KIRINDI OYA

IRRIGATION SETTLEMENT PROJECT

DIETARY INTAKE AND NUTRITION STATUS SURVEY

RESEARCH STUDY No. 70

May 1986

AGRARIAN RESEARCH AND TRAINING INSTITUTE,
114, Wijerama Mawatha, Colombo 7.

SRI LANKA

KIRINDI OYA IRRIGATION AND SETTLEMENT PROJECT

Dietary Intake and Nutrition Status Survey

Mrs. Indra Tudawe

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FOREWORD

The Agrarian Research & Training Institute was entrusted with the responsibility for benefit monitoring and evaluation of the Kirindi Oya Irrigation and Settlement Project by the Ministry of Lands & Land Development at the instance of the donor agencies. The evaluation plan prepared by the ARTI and accepted by the implementing and funding agencies had identified several studies to cover all the important aspects of the project. The first major study carried out in this connection was the baseline survey to assess the pre-project situation in the project area. In addition, there were a few component studies on such areas as agricultural credit, employment generation and economic efficiency of paddy farming.

This study on Dietary Intake and Nutritional Status of the population in the project area was undertaken at the very beginning as improvement of health and nutritional status of the people was expected to be one of the most important impacts of the project. The field survey was conducted in 1980/81 Maha season. However, due to certain unfortunate circumstances the analysis of the data and the writing of the report was unduly delayed. Ultimately, Mrs. Indra Tudawe who was associated with the survey as a student researcher before she joined the ARTI as a staff member had to re-anaylse the data and write this report in this form. I believe that the information and data provided in this report are of immense value not only to the Project Director of Kirindi Oya but also to the others who are interested in the nutritional status of the people in Sri Lanka.

I wish to record my appreciation of the work done by Mrs. Tudawe in this connection. If not for her effort this report may not have seen the light of the day in this form.

T.B. Subasinghe
DIRECTOR

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ABBREVIATIONS

1. Major two to four group
   - Paddy farms of land size of two to four acres under Major Irrigation Schemes

2. Minor two to four group
   - Paddy farms of land size of two to four acres under the Minor Irrigation Schemes

3. Minor less than two acre group
   - Paddy farms of land size of less than two acres under the Minor Irrigation Schemes

4. Labour group
   - Landless labour group

5. Pre and Post refer to the pre-harvest period and the post-harvest period

6. Consumption unit
   - The daily intake of energy and nutrient intake of a man between the ages of 20-34

7. Pre and Post less than Rs. 4.00 or pre and post / than Rs. 4.00
   - Consumption unit expenditure on food over pre and post harvest periods was less than Rs. 4.00

8. Pre / Rs. 4 and post Rs. 4-6
   - Consumption unit expenditure on food over pre-harvest was less than Rs. 4.00 and post-harvest was between Rs. 4-6

9. Pre and Post Rs. 4-6
   - Consumption unit expenditure on food over pre-harvest period was between Rs. 4-6

10. Pre Rs. 4-6 and Post over Rs. 6
    - Consumption unit expenditure on food over pre-harvest period was between Rs. 4-6 and post-harvest period over Rs. 6.00

Chapter One

INTRODUCTION

The Kirindi Oya Irrigation and Settlement Scheme is situated in the South Eastern Sector of the Dry Zone of Sri Lanka, in the Hambantota District. The main project area is within the Assistant Government Agent's Division of Hambantota, Tissamaharama (Hambantota District) and Tanamalvila of the Monaragala District. The dam and the reservoir of the irrigation scheme are located on the boundaries of Hambantota and Monaragala districts. The total project area covers 21,000 ha. and in the centre of this area is the major town of Tissamaharama.

1.1 THE OBJECTIVES AND STRATEGIES OF THE KIRINDI OYA PROJECT

The overall objectives of the Kirindi Oya project are;to raise agricultural productivity, to generate employment opportunities and to initiate a programme of land settlement. The undeveloped fertile land is the main natural resources which could be utilised for agricultural development with the provision of irrigation facilities.

The command area of the project covers about 12,934 ha. out of which nearly 4034 ha. have already been provided with irrigation facilities fed by the six major irrigation tanks under the existing Kirindi Oya scheme viz. Tissa Wewa, Weerawila Wewa, Deborawewa, Panagamuwa Wewa, and Badagiriya Wewa. The minor irrigation tanks in the area provide irrigation for approximately 337 ha. of land. The proposal envisages the rehabilitation of irrigation structures falling within the area coverd by the major irrigation tanks. The balance of nearly 8500 ha. falls within the proposed irrigation augmentation area where new settlements are planned for. This area consists of seven tracts on the right bank in the extent of 5000 ha. and five tracts on the left bank with extent of 3610 ha.

The large reservoir which the project plans to build, would have a capacity of about 200 million cubic metres and an associated system of distributory canals on both banks of the Kirindi Oya river. The project reservoir in conjunction with the existing major and minor irrigation tanks are expected to assure irrigation for double cropping of paddy annually, in the 4371 ha. of existing paddy land and 4,200 ha of new land. Water is also to be provided for a total of 5,506 ha. of upland for both the wet and dry seasons.(1)

The project proposes to settle nearly 8320 families. The new hamlets or villages in which these families are to be settled will be complete with the necessary infra-structure and will provide them with small farms with which to support themselves. The agricultural extension service is also to be enhanced with a view to ensure the full benefits from the irrigation and settlement facilities.

1.2 BENEFITS OF THE KIRINDI OYA PROJECT

The small farmers of the area are expected to benefit most from the project. It is expected that implementation of the project will generate a substantial increase in farm income over the subsistence level prevailing at present. The project aims to settle approximately 8,320 families, most of whom are landless labourers or shifting cultivators. In terms of employment it is estimated that the construction programme of the project would generate about 6.2 million man days of direct employment over seven years, and on completion of the project 0.8 million man days farm labour will be employed for intensive irrigated farming. At the rate of 250 days of employment per year, these are equivalent to about 3,500 jobs during construction period and thereafter 3,200 jobs annually. Once the project is completed and the targeted amount of land brought under multiple cropping of paddy and upland crops, it is expected that the increased paddy and cotton production will result in a foreign exchange cost saving of about U.S. dollars 8.2 million annually.(2)

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(1) Socio-economic survey of the Kirindi Oya Project area, Colombo, Ministry of Lands and Land Development, 1980.

(2) Appraisal Report - Kirindi Oya Irrigation and Settlement Project, Bangkok, Asian Development Bank, 1979.

1.3 AGRICULTURAL ACTIVITY

Hambantota is basically an agricultural district in which paddy - particularly irrigated paddy cultivation is predominant. The major irrigation scheme which is part of the existing Kirindi Oya System obtains the basic water supply from a diversion structure and canals located upstream of the reservoirs on the perennial Kirindi Oya. The minor tanks, are totally dependant on rain water.

Of the two seasons *Maha* and *Yala*, *Maha* season (from November to March) receives a greater proportion of rainfall and produces the major crop of the year. For instance, during *Maha* season, out of the total land irrigated for paddy, approximately 90 percent is grown and harvested under the major irrigation scheme, while the land under the minor irrigation scheme cultivates about 75 percent of land and harvests approximately 60 percent. However, during the *Yala* season, land cultivated under major and minor irrigation schemes are reduced by 50 percent and 25 percent respectively.

The paddy yields obtained during *Maha* from irrigated paddy land, especially those under the major irrigation scheme on average, are amongst the highest in the country. The assurance of water availability in this season attract farmers to invest on the necessary agricultural inputs to ensure a healthy crop. Although nearly all the paddy land under major irrigation schemes are supplied with water over the *Maha* period, some only obtain water every alternate *Yala* season.

Hence many farmers tend to seek casual employment to supplement their incomes and in some areas those unable to cultivate paddy, divert the use of such 'paddy' lands to cultivate subsidiary crops.

Most of the subsidiary food crops are grown in the tradi ional rain-fed *Chenas* or shifting cultivation which is done mainly in the *Maha* season, (from September to February). Crops such as pulses, vegetables and chillies are grown in *Maha* and gingelly (sesame) etc., in *Yala*.

1.4 MONITORING OF DIETARY INTAKE AND NUTRITIONAL STATUS OF PROJECT POPULATION

The Kirindi Oya Project is expected to generate employment and increase income of the target population. However, past experience in irrigation and settlement project has shown that initial benefits derived from the project are unevenly distributed among the target population as there tends to be 'pockets' within the target population that do not derive benefits to the same extent as do others. This is largely due to the uneven distribution of resources particularly ownership and control of land which profoundly influence the distribution of income.

Economic differentiation due to such resource constraints are often reflected in the household food intake and nutritional status of the target population. The reason being that low income households tend to cut back on the expenditure related to food intake thus resulting in adverse effects on the nutritional status of the householders.

Therefore assessing the nutritional status of the project 'beneficiaries' on a periodic basis is essential, first to ensure that until such time better distribution of benefits are achieved, such 'vulnerable groups' can be directed with some assistance through existing welfare programmes of the country. Secondly, such information would act as a guideline to policy makers/project implementors for necessary action so as to ensure that benefits intended by the project are accrued to the beneficiaries.

1.5 THE AR & TI STUDY

The AR & TI study on dietary intake and nutritional status is the first of three such surveys to be launched. The current survey assesses the baseline conditions of the project population with regard to the said indicators and the other two surveys will be conducted during the mid and post project periods.

The study grouped the project community on the basis of the most relevant indicators of social and economic conditions of the area viz. employment, land size and type of irrigation facilities. An AR & TI study on Kirindi Oya baseline Socio-Economic situation

These are,

(a) Paddy farmers with land size of two to four acres under the major irrigation schemes.

(b) Paddy farmers with land size of two to four acres under the minor irrigation schemes.

(c) Paddy farmers with land size of less than two acres under the minor irrigation schemes.

(d) Landless labour group.

The objectives of the study are :

(a) to measure the dietary intake and nutritional status of the four groups with a view to assess the current situation of the households with regard to above.

(b) examine the degree of disparity in dietary intake and nutritional status between the groups.

(c) attempt to study the causes of dietary deficiencies and under-nutrition through socio-economic and other related information.

(d) Suggest possible short and long-term intervention programmes to the groups identified through the study as 'nutritionally vulnerable'.

The study was conducted in two phases on the basis of relative food availability. The first was between January, February which was the time prior to harvesting of the Maha paddy crop. The second phase between May - June which was the period immediately subsequent to the harvesting of the Maha paddy crop. The former period was considered as the 'lean' and the latter as the 'peak' with regard to food availability and intake.

Chapter Two

SURVEY PROCEDURE

2.0 SAMPLE SELECTION

2.1 SELECTION OF GROUPS AND AREA OF STUDY

In selecting the sample, certain fundamental aspects were taken into consideration following the experience gained on completing the field work for the baseline socio-economic survey of the project area. As the households selected were to act as indicators to measure the degree to which the project has benefitted the community and its effects on the nutritional status of the project community, the households were categorised into 'functional groups' in order to identify as far as possible the 'nutritionally vulnerable' groups of households. The household selection was based on the most relevant indicators of social and economic conditions such as employment, size of the land holding and availability of irrigation facilities.

As the agricultural sector is to benefit most from the project; the full impact would be felt by the agricultural community, particularly those cultivating paddy. Therefore, paddy cultivators were included in the study to act as a group to indicate the degree of change/success in the paddy sector once the project is implemented. The project also envisaged increased employment opportunities essentially in hired labour. In order to measure the effect of the expected employment opportunities or household income on the nutritional status of the household members, the landless labour group was also included in the study.

The project area consists of fourteen Grama Sevaka (GS) divisions which are the lowest administrative units. Of them ten GS divisions were selected for the survey because of the wide distribution of the type of households chosen for the study within these divisions.

2.2 SELECTION OF SUB-GROUPS WITHIN PADDY CULTIVATION

Two factors considered important in the selection of sub-groups in the paddy cultivating community were the size of land holding and availability of irrigation water. As the only source of water for irrigation of paddy are the minor and major irrigation tanks, these were considered as the sub-groups for the source of irrigation water.

In selecting suitable land holding size for the study, information from the AR & TI Baseline Socio-economic Survey and the Appraisal Report were utilised. These sources indicated that nearly 12 percent of the paddy farms were less than one acre in size, 31 percent between one to two acres, 48 percent between two to four acres of land area and the remaining being of larger acreage. The common land sizes for paddy farms appeared to be those between one to two acres and two to four acres. Most of the paddy farms between one to two acres obtained water for cultivation from minor irrigation tanks. Paddy farms of landsize two to four acres were usually irrigated mainly from major tanks but also from minor tanks. As the paddy farms selected for the study were to represent the majority of the paddy cultivators, the study chose the following groups for the survey:

(a) Paddy farms of land size of two to four acres under major irrigation schemes;

(b) Paddy farms of land size of two to four acres under minor irrigation schemes;

(c) Paddy farms of land size of less than two acres under minor irrigation schemes.

The fourth household group selected as mentioned earlier was the landless labour group.

2.3 SELECTION OF SAMPLE SIZE

According to the household categories forty households were chosen from each of the four groups. On account of constraints on resources and the necessity for daily supervision of field workers forty households per group was a practicable number to survey. The forty households for each group was selected from the ten GS divisions on a random basis. Each investigator or field worker had to survey a minimum of four houses daily and was to have paid each household two to three visits per day. However, as the field worker was obliged to travel on foot it was necessary for the four houses under study to be within a maximum radius of half a mile. When investigating the location of the randomly selected households it was found that they were not of close proximity to each other as desired. Hence, most of the 160 households selected on a random basis could not be included in the final sample of the study.

In order to overcome the above problem "Cluster sampling" was selected for the study. For this purpose, eleven households from the forty of each of the four groups (i.e. those randomly selected for the study) were chosen. Each of the households selected was to act as a focal point. From each of the focal points, three to four houses in the same category which were of close proximity to the focal household were selected. In total, nearly forty four households from each group were selected; four additional households were selected to act as reserves for the study.

The following is a list of Grama Sevaka divisions and the number of households selected from each division:

(1) Paddy farms with a land size of two to four acres under major irrigation schemes.

(i)	Tissa North	- 9 households
(ii)	Tissa South	- 4 households
(iii)	Wirawila	- 11 households
(iv)	Nedigamwila	- 7 households
(v)	Magama	- 4 households
(vi)	Ranakeliya North	- 4 households
(vii)	Ranakeliya South	- 4 households

(2) Paddy farms with a land size of two to four acres under minor irrigation schemes.

(i)	Rankeliya North	- 10 households
(ii)	Bundala	- 13 households
(iii)	Badagiriya	- 17 households

(3) Paddy farms with a land size of less than one to two acres under minor irrigation schemes.

(i)	Bundala	- 8 households
(ii)	Kavantissapura	- 9 households
(iii)	Bandagiriya	- 15 households
(iv)	Weerawila	- 8 households

(4) Landless labour group.

(i)	Andalla	- 4 households
(ii)	Tissa South	- 4 households
(iii)	Nedigamwila	- 5 households
(iv)	Kirinda	- 4 households
(v)	Debarawewa	- 5 households
(vi)	Bundala	- 4 households
(vii)	Kavantissapura	- 5 households
(viii)	Rankeliya North	- 5 households
(ix)	Rankeliya South	- 4 households

2.4 PERIOD OF STUDY

Due to time and resource constraints the study was limited to one cultivation season. The *Maha* cultivation season was chosen because of its peak agricultural activity. Two periods of study was the pre-harvest and the post-harvest phases of *Maha*. The pre-harvest period was defined as the time prior to the harvest, this served as the 'lean period' since it was considered that due to the reduced employment opportunities and therefore of income, the overall food intake of the community would be less. The post-harvest period was to represent the 'peak period' in terms of food intake, as employment opportunities (agricultural labour) and income were expected to increase or be at its highest during this time.

2.5 DIETARY METHODOLOGY

The dietary intake survey was carried out in two phases. The first phase was in Janaury-February 1981 (pre-harvest period) and the second during the month of May-June 1981 (post-harvest period). In selecting the months for the survey, days of local festivities were avoided since food intake during these times would not have represented the norm.

Food intake of the selected households[1] were measured over seven consecutive days. The survey was limited to seven days since studies conducted in this field have shown that food intake measured over seven days is sufficient to provide a correct representation of the normal food intake by the household.

The food was weighed in the 'ready for the pot' stage by the investigators i.e. raw foods cleaned and inedible contents removed. Any waste food from meals was also measured. The only food items that were not weighed were spices as the quantities utilised were too small to be weighed in the pairs of scales used for the study. The pair of scales used for the study was Salter model 12 s, which measured to the nearest 10 grammes.

The ten investigators employed for the survey were subjected to short training on the survey procedure. Each investigator was allocated a minimum of three or a maximum of five houses and were directed to visit each house at least two to three times a day in order to weigh the food. Along with the information on quantities of raw food the following information was also collected.

(1) List of members of the household, their age and sex.
(2) List of household members absent for meals and age and sex of visitors present for meals.

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[1] Household is defined as consisting of one or more persons living in the same dwelling with shared cooking, where all members with regular sources of income contribute towards the expenditure on food.

(3) Unpurchased food items were recorded:

(4) Daily expenses on purchased food with an inventory of items purchased:

(5) Current market value of foods (obtained from the local markets):

(6) Information of weekly/monthly income and sources of income.

The above data was gathered for the pre-harvest and the post-harvest periods of the study.

Data Collection on Income and Expenditure on Food by the Household

Information on the monthly income of the household was collected by requesting the members of the household to itemise the sources of income and amount earned from each source. This was done during both periods of study.

Total expenditure on food was obtained by collecting the cost of purchased food and imputing the market value on unpurchased food of the household. Each horsehold was requested to keep a record of items purchased daily and same was recorded by the investigators. In the daily record of food intake, unpurchased food items were also noted by the investigators.

Calculation of a 'Consumption Unit' of Food Intake

Once the weekly consumption of food was known, it was then converted to energy and nutrients using the food composition tables. The household number of persons, their age and sex (which are recorded) and their respective physiological requirement of energy and nutrients were noted using the recommended daily allowance calculated by the Medical Research Institute (Annexure 1). As seen from this table the highest energy requirements of the normal population[1] is by the adult man between the ages of 20-39 years. The respective daily intake of

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(1) Normal population means those in their normal physiological condition (not pregnant and lactating women).

energy and nutrient of males of this age group was considered as a 'consumption unit'. For instance, a 'consumption unit' of energy refers to a daily intake of 2530 kilocalories (K cals) which is the physiological requirement of energy for an adult man.

In order to calculate the number of total 'consumption units' for a household, the membership of the family is reduced to a number of equal 'consumption units', which means in practice women, children and elderly men of different ages are regarded as equivalent in their physiological requirements to certain fractions of the adult man. The total household 'consumption units' are thus calculated and the 'consumption unit' intake of energy and nutrients are calculated by dividing the weekly intake of the above by the total number of 'consumption units'[1] (c.u.). This method of c.u. was used as opposed to calculating the 'per capita' daily intake, since, the latter method would not reflect the different age structure of the household membership and therefore, would tend to overstate the adequacy or deficiency of food intake by the household.

2.6 ANTHROPOMETRIC METHOD

Heights, weights and ages of all members of the household were measured. Stature or length was measured in centimetres using a wooden height measuring board which allowed values to be read to the nearest 0.1 c.m.

Weight of children under five years was measured with a Salter hanging scale which could measure to the nearest 0.1 kg. Adults were weighed with the aid of a Detecto scale which was calibrated to measure to the nearest 0.5 kg. Dates of birth of children under eighteen years was obtained from their horoscopes. The height board and the weighing scales were checked periodically to ensure their accuracy, particularly

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(1) When the total number of c.u. are calculated, household members absent for meals and visitors present for meals are also taken into account.

as these instruments were subjected to rough transportation. The staff employed for the survey were those trained in these techniques by the Agrarian Research & Training Institute for an earlier anthropometric survey. A short refresher course was conducted prior to the survey and the investigators were closely supervised during the survey. All anthropometric measurements were taken during the first phase of the study.

Socio-Economic Information

A standard socio-economic questionnaire for each household was completed during the first phase of the study. At the end of the survey the investigators were requested to write an account on the major difficulties faced by the households and the village at large in order to obtain an overview of the prevailing conditions.

Sources of Information

Nutrients content of the food consumed was obtained from the Sri Lankan Food Composition tables[1] and the Indian Food Composition tables[2]. Information regarding the nutrient content in coconut milk was obtained from a survey conducted by the Marga Institute[3]. Anthropometric reference standards were taken from the World Health Organisation publication on 'Guideline on measurement of nutrition impact'[4]

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(1) Food composition tables for Sri Lanka. Colombo, World Health Foundation/Medical Research Institute of Sri Lanka, 1979.

(2) Gopalan, C and Rama Shasthri, B.V. Nutrition values of Indian foods. Delhi, National Nutrition Institute/Indian Council of Medical Research, 1971.

(3) De Mel, B.V. and Jogarathnam, T. Population growth, nutrition and food supplies in Sri Lanka, Marga, 4(3) 1977, pp. 60-92

(4) Dustin, J.A. and Dixon, H. *et al* Measurement of nutritional impact - A guideline for measurement of nutritional impact of supplementary feeding programme aimed at vulnerable groups. Geneva, WHO, 1979

2.7 SOME METHODOLOGICAL PROBLEMS

(i) Using the household as a unit to measure the community's good consumption levels is subject to several drawbacks. For instance, this type of study does not measure the actual intake of food by the household members, i.e. intra-family distribution of food cannot be known. The distribution of food amongst the family members is calculated by taking the ratio of the physiological requirement of each of the family members which is based on their age and sex, i.e. 'Consumption Unit' method. This method, however, assumes that the quantity of food available to the household/family for each meal is proportionally divided among the members according to their physiological requirements. This assumption obviously has certain inherent errors but, in order to avoid this error actual intra-familial distribution of food has to be known. This needless to say would be a time consuming and a costly method compared to the former and therefore, was considered impractical and financially not feasible to conduct over the given sample population.

Although the 'consumption unit' method does not indicate the intra-familial distribution of food, it does indicate the adequacy/inadequacy of food consumed at the household level. As the purpose of the study is to obtain basic food data on actual food intake of population groups, including types and cost of sources of food, potential of improving the food consumption levels and the 'Nutritional quality' of the diet, a household food intake survey fulfilled the objectives of conducting this study.

(ii) The other usual sources of non-sampling errors in such a study are the investigator error, where reading of the weighing scale may not be accurately recorded, errors introduced due to the faulty mechanism of the scales and errors due to the participant families attempting to change their usual dietary patterns and intake because their eating habits are being scrutinised. These errors as far as possible were reduced by training the investigators and informing them of the source of errors.

(iii) Another form of error can be introduced when the food intake data is converted to its respective energy and nutrient content. For this purpose standard food composition tables are used, which give the average nutrient values of food items. However, particularly in fruits and vegetables the vitamins and mineral content vary with ecological, geographical and other environmental factors. Hence, the use of average nutrient values of the food composition tables would not be strictly accurate. However, once again due to the objectives and the nature of the study, these figures are not expected to distort the nutrient intake values to the extent where incorrect representation of the dietary intake of the community would be given.

Chapter Three

SOCIO-ECONOMIC SURVEY FINDINGS

3.1 POPULATION DATA

The Hambantota district population constitute 2.7 percent (424,102) of the total population of Sri Lanka in 1971 and 2.9 percent in 1981. The annual population growth for period 1971-1981 for Sri Lanka was 1.7 percent and for the district of Hambantota, this figure was 2.4 percent [1]. The rate of net migration in 1981 was 0.2 percent for Hambantota district. Population density per square kilometre has increased from 131 in 1971 to 164 in 1981 in the Hambantota district whereas the average population density for Sri Lanka was 196 in 1971 and 230 in 1981 per square kilometre. Of the total population in the district only 9.7 percent lives in the urban areas with the remainder residing in the rural sector.

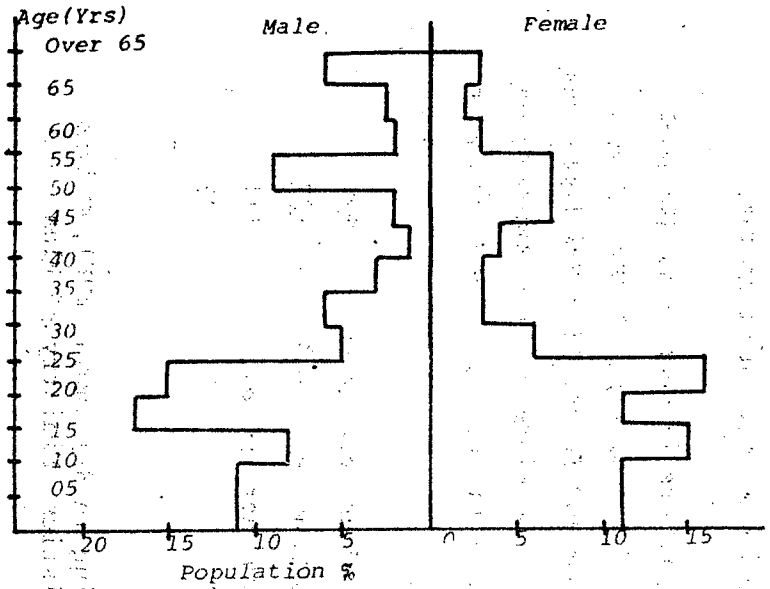
In general high masculinity numbers is seen to be the norm for the country and this is reflected in the project area as well. The average sex ration viz. males for 100 females for Sri Lanka was 106 in 1971 and 103 in 1981, and for the district of Hambantota was 106 and 104 respectively. The sex ratio of the population under study is as follows:

Major irrigation with two to four acre group	-	109
Minor irrigation with two to four acre group	-	127
Minor irrigation less than two acre group	-	111
Landless labour group	-	97

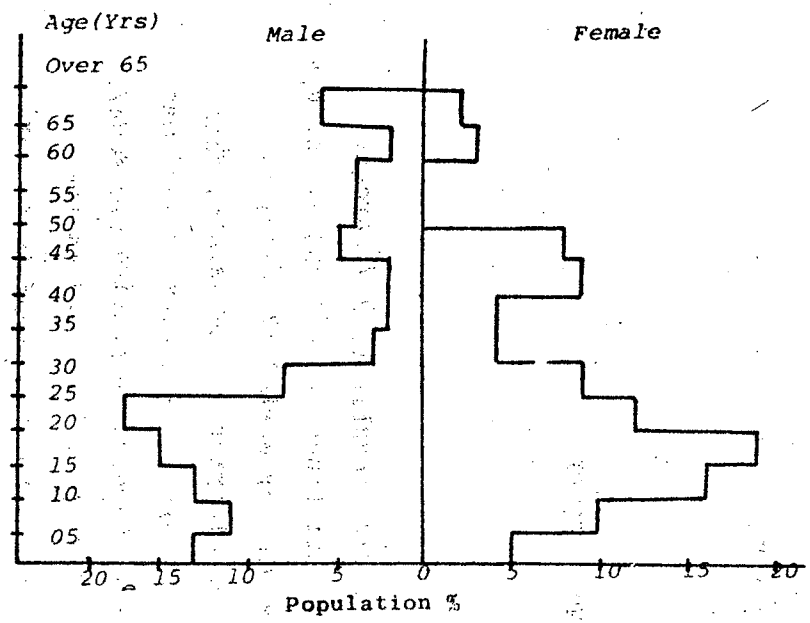
(1) Census of Population and Housing in Sri Lanka, 1981, Colombo, Department of Census and Statistics, Ministry of Plan Implementation, 1981.

FIGURE 1

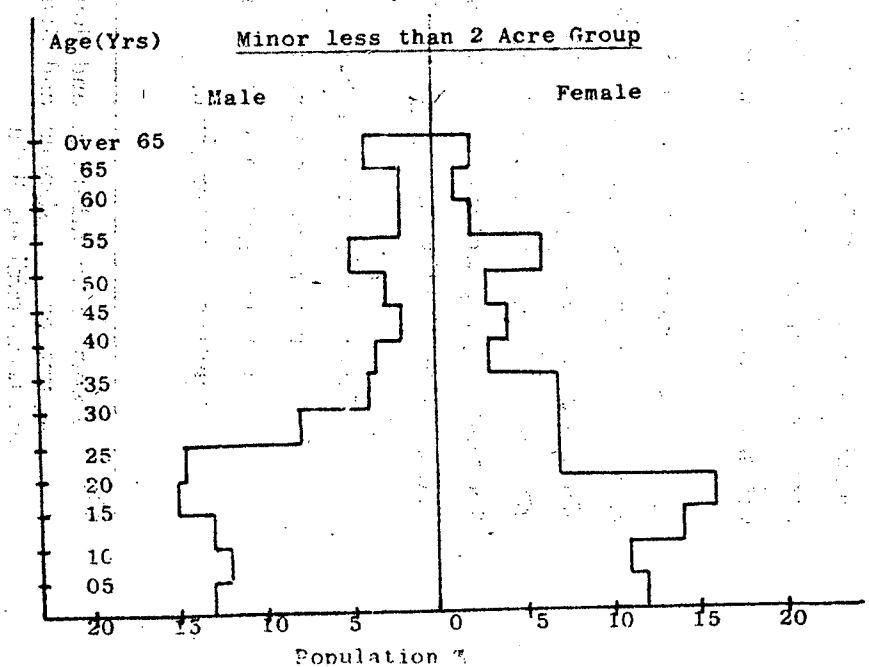
Major 2-4 Acre-Group



Minor 2-4 Acre Group



Minor less than 2 Acre Group



Landless Labour

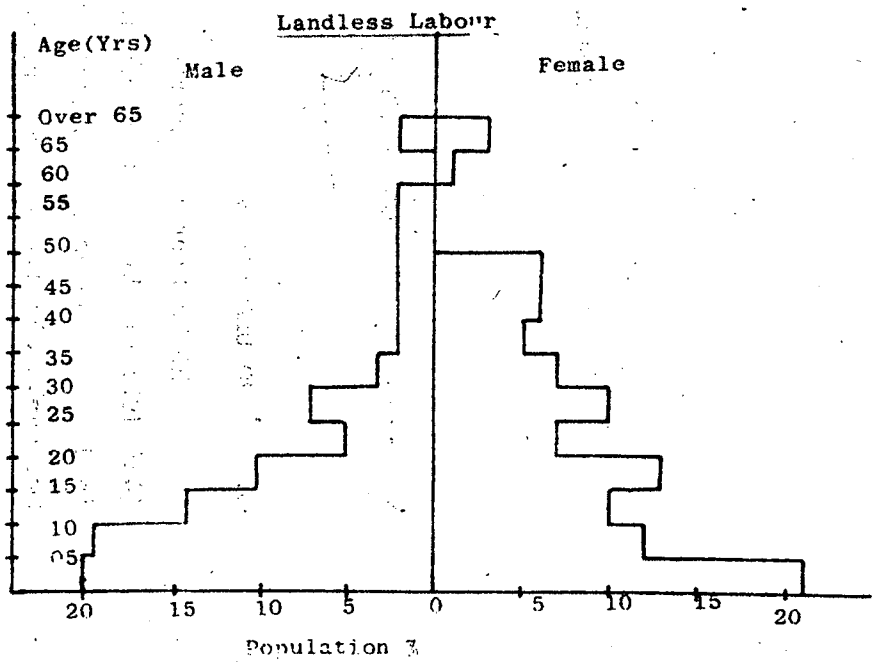


Figure I shows the population profile for each of the groups of households under study. This indicates the proportion of males and females according to the given age groups. The population profile of the major irrigation areas with two to four acres shows that the under five year old group constitutes 11 percent of the population in both sexes, whereas over ten year and under twenty five years group constitutes the largest segment of the population. A similar situation can be seen for the population belonging to the minor irrigation areas with two to four group and less than two acre group. However, the population profile of the landless labour group is quite different, with the under five year old group constituting the single largest segment (20 percent) of the population. The under five year old group of the Hambantota district consitutes only 13 percent of the population, compared to the 20 percent of the landless labour group.

The former three groups with a reduced under five year old population indicate a lowering of the average birth rate over time. A possible explanation for this reduction could be the effectiveness of the family planning programme which is conducted extensively by the government. Another possibility is that those households living under the irrigation tank scheme, have the highest eligibility claims for selection of land under the settlement programme. The relatives and friends of the householders therefore reside with them so as to be eligible for claims to land. This large adult population in the households has resulted in depressing the percentage of the under five year old population. This however, is not seen in the landless labour group as these households have a much reduced claim on eligibility to land.

3.2 HEALTH INFORMATION AND FACILITIES

The crude death rate for the district of Hambantota in 1971 was 5.7 which was reduced to 4.8 per 1000 population in 1980. The average rate for Sri Lanka was 7.5 in 1971 and 6.1 per 1000 population in 1981. The infant mortality rate for Hambantota was 36 in 1970 and 28 per 1000 live births in 1978. The national infant mortality rate in 1970 was 47.5 and 37.1 per 1000 live births in 1978. Similarly, the maternal mortality rate has reduced over time in Hambantota and is lower than the national figures. According to the indicators given above, the Hambantota district appears to have an above average health service or facilities. There are two district hospitals in the project area viz. in Hambantota and Tissamaharama, the former being a better equipped

hospital with a larger number of beds. Data from the survey indicates that a majority of the households attend the district hospital for treatment. Western medical treatment appears to be preferred by most. The following table indicates the places visited by the population under study for medical treatment. There does not appear to be any major difference between groups regarding the selection of place of medical treatment.

Table I - Place of Medical Treatment

	Percentage of households			
	1	2	3	4
major 2-4 acres	3.8	78.3	13.6	4.3
minor 2-4 acres	4.4	77.8	8.9	8.9
minor less than 2 acres	16.6	51.9	22.2	9.2
landless labour	18.0	54.0	20.0	8.0

Code 1 - State dispensary
2 - State hospital
3 - Private doctor (Western medicine)
4 - Private doctor (Ayurvedic medicine)

Immunisation Status of Under five year old children

The vaccinations which are presented to all children under five years of age are those against poliomyelitis, tuberculosis, diptheria, tetanus and whooping cough. Of the total number of children belonging to each household group, only 65 percent of the children of the major two to four acre group, 65 percent of the minor two to four acre group, 54.6 percent of the minor two acre group and 35 percent of the landless labour group had obtained full immunisation. The overall immunisation programme coverage for this area appears to be poor. Reasons for this low coverage may range from unawareness among mothers to the distance to the clinic. However, one major factor appears to be the poor child care facilities available to the community. The mother and child health clinics in the area tend to be extremely crowded during clinic days and the medical staff available to cope with the large number of patients is inadequate.

The low maternal infant mortality rates for the Hambantota district compared to the country average, implies an above average health service, water and sanitation facilities etc. However, the contrary is seen from the poor immunisation status of children under five years of age, inadequate water and sanitation facilities available to the community. A possible explanation is that the data for the mortality rates tend to be more accurate over a larger population (i.e., national average) as certain distortions tend to occur when smaller populations are used. Also the degree of under-reporting of maternal and infant deaths is likely for the relatively low mortality rates.

3.3 EDUCATIONAL STATUS

The following table indicates the percentage of males and females who have obtained a primary education and the percentage that is illiterate for each of the groups in the study. A high literacy rate is observed as expected with a larger number of males being literate compared to the females. This is seen for all groups. However, the literacy rate of females in the minor, less than two acres and landless labour group is significantly less than the other two groups.

Table 2 - Educational Status

	Primary education			Illiterate		
	Males	Females	com-bined	Males	Females	Com-bined
	%	%	%	%	%	%
Major 2-4 acres	87.9	81.3	84.9	12.1	18.7	15.4
Minor 2-4 acres	87.8	81.6	84.8	12.2	18.4	15.3
Minor less than 2 acres	83.3	69.4	76.4	16.7	30.6	23.7
Landless labour	81.2	70.3	75.8	18.8	29.7	24.3

It is likely that the reduced literacy rates amongst the former two groups is linked to their low socio-economic status.

3.4 ETHNICITY AND RELIGION

The predominant religion for both Sri Lanka and the project area is Buddhism, which is practiced by nearly 67 percent and 97 percent of the respective populations. The main religion amongst the households under the study is Buddhism. For instance, all the households that belonged to the major irrigation two to four acre group, minor irrigation two to four acre group and minor irrigation less than two acre group were Buddhists. Except for 8 percent of households which were Muslim, the remaining in the landless labour group were also Buddhists. In terms of ethnicity in the project area, the low-country Sinhalese constitute the majority of the population. The Sri Lankan and Indian Tamils are the next largest groups.

3.5 WATER AND SANITATION

Availability of toilet facilities to the household groups under study are poor, with the exception of the major irrigation two to four acre group. Table 3 indicates the availability of toilet facilities to the household and the type of toilets available. Once again with the exception of the above group of households, majority of the remaining have access only to public toilet facilities. The usage of public toilet facilities by the above population is unknown. As the public toilet facilities in this area are not evenly distributed or closely located to each other, it is likely that ready access to this facility is very limited.

Table 3 - Availability of Latrines and Type of Facility available

	Availability of latrine		Type of facility	
	% with	% without	% public	% private
major 2-4 acres	93.3	2.7	16.3	83.7
minor 2-4 acres	62.9	37.1	39.8	60.2
minor less than 2 acres	43.2	56.8	49.2	50.8
landless labour	41.6	58.4	55.8	44.2

Household running water facility is not available to any of the households. Sources of domestic water are the irrigation tanks, wells, canals, and street stand pipes. Table 4 indicates the source of water used by the households for drinking purposes and for washing and bathing.

Table 4 - Sources of Water for Drinking and Washing

	Drinking Water source % of households				Bathing/washing water sources % of households			
	1	2	3	4	1	2	3	4
major 2-4 acres	73.2	19.5	-	7.3	9.8	-	39	51.2
minor 2-4 acres	5.3	42.1	5.3	47.3	-	-	2.6	97.4
minor less than 2 acres	11.1	50.0	16.6	25.0	-	-	-	100.0
landless labour	19.4	50.0	16.6	13.8	-	-	70	30.0

Code 1 - own well
2 - nearby well
3 - street stand pipes
4 - irrigation tank canals.

Majority of the major two to four acre household groups have their own wells whereas most of the households of the other groups have to obtain drinking water from a nearby well or irrigation tank/ canal. However, obtaining water, particularly for drinking purposes is a great problem to many households during the dry season, since, many sources of water tend to dry up. As a result water is collected from stagnant water holes which the people share with the cattle for drinking and bathing. This problem is particularly acute in areas such as Bundala, Pallemala (Bandagiriya), Kirinda and Kawantissapura. In addition to the sparse availability of water, it is found that the quality of water is not consistent over the project area. For instance, a survey and tests have revealed that in areas

like Bundala and Pallemala, water contains a higher quantity of dissolved solids than the maximum standards proposed by the World Health Organisation [1]. Also in certain areas the ground water tends to be saline or highly mineralised. In areas such as Bundala, where the water sources dry up, local government authorities distribute drinking water by bowsers.

Apart from the much reduced level of water availability, use of water from stagnant pools for drinking purposes is also a health hazard as many water-borne diseases can be transmitted. This could be a problem especially since only a handful of households that are economically stable boil and cool the water before drinking. Many households do not have the fuel resources, the time nor the awareness to appreciate boiled drinking water.

Use of stagnant water, inadequacy of water and poor sanitary conditions are factors that tend to contribute towards promoting infectious diseases such as diarrhoea, dysentry and other water-borne diseases. However, it was not possible to assess the incidence of those diseases in the given community by this study. Although the questionnaire administered to the households did inquire about any member of the household who had been afflicted by diseases over the the last year, many were not able to answer clearly. For instance, many could not recall and others were not certain if the symptoms that the member had was that of the above illnesses. In order to assess the extent of the problem relating to the above diseases, a more detailed questionnaire pertaining to the topic would have to be administered. It should be a longitudinal study so that the seasonal/monthly incidences and the prevalence rates could be calculated over both the wet and dry seasons.

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(1) Socio-economic Survey of the Kirindi Oya Project area, Colombo, Ministry of Lands and Land Development, 1980.

3.6 OTHER FACILITIES

The district has no rail connection. Movement of goods and passengers are exclusively by road. It appears that the lack of rail facilities is a definite disadvantage, particularly to the farming community because the transport costs by road is much higher than by rail. None of the households in the study had a domestic supply of electricity. For lighting purposes petromax lamps or ordinary lamps were used. However, the Hambantota district does have a supply of electricity but only a small percentage of houses in the project area had a domestic supply. All thehouseholds studied used fire-wood for cooking. Many women of poorer households spent a major part of the day collecting fire-wood as many had to walk far to collect them. Fire-wood is available for sale but many of the groups in the study find the prices prohibitive.

3.7 HOUSING AND GENERAL HOUSEHOLD INFORMATION

Type of Housing

Majority of the houses in the Hambantota district are termed semi-permanent structures. Nearly 72.1 percent of the houses in 1971 and 69.5 percent in 1981 are classified in this manner. The table 5 shows the percentage of semi-permanent houses in each of the groups under study.

Table 5 - Type of Housing

Groups	% of semi-permanent houses	% of permanent houses
major 2-4 acres	51	49
minor 2-4 acres	66	34
minor less than 2 acres	79.3	20.7
landless labour	88.5	11.5

Table 5 shows that the highest number of permanent structures of houses are in the first group and the number decreases down the column. In the semi-permanent structures the reverse appears to be the case. Houses termed semi-permanent are those which have clay/mud walls, cadjan/palmyrah/straw as roofs, clay/mud/cement for the floor. Permanent houses are those with tiles/asbestos/metal sheets for the roof, cement blocks/stone blocks/cabook walls and cement floors[1].

Ownership of Land and Houses

Majority of the study population were living in their own houses, as shown in table 6.

Table 6 - Ownership of Houses

Group	Own house	Rented house
major 2-4 acres	90.2 %	9.8 %
minor 2-4 acres	100 %	-
minor less than 2 acres	100 %	-
landless labour	96.4 %	3.6 %

(1) Socio-economic indicators of Sri Lanka, Colombo. Dept. of Census and Statistics, 1983.

3.8 LAND TENURE AND CULTIVATION OF CROPS

In terms of ownership of land in which the house was located, in most of the study groups the land was owned by the crown/state. This is shown in Table 7.

Table 7 - Ownership of Land

Group	own land	state land	private land
major 2-4 acres	24.4%	58.6%	17.0%
minor 2-4 acres	15.8%	84.2%	-
minor less than 2 acres	51.4%	48.6%	13.8%
landless labour	25 %	61.1%	

Majority of the paddy farmers (74.9 percent) of the major two to four acre group cultivate on leased land with the remainder cultivating their own land. In the minor two to four acre group the majority cultivated paddy in their own land (88.6 percent) and in the minor less than two acre group of households, majority owned the paddy land they cultivated.

Type of Crop and Cultivation

The following table indicates the type of crops grown by the groups of households over *Yala* and *Maha* of the year of study.

Table 8 - Types of Crops and Cultivation

% of household with		major 2-4	minor 2-4	minor less than 2	landless labour
Yala 1980	(a) No crop or cultivation	20.0	47.4	57.6	88.8
	(b) Rice cultivation only	67.5	31.5	21.2	-
	(c) Chena cultivation only	10.0	-	6.0	-
	(d) Rice and chena cultivation	-	-	-	-
	(e) home gardens	2.5	21.1	15.2	11.1
Maha 1980	(a) No crop or cultivation	7.3	30.5	41.6	69.4
	(b) paddy cultivation only	60.9	59.0	38.8	13.8
	(c) chena cultivation only	-	7.8	13.8	-
	(d) paddy and chena cultivation	31.7	2.6	-	-
	(e) home gardens	-	-	5.6	16.6

As expected the highest number of households that cultivated paddy during both *Yala* and *Maha* seasons is the major two to four acre group. A possible reason for this availability of water was given in the introductory chapter of this report. However, nearly 28 percent of the group was not able to cultivate any crop in *Yala* due to insufficient availability of water. Similarly, a majority of the other groups of household could not cultivate paddy in *Yala* essentially for the same reason.

Home gardening appears to be practiced by quite a few, particularly during *Yala*.

The situation is somewhat changed in *Maha* where more households are able to cultivate paddy. However, even in *Maha* nearly 37 percent of the minor two to four acre group and 55 percent of the minor less than 2 acre group were unable to cultivate paddy in *Maha* due to inadequate water supply. Based on the information available the study classified the minor two to four acre group and minor less than two acre group as paddy cultivators. However, nearly 40 percent of farmers and 50 percent of the cultivators have not been able to cultivate paddy during the year in which the survey was conducted. Of the non-cultivators in the last three groups only a few appear to be involved in *chena* cultivation. A possibility exists that these households did not report such activities since cultivation on state land without permits is illegal.

Rearing of Animals

Although the community under study is essentially a farming community, rearing of animals does not appear to be very common or popular as seen by table 9.

Table 9 - Type of Animals Reared by Households

	Type of animal and percentage by households		
	fowl	goats	cows
major 2-4 acre	17.1	-	17.1
minor 2-4 acre	7.9	10.5	22.4
minor less than 2 acres	11.0	16.0	-
landless labour	16	3	3

3.9 OCCUPATION OF THE EMPLOYED IN THE HOUSEHOLDS

Table 10 indicates the type of employment of those who are employed or the economic activity of the household members.

Table 10 - Occupation of the Employed in the Household

	1	2	3	4	5	6
major 2-4 acre gp.	12.4	69.4	-	-	-	22.7
minor 2-4 acre gp.	47.5	22.7	14.3	-	-	25.6
minor less than 2 acre gp.	35.0	-	32.5	15.0	8.8	8.7
landless labour gp.	1.8	-	56.4	27.3	6.7	7.8

(1) paddy farmers - cultivated own land
(2) paddy farmers - cultivated leased land
(3) agricultural labourer
(4) labour (hired)
(5) fishermen
(6) other occupations - weaving, clerical work, public transport, carpentry.

Main occupations of the households of major two to four acre group, minor two to four acre group is as expected, farming especially paddy. The minor less than two acre group although classified by the study as paddy farming households, have sought other employment opportunities because of scarcity of water for cultivation. In the landless labour group as expected many have taken up work as daily hired labour.

Table 11 - Information on Economic Activity of the Household

	major 2-4 acre gp.	minor 2-4 acre gp.	minor less than 2 acre gp.	landless labour gp.
Average number of dependants per H.H.	2.8	3	2.5	3.2
Average H.H. size	7.5	7.7	7.3	6.5
Dependancy ratio	60.6	63.3	53.3	98.3
Percentage of dependants in the population	37.7	38.8	34.8	50.4
Average number of income earners per H.H.	2.2	2.0	2.0	1.4
Economic activity rate (employed/economically active)	45.5	41.6	42.7	44.8
Number of dependants per employed person	2.5	2.9	2.6	3.5
Economically inactive population+unemployed / employed percentage receiving food stamps	28	76	78	97

The age groups considered as 'dependants' or economically inactive are those below 15 years of age and those above 65 years[1]. The average number of dependants per household is highest in the landless labour group as with the dependancy ratio and the percentage of dependants in a given group. This is mainly due to the large under 15 year old group in this population as opposed to the other three categories. However, the average household size is found to be lowest in the landless labour group since many are young families, whereas, in the other three groups the household size is large since the 'extended family' system occurs extensively. The overall household size in all farm groups is much higher than the figure 5.75 for the dry zone areas.(i.e. zone 2), as given in the Consumer Finance Survey of the Central Bank of Ceylon, 1979/80.

(1) Any disabled persons in the sample have not been included as 'dependants', hence given figures may be slightly under-stated.

The average number of income earners per household is lowest in the landless group as explained earlier viz. 1.4 This is much lower than the national figure of 1.64 in 1978/79[1]. This is further highlighted by the figure given for the number of dependants per employed person, with the landless labour group figure being the highest at 3.5 Food stamps are only given to households with an average income of less than Rs. 300 per month. According to the study figures nearly all of the landless labour and 75 percent of the households in the Minor two to four acre and Minor less than two acre group are given food stamps. This and other indicators given in the table show to some extent the magnitude of poverty within the groups.

3.10 HOUSEHOLD INCOME[2]

Table 12 indicates the percentage of households which fall into the given income categories.

Table 12 - Household income

monthly income groups in Rupees	Major 2-4 acres		Minor 2-4 acres		Minor less than 2 acres		Landless labour	
	Pre-harvest %	Post har. %	Pre har. %	Post har. %	Pre har. %	Post har. %	Pre har. %	Post har. %
less than 200	18.2	5.4	9.1	7.1	20	12.1	23.5	8.3
less than 300	18.2	10.8	24.2	14.3	13.3	15.2	20.6	36.1
301 - 600	30.3	29.7	39.3	39.3	26.7	48.5	50	47.2
601 - 800	12.1	13.5	3	3.6	20	18.2	5.8	8.3
801 - 1000	-	10.8	9.1	21.4	3.3	3.0	-	-
1000 - 1800	21.2	29.7	15.2	14.3	16.7	3.0	-	-

(1) Consumer Finance and Socio-economic Survey, 1979-80, Colombo, Central Bank of Ceylon, Dept. of Statistics 1983.

(2) Household income is the total income of the household where all sources of income were taken into account.

An increase in household income from the pre-harvest period to the post-harvest period is shown by certain households whereas others appear to have had a similar income over the two periods of study. The major two to four acre group indicates a definite shift from lower income range to a higher one in the post-harvest period. However, in the other household groups, a shift to the higher income groups over the post-harvest period are observed only in a few income categories viz. less than Rs. 200/- a month, in the minor two acre and landless labour group, Rs. 801-1000/- group in the minor two to four acre group, less than Rs. 300/- group in the landless labour group.

Reasons for the observed variation in income patterns between the four groups of households over the two periods are several; time of collection of information, method of collection and its accuracy. For instance farm households that cultivated paddy obtained a higher income in the post-harvest period than pre-harvest, simply due to the sale of the crop eg. majority of the major two to four acre group and some of minor two to four acre group.

However, differences in income patterns amongst the paddy cultivators are essentially due to the method by which post-harvest income was calculated. The household monthly income of paddy farmers was calculated using the yield of the crop and the current market price of paddy. The total value of the sale of crop was then divided by five or six months to obtain an estimate value for the monthly incomes of the household plus all other sources of income that were declared by the household. The value/income from paddy alone was very much an approximation of the monthly income due to a variety of reasons. Farmers dispose their stocks of paddy or other cereal crops in different ways. Those in need of immediate cash tend to sell crops as the harvesting is complete, keeping behind a quantity for domestic consumption. For this group of farmers, the average monthly income as calculated above would be nearest to the actual figure recorded. However, certain farmers especially in the major two to four acre group who are not facing a cash-flow problem, either keep the entire stock till the market prices are at its highest or sell in instalments as cash is required. Therefore, some will dispose stocks within the same month whilst others may wait for as

long as three to four months. It is in the latter group that such estimation of the income tend to understate the household income.

Households that obtained income through providing hired-labour for agricultural activities recorded little shift in monthly income over the two periods of study due to the following reasons: One is that household income was collected for period/month during ,ich the survey was conducted. The 'pre-harvest'period survey was conducted once all the preparatory and cultivation activities were completed and 'post-harvest' when the harvesting activities were completed(1). Therefore the income data was collected when there was minimum agricultural activity thus minimal need for hired-labour. As a result the households that provided hired-labour recorded as obtaining a low and similar income over both periods of the survey. The second reason being the difficulty in obtaining correct information regarding their income. For instance, in order to calculate the income of causal wage employees the number of days of employment for a given period had to be ascertained. However, reliable information was difficult to collect due to the irregularity in employment opportunities (in relation to hired-labour, and recall lapses. In order to overcome these biases and obtain a relatively true representation of the average household income, data on sources of income would have to be collected at several points over the year so that these seasonal biases and other factors which will act to distort the income figure would be averaged out, or minimised.

In terms of debts of the household, about 25 percent of the minor two to four acre group, 26.2 percent of the minor less than two acre group and 32.8 percent of the landless labour group admitted

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(1) This was because the paddy cultivating households were not willing to participate in the survey during the 'busy' period in the field.

being in debt during the survey month either to a neighbour or village money lender or to the village boutique for the goods purchased. This was so for both periods of study. However, extensive details on credit facilities available and repayment of loans/debts could not be examined within the scope of this study.

Chapter Four

STATISTICAL ANALYSIS OF DATA

4.1 DIETARY SURVEY DATA

The households in each of the four groups were further categorised in such a way so that each household remained in the same category over the two periods of study. These categorisations were conducted so as to permit detailed examination of changes in dietary intake within one household over the two periods of survey. The following criteria were used for categorisation.

(a) Each household was categorised according to its pre and post harvest monthly income/earnings during the periods of survey.

(b) Each household was classed according to the pre and post harvest total expenditure on food per consumption unit by the household[1] (both the value of purchased and unpurchased food).

i.e. for consumption unit expense on food per day or amount spent for or value of the food consumed by the adult male.

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(1) Expenditure on food per consumption unit was employed to standardise the household expenditure on food so as to enable grouping of households without having to take into account the individual household size. Per capita expenditure was not used since this would ignore the different age and sex in the household.

Groups according to the monthly income of household classes.

(i) Households with less than Rs. 200/- of monthly income during the pre and post harvest periods.

(ii) Households between Rs. 201-300/- of monthly income during the pre and post harvest periods.

(iii) Households between Rs. 301-600/- of monthly income during the pre and post harvest periods.

(iv) Households between Rs. 301-600/- of monthly income during the pre harvest period and between Rs. 601-800/- over the post-harvest period.

(v) Households between Rs. 601-800/- of monthly income over the pre and post harvest periods.

(vi) Households between Rs. 601-800/- of monthly income during the pre harvest period and Rs. 801/- to over 1000 over the post harvest period.

Table 13 - Categorisation of households according to the pre and post harvest monthly income of the Households

Groups	Income classes					
	class (i)	class (ii)	class (iii)	class (iv)	class (v)	class (vi)
Major Irrigation 2-4 acres	5.4%	10.8%	29.7%	13.5%	20.8%	19.7%
Minor Irrigation 2-4 acres	7.1%	14.3%	39.3%	15.0%	15.2%	9.1%
Minor Irrigation less than 2 acres	20 %	15.2%	48.5%	11.0%	3.2%	2.1%
Landless labour	22 %	20.6%	55.8%	1.6%	-	-

Groups according to the per consumption unit expenditure on food classes.

(a) Consumption unit expenditure on food over pre and post harvest periods was less than Rs. 4.00 (abbreviated to pre and post Rs. 4.00).

(b) Consumption unit expenditure on food over pre harvest was less than Rs. 4.00 and post harvest was between Rs. 4-6

(c) Consumption unit expenditure on food over pre and post harvest was between Rs. 4-6. (Abbreviated to pre and post Rs. 4-6)

(d) Consumption unit expenditure on food over pre-harvest period was between Rs. 4-6 and post-harvest period over Rs. 6.00

Table 14 - Percentage of households in each consumption unit expenditure on food over pre and post harvest periods.

Groups	Consumption Unit classes			
	class (a)	class (b)	class (c)	class (d)
Major Irrigation 2-4 acres	25.6%	35.9%	20.0%	17.9%
Minor Irrigation 2-4 acres	33.2%	42.4%	24.3%	-
Minor Irrigation less than 2 acres	48.6%	51.4%	-	-
Landless labour	74.2%	25.8%	-	-

Regarding the income and expenditure of the two classes the following aspects of the household were examined in detail.

1. Within the income classes the expenditure on purchased food only was examined.
2. Within the expenditure classes the total household income was examined.

3. In both classes per consumption unit intake of energy, protein, Vitamin A, Vitamin B_2, and iron by each household during the pre and post harvest periods was examined. To find out if there has been a significant increase in intake of these nutrients by the households over the two periods of study, a one tailed student's test was conducted on these data for each of the classes. Results are indicated in the next chapter.

The cost of purchased food by the hosueholds as a percentage of its total income was calculated and the results are given in table 15.

Table 15 - Expenditure on purchased food as a percentage of household income.

Food Expenditure as % of income	Major 2-4 acre % of H.H		Minor 2-4 acre % of H.H		Minor less than 2 acre % of H.H.		Landless labour % of H.H.	
	Pre-har.	Post-har.	Pre-har.	Post har.	Pre-har.	Post-har.	Pre-har.	Post-har.
Less than - 50	18.8	2.6	6.2	6.2	12.5	21.4	-	-
51 - 60	12.5	2.6	12.4	6.2	8.3	7.1	6.5	-
61 - 75	9.3	2.6	3.1	3.1	4.2	7.1	6.5	10
76 - 85	9.3	2.6	9.4	18.8	8.3	10.7	3.2	6.6
86 -100	6.3	5.0	9.4	6.2	20.8	3.6	6.5	3.4
100 -150	12.5	25.6	28.0	40.6	25.0	25.0	29.0	36.7
Over 150	31.3	58.9	27.7	18.8	20.8	25.0	48.3	43.3

(H.H. - Households)

According to the information given in Table 16, it appears that over 50 percent of the survey population has spent over 100 percent of their total earnings on purchasing food alone over both periods of the study. If we assume that nearly all the income is spent on food alone, then it is equally fair to assure that these households would have to look elsewhere for funds for expenditure on household/field requirements, i.e. credit facilities or loans from banks and village money lender. However, according to the information given on this subject in chapter three, no household of major irrigation two to four acre group and about 25-30 percent of the remaining three groups have confessed to taking a

loan etc. The vast difference in household expenditure on food and household income could not be balanced based on the information available. Since the income data did not seem very reliable, analysis of data was restricted to 'consumption unit' classes only.

4.2 ANTHROPOMETRIC SURVEY

The data collected were examined in the following manner: Heights, weights and ages of the under five year old population was classified according to the Waterlow and Gomez classification system.

Gomez Classification(1)

Weight for age classification is used to define severity of protein-energy malnutrition. The cut-off points of the first, second and third degree malnutrition is given below:

(i) Normal corresponds to $\geq$ 90 percent of the medium weight for age of the reference population.

(ii) First degree corresponds to 76-90 percent of the above population.

(iii) Second degree corresponds to 61-75 percent of the above population.

(iv) Third degree corresponds to $\leq$ 60 percent of the given population.

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(1) Gomez F. *et al* 'Mortality in second and third degree malnutrition' Journal of Tropical Paediatrics and African Child Health. 2,77,1956.

Waterlow Classification [2]

Weight for height and height for age used to define present and past states of nutrition respectively.

	Nutritional Status Category	Height for Age	Weight for age
(i)	'Normal Nutrition'	normal	normal
(ii)	Acute undernutrition ('wasting')	normal	low (a)
(iii)	Chronic undernutrition ('stunting')	low (b)	normal
(iv)	Concurrent, acute and chronic undernutrition (concurrent 'wasting' and 'stunting')	low (b)	low (a)

(a) defined as less than 80 percent of 'reference median' 'weight for height' of the reference population.

(b) defined as less than 90 percent of 'reference median' height for age of the reference population.

Reference standards used were NCHS growth charts [3]

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(2) Waterlow J.C.& Rutishauser, I.H.E. - 'Malnutrition in Man', in Malnutrition and Mental Developments Symposium of the Swedish Nutrition Foundation, XII edited by Cravioto, J, *et al*, Uppsala, Al Quist and Wicksell, 1974. pp. 13 - 26

(3) NCHS growth charts, United States Public Health Services/Health Resources Administration, Rockville, 1976

Chapter Five

DIETARY INTAKE SURVEY AND DISCUSSION

The household consumption of energy together with certain nutrients have been examined in detail in this chapter. Selection of nutrients to be examined in detail were based on certain epidemiological evidence in Sri Lanka. For instance there is evidence of protein-energy undernutrition, anemia, and vitamin A deficiency and its related diseases. Therefore, the study looked into the consumption unit intake of the household's energy, protein, iron and vitamin A. The intake of vitamin B_2 or riboflavin was also noted.

The household energy and nutrient intakes are expressed in terms of the average intake per consumption unit for a given group of households. Also the standard deviation is given.

5.1 ENERGY INTAKE

Physiological Need for Energy

Energy is primarily necessary for synthesis of new organic substance as the body continually converts and replaces its component parts, for internal work such as blood circulation, maintaining the ionic balance, etc. Such internal processes constitute resting energy changes called basal metabolism i.e. this is the minimum quantity of energy required for a living body. In addition to this, energy is needed for external work performed by the muscles i.e physical activities of everyday life.

The energy requirement [1] of individuals depend on four variables interrelated in a complex manner.

(a) Physical activity

(b) Body size and composition

(c) Age

(d) Climate and ecological factors

Apart from these in childhood and adolescence there are additional needs for growth and needs are also increased during pregnancy and lactation. Energy requirements for different age groups, sexes and weights, etc. are given in table 1, in the annexures.

Per Consumption Unit Intake of Energy

Consumption unit intake of energy by the households is examined within the expenditure on food groups as given in chapter five.

Expenditure group, pre and post harvest less than Rs. 4/- per consumption unit

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(1) Energy requirement is defined as the energy intake that is considered adequate to meet the needs of the average healthy person in a specific age/sex category

Table 16 - Pre and Post-harvest per Consumption Unit Intake of Energy and Nutrients in the Expenditure Group.
Pre and Post Rs. 4/=

Group	PRE HARVEST					POST HARVEST				
	Energy	Protein	Vit A	Vit B_2	Fe	Energy	Protein	Vit A	Vit B_2	Iron
	Kcals	gms	micgm	micgm	mgms	Kcals	mg	micgm	micgm	mgms
Major Mean 2-4 acre	1505	37	281	712	16.7	1744	40	281	785	17.5
(25.6%) SD	233	55	95	150	5.2	125	3.8	82	77	2
Minor Mean 2-4 acre	1460	35.1	218	563	14.2	1829	44	325	737	18.5
(43.2%) SD	195	5.8	106	110	3	127	5.2	113	176	2.7
Minor Mean less than 2 acre	1502	38	310	616	15.5	1766	40	265	715	16
(48.6%) SD	160	5.7	101	124	2.9	189	4.7	86	155	2.4
Land- Mean less lab- our	1401	33.6	279	537	14	1574	46.5	237	677	15.6
(74.8%) SD	201	4.9	101	152	2.8	187	3.1	66	87	2.6

( ) - % households in each group

Units of measurement - Energy in Kilocalories (Kcals)
Protein in grammes (gms)
Vit. A in microgrammes (micgms)
Vit. B_2 in microgrammes (micgms)
Iron in milligrammes (mgms)
SD - Standard Division

The energy requirement per consumption unit (i.e. adult male) is given as 2530 kcals (Ann 1). The energy intake during the pre-harvest period was found to be very low in all the households within this expenditure group. These households have only consumed between 55-62 percent of the energy requirement. This situation improved in the post-harvest period where most of the households achieved 60-72 percent of the energy requirement. The energy intake was significantly higher in the post harvest period(1). However, over both periods of study the landless labour group consumed the least amount of energy. Nearly 50 percent of the households of the survey population except major two to four group belong to this expenditure group and the diets of all of these households are energy deficient and possible repercussions of this will be discussed later in this chapter.

Expenditure group, pre/Rs. 4 and post harvest Rs. 4-6 per consumption unit

Table 17 - Pre and Post harvest per Consumption Unit Intake of Energy and Nutrients in the above Expenditure Group

Groups		PRE HARVEST					POST HARVEST				
		Energy Kcals	Protein gms	Vit A micgm	Vit B_2 micgm	Iron mgm	Energy Kcals	Protein gms	Vit A micgm	Vit B_2 micgm	Iron mgm
Major 2--4 acres (35.9%)	Mean	1908	53	297	870	22.4	2315	55.7	444	1070	25.3
	SD	193	3.5	90	201	7.6	271	6.9	150	118	4.5
Minor 2-4 acres (32.4%)	Mean	1953	49	370	693	18	2180	52.6	328	914	22
	SD	111	4.5	130	142	3.5	212	5.1	106	133	4.0
Minor less than 2 acres (51.4%)	Mean	2007	55	282	984	22.8	2451	59	397	1104	23
	SD	241	3.4	98	210	6.7	250	4.4	158	228	4.8
Land-less labour (25.8%)	Mean	1835	46.5	237	677	17.8	2030	53	394	767	19.3
	SD	107	3.1	66	86.6	1.6	172	4.7	101	128	1.8

( ) - % of households in each group.

(1) Significant at 1% level.

These households have managed to consume on average only about 75 percent of the daily energy requirements in the pre-harvest period thus being energy deficient at the household level. However, the majority of households over the post-harvest period have spent more on food but have also achieved the requirement of energy. The energy intake over post-harvest period is significantly higher than pre-harvest[1]. The landless labour group in this expenditure group also have consumed the least amount of energy when compared to the other three groups of households. It is interesting to note that although during the pre-harvest period this group of households fall into the less than Rs. 4 expenditure group's energy intake, they have consumed a much greater content of energy than former groups. On examining the data closely it was found that although both groups fell into the pre harvest / Rs.4 expenditure group, the second group's expenditure per consumption unit was closer to Rs. 4. This is also seen by the tables in the annexures which indicate the average intake of food items over pre and post harvest periods by the different expenditure groups. Particularly, in terms of quantity of rice consumed, the households in the pre and post / Rs. 4 expenditure group have consumed less rice than the latter. The differences in energy intake by the two expenditure groups can be accounted for in this manner.

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(1) Significant at 1% level

Expenditure groups pre and post harvest Rs. 4-6 and pre harvest Rs. 4-6 and post harvest greater than Rs. 6. per consumption unit.

Table 18 - Pre and Post Harvest per Consumption Unit Intake of Energy and Nutrients in the above Expenditure Groups

Groups		PRE HARVEST					POST HARVEST				
		Energy kcals	Protein gms	Vit A gms	Vit B_2 gms	Iron mgs	Energy kcals	Protein gms	Vit A gms	Vit B_2 gms	Iron mgms
Major 2-4 acre, pre & post Rs 4-6 expenditure group (20.6%)	mean	2734	64	483	1044	28.4	2654	61	419	1096	25.5
	SD	319	5.9	103	209	8.3	195	5.3	150	123	3.6
Minor 2-4 acre, pre & post Rs 4-6 expenditure group	mean	2397	56.6	337	976	22	2433	58.5	306	1027	24.1
	SD	183	6.6	121	137	3.1	288	6.2	107	107	4.8
major 2-4 acre pre & post greater than Rs 6 expenditure group (17.9%)	mean	2643	56	489	989	23	2895	64.1	437	1108	24.5
	SD	317	4.2	105	158	3.9	250	3.6	121	109	5.7

( ) - % of households.

Except for a few households, the rest have achieved the required quantity of energy over both periods of study. There was no significant difference in energy intake over the pre and post harvest periods.

PER CONSUMPTION UNIT INTAKE OF FOOD

The foods in the diet were broadly categorised into a number of groups and the per consumption unit intake of food items. This was done partly to be able to understand the energy and nutrient intake differences over the two periods of study within households and partly to identify deficiencies in diet in terms of type and quantity of food items and reasons for same. The food items were categorised as rice, pulses, wheat flour (bread), roots and tubers, green leafy vegetables, meat, fresh and dry fish, other vegetables, milk, fruits, coconut, sugar and jaggery.

(a) Rice

According to Tables II to IV of the annexures, practically all the households except for a few of the major irrigation 2-4 group have consumed a higher quantity of rice in the post-harvest phase than the pre-harvest period. The increase in rice consumption over the post-harvest period is approximately 50-100 gms. per consumption unit per day. The contribution of rice towards the total energy intake ranges from 65-80 percent in majority of households. The diet of the households with a low per consumption unit expenditure, obtained a higher percentage of energy from rice. Therefore the main reason for the increased intake of energy in the post-harvest period was due to more rice being consumed by the households. More rice consumption may be due to a number of reasons·

(a) higher income in the post-harvest period leading to enhanced purchasing power·

(b) reduced price of rice in this period·

(c) paddy harvested from fields made available in plenty for domestic consumption than in the pre-harvest season.

(b) Pulses

Pulses were available in plenty during the pre-harvest season since they were recently harvested from *chena* cultivation. However, the opposite was seen in the post-harvest period thus explaining the increased price of pulses in the latter period of study (Annexures table VI). Pulses are food items with a high content of energy and protein. However, the consumption of this item amongst these householders was poor. The relevant tables in the annexures indicate that on average only about 50 percent of the survey population consumed pulses and among those who did, the quantities taken were very small. Many of the householders who grew the crop preferred to sell it and purchase other requirements as this crop fetched a relatively good price in the market. Food habits/ preferences also appear to play a role in this since many bought and consumed masoor dhal/lentils as opposed to the locally grown cowpea which was much cheaper in price per kilogramme.

(c) Roots and Tubers

Once again the consumption of these items was very poor. Apart from potatoes which were consumed by some, other roots and tubers were rarely eaten. Roots and tubers are good sources of energy and can contribute significantly towards energy deficient diet, if, consumed regularly and in fair quantity by the population. The reason for low consumption is not clear but, food preferences and/or availability factors may be partly responsible.

(d) Coconut

This item also contributes significantly towards the total energy intake in the diet. A certain amount of coconut is used daily by all households. The contribution of coconuts to the total energy intake ranged between 12-20 percent in the different expenditure groups with the higher expenditure groups usually consuming more.

(e) Sugar and Jaggery

One or both of these contribute fair quantities of energy towards the total intake varying from about 10-15 percent. These items were consumed by all households.

(f) Wheat Flour (bread)

This is another good source of energy. According to Table II to V in the annexures, bread is consumed essentially by the low expenditure group i.e. less than Rs. 4. per consumption unit. Rice seems to be preferred over bread.

(g) Other food items such as fish, other vegetables, fruits, green leafy vegetables and milk contributed different amounts of energy. Fish is a good source of energy but, except in a few households, this contributed only about 5% of the total energy intake. This was due to small quantities of fish being consumed by the households. Although milk is a good source of energy, domestic consumption of milk is not common except where there are pre-school children. Even if milk is produced at home, it is sold as fresh milk or curd.

ENERGY DEFICIENT DIETS

Energy deficiency in diets was observed amongst all the households that belong to the low expenditure group. Major reasons for this deficiency was not because of the limited food items in the diet or its poor quality but because of the inadequate quantity of food. If the households with an energy deficient diet were to increase the quantities eaten then the energy requirement would be met as seen in the higher expenditure groups in the survey sample. Also, if the diet were to include more food with high energy density such as pulses, fish, etc. then the energy requirement could be met. However, the cost of these items and the low income of the households appear to be the reasons that act against achieving the required levels.

Energy deficiency in diets often go hand in hand with deficiencies of most other nutrients in the diet and as a result, the individual would become under-nourished. This affects individuals in different physiological states in different ways. For instance, infants and pre-schoolers undergoing crucial physiological changes (as growth and development occurs at this stage)-any dietary deficiencies would place them at the risk of having permanent or semi-permanent growth retardation. This would be elaborated further later in this chapter. Similarly, females who are pregnant are at risk of having under-weight or premature babies. Amongst the adult active population, such dietary patterns would, over time, reduce the potential work out-put per individual, reduce resistance to infection, etc. The body is capable of adapting to dietary shortages on a short-term basis but if these conditions are prolonged then the above consequences would follow.

5.2 PROTEIN INTAKE

Physiological requirement of protein

Proteins are indispensable constituents of living organisms and as such participate in all vital processes. Proteins are essential to growth since proteins provide the essential amino-acids which are the bases for tissue synthesis. Proteins are essential for the synthesis of hormones, enzymes, plasma proteins,etc. Although proteins can be used as a source of energy, it would be wasteful and expensive to use it for such purposes when other cheaper energy sources are readily available in the diet eg. fats and carbohydrates. The requirement of protein is given as 55 gms. per consumption unit (see Annex I).

(a) Intake of Protein Per Consumption Unit

Considering the intake by the expenditure groups, the lowest expenditure group, pre and post less than Rs. 4 group, on average consumed about 65 percent of their protein requirement in the pre-harvest period. This situation appeared to have improved over the post-harvest period where these households consumed a minimum of 65 percent of their requirements and a maximum of 85 percent. Households classed under the remaining expenditure groups did consume the required quantity of protein per consumption unit with pre and post Rs. 4-6 group achieving a minimum of 80 percent of protein requirement. All households consumed a significantly higher amount of protein over the post-harvest period(1).

(b) Food That Contribute Towards Protein Intake

Over 60 percent of the total protein intake per consumption unit was obtained from rice in a majority of households. The only animal protein was that of fish, contributed between 20-30 percent towards the total protein intake, the higher end of the range being from households of the higher expenditure on food groups. i.e. Rs. 4-6 per consumption unit. Households that consumed meat were totally absent in the survey population. Food taboos due to religious beliefs is a likely reason for this. The intake of other sources of protein such as milk and pulses as a practice was again uncommon. There exists a strong correlation between protein and energy intake and this is because large quantities of both were supplied by the same food source, rice.

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(1) Significant at 5% level

(c) Quantity and Quality of Protein in the Diet

It is interesting to note that households with protein deficient diets are also energy deficient and those that are energy adequate are also protein adequate. It can be said that with the type of diet consumed by the households i.e. with rice as the staple, if the energy needs of the households are met, the protein requirements would be automatically fulfilled. This refers only to the quantity of protein in the diet, however, its adequacy in terms of quality may not be sufficient and may need supplementation.

For instance, some of the building blocks of protein are essential amino acids[1] and in order to obtain a good supply of these a mixed diet is needed. For example, the availability of the essential amino acid lysine is limited in rice, but it is found in animal foods and some pulses. Therefore, if cereals are taken together with animal food and pulses the amino acid deficiency can be met.

On examining the dietary habits of this population it appears that the animal proteins intake in quantity is small. This is explained by the prohibitive cost to certain households. The necessary amino acids can also be obtained from pulses grown and available locally. Again the limited consumption of pulses by the households may pose a problem. The quantitative and qualitative protein deficiencies together with inadequate energy content in the diet would adversely affect the normal growth and development process of infants, pre-school children and pregnant women. Although this study cannot provide more details on the subject, one can predict that children facing the given circumstances are at great risk of being victims of undernutrition.

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(1) There are 8 of these essential amino acids which cannot be synthesised by the body and therefore has to be taken through the diet.

5.3 INTAKE OF VITAMIN A

Physiological Requirement of Vitamin A

Vitamin A is a necessary nutrient for man and animals. In the absence of an adequate dietary intake of Vitamin A or its carotenoid precursors for a significant period a number of abnormalities appear. In humans this deficiency prominently affect the eyes, externally by disrupting the epithelia of the cornea and conjunctiva and internally by lowering the sensitivity to light. The former condition is known as Xerophthalmia and the latter as Night blindness. The Vitamin A intake per consumption unit is given as 750 microgrammes (see Annexure I).

Intake of Vitamin A Per Consumption Unit

Examining the Vitamin A intake within the given expenditure groups (Tables 17,18 and 19), the lowest intake of Vitamin A over both periods of study was observed in the less than Rs. 4 per consumption unit expenditure on food group. A majority of these households did not even consume one third of the recommended intake. Households that spent Rs. 4-6 and over Rs. 6 per consumption unit expenditure on food, had on average consumed around 50 percent and 75 percent respectively of the required Vitamin A content. The diets of all expenditure groups were deficient in Vitamin A with the low expenditure groups being severely so. However, in nearly all the households the post-harvest intake of Vitamin A was significantly higher(1).

As this survey was only able to conduct dietary studies, from these results it is only possible to identify those who are 'at-risk' of Vitamin A deficiency and not the degree or extent of the deficiency. To identify the latter detailed biochemical tests would need to be carried out.

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(1) Significant at 5% level

Food

Sources of Vitamin A and its Consumption by the Study Population.

Although the diet of this population is deficient in Vitamin A, this area has food that are very good sources of Vitamin A, and Carotene and are comparatively cheap and can be grown in home gardens. Vegetables such as green leafy vegetables, bitter gourd, tomatoes, brinjals, pulses, etc. and locally grown fruits such as mangoes, sweet melon, papaw and wood-apples, etc., if taken in adequate quantities would certainly be able to supply the daily requirements of Vitamin A for the household. Once again, rather than a variety of foods in the diet, it is the insufficient quantity of the food consumed that appear to cause the diet to be deficient in Vitamin A.

It may be reasonable to state that the insufficient income of the lower expenditure groups may be a major contributory factor for the consumption of small quantities of food together with the unawareness of the best utilisation of the available food items. However, in the higher expenditure groups i.e. Rs. 4-6 per consumption unit and greater than Rs. 6 per consumption unit, the second reason, lack of necessary nutritional knowledge and prevention of nutritional disease is likely to be the cause for low intakes of the required food items. There is a strong possibility that children in particular who can pick fruits from nearby trees etc., would consume them but this would not be recorded in the questionnaire of the household dietary study. Unfortunately, such intakes cannot be estimated, but is likely to lead to under-estimation of Vitamin A intake.

5.4 INTAKE OF VITAMIN B_2 (RIBOFLAVIN)

Physiological need for Vitamin B_2 (1)

Riboflavin has an essential role in the oxidative mechanisms in the cells of all body tissues. It has been found that certain

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(1) Report of a Joint FAO/UNICEF/WHO expert committee. 'Methodology of Nutrition Surveillance' Geneva, WHO, 1976 (WHO Technical Report Series - No. 593)

conditions that are common in malnourished people such as sores at the angles of the mouth (angular stomatitis), sore, swollen lips (cheilosis), swollen, cissured and painful tongues (glossitis) and redness and congestion at the edges of the corner of the eye were rapidly cured by supplying small doses of Vitamin B_2. These conditions are common in children in tropical areas where the diet supply of meat, milk, fruits and vegetables are poor. The intake of Vitamin B_2 per consumption unit is 1800 microgrammes (see Annexure I)

Intake of Vitamin B_2 Per Consumption Unit

Statistics on the intake of Vitamin B_2 in households within the classes of expenditure on food indicate (Tables 18-20) that those belonging to the less than Rs. 4 per consumption unit expenditure, managed to secure only a maximum of 50 percent of their requirements whereas the higher expenditure group of households consumed between 50-75 percent of the required level. The Vitamin B_2 intake was significantly higher in the post-harvest period[1].

Sources of Vitamin B_2

The diets studied are deficient in Vitamin B_2 intake despite the fact that Vitamin B_2 is widely distributed since found in most foods. Animal food sources, certain green leafy vegetables and most pulses are rich sources of this Vitamin. Whole cereal grains contain useful amounts of the Vitamin but the amount depends on the extent of milling. In the study population rice provided over 50 percent of the intake of Vitamin B_2 per consumption unit with other vegetables, pulses, fish, etc., contributing much lesser amounts. Once again the recommended intake of Vitamin B_2 can be achieved by these households if a high quantity food that is currently being consumed is taken.

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(1) Significant at 1% level

5.5 INTAKE OF IRON

Physiological Need for Iron and its Functions

Nutritional anaemia and deficiency of haemopoietic nutrients are found in people of all age groups but is common among pregnant women and young children in most developing countries and Sri Lanka is no exception to this. It is evident that iron deficiency is by far the commonest nutritional disorder and the cause of anaemia. The second most common cause of nutritional anaemia is folate deficiency. Other nutritional deficiencies that play a less important role in the pathogenesis of anaemia are Vitamin B_2 deficiency and possibly protein deficiency(1).

Severe anaemia in pregnant women increases natural morbidity and mortality and involves a higher risk for the foetus. The deleterious effects of milder forms of anaemia are not well defined, although some studies have suggested a correlation between natural maternal haemoglobin concentration and foetal birth weight. It has also been found that severe anaemia impairs near-maximum work capacity in adults. However, the extent to which work capacity is impaired by moderate anaemia is less easily measured(1).

Iron requirement is highest when there is a rapid expansion of tissues and red cell mass, such as that occurs in infancy, childhood and pregnancy. Therefore, these groups in a given population are more prone to suffer from anaemia or iron deficiency, when dietary iron intake appears to be unsatisfactory.

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(1) Report of a Joint IEAE/USAID/WHO meeting. Control of Nutritional anaemia with special reference to iron deficiency. Geneva, WHO, 1973, (WHO Technical Report Series No. 580)

Intake of Iron Per Consumption Unit

Iron requirement per consumption unit is given as 9 milligrammes (see Annexure I). The requirement of iron for adolescent females, women and particularly pregnant women is much higher requiring 28 mg. per day for the first two categories. The Iron intake data given in Tables 18-20 indicates that on average all households have achieved the recommended intake for an adult male of 9 mgms over both periods of study. A majority of the less than Rs. 4 expenditure on food per consumption unit group of households were not able to consume the quantity required by the adult and adolescent females of the households particularly in the pre-harvest stage and also in the post-harvest periods in some households. Most of the households in the higher expenditure groups were able to consume the relevant quantity of iron required by both sexes. There was no significant difference in the intake of iron over the two periods of study in the households.

Sources of Iron and its Absorption

Unlike most other nutrients where the intake can be known from converting the food consumed to the respective nutrient, estimating iron intake is not so simple. This is basically due to the absorption mechanism of iron in the body and factors that affect this action. Studies have indicated that in normal people there is a variation in iron absorption from less than 1 percent with some vegetable foods to 10-25 percent with meat. The small proportion of iron absorbed from vegetable food indicate the presence of certain inhibitors affecting iron absorption such as phosphate and phytates. Other food that inhibit iron absorption are milk, eggs and tea. The effect of tea is particularly strong where iron absorption from a meal containing rice decreased from 12 percent to 2 percent when tea was taken with the meal(1). There are also foods such as red meat, fish, chicken and liver that increase the intake of iron from plant materials(1).

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(1) Report of a Joint IEAE/USAID/WHO meeting. 'Control of Nutritional Anaemia with special reference to iron deficiency' Geneva, WHO, 1973. (WHO Technical Report Series. No. 580)

Assuming that the diet of this group of households is a normal mixed diet, then it is expected to provide approximately 12-15 mgs. of iron of which a little over 1 mg. would be absorbed by the body. This amount of iron would be adequate to fulfill the biochemical need of iron of an adult man. However, as the need of adolescent girls, women and pregnant and lactating women are greater, unless the diet provided at least 10 percent of the energy from animal sources, the iron absorbed would be inadequate for the above group and would not be able to meet their requirements without iron supplementation[1].

Considering the average diet of the survey population, it can be observed that the group weighs heavily on plant food sources for their energy and nutrient requirements. The diet of almost all the households, (with the exception of about 10 percent), does not provide 10 percent of energy from animal foods.

Therefore, it seems very unlikely that the iron requirement of growing children, adolescent girls or by women especially during pregnancy and lactation, would be met from the diet alone. However, a haemoglobin count or relevant biochemical tests would have to be conducted inthis group of the population in order to confirm iron deficiency.

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(1) Report of a Joint IEAE/USAID/WHO meeting. 'Control of Nutritional Anaemia with special reference to iron deficiency. Geneva, WHO, 1973. (WHO Technical Report Series. No. 580)

Chapter Six

ANTHROPOMETRIC MEASUREMENT DATA AND DISCUSSION

Anthropometric indicators are most commonly used as proxies for 'Nutritional Status' and these body measurements fall into two categories, linear measures of size such as height or length, head and chest circumference, combinations of which are said to represent the past environmental effects. Measures of mass such as weight, head and chest circumference and skinfold thickness can be influenced by both long-term and relatively short-term factors. The three measurements examined in this study are weight-for-height (indicates wasting of body mass), height for age (indicates stunting) and weight for age of children between 0-60 months.

Table 19 - Percent Prevalence of Acute, Chronic and Concurrent Acute and Chronic undernutrition of children of age 0-60 months in the Four Household Groups.

Group	Acute undernutrition	Chronic under-nutrition	Concurrent acute and chronic undernutrition
Major 2-4	5.2	15.6	1.2
Minor 2-4 acres	4.9	16.6	1.2
Minor less than 2 acres	10.8	27.1	5.3
landless labour	15.6	35.1	10.6

(classifications as given in section 4.3)

6.1 ACUTE UNDERNUTRITION OF 0-60 MONTH OLD CHILDREN

Acute undernutrition or wasting is measured by taking the weight for-height ratio of each child and comparing this figure with that of the reference standard. Acute undernutrition classification indicates the reduction/increase in weight for a given height of a child and therefore is considered as an indicator of the recent nutritional deficiency/adequacy of a population. According to the figures in the Table 20 incidence of acute undernutrition is highest in the landless labour group where nearly one fifth of the 0-60 month population are identified as such. Of the same population in the minor less than two acres group over 10 percent are acutely undernourished. Incidence of acute undernutrition in the ramaining two groups are half of that of the latter group.

Percent prevalence of acute undernutrition in pre-school children of different age group for the Hambantota district as given in a national survey[1] is given below:

Months	0-12	13-24	25-36	0-60
percent prevalence	43%	8.0%	14.1%	6.7%

The percent prevalence of acute undernutrition of the children of the landless labour and Minor less than two acre group is much higher than the average figure for the district whereas for the remaining groups the oppssite is true. The figures in table 20 for acute undernutrition are aggregate figure for 0-60 month age group. Examining the nutritional status of these children in a disaggregated manner by age was not possible since the number in each age group was too small. Therefore, reasons for the given situation can only be generalised. Weight loss of children can be explained simply by the inadequate intake of food due to the unavailability of food at the household level or unavailability of food to the child

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(1) 24 District Nutritional Status Survey
Colombo, Ministry of Plan Implementation,
Food and NutritionalPolicy Planning Division, 1982

due to other reasons (e.g. beliefs). The inadequate intake due to unavailability appears to be the obvious reason for the observed acute undernutrition in this population group.

This is because over 75 percent of the children identified as under-nourished were from households that belonged to the expenditure group of less than Rs. 4 per day, per consumption unit where the diets were found to be macro and micro nutrient deficient.

Unavailability of food to the child due to other factors that can cause acute undernutrition in infants and one to two year old children are: early cessation of breast milk together with improper and insufficient supplementation with complementary foods for weaning purposes. This problem tends to be much less in the higher age groups since food is given from the 'family pot' without discrimination in regard to type of foods. This is provided that the household level of food intake is adequate so the child in turn would obtain a sufficient intake of food. Another factor that leads to the deterioration of nutritional status of both younger and older children is the effects of parasitic infestations, bacterial and viral infection (eg. diarrhoea, worms, etc.). The reason for this being that many mothers withhold food from a diseased child since food is considered to aggrevate the illness. Withholding of food from a sick child who is already suffering from acute undernutrition would worsen the conditon and has been found to be fatal. Also poor living conditions with poor water supply and sanitary fccilities, a lack of knowledge of proper nutritional practices and hygiene and inadequate basic health care services (both preventive and curative) are contributory factors towards undernutrition in such a community.

6.2 CHRONIC UNDERNUTRITION

The figures in Table 20 indicate the percent prevalence of chronic under-nutrition and the highest is seen for the landless labour group with lowest in the major irrigation two to four acre group. The percent prevalence chronic undernutrition in the pre-school children of the rural Hambantota as found according to a national survey[1] is given below:

Months	28-36	37-48	49-60	0-60
Percent prevalence	19.2%	28.6%	31.6%	21.3%

The average figures of chronic undernutrition in the labour group and the Minor less than two group are significantly higher than the average figure given for the district. Once again the undernutrition could not be viewed in terms of age groups since the sampel size of the 0-60 month population was not large enough for valid interpretation of disaggregated data. Chronic undernutrition or stunting is measured by taking the height for age ratio of each child and comparing this with the reference standards. This shows the adequacy/inadequacy of height gained for a given age group. Since stunting cannot be produced over a short period it is considered to reflect the past status of nutrition. As chronic undernutrition is not an indicator of short-term fluctuations in food intake it would not reflect any fluctuations in intake due to food shortages over a short period.

Stunting usually results when the food intake of an individual is low, relative to their needs, over a long period of time and the condition will deteriorate with the length of the period of deprivation of food. However, in communities where the intake of food

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(1) 24 District Nutritional Status Survey
Colombo, Ministry of Plan Implementation,
Food and Nutrition Policy Planning Division, 1980.

is maintained at a low level, a progressive increase in the proportion of children suffering from chronic undernutrition can be found and would increase with the increasing age of children. In the study population it is the low intake of food by the individuals that has caused the high proportion of children suffering from chronic-undernutrition since once again almost all the children classified as suffering from undernutrition are from households that belong to the expenditure group less than Rs. 4 per day, per consumption unit. As given in chapter 5, the dietary intake of energy, protein and Vitamins were found to be very low in these households.

6.3 CONCURRENT ACUTE AND CHRONIC UNDERNUTRITION

This category includes those children who are suffering from both acute and chronic undernutrition. Table 20 shows the percent prevalence of concurrent acute and chronic undernutrition. The highest percentage of children suffering from undernutrition is seen in the landless labour group followed by the Minor irrigation less than two acres group. The children of these groups indicate that their past and present state of nutrition is very poor and is a reflection of the poor food intake and general environmental conditions. These children are at great risk of having permanent effects in terms of growth retardation and on mental development and hence is a group that needs immediate remedial action. Once again examining the data on an age-wise break-down was not possible due to the small size of the sample. The concurrent acute and chronic undernutrition percent prevalence for the Hambantota district (rural) is given as 1.2 in 1982.(1) Comparing this Figure with the figures of the study, the latter seems very small compared to the national survey sample and since the figures are expressed in percentage terms, the study figures appear to be much higher than the survey data.

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(1) 24 District Nutritional Status Survey : Colombo, Ministry of Plan Implementation, Food and Nutrition Policy Planning Division, 1980.

Gomez Classification

The weight of a child for a given age is compared to the reference standard and a degree of undernutrition is accorded to each value ie. first, second and third. The figures given in Table 20 are those found to be suffering from second and third degree undernutrition.

Table 20 - 0-60 Month Old Children Divided According to Gomez Classification

Groups		2nd degree and 3rd degree
Major	2-4	9.2
Minor	2-4	10.6
Minor less than	2	17.6
Landless labour		30.7

The children who are under-weight according to their age is shown in Table 21 for the four groups. The highest percentage of children who are under-weight for age are in the landless labour group. Low weight for age can be a result of acute and/or chronic undernutrition. For example, a recent illness or acute deprivation of food can cause this or chronic deprivation of food can produce deficits in both weight and height so that body proportions are not greatly reduced but are low when compared with the normal children. The latter ie. chronic deprivation, appear to be true for majority of the children in all groups since most who were classified as being chronically undernourished were also under-weight for age.

According to all the anthropometric information on undernutrition, the landless labour group has the highest percentage

of undernourished children. Also the majority of the children who were identified to be undernourished were from households that belonged to the expenditure group less than Rs. 4 per day per consumption unit. As indicated in the study method all the measurements were taken during the pre-harvest phase of the study and is a reflection of nutrition and health conditions of the child population at the time. The study did initially propose to measure the same indicators over the post-harvest season for comparative purposes. But as the commencement of the study was delayed, it did not seem useful in conducting anthropometic surveys within two months of each other to observe any significant change. Therefore, any improvements in the nutritional status due to the increased consumption of food in the post-harvest period could not be recorded by the study.

Chapter Seven

OBSERVATIONS AND CONCLUSIONS

The study was conducted to record the pre-project conditions in terms of nutritional status and other related factors of the population in the project area. The purpose was to examine the extent to which economic development of the area, influences the nutritional status of different groups of the population where the benefits accrued by each group of the population is likely to differ from each other. Identifying the 'nutritionally vulnerable' groups was much easier once the community was divided into functional groups. Together with this the effect of seasonality on household food intake was examined. The study attempts to highlight the pre-project conditions and provide reasons for the observed dietary and nutritional deficiencies recorded at the household level and offer suggestions for possible intervention/remedial action.

7.1 SOCIO-ECONOMIC CONDITIONS

The population profile for three groups under the study shows that a large segment of the population is between the ages of 10-25 years. The shape of the profile indicates a relatively recent reduction in the under five year old population thus indicating a reduced birth rate. However, the landless labour group of households indicated the contrary with nearly one-fifth of the population being that of pre-school children. Reasons for this are not clear but can only be speculated. Almost all the study population were Sinhala Buddhists, being the prominent ethno-religious group of the area.

A majority of the males and females in all four groups have obtained their primary education. However, in the minor irrigation less than two acres and landless labour group, the percentage of

females with primary education was significantly less than those in the first two groups. Also the combined (female and male) percentage of illiterate population was high in the last two groups. It is likely that the reduced literacy rates amongst these two groups are linked to their low socio-economic status.

The overall health facilities appear to be above average in the study population and the district of Hambantota in comparison to the national figure viz. mortality rates of infants and mothers. However, although the health facilities and other indicators of health services appear to be above national average, the immunisation programme of pre-school children has covered only two-thirds of this population.

The water and sanitation facilities available to a majority of the study population is poor, with the exception of the major irrigation two to four groups. Many of the minor irrigation less than two acre and landless labour group do not have the facility of latrines or access to nearby well for a drinking water supply. In addition to these, since fire wood is scarce and expensive in the area, many households do not boil their drinking water. Consequences of living in such conditions are likely to be increased incidence in water-borne diseases such as diarrhoea, hookworms etc. Incidence of such diseases are likely to be high particularly in the dry season when the water availability becomes even more restricted in the area. However, as this study did not examine these aspects in depth, it is not possible to obtain an accurate picture with regard to the effects of environmental conditions on health - particularly in relation to pre-school children who tend to be prone to such diseases. Nevertheless, where possible, it would be useful to conduct health education programmes so as to inform this group of people of the causes and prevention of these diseases.

A majority in all groups, had their houses located in state land. However, nearly all had built their own house. In terms of the structure of the house, most houses (with the exception of the major irrigation two to four) were classified as semi-permanent. Rearing

of animals did not appear to be common in the study group of households nor did the domestic consumption of their produce. The reason for this could be economic rather than food habits and taboos.

In terms of occupation, the majority in the four groups of households were engaged in agricultural activities. Seventy five percent of those employed in the major irrigation and minor irrigation two to four group were paddy farmers though only 35 percent of the employed in the minor irrigation less than two acre group were farmers. The landless labour group, as expected were engaged in agricultural or other hired labour work. Many households in the minor irrigation two to four acre and less than two acre group, cultivated paddy in their own lands whereas the major irrigation two to four acre group cultivation was mainly on leased land. (The latter being the prime land for paddy cultivation due to availability of water from the major irrigation scheme). Many who leased land in the last group were from 'old farm families' of the area, thus owning the best land, but are no longer farmers as have taken up other occupations.

The highest average number of dependants was found in the landless labour group together with the highest dependancy ratio and the lowest number of income earners per household. Nearly all the households in the landless community obtained food stamps and so did a majority of the households under the minor irrigation schemes. However, the average household size was lowest in the landless labour group but this figure in all groups were higher than the average national figure. The main reason for this was the composition and age structure of the families. The 'extended family' system is found among all groups but least within the landless labour.

The income or the total earnings of a majority of the households have improved during the post-harvest season due to the sale of agricultural produce viz. paddy and *chena* crops and the increased employment opportunities in terms of hired labour in the agricultural sector. Certain problems encountered in collecting income data were highlighted in earlier chapters.

However, despite the deficiencies in income data, most of major irrigation two to four and minor irrigation two to four acre groups of households appear to have earned higher amounts in the post-harvest phase than the remaining two groups with the landless labour group having earned the lowest. In most socio-economic aspects, majority of the minor irrigation and landless labour group appear to be the most deprived, with the latter being more so than the former.

Examining the households within the expenditure groups, it was found that nearly 75 percent of the landless labour group and over 50 percent of the minor less than two acre group was in the lowest expenditure group. This indicator also highlights the degree of poverty in these groups of households.

7.2 DATA ON DIETARY INTAKE

Dietary intake data was examined in terms of energy, protein, vitamin A, vitamin B_2 and iron since previous national surveys and certain epidemiological evidence indicated deficiencies of these in the Sri Lankan community. With regard to the energy intake, all households in the four groups received significantly higher amounts over the post-harvest period than the pre-harvest, but the actual intake per consumption unit varied depending on the household expenditure group. The lowest intake of energy over both seasons was found in the lowest expenditure group of less than Rs. 4 per consumption unit (viz. per adult male) in all four groups, with the lowest intake being in the landless labour group. Households which belonged to this group obtained only one half to less than three fourths of the daily requirement of energy from the diet which was very much an energy deficient diet. In households classed under the expenditure group Rs. 4-6 per consumption unit, the majority obtained the required intake of energy and so did the other higher expenditure groups. This applied to all households in the four groups.

The energy deficient diets in the household in the lower expenditure group was due to the inadequate intake of food in

terms of quantity rather than due to poor quality of the diet, viz. low energy density diet. The households in the higher expenditure group managed to secure the required amount of energy simply by consuming a greater quantity of similar food that was consumed by the lower expenditure households. Therefore if the current diet is consumed by these households with relatively small increases in food quantity, then it would be sufficient to meet the daily requirement of energy. However, an adequate income to purchase the additional food appears to be a problem for these households. Also, where households do have access to vegetables (through home gardens and *chena* cultivations) and paddy, the crop harvested tends to be sold rather than used to meet the domestic needs so that it becomes a source of revenue rather than an item of food for consumption. Therefore, the expected enhanced economic activity of the area on project implementation, which would lead to an increased household income together with a nutrition/health education programme and promotion of home garden crops for domestic consumption should in turn enhance the household intake of energy.

Rice, the food item which supplied the major portion of household energy intake (nearly 70 percent) is responsible for providing a large proportion of the daily protein intake as well. Most of the reasons given for inadequate energy intake also hold true in relation to protein intake. The post-harvest intake of protein was significantly higher than the pre-harvest intake in almost all the households of the four groups. The households belonging to the lowest expenditure group of less than Rs. 4 per consumption unit were not able to consume the daily requirement of protein. Once again, the reason being that the diet was inadequate in quantity. Therefore if an increased quantity of currently consumed food types are taken then the requirement in terms of protein would be met. However, in diets of the study sample where the daily protein requirement was met, protein quality may still be low. This can also be remedied if the households were to consume pulses and fish which are high energy and high protein density foods and have the necessary amino acids to improve the protein quality of a cereal based diet. In all diets where the energy requirement was

met, the protein requirement was also met. This shows that, if a given diet of this community is able to meet the daily energy requirement of a household then it is almost certain of achieving its protein requirement.

Vitamin B_2 or Riboflavin intake was significantly higher in the post-harvest stage mainly since the major source of this vitamin in the diet was rice and consumption of rice was also higher in thie period of study. However, in the household expenditure group of less than Rs. 4 per consumption unit, the daily intake was less than 50 percent of the requirement over both periods of study. Although the situation improved with the higher expenditure groups, almost none were able to achieve the reccmmended requirement. Similarly, the vitamin A intake by the households followed a similar pattern although the vitamin A contribution from rice was very little. Foods containing the two vitamins are available in plenty in the area and particularly with regard to vitamin A, some of its rich sources are cheap as well. Once again, the problem lies in the inadequate consumption of these food items and the reasons for this are partly economic and partly perhaps the unawareness/lack of knowledge of the need of vitamin A. The latter appears to be true with regard to the higher expenditure group of households where insufficient funds were not the cause for insufficient intake.

Iron intake values are more complex and difficult to explain in terms of adequacy. All households belonging to the different expenditure groups have achieved the required quantity of intake from the diet over both periods of the study. However, there is uncertainity regarding whether the biochemical need was met by the dietary iron because of the complexity of the body absorption mechanism of iron. Absorption of iron from a given diet depends on the type of food in the diet. For instance, on an essentially plant-material-based diet, the level of absorption is very low due to certain inhibitors in these foods.

However, absorption is enhanced on consumption of animal foods. Such consumption was minimal in the average diet of this community. Therefore, although iron was physically available in the diet, the

adequacy of the amount absorbed is doubtful. This is particularly so for adolescent females and pregnant and lactating women whose iron requirements are much higher than average. Although iron deficiency anaemia seems likely in this community, a red blood cell count etc. of the 'at risk' group is needed prior to conformation of same.

7.3 ANTHROPOMETRIC INFORMATION

The nationwide existing problem of malnutrition is also apparent in the study population. The percent prevalence of malnutrition/ undernutrition which was measured in terms of acute, chronic, concurrent acute and chronic and weight for age, varied between the four groups under the study. The highest percent prevalence for all the anthropometric indicators given above, was found amongst the landless labour group followed by the minor less than two acre group. Current or recent dietary deficiencies due to reduced availability of food or loss of nutrients due to infectious and parasitic diseases is indicated by the percent prevalence of acute undernutrition. This was rather high in the landless labour and minor less than two acre group.

However, dietary deficiencies in this community is not purely a seasonal problem, as the percent prevalence of chronic undernutrition which is an indicator of long-term deprivation of food is also high in all groups but particularly in the above two groups. The percent prevalence of concurrent acute and chronic undernutrition shows children who have not had adequate food in the past and present and again the landless labour group is the most deprived. The same situation was seen when the data was examined in terms of children who are under-weight for a given age.

There was a positive correlation between poor nutritional status and the low expenditure groups since over 75 percent of children who were classified as undernourished were from the per consumption unit expenditure of less than Rs. 4 per day, in all four groups. Based on the dietary and anthropometric data, the households in this expenditure group can be identified as those 'at risk' of suffering from

malnutrition or as 'nutritionally vulnerable' community. Since the anthropometric measurements were taken over the pre-harvest period, which was the 'lean' period for food compared to the post-harvest period, it could be said that it represents the 'worst' period nutritionally and thus would present a biased view of the nutritional conditions of the population. However, although the pre-harvest period was act as the 'lean' period in terms of food intake, the study could not capture a true representation of a 'lean' period since during this phase the *chena* crops were harvested. This meant an abundant supply of vegetables, some pulses and to an extent increased employment opportunities to the hired labour force and an overall increase in earnings or reduced expenditure on purchased food in all four groups. Therefore, although the pre-harvest phase of the study in regard to food intake was less than that of post-harvest, the figures given or observations made based on the anthropometric data can be taken as the average condition of this community.

With the given information on socio-economic, dietary and anthropometric data, it is reasonable to state that the 'nutritionally vulnerable' group of expenditure on food less than Rs. 4 per consumption unit group of households, would be able to increase their food intake with additional household income/earnings. This was seen by the increased intake of food in the post-harvest period which was due to the enhanced household income/earnings together with the reduced market price of rice and some other food items. However, in order to increase food intake further so that not only energy and protein requirement are met but also other nutrients, a health and nutrition education programme can be initiated with information suited to this community.

7.4 RECOMMENDATIONS

Nutritional improvements are usually linked to expanded food production and an increase in food production in turn is considered to proportionally increase/enhance the nutritional status of the population. Likewise, an increase in income is thought to be a good

proxy indicator of nutritional improvements.

However, the issue of increased food production alone leading to enhanced nutritional status in a given area would depend entirely on the kind of crop grown in the area, the cost and the availability of other foods in the market. Similarly, possible increases in income mandatorily leading to a higher food consumption and/or to an improvement in nutritional status would depend on the type of food consumed and particularly on the priorities set by the household in the disbursement of their income. The latter reason is of particular importance when referring to subsistence farming/hired labour households. Therefore, the above factors together with other factors such as improved health and sanitary conditions, enhanced knowledge on nutritional matters among certain households, better food availability/less seasonal fluctuation of food availability, better purchasing power, etc. also have a bearing on improving the nutritional conditions, particularly in reducing the incidence of malnutrition.

The AR&TI study results indicate that the landless labour and the minor less than two acre groups to be amongst the 'poorest' in the community needing assistance in many areas including increases in income. Therefore, attention should primarily be given to strategies where these household incomes can be improved. Since both these groups derive a bulk of their income through hired-labour activities in the agricultural sector where employment opportunities fluctuate seasons, possible sources of employment opportunities to supplement the income of these groups need to be explored. Development of off-farm employment opportunities for this group appears to be essential.

Together with programmes aimed at providing these groups with employment opportunities and therefore, improvement of income, an educational programme in health and nutrition would be value so as to provide households the necessary knowledge that would assist them in forming consumption priorities. Information on intra-household budget control, obtaining nutritional improvements through changes in spending patterns on food, child care (particularly in relation to water-borne

diseases), better utilisation of available food, breast-feeding and home made weaning foods etc. need to be incorporated into such education programmes.

The Food and Nutrition Policy Planning Division of the Ministry of Plan Implementation is currently drawing-up a national nutrition education programme from which nutrition education materials could be obtained. However, in the first place, information dissemination channels to these 'needy' groups have to be established. Although consumption patterns may be influenced by agricultural policies and projects, the final decision regarding actual food intake are made by various households which is based upon various social, cultural and economic reasons. Therefore such an education programme would be of great use in attitude formation which is important in family decision making. Home gardens should be encouraged in all groups of households ideally with food crop mixes for direct consumption. Cultivation of pulses, vegetables and yams should be advocated with the necessary extension services.

Fish is a major source of protein and energy. It is currently a commodity economically prohibitive to most. A strong case exists for agricultural projects in the area to make available this rich source of protein at a price within reach of the 'poor'. Also a case exists for promotion of animal husbandry in the households. This could be encouraged by providing credit facilities and extension services. This will act as a source of revenue and a rich source of protein and energy to the households.

Until benefits from the Kirindi Oya project can be accrued by the 'poor', it is possible to reduce the current low status of nutrition through a concerted direction of certain short-term intervention programmes in existence in the country. These include two supplementary feeding programmes; the Thriposha and school biscuit feeding programmes. These programme implementation can be strengthened with adequate coverage of the 'nutritionally vulnerable' groups together with closely monitored record keeping system of anthropometric information of the

programme recipients. The latter is useful to indicate the extent of coverage of the programme and highlight resultant changes in nutritional status of the community. Also a certain amount of nutrition education materials can be passed on to the community from such clinics and schools where these supplementary feeding programmes are being conducted.

Finally, two groups (viz. landless labour and minor less than two acre) need additional attention, in particular, since within the Kirindi Oya project, allotments of land are generally given to 'old' residents in the area on the basis of a number of prescribed criteria. Therefore, some of the households belonging to the above two groups may not receive land allotments on account of situational inabilities which prevent satisfaction of the prescribed selection criteria. It is therefore, likely that the adverse nutritional status of some of the low income households may persist for an extended time, even beyond the project settlement and 'take-off' development stages. Hence it would be useful for the Kirindi Oya project development programme to include a component where the nutritional status of a cross-section of the community can be periodically ascertained. This would provide information to include any necessary intervention directly in the on-going programme to reach high social benefit levels. A monitoring and evaluation component in health and nutrition is needed since combined indicators of these factors would act as proxy indicators of the degree of socio-economic and cultural change in the community which are bound to occur in the post-project implementation period. Such a nutrition surveillance project would be able to identify those 'at risk' of malnutrition and advice on necessary action before the situation worsens.

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ANNEX

Table I

Daily Recommended Nutrient Allowance for Sri Lanka by The Medical Research Institute

Age & Sex	Weight (Kg.)	Energy (Kcals)	Protein (gms)	Iron (mg)	Vit.A (micgm)	Vit.B_2 (micgm)
7-12 month (M^+ & F^+)	7.3	817	19	10	300	500
1- 3 yrs (")	12.0	1212	24	10	250	800
4- 6 yrs. (")	18.2	1656	31	10	300	1100
7- 9 yrs. (")	26.2	1841	35	10	400	1300
10-12 yrs. (f)	36.0	2238	46	10	575	1400
13-15 yrs. (m)	49.0	2337	49	18	725	1700
16-19 yrs. (m)	51.0	2500	51	9	750	1800
20-39 yrs. (m)	55.0	2530	55	9	750	1800
40-49 yrs. (m)	-	2404	55	9	750	1800
50-59 yrs. (m)	-	2277	55	9	750	1800
60-69 yrs. (m)	-	2024	55	9	750	1800
70 yrs & over (m)	-	1770	55	9	750	1800
13-15 yrs. (f)	40.0	2300	46	24	725	1500
16-19 yrs. (f)	43.8	2200	42	28	750	1400
20-39 yrs. (f)	47.0	1900	47	28	750	1300
40-49 yrs. (f)	-	1805	47	28	750	1300
50-59 yrs. (f)	-	1710	47	28	750	1300
60-69 yrs. (f)	-	1520	47	28	750	1300
70 yrs. & over (f)	-	1330	47	24	750	1300
Pregnancy (First half)	-	+150	46	40	750	1400
Pregnancy (Second half)	-	+350	+15	40	750	+200
Lactation	-	+550	+28	40	+10	+400

m^+ - male f^+ - female

Units - Kilogrammes - Kgs. Milligrammes - mgms.
Kilocalories - Kcals. Microgrammes - micgm.

Table II

Average Consumption of Food Items per Adult Consumption Unit of the Major Irrigation, 2-4 Acre Group

Group	Period	Rice gms.		Green leafy vegetables gms.		Other vege-tables gms.		Fresh & dry fish gms.		Coconut kernals		Roots & tubers gms.	
		Mean	sd	Mean	sd	Mean	sd	Mean	sd	Mean	sd	Mean	sd
Pre & post Rs. 4	Pre harv.	316	72	10	2	150	50	20	5	120	26	30	10
	Post harv.	405	58	21	8	105	22	20	6	200	28	-	-
Pre Rs. 4 Post Rs. 4-6	Pre harv.	367	58	20	11	160	40	30	13	165	50	31	12
	Post harv.	495	52	25	10	130	40	35	10	287	75	10	5
Pre & post Rs. 4-6	Pre harv.	540	65	21	9	140	45	50	12	225	60	25	10
	Post harv.	530	42	27	11	110	30	52	15	252	55	-	-
Pre Rs. 4-6 & post over Rs. 6	Pre harv.	500	70	20	7	200	30	50	17	250	90	40	10
	Post harv.	560	86	30	12	150	45	55	16	245	65	-	-

Table III

Average Intake of Food Items per Consumption Unit Over Pre and Post-Harvest Period in the Minor Irrigation 2-4 Acre Group

Group	Period	Rice gms		Wheat Flour gms		Pulses gms		Green Leafy Vegetable gms		Roots & Tubers gms		Other Vegetable gms		Fresh & Dry Fish gms		Sugar gms		Coconut (K cals)	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Pre & Post Rs. 4	Pre	275	49	35	20	-	-	20	11	-	-	140	55	40	20	55	13	130	19
	Post	340	85	20	10	-	-	21	12	-	-	100	35	31	17	60	20	140	20
Pre Rs. 4 Post Rs.4-6	Pre	325	83	40	20	(1) 20	(1) 20	10	15	11	-	150	40	60	30	48	14	122	23
	Post	430	47	-	-	-	-	25	13	-	-	118	35	41	8	52	12	138	42
Pre & Post Rs. 4-6	Pre	445	75	-	-	10	5	10	5	-	-	170	60	50	19	53	10	181	37
	Post	490	63	-	-	-	-	20	11	-	-	110	39	47	17	57	15	206	15

(1) Only 50% of households in group consumed this groups. Where at least 50-75% of households did not consume a given food item, the average weights were not calculated.

Table IV

Average Intake of Food Items per Consumption Unit Over the Pre and Post-Harvest Period in the Minor Irrigation Less than Two Acre Group

Group	Period	Rice gms		Wheat Flour gms		Pulses gms		Green Leafy Vegetables gms		Roots & Tubers gms		Other Vegetables gms		Fresh & Dry Fish gms		Sugar gms		Coconut (K cals)	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Pre & Post Rs. 4 (48.6%)	Pre	300	72	35	15	15*	5	15**	3	-	-	100	35	40	19	37	12	100	34
	Post	345	51	34	17	-	-	21	9	12**	5	100	42	30	10	42	14	152	45
Pre Rs. 4 & Post Rs. 4	Pre	320	60	20	55	22	7	25	12	18**	6	160	42	50	22	42	15	121	42
	Post	440	54	50	12	20	5	20	5	-	-	130	40	45	12	50	15	157	32

* 50% of households consumed item

** Less than 50% of households consumed item

Table V

Average Intake of Food Items per Consumption Unit Over Pre and Post-Period in the Landless Labour Group

Group	Period	Rice gms		Wheat Flour gms		Pulses gms		Green Leafy Vegetables gms		Roots & Tubers gms		Other Vegetables gms		Fresh & Dry Fish gms		Sugar gms		Coconut (k cals)	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Pre & Post Rs. 4 (74.2%)	Pre	290	65	30	10	10*	3	15	5	17*	6	70	30	30	14	40	12	115	40
	Post	340	58	30	15	15	5	20	10	15	5	90	20	25	10	45	10	138	24
Pre Rs. 4 & Post Rs. 4-6 (25.8%)	Pre	340	53	50	12	-	-	10	5	-	-	85	40	25	7	50	11	121	42
	Post	390	45	50	10	20	5	15	5	-	-	110	25	37	15	55	15	157	32

* 50% of total number in the group consumed this item.

Table VI

Average Retail Price of Food Over Pre and Post Harvest Period

Food Item	Pre-harvest prices Rs. per Kg.	Post-harvest prices Rs. per Kg.	% increase/ decrease in price
Rice (country)	5.25	4.50	14
Dhal (Mysoor)	12.50	15.50	20
Other pulses	6.00	10.00	66
Sweet potatoes	3.00	4.00	33
Potatoes	8.00	11.50	44
Green leafy vegetables	1.00	1.00	-
Dry fish (small)	20.00	20.50	3
Fresh fish	3.50	4.50	28
Coconut	3.50	2.50	28
Tomatoes	2.00	8.00	200
Red onions	2.40	6.00	46
Orbegenes	2.00	3.50	90
Field beans	2.00	4.00	100
French beans	4.00	6.50	64
Ladies fingers	3.00	6.00	100
Snake gourd	3.00	4.75	58
Bitter gourd	5.00	3.00	60

$$\% \text{ increase in price/decrease} = \frac{\text{Pre-harvest price} - \text{Post-harvest price}}{\text{Pre-harvest price}}$$