of the crops that are studied by us, *and such integration is taking place to a certain extent,* particularly in the districts of Vavuniya and Badulla. This suggests the possibility of some traders in the Colombo market to have links stretching back to farm level, which may perhaps enable them to control the volume of supplies entering the terminal market. It is also interesting to note that *some relatively bigger traders operating at farm level* particularly in Badulla and Vavuniya districts *had arrangements to sell the produce collected by them to institutions involved in processing animal feed,* such as the Government Business Undertaking of B.C.C. Co. Ltd., Oils and Fats Corporation and Moosajees Ltd.

11.1.2 Traders at the rural fair

Rural fairs or periodic open markets are held once a week or twice a week in the villages or nearby small towns. The market days within a certain area are distributed in such a way that the same traders are able to visit all of them.[2]

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1 They establish friendship after doing business with each other for a long period. In some cases they are related to each other through marriages.

2 S.M.P. Senanayake "Periodic Rural Markets in Kurunegala District." ARTI, Colombo, 1980.

This category of traders usually do not belong to the area in which the fair (weekly or twice a week) is being held. They bring to the fair from other places the commodities which are of short supply in the area, and at the same time they will collect the produce brought to the fair by farmers. They come in lorries as single individuals or as a group of a few individuals. Selling of grains at rural fair is very common in Badulla and Hambantota districts than in other two places studied. Although, there are many allegations such as dealing short weights and measures, collusive behaviour, etc., made against traders they nevertheless assembling stage, to the existing traders (boutique-keepers) in the area.

Direct sales to the consumers by producers are mainly done at the rural fairs, but volumes thus marketed are very much smaller than what they sell to the other traders who visit the fairs. It is also not uncommon for some individuals to buy a head-load or two of a certain commodity from the producers and to sell the same to the consumers. Sales Assistants are usually engaged by visiting traders, and these assistants start approaching the producer from the point of "local council market limit", upto the place where the fair is being held. So the bargaining process starts long before the producer unloads his goods. It is not really competitive bidding, as while one sales assistant is negotiating with a producer others always tend to keep out until the farmer is withdrawn. The same process will be again started with a new sales assistant.

The physical facilities available in many rural fairs are poor. The temporary sheds errected by Local Government Institutions are grossly inadequate and also space available is not enough to cater to the needs of the producers and buyers. *Unavailability of sufficient space for loading and unloading of goods can lack of sanitary facilities* are common characteristics in most rural fairs.

Lack of proper market supervision has led to various trade abuses. Amongst these short weights and measures, excessive market charges, and control of activities in the market by "personae non-grata" stand as most prominent. Extermination of such practices therefore,

should invite the early attention of the officials involved in improving agricultural marketing systems in the country.[1]

Further, it was found that *price information received by farmers at the fair is more often timeworn (stale)* and above all tends to be trader-biased. There is little value to such information to the farmer, as they have to wait for another week to respond to changes in price.

11.1.3 Assembly agent and the visiting trader,

Usually, the assembly agent purchases produce from farmers on behalf of a principal trader operating in a main terminal market, for a commission payment. But, in this study it was found that most assembly traders in producing areas act as agents for visiting traders (traders who take lorries to the producing areas to collect produce). In this case, the visiting trader employs a person from the same locality to collect the produce for him, provides him necessary finance, and pay him a commission depending on the volumes collected. It was observed that *small scale retailers or tea-shop keepers in the villages form the majority of the assembly agents* since such involvements allowed them to earn an additional income. The prices to be paid to the producers are usually determined on the basis of ongoing prices that prevail in the distant places to where such produce is transported by the visiting trader. However, it is interesting to note that *prices paid by this group of traders are sometimes little higher that what is paid at the village boutiques.* In any case since this arrangement increases the number of buyers in a given locality, *their activities might introduce some form of competition to the existing marketing outlets at producer level.* Further, as shown in the appendices, 11.1(a),(b),(c),(d) and (e), some visiting traders are also purchasing the commodities directly from producers, thus by-passing a second intermediary - i.e. assembly agent. However, the number of farmers thus served and the quantities collected are smaller than the number of farmers served and quantities collected through assembly agents. Although visiting traders and their

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1 See also Dudly Fernando - 'Pola in the National Context' Ceylon Daily News - 21st October 1975 and 'The Middleman's Paradise', Ceylon Daily News - 19th September 1975.

assembly agents form a regular marketing channel in almost all areas studied, Vavuniya district presented a slightly different case. There, most of the assembly agents interviewed were the agents of commission merchants operating in main wholesale markets such as Colombo and Chunnakam. They operate for a 2% commission from their principals on the value of the produce collected.

As can be seen from the above mentioned appendix tables the crops covered by the assembly agents do not show a variation; the main criteria being their concentration on the crop that is widely grown in the area where their operations takes place.

11.1.4 Commission agents

Some farmers mostly the larger ones, *have established connections with the commission agents thus by-passing all other intermediaries operating at the village level.* They send their produce directly to the terminal markets through transport agents. The activities of the commission agents will be discussed in more detail later in this chapter. It is sufficient to indicate here that the number of farmers served by commission agents are very small, unlike in the case of vegetables.

11.2 INSTITUTIONAL MARKETING OUTLETS AT PRODUCER LEVEL

The first hand institutional marketing outlets available to producers include, Co-operative Societies, purchasing centres of the Marketing Department, Agricultural Service Centres, collecting centres of the Sri Lanka Cooperative Marketing Federation and Agricultural Extension Centre. Amongst these, the Agricultural Extension Centres of the Department of Agriculture is involved in purchasing the products only marginally, more specifically their buying is limited to the purchase of seeds. Further, they are not expected to involve in large-scale purchases as such activities lie outside the purview of the Department of Agriculture. Similarly, the involvement of the APC in buying these commodities were seen only in Vavuniya district, among the areas surveyed. In Vavuniya district, the buying activities of the co-operatives were weak and hence, the importance of the Agricultural Service Committee. In Pavatkulam (68%) and, Chettikulam (81%) the farmers interviewed

marketed their products through the APCs, the volumes being 79% and 89% of the total blackgram sales respectively.

Similarly, the Co-operative Marketing Federation (Markfed) does not operate purchasing centres at village level. It is the Apex Organisation of all Multi-purpose Co-operative Societies and hence is involved in wholesalling the commodities collected by its member societies. However, farmers are free to send their produce direct to the Markfed, thus by passing their primary co-operatives for sale on commission basis. In this study, it was found that this practice was adopted by only 6% of the farmers at Mahakanadarawa area in Anuradhapura district. The volumes thus marketed were also negligible; 2% of the total sales.

11.2.1 Marketing Department Collecting Centres

The Department for Development of Marketing operates a number of purchasing centres scattered in the producing areas. As in the case of Markfed, the Marketing Department also allow producers to send their commodities direct to their Commission Sales Centre at 4th Cross Street in Colombo. Either through the purchasing centres or directly through the Commission Sales Centre, *the activities of the Marketing Department, were of benefit to a limited number of farmers interviewed,* and that too only in the districts of Anuradhapura and Hambantota. About 6% of the greengram cultivators of Gonnoruwa in Hambantota sold their greengram through the Marketing Department. Twenty percent of the cowpea farmers at Magama also sold their produce, (about 55% of the total volume sold) to the Marketing Department during that season.

The volume was only 1.5% of the total sales made by the sample of Gonnoruwa farmers during that season. In case of blackgram, the total sales reported in Weerawila had been to Marketing Department, but the number of farmers who sold blackgram was very marginal in Hambantota district.

In Anuradhapura also 4% of the blackgram farmers sold their produce to the Marketing Department. *The number of areas as well as number of farmers served by the Marketing Department has been very limited.* Further, their purchases of the crops under study are also limited to a

few types. The volume collected too were negligible. Perhaps, the reason could be the fact that the Marketing Department was held responsible for operating a floor price scheme only for cowpea and greengram at the time of the survey.

11.2.2 The Multi-purpose Co-operative Societies

The purchase of these products *by primary level multi-purpose cooperative societies is done on behalf of a multiplicity of organisations operating at the national level.* The Sri Lanka Co-operative Marketing Federation, Paddy Marketing Board, Oils and Fats Corporation, and Marketing Department are amongst such organisations. The Co-operatives collect these produce from farmers and send to the above organisations depending on the agreement, for resale, industrial consumption, or for exports.

The Co-operatives are supposed to find their own capital for financing purchases, mainly through the People's Bank, *provide personnel for purchasing and to provide transport and storage services, for which the co-operative will usually receive a commission of 2%.* In some cases, the cooperatives have to collect the produce from farmers and send it to the principals in the terminal market. After sales are effected at the terminal market the principal sends the sales proceeds to the cooperative after having deducted a commission for their services as well as handling charges. The cooperative in turn charges commission, transport costs, and handling charges from the producer and the balance will be paid to him. Our study showed that cooperative buying of maize and cowpea was well marked in Badulla district, whereas in Anuradhapura district, their involvement was significant in most crops under study. The more important crops were maize, greengram, blackgram and cowpea. In Hambantota and Vavuniya, purchasing activities by cooperatives seem to be very weak.

11.3 FARMERS' PREFERENCE AND FACTORS INFLUENCING THE ULTIMATE SELECTION OF THE BUYER

In view of the multiplicity of first-hand marketing outlets available to producers, it was thought worthwhile to obtain farmer preferences towards various types of marketing channels available to him in terms of a few criteria identified during the preliminary survey.

The general pattern emerging from this analyais is that, whilst the institutional sources were preferred by most farmers in terms of fair price and accurate weights and measures, the private sources are being preferred in terms of ready payments of cash for the products sold and for less cumbersome procedures. Both sources are being criticised by farmers in the activities regarding the provision of credit facilities, location of purchasing sites and cordial buyer-seller relationship (the services offered to farmers or the manner in which the farmers are treated when they wanted to sell their produce).

It is interesting however, that *farmers view - cooperatives as the ideal outlet for marketing farm products.* Equally, interesting is that the *village boutique-keeper*(or the trader in the nearest town according to our definitions) *is being put in the second place, compared with distant entities, like Marketing Department, as well as the Commission Agents operating in the terminal markets.* However, this analysis refutes the two contrasting myths widely held in Sri Lanka, about agricultural marketing, namely -

a) The private traders are serving the farmers better than the cooperatives, and
b) By forming monopolistic marketing boards, the farmers can be freed from the clutches of so called unscrupulous private traders.

Of course, the attitudes of producers can vary from each other, but if we accept the fact that law of averages approximate the real world situation, the findings of this analysis should provoke the policy-makers thinking of the services expected by farmers through any marketing system imposed upon them. But one important point which has to be emphasised is that *farmers are not always fortunate enough to sell their produce to the preferred outlet.* In fact, 123 farmers in the total sample of 459 farmers, did not sell their produce to the preferred outlet. In improving facilities for marketing of these crops, the reasons given by the farmers provide very good guidelines. Amongst these, the most important is limitations in purchasing by the institutional marketing outlets. Such limitations are -

a) *The cooperative society in the area does not buy the produce.*
b) *When they (coops) buy, they buy only a few crops (i.e. They may buy maize, but not cowpea).*
c) *The quantities bought are limited.*
d) *The coops buy only occasionally.*

The procedural difficulties in selling to institutional outlets also have prevented 15 farmers from selling their produce to the former. The need for ready cash, transport difficulties, (due to poor access to purchasing centres) are also some of the factors which might determine the final selection of the buyer by the farmers.

11.4 THE NATURE OF COMPETITION

The foregoing analysis helps us to identify the various types of marketing outlets that are generally available to producers of these crops. However, this does not mean that producer in a given area has multiplicity of marketing outlets, among which he could choose his own according to his scale of preference. In fact, it has been shown that, the institutional marketing outlets, such as cooperatives and purchasing centres of the Marketing Department do have their own limitations and problems in buying these products. *In areas where there is some form of competition in the assembly trade level, that competition generally originates from the private buyers side (competition from visiting traders and traders who come to rural fairs) the competition offered by institutional sources being hardly adequate.* Thus, it is not uncommon for a few traders in a given location to have bigger market shares, the share of the rest being marginal. *The bigger traders accumulate market power in their hands through their greater capital base, ownership of modes of transport, continued patronage with producers and better access to price and market information.*

The entry into the market by new buyers is also limited, mainly due to capital restrictions. For instance, if we assume the price of 1 cwt of produce to be around Rs. 100/-, then to buy one lorry load of produce (100 cwt) the buyer should have Rs. 10,000 in his possession just to pay for the produce bought. Therefore, it can be argued that the new buyer should have at least Rs. 15,000 (Rs. 10,000 for one lorry

load and Rs. 5,000 to continue purchasing operations till he sells the first load in the market) in hand as working capital. The building rents and other expenses will be around another Rs. 5,000. In view of the fact that he has to advance some money to his clients before the harvest, which he is obliged to provide, if he were to stay in the business, the actual sum needed should be very much greater than this figure. This is the reason why, in many areas we find only a handful of big traders, the rest acting as intermediaries between the producers and bigger traders. This latter category of traders have direct links with traders in main terminal markets, as well as better access to price information. The fact that many traders as well as farmers interviewed said that they get the price information from town or from other traders should mean that they set the price in accordance with the price set by the bigger traders.

11.5 THE WHOLESALE TRADE

In Sri Lanka, the most important wholesale market for grains is Colombo and therefore, information presented in this section is predominantly related to the same. However, the general points that emerge from this analysis would apply to two other main wholesale markets as well - i.e. Kandy and Chunnakam.The Commission sales section is located along 4th Cross Street, Pettah, Colombo 11, and the Wholesale Trade mainly along 5th Cross Street. Old Moor Street and Maliban Street are also the places where grain trade is highly concentrated in Colombo. The two major categories of private traders operating at wholesale level are, (a) wholesale cum retailers, and (b) commission agents.

11.5.1 Wholesale-cum-retailers

The wholesale-cum-retailer buys his requirements from the commission agents either for ready cash or for credit. He in turn sells his goods to his buyers, mostly for ready cash, but occasionally for credit. Some wholesalers of course have links with commission agents, either through the latter entering into partnership with the former, or commission agent himself expanding his business to cover wholesale

trade as well.[1] It was noticed from observations that many wholesellers display samples of various products, although they may not be actually available with them. If the buyer agrees to buy a certain commodity which is not available with the trader then the wholeseller will instruct a labourer to bring the required amount from another trader. However, the buyer would think that the goods are brought from the traders own warehouse.

11.5.2 Commission agents[2]

There are about 500 grain traders in Colombo market and about 125-150 get direct supplies from producing areas and are concentrated at 4th Cross Street. The traders here are mainly involved in commission sales. The produce is brought to them from all producing areas in the country, by traders at assembly level . *Unlike, in the vegetable trade, very few producers send their produce direct to the commission agents.* The sellers find their own transport and transport charges are borne by them. The buyers consist of wholesellers at 5th Cross Street, hotel keepers in Colombo and suburbs, and retailers from various parts of the country. *Both 4th and 5th Cross Streets are the most congested areas in the city, space for parking and turn-around of vehicles being grossly inadequate.* The loading and unloading of produce therefore presents a big problem. There is a big gang of labourers at the service of both buyers and sellers for loading and unloading, called *'natamys'*. They are paid on piece rate, about -/50 cts, a piece.[3]

The labour charges for unloading will be borne by the seller, whereas the charges for loading is paid by the buyer. Usually, the

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1 This group is commonly known as Commission Agents and General Merchants.

2 The author is extremely grateful to Mr. Muthukumarana of *'Samastha Lanka Welanda Manthrana Sabhawa'* for introducing him to many commission agents and wholesellers to collect the information presented here.

3 Some *'natamys'* hire push carts from push-cart owners for a daily payment of Rs. 25/- each. It is interesting to note that these push carts are owned by only a handful of individuals, and hire charges are exorbitant. According to the labourers the owners can earn the total cost incurred on purchasing the same within about six months.

commission agent arranges for the services of labourers for such purposes. The commission agent does not buy the produce outright, but sells it on behalf of the seller (the seller could be a village level trader or a real producer). *The commission agent receives a commission of 5% of the value of the sales effected.*[1] However, the commission agent may advise the farmer or the village trader on market and price trends and thus enter into verbal agreement to postpone sales, until the conditions improve. In such cases, the commission agent arranges for storing of the produce at his stores.

On the spot observations as well as the interviews held with some traders who volunteered to provide information, revealed the following:

a) Although the business names are different, it is possible that *one individual trader or a group of individuals (a family) to own more than one shop.* When they are not in the same family, it was found that they are socially related to each other.

b) *Many traders have a regular clientele, due to long patronage, mutual trust and for other socio-cultural relationships.* For such clientele credit facilities are being provided either by accepting post-dated cheques or sometimes on mutual trust, and personal knowledge of client's credit worthiness.

c) Almost *all commission agents do actually handle the sale of all types of grains, but, this does not preclude some individuals specialising in selected types of commodities,* thus enabling them to have a certain degree of control over the prices of such commodities. This power tends to be more intense when these traders have established links, though provision of credit, etc., or through social relationships, with the traders in producing areas. In such circumstances it is possible for some of the traders to limit the supplies entering the Colombo market, as they are in a position to arrange for storing the produce in the

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1 Commission for potatoes and chillies is 3%.

producing areas themselves. However, many traders denied this practice while others agreed that there is a possibility of such practices emerging. In the latter case, it was told by farmers and others, that Colombo traders provide finance for such operations for an interest, ranging from 15 -25% for a period up to 6 months.

d) *The entry into this business seems to be extremely limited.* Lack of space for new businesses at popular places presents the biggest bottleneck, with resulting necessity for an initial capital of a few hundred thousand rupees. The ownership of business premises is highly concentrated and further it is mostly in the hands of one ethnic group. Thus, the entry by other social groups, into the business is difficult.

Since there is no expansion of the available space, the entry is effected through following two means:

1 *By changing the tenancy* - (normally called as 'change of bill') under this system the new-entrant has to pay for the stock in hand, furniture, equipments, etc., as well as a payment for 'goodwill' of the business. Many a times the payment for goodwill is exorbitant so that only a few could afford to pay. The interesting point is that, because of the limited availability of shop space in the context of high demand, amounts to be paid as goodwill are always on the increase. Here again, preference is usually given to persons who are already in the business, or who has social and/or economic connections with the persons intending to transfer tenancy.

2 *By sub-letting the space* for a specific period. In this case, the tenancy is not transferred to the new-entrant, but he is given the right to carry on business for a fixed monthly or daily payment.

The business in the market starts early in the morning. Price information is collected through brokers and by telephone calls. At

times bargaining over price is done under the cover of a handkerchief using their fingers. This 'code language' is known only to a few buyers who have a regular clientele with the trader.

It should be noted that the evidences discussed earlier on structural and behavioural aspects of the Colombo grain market in suggestive of an impare - competition among the traders. However, for a rigorous test of the exact nature of the competition in the market these evidences has to be compared with the performance characteristics such as volume of turn over, inventories held, profit levels etc. Quantified information was not available to the authors on these characteristics and it is unfair to make value judgements over the structure of the market. The apparent imperfection with regard to the entry conditions and other factors that lead to grouping of traders etc., may require some remedial measures. Perhaps, the general tendency for more and more government intervention in trade during the period preceding to the year of this investigation, and the frequent price changes effected by the government could have contributed to the observed structural and behavioural characteristics.

11.5.3 Institutional marketing outlets

At the time of this investigation four organisations were involved in procurement and marketing of coarse grains and grain legumes. Those were,

a) Paddy Marketing Board (PMB)
b) Department for Development of Marketing (MD)
c) Oils and Fats Corporation (OFC)
d) Cooperative Marketing Federation (Markfed)

Amongst these, the first three operated independent floor-price schemes for some of the crops studied. However, the actual operation of the floor-price scheme introduced by the OFC was implemented by the PMB on behalf of the OFC. This was mainly because the OFC did not have a proper purchasing mechanism in producing areas. The PMB operated floor-price schemes of its own for blackgram and soya bean, and on behalf of the OFC for maize and sorghum. The MD operated an independent floor price scheme for cowpea and greengram.

However, since January 1980 a common floor price scheme was established by the government in respect of twelve commodities including the entire list of commodities covered in the present study. The operational details of the new scheme will be discussed later in this chapter.

Under the earlier floor price scheme the Ministry of Agricultural Development and Research was issuing *ad hoc* directives to the Paddy Marketing Board to collect these produce when the Ministry received complaints from Government Agents in the districts as well as from Members of Parliament in the producing areas. According to such directives, Paddy Marketing Board in turn purchased through the local cooperatives some of these produce as a special service to the producers.[1]

Table 11.1 - Purchases by PMB - 1974-1980 (in tons)

	1974	1975	1976	1977	1978	1979	1980
Maize	04	11,776	10,704	15,476	7,666	125	404
Sorghum	46	779	71	96	36	2	0.1
Blackgram	-	-	-	7,352	6,721	n.a.	14.3
Soya bean	-	-	-	-	411	290	320
Gingelly	-	-	-	-	-	-	1,947

Source : Statistical Bulletin - Paddy Marketing Board

1 The Paddy Marketing Board Act. No. 14, 1971 has given powers to the Board to involve in procurement, hulling, milling and distribution of rice/paddy. For the Board to engage in purchasing of other commodities, the Minister of Agricultural Development and Research should issue an order under section 13(2) of the above act.

Table 11.2 - Sales by PMB - 1974-1980

		O&FC	MD	CARE	Private	BCC Co. Ltd.	Exports
Maize	1974	02	-	-	-	-	-
	1975	1,882	1,784	-	5,158	-	-
	1976	2,317	-	-	168	-	4,000 (Singapore)
	1977	1,425	-	1,650	-	1,600	-
	1978	6,144	-	859	-	662	-
	1979	-	-	122	-	-	-
	1980	-	-	206	-	194	-
Sorghum	1974	40.5	-	4.5	-	-	-
	1975	13	-	232	-	-	-
	1976	-	-	432	-	-	-
	1977 - 1980	No sales					
Blackgram	1974	-	-	-	-	-	-
	1975	-	-	-	-	-	-
	1976	-	-	-	-	-	-
	1977	-	-	-	545	-	6,000 (Japan)
	1978	599	-	-	1,545	-	-
	1979	-	-	-	4,517	-	10 (Japan)
	1980	-	-	-	14	-	-
Soyabean	1974-1977	No sales					
	1978	-	-	250	07	148	-
	1979	-	-	281	-	-	-
	1980	-	-	319	-	-	-

Source : Statistical Bulletin - Paddy Marketing Board

But PMB due to other problems such as non-availability of adequate storage and lack of market outlets etc., was engaged in purchasing these commodities on a periodic basis. Since procurement of these products was a sideline activity of the PMB, it was compelled to clear its stores, etc., to enable them to purchase paddy when paddy started flowing into the PMB stores. This became an unmanageable task to the PMB, because of the time difference between the peak harvesting

season of the crops under study and that of paddy was too short, i.e. about a month. The amounts of produce collected by the PMB is given in Table 11.1 during the six years from 1974-1979 and the first year of the new floor price scheme i.e. 1980. It is interesting to see however, that unlike for paddy, PMB does not have an inbuilt mechanism for disposing the produce collected under the floor price scheme. It is widely known that the rice rationing scheme of the government provided the outlet for paddy that was collected through the guaranteed price scheme. Due for these two reasons, the PMB faced severe problems with regard to storage and working capital. On top of this, the vulnerability of these crops for storage damages posed a new set of problems to the PMB. This is why the Paddy Marketing Board was compelled to dump some of the produce collected under the floor price scheme in foreign markets while there was a severe shortage of leguminous dhall in the local market. The author was constantly observing the newspaper advertisements of the PMB appeared over last 2-3 years and of the opinion that, the advertisements which ordered the cooperatives to stop buying crops other than paddy always caused downward pressures on open market prices of these crops.

The information given in Table 11.2 provide evidence for non-availability of dependable buyers for the produce collected by the Paddy Marketing Board (PMB). The Oils and Fats Corporation was the largest buyer of maize till 1978, but after that it has completely given up the purchases from PMB. It is only in case of soyabeans the PMB has a reliable outlet, the CARE Organisation. The PMB had been able to export 4,000 metric tones of maize to Singapore in 1976, and the following year, but had not been able to continue it since then.

The Department for Development of Marketing operated special floor price schemes for cowpea and greengram. The purchases were done mainly through its own purchasing centres located in the producing areas. In addition, the MD opened up a wholesale store for dry-provisions which included all the produce covered under the present study, at 4th Cross Street, Colombo in the heart of the private grain market, in 1976, and farmers were encouraged to send their produce direct there, for sale on commission basis. This was regarded as one of the most

effective manners in which the Department could offer competition to the private traders. The quantities purchased and handled by the MD through both these arrangements are given in Table 11.3. The MD operates a network of sales depots scattered in many parts of the island, and it also has contracts with institutions such as hospitals and armed forces etc., to supply some of the commodities collected by them. However, both these arrangements seems to be inadequate for disposal of the entire quantity of produce bought by the Department. Thus, the department complains that its operating capital is held up in unsold stocks.

The apex level cooperative for the entire primary cooperative network in the island is the Cooperative Marketing Federation. It also encouraged the cooperatives in producing areas to collect and send the produce under present study to the wholesale centre of the Markfed. But, as the co-operatives were acting as village level agent for PMB also, the quantities received by the Markfed was negligible.

The new floor price scheme implemented in January 1980 envisaged to safeguard the producers from sharp price drops during the period immediately after harvest. In this sense it was an 'insurance price' which enabled the producers to cover their production costs even if they were to sell at minimum stipulated prices. Also, the floor prices were announced at the beginning of each season, so that the farmers knew the lowest prices they will receive for their products before their planting decisions were made.

The new common floor price scheme replaced the several independent schemes implemented by various government institutions. The PMB, the executing agency is expected to buy at the stipulated prices at the time of harvest in order to sell when market prices go up. No attempt was made here to replace the private trader, the objective being the increased competition in the market. Under the new scheme the Agricultural Service Committees producing areas have been appointed as agents of the PMB.

During the first four seasons (2 years) of operation of the new scheme the Government has revised the prices four times. However, the quantities collected by the PMB seems to be too low. There could be several reasons for this. Amongst these some of the known reasons include,

a) The purchasing agents (Agricultural Services Committees) lack necessary resources such as capital, packing materials, equipments for testing etc., and therefore do not engage in purchasing these commodities.

b) The lowest open market prices for ungraded products could fetch better incomes to farmers, even if that price is little less than the floor price.

c) The strict standards and quality specifications laid down by the PMB may have discouraged producers to sell to the PMB.

d) The delays in payment to producers by PMB and its authorised agents will compell the producers to sell to the private traders.

For whichever reason this situation has arisen, one important point is that the mere announcement of a floor price is of limited benefit to the producers, if the operational side of the scheme is weak.

Thus, it can be seen that there is no dearth of institutions involved in marketing of coarse grains and grain legumes at the national level, with their corresponding agencies at producers level in the island. Nor, is there a lack of policies to help both the producers and the consumer. However, comparing the quantities handled by these institutions together with that of private trade, it is clear that these agencies could hardly offer competitive prices to the producers. The major part of the deficiency seems to have stemmed from poor implementation of the existing policies, and inefficient management of the procuring and distributing mechanisms.

11.6 SUMMARY

Available information is hardly sufficient to diagnose the exact nature of the competition that prevails in the grain wholesale trade in Colombo. Quantified information is seriously lacking with regard

to the most important performance characteristics such as level of profits, returns on investments and volume of turnover. However, there are few deficiencies related to structural and behavioural characteristics of the market. These deficiencies could result from the imperfections in the market or as a consequence of the environment within which the market has to operate.

There is no dearth of Government policies or institutions to support the producer. However, all in all they have failed in their efforts due mainly for operational weaknesses and management deficiencies.

Chapter Twelve

PROSPECTS FOR EXPANSION IN THE PRODUCTION OF COARSE GRAINS AND GRAIN LEGUMES - (SUMMARY AND RECOMMENDATIONS)

To discuss the question of what are the prospects for expansion of production of the coarse grains and grain legume crops, one should first examine the *needs and motivations for expansion.* The thrust of agricultural and food policies in Sri Lanka since independence had been, on *import substitution* and *self sufficiency* in basic food items. A discussion of the economic implications or justification of these policies vis-a-vis alternative policies falls outside the scope of this study; suffice it to say that these policies even if not the best from the economic view point, are justified on the grounds that they seek to reduce the political vulnerability of the country in a situation of serious disturbances or crisis in the food market. Thus, accepting self reliance in basic foods as the major motivational force for national food production, the limits within which policies relating to self-sufficiency should operate have to be prescribed. Leading from this point, a whole host of questions arise; self-sufficiency in which food items?; import substitutions in which areas?; a crop in itself or in technologies involved in producing the crops? etc. Policies have clearly indicated that self-sufficiency in rice is one goal; but here again the question arises as to self-sufficiency at what levels of consumption? Another clear policy indication is for substitution for imports of wheat flour. But there are many un-answered questions in this area too. Substitution to what extent and by what? Cereals, pulses and root crops or only cereals and if so which one or more of the cereals; rice, sorghum, kurakkan and maize?

Nutrition, an important dimension of food has received considerable attention in recent times. Food policies therefore necessarily absorb this third dimension and have the upliftment of the *nutritional status of the people* as another goal.

Free availability of a commodity either through imports or production does not necessarily imply that it reaches all sections of the people. *The price at which it would be available to the consumers* would be an important consideration in trade policies, perhaps even critical when it relates to food items. These trade policies which are closely linked with food production policies have a part to play in the selection of food crops for import substitution oriented production programmes, in determining the desired degree of self-sufficiency to which production programmes should be geared to, and in *providing support to sustain a continued interest in the crops by the growers.*

The demand for the different cereals and grain legumes have to be considered in the selection of crops for expansion of production. Absence of or changes in demand affect production. In a reverse situation of insufficient supply of any commodity, specially in the absence of suitable substitutes, consumers experience great hardship. Consumer preferences influence the demands, very much so, in a situation of free availability of many alternatives to choose from.

Hence, *a plan for a well integrated food production programme* has to recognise the relative importance of each of a complex of factors, and also identify the necessary and sufficient conditions for operation of the plan. Plans are limited by the data base available and their success is affected by unexpected deviations from the basic assumptions. An attempt would, however, be made here to examine the prospects for expansion of production of the crops studies, under very simplistic assumptions relating to demands, consumer preferences and nutritional requirements, and the strategy for achieving production goals discussed.

12.1 REQUIREMENTS OF COARSE GRAINS AND GRAIN LEGUMES

Demand for any food item by a household depends on its size, and composition by age, its income, the price of the commodity, prices of

substitute and complementary commodities, and also food preferences. The task of forecasting demands is thus not made easy in a situation where for want of adequate and reliable information the impact of at least a few major factors cannot be studied in depth.

Before proceeding to estimate demands based on consumption patterns and nutritional requirements, some mention need be made about consumer preference. Coarse grains are considered as inferior food, are priced lower than rice or wheat, and constitute the staple food of the rural poor through necessity. It has been generally observed that as the income levels rise there is a greater preference for the softer grains, rice and wheat.

In Sri Lanka, coarse grains are being produced and consumed mostly by semi-subsistence[1] farm families in the low paddy producing areas, as a substitute for rice. Hence, it could be said that for the country as a whole, even at present, there is a high level of sophistication in the consumption of cereals. Drastic reversals in food habits in favour of coarse cereals are not likely to occur except in times of a serious shortage of rice and or wheat which could be due to low production either within or outside the country, or forced by restriction on imports or adjustments of prices. Even in such situations of a shortage of rice or wheat, the substitution will not be confined to only coarse cereals; roots and tubers and leguminous grains too meet the demand for substitution. It is assumed that *an increased demand for coarse cereals will not be brought about through forced measures, but by strategies such as partial substitution for wheat flour in bread and popularising consumption by facilitating and distribution of the products in a form that would be convenient for the preparation of food.*

With regard to other food habits, what is of relevance and concern for this study is the extent to which the community will move towards

1 They are termed semi-subsistence as even though most farms are of a subsistence nature with regard to cereals (including paddy in some area), they grow pulses and other crops mainly for the market.

consuming more and more animal protein in relation to vegetables. The prospects of any big change in this direction is remote. On the other hand the current consumption patterns indicate that there would be an even greater demand for, and reliance on vegetables rather than animal protein due to the increasing price gaps between the commodities that provide the two different sources of protein.

In the absence of a series of data on actual food consumption, the information on the net food availability presented in the annual food balance sheets could serve as a proxy variable to indicate the pattern of consumption. The net per capita supplies of selected food items are given in Table 12.1.

Based on the recommendations of calories and protein requirements for the various age groups, by the Medical Research Institute, the weighted average for the Sri Lankan population excluding infants less than 1 year, work out to 2,000 calories and 43 grams of protein per head. In terms of the national average supply of these nutrients during 1975-79,(i.e. 2,257 calories and 48 gm of protein) the nutritional supply slightly exceeds the recommended levels; a seemingly satisfactory situation regarding the nutritional status of the people. But, an examination of the composition of the average diet at the national level, as well as by income groups reveals the deficiencies in the diet of the country's population, specially the low income level groups. (Tables 12.2 & 12.3)

The supply position in respect of cereals is very satisfactory, with rice being short of the recommended requirements by less than 4 kg/head[1]. The oversupply of wheat flour, more than compensates for this shortage. The low demand for coarse cereals in a situation of an abundant supply of wheat flour is once again underlined.

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1 The supply is averaged over the entire population while the average requirement is based only on the population, aged 1 and above, and therefore an over-estimate as the requirement of children, would be less than this average.

The supply position in respect of the items which are the main sources of proteins is far from satisfactory. The short falls in pulses, animal protein, milk and milk products, and vegetables could be considered to be roughly 2/3rd, 1/2, 2/3rd of the total requirements. Further, the maldistribution in the available supply of food, and the greater dependency of the low income level population on vegetable sources of protein, have their impact, specially on the low income level groups of the population. Table 12.3 provides a picture of the differential composition of the diets of different income groups;

Animal proteins specially meat and eggs were lacking to a great degree in the diet of the low income groups. Fish consumption however, was relatively more satisfactory. Even among the poor income groups, this commodity was generally accessible than meat or eggs, partly due to the prevalence of fair degree of households engaged in fishing in the low income groups, and also because many varieties of fish were available, ranging over a wide range of prices, making it possible for the low income groups to purchase smaller varieties of fish at cheaper prices. With the current price levels of fish, the consumption behaviour could reflect low overall consumption and or maldistribution;

As rice was available on ration to almost all households at the time of the survey there was hardly any difference in consumption between the different income groups, but though overall consumption of coarse grains was generally low, the group with incomes less than Rs. 200/- per household per month consumed relatively much higher amounts of these cereals;

Wheat flour was consumed more in the form of bread by the higher income groups, while the use of flour for preparation of food was observed mainly in low income groups.

A need for expanding the supply of vegetable sources of protein is clearly indicated; a rise to about twice the present levels in order to achieve at a satisfactory, but far from ideal nutritional status.

The estimates of requirements of cereals and pulses for human food at the current levels and composition of supply are given in Table 12.4.

Production of coarse grains have generally declined since 1978, and the average production of the three coarse grains, maize, sorghum and kurakkan during these three years 1978-80 was around at 607,500 cwt, 5,300 cwt, and 210,600 cwt respectively, totalling 823,400 cwt. Hence, an immediate increase of about 114,000 cwt. and an incremental increase of 1.7% of each years production thereafter, is necessary to meet at least the demands at the current level of consumption. The production of rice at current levels is around 1,328,000 tons and at the current consumption level, which is considered satisfactory, 1,384,000 tons were required in 1981; a short fall of 56,000 tons which calls for an increase of 4% of current availability. Policy decisions regarding the extent of replacement of wheat imports by rice and other grains, would place additional demands on production of cereals.[1] The quantitative needs, incorporating the various alternative policy decisions will not be a subject for discussion in this report.

With regard to production of grain legumes, the current total production of cowpea, greengram, blackgram and soya bean together is about 799,400[2] cwts determining the level of consumption. But as already indicated, there is a big gap between desirable levels of consumption and current availability and hence there is a great scope for expansion of production even when considered purely from the point of view of demand for human food. The current level of production falls short of 1,400,000 cwts in 1981 to meet the requirements of the pulse component (7.75 kg per person per year) in a nutritionally recommended diet.

The imports of beans and pulses and the productions of the grain legumes are shown in Figures II & V respectively. The extents of land devoted to production of the different crops during 1975-1980 are given in Table 12.5. One observes a drastic decline in the extents cultivated under coarse cereals from 1978 to 1980. There is also a fall in the total land area cultivated under greengram, cowpea, soya bean and

1. Currently maize is the only cereal which has some demand outside the demand of human food.
2. Average for the three years '78 - '80.

blackgram. In respect of oil seeds such as ground nuts and gingelly, the former registers a decline, while the latter has claimed more land over the recent years (83% increase). Given this background, it is very difficult to forecast production during subsequent years. *Shifts occur from crop to crop depending on many factors, price incentives having the greatest impact on decisions of producers.* No attempt will be made to discuss the gaps between furure supplies and demands, and land requirements and productivity levels for desired targets. The rest of the chapter would be devoted to a discussion on the analysis of constraints to production and measures to be adopted for expansion of production.

12.2 EXPANSION OF DEMAND

The study has revealed that presently kurakkan and maize are being grown only as a substitute cereal for rice and the demand for coarse cereals including sorghum, as human food is not high enough to warrant promotion of expansion of these crops. In the context of the experimental efforts to introduce wheat as a crop the value of this coarse cereal as human food is bound to decrease further if wheat cultivation proves to be a success, but maize has its uses in the livestock feed industry which currently absorb about 8,000 tons annually.

Three possible demand shifters can be identified to promote further utilisation of the three coarse cereals kurakkan, maize and sorghum within the country.

12.2.1 Improvements in livestock feed industry

Maize being a principal raw material for livestock feed, it has a derived demand which is affected by changes in the demand for the livestock feed. Policies relating to livestock development would thus have an impact on demand for maize and hence its production. At present the quantum of locally produced maize used in livestock feed manufacture is low. This may be partly due to the livestock feed manufacturers being not in a position to obtain a regular supply of the local produce in sufficient quantities to enable them to utilise their available

manufacturing capacity. A suitable marketing mechanism[1] should be able to correct this situation and expand the demand for local produce.

12.2.2 Introduction of new agro-based industries

Another untapped area for utilisation of coarse cereals, maize in particular, lies within the field of agro-based industries; specifically relating to the extraction of vegetable oil. Such a venture could be undertaken by both local and foreign investors.

12.2.3 Popularisation of use of cereals by introduction of pre-processed food

The low demand for these cereals as human food could be attributed to the abundant supply of wheat, specially in the pre-cooked convenient form of bread.

i) There is potential for the utilisation of some of the cereal grains particularly sorghum, substituting for upto 10% of wheat flour in bread. An efficient mechanism for supply of grain for conversion to flour regularly and sufficiently, has to be evolved to effect and sustain a programme for substitution.

ii) An additional demand could be created if consumers, particularly the urban dwellers were provided access to the cereals in the form of flour or a pre-processed food such as flakes, crispies, and biscuits. This area could be explored with a view to providing such items at a cost that would be acceptable, when comparisons are made between meals of these products and meals with bread, and future investments encouraged if the market is favourable. In any case, if the qualities of these new products are comparable with that of imported items, there could be a ready demand from the tourist industry.

The grain legume crops as a group are produced in this country, mainly for human consumption. Exports of such grains were fairly recent occurrences and confined only to blackgram which has a relatively

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1 Chapter Twelve, p. 251.

restricted market within the country[1]. The need for expansion of production of the grain legume crops, for the purpose of raising the nutritional standards of the population has already been discussed. Cowpea and greengram have potential for expansion as they are mainly substitutes for vegetables in curries and being used for preparation of other food items. Blackgram has very special uses in terms of food items and has a restricted market locally.

Soya bean, a high protein grain legume, and a recently introduced crop to this country, is utilised as a component in the preparation of *'Thriposha'*, a supplementary food provided by the Ministry of Health for the nutritionally impoverished groups as an intervention in nutritional upliftment. A purchase of 2,844,800 lbs had been targetted for this purpose for 1981. Soya bean is also used as an ingredient of animal feed. The present overall demand for soya beans for all purposes is estimated at 10,000 tons. Soya has a wide range of potential uses in pre-processed food, such as milk and meat and it is possible to increase the demand further.

The potential for export of cereals and the pulses used specially in animal feed could be fully exploited. The maintenance of international standards and grades is a sine-que-non for this purpose.

12.3 IMPROVEMENT OF PRODUCTIVITY

Increases in supply to meet increased demands have generally resulted from expansion of land devoted to the crop (extensive cultivation) rather than by increasing the productivity per unit of land already allocated for the crop (intensive cultivation). *Promotional measures such as price incentives, credit, research and extension facilities have failed to increase the average yield per acre of the crops over the last decade.*

The stagnation is a confounded issue of *both economic and agronomic constraints, which are mainly the cause as well as the result of (1) the basic structure of the farming systems that accommodate these*

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1 Exports of beans and peas (mainly blackgram) in cwts.

1977	1978	1979	1980
2431	22006	27600	21161

crops, and (2) the low priority and support provided by the state to these crops in comparison to even the other crops such as chillies and potatoes within the subsidiary food crops, in the programmes for expansion of food production.

12.3.1 Low levels of management and lack of specialised knowledge of crop husbandry

The cultivation of coarse cereals and grain legumes has always been an adjunct to paddy cultivation.[1] These crops along with chilli and yams are mainly grown in family farms which combine paddy on lowland; the subsidiary crops being mostly cultivated under the traditional *chena* system on unirrigated land. The farmers have by trial and error evolved cropping systems suited to their environment, income levels and family labour, the underlying motives being to increase farm food supply specially with regard to cereals, and to increase farm incomes with very little additional cash investments for cultivation of the subsidiary food crops or cash crops in the system.[2]

Generally most of the male labourers withdraw from the *chena* cultivation immediately after clearing the jungles to attend to land preparation for paddy cultivation and thereafter the experienced farmers concentrate on the paddy cultivation operations, while the planting, sowing and tending of the crops in the unirrigated land is left to those who could be spared from the paddy cultivation. In highlands close to the homesteads it is mostly the women who attend to the subsidiary food crop cultivation in addition to their household duties. Thus the management of these crops unlike in paddy, does not receive the individual and continuous attention of at least one member of the family let alone the experienced farmer. This results in lack of specialised knowledge of crop husbandry.

The traditional *chena* system of cultivation itself indirectly contributed to low levels of management. This system which provides for recuperation of soil fertility during intercultivational periods, and

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1 Chapter Four - Summary, p. 58

2 Chapter Four - Summary and Chapter Six Summary. pp. 58 & 133

also inhibits weed growth, helped in maintaining the productivity levels, even though low, constant from year to year without use of fertiliser or improved weed control practices. Viewed against the fact that *chena* cycles have increasingly become shorter due to the pressure of population on land and also the policy of regularising the encroachments on *chena* land and allocating such land to the farmer for settled cultivation, the soil would need enrichment with applied nutrients during each cultivation season and weed growth has to be properly controlled in order to at least sustain a satisfactory level of productivity.

Soil acidity inhibits productivity of crops such as maize and probably soil amendments may become necessary from time to time in some farmers' fields.

The farmers' practice of using mainly their own or neighbour's seeds leads to degeneration of stocks and has an impact on productivity. Farmers lack skills in identifying diseases and use of correct chemicals for control of diseases and pests. Other areas in which farmers' need education are in avoiding excess use of seed, and times of planting.

12.3.2 Instability of the market for the produce and the inadequacies of the supportive policies for production

The market for the coarse cereals and grain legumes had always been unstable and pricing and other supportive policies had not been constitently committed towards any planned increase in production of these crops, to motivate producers to acquire specialised knowledge and skills for their improved cultivation. Farmers however have responded to favourable policies by cultivating additional land or redistributing the available land to take advantage of the profitable crops at any given time. Past experiences of impact of trade and procurement policies have indicated such trends.[1] They seem to consider that a rational way of increasing the incomes from a unit of land, in the face of uncertainties of the market is to practice a low-cost,

1 Chapter One , Page 3 - para 2 and 4.

less effort, mainly family labour dependent farming with the flexibility of re-allocation of land among crops of the system to take advantage of the market.

No special effort was made to single out crops within this group of coarse cereals and pulse crops for a forceful and sustained drive towards achievement of set goals of production. In the promotion of enhanced production of subsidiary food crops, chilli, onions and potatoes were singled out for special effort long before the coarse cereals and pulses as a group gained some importance in the food production programmes.[1] Chilli competes with pulses on many farms on unirrigated land.[2] A comparison of numbers and amounts of loans taken for cultivation for chillies, with that of the residual category of subsidiary food crops comprising of cereals, pulses and oil seeds, gives a rough indication of the levels of intensities of cultivation of the different crops. The cultivations of ill-drained paddy fields in *yala* too generally favoured chilli to pulses as it was a more profitable crop.[3]

12.3.3 Farmers' opinions

Farmers' responses to the question of what was considered the major constraints to production of each crop indicated concerns about the basic resources of land, labour, cash and water for cultivation and also marketing facilities and reflected a lack of interest in crop management aspects. (Appendix Table 13)

No marked differences were observed cropwise within an area. The relative importance of the different resource constraints were however reflected.[4] Information on prices did not figure as a major constraint.

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1 Chapter One , page 2 - para 3
2 Chapter Six , page 125 - item No. 6
3 Chapter Six, page 129 - item No. 4
4 Lack of marketing facilities and water for the farmers of Hambantota, shortage of land for cultivation of maize and cowpea for Gemunupura/ Tissapura farmers, labour shortage for cultivation of Blackgram in Chettikulam are worthy of note.

12.4 APPROACH TO RESEARCH

Agronomic research conducted on these crops had so far been geared towards increasing the productivity of single crops. Such research results though of great value, have not had the desired impact on productivity. Producers on a commercial scale would normally be willing to acquire and utilise such specialised knowledge and reap the benefits of the research. But, contrary to expectations, the settled highland cultivations in Chettikulam, which can be treated as approaching commercial scales of production, because holdings were very large and blackgram the dominant crop was grown for the market, also reflected low levels of crop management. In the context of a production situation where these crops seem to be of secondary or marginal value to semi-subsistence farms, such research may not be able to make a meaningful contribution to improved farming. An improved variety - a major contribution of research - may be adopted, but without the attendent practices which involve high cash investments and special skills. As has already been discussed, the basic structure, philosophy, and resources of these farming enterprises do not favour the aim of high level productivity concomitant with high levels of investment and gaining of expertise in crop husbandry. Therefore, the research approach and research recommendations need to be oriented to suit the existing farming structures, and evoke the interests of the farmers in increasing the productivity of all crops in their farm. In the interests of the beneficiaries, the research should be based on a farm cropping system approach[1] and principally be area and season specific, recognising the paddy production capabilities of each area the land water and labour resources of the average farm, the existing patterns of cropping and labour availability, and also ideally aim at providing recommendations of crop-mixes, holding sizes, and management levels feasible for adoption resulting in increases in the productivity of each crop and of the farm incomes. Cropping systems research will find its useful applications in the context of stable farming systems.

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1 Such an approach is currently being employed in the Dept. of Agriculture/IDRC project in the Dry Zone - Research Station at Maha Illuppalama.

12.5 STRATEGIES FOR INCREASING PRODUCTION

Increases in production can result from the increases in the acreage under cultivation as envisaged in the Mahaweli Development Project, and other Irrigation Development projects. The foregoing discussions have highlighted the possibilities for increasing the demands of the different crops, the elements of the environment that have influenced the reluctance in the upgrading of levels of management for increasing productivity and thus prevented the acquisition of specialised knowledge, identified special areas of deficiencies in crop husbandry, and focussed attention on the status of the agronomic research and the need to orient it to suit the existing farm structure.

Strategies could be devised to achieve the desired goals within the given framework of policies and existing farming structures, both physical and economic; or to change the farming environment in terms of policies and structures to suit the goal. Before proceeding to discuss strategies it is pertinent to mention that *the lack of a reliable data base* relating to subsidiary crops; both food and other crops, constrains the study and preparation of production plans in respect of these crops. It limited the scope of the analysis of this study and prevented a fuller discussion of production goals and strategies in relation to a time scale. A discussion of strategies becomes more meaningful when related to specific production plans which emphasise the relative positions of the crops with regard to competing crops, in the overall plan of agricultural production.

12.5.1 Strategies of immediate relevance in improving production to meet the current demands, with the existing semi-subsistence farm structures

1. An immediate benefit of the research done so far could be made to accrue to the farmer and the nation, if based on the findings, efforts are directed towards providing *recommendations for crop management levels which, though not considered to be fully exploitative of the potential, are capable of increasing the productivity to sufficiently higher-levels to provide better returns than at present, with little additional inputs and expertise.*

2 *The distribution of foundation seeds to farmers at appropriate frequencies* would be a basic step in improving levels of productivity. The Department of Agriculture could actively pursue a programme for this purpose.

3 *Intensified farmer education on seed selection for sowing/planting, use of desirable quantities of seed, time of planting, identification of diseases , use of the correct chemicals in control of each disease and pests and storage practices* could contribute to an upgrading of management levels and hence increase of productivity. The extension service could concentrate on these aspects relating them if applicable, to recommendations that would ensue from suggestion at (1) above.

4 *The use of ill drained paddy lands for cultivation of these crops during yala* is a strategy that was intended increase water use efficiency and increase production of subsidiary food crops. Farmers' need to be convinced about the benefits of such a decision vis-a-vis cultivating paddy under insufficient water conditions.[1]

5 *Operation of a floor price scheme*[2] provides a support for production. For such prices to be effective they should be based on timely information on the market trends and production costs of the crop itself, and also relative to its competitors. The information required for this purpose should be reliable and obtained through a continous monitoring process.

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1 For a comparison of paddy cultivation with that of chillies and pulses, see Chapter Six, page 132 para 4 to page 133 para 2. The benefit cost returns and water use efficiency need to be studied in the context of water being no longer a free input for the farmer and the States policy of determining the crops grown in *Yala* based on water availability.

2 The Ministry of Agriculture and Research has introduced a revised floor price scheme since 1980. Chapter Eleven, page 232, para 2 to page 233, para 3.

6 *Provision of well drained small scale, low cost, facility* for on-farm storage would reduce crop losses during storage and increase the supply, and also provide a greater incentive for increased production as farmers will be in a better position to manipulate sales to take advantage of the prices.

12.5.2 Strategies for expansion of production in a long term programme

Expansion of production by increasing both the demand and supply can be considered seriously only if a firm commitment to enhance the production of any of the crops is entrenched in the long term plan. Crops have to be singled out for specific attention. Strategies could and need be varied according to the purpose and volume of produce in respect of which production is planned for.

1 Production for industrial needs

Produce required for industrial purposes have to be available for purchase in sufficient quantities and in time by the users.[1] The extents of the time concentrated demands could motivate production on commercial scales, and if profit is sufficiently attractive, the unirrigated lands and ill drained paddy fields in *yala* in the farm may be devoted mainly or entirely to the crop, specially in areas which are located in close proximity to the industrial plants. Once in production of a crop and having acquired expertise in its husbandry, a farmer would be reluctant to withdraw from it unless compelled by very adverse market forces or other very severe problems.

Farm structure - crop specialisation, and scale of operation

In a situation where the demand for a crop is mainly for an industry or even an export market,[2] various policy options relating to the crop farm structure can arise. Should policies favour crop specialisation and large scale mono-cropping or

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1 Demands identified are for maize in livestock feed industry and extraction of vegetable oil, sorghum as substitute for wheat flour in bread, and cereals and soya bean in pre-processed food. Chapter Twelve, page 241, para 1 to page 242, para 2.

2 Export market for both cereals and pulses for use as livestock feed.

encourage both large scale and family farms with crop specialisation or allow a continuance of present system are some basic questions that need be answered as other strategies evolved have to necessarily suit the farm structures.

Market mechanisms and extension services

Manufacturers require a regular supply of raw materials in sufficient quantities to maximise the utilisation of the available manufacturing capacity. The flow of raw material from the farms is concentrated at the time of harvest; presently the *maha* harvests providing 95 -99% of the products during a year. Thus the need for planned production, purchase and storage to ensure the ideal position relating to the supply of materials is emphasised. An effective method by which this could be achieved is to *encourage feed manufacturers to enter into contracts with farmers, ideally with farmer co-operatives, if not possible thraugh existing ones, then through informal groups mainly for purchase of the produce at a pre-determined price acceptable to both parties.*[1] The Ministry of Agricultural Research and Development could take the responsibility of bargaining with such agencies in the initial period. Provision of extension advice and improved seed could also be undertaken by feed manufacturers. What is proposed is a parallel mechanism to what is currently operated by the Ceylon Tobacco Company in relation to tobacco. The storage aspect would loom large in the process of ensuring a regular supply throughout the year. It is assumed that in the planned contract buying system the manufacturers would make an all out effort to buy almost all their entire requirements for a year, at the time of the *maha* harvest and make their own arrangements to store the grain for use during the year.

2 Development of cropping systems

Stability, crop-mixes, size of holdings and incomes

Stable farming systems have to be evolved within the context of the policies regarding farm structures, for each distinct agro-

1 Contract buying has to be necessarily effected through Farmer Co-operatives or informal groups when production is in small farms.

ecological zone. While providing a set of alternative systems for each area it would be *desirable to restrict the number of crops within each system and area.* Such stable systems would *promote specialisation in crop husbandry* and also facilitate concentration and attention by the state in the production of any single crop.

The potential for promotion of coarse cereal and pulse production in areas where the land and or water are limiting for paddy cultivation could be exploited if a system exclusive of paddy, but capable of yielding incomes high enough to purchase the requirements of rice for food or compensate for loss in rice for food due to its cultivation could be developed for such areas.

Mixed farming is a practice that is prevalent in some parts of the country. At the current low levels of management this practice seems to have to some advantages to the growers, in that it saves labour in sowing and other operations, as no differential attention is given to the crops grown. Whether such crop-mixes provided an environment of coexistence with benefits of sharing of nutrients and complementing of crops for proper development of each (eg. shade for one plant from another etc.) or inhibited the proper growth and development of one or more crops, may be closely examined in order to decide on whether such practices should be eliminated or accommodated in the stable farming system.

With the development of stable farming systems for each area answers to *what should be the holding sizes of different types of land within a farm in a specified area, for provision of a sufficient farm incomes and or that can be managed by the family labour alone or with available labour should emerge.* Such information would be of value in the allocation of land in new settlements to *minimise the underutilisation of the unirrigated land.*[1]

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1 Chapter Four, pp. 59, last para; pp. 54 para 2 to pp. 56 para 5.

The stabilisation of cultivation of paddy lands during yala could also form a component of cropping systems research in any area.[1]

3 Provision of suitable supporting measures

Extension Services

Advisory leaflets containing recommendations of research had been made available in respect of most crops. No special field extention programme was instituted for these crops except in the special project areas which were chosen for promotion of cultivation of pulses among other subsidiary food crops such as chilli and onions, during *yala*. The main concern of the agricultural extension services was the paddy crop. The extension officers were also however expected to provide the necessary advice and services in respect of all other fields crop in their areas. Extension efforts relating to the coarse cereals and pulses have to be specially improved to meet demands of higher levels of cultivation. *The service could be made more effective if it is geared to suit the farming systems of the area; the officers could be made responsible for the overall improvement of the farms and to assist the farmer in the cultivation of all crops in the system.*

Extension work should also be extended to cover marketing aspects. Guidance should be provided in advance of each cultivation season regarding possible oversupplies of any commodity within the system, to enable a proper choice of crops for cultivation.

Pricing and procurement

Floor prices can have the desired impact on production if complemented by suitable procurement arrangements and distribution systems. Government intervention in procurement should be acutely competitive with, but not eliminate the private

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1 See Footnote 1 of pp. 249 and Chapter Four, pp. 58 para 1.

involvement in marketing. The state could regulate the markets and the prices, if proper buffer stocking arrangements are introduced for the produce. With regional specialisation of crops, it would be economical to establish *regional buffer stocks schemes* as opposed to a national scheme.

Credit

Though farmers mentioned lack of cash as a constraint for cultivation of these crops,[1] *utilisation of the loan facilities provided for these crops under the credit scheme for the subsidiary food crops was very poor.* The introduction of stabilised farming systems, the development of a loan scheme to facilitate the financing operation of the entire farm could be developed. In the formulation of such a scheme the cash and kind flows *of crop produce, potential for financing an operation relating to one crop from the proceeds of another, and needs of cash for hiring labour, have to be recognised to regulate the release of loans in stages, for effective use in production.*

12.6 CONCLUSIONS

The facts that the demands for cereals and grain legumes had been almost exclusively for local human consumption in the form of food prepared directly from the grains, with a great degree of substitutability and complementarity among them and other grains, and that the extent of support and drive for increased production provided by the State varied over time, with the demands of these crops being regulated by the availability of mainly wheat and rice, and also masoor dhal in the case of pulses, could be a few basic reasons for the inability to create sufficient interest among farmers to enhance production through use of improved technology. Farmers who grew these crops continued to grow them in the traditional manner[2] in *chenas* which helped maintain static

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1 Appendix 21

2 Excludes Soya bean to which farmers have been introduced very recently along with the use of fertiliser and other improved practices.

levels of productivity even at the low-input level of cultivation; the coarse grains were grown to satisfy food requirements at the farm level, and pulses along with other food or cash crops for the market. Quick responses to demands and prices of the market oriented crops have been observed to be brought about by extensive use of land for the most favoured crops.

Thus, in any serious attempt to increase production of these crops, first and foremost the needs for these crops within the food policies and production programmes vis-a-vis that of other crops that have a direct impact on these crops should be examined, and whether these needs warrant special interest in promotion of any subsidiary crop for provision of food should be ascertained.

Production for newly created demands in areas other than consumption of grain directly as food[1] with assurance of absorption of the produce, could activate interest and promote specialised cultivation of any particular crop. If such demands arise in the area of pre-processing for food, they indirectly meet the needs of the food production programmes.

In the context of the *chena* system of cultivation giving way to a settled system of cultivation of highland, the development of farming systems suited to each agro-ecological zone should provide a sound base for cultivation for the farmer, and facilitate the planning for promotion of crops selectively. The farm structures and systems should be flexible enough to gear themselves towards large scale production of any one or two crops from within the system.

The systems should be supported by pricing, procurement and credit policies which should be sensitive to the differential needs of the crops, and also at the same time recognise the competitiveness and/or complementarity of these and other cash crops in the system. Generally

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1 The demands for Soya bean are varied and lie within the food industry and livestock feed industry.

there had been a tendency to plan for coarse cereals and pulses as a group, this group having a lower priority than any single crop among others in the subsidiary food crops group. Floor prices however are fixed differentially for each crop, but not with a consideration of the competition effects of prices of one on another.

Thus with creation of new demands, the movement towards settled farming, regional specialisations, suitable farming systems, and supporting policies flexible enough to suit varying needs of farm structures, type of demands and crops, it should be possible to expand production in the pulses, and coarse cereals, specially maize, by improved methods of cultivation.

Table 12.1 - Per capita Supplies of Selected Food Items (kg per year)

Food item	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	Average (75-79)
Cereals														
Rice	92.37	96.82	98.18	109.84	103.15	91.89	89.53	99.01	82.43	94.02	109.00	97.18	91.87	94.90
Wheat flour	39.49	32.98	31.79	29.51	23.44	33.15	34.28	32.60	38.57	40.55	43.00	45.04	37.92	40.42
Other grains	3.74	2.97	2.67	2.15	1.88	1.77	2.68	3.06	3.58	3.47	4.01	2.76	2.30	3.22
Pulses														
Greengram	1.10	0.69	0.20	0.17	0.15	0.18	0.32	0.32	0.54	0.38	0.48	0.60	0.52	0.50
Other pulses	5.23	4.73	6.46	5.74	2.54	2.51	1.02	0.47	1.45	1.27	1.16	2.57	3.87	2.06
Fish	9.29	11.11	10.81	8.25	7.28	8.29	7.84	6.46	7.00	6.88	9.66	9.66	8.95	8.43
Eggs	1.83	1.84	1.96	1.92	2.00	2.49	1.96	1.47	1.52	1.48	1.52	1.41	1.66	1.52
Meat	1.63	1.74	1.93	1.71	1.77	1.73	1.71	1.20	1.86	1.41	1.26	1.29	1.18	1.40
Milk	12.81	13.16	11.56	12.05	12.97	16.01	16.37	11.17	11.52	12.42	14.60	14.60	14.77	13.58
	38.57	37.74	38.78	47.47	37.61	35.11	35.19	35.48	34.88	35.65	34.91	34.77	34.60	34.96

Source - Food Balance Sheets

Table 12.2 - A Comparison of average Requirements of Selected Food Items for a Balanced Diet with average Supply (kgs/person/year)

	Average supply during 1975-79		Average requirement for a nutritionally recommended diet
Rice	94.90		98.75
Other cereals	43.64		31.80
Wheat		40.42	
Others		3.22	
Pulses	2.56		7.75
Animal foods	11.35		27.01
Milk and milk products	13.58		52.02
Vegetables	34.96		53.49

Source of information - Food Balance Sheets.

Weighted average computed on the basis of the recommendation of the Departments of Nutrition, Medical Research Institute and the percentage distribution of population age 1 year and above by sex and age at the Census of Population 1971. The specific requirements of pregnant and lactating mothers and children under 1 year of age have not been considered in this computation.

Table 12.3 - Per Capita Consumption /Month by Income Groups

Items	Under Rs. 200	Rs. 200-399	Rs. 400-599	Rs. 600-799	Rs. 800-999	1000 & over	All income groups
Rationed rice (lb)	7.98	7.59	7.21	7.23	6.30	5.56	7.58
Outside ration rice (lb)	7.91	9.87	11.80	12.34	11.44	13.56	9.68
Other grains (lb) (kurakkan, maize etc.)	0.77	0.44	0.49	0.45	0.55	0.40	0.57
Wheat flour (lb)	3.98	3.45	2.94	1.96	1.37	1.73	3.40
Bread (lb)	2.98	3.92	4.28	5.50	4.87	5.98	3.78
Dhal (lb)	0.69	0.76	0.76	0.81	0.80	1.02	0.74
Greengram (lb)	0.20	0.23	0.32	0.23	0.29	0.25	0.23
Other pulses	0.06	0.07	0.09	0.05	0.06	0.16	0.07
Meat (lb)	0.26	0.48	0.81	1.12	1.18	2.03	0.54
Fish (lb)	1.69	2.50	3.05	2.92	2.01	3.65	2.34
Eggs (Nos)	2.13	7.41	16.10	28.77	35.97	58.57	8.46

Source - Preliminary report on the socio-economic survey of Ceylon 1969/70.
Department of Census & Statistics

Table 12.4 - Estimates of Requirements of Cereals and Pulses for Food[1]

Year	Population[2] (in thousands)	Rice (in thousands) long tons	Wheat flour (in thousands) long tons	Other grains (in thousands) cwts	Pulses (in thousands) cwts
1981	14850	1384.10	589.52	939.26	746.74
1986	16155	1505.82	641.36	1021.86	812.41
1991	17577	1638.24	697.76	1111.72	883.85
1996	19122	1782.30	759.12	1209.49	961.58
2001	20804	1939.04	825.88	1315.85	1046.14

1 Based on average supply during 75-79.
2 1981 - as at Census on 17th March 1981.
Figures for the other years estimated on an assumption of a growth of 1.7%.

Table 12.5 - Extent of Land Cultivated under Each Crop

Crop	1975 Maha	1975 Yala	1975 Total	1976 Maha	1976 Yala	1976 Total	1977 Maha	1977 Yala	1977 Total
Kurakkan	61872	4417	66289	47894	1125	49019	61923	1322	63245
Maize	94875	4165	99040	74765	417	75182	90074	696	90770
Sorghum	7814	1469	9823	2365	81	2446	3390	41	3431
Cowpea	13490	8088	21578	24988	22528	47516	53620	20917	74537
Greengram	18488	4378	22866	16844	3823	20667	24568	5941	30509
Blackgram	4329	697	5026	10704	1875	12579	30909	3370	34279
Soyabeans	2029	789	2818	1102	678	1780	1300	1202	2502
Groundnuts	15542	3667	1909	13196	3419	16615	13101	2911	16012
Gingelly	5186	26236	31422	7724	39214	46938	5192	28272	33464

Crop	1978 Maha	1978 Yala	1978 Total	1979 Maha	1979 Yala	1979 Total	1980 Maha	1980 Yala	1980 Total
Kurakkan	42850	755	43605	26085	685	26770	18897	943	19840
Maize	69987	731	70718	57244	507	57751	56841	861	57702
Sorghum	1321	32	1353	407	92	499	239	0	239
Cowpea	48672	19444	68116	62262	12529	74791	43493	19621	63114
Greengram	25168	4964	30132	26776	3348	30124	26581	8495	35076
Blackgram	31760	2983	34743	20883	758	21591	n.a.	n.a.	n.a.
Soyabeans	4141	629	4770	2129	887	3016	n.a.	n.a.	n.a.
Groundnuts	17230	3227	20457	9629	2855	12484	n.a.	n.a.	n.a.
Gingelly	12975	28977	41952	15327	25965	41292	19625	58224	77849

Source - Ministry of Agriculture

Appendix 1

DISTINGUISHING CHARACTERISTICS OF AGRO-ECOLOGICAL REGIONS OF SRI LANKA

Agro-ecological regions	Monthly Histograms of 75% rainfall probability for respective regions	75% Expectancy value of annual rainfall(ins)	75% Expectancy of dryness of particular months	Major soil groups	Terrain
			Jan Feb Mar May Jun Jul Aug Sep		
DL_1		> 30	J½ F ½M My½ Jun Jul Aug ½Sep	Reddish Brown Earths and Low Humic Gley Soils	Undulating
DL_5		> 20	J½ F M My Jun Jul Aug ½Sep	Reddish Brown Earths with high amount of gravel in sub soil, Low Humic Solidized Solenetz	Undulating and flat
IL_2		> 45	* F½ M My½ Jun Jul Aug ½Sep	Reddish Brown Earths, Immature Brown Loams and Low Humic Gley soils	Rolling, hilly and undulating
IL_3		> 35	J F ½M My½ Jun Jul Aug ½Sep	Reddish Brown Earths, Non Calcic Brown soils and Low Humic Gley soils	Undulating

* Denotes wetness for the month - J½ denotes second half of January
½M denotes first half of March
Similarly for other months

Appendix 2 - Population by Age Group

District	Study area	Age Groups				
		Less than 14 years	14-20	21-50	51-65	Over 65
Anuradhapura	Palayakulama	38.2	21.6	36.7	3.5	0.0
	Halmillakulama	35.2	21.3	32.0	9.0	2.5
	Mahakanadarawa	38.3	23.0	31.9	5.3	1.5
	Mahavilachchiya	36.4	21.7	31.0	8.7	2.2
Vavuniya	Chettikulam	30.2	24.9	38.0	5.9	1.0
	Pavatkulam	36.3	21.9	32.8	6.0	3.0
Hambantota	Gonnoruwa	43.4	10.7	42.0	3.9	0.0
	Magama	29.5	20.8	37.7	8.2	3.8
Badulla	Mapakadawewa	38.0	21.7	29.9	7.6	2.7
	Gemunupura/ Tissapura	47.8	17.0	31.2	3.9	0.0
Elahera Project	Attanakadawala	30.2	16.7	39.1	9.9	4.2
	Bakamuna	34.0	21.5	38.0	5.0	1.5

Appendix 3 - A NOTE ON THE COMPUTATIONS OF INCOME FROM SINGLE CROP

Computation of incomes from single crops presented difficulties as some crops had not been harvested at the time of the survey and estimates of production had to be employed in place of the actual production. At the time of the survey during March-April 1977 and *maha* 76/77 the paddy crop had not been harvested by even a single farmer in Mahavilachchiya or Pavatkulam (only 3 farmers cultivated) most farmers in Halmillakulama, Mahakanadarawa and Yodakandiya, and a small minority of farmers in the other areas. The average yields and average selling price relating to the reporting farm households were used to estimate the paddy incomes of households where this crop had not been harvested. For Mahavilachchiya where none of the farmers had harvested their paddy the average paddy yield was obtained from an extraneous source.[1] In the Elahera Project area, the *yala* paddy crops of most households were standing in the field at the time of the survey. Hereagain the average yield based on the reporting farm households, were used to compute the missing information of individual households.

The use of an imputed value for the paddy income of each household is not likely to have any serious impact on the average household income or the pattern of composition of these incomes. It could slightly affect the distribution pattern of households by total incomes and farm incomes. The pattern of distribution of paddy incomes of households, specially in the colonisation areas of Mahakanadarawa, Mahavilachchiya and Elahera Project area, could be expected to be affected to a greater degree by use of imputed values. The distribution of paddy income was however not considered for a separate analysis.

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1 A study of Five Settlement Schemes prior to Irrigation Modernisation, Part II - Mahavilachchiya. The average yields were based on information obtained through maintenance of farms records throughout the season on a sample of farmers.

Appendix 4

List of the questions as posed to farmers discussed in the cropwise analysis under Chapter Five

* denotes that crop specific information was sought in respect of Kurakkan, Maize, Sorghum, Cowpea, Blackgram, Greengram, Toor dhal and Soyabean.

* 1 When and how do you normally sow your crops and what are the seed rates? in (i) *Maha* (ii) *Yala*

* 2 What are the varieties known to you?

* 3 Which of these varieties do you prefer to grow and reasons?

* 4 Were you able to get seed material of the preferred varieties, and source from which you obtained it?

5 Were you able to get seed material in time?

6 Did you use fertiliser on your lowland holding/highland holding/ and *chena* holding during (i) *Maha* 76/77 and (ii) *Yala* 76 or *Yala* 77?

* 7 Name of fertiliser and quantity used and time of application?

8 Did you have any difficulties in obtaining fertiliser during *Maha* 76/77 and *Yala* 77? If yes, what are the difficulties?

9 Do you agree that pulse crops enrich the soil and is beneficial to the succeeding crop?

10 Did you weed your lowland holding, highland holding and *chena* holding during (i) *Maha* 76/77 and (ii) *Yala* 76 or *Yala* 77?

* 11 Method of weeding adopted if any during the reference period?

* 12 What diseases appreciably reduce the yields of your crops?

13 Do you believe that sowing times has an effect on the incidence of disease?

* 14 If yes, that times of sowing exposes the crop to the highest risk of attack?

* 15 What insect pests appreciably reduce the yields of your crops and what control measures do you adopt?

* 16 What are the other pests that appreciably reduce the yields of your crops and what control measures do you adopt?

* 17 Have you at any time abandoned or were you considering, abandonce of your cultivation of any or due to high incidence of damage caused by diseases or pests? If yes, what diseases/pests.

* 18 What problems do you encounter when harvesting the crops grown by you?

* 19 What yields did you obtain from the crops grown by you during *Maha* 76/77 and *Yala* 77?

* 20 How do you thresh your crops?

* 21 What are the crops that are least affected by rain?
i) at early stages of growth, and
ii) at harvest

* 22 What are the crops that are least affected by drought?

* 23 Indicate your preference in respect of the following characteristics of a crop?
Age (months) height (ft) No. of picks at harvest Head type.

* 24 Indicate your preference in respect of the following:

Characteristics in view of marketing, seed size, seed colour and seed shape.

Appendix 5

The conversion rates from volume measure, to weight measure

	Equivalent of a bushel in lbs
Kurakkan	52
Maize	59
Sorghum	56
Greengram	59
Blackgram	64
Cowpea	65
Soyabean	64

Appendix 6 - Preferences in Crops for Maha Cultivation (Average Scores)

Crops	Anuradhapura				Vavuniya		Hambantota		Badulla		Elahera Project	
	Palayakulama	Halmillakulama	Mahakanadarawa	Mahavilachchiya	Chettikulam	Pavatkulam	Gonnoruwa	Magama	Mapakadawewa	Gemunupura/ Tissapura	Attanakadawala	Bakamuna
Crops studied												
Kurakkan	2.1	2.2	2.2	1.4	0.7	1.0	2.1	1.3	1.1	0.4	-	0.2
Maize	1.2	1.7	0.9	1.9	0.3	0.3	0.7	0.9	3.4	2.5	0.5	0.7
Sorghum	-	-	0.1	0.1	0.1	0.1	-	-	-	-	-	-
Cowpea	1.7	1.3	1.9	1.9	1.3	1.6	1.0	0.8	0.5	1.7	1.7	1.1
Greengram	0.4	-	0.2	0.1	0.7	0.2	0.8	1.1	0.7	0.4	0.7	0.1
Blackgram	0.4	0.1	0.9	0.3	3.2	3.5	0.1	-	0.3	0.2	*	0.3
Soyabean	-	-	-	-	-	-	-	-	-	-	0.1	0.1
Cash crops												
Chilli	1.8	2.5	1.4	1.5	0.8	0.5	2.0	2.7	0.2	0.5	0.6	0.5
Tobacco	-	-	0.1	0.1	-	-	-	-	0.1	0.1	-	-
Sugarcane	-	-	-	-	-	-	-	-	0.3	0.1	-	-
Cotton	-	-	-	-	-	-	2.8	0.2	-	-	-	-
Other grains												
Paddy	2.3	2.2	2.3	2.4	2.5	1.5	1.3	2.6	1.8	3.5	3.7	3.4
Meneri	-	-	-	-	0.1	-	-	-	-	-	-	-
Oil seeds												
Gingelly	-	-	-	-	-	-	-	-	-	-	0.1	0.2
Groundnut	-	-	-	-	-	0.1	0.3	0.3	-	-	0.1	0.8

* Less than 0.1

Appendix 7 - First Preferences in Crops for Maha Cultivation

Crop	Anuradhapura				Vavuniya		Hambantota		Badulla		Elahera Project	
	Palayakulama N=29	Halmillakulama N=43	Mahakanadarawa N=82	Mahavilachchiya N=79	Chettikulam N=35	Pavatkulam N=30	Gonnoruwa N=38	Magama N=30	Mapakadawewa N=30	Gemunupura/ Tissapura N=65	Attanakadawala N=31	Bakamuna N=27
Paddy	55.2	44.2	50.0	58.2	55.7	16.7	28.9	60.0	43.3	84.6	93.5	81.5
Kurakkan	17.2	18.6	14.6	6.3	2.9	3.3	23.7	-	-	-	-	-
Maize	-	2.3	1.2	6.3	-	-	-	3.3	46.7	9.2	-	-
Sorghum	-	-	-	1.3	2.9	-	-	-	-	-	-	-
Cowpea	6.9	2.3	17.1	8.9	2.9	6.7	5.3	6.7	3.3	4.6	-	7.4
Greengram	3.4	-	-	-	-	-	-	3.3	-	-	-	-
Blackgram	-	-	7.3	-	35.7	70.0	-	-	-	-	-	-
Soyabean	-	-	-	-	-	-	-	-	-	-	3.2	-
Chilli	17.2	32.6	8.5	17.7	-	-	13.2	26.7	-	1.5	-	3.7
Cotton	-	-	-	-	-	-	28.9	-	-	-	-	-
Tobacco	-	-	1.2	1.3	-	-	-	-	-	-	-	-
Sugar cane	-	-	-	-	-	-	-	-	6.7	-	-	-
Groundnut	-	-	-	-	-	3.3	-	-	-	-	3.2	3.7

Appendix 8

REASONS FOR PREFERING TO CULTIVATE A CROP DURING MAHA[1]

Crop	Reasons for preferance	Anuradhapura								Vavuniya				Hambantota				Badulla				Elahera Project			
		Palayakulama		Halmillakulama		Mahakanadarawa		Mahavillachiya		Chettikulam		Pavatkulam		Gonnoruwa		Magama		Mapakadawewa		Gemunupura/ Tissapura		Attanakadawewa		Bakamuna	
		No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%
Paddy	For consumption	13	72.2	24	96.0	35	67.3	35	67.3	21	91.3	12	75.0	14	100	13	65.0	16	88.9	47	82.5	16	55.2	14	58.3
	For sale	-	-	5	20.0	4	7.7	4	7.7	-	-	1	6.2	8	57.1	3	15.0	5	27.8	7	12.3	2	6.9	1	4.2
	High income	6	33.3	-	-	10	19.2	18	34.6	1	4.3	5	31.2	1	7.1	12	60.0	3	27.8	25	43.9	6	20.7	3	12.5
	Easy to cultivate	1	5.6	2	8.0	6	11.5	1	1.9	-	-	-	-	-	-	1	5.0	-	-	-	-	2	6.9	8	33.3
	Traditional practice	-	-	-	-	1	1.9	1	1.9	2	8.7	-	-	-	-	-	-	-	-	1	1.8	-	-	-	-
	Easily marketable	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1.8	4	13.8	-	-
	Other	3	16.7	-	-	1	1.9	1	1.9	-	-	-	-	-	-	-	-	1	5.6	2	3.5	2	6.9	3	12.5
	Total responses	18	100	25	100	52	100	52	100	23	100	16	100	14	100	20	100	18	100	57	100	29	100	24	100
Kurakkan	For consumption	18	85.7	34	97.1	41	66.1	45	86.5	-	-	13	100	29	100	19	100	9	64.3	-	-	-	-	-	-
	For sale	-	-	1	2.9	1	1.6	2	3.8	-	-	-	-	6	20.7	1	5.3	4	28.6	-	-	-	-	-	-
	High income	2	9.5	-	-	9	14.5	3	5.8	-	-	-	-	-	-	-	-	1	7.1	-	-	-	-	-	-
	Less water needed/ Resistant to draught	1	4.8	-	-	1	1.6	1	1.9	-	-	-	-	-	-	-	-	1	7.1	-	-	-	-	-	-
	Easy to cultivate	3	14.3	1	2.9	7	11.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Less diseases	-	-	-	-	-	-	1	1.9	-	-	-	-	-	-	-	-	1.	7.1	-	-	-	-	-	-
	Other	1	4.8	-	-	2	3.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total responses	21	100	35	100	62	100	52	100	-	-	13	100	29	100	19	100	14	100	-	-	-	-	-	-
Naize	For consumption	8	50.0	26	76.5	8	26.7	34	94.4	-	-	-	-	-	-	13	86.7	24	80.0	44	78.6	-	-	-	-
	For sale	5	31.2	11	34.4	5	16.7	15	41.7	-	-	-	-	-	-	1	6.7	9	30.0	11	19.6	-	-	-	-
	High income	4	25.0	6	17.6	11	36.3	19	52.8	-	-	-	-	-	-	-	-	5	16.7	18	32.1	-	-	-	-
	Easy to cultivate	3	18.8	1	2.9	3	10.0	5	13.9	-	-	-	-	-	-	1	6.7	-	-	5	8.9	-	-	-	-
	Suitable for the climate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	6.7	2	6.7	5	8.9	-	-	-	-
	Less diseases	-	-	-	-	-	-	3	8.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Other	1	6.2	-	-	6	20.0	3	8.3	-	-	-	-	-	-	-	-	3	10.0	3	5.4	-	-	-	-
	Total responses	16	100	34	100	30	100	36	100	-	-	-	-	-	-	15	100	30	100	56	100	-	-	-	-
Cowpea	For consumption	15	62.5	24	68.6	29	43.3	33	40.3	19	76.0	13	65.0	13	59.1	-	-	-	-	26	52.0	12	57.1	3	27.3
	For sale	9	37.5	15	42.9	7	10.4	13	19.4	-	-	2	10.0	8	36.4	-	-	-	-	9	18.0	1	4.8	1	9.1
	High income	11	45.8	10	28.6	29	43.3	34	50.7	4	16.0	7	35.0	7	31.8	-	-	-	-	24	48.0	9	42.9	7	63.6
	Easy to cultivate	2	8.3	-	-	10	14.9	2	3.0	-	-	1	5.0	-	-	-	-	-	-	-	-	1	4.8	-	-
	Less water needed/ Resistant to draught	1	4.2	-	-	4	11.4	1	1.5	2	8.0	1	5.0	-	-	-	-	-	-	4	8.0	-	-	-	-
	less diseases	-	-	-	-	1	1.5	-	-	-	-	-	-	1	4.5	-	-	-	-	1	2.0	1	4.8	-	-
	Other	1	4.2	1	2.9	5	7.5	1	1.5	4	16.0	-	-	1	4.5	-	-	-	-	6	12.0	4	19.0	-	-
	Total responses	24	100	35	100	67	100	67	100	25	100	20	100	22	100	-	-	-	-	50	100	21	100	11	100
Greengram	For consumption	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	44.4	-	-	-	-	-	-	-	-
	For sale	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	11.1	-	-	-	-	-	-	-	-
	High income	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12	66.7	-	-	-	-	-	-	-	-
	Short duration	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	5.6	-	-	-	-	-	-	-	-
	Total responses	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18	100	-	-	-	-	-	-	-	-
Blackgram	For sale	-	-	-	-	2	6.2	-	-	-	-	3	10.7	-	-	-	-	-	-	-	-	-	-	-	-
	High income	-	-	-	-	15	46.9	-	-	31	88.6	20	71.4	-	-	-	-	-	-	-	-	-	-	-	-
	Easy to cultivate	-	-	-	-	6	48.8	-	-	1	2.9	8	28.6	-	-	-	-	-	-	-	-	-	-	-	-
	Less water needed/ Resistant to draught	-	-	-	-	2	6.2	-	-	3	8.6	2	7.1	-	-	-	-	-	-	-	-	-	-	-	-
	Less diseases	-	-	-	-	-	-	-	-	-	-	1	3.6	-	-	-	-	-	-	-	-	-	-	-	-
	Less experses	-	-	-	-	-	-	-	-	4	-	3	10.7	-	-	-	-	-	-	-	-	-	-	-	-
	Other	-	-	-	-	7	21.9	-	-	3	8.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total responses	-	-	-	-	32	100	-	-	35	100	28	100	-	-	-	-	-	-	-	-	-	-	-	-
Chillies	For consumption	4	19.0	4	10.0	13	26.5	15	30.6	-	-	-	-	6	20.0	2	6.9	-	-	-	-	-	-	-	-
	For sale	4	19.0	12	30.0	9	18.4	10	20.4	-	-	-	-	10	33.3	4	13.8	-	-	-	-	-	-	-	-
	High income	18	85.7	28	70.0	28	57.1	36	73.5	-	-	-	-	21	70.0	23	79.3	-	-	-	-	-	-	-	-
	Easy to cultivate	-	-	-	-	3	6.1	-	-	-	-	-	-	-	-	1	3.4	-	-	-	-	-	-	-	-
	Easily marketable	-	-	-	-	2	4.1	-	-	-	-	-	-	1	3.3	2	6.9	-	-	-	-	-	-	-	-
	Others	1	4.8	-	-	1	2.0	-	-	-	-	-	-	-	-	1	3.4	-	-	-	-	-	-	-	-
	Total responses	21	100	40	100	49	100	49	100	-	-	-	-	30	100	29	100	-	-	-	-	-	-	-	-
Cotton	For sale	-	-	-	-	-	-	-	-	-	-	-	-	8	22.2	-	-	-	-	-	-	-	-	-	-
	High income	-	-	-	-	-	-	-	-	-	-	-	-	2.8	77.8	-	-	-	-	-	-	-	-	-	-
	Resistant to draught	-	-	-	-	-	-	-	-	-	-	-	-	1	2.8	-	-	-	-	-	-	-	-	-	-
	Suitable for the area	-	-	-	-	-	-	-	-	-	-	-	-	1	2.8	-	-	-	-	-	-	-	-	-	-
	Total responses	-	-	-	-	-	-	-	-	-	-	-	-	36	100	-	-	-	-	-	-	-	-	-	-

(1) Total responses relate to crops that had an average score of 0.9 or more and only the number of farmers who mentioned each such cash crop as a 1st, 2nd or 3rd preference.

Appendix 9 - Preferences in Crops for Maha Cultivation Differentiated by Availability or Non-availability of Lowland (Average Scores) *

Crops	Anuradhapura				Vavuniya		Hambantota				Badulla	
	Palayakulama		Halmillakulama		Chettikulam		Gonnoruwa		Magama		Mapakadawewa	
	Farms without lowland	Farms with lowland	Farms without lowland	Farms with lowland	Farms without lowland	Farms with lowland	Farms without lowland	Farms with lowland	Farms without lowland	Farms with lowland	Farms without lowland	Farms with lowland
Crops studied												
Kurakkan	3.5	1.7	2.3	2.2	0.2	0.8	2.8	1.4	1.3	1.3	1.2	0.8
Maize	1.7	1.0	1.8	1.7	0.1	0.3	0.9	0.5	1.3	0.8	3.8	3.0
Sorghum	-	*	-	-	-	0.4	0.1	-	-	-	-	-
Cowpea	0.8	1.9	0.8	1.5	1.6	1.2	1.0	1.0	1.9	0.7	0.2	0.7
Greengram	-	0.5	0.2	-	0.3	0.9	0.6	1.2	0.9	1.2	1.1	0.5
Blackgram	-	0.5	0.5	0.1	4.0	2.8	-	0.1	-	-	0.3	0.3
Cash crops												
Chilli	1.7	1.9	2.7	2.5	0.4	1.0	2.0	2.1	3.4	2.5	-	0.4
Tobacco	-	-	-	-	-	-	-	-	-	-	-	0.2
Sugarcane	-	-	-	-	-	-	-	-	-	-	-	0.5
Cotton	-	-	-	-	-	-	2.4	2.9	0.7	-	-	-
Other grains												
Paddy	2.0	2.4	2.0	2.2	0.6	3.3	0.4	2.1	-	3.3	1.1	3.1
Meneri	-	-	-	-	0.1	-	-	-	-	-	-	-
Oil seed crops												
Gingelly	-	-	-	-	-	-	0.2	-	-	-	-	-
Groundnut	-	-	-	-	-	-	1.1	0.2	0.3	0.2	-	-

* First preference - 4; Second preference - 3; Third preference - 2; Fourth and lesser order of preference - 1; crop not mentioned - 0.

Appendix 10 - Preferences in Crops for Yala Cultivation (Average Score) *

Crops	Anuradhapura				Vavuniya		Hambantota		Badulla		Elahera Project	
	Palayakulama	Halmillakulama	Mahakanadarawa	Mahavilachchiya	Chettikulam	Pavatkulam	Gonnoruwa	Magama	Mapakadawewa	Gemunupura/ Tissapura	Attanakadawala	Bakamuna
Crops studied												
Kurakkan	-	-	0.1	-	-	-	-	-	-	-	-	0.1
Maize	-	-	-	-	-	-	-	-	0.2	-	-	-
Cowpea	0.6	0.8	1.2	0.6	-	0.5	0.3	0.1	-	0.1	1.5	0.8
Greengram	-	-	0.1	0.1	-	-	0.2	-	-	-	0.8	0.7
Blackgram	-	0.1	0.1	0.1	0.1	-	0.1	-	-	-	-	0.1
Soyabean	-	-	-	-	-	-	-	-	-	-	0.4	0.2
Cash crops												
Chilli	-	-	0.3	-	1.0	-	0.1	0.1	-	-	3.3	3.1
Tobacco	-	0.1	-	-	-	-	-	-	-	-	*	-
Other grains												
Paddy	1.2	0.5	0.3	0.6	1.9	0.4	-	0.5	0.3	-	1.4	1.2
Meneri	-	-	-	-	-	-	1.7	-	-	-	-	-
Oil seed crops												
Gingelly	1.9	1.9	1.4	2.2	1.1	3.5	-	-	-	-	-	-
Groundnut	-	-	-	-	0.2	-	0.7	0.1	-	-	0.6	1.6

* First preference - 4; Second preference - 3; Third preference - 2; Fourth and lesser order of preference - 1; crop not mentioned - 0.

Appendix 11 - First Preference in Crops for Yala Cultivation

Crop	Anuradhapura				Vavuniya		Hambantota		Badulla		Elahera Project	
	Palayakulama	Halmillakulama	Mahakanadarawa	Mahavilachchiya	Chettikulam	Pavatkulam	Gonnoruwa	Magama	Mapakadawewa	Gemunupura/ Tissapura	Attanakadawala	Bakamuna
Paddy	31.0	11.6	7.3	13.9	48.6	10.0	-	13.3	6.7	-	19.4	25.9
Kurakkan	-	-	1.2	-	-	-	-	-	-	-	-	3.7
Maize	-	-	-	-	-	-	-	-	3.3	-	-	-
Cowpea	-	7.0	15.9	6.3	-	6.7	5.3	3.3	-	3.1	-	-
Greengram	-	-	-	-	-	-	2.6	-	-	-	3.2	-
Blackgram	-	-	1.2	1.3	-	-	-	-	-	-	-	-
Soyabean	-	-	-	-	-	-	-	-	-	-	3.2	-
Chilli	-	-	3.7	-	-	-	2.6	3.3	-	-	70.9	59.3
Tobacco	-	2.3	-	-	-	-	-	-	-	-	-	-
Gingelly	31.0	37.2	30.5	44.3	11.4	76.7	-	-	-	-	-	-
Groundnut	-	-	-	-	-	-	10.5	6.7	-	-	3.2	7.4
Meneri	-	-	-	-	-	-	39.5	-	-	-	-	-

Appendix.12

REASONS FOR PREFERING TO CULTIVATE A CROP DURING YALA

Crop	Reasons	Anuradhapura						Vavuniya				Hambantota		Mahaweli project			
		Palayakulama		Halmillakulama		Mahakanadarawa		Mahawilachchiya		Chettikulam		Pavatkulam		Gonnoruwa		Attanakadewela		Bakamuna	
		No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%
Cowpea	High income	1	16.7	3	27.3	8	29.6	3	60.0	-	-	-	-	-	-	11	55.0	-	-
	Less water needed/	3	50.0	3	27.3	5	18.5	3	60.0	-	-	-	-	-	-	-	-	-	-
	Resistant to draught	-	-	1	9.1	8	29.6	4	80.0	-	-	-	-	-	-	-	-	-	-
	For consumption	2	33.3	3	27.3	2	7.4	4	80.0	-	-	-	-	-	-	6	30.0	-	-
	For sale	-	-	1	9.1	-	-	1	20.0	-	-	-	-	-	-	2	10.0	-	-
	Other	1	16.7	2	18.2	4	14.8	-	-	-	-	-	-	-	-	2	10.0	-	-
	Total responses	6	100.	11	100.	27	100.	5	100.	-	-	-	-	-	-	20	100.	-	-
Paddy	For consumption	7	77.8	-	-	-	-	7	77.8	15	100	-	-	-	-	12	85.7	6	66.7
	High income	1	11.1	-	-	-	-	1	11.1	-	-	-	-	-	-	3	21.4	-	-
	Other	2	22.2	-	-	-	-	1	11.1	-	-	-	-	-	-	1	7.1	6	66.7
	Total responses	9	100.	-	-	-	-	9	100.	15	100	-	-	-	-	1.4	100.	9	100.
Chilli	High income	-	-	-	-	-	-	-	-	14.	100	-	-	-	-	26	92.9	21	91.3
	Other	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	14.3	4	17.4
	All responses	-	-	-	-	-	-	-	-	14	100	-	-	-	-	28	100.	23	100.
Gingelly	Consumption	1	6.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	For sale	4	26.7	3	13.6	3	9.4	7	20.0	-	-	2	7.4	-	-	-	-	-	-
	High income	1	6.7	2	9.1	2	6.2	1	2.9	-	-	-	-	-	-	-	-	-	-
	Less water needed	3	20.0	2	9.1	3	9.4	7	20.0	11	91.7	5	18.5	-	-	-	-	-	-
	Resistant to draught	3	20.0	12	54.5	14	43.8	24	68.6	-	-	24	88.9	-	-	-	-	-	-
	Only possible crop	3	20.0	3	13.6	2	6.2	6	17.1	-	-	-	-	-	-	-	-	-	-
	Others	2	13.3	1	4.5	6	18.8	-	-	1	8.3	-	-	-	-	-	-	-	-
	Total responses	15	100.	22	100.	32	100.	35	100.	12	100.	27	100.	-	-	-	-	-	-
Meneri	For consumption	-	-	-	-	-	-	-	-	-	-	-	-	6	35.3	-	-	-	-
	Less water needed	-	-	-	-	-	-	-	-	-	-	-	-	7	41.2	-	-	-	-
	Suitable for the area	-	-	-	-	-	-	-	-	-	-	-	-	2	11.7	-	-	-	-
	Others	-	-	-	-	-	-	-	-	-	-	-	-	2	11.7	-	-	-	-
	Total responses	-	-	-	-	-	-	-	-	-	-	-	-	17	100.	-	-	-	-
Groundnut	High income	-	-	-	-	-	-	-	-	-	-	-	-	4	50.0	-	-	10	66.7
	Consumption	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	20.0
	Less water needed	-	-	-	-	-	-	-	-	-	-	-	-	5	62.5	-	-	-	-
	Other	-	-	-	-	-	-	-	-	-	-	-	-	1	12.5	-	-	5	33.3
	All responses	-	-	-	-	-	-	-	-	-	-	-	-	8	100.	-	-	15	100.

Appendix 13 - Number, Total Extent and Average Extent of Chena Crop Holdings on which Costs of Cultivation and Returns were Based

Crop		Anuradhapura				Vavuniya		Hambantota		Badulla
		Palayakulama	Halmillakulama	Mahakanadarawa	Mahavilachchiya	Chettikulam	Pavatkulam	Gonnoruwa	Magama	Gemunupura/ Tissapura
Kurakkan	n	21	11	40	33	6	10	24	9	5
	Σx	27.00	10.50	54.75	41.25	8.75	15.00	48.25	6.75	3.50
	$\bar{x}$	1.29	0.95	1.37	1.25	1.46	1.50	2.01	0.75	0.70
Maize	n	14	15	19	43	6		17	14	12
	Σx	14.00	11.00	14.14	46.63	2.26		7.81	5.31	11.50
	$\bar{x}$	1.00	0.73	0.74	1.08	0.38		0.46	0.38	0.96
Cowpea	n	13	17	20	37	6		15	11	5
	Σx	8.50	7.75	9.87	27.50	2.75		3.14	4.42	2.50
	$\bar{x}$	0.65	0.46	0.49	0.74	0.46		0.21	0.40	0.50
Greengram	n							17	13	
	Σx							5.45	13.51	
	$\bar{x}$							0.32	1.04	
Blackgram	n			12			11			
	Σx			6.91			56.50			
	$\bar{x}$			0.58			5.14			
Chilli	n	6	20		17				14	
	Σx	6.25	20.25		23.38				20.75	
	$\bar{x}$	1.04	1.01		1.38				1.48	

n denotes number of holdings, Σx denotes total extent in acres, $\bar{x}$ denotes average extent of holding in acres

Appendix 14 - Number, Total Extent and average Extent of Highland Crop Holdings on which Costs of Cultivation and Returns were Based

Crop		Anuradhapura				Vavuniya		Hambantota	Badulla
		Palayakulama	Halmillakulama	Mahakanadarawa	Mahavilachchiya	Chettikulam	Pavatkulam	Gonnoruwa	Gemunupura/ Tissapura
Kurakkan	n			12		10			5
	Σ x			5.96		9.37			1.13
	$\bar{x}$			0.50		0.94			0.23
Maize	n			14	15			6	24
	Σ x			5.70	7.38			1.66	11.63
	$\bar{x}$			0.41	0.49			0.28	0.48
Cowpea	n	6	8	28	27	15		6	12
	Σ x	5.25	5.75	8.49	13.98	5.89		2.76	3.00
	$\bar{x}$	0.88	0.72	0.30	0.52	0.39		0.46	0.25
Greengram	n					7			
	Σ x					3.38			
	$\bar{x}$					0.48			
Blackgram	n			5		26	15		
	Σ x			1.33		140.13	22.75		
	$\bar{x}$			0.27		5.39	1.52		
Chilli	n				6				
	Σ x				2.38				
	$\bar{x}$				0.40				

n denotes number of holdings, Σ x denotes total extent in acres, $\bar{x}$ denotes average extent of holding in acres

Appendix 15 - Number, Total Extent and Average Extent of Lowland Crop Holdings on which Costs of Cultivation and Returns were Based

		Elahera Project	
		Attanakadawala	Bakamuna
Cowpea	n	7	14
	Σ x	9.13	5.01
	$\bar{x}$	0.45	0.36
Greengram	n	5	10
	Σ x	2.13	2.75
	$\bar{x}$	0.43	0.28
Chilli	n	15	14
	Σ x	19.75	12.62
	$\bar{x}$	1.32	0.90

Appendix 16a - Wage Rates[1] - Chena Cultivation Maha 76/77

Crop	Anuradhapura				Vavuniya		Hambantota		Badulla
	Palayakulama	Halmillakulama	Mahakanadarawa	Mahavilachchiya	Chettikulam	Pavatkulam	Gonnoruwa	Magama	Gemunupura/ Tissapura
Kurakkan	7.50	7.75	7.00	7.75	9.50	8.00	6.00	6.00	6.50
Maize	7.00	7.00	5.75	7.50	10.50		6.00	6.75	5.00
Cowpea	7.00	9.50	7.25	6.50	9.25		6.75	7.25	7.00
Greengram							5.50	7.00	
Blackgram			7.25			10.00			
Chilli	7.50	8.50		7.75			7.25	7.25	

1 Average wage rate = $\frac{\text{Total cash payment for hired labour}}{\text{Total no. of mandays of hired labour}}$

Appendix 16b - Wage Rates[1] - Highland Cultivation Maha 76/77

Crop	Anuradhapura				Vavuniya		Hambantota	Badulla
	Palayakulama	Halmillakulama	Mahakanadarawa	Mahavilachchiya	Chettikulam	Pavatkulam	Gonnoruwa	Gemunupura/ Tissapura
Kurakkan			7.75		8.75			5.50
Maize			8.00	9.50			7.50	5.25
Cowpea	8.00	8.00	7.75	6.50	9.50		8.00	5.00
Greengram					5.50			
Blackgram			7.75		12.25	10.00		
Chilli				6.25				

1 Average wage rate - $\frac{\text{Total cash payment for hired labour}}{\text{Total No. of mandays of hired labour}}$

Appendix 17a - Wage Rates Including Cost of Food Provided[1] - Chena Cultivation (Maha 76/77)

Crop	Anuradhapura				Vavuniya		Hambantota		Badulla
	Palayakulama	Halmillakulama	Mahakanadarawa	Mahavilachchiya	Chettikulam[2]	Pavatkulam[2]	Gonnoruwa	Magama	Gemunupura/ Tissapura
Kurakkan	10.00	10.50	9.50	10.75	10.00	8.00	9.75	9.75	9.00
Maize	10.00	10.75	7.25	9.25	10.75		9.00	12.25	7.25
Cowpea	8.25	9.50	9.25	8.50	9.25		10.00	12.25	8.50
Greengram							9.75	12.75	
Blackgram			9.75			10.25			
Chilli	9.75	9.75		9.75			12.75	12.75	

1 Average wage rate - $\frac{\text{Total expenses on hired labour}}{\text{Total No. of mandays of hired labour}}$

2 Food is not generally provided in this area

Appendix 17b - Wage Rates Including Cost of Food Provided[1] - Highland (Maha 76/77)

Crop	Anuradhapura				Vavuniya		Hambantota	Badulla
	Palayakulama	Halmillakulama	Mahakanadarawa	Mahavilachchiya	Chettikulam[2]	Pavatkulam[2]	Gonnoruwa	Gemunupura/ Tissapura
Kurakkan			10.00		8.75			9.50
Maize			11.25	13.25			12.50	8.50
Cowpea	10.75	8.00	9.75	8.75	9.50		9.25	7.75
Greengram					5.50			
Blackgram			9.50		12.25	10.00		
Chilli				8.50				

1 Average wage rate - $\frac{\text{Total expenses on hired labour}}{\text{Total no. of mandays of hired labour}}$

2 Food is not generally provided in this area

Appendix 18 - A Note on the Computations of Indices of Returns

Gross returns/acre = $y \times p$

y denotes the average yield/acre, and
p the average selling price per unit of produce

Net return/acre = $y \times p$ - Costs/acre

= $y \times p - (c_f + c_h + c_o)$

where c_f, c_h and c_o denote costs of family labour, cost of hired labour and other expenses[1] respectively.

$c_h = n_h \times w_h$ $\quad c_f = n_f \times w_f$

where n_h, n_f denote number of hired labour and family labour units respectively.

w_h denotes the hired labour wage rate and w_f the opportunity cost of a family labour unit

$c_c = c_h + c_o$

and c_c denotes costs incurred mainly in cash for payment of hired labour draught power use and material inputs.

Net return/acre = $y \times p - (nw_h + c_o)$

(family labour valued at hired labour wage rate)

n denotes total labour units

$n = n_f + n_h$

Net return/acre = $y \times p - c_c$

(assuming that family labour has no opportunity cost)

Return for a unit of family Labour $\quad \frac{y \times p - c_c}{n_f} = \frac{y \times p - c_c}{n_f}$ - Cash investment is recovered without interest and balance considered as accruing to the family labour investment

Return/unit of cash $\quad \frac{yp - c_f}{c_c}$

Wages for the family labour investment is recovered at the prevailing wage rate for hired labour and balance is the gross return for total cash investment.

Gross return/unit of cash (attaching zero value to family labour + owned inputs) $\quad \frac{y \times p}{c_c}$

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1 C_o includes imputed value of own seeds and own tractor use, but excludes value of own buffalo use. Buffaloes were hardly used in the cultivation of the crop on unirrigated land.

Appendix 19 - Wage Rates (Lowland)

Crop	Elahera Project	
	Attanakadawala	Bakamuna
Cowpea	4.75	5.00
Greengram	5.25	5.25
Chilli	5.25	5.50

Wage rates (Lowland - including cost for food)

Crop	Elahera Project	
	Attanakadawala	Bakamuna
Cowpea	8.50	9.00
Greengram	9.50	8.25
Chilli	9.50	10.00

Appendix 20a - Percentage of (1) farmers utilising
(2) produce marketed, through various channels in Maha 76/77

Crop : Kurakkan

Channels of Marketing	Anuradhapura								Vavuniya		Badulla			
	Palayakulama		Halmillakulama		Mahakanadarawa		Mahavilachchiya		Chettikulam		Mapakadawewa		Gemunupura/ Tissapura	
	N-2 Q-10.0		N-2 Q-13.0		N-19 Q-114.2		N-6 Q-32.0		N-4 Q-12.9		N-2 Q-1.3		N-10 Q-21.2	
	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Fair	-	-	-	-	-	-	-	-	-	-	-	-	40.0	22.2
Assembly Agent	-	-	-	-	21.1	18.4	16.7	18.8	-	-	-	-	10.0	14.2
Trucker Buyer	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Marketing Department	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Co-operative society	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Markfed	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Village Boutique Keeper	-	-	*	*	84.2	81.6	83.3	81.3	*	*	*	*	50.0	63.7
Commission Agent	-	-	-	-	-	-	-	-	*	*	-	-	-	-
Agricultural Extension Centre	*	*	-	-	-	-	-	-	-	-	-	-	-	-

* Percentages not computed as no. of farmers reporting sales, were less than five.
N denotes number of farmers reporting sales.
Q denotes quantity sold in bushels.

Appendix 20b - Percentage of (1) farmers utilising
(2) produce marketed, through various channels in Maha 76/77

Crop: Maize

Channels of marketing	Anuradhapura								Vavuniya				Hambantota		Badulla			
	Palayakulama		Halmillakulama		Mahakanadarawa		Mahavilachchiya		Chettikulam		Pavatkulam		Magama		Mapakadawewa		Gemunupura/ Tissapura	
	N-16	Q-271.0	N-37	Q-394.5	N-36	Q-290.0	N-58	Q-886.0	N-4	Q-9.9	N-1	Q-3.0	N-1	Q-7.1	N-16	Q-48.7	N-36	Q-142.0
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Fair	-	-	-	-	-	-	-	-	-	-	-	-	-	-	87.5	59.9	63.9	43.7
Assembly Agent	31.3	38.9	18.9	15.1	19.4	20.1	6.9	6.1	-	-	-	-	-	-	6.3	15.4	2.8	4.1
Trucker Buyer	-	-	2.7	1.0	-	-	1.7	5.8	-	-	-	-	-	-	-	-	-	-
Marketing Department	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Co-operative Society	18.8	8.1	45.9	60.1	52.8	62.3	67.2	76.9	-	-	-	-	-	-	-	-	11.1	25.7
Markfed	-	-	-	-	5.6	1.8	-	-	-	-	-	-	-	-	-	-	-	-
Village Boutique Keeper	31.3	21.8	43.2	22.6	38.9	15.7	29.3	11.2	*	*	*	*	*	*	50.0	24.6	25.0	23.4
Commission Agent	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Agricultural Extension Centre	18.8	31.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

* Percentages not computed as no. of farmers reporting sales, were less than five.
N denotes number of farmers reporting sales.
Q denotes quantity sold in bushels.

Appendix 20c - Percentage of (1) farmers utilising
(2) Produce marketed, through various channels in Maha 76/77

Crop - Greengram

Channels of Marketing	Anuradhapura						Vavuniya		Hambantota				Badulla	
	Palayakulama		Mahakanadarawa		Mahavilachchiya		Chettikulam		Gonnoruwa		Magama		Mapakadawewa	
	N-3 %	Q-5.9 %	N-4 %	Q-8.6 %	N-2 %	Q-4.2 %	N-2 %	Q-3.1 %	N-16 %	Q-67.1 %	N-8 %	Q-83.4 %	N-2 %	Q-0.1 %
Fair	-	-	-	-	-	-	-	-	87.5	89.9	-	-	*	*
Assembly Agent	-	-	*	*	-	-	-	-	6.3	0.9	62.5	94.4	-	-
Trucker Buyer	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Marketing Department	-	-	-	-	-	-	-	-	6.3	1.5	-	-	-	-
Co-operative Society	*	*	-	-	*	*	-	-	6.3	1.6	-	-	-	-
Markfed	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Village Boutique Keeper	*	*	*	*	*	*	*	*	12.5	6.1	37.5	5.6	-	-
Commission Agent	*	*	-	-	-	-	-	-	-	-	-	-	-	-
Agricultural Extension Centre	-	-	-	-	-	-	-	-	-	-	-	-	-	-

* Percentages not computed as no. of farmers reporting sales, were less than five.
N denotes number of farmers reporting sales.
Q denotes quantity sold in bushels.

Appendix 20d - Percentage of (1) farmers utilising
(2) produce marketed, through various channels in Maha 76/77

Crop - Blackgram

Channels of Marketing	Anuradhapura								Vavuniya				Hambantota		Badulla			
	Palayakulama		Halmillakulama		Mahakanadarawa		Mahavilachchiya		Chettikulam		Pavatkulam		Gonnorwa		Mapakadawewa		Gemunupura/ Tissapura	
	N-4	Q-11.6	N-2	Q-5.0	N-27	Q-172.2	N-7	Q-13.0	N-32	Q-1445.6	N-25	Q-367.7	N-1	Q-35.0	N-1	Q-0.3	N-2	Q-0.4
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Fair	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	*	*
Assembly Agent	*	*	*	*	22.2	27.1	-	-	9.4	2.5	20.0	5.1	-	-	-	-	-	-
Trucker Buyer	-	-	*	*	3.7	17.4	-	-	-	-	4.0	1.1	-	-	-	-	-	-
Marketing Department	-	-	-	-	3.7	2.5	-	-	-	-	-	-	*	*	-	-	-	-
Co-operative Society	*	*	-	-	-	-	14.3	3.9	3.1	1.0	-	-	-	-	-	-	-	-
Markfed	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	*
Village Boutique Keeper	*	*	-	-	66.7	36.1	85.7	96.2	9.4	3.1	28.0	14.9	-	-	*	*	-	-
Commission Agent	*	*	-	-	7.4	16.8	-	-	3.1	2.8	-	-	-	-	-	-	-	-
Agricultural Productivity Committee	-	-	-	-	-	-	-	-	81.3	88.7	68.0	78.9	-	-	-	-	-	-
Mill	-	-	-	-	-	-	-	-	3.1	1.9	-	-	-	-	-	-	-	-

* Percentages not computed as no. of farmers reporting sales, were less than five.
N denotes number of farmers reporting sales,
Q denotes quantity sold in bushels.

Appendix 20e - Percentage of (1) farmers utilising
(2) produce marketed, through various channels in Maha 76/77

Crop - Cowpea

Channels of Marketing	Anuradhapura								Vavuniya				Hambantota				Badulla			
	Palayakulama		Halmillakulama		Mahakanadarawa		Mahavilachchiya		Chettikulam		Pavatkulam		Gonnoruwa		Magama		Mapakadawewa		Gemunupura/ Tissapura	
	N-16	Q-82.0	N-20	Q-71.3	N-38	Q-101.9	N-38	Q-168.7	N-6	Q-23.7	N-1	Q-8.0	N-11	Q-32.7	N-5	Q-54.8	N-3	Q-0.3	N-13	Q-13.9
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Fair	-	-	15.0	13.3	-	-	2.6	0.4	-	-	-	-	72.7	45.4	20.0	1.8	*	*	69.2	48.9
Assembly Agent	25.0	21.9	20.0	21.7	21.1	17.7	7.9	5.4	-	-	-	-	9.1	32.7	60.0	31.9	-	-	-	-
Trucker Buyer	-	-	10.0	9.8	2.6	9.8	2.6	12.5	16.7	42.2	-	-	-	-	-	-	-	-	-	-
Marketing Department	6.3	3.0	-	-	-	-	-	-	-	-	-	-	-	-	20.0	55.5		-	-	-
Co-operative Society	6.3	1.5	-	-	2.6	9.8	21.1	32.9	-	-	-	-	9.1	5.5	-	-	-	-	7.7	7.2
Markfed	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Village Boutique	56.3	40.1	55.0	55.1	73.7	62.7	65.8	48.8	50.0	29.5	*	*	9.1	16.4	40.0	10.9	*	*	23.1	38.8
Commission Agent	6.3	13.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Agricultural Extension Centre	12.5	19.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mill	-	-	-	-	-	-	-	-	33.3	28.3	-	-	-	-	-	-	-	-	-	-
Neighbours	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.7	5.0

* Percentages not computed as no. of farmers reporting sales, were less than five.
N denotes number of farmers reporting sales.
Q denotes quantity sold in bushels.

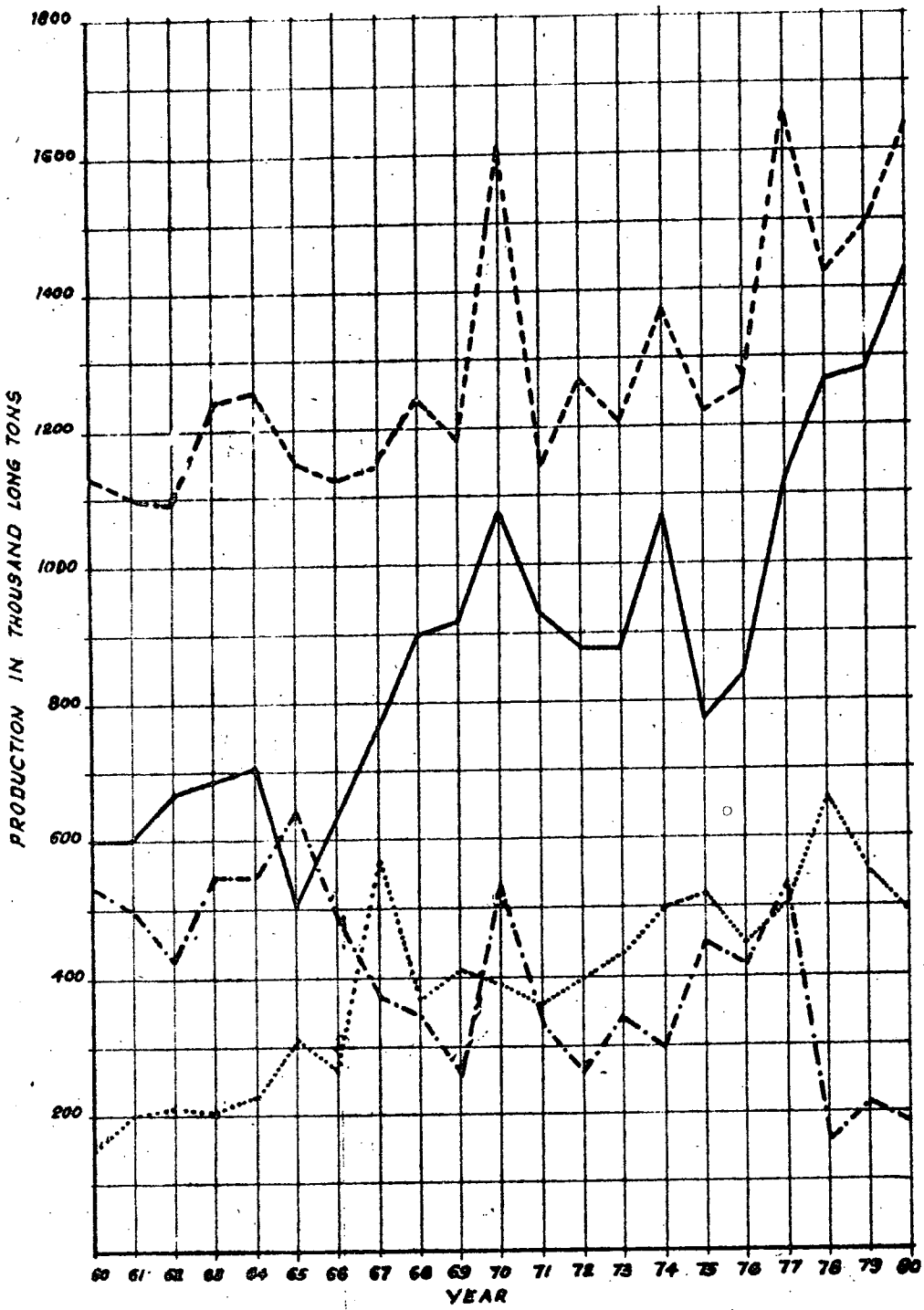
Appendix 21 - Ranking of Major Constraints for production of crops (Average Scores)

	Anuradhapura				Vavuniya		Hambantota		Badulla		Elahera Project	
	Palayakulama	Halmillakulama	Mahakanadarawa	Mahavilachchiya	Chettikulam	Pavatkulam	Gonnoruwa	Magama	Mapakadaweva	Gemunupura/ Tissapura	Attanakadawala	Bakamuna
KURAKKAN												
Land shortage	0.7	1.1	0.4	0.6	0.1	0.2	0.1	0.4	0.4	0.6	-	0.1
Labour shortage	1.0	0.2	0.6	0.6	0.9	0.4	0.5	0.2	0.3	*	-	0.1
Lack of funds	0.9	1.1	1.0	0.9	0.5	0.4	1.3	0.9	1.3	0.4	*	-
Lack of knowledge about prices	0.1	-	0.1	-	-	-	-	-	0.1	*	-	-
Lack of marketing facilities	0.7	0.5	0.4	0.7	*	0.3	1.1	0.6	0.4	0.2	0.2	-
Lack of water	*	0.8	0.2	0.6	-	-	0.9	0.8		0.2	0.1	-
Difficulties in obtaining seeds	0.1	0.1	-	-	-	-	0.1	-		-	-	-
Lack of road facilities	0.1	-	-	-	-	-	-	-	1.0**	-	-	-
Lack of inputs (other than seed)	0.1	-	-	-	-	-	0.1	-		-	-	-
Lack of agricultural implements	-	0.1	-	-	-	-	0.2	-		-	-	-
Damage by insects and pests	-	0.1	-	-	-	-	0.2	-		-	-	-
Damage by animals	-	-	-	0.1	-	-	-	0.1		-	0.1	0.1
MAIZE												
Land shortage	0.4	1.1	0.2	0.7	*	-	0.1	0.6	0.5	1.6	0.1	0.3
Labour shortage	0.6	0.3	0.4	0.6	0.2	-	0.6	0.2	0.3	*	-	0.2
Lack of funds	0.8	1.4	1.1	1.2	0.2	0.2	1.4	1.4	1.9	0.8	-	*
Lack of knowledge about prices	0.2	*	0.1	-	0.1	-	-	-	0.1	0.1	-	-
Lack of marketing facilities	0.6	0.4	0.3	0.6	0.1	0.3	1.2	0.9	0.7	0.7	0.3	-
Lack of water	*	0.8	0.2	0.8	-	-	1.0	0.6		1.0	0.2	0.3
Difficulties in obtaining seeds	0.1	0.1	*	-	-	-	0.1	-		0.2	-	-
Lack of road facilities	0.1	-	*	-	-	-	-	*		-	-	-
Lack of inputs (other than seed)	0.1	-	-	*	-	-	0.1	-		0.1	0.1	-
Lack of agricultural implements	0.2	-	*	*	-	-	0.2	*	2.1**	0.1	-	-
Damage by insects and pests	0.1	-	*	-	-	-	0.2	-		-	-	-
Damage by animals	-	-	*	0.1	-	-	-	0.1		0.1	0.1	0.1
Unavailability of tractors	0.1	-	-	-	*	-	-	-	-	-	0.1	-
Excessive rain	-	-	-	-	-	-	-	-		0.2	-	-
Crop diseases	-	-	-	-	-	-	-	-	-	0.1	-	-
Shortage of buffaloes	-	-	-	-	-	-	-	-	-	-	-	0.1
Difficulties in processing	-	-	-	-	-	-	-	-	-	-	-	0.1
GREENGRAM												
Land shortage	0.2	0.1	0.1	0.1	0.2	-	0.1	0.5	0.3	0.6	0.7	0.7
Labour shortage	0.1	-	0.2	*	0.2	-	0.2	0.2	0.1	0.1	0.1	0.3
Lack of funds	0.4	0.2	0.4	0.1	0.4	-	1.2	1.0	1.1	0.2	0.3	0.3
Lack of knowledge about prices	-	-	0.1	-	-	-	-	-	-	*	*	0.1
Lack of marketing facilities	0.2	0.1	0.2	*	0.2	-	1.2	1.8	0.6	0.1	0.4	-
Lack of water	0.1	0.1	0.1	0.1	0.1		0.9	0.7		0.4	0.6	0.3
Difficulties in obtaining seeds	0.1	-	*	-	-	-	-	0.2		0.1	-	-
Lack of road facilities	-	-	-	-	-	-	-	*		-	-	-
Lack of inputs (other than seed)	-	-	*	-	-	-	0.1	-		*	0.1	0.1
Lack of agricultural implements	-	-	-	*	-	-	0.3	*	1.2**	*	-	-
Damage by insects and pests	-	-	-	-	-	-	0.2	-		-	-	-
Damage by animals	-	-	-	-	-	-	-	0.2		*	0.1	-
Unavailability of tractors	0.1	-	-	-	-	-	-	-		-	-	-
Excessive rain	-	-	-	-	-	-	-	-		0.1	-	-
Crop diseases	-	-	-	-	-	-	-	-		0.1	-	-
Shortage of buffaloes	-	-	-	-	-	-	-	-	-	-		0.1
Difficulties in processing	-	-	-	-	-	-	-	-	-	-	-	0.1
BLACKGRAM												
Land shortage	0.1	0.1	0.1	0.3	0.1	0.6	-	0.2	-	0.3	-	0.2
Labour shortage	0.2	-	0.3	0.1	2.1	0.7	-	-	*	*	-	0.1
Lack of funds	0.5	0.3	0.5	0.3	1.8	1.4	0.1	0.4	-	0.1	-	0.1
Lack of knowledge about prices	-	-	0.1	-	*	-	-	-	-	*	0.1	-
Lack of marketing facilities	0.2	0.1	0.4	0.1	0.2	0.2	0.2	0.3	-	0.1	-	-
Lack of water	0.1	0.2	0.1	0.1	0.3	-	0.1	-		0.2	0.3	0.1
Difficulties in obtaining seeds	0.1	-	0.1		-	-	-	-		0.1	-	-
Lack of road facilities	0.1	-	-	-	-	-	-	-		-	-	-
Lack of inputs (other than seed)	0.1	-	-	-	-	-	*	-		*	0.1	-
Lack of agricultural implements	-	-	-	-	-	-	0.1	-		*	-	-
Damage by insects and pests	-	-	-	-	-	-	0.1	-		*	0.1	-
Damage by animals	-	-	-	-	-	-	-	-	0.5**	*	0.1	-
Unavailability of tractors	0.1	-	-	-	-	-	-	-		-	*	-
Excessive rain	-	-	-	-	-	-	-	-		0.1	-	-
Shortage of buffaloes	-	-	-	-	-	-	-	-		-	-	0.1
No guaranteed price scheme	-	-	-	-	-	-	-	-		-	-	0.1
COWPEA												
Land shortage	0.6	1.0	0.4	0.7	-	0.3	0.1	0.3	0.2	1.2	0.6	0.6
Labour shortage	0.6	0.3	0.6	0.6	0.5	0.1	0.5	0.1	0.1	0.1	0.2	0.4
Lack of funds	0.6	1.2	1.1	1.2	0.5	0.4	1.3	1.2	0.8	0.7	0.5	0.1
Lack of knowledge about prices	0.1	-	0.1	-	-	-	-	-	0.1	0.1	0.1	0.2
Lack of marketing facilities	0.7	0.4	0.6	0.6	0.1	0.2	1.2	0.9	0.3	0.6	0.7	-
Lack of water	0.1	0.6	0.3	0.5	-	-	0.8	0.6		0.8	1.0	0.5
Difficulties in obtaining seeds	0.1	-	0.1	-	-	-	0.1	-		0.2	-	-
Lack of road facilities	0.1	-	-	-	-	-	-	0.1		-	-	-
Lack of inputs (other than seed)	0.1	-	*	-	-	-	0.1	-		0.1	0.2	*
Lack of agricultural implements	-	0.1	0.1	*	-	-	0.2	-		0.1	-	-
Damage by insects and pests	-	0.1	-	-	-	-	0.2	-		-	-	-
Damage by animals	-	*	0.1	*	-	-	-	0.1	0.7**	0.1	0.2	0.3
Unavailability of tractors	0.1	-	-	-	0.1	-	-	-		-	0.2	-
Excessive rain	-	-	-	-	-	-	-	-		0.2	-	-
Crop diseases	-	-	*	*	-	-	-	-		0.1	-	-
Shortage of buffaloes	-	-	-	-	-	-	-	-		-	-	-
No guaranteed price scheme	-	-	-	-	-	-	-	-		-	-	0.1
Lack of storage facilities	0.1	-	-	-	-	-	-	-		-	-	-
Difficulties in processing	-	-	-	-	-	-	-	-		-	-	0.1

** Mainly lack of water

Based on 3 major constraints ranked in order of importance. Scores being computed for each constraint, ranging from 1-3 -1st - 3, 2nd - 2, 3rd - 1

Figure 11 PRODUCTION AND IMPORTS OF RICE AND IMPORTS OF WHEAT FLOUR *



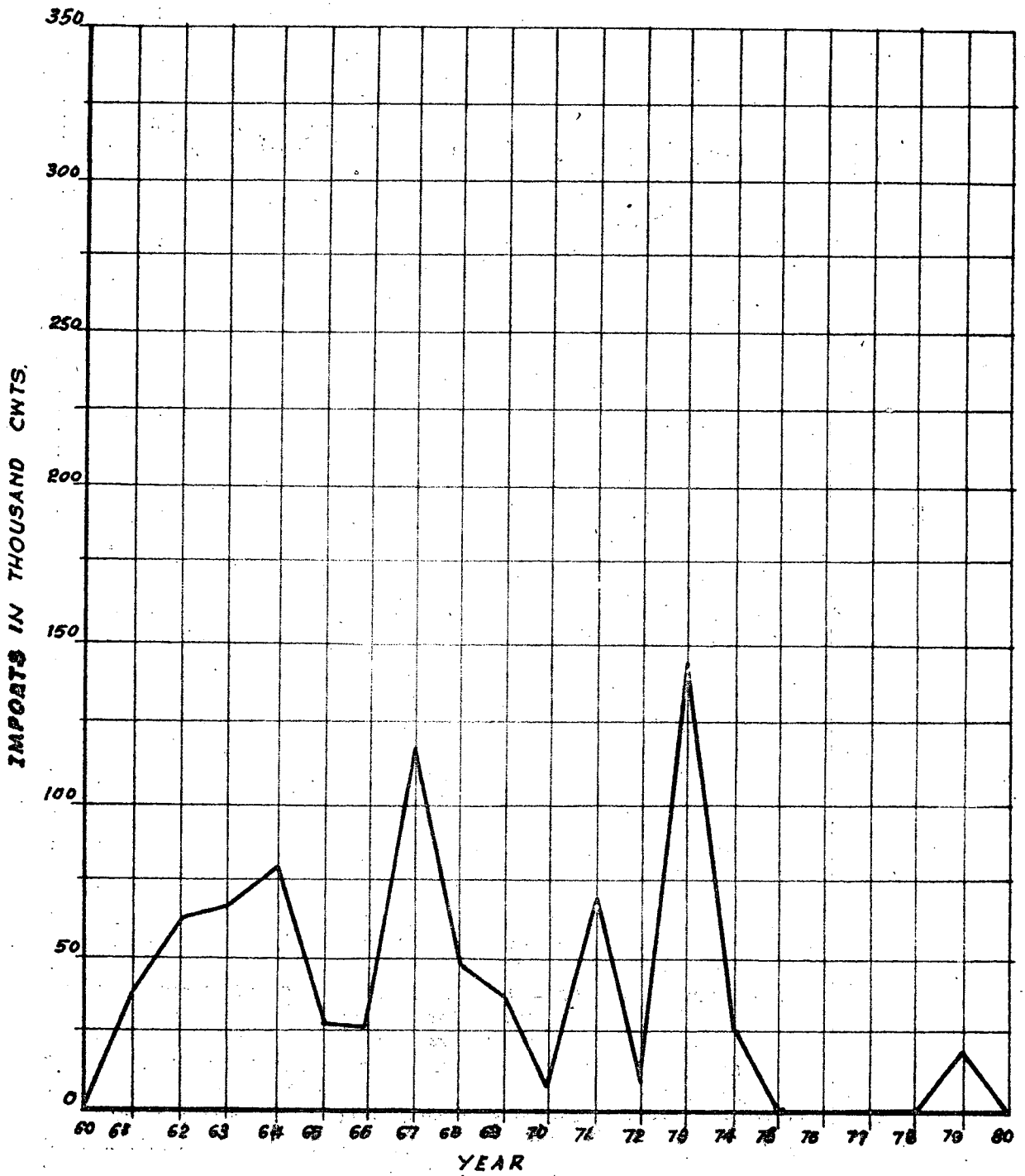
SOURCES OF INFORMATION - RICE - MINISTRY OF AGRICULTURE AND CUSTOMS RETURNS.
WHEAT FLOUR - FOOD COMMISSIONER, CUSTOMS RETURNS,
1978 FIGURE - FOOD BALANCE SHEET.

* INCLUDES FLOUR EQUIVALENT OF WHEAT IMPORTS (1 TON OF WHEAT = 0·72 TONS OF WHEAT FLOUR).

- - - - - PRODUCTION + IMPORTS OF RICE
——— PRODUCTION OF RICE ..... IMPORTS OF WHEAT FLOUR -·-·-·- IMPORTS OF RICE

Figure III

IMPORTS OF MAIZE

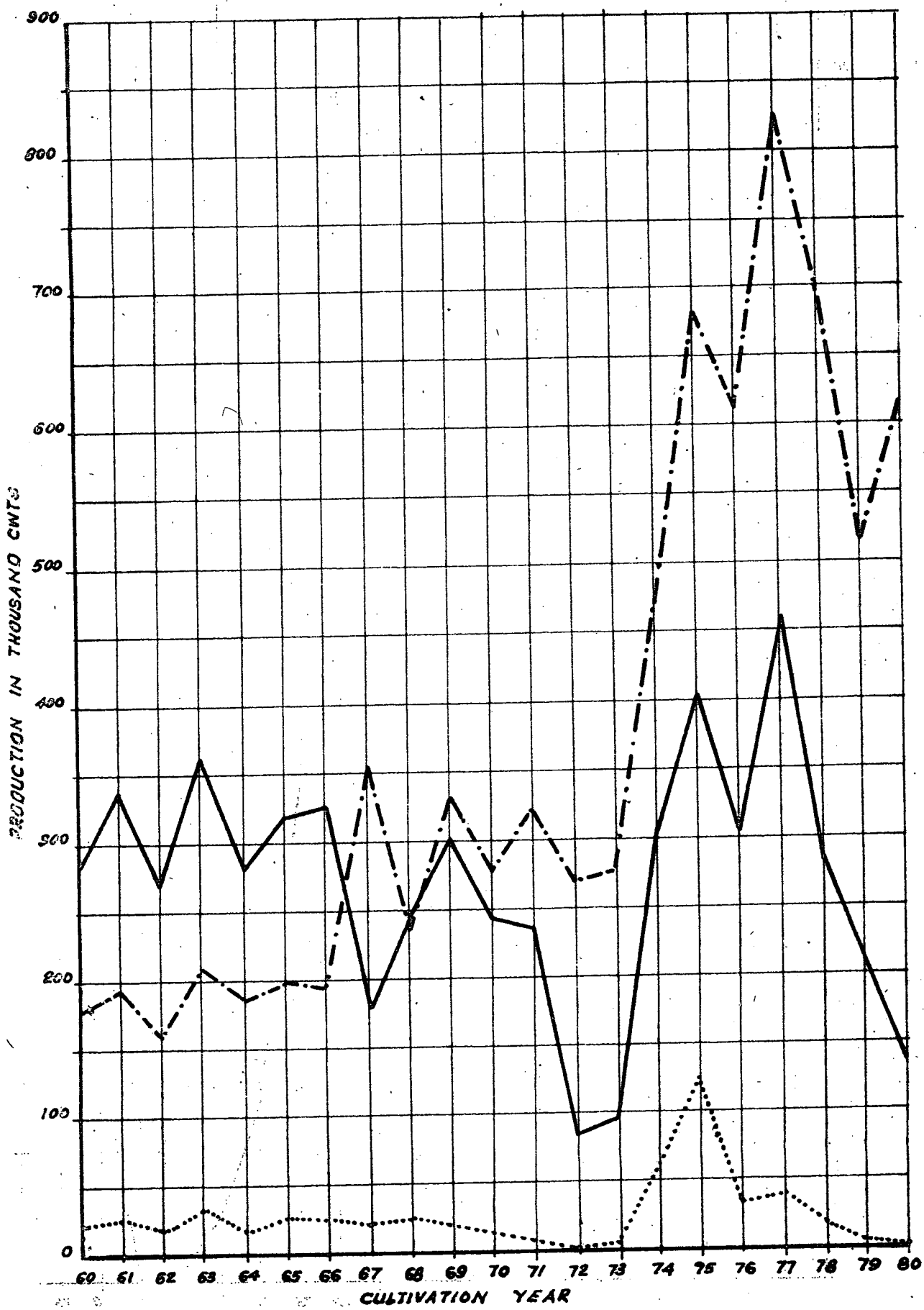


SOURCE OF INFORMATION

– MINISTRY OF AGRICULTURE

Figure IV

PRODUCTION OF MAIZE, SORGHUM AND KURAKKAN

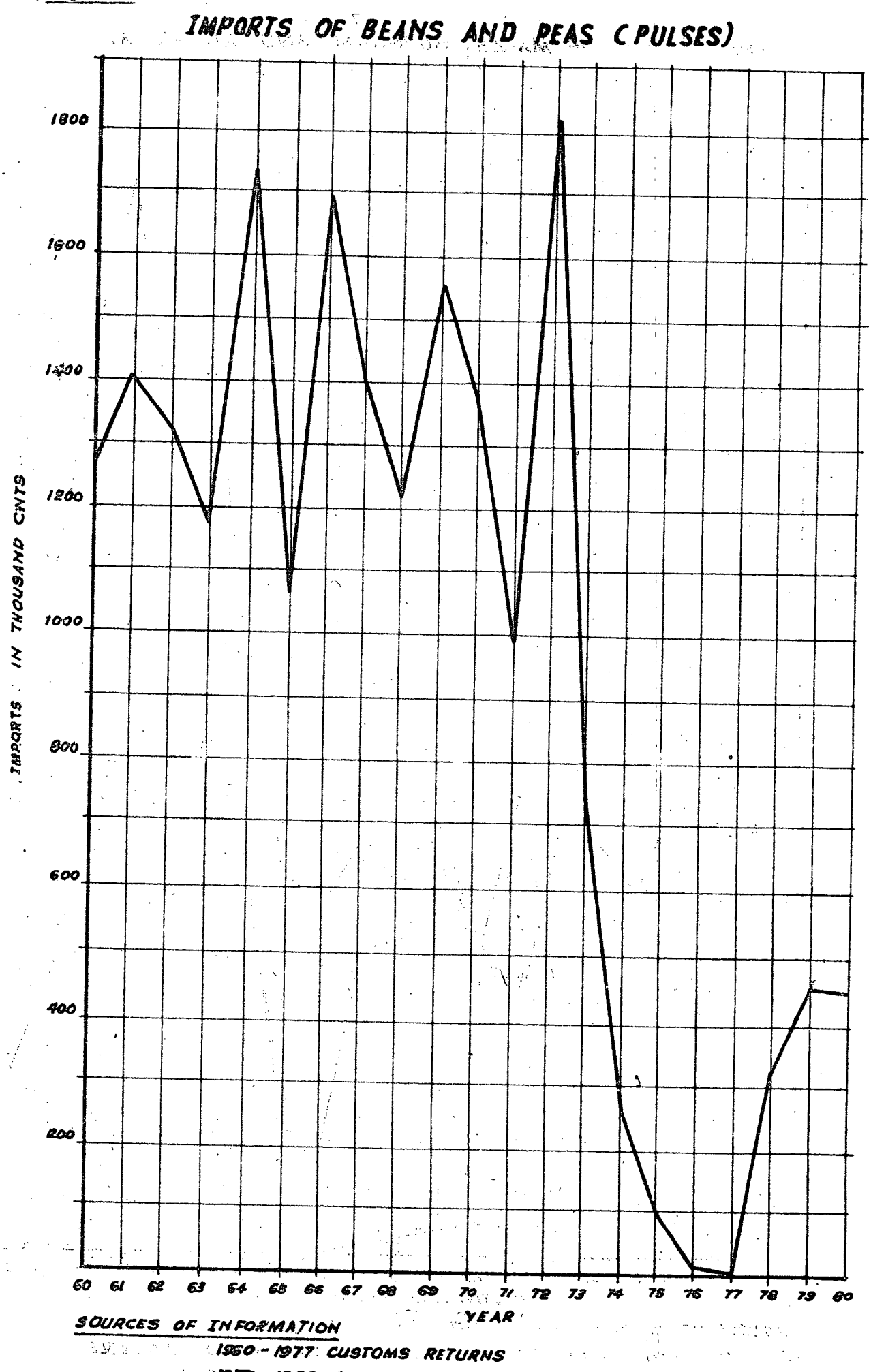


SOURCE OF INFORMATION - MINISTRY OF AGRICULTURE

1969 AND 1971 PRODUCTION FIGURES FOR SORGHUM NOT AVAILABLE.

-.-.-.- MAIZE ——— KURAKKAN ..... SORGHUM

Figure V



SOURCES OF INFORMATION

1960 - 1977 CUSTOMS RETURNS

1977 - 1980 CWE.

Figure VI PRODUCTION OF COWPEA, GREENGRAM, BLACKGRAM AND SOYABEANS