A COMPARISON OF NUTRITIONAL STATUS OF PRESCHOOL CHILDREN OF COOPERATIVE AND INDIVIDUAL FARMERS IN RURAL ETHIOPIA.

BY

MELKIE EDRIS YUSUF

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Science in Applied Human Nutrition in the Department of Food Technology and Nutrition, College of Agriculture and Veterinary Sciences, University of Nairobi.

DECLARATION

This thesis is my original work and has not been presented for a degree in any other university.

Melkile Edris Yusuf

Nov. 30/1989

Date

This thesis has been submitted for examination with our approval as university supervisors.

Ms. A. Ehrlich
Lecturer, Department of Food Technology and Nutrition

Nov. 30/1989

Date

Dr. G. K. Maritim
Lecturer, Head of Unit of Applied Human Nutrition.

Nov. 30, 1989

Date
DEDICATIONS

This thesis is dedicated to my wife, Sister Melesu Tesema, as a reward for her invaluable encouragement, patience and indispensable support to my undergraduate and postgraduate education.

As a young man being a driver I struggled hard to reach where I am now. However, it was not only my personal effort, but it was my wife's encouragement and support without which my present educational status could not have been achieved. Therefore, the Lion's share of the credit, as far as my education is concerned, is given to my better half Melesu Tesema.
### TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title</td>
<td>i</td>
</tr>
<tr>
<td>Declaration</td>
<td>ii</td>
</tr>
<tr>
<td>Dedication</td>
<td>iii</td>
</tr>
<tr>
<td>List of tables</td>
<td>iv</td>
</tr>
<tr>
<td>List of figures</td>
<td>ix</td>
</tr>
<tr>
<td>List of appendices</td>
<td>x</td>
</tr>
<tr>
<td>List of definitions</td>
<td>xi</td>
</tr>
<tr>
<td>List of abbreviations</td>
<td>xiv</td>
</tr>
<tr>
<td>Acknowledgement</td>
<td>xv</td>
</tr>
<tr>
<td>Abstract</td>
<td>xvii</td>
</tr>
<tr>
<td><strong>CHAPTER ONE</strong></td>
<td></td>
</tr>
<tr>
<td>1.1 Introduction</td>
<td>1</td>
</tr>
<tr>
<td>1.1.1 Statement of the problem</td>
<td>1</td>
</tr>
<tr>
<td>1.1.2 Background research</td>
<td>2</td>
</tr>
<tr>
<td>1.1.3 Study objectives</td>
<td>5</td>
</tr>
<tr>
<td>1.1.4 Statement of hypothesis</td>
<td>6</td>
</tr>
<tr>
<td>1.1.5 Benefit of the study</td>
<td>6</td>
</tr>
<tr>
<td><strong>CHAPTER TWO</strong></td>
<td></td>
</tr>
<tr>
<td>2.1 Literature review</td>
<td>8</td>
</tr>
<tr>
<td>2.1.1 General paragraph</td>
<td>8</td>
</tr>
<tr>
<td>2.1.2 Nutritional status in Ethiopia and other developing countries</td>
<td>9</td>
</tr>
<tr>
<td>2.1.3 Factors associated with nutritional status</td>
<td>11</td>
</tr>
<tr>
<td>Section</td>
<td>Title</td>
</tr>
<tr>
<td>---------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>2.1.4</td>
<td>Assessment of nutritional status</td>
</tr>
<tr>
<td>2.1.5</td>
<td>Nutritional status in relation to household income</td>
</tr>
<tr>
<td>2.1.6</td>
<td>Nutritional status in relation to household land size</td>
</tr>
<tr>
<td>2.1.7</td>
<td>Nutritional status in relation to household family size</td>
</tr>
<tr>
<td>2.1.8</td>
<td>Education of mother in relation to nutritional status</td>
</tr>
<tr>
<td>2.1.9</td>
<td>Access to health service</td>
</tr>
</tbody>
</table>

CHAPTER THREE

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1</td>
<td>Materials and methods</td>
<td>33</td>
</tr>
<tr>
<td>3.1.1</td>
<td>Summary statement</td>
<td>33</td>
</tr>
<tr>
<td>3.1.2</td>
<td>Description of the study area</td>
<td>33</td>
</tr>
<tr>
<td>3.1.4</td>
<td>Sample size determination</td>
<td>35</td>
</tr>
<tr>
<td>3.1.3</td>
<td>Study design</td>
<td>37</td>
</tr>
<tr>
<td>3.1.5</td>
<td>Study instruments</td>
<td>40</td>
</tr>
<tr>
<td>3.1.6</td>
<td>Training of enumerators</td>
<td>40</td>
</tr>
<tr>
<td>3.1.7</td>
<td>Pilot study</td>
<td>41</td>
</tr>
<tr>
<td>3.1.8</td>
<td>Data collection</td>
<td>42</td>
</tr>
<tr>
<td>3.1.9</td>
<td>Data analysis</td>
<td>44</td>
</tr>
</tbody>
</table>

CHAPTER FOUR

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1</td>
<td>Research Implementation</td>
<td>46</td>
</tr>
<tr>
<td>4.1.1</td>
<td>Preliminary visit to the study area</td>
<td>46</td>
</tr>
<tr>
<td>4.1.2</td>
<td>Pilot phase</td>
<td>47</td>
</tr>
<tr>
<td>4.1.3</td>
<td>Sampling procedure</td>
<td>48</td>
</tr>
</tbody>
</table>
### Problems encountered

4.1.4 Problems encountered

| 4.1.4.1 Transport problem | 49 |
| 4.1.4.2 Problem of Income determination | 50 |
| 4.1.4.3 Problem of acceptance and participation by the community | 51 |

### CHAPTER FIVE

| 5.1 Results | 54 |
| 5.1.1 Demographic characteristics | 54 |
| 5.1.2 Household size | 55 |
| 5.1.3 Nutritional status of the study children | 55 |
| 5.1.3.1 Weight for age | 59 |
| 5.1.3.2 Weight for height | 60 |
| 5.1.3.3 Height for age | 61 |
| 5.1.4 Education of the study population | 62 |
| 5.1.5 Marital status of the study population | 63 |
| 5.1.6 Household land size | 63 |
| 5.1.7 Household annual income | 64 |
| 5.1.8 Material for house construction | 66 |
| 5.1.8.1 Sanitary facilities | 66 |
| 5.1.8.2 Cooking fuel | 66 |
| 5.1.8.3 Water source | 67 |
| 5.1.9 Accessibility to health service | 69 |
| 5.1.10 Age of mothers at their first pregnancy | 70 |
| 5.1.11 Child morbidity | 72 |
VII

CHAPTER SIX

6.1 Discussion.............................76
6.1.1 Demographic characteristics.........76
6.1.2 Education of parents..................77
6.1.3 Socioeconomic status.................78
6.1.4 Nutritional status of the study children........80
6.1.5 Water source of the study population...83
6.1.6 Villagization........................84
6.1.7 Age of mother at their first pregnancy, number of pregnancies and number of live children in the family........85
6.1.8 Morbidity experience................86

CHAPTER SEVEN

7.1 Conclusion and recommendation.........88
7.1.1 Conclusion..........................88
7.1.2 Recommendation.....................94

CHAPTER EIGHT

8.1 Reference............................96
VIII
LIST OF TABLES

1 Distribution of the study population by age and sex.................................55
2 Distribution of preschool children by area and below -2SD of W/A, W/H and H/A........57
3 Distribution of the study children by area and W/A Z-score............................59
4 Distribution of the study children by area and W/H Z-score............................60
5 Distribution of the study children by area and H/A Z-score............................61
6 Distribution of households by land size in the coops and non-coops..................64
7 Distribution of households by income in the non-coops................................65
8 Distribution of households by area and type of water source...........................68
9 Distribution of households by time taken to reach nearest source of water for the coops and non-coops...............................................68
10 Distribution of households by travel time to health station in the coops and non-coops.................................................................70
11 Distribution by last reported visit of households in the coops and non-coops......70
12 Distribution of mothers by age at their first pregnancy in the coops & non-coops....71
13 Correlation matrix of independent variables with specific nutrition indicator(coops)....73
14 Correlation matrix of independent variables with specific nutrition indicator(non-coops)74
<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Study design</td>
<td>38</td>
</tr>
<tr>
<td>2</td>
<td>Distribution of the study children by area and below -2 SD of weight for age</td>
<td>109</td>
</tr>
<tr>
<td>3</td>
<td>Distribution of the study children by area and below -2SD of weight for height</td>
<td>110</td>
</tr>
<tr>
<td>4</td>
<td>Distribution of the study children by area and below -2SD of height for age</td>
<td>111</td>
</tr>
<tr>
<td>5</td>
<td>Distribution of study children by area and below -2SD of W/A, W/H and H/A</td>
<td>112</td>
</tr>
</tbody>
</table>
Appendix I

Correlation Matrix of specific independent variables with nutritional indicators of the coops.......................102

Correlation Matrix of specific independent variables with nutritional indicators of the non-coops...................102

Appendix II

Result from Anova of land size between the coops and non-coops........................................103

Result from Anova of total annual income between the coops and non-coops.................................103

Appendix III

Result from multiple regression of land size and total annual income with nutritional status (W/A)......................104

Result from multiple regression of land size and total annual income with nutritional status (H/A)......................105

Appendix IV

Nutritional Status of the study children by age and sex and below -2SD of W/A, W/H and H/A..........................106

Questionnaires

Demography questionnaire..............................113
Socioeconomic questionnaire..........................114
Anthropometric measurement..........................119
Morbidity questionnaire...............................120
XI

DEFINITIONS

Agriculture Producers' Cooperative, an economic society through which farmers in a Peasant Association join their means of production on their own free will in part or as a whole under a single administration or a common property so as to preserve and consolidate their common benefit. (PMAC. 1979).

AGRICULTURE PRODUCERS' COOPERATIVES

The first stage in the establishment of a primary Producers' Cooperative (called Malba) is the transfer of all private land to common holdings (except one-fifth of a hectare for individual cultivation). Draft animals and implements remain individual property. To reach the second and advanced stage (Welba) all land (except one-tenth of a hectare for individual cultivation) and draft animals and implements have to be transferred to the cooperatives. A minimum of 3 farmers may initiate a Malba or they can directly form Welba, but in the latter case, 30 farmers are needed for registration (FAO Rom 1983).

2 Farmer- is arbitrarily defined as one deriving more than a third of
his annual income from his own agricultural production.

3 Teff- The staple food of Ethiopians, 'injera' is made from teff (Eragrostis Abyssinica), which is a tiny grain related to millet and indigenous to Ethiopia.

4 Household size=All the people who live at least for three months together and operate as a unit, including such members as unrelated servants, labourers and relatives.

5 Madiga- A unit of weight measurement which is approximately 25 kgs.

6 Diarrhea- Three or more loose stools over a period of 24 hours with or without mucus and/or blood in it (WHO definition).

7 Malnutrition- Weight for height Z-score of less than -2 and above 2 SD according
to the NCHS (USA) reference standards.

8 Dependency ratio- The proportion of dependents who are below fifteen and above sixty five years of age in the study households.

9 Villagization- It is a government policy designed to bring the farmers together in villages who had been settled in scattered houses and occupied a large acres of land.
XIV
ABBREVIATION

1 PMAC = Provisional Military Administrative Council
2 EPI = Expanded Immunization Programme
3 MCH = Maternal and Child Health
4 PAs = Peasant Associations
5 NCHS = National Center of Health Statistics
6 APC = Agricultural Producers' Cooperative
7 AMC = Agricultural Marketing Corporation
8 Coops = Cooperatives
9 Non-coops = Individual farmers
10 W/A = Weight for age
11 H/A = Height for age
12 W/H = Weight for height
13 IDRC = International Development Research Center
14 WHO = World Health Organization
15 FAO = Food and Agriculture Organization
16 GCMS = Gondar College of Medical Sciences
ACKNOWLEDGEMENT

I am highly indebted to Prof. A. A. Kielmann, Head, Unit of Applied Human Nutrition for requesting the International Development Research Center to sponsor me and for his fatherly advice and encouragement throughout the study. My special appreciations go to IDRC for providing me with the scholarship and for financing my project. I am grateful to the German Technical Co-operation (GTZ) for financing the establishment of the Applied Human Nutrition Programme.

I am very grateful to my advisor Ms. Anne Ehrlich for her continual guidance, helpful suggestion and encouragement during the study. She has helped me tirelessly and graciously from the beginning of the proposal writing to the completion of the thesis. I am grateful to Dr. G. K. Maritim and Mrs. N. Kielmann for reviewing my thesis and their continuous guidance throughout the course.

I would like to extend my sincere appreciation to South Gondar Regional Party Committee for providing me with research permission. I am deeply indebted to Addis Abeba University for giving me study leave. I would like
to express my gratitude to my advisor in Ethiopia, Dr. Masresha Abuhay, Assistant Dean of GCMS for his advice and helpful suggestion. My sincere gratitude goes to Mr. Amsalu Feleke, Head of Northern Gondar Regional Health Department, for his indispensable support when I was stacked with transport problem. It was unthinkable to bring the data collection phase to its end without his help. The Peasant Association Officials and Community guides had positively contributed to this study and they are duly acknowledged. My thanks go to the parents of the study children for their cooperation, patience and for sparing their time for this study.

I wish to thank Elsa Assefa, Alemayehu Masresha and Habtamua Sisay who had faced all the hardship in the field with me being my enumerators.

Last but not least I am deeply indebted to my daughters, Senafekesh, Yeketwork and Yetenayet for bearing the pain of longing for me while I was away from them for about two years. I am also thankful to their grand mother, Tsehaynesh Tesema who was taking care of them in my absence.
A cross-sectional study was carried out in Dera Aweraja (district) in South Gondar Region North West Ethiopia. A total of 376 children aged 6-59 months were studied. The objective of the study was to compare the nutritional status of preschool children of the cooperative and individual farmers and to determine factors that are attributable to the difference of the nutritional status of the two groups of children.

For the purpose of this study, two agriculture producers' cooperatives and four villages of individual farmers surrounding these cooperatives were included in the population sampled. Since there were only two cooperatives in Dera Aweraja (district) Korata and Jigna were selected for the study. The four villages which were included in the study were randomly chosen from among a total of seven villages surrounding both coops. In the Korata (APC) 82 households were selected using comprehensive sampling technique because there were only 82 households which had children under five years of age. In the two villages surrounding Korata, systematic sampling technique was employed to select households for the study. The same technique was used in the Jigna
(APC) and the surrounding villages. In those households identified for the study, the pretested questionnaires were administered and anthropometric measurements, weight and height of children aged 0-5 years were taken. The result of the investigation showed that, the mean family size of the study population was 5 and that there was no significant difference between the coops and non-coops.

The overall malnutrition rate has been found to be very high. Using the WHO criteria, The measure of weight for age below minus two standard division was 51.6%, that of height for age was 55.9% and that of weight for height was 12.5%. The nutritional status of the pre-school children of the cooperative farmers was found to be significantly better than that of the individual farmers. Weight for age, weight for height and height for age was crosstabulated by coops and non-coops. The result obtained was (P<.01), (P>.1) and (P<.01) respectively.

There was no statistically significant difference in nutritional status among the different age groups of the study children and between male and female. But the age group 12-36 months seemed more affected than the other age groups.
The educational level of the mothers and head of the households was only adult education and had no relation with nutritional status of their children.

The mean land size of the coops was 3.63 ha. while that of the individual farm was 1.44 ha. The mean annual income of the coops and individual farmers was 1,017 Birr and 329 Birr respectively.

Age of the mothers at first pregnancy total number of pregnancies and number of live children in the family were not related to nutritional status.

Diarrhea was found to have some effect on nutritional status on the study children but fever was shown to have had no effect of nutrition on the pre-school children both in the cooperatives and individual farms.

According to the results of the investigation, size of land available to each household was found to be the most important determinant factor of income of the households and nutritional status of the pre-school children.
CHAPTER ONE

1.1 INTRODUCTION

1.1.1 STATEMENT OF THE PROBLEM

Government policy in Ethiopia has encouraged the establishment of cooperative farming with the intention of facilitating the provision of social services, in addition to upgrading of agricultural inputs. The response has been slow but favourable and numerous cooperative farmers (coops) have emerged, however, over 75% of the peasants still cultivate their land on an individual basis. Because of such inputs as better management, credit facilities, and improved health services which are made available to the coops, it is reasonable to postulate that, among other things, the state of health and nutrition has not only improved among the people in the coops, but it is also better compared to that of the individual farmers. To date, however, there is no empirical evidence to substantiate this assumption and it is the purpose of this investigation to test this hypothesis. It is believed that basically socioeconomic development guarantees improvement in nutritional status. In a similar reform policy amongst Mexican "ejidos" and is similar in many ways to the coops of Ethiopia, the health and nutritional status of
the Mexican members of the communities were found to have improved significantly as indicated by a lower prevalence of child malnutrition and a decline in the infant mortality rates (DeWalt, et al., 1987).

1.1.2 BACKGROUND RESEARCH

Agriculture is the oldest industry in Ethiopia. It was the source of existence (subsistence) in the past and is deeply rooted within the Ethiopian culture. About 87.4% of the population is directly dependent on agriculture which contributes to more than 70% of the total national income. Despite the major role it played in the economic development of the country, agriculture was the most neglected sector of all economic activities. As a result, the country has suffered from occasional shortage of food and cash crops. Before the 1974 revolution, the productivity of the agricultural land was very low. This was attributed to;

1. Primitive and very labour intensive farming methods
2. Land not being put to maximum use due to inappropriate choices of crops
3. Scientific methods of farming, appropriate use of fertilizers, selection of seeds etc. were not known.
The past system of land tenure which existed prior to the revolution in 1974 (Richard, 1987).

Ethiopia, was until recently, known as a country with fertile soil and adequate rainfall. However, as a result of weather change and multiplicity of prevailing mentioned factors, there has been a recurrence of drought in some parts of Ethiopia over the last 16 years.

The rugged topography of the Ethiopian mountains and highlands, combined with agricultural practices which have further worn the land, such as using the ox-plough for cultivation, have led to an extreme deforestation of the highlands. Originally 40% of the country was covered with forests extending from about 1,500 to about 3,200-3,700 meters above sea level. Today, the country has only 3% of forest cover. Cultivation and excessive grazing led to soil erosion and high water loss due to run-off during the rainy season (Hurni, 1989).

As soil condition deteriorates, people attempt to move to other more productive lands. Eventually, when there is no more land available such people are forced to adapt to smaller tracts of land requiring intensive labour and more
expensive inputs to ensure an adequate yield. Despite attempts to cope under those harsh conditions they are, nevertheless at higher risk of experiencing higher rates of malnutrition and even death.

Unfavourable climatic conditions such as drought are common as are also occasional floods. In the past, drought mostly affected the northern part of the country. This situation first arose in Ethiopia 16 years ago. The drought occurred in some parts of Wollo Region. As the action taken in the following years was not timely enough, the conditions continued to deteriorate. The population of Wollo was estimated to be 2.4 millions. Out of the total population of 2.4 millions 50-100,000 deaths occurred. Widespread migration in search of food took place (Shandange et al., 1974). The condition of drought spread to the neighbouring regions and especially more vulnerable groups; mothers and children were affected. In part due to the resultant problems, the government changed its policies with respect to the organization of agriculture production.

After the 1974 revolution measures were taken to improve the agriculture sector of the Ethiopian economy. The most important measure was the land
proclamation of Yekatit 1967 (Ethiopian calendar) that eradicated tenancy and facilitated equitable distribution of land. The formation of peasant association enabled large scale distribution of fertilizers which enabled farmers to produce more and introduce the importance of cooperative farming (PMAC, 1975). Hence, cooperative farming was introduced and the farmers have been organized into peasant association.

Those people who had been moved from drought stricken areas to the higher potential areas of the country, where there is adequate rainfall and fertile soil, have been organized into cooperative. It has been postulated that the living condition of the cooperative farmers is better than that of the individual farmers. This study, therefore, was intended to demonstrate the difference or similarity in the nutritional status of preschool children of the cooperative and individual farmers in Dera Aweraja in South Gondar Region, North Western part of Ethiopia. The objectives, the hypothesis and benefits of this study, therefore, are stated below.

1.1.3 STUDY OBJECTIVES

1 To compare the nutritional status of preschool children of cooperative farmers and
individual farmers in Gondar Region, North West Ethiopia.

2 To determine the factors that are attributable to the difference in nutritional status of the two groups of children, including the following

1 household income
2 household land size
3 education of the head of the household
4 maternal education
5 access to health service
6 morbidity experience one week prior to the survey.
7 Household size

1.1.4 HYPOTHESIS

The nutritional status of pre-school children of cooperative farmers is significantly better than that of individual farmers.

1.1.5 BENEFIT OF THE STUDY

Although there have been many nutrition and health studies of urban and villages populations in Ethiopia, there is little published information on nutritional status of the cooperative and individual farmers of Dera Aweraja in South Gondar Region North West Ethiopia.
The results of this investigation will provide a foundation upon which policies, within the agricultural sector which are associated with food availability and nutrition, can be formulated.
Like many developing countries Ethiopia’s economy is based primarily on the agricultural sector. About 90 per cent of the total population lives in rural areas, and is engaged in agricultural activities, largely subsistence farming. Before the 1974 revolution land was distributed according to a feudal system which proved to be the biggest bottleneck to rural development in Ethiopia. Rural land was redistributed to the tiller following the revolution in 1975. The proclamation following the revolution converted all rural lands into collective property (PMAC.1975).

Some policy commitments on the part of the government to promoting good nutrition is a prerequisite for deciding on and implementing the necessary actions. It has been claimed that the purpose of nutritional surveillance is a part of continuing attempt to change government policy in favour of nutrition or social equity, where such concerns are missing (WHO. 1984).

Food policies are frequently designed to achieve a number of objectives, while improved nutrition may be an expected outcome, it is frequently not
one of the explicit policy objectives (Alderman, 1981).

Absolute poverty, poor health and sanitary conditions, limited knowledge of nutritional matters among certain households, and fluctuations in incomes are some of the principal reasons for the prevalence of malnutrition.

Improved nutrition is assumed to be linked directly to expanded food production. Increase in incomes are good proxy for improved nutrition (Andersen, 1981).

2.1.2 NUTRITIONAL STATUS IN ETHIOPIA AND OTHER DEVELOPING COUNTRIES

In many developing countries including Ethiopia, the prevalence of all degrees of PEM is reported to be in the range of 30-60% W/A (Phillip et al 1981). A study conducted in a rural district and an urban slum in Ethiopia showed the prevalence of severe PEM to be less than 3% (Hofvander and Eksmyr, 1970)

Malnutrition varies from country to country depending on economic, ecological, social and other factors. In Ethiopia at present the most serious nutritional problems are mainly due to low intake of foods in general. The problem is more severe among children and it is estimated that 2% of the children aged 1-3 years suffer from
kwashiorkor 4% from marasmus and 60% underweight (Ethiopian Nutrition Institute. 1989).

Zein and Mekonnen (1983) have found low levels of health status, including high morbidity rates, malnutrition and household sanitation as well as illiteracy in some of the coops.

The nutrition investigations done during recent years in Iringa Region, Tanzania has shown the levels of PEM, measured as growth retardation, are very high. Most of the communities (villages) studied had between 40-70% of the underfive year old children being moderately malnourished below 80% of the Harvard standard weight for age (Mrisho. 1985). Study done by the Italian Medical Team in Tanzania looked at nutritional status of male and female children, it was found that there was no statistical difference in the prevalence of PEM in either sex. Looking at the studies covering 11,703 underfives and 1,487 adults, it is seen that overall prevalence of all forms of PEM ranges between 30-80% with most areas having a mean of half the underfive population being undernourished (Ljungovist 1985).

In Swaziland National Nutrition Status Survey was undertaken. The purpose of the study was to find out factors that are linked with under
nutrition such as feeding practices, whether or not the child was immunized, frequency of diarrhea and the socioeconomic status of the household.

The result of the survey showed that nearly one third (30%) of all young children in the rural areas were nutritionally stunted. Children became more stunted as they grow older. Only 13% of children between 3 and 6 months were stunted whereas 42% of children aged 18 and 24 months were stunted. Nutritional wasting was uncommon. Less than 1% of both rural and peri-urban children were classified as nutritionally wasted (Swaziland National Nutrition Council 1985).

2.1.3 FACTORS ASSOCIATED WITH NUTRITIONAL STATUS

Under the land reform decree of March 1975 rural land was nationalized and users' rights were uniformly limited to 10 hectares per family. To implement the reform and for future development, the farmers have been organized into Peasant Associations (PAs).

The Peasant Associations are organized on the basis of land holdings of a maximum of 800 hectares per association. They have been given wide ranged power. The following are the main functions included in this charter:
1 distribution and administration of land within their areas,
2 establishment of schools, clinics and others.
3 cultivation of land for old people, widowed or disabled persons,
4 undertaking villagization programme,
5 establishment of Judicial tribunals to hear land disputes, and
6 monitoring, administrating and applying conservation and land use measure.

All farm families within the Peasant Associations constitute the General Assembly, which elects a 15-member executive committee.

Resources for day to day activities of the PAs are generated through contribution from members. Government on the other hand gives technical assistance (FAO, 1983)

Families with their own piped water had the least stunted children, families who obtained their water from an unprotected spring, river or stream had the most stunted children.

Families who had no latrine had many more stunted children than families with concrete latrine or a flush toilet.
The paper has recommended that child nutrition must be improved through tackling poverty. Development programmes must focus on the poorest groups in the country, people with little land or poor land, people living far from towns or roads, people who have difficulty getting credit or other help to improve their lives (Swaziland National Nutrition Council. 1985).

As economic condition improves, there is usually a lag in the rate at which benefits reach the poor. In Mexico, malnutrition is common but in Taiwan it is rare; the disparities in income distribution are much greater in Mexico, even though per capita income is twice as much $530 versus $270 (Tylor and Tylor. 1976).

Fish as food is generally valued for its nutritional and sensual qualities as a food: taste, texture, and odour. Fish complements the meal. In some countries fish is an ingredient in food preparation for young children. From nutritional point of view, the use of fish in such food preparation would be a wise means to help in alleviating malnutrition which is usually evident among young children.

Fish makes an important contribution to
micronutrient supplies: vitamins, minerals and fatty acids (Teuscher, 1986).

Illiteracy has significantly declined from 50% in 1978 to 13% in 1984 and adult education enrollment from zero to nearly 200,000. The government of Ethiopia after the revolution focused on these points and improved them a lot. Different kinds of cooperatives had been undertaken by the developing countries. Farmers were organized into cooperatives to get credit from the development bank, but they cultivate their land on an individual basis (Apthrope, 1972). The cooperative in Ethiopia is different since all means of production are held in common. All members work on the land together, but one is paid according to his/her work.

It has been observed that in the same socio-cultural and ecological environment, that malnutrition affects only some households. These are mainly related to the socio-economic status of the household.

It has been established that clean water supply close to the home and a hygienic toilet are believed to be among the cornerstone of those environmental and social changes which produced the dramatic decline in infectious disease in
High mortality rate among infants and young children are a poignant measure of the human cost of poverty and inequality in developing countries. A study in Brazil examines the link between one such program Urban Water Project and changes in early childhood mortality patterns in that country during the early 1970.

Access to internal piped water in the house is likely to be of most direct benefit in lowering child mortality by reducing exposure to water-borne disease, particularly diarrheal disorders (Merrick, 1976).

The potential of various co-operative farming for increasing agricultural production is of growing interest to planners and administrators faced with the problem of feeding an expanding population. The implications of co-operative farming for programme of land and agrarian reform and for transforming agriculture from a subsistence to a market economy is also an aspect of agricultural development receiving increasing attention in developing countries (FAO, 1964).
2.1.4 ASSESSMENT OF NUTRITIONAL STATUS.

The most important nutritional problem in the world today is that of protein-energy malnutrition (PEM). To assess the presence or absence of malnutrition, three measurements should be chosen.

Age

Weight, and

Height. Length supine for children under 2-years of age and height standing for children aged 2-years and more.

These three measurements are combined to form three indicators of nutritional status

Weight for age,

Weight for height, and

Height for age.

These indicators are compared with those obtained from an international reference population (NCHS). (WHO, 1983).

The use of height for age and weight for height as primary indicators of nutritional status in children was recommended by (A joint FAO/UNICEF/WHO Expert committee on Nutritional Surveillance 1976). Deficit in height for age was termed "stunting" that of weight for height "wasting". It is also recommended that weight for height be used as an indicator of present state of
nutrition and height for age as an indicator for past nutrition (Waterlow, 1977).

It is recommended that measurements of a study population should be related to the NCHS reference population by standardized deviation scores (Z-scores) rather than as a percentage of the median. The use of centiles is not recommended because of the fact that in less developed countries a large number of children are so far outside the range of the reference population that they cannot be accurately classified by centiles. (Waterlow, 1977).

2.1.5 NUTRITIONAL STATUS IN RELATION TO HOUSEHOLD INCOME

A comparative investigation among cash crop and principally food crop growing individual farmers in Ethiopia has indicated that income realized from farm produce was not associated with any change in the nutritional status of preschool children (Yemanie et al., 1985). On average the cash crop producers generated as much as three times the income of food growers. It would appear that available resources may not always be utilized to purchase more food.
In Ethiopia, the physical growth of children in both rural and urban settlements has been studied. The findings of these reports gave an almost unanimous picture; the weight and height curves of infants very closely correspond to western standards during the first 3-5 months of life. Ethiopian children living under hygienic and high socioeconomic conditions, the anthropometric data of a group of preschool children are approximately similar to those of average children in Europe and North America. Ethiopian preschool children from higher socioeconomic classes, with fathers and mothers having a university or college education, have a physical growth superior to that of children belonging to the same ethnic groups but living under poorer conditions (Eksmyr, 1970).

Adequate or healthy nutritional status in children was significantly associated with paternal occupation of trading, mechanical and clerical work, while poor nutritional status was associated with children of farmers and herdsmen (Cherian, 1984).

A comparative study of nutritional status of preschool children of estate workers and small scale farmers in Limuru Division (Kenya) has indicated that children of small scale farmers were
better off nutritionally than children of estate workers (Kinyingi, 1988).

Infants from families of low socioeconomic status are much more likely to be malnourished than infants from families of higher socio-economic status. Families of low socioeconomic status are less able to afford food supplements for their children, and are more likely to live in extremely poor housing conditions which predisposes to illness. Both of these will lead to infants malnutrition (Apthrope, 1972).

Inadequate dietary intakes and high incidence of infectious disease are the main biological factors which ultimately determines nutritional status in developing countries.

Low income levels of developing nations limits the kinds and the amounts of food available for consumption. Low income also increases the likelihood of infection through such mechanisms as lack of shoes, inadequate shelter and housing and limited facilities and supplies for personal hygiene.

Many studies have shown that people in developing countries are exposed to a much greater infective load than in industrialized nations. Studies in Guatemala have shown that 15 to 40
percent of the new borns show signs indicative of fetal infection. The prevalence of infectious disease is also very high in young children in developing countries as shown in a study of Guatemalan children 1 to 3 years of age (Martorell, 1980).

Any change in income or income form influence nutritional status at the household and individual levels. The nutritional impact of an increase in real income is influenced and perhaps dictated by who controls it within the household.

The well being of the children will also depend on the mother's nutritional knowledge, the ages of the children, and the degree to which other household members are involved or become involved in child care (Merrill, 1984).

The effect of income is measured by expenditure on food, which reflects a household's income and resources. A study in Bangladesh has shown positive effect on food consumption. But the elasticity of income with respect to food expenditure is usually less than 1. It has been shown empirically that as income rises beyond a threshold level, people tend to spend proportionately less on food than on non-food items (Chaudhury, 1986).
Inadequate nutrition has often been described as a social disease in countries where malnutrition is common, its causes include factors inherent in the very nature of the society. Similarly in countries where malnutrition has been overcome rapidly, political improvements have been major contributory factors.

In a typical developing country 50-80 per cent of the population is rural. Ethiopia is an example of this. In India the average size of land holding is 3.2 ha, but about 70 per cent of holdings are below this average. 22 per cent of rural families own no land at all and 47 per cent own less than 0.4 ha. It is the small farmer together with the growing number of the landless and the unemployed, who lack the soil, the water, the fertilizer as well as economic and political power to feed themselves. The land tenure system in many countries favours the big landlord who employs farm labour at low wages (Grant, 1986).

In Nicaragua, changes in land ownership showed progress. In 1972, 63.1% of rural income was claimed by moderate and large landowners, and only 7.5% went to rural labourers. This trend has
shifted with the advent of small individual farmers organized in credit and service association, production cooperatives and state farms. Domestic production has increased. Per capita yearly food consumption parallels this growth in production (Collins et al., 1985). In another study among Mexican "ejidos" which are also a result of agrarian reform and are in many ways similar to the coops of Ethiopia. The health and nutritional status of the members of the communities were found to have improved significantly as indicated by less child malnutrition and lowered infant mortality rate (DeWalt, et al., 1987).

The authors also provide a state of the art review of the life condition of the communal agrarian system and conclude that contrary to the view held by some western scholars, such systems are not necessarily inefficient.

A meaningful land reform programme will inevitably destroy or limit the power base of many persons. Many countries have legislated land reform but only a few can be said to have achieved real land reform and these reforms were only implemented when there was a change in government in circumstances that favoured drastic change, as in Mexico, Japan, Taiwan and Kenya (World Bank,
The land reform of Ethiopia was also similar and with the land reform the users' rights were also uniformly limited to 10 ha. per family.

It has been hypothesized that one of the most important obstacles limiting the development in rural agricultural societies is the amount of land available to the families. The greater the amount of land available to the small-scale farming families, the better the nutritional status of the young children in the family (PAMC 1975). In Guatemala, land availability was significantly associated with nutritional status of young children and may thus be used as an indicator of health and nutritional status of the family (Valverde et al., 1977).

Among all other things land is a useful means of classifying much of rural population for food, nutrition and poverty consideration.

A study was done in Jamaica on landholdings. The population of Rural Jamaica was stratified into three categories based on land. Households were classified: (a) landless (b) those operating one to three acres and (c) those operating more than three and less than six acres. Fifty sample was taken in each stratum.
The landless households were poorer than others, and the subsistence farm households were the least deprived of the measures.

The prevalence of inadequate diets varied significantly across the household categories, being highest among the subsistence farm households. The money value of the food consumed was significantly lower for landless households than for the subsistence farm households (Omawale, 1984).

The most widespread cause of rural poverty appears to be unequal distribution of land. A study of malnutrition and land ownership in Southern Brazil, has shown that the prevalence of stunting and under weight was higher among children of landless families than children of landed families.

In many developing countries including Ethiopia land reform has been done to alleviate malnutrition. After the revolution in Ethiopia in 1974, the new government implemented radical agrarian reform measures to promote more economic equality in the country. A similar attempt to introduce radical agrarian reform in Nicaragua in 1979, met with more success (Melville, 1988).

The prevalence of malnourished children in Nigeria is greatest in landless agricultural
workers, intermediate in small-scale farmers and least in merchants and skilled workers. The greater the amount of land available to small-scale farming families, the better the nutritional status of the young children in the family.

A study done in Guatemala on land availability and nutritional status of 2-and-3 year old children of Guatemala families of various occupation. For purposes of analyses three categories of land size was defined: 0 to 1.9, 2, 4.9 and equal to or greater than five mazanas.

Neither comparison of the group means, nor correlation analyses, yields statistically significant relationships between the amount of land available to the family and nutritional status of the 2-and-3 year old children (Ritchie, J. 1983).

2.1.7 NUTRITIONAL STATUS IN RELATION TO HOUSEHOLD SIZE

Large household size lowers the quality of attention given to individual children. In the clinic of Indian National Institute of nutrition, 61 per cent of all cases of protein-energy malnutrition were children with three or more older siblings. The youthfulness of any rapidly growing population results in a high ratio of young
dependents to economically active adults (Cherian, et al., 1984).

In traditional African societies, to have many children was considered important, because some were expected to die and those who lived were needed to help their parents on the farm and in the home. As a household size increases however, any new resources earned are quickly swallowed up as needs grow with each new child born. Poor families become poorer and often cannot provide the basic necessities upon which good health and welfare depend.

Studies have shown that where birth intervals are small and pregnancies frequent, the younger children have lower birth weights than children born in smaller families. Children with low birth weight have less chance of survival and achieving good health than have those born within the normal weight range (Ritchie, 1983).

Families with more than three children who were older than the child in the survey had more stunting than those with only 1 or 2 children. Families with 8 or more living children had the highest amount of severe stunting (Swaziland National Nutrition Council 1985).
Increased household size may adversely affect the nutritional status of every member of the household because it may be associated with decreased allocation of food to each member of the household.

In some situation, however, household size may itself indicate higher economic status. It is not household size per se but the number of adults relative to children. The lower the dependency ratio, the higher the nutrient intake of the household members (Chaudhury, 1986).

Household size composition is important if a household has more members of older ages they could be contributing to the household resources as opposed to families with younger household members who would consume resources (Mrisho, 1985)

2.1.8 EDUCATION OF MOTHER IN RELATION TO NUTRITIONAL STATUS

Many studies have shown that women’s education is the singularly most important determinant factor in a child’s health. In 1966 survey in Bombay was shown that the infant mortality rate of children born to uneducated mothers was twice as high as that amongst mothers who had completed primary education, and three
times that of mothers who had had secondary education. Recent studies have confirmed this and it holds true even for mothers within equal low income communities (Justin, et al., 1985).

Mother's education was strongly related to how stunted her children were. Mothers with no education, or only some adult education, were more likely to have stunted children than mothers who had been to college or university (Swaziland National Nutrition Council 1985).

Education is associated with great awareness of the importance of nutrition, the nutrient content of food and nutrition options from market purchases or from home productions. On the other hand education is also a measure of taste. Higher education may also increase the desire to consume status food and non-food items.

The effect of education on nutrient intake in the household is likely to be more positive for female than male education. Female education leads to efficiency in the allocation of food consumption and also to an awareness of the importance of nutrition and less regard for status consumption. However, in a study of nutrient adequacy in Bangladesh none of the educational measures was significantly associated with nutrient adequacy.
with the exception of the relationship between husband's education and calorie adequacy. Male education has a positive effect on nutrition, which is mostly due to the positive association of education and expenditure (Chaudhury, 1984).

A study in Brazil illustrates the strong link between maternal education and child's survival chances. There was a steady decline in the proportion of children dying as educational attainment increases (Merrick, 1976).

It is well recognized that removal of poverty does not, by itself guarantee good nutritional status.

Within the same overall income level, some families have malnourished children and some do not. Furthermore, even with the very significantly improved social conditions, malnutrition may persist within some populations. Education plays a fundamental role despite its lack of success in some countries.

The author has recommended that adequate income, adequate housing and adequate education are necessary together before malnutrition can be eliminated. Thus, while socioeconomic improvements themselves are fundamental, unless health and nutrition education are continued and adapted to
the new conditions, overall success will be limited (Pellett. 1981).

2.1.9 ACCESS TO HEALTH SERVICE

A case comparison study, among Latin American families, was designed in which cases were those mothers of children 0-4 years old who did not use medical service for their preschool child within the last year. The comparison group were user mothers. There is no statistically significant independent association between illness and use of medical services when both family size and child's age are controlled in analysis (Selwyn 1987).

Immunization affects nutritional status. In the nutritional status survey of Mauritanian children during a drought emergency, those who were not immunized were with the poorest nutritional status. Measles represents a considerable threat to debilitated children and high fatality rates have been reported (Koster et al., 1981) quoted by Weather 1983.

The Rural Health Research Center at Narangwal, Punjab, carried out investigation on the interactions of nutrition and infections in preschool Punjabi village children. The project also aimed to envolve a system of rural health care
sensitive to the needs of the vulnerable child population. In three groups of villages, nutrition care and medical care were given singly and combined, a fourth group (emergency care only) served as control.

The result showed that, children in villages receiving nutrition care, whether alone or in combination with medical care services, exhibited the highest mean weight; those from villages receiving medical care alone were the next highest; and those in the control village had the lowest weight (Kielmann et al., 1979).

The living condition of the farmers in the study area was very poor. They were poorly dressed, bare footed and with poor housing condition. There was no health care facility in the vicinity. They travelled a long distance to seek medical care service. Because of the above problem, they do not seek medical care when they get sick, (Kielmann, et al 1979). have found that most bacterial, viral and protozal infections are known to be the main precipitating causes of kwashiorkor. Intestinal parasites present in large numbers would interfere with intake, absorption and protein retention. These conditions, therefore, might have contributed to the poor nutritional status of the study area.
Nicaragua showed economic progress and increased food production after the revolution. The health facilities and health service activities has been improved since then. The infant mortality rate has dropped from 121 in 1978 to 74 in 1983. Vaccination coverage has more than tripled; the health budget is more than five times the amount the previous government spent in 1978. (Anthrope, 1972). More than twice as many clinics and physicians now serve the people, which is similar in Ethiopia after the revolution in 1974.
CHAPTER THREE

3.1 MATERIALS AND METHODS

3.1.1 SUMMARY STATEMENT

A cross-sectional study with descriptive and analytical components was undertaken in Dera Aweraja, Gondar Region in Ethiopia. The study was carried out in two Agricultural Producers' Cooperative in the district and among individual farmers living in villages surrounding the cooperatives. The objective of this study was to compare the nutritional status of preschool children of the cooperative and individual farmers and to determine factors that are related (attributable) to the difference of nutritional status of the two groups of children.

3.1.2 DESCRIPTION OF THE STUDY AREA

The Aweraja (district) which was the study site is inhabited by 182,738 people, according to the 1984 census, of which 93,595 (51.22%) are males and 89,143 (48.78%) are females. All of them are of the same ethnic group and they speak the same language (Amharic). Most of them follow the Orthodox Christian church and the rest are Moslems.
This Aweraja is weinadega, which means a medium potential land area, lying at an altitude of 1,800 meters above sea level. Agricultural products include teff, wheat, millet, chick pea, lentils, rice, and pepper. Cash crops include coffee, sesame, nigurseed, and linseed. The Aweraja has 46 peasant associations. All farmers are organized in peasant associations and there are two Agriculture Producers' Cooperatives (APC) among them. All of them are gathered in villages and each village consists of an average of 400 households. The study was carried out in six villages, two of which belonged to the agriculture producers' cooperative and four of which belonged to individual farmers. All households with children in the age group 6-59 months old in these villages were considered the target population for the study.

In one of the coops (Korata) there is a health station which was built on a self-reliance basis and run by a health assistant who was paid by the Ministry of Health. Fees are charged only for medication. Health facilities were less accessible to individual farmers because the health station is located within the Korata Producers' Cooperative village and the individual farmers have
to walk for about 5 km. As far as the service is concerned it is equal to all members of the villages surrounding the coop, according to the information obtained from the health assistant and the respondents.

In the Jigna Producers' Cooperative, there is no health service unit. There is only one community health worker with some basic instruments and drugs for first aid. Both the members of the coops and individual farmers used the nearest health stations which were about 20 km from their villages.

3.1.3 SAMPLE SIZE DETERMINATION

Sampling frame: All children 6-59 months of age belonging to agriculture producers' cooperative and individual farmers in the Aweraja comprised the sampling frame.

The sample size was determined using the following formula.

\[ n = \frac{z^2(pq)}{(r)^2} \]

Where

- \( p \) is the proportion of malnourished children
- \( q \) is the proportion of well nourished children
- \( Z \) is the degree of precision
- \( r \) is the range at which the result of the investigation will lie.
Then \( p \) is estimated to be 40% (Zein., et al., 1984). \( q \) is then 100-40= 60%. \( Z \) is 5% and its value is 1.96 and \( r \) is 5%.

\[
\begin{align*}
\text{Sample Size } &= \frac{(1.96)^2(.4 \times .6)}{(.05)^2} \\
&= 369
\end{align*}
\]

Since there were four distinct groups in the study, the sample size in each group was approximately determined to be 110, in order to account for incomplete or lost questionnaires. The groups were as stated in figure 1. The total sample size is 440.

The total number of households which are members of the Korata Agriculture Producers' Cooperative was 165. Only 82 households had children under five years of age and hence all these households were visited and children were examined. One child in each household was randomly selected if there were more than one under five years.

Since this number was the number of children who were needed for comparison from the other two villages included in the study, 41 children were taken from the 458 households of village two and 41 from the 514 households of village three. Out of the 384 households sampled, 8 were incomplete. Therefore, the sample size upon
completion of the survey decreased to 376.

3.1.4 STUDY DESIGN

The study was carried out using a cross-sectional study design. All children in the age group 6-59 months in the study villages comprised the study. The total number of children was 376.
STUDY DESIGN

DERA AWERAJA

JIGNA PRODUCERS' COOPERATIVE
H.H NO. 110

VILLAGES 2/4 SURROUNDING JIGNA WITHIN 5 KM OF RADIUS

KORATA PRODUCERS' COOPERATIVE
H.H NO. 82

VILLAGES 2/3 SURROUNDING KORATA WITHIN 5 KM OF RADIUS

ADMINISTRATION OF STRUCTURED QUESTIONNAIRES AND ANTHROPOMETRIC (WT. & HT.) MEASUREMENTS OF ALL CHILDREN 6-59 MONTHS OF AGE WHO WERE IDENTIFIED FOR THE STUDY 376 CHILDREN.

PREVALENCE OF MALNUTRITION

WELL NOURISHED

MALNOURISHED

DETERMINE ATTRIBUTABLE FACTORS OF MALNUTRITION

Figure 1
As is indicated in figure 1, in the study area (Dera Aweraja) there were only two producers' cooperatives, Korata and Jigna. Both of them were included in the study, hence purposive sampling was undertaken.

Within the Korata agriculture producers cooperative, purposive sampling was also undertaken. As there were 82 households which had children under five years of age, all of them were visited but only one child was selected from each household, and this child was selected randomly.

The villages which had been included in the study were chosen randomly from the 3 villages surrounding Korata. Within the two villages selected around Korata, the method of household selection was systematic sampling. All households were registered but the houses were not numbered. However, we used the registration number for each household. To select households for the study in village two and village three, systematic sampling technique was used. Since 41 households were needed from each village, the sampling interval was determined by dividing the total number of households in village two and village three by 41 respectively. The first household was identified by using a random number table. The remaining households were chosen systematically using the
registration list, until 41 households were sampled. One household was chosen at the interval of eleven and twelve households in village two and three respectively.

The same technique was used in Jigna Agriculture Producers' Cooperative and the surrounding villages included in the study. The sample size was 110 households in the Jigna (APC) and 55 were taken from villages five and six.

3.1.5 STUDY INSTRUMENTS

The questionnaire comprised four parts of which the first part dealt with demography, the second part contained socioeconomic questions, the third part included anthropometric assessment and the last part dealt with morbidity data of seven days recall. This questionnaire also dealt with age, sex, and history of an illness within the week prior to the study.

3.1.6 TRAINING OF INTERVIEWERS

Enumerators were recruited among candidates who had completed high school. An intensive training of 15 days duration was given on how to administer the questionnaires and measure weight and height. The interviewers worked in MCH
clinic for 15 days for their practical experience. All of the enumerators were fluent in Amharic, which was the language spoken by all the people interviewed.

3.1.7 PILOT PHASE

The questionnaire was pretested on rural households considered to be similar in all respects to the study area. Weight and height measurements were also taken on children that were found in the same household. However, this data were not used for analysis.

After the questionnaire was pretested and interviewers had been found to have satisfactorily acquired the skills of interviewing and measuring weight and height, a pilot study was conducted in two farmers' villages, one of which belonged to the Producers' cooperative and the other belonged to the individual farmers. Twenty six children were sampled during the pilot phase. The results of the pilot were discussed with advisors in Nairobi and relevant changes were made, especially for the socioeconomic questions. Data for the final study was collected between February 25 and April 28 1989. Every questionnaire was checked for accuracy and completeness immediately following the interview.
3.1.8 DATA COLLECTION

The purpose of the study was communicated to the Farmer's Association through the South Gondar Region Party Committee and Aweraja Agriculture Agency. The chairman of each respective Peasant Association was contacted in person by the principal investigator to facilitate participation in the study villages. Residents were informed about the study during village meetings. Announcements were also made by the study guides the day before data collectors (enumerators) and the principal investigator arrived at their respective villages. Village leaders and community guides fixed the days of the week that were convenient for the villagers by considering market and holidays. Houses in the study villages were not numbered, but a register was available with the name of the head of the household written against the registration number. The community guides knew each head of the household in the study villages. The names of the heads of households selected for the study were given to the community guides, who identified the houses and checked whether they had children under five years of age. If so, they qualified for the study and were informed about the next visit. If a selected
household did not have a child under five years of age, then the next household either to the left or to the right, at the back or in front was taken by choosing the direction randomly (Abraham. 1984).

Weight was measured using a hanging Salter spring balance which has a capacity of 25 kgs and is calibrated at intervals of 0.1kg. The children were weighed either naked or with light clothing on, and their weight was recorded to the nearest 0.1kg. The scales were checked and adjusted with a known weight before every measuring session.

Length was measured using a wooden board that was made locally to which a measuring tape with an accuracy of 0.1cm was attached. The board measures upto 98 cms and had a mobile foot/head piece. Height of children older than 2 years was measured using a standing measure put on a flat surface and the child was required to be barefoot. The children stood on the measuring board with their feet at 90 degrees to the measuring board and the heels, buttocks and shoulders and back of the head touching the board. Their heads were held erect with the lower edge of the orbit of the eye in the same horizontal plane as the external canal of the ear. Using a ruler the exact level of the top of the head was determined. For
children below two years of age recumbent (crown-heel) length measurement was used as described by WHO (1983). The child was laid on the board and the head was positioned firmly against the fixed head board, with eyes looking vertically. The knees were extended and the feet flexed at right angles to the lower legs. The sliding foot piece was moved to obtain firm contact with the heels and the length was read.

The ages of study children were recorded in months as reported by respondents, but for some children, their age was calculated from date of birth. The age of the child was not verified by any documentation.

Income was determined by asking for the number of madigas (1 madiga=25kgs) harvested from different grains and cereals during the last harvest season and multiplied by the average local market price in Birr.

Morbidity history was obtained by asking each respondent if the child had any history of illness in the week prior to the day she/he was interviewed.

3.1.9 DATA ANALYSIS

Data were processed by a computer using CDC, Dbase III and SPSS/PC programmes. CDC was used
for anthropometric date, weight and height measurements and Dbase III was used for socioeconomic and morbidity data. After entering the data into the computer cleaning and editing was also done using these programmes.

Frequency of variables, crosstabulation, correlation of independent variables with specific nutrition indicators, analysis of variance and multiple regression were done using SPSS/PC. Tests of significance were done using the chi-square and Anova. Anthropometric indices, weight for age, weight for height and height for age were used as indicators of nutritional status. The NCHS standard deviation reference figures, that is Z-scores were used as the reference and -2 S.D. was taken as the cut-off point. Thus, those who were below -2 S.D. were considered to be malnourished.

Details of methodological problems encountered during this investigation are discussed in chapter four.
CHAPTER FOUR

4.1 RESEARCH IMPLEMENTATION

4.1.1 PRELIMINARY VISIT

The data collection of this investigation was carried out in Dera Aweraja, South Gondar Region, North West Ethiopia. Permission to undertake the research was obtained from the office of South Gondar Regional Party Committee in January 1989. The Committee instructed the Regional Agriculture Agency to write a cooperative letter to the appropriate Peasant Associations in the study area. Accordingly the head of that agency wrote a letter to the chairman of Jigna and Korata Agriculture Producers' Cooperatives. This letter was taken on the first visit to the study area, and the author was able to talk with the chairman and village leaders of the respective Peasant Associations. The chairman of the Jigna (APC) was also the chairman of the other villages (village 5 and 6) surrounding it. The same was true of the Korata (APC) and the surrounding villages (village 2 and 3). These leaders were very cooperative and receptive. The villagers were informed of the intended study during a village meeting. The purpose of the study was explained to them by the principal investigator in the presence of the village chief.
Since the survey team did not know the area and the study population, the principal investigator hired three residents of the study area to act as community guides to the survey team and facilitate the data collection process. With the chairman and other committee members of the peasant association, three people who had some formal education and who were accepted by the community were recruited. Thereafter, the recruitment of field assistants (interviewers) followed. Candidates were recruited amongst high school graduates. An intensive training period of 15 days for interviewers included preparation for questionnaire administration and measuring weight and height. The enumerators worked for 15 days in the M.C.H. clinic for the practical experience in weighing and measuring children.

4:1.2 PILOT PHASE

The questionnaire was pretested on rural households considered to be similar in all respects to the study households. Weight and height measurements were also taken on children that were found in the same households; this data was not however, used for analysis. During this time the security of the study area was relatively good. The Gondar College of Medical Sciences (GCMS) in
which this pilot work was done was cooperative and optimistic about the study. In general everything was favourable to the survey team.

After the pilot survey, the investigator came back to Nairobi for a progress seminar. The seminar was held on February 2, 1989. After the seminar some modifications were made on the socioeconomic questionnaire and then on February 18, 1989. the investigator returned to Ethiopia with a modified questionnaire, and some equipment for the main survey. The height measure and length measuring boards were procured from (GCMS) during the pilot study. On February 25, 1989, the actual survey was started in the Korata (APC).

4.1.3 SAMPLING PROCEDURE

Multistage sampling technique was used. Non-random sampling was used for determining the coops to be included, as there were only two Agriculture Producers’ Cooperatives in Dera Aweraja. Both of them were therefore included. In the Korata (APC) a comprehensive sampling technique was also used, as there were only 82 households which had children under five years of age, and therefore all of them were included in the study. The surrounding villages included in the study were
chosen randomly and the study households within the area were selected systematically (see chapter three).

For two weeks following the commencement of the data collection, the general conditions for the survey team were favourable. When the study team was half way through data collection in the Korata (APC) and surrounding villages, transport problems were encountered.

4.1.4 PROBLEMS ENCOUNTERED

4.1.4.1 PROBLEM OF TRANSPORT

The biggest problem during the data collection phase was transport. In the area where I did my survey, there was no public transport. There was a dry weather road leading to the cooperative farms, but there was no road to the other villages included in the study.

The Gondar College of Medical Sciences was cooperative during the pilot survey. But for reasons which were not clear to me, while I was half way into the completion of the actual survey, all support from the college, including essential help with transport, was stopped. It was not
possible to continue with data collection without transport. It was too far for the survey team to walk every day to and from the study areas. It was also difficult for us to stay in villages as we could not get accommodation there. Although the security was relatively good in the area during that time, there was no guarantee that this would continue. A lot of money had already been spent on the project and the time allocated for the field work was coming to an end.

Finally, the investigator asked the Northern Gondar Regional Health Department, through his local advisor, to provide the survey team with a vehicle at a reasonable cost per kilometer. Thanks to that department, a vehicle was given to the survey team, with a driver, to be used for about a month. The survey team was then able to finish the data collection in April 1989.

4.1.5.2 PROBLEM OF INCOME DETERMINATION

The survey team had a problem in determining the true income of the individual farmers during the first two to three days of the survey. After the first two days, the respondents understood the purpose of the study better and gave accurate answers to these sensitive questions. Amongst the cooperative farmers, information about
incomes was not problematic because accounts of income have been recorded centrally for the whole year. The number of hours an individual member has worked is registered and according to his/her work how much of what he/she gained is also recorded for the last harvest season and multiplied by the amount of madigas obtained by the average local market price in Birr.

4.1.5.3 PROBLEM OF ACCEPTANCE AND PARTICIPATION

The survey was done in six villages. The chairman of the farmers’ associations, village leaders and community guides were with the survey team during the first phase while we were in Korata cooperative farm and the surrounding villages, villages two and three. There was little resistance from the mothers and the heads of these households when we asked them to let us measure their children. However, there was little acceptance of the study team and poor cooperation by the community members in the last two villages (villages 5 and 6). People in those villages were suspicious and were generally unwilling to cooperate. Mothers in that area do not let other people look at their children let alone measure them. They are said to be afraid of the evil eye. In particular, children who are well fed and have a light skin color are
often covered using heavy clothing so that they cannot be seen. In some cases such children are deprived of sunlight; and indeed some of them were found to be suffering from deficiency conditions, such as rickets.

We could see from the mothers' faces that they were not happy about the procedures used, especially when we put the child in the plastic pants for weighing, and when we laid the under-two year olds on the board for measuring length. And if the child cried, the mothers were clearly distressed and disturbed. Some times we could not find mothers because when they saw our vehicle, they closed their houses and sat inside all day until we left in the evening. Alternatively some of them went to their farm and stayed in the field from dawn to dusk, possibly in order to avoid meeting the survey team. Eventually, the study team talked to the elders and explained to them the purpose of the survey clearly. The team also introduced itself as a health workers team, from Addis Abeba with the above mentioned mission. The elders were convinced and they requested mothers and the heads of the households to cooperate with the team, and in the mean time they also brought sick people for treatment. This was partly to test whether or not the members of the study team were
health workers. The principal investigator therefore made an effort to see those patients and treat them with drugs bought from a local pharmacy. In so doing, a positive rapport was created between the community members and the survey team. Following this the community atmosphere was conducive for the team to complete the data collection.

Despite the many problems encountered during the implementation of this research, the study was completed successfully. The results of the investigation are presented in chapter five.
5.1 RESULTS

There were 1929 persons in 376 households for which data on demography, socioeconomic status and anthropometry were obtained. These included 978 (50.4%) males and 951 (49.6%) females.

5.1.1 DEMOGRAPHIC CHARACTERISTICS

The distribution of the study population by age and sex is shown in Table 1. About fifty eight percent of the population were below 15 years of age representing a high dependency ratio of 1:1.3, which is similar to other developing countries. There was a preponderance of females in the age group 15-44.9 years (21.1%), while among other age groups the number of males was greater than that of females. Overall the sex ratio was 1.03:1 males to females. The study sample was comprised of 189 households from the Agricultural Producers' Cooperatives and 187 households from the individual farmers' households.
Table 1  Distribution of the study population by age and sex

\( n = 1929 \)

<table>
<thead>
<tr>
<th>Age in years</th>
<th>Sex</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>0-4</td>
<td>232(12.0)*</td>
<td>225(11.7)</td>
</tr>
<tr>
<td>5-14</td>
<td>329(16.9)</td>
<td>297(15.4)</td>
</tr>
<tr>
<td>15-44</td>
<td>290(15.0)</td>
<td>407(21.1)</td>
</tr>
<tr>
<td>45-54</td>
<td>97(5.0)</td>
<td>15(0.8)</td>
</tr>
<tr>
<td>55+</td>
<td>30(1.5)</td>
<td>7(0.4)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>978(50.7)</strong></td>
<td><strong>951(49.3)</strong></td>
</tr>
</tbody>
</table>

* Figures in parenthesis are percentage.

5.1.2  HOUSEHOLD SIZE

The household size of the study area was found to be similar throughout the survey sites. The overall average household size was 5. persons. Averages for individual villages were 5, 5.08, 5.28, 5.44, 5, and 4.84 for Korata, village 2, village 3, Jigna, village 5, and village 6, respectively.

5.1.3  NUTRITIONAL STATUS OF THE STUDY CHILDREN

The nutritional status of the study children was assessed using the indicators weight-for-age,
weight-for-height and height-for-age, according to the NCHS reference standard taking 2 S.D as cutoff point. The study children who fell below -2 S.D of the above indicators were considered malnourished and above -2 S.D well nourished.

The results have been tabulated to show the number and percentage of children who fit the definitions of malnutrition of (WHO. 1983) Measuring Changes In Nutritional Status. The results of weight-for-age, weight-for-height, and height-for-age are tabulated. It is recommended that the measurement of the study population should be related to NCHS reference population by standardized division (Z-score) rather than as a percentage of the median. Therefore, Z-score has been used for reporting the result.
Table 2  Distribution of preschool-children according to nutritional status.

\[ n = 376 \]

\[ \begin{array}{|c|c|c|c|}
\hline
\text{Area} & \text{W/A} & \text{W/H} & \text{H/A} \\
\hline
\text{Co.Kor} & 30(37.0) & 8 (9.8) & 29(35.8) \\
\text{Co.Jig} & 53(49.0) & 10(9.3) & 62(57.4) \\
\text{Ind.v2} & 25(62.5) & 6(15.0) & 17(42.5) \\
\text{Ind.v3} & 26(61.9) & 7(16.7) & 27(64.3) \\
\text{Ind.v5} & 31(57.4) & 6(11.1) & 38(70.4) \\
\text{Ind.v6} & 30(58.8) & 10(19.6) & 37(72.5) \\
\hline
\text{Total} & 195(51.9) & 47(12.5) & 210(55.9) \\
\hline
\end{array} \]

Figures in parenthesis are percentages.

\( \text{Co.Kor} = \text{Korata Cooperative Farm} \)

\( \text{Co.Jig} = \text{Jigna Cooperative Farm} \)

\( \text{Ind.v2} = \text{village2 of Individual Farmers.} \)

\( \text{Ind.v3} = \text{village3 of Individual Farmers.} \)

\( \text{Ind.v5} = \text{Village5 of Individual Farmers.} \)

\( \text{Ind.v6} = \text{village6 of Individual Farmers.} \)

Figures in parenthesis are percentages.

Table 2 shows the malnutrition rates (weight-for-age, weight-for-height and height-for-age respectively) in the 6 different villages studied.
The overall prevalence of malnutrition as defined by the indicators, weight-for-age, weight-for-height and height-for-age was found to be very high. The prevalence rates from the Korata (APC) showed better results, especially with regard to stunting (defined as low height for age) which is high in all other sites. The overall prevalence of stunting is 55.9%, while the prevalence of wasting is 12.5% and appears to be high amongst the individual farmers' households compared to the cooperative farmers' households.

The impression is confirmed in Table 3, 4 and 5, which show the difference in weight-for-age, weight-for-height and height-for-age between children in cooperatives and individual farmers. The difference of nutritional status using the indicators, weight-for-age and height-for-age showed statistical significance with higher prevalence in individual farmers. With regard to wasting, the results in Table 4 showed a higher prevalence of wasting in non-coops compared to coops. This difference did not however reach statistical significance (P=0.079).

In order to investigate the association of age and sex to these anthropometric results, cross-tabulation and chi-square testing was done
There was no significant differences in nutritional status between male and female, nor were there significant differences in malnutrition rates of children in different age groups. Both stunting and wasting were more prevalent in children aged 1-4 years old, but the relationship with age did not reach statistical significance (P=0.079).

5.1.3.1 WEIGHT-FOR-AGE

Weight-for-age as an index of malnutrition shows a similar, significant difference in favour of coops. (See Table 3).

Table 3 Nutritional status of the study children by area and W/A Z-scores

<table>
<thead>
<tr>
<th>Area</th>
<th>Weight-for-age Z-score</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt; -2.5D</td>
<td>&gt; -2.5D</td>
</tr>
<tr>
<td>Coops</td>
<td>83(43.9)*</td>
<td>106(56.1)</td>
</tr>
<tr>
<td>Non-coops</td>
<td>112(59.9)</td>
<td>75(40.1)</td>
</tr>
<tr>
<td>Total</td>
<td>195(51.9)</td>
<td>181(48.1)</td>
</tr>
</tbody>
</table>

$\chi^2 = 9.61$ D.F = 1 $P$ value = 0.00193.

* Figures in parenthesis are percentage.
5.1.3.2 WEIGHT-FOR-HEIGHT

Weight-for-height is an indicator of acute malnutrition, also called wasting. The result in Table 4 showed a more favourable situation for the children in the coops, but the difference does not reach statistical significance. Despite the small land holdings, low income and inaccessibility to social services in the non-coops, there was no significant difference in wasting ($P=0.079$) between the coops and non-coops. It suggested that there is some degree of adaptation by the children of the individual farmers and hence the little difference in the level of wasting in the children of the two groups, coops and non-coops. Overall the prevalence of wasting is high in both coops and non-coops.

Table 4 Nutritional status of the study children by coops and non-coops and W/H Z-score

<table>
<thead>
<tr>
<th>Area</th>
<th>Weight for height</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt; -2 S.D</td>
<td>&gt; -2 S.D</td>
</tr>
<tr>
<td>Coops</td>
<td>18(9.5)*</td>
<td>171(90.5)</td>
</tr>
<tr>
<td>non-coops</td>
<td>29(15.5)</td>
<td>158(84.5)</td>
</tr>
<tr>
<td>Total</td>
<td>47(12.5)</td>
<td>329(87.5)</td>
</tr>
</tbody>
</table>

$X^2 = 3.08$  $D.F = 1$  $P \text{ value} = .079$

*Figures in parenthesis are percentages.
5.1.3.3 HEIGHT-FOR-AGE

The nutritional status of the study children indicates the effects of chronic malnutrition as is manifested by a high prevalence of stunting; a high proportion having low height for age scores. Thus 55.9% of the children measured fell below -2SD of the WHO standards in their observed heights for their ages at the time of the study.

The result displayed in Table 5 shows a high prevalence of chronic malnutrition in all the sites studied. There is, however, significantly less stunting in cooperative farmers' households than in individual farmers' households, particularly in Korata coop.

Table 5  Nutritional status of the study children by coops and non-coops and H/A Z-score

<table>
<thead>
<tr>
<th>Area</th>
<th>Height-for-age Z-score</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt; -2.5D</td>
<td>&gt; -2.5D</td>
</tr>
<tr>
<td>Coops</td>
<td>91(48.1)*</td>
<td>98(51.9)</td>
</tr>
<tr>
<td>Non-coops</td>
<td>119(63.6)</td>
<td>68(36.4)</td>
</tr>
<tr>
<td>Total</td>
<td>210(55.9)</td>
<td>166(44.1)</td>
</tr>
</tbody>
</table>

\[ X^2 = 9.14 \quad D.F = 1 \quad P \text{ value}= .0025 \]

* Figures in parenthesis are percentage.
These results will be the subject of further discussion in Chapter six. Here it is possible to conclude that living in a cooperative farmer's household does confer better protection for children under five years of age against chronic malnutrition, as measured by stunting as an internationally-agreed index. There may also be some degree of protection against acute malnutrition (wasting). However, this has not been shown to be statistically significant in this study.

EDUCATION OF THE STUDY POPULATION

The level of literacy among the study population was examined in those aged ten years of age and above. These comprised (56.6%), of the total (n=1,053). Literacy rate was determined by asking the respondents whether they could read and write.

Generally, the educational level of the population was very low. 8.0% had had formal education from first to sixth grade and 2.0% were educated above sixth grade. There was no one educated above grade ten in the study population.

Among the adult population who had no formal education, 28.2% had been to literacy class and could read and write. The proportion of males to
females among those who have been to literacy class were 70% and 30%, respectively.

5.1.5 MARITAL STATUS

Amongst the study population older than 15 years of age, it was found that the majority (89.2%) were married whereas only a small proportion were either divorced (2.2%) or widowed (1.6%).

5.1.6 HOUSEHOLD LAND SIZE

The land size per household in all areas varied from 0.25 ha. to 4.25 ha. The smallest amount of land owned was found among individual farmers, and the highest among producers' cooperatives. The average land size of the households was 3.63 hectares in the coops and 1.44 hectares in the non-coops. The total amount of land of the Jigna and Korata (APC) was 1,525 and 439.7 hectares, respectively. When it was divided by the members of the Jigna and Korata (APC), each member of the Korata and Jigna has 4.2 ha. and 3.09 ha., respectively. The distribution of the land size is shown in Table 6. In addition to the land made available to the households within the two Agricultural Producers' Cooperatives, Jigna and Korata got loans* of money from the National
Development Bank for farm implements. Both Jigna and Korata (APC) received 135,349 and 71,115 Ethiopian Birr, respectively, in the past year (1988). This did not apply to the individual farmers as they neither were given loans of money nor given farm implements on credit. There is a statistically significant difference ($P=0.00001$) in land size and in income between the cooperative and individual farmers. The result of the analysis of variance were found in appendix II, and those for the regression in appendix III.

Table 6 Distribution of households by land size in coops and non-coops

<table>
<thead>
<tr>
<th>Land size in hectares</th>
<th>Coops</th>
<th>Non-coops</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>374(100)</td>
<td>189(100)</td>
<td>185(100)</td>
</tr>
<tr>
<td>0.99 ha</td>
<td>0%</td>
<td>23.8%</td>
<td>11.8%</td>
</tr>
<tr>
<td>1-1.99 ha</td>
<td>0%</td>
<td>48.1%</td>
<td>26.7%</td>
</tr>
<tr>
<td>2-3.99 ha</td>
<td>0%</td>
<td>24.3%</td>
<td>12.0%</td>
</tr>
<tr>
<td>4- ha</td>
<td>42.9%</td>
<td>3.2%</td>
<td>23.3%</td>
</tr>
<tr>
<td>4.99 ha</td>
<td>57.1%</td>
<td>0.5%</td>
<td>29.1%</td>
</tr>
</tbody>
</table>

$x^2 = 347.5$  \hspace{1cm} D.F = 4  \hspace{1cm} (P<0.0001).

5.1.7 HOUSEHOLD ANNUAL INCOME

The annual income of the study households
ranged from 30 Birr to 1,545 Birr. The average income of all households in the study area is 681 Birr. The income distribution is shown in Table 7. The lowest income was found amongst the individual farmers and the highest in the Producers' Cooperative, although even between cooperatives a significant difference in income was found. The average annual income of the cooperative and individual farmers was 1,017 and 329 Ethiopian Birr, which is $491 and $159 US dollars, respectively. In general there are no remittance received from outside the household as only two individual farmers were found to receive financial remittance and some contribution in kind from their sons.

Table 7 Distribution of households by income between coops and non-coops

\[ n = 376 \]

<table>
<thead>
<tr>
<th>Area</th>
<th>Annual Income in Ethiopian Birr</th>
<th>0-</th>
<th>100-</th>
<th>300-</th>
<th>600-</th>
<th>1000-</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>99</td>
<td>299</td>
<td>599</td>
<td>999</td>
<td>1999</td>
<td>189(100)</td>
</tr>
<tr>
<td>Coops</td>
<td></td>
<td>0%</td>
<td>0%</td>
<td>12.7%</td>
<td>31.2%</td>
<td>56.1%</td>
<td>189(100)</td>
</tr>
<tr>
<td>Non-coops</td>
<td></td>
<td>6.4%</td>
<td>44.4%</td>
<td>42.8%</td>
<td>5.3%</td>
<td>1.1%</td>
<td>187(100)</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>3.2%</td>
<td>22.0%</td>
<td>27.6%</td>
<td>18.4%</td>
<td>28.7%</td>
<td>376(100)</td>
</tr>
</tbody>
</table>

\[ \chi^2 = 259. \quad D.F = 4 \quad P < 0.0001 \]*

*with Fisher's correction.*
5.1.8 MATERIAL FOR HOUSE CONSTRUCTION AND ENVIRONMENTAL CHARACTERISTICS

The material used for house roofing were thatch and corrugated iron sheeting. Seventy six percent of the households used thatch, and twenty four percent corrugated iron sheeting. The walls of all houses in all study areas were made of stick and mud, and the floors were earthen 75.5% had only one room, 24% had four rooms, the rest of the houses (0.5%) had two rooms.

5.1.8.1 SANITARY FACILITIES

One hundred twenty homes (32%) had pit latrines whereas two hundred fifty five (68%) had no latrines at all. Most residents from the villages defecate in the open fields. Most households with pit latrine (75.0%) were found in the coops, whereas only 25.0% belonged to individual farmers.

5.1.8.2 COOKING FUEL

The majority (80.3%) of the households used wood for cooking, and some (19.7%) used wood and cow dung. Of the households using wood for cooking 58.6% were coop households and 41.4% individual farmers. All household used Kerosene for light.
5.1.8.3 WATER SOURCE

About fourteen percent had tap water in their village which was predominantly found in the Jigna cooperative farm. 44.8% had wells, and 38.1% had to get their water from river, whereas ten households (2.7%) obtained their water from Lake Tana in the Korata cooperative farm. The distance of the water source to their homes was not very far for most households. One hundred twenty one (32.2%) travel less than one hour and two hundred fifty five (67.8%) households travel for more than one hour. Fifty three percent used the same water source for drinking, cooking and washing, whereas 47.5% used different water source for drinking, cooking and washing. The type of water source and distance of the water source in terms of time taken to reach the source from home of the coops and non-coops is presented in Table 8 and 9.
Table 8 Distribution of households by area and type of water source. 

\[ n = 376 \]

<table>
<thead>
<tr>
<th>Area</th>
<th>Water source</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tap</td>
<td>Well</td>
</tr>
<tr>
<td>Coops</td>
<td>53</td>
<td>72</td>
</tr>
<tr>
<td>non-coops</td>
<td>109</td>
<td>78</td>
</tr>
</tbody>
</table>

| Coops |  53(28.0%) |  180(38.1%) |  132(28.6%) |  10(5.3%) |
| non-coops | 109(58.3%) |  78(41.7%) |       | 0%      |

Total | 14.1% | 48.1% | 35.1% | 2.7% | 376(100) |

Figures in parenthesis are percentages.

Table 9 Distribution of households by time taken to reach nearest source of water for the coops and non-coops

\[ n = 376 \]

<table>
<thead>
<tr>
<th>Area</th>
<th>Time taken to reach the water source</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt; 1hr</td>
<td>&gt; 1hr</td>
</tr>
<tr>
<td>Coops</td>
<td>81(42.9)</td>
<td>108(57.1)</td>
</tr>
<tr>
<td>Non-coops</td>
<td>40(21.4)</td>
<td>147(78.6)</td>
</tr>
</tbody>
</table>

Total | 115(30.6) |  6(1.6) | 255(67.8) | 376(100) |

\[ \chi^2 = 28.8 \quad df = 1 \quad P < .00001.* \]

*With Yates correction.

*Figures in parenthesis are percentages.*
Thus, the majority of the study population have no access to clean water. They get water from unprotected rivers, wells and lake. Only the minority of them (14.2%) have access to pipe water in Jigna (APC).

5.1.9 ACCESSIBILITY TO HEALTH SERVICE

There was statistically significant difference found in accessibility to health service between the coops and non-coops (P<.001). Eighty two households (22%) travel less than fifteen minutes to reach the health service unit, all from the Korata (APC). Fifty five (14.2%) travel more than fifteen minutes but less than an hour. One hundred eighty households (28.8%) travel more than an hour but less than two hours. One hundred thirty (34.7%) travel more than two hours. Out of the total 376 households forty four (11.8%) had visited a health service unit one week prior to the survey. One hundred eight (28.8%) had visited the health service unit two weeks before the survey, and ninety two (24.5%) had visited a month ago. One hundred twenty nine (34.4%) had not been to the health service unit for more than three months, and the reason given by them was that, they had no health problem in the family. The time taken for the households to reach the nearest health station
and distribution by last reported visit of households is shown in Table 10 and 11.

Table 10 Distribution of households by travel time to health station of coops and non-coops

<table>
<thead>
<tr>
<th>Area</th>
<th>Travel time</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt; 15min</td>
<td>15min-1hr</td>
</tr>
<tr>
<td>Coops</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>42.8%</td>
<td>0%</td>
</tr>
<tr>
<td>Non-coops</td>
<td>1.1%</td>
<td>28.3%</td>
</tr>
<tr>
<td>Total</td>
<td>22.1%</td>
<td>14.1%</td>
</tr>
</tbody>
</table>

$X^2 = 191$    $df = 3$    $P < .001$

Table 11 Distribution by last reported visit of households in the coops and non-coops

<table>
<thead>
<tr>
<th>Area</th>
<th>Last visit</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt; 1wk</td>
<td>1wk-1mo</td>
</tr>
<tr>
<td>Coops</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>13.7%</td>
<td>38.6%</td>
</tr>
<tr>
<td>Non-coops</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>9.1%</td>
<td>19.3%</td>
</tr>
<tr>
<td>Total</td>
<td>11.4%</td>
<td>28.9%</td>
</tr>
</tbody>
</table>

$X^2 = 30$    $df = 3$    $P < .001$

5.1.10 AGE OF MOTHER AT THEIR FIRST PREGNANCY

The age of the first pregnancy among mothers in
the study ranged from 12-30 years. The mean age was 16.8 years. The number of mothers who had their first pregnancy before the age of 16 years were 113(59.9%) and 88(47.1%) between 16-20 years were 70(37.0%) and 89(47.6%) and above 20 years were 6(3.2%) and 10 (5.3%) in the coops and non-coops respectively. There was no significant difference in mothers' age at their first pregnancy between the coops and non-coops (P>.05).

Table 12 presents the distribution of mothers by age at first pregnancy between the coops and non-coops.

Table 12 Distribution of mothers by age at their first pregnancy in the coops and non-coops

<table>
<thead>
<tr>
<th>Age of mothers at first pregnancy (years)</th>
<th>Coops</th>
<th>Non-coops</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coops</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 16</td>
<td>59.9%</td>
<td>47.1%</td>
<td>53.4%</td>
</tr>
<tr>
<td>17-20</td>
<td>37.0%</td>
<td>47.6%</td>
<td>42.3%</td>
</tr>
<tr>
<td>&gt; 20</td>
<td>3.2%</td>
<td>5.3%</td>
<td>4.2%</td>
</tr>
</tbody>
</table>

| Total | 189(100) | 187(100) | 376(100) |

\[ x^2 = 6.2 \quad \text{df} = 2 \quad (P > .05) \]

Out of total number of 189 females 113 (59.8%) were pregnant for the first time at the age below 16 years in the coops and 70 (37%) in the non-coops. The difference between the coops and
non-coops was not significant (P>.05). The number of mothers who had 1-3 pregnancies were one hundred sixty (43.5%), 4-6 pregnancies were one hundred thirty (35.5%), 7-10 pregnancies were seventy eight (21.2%) and 11+ pregnancies were nine (2.4%). The average number of live children of study households was 3.5.

Number of pregnancies of mothers and number of live children of a household is positively correlated with cultivated land size. Correlated Matrix of specific independent variables and nutrition indicators is shown in appendix 1.

5.1.11 CHILD MORBIDITY

There were forty eight (12.9%) children who had been ill seven days prior to the survey. Twenty three of whom (47.9%) had diarrhea and twenty four (50%) had fever. But the mother of one child could not explain the type of illness that her child had a week before the interview. The highest morbidity experience was found in Korata.

Cultivated land size was positively correlated with weight for age and height for age. Health service availability was also positively correlated with height for age. But land size in hectares was negatively correlated with height for age whereas distance of health service facilities
was also negatively correlated with weight for age and height for age. Diarrhea was found to have some effect on nutritional status (W/A) but fever had no significant effect on nutrition of the preschool children both in coops and non-coops. The correlation matrix is shown in (Table 13 and 14).

Independent variables and their correlation coefficient which were statistically significant for each nutritional indicator in the coops are shown in Table 13.

Table 13 Correlation matrix of independent variables with specific nutrition indicators (coops)

<table>
<thead>
<tr>
<th>Variables</th>
<th>W/A</th>
<th>W/H</th>
<th>H/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land size in hectares</td>
<td>-.1506</td>
<td>.0408</td>
<td>-.1956**</td>
</tr>
<tr>
<td>Cultivated land in hectares</td>
<td>.1867**</td>
<td>.0205</td>
<td>.1977**</td>
</tr>
<tr>
<td>Cash crop production</td>
<td>-.1443*</td>
<td>-.0590</td>
<td>-.1244*</td>
</tr>
<tr>
<td>Health service availability</td>
<td>.0672</td>
<td>.0098</td>
<td>.1770**</td>
</tr>
<tr>
<td>Distance of health service</td>
<td>-.1586*</td>
<td>-.0271</td>
<td>-.2342**</td>
</tr>
<tr>
<td>Illness</td>
<td>.1351*</td>
<td>.0496</td>
<td>.0588</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>.1786**</td>
<td>.0765</td>
<td>.0803</td>
</tr>
</tbody>
</table>

1 tailed significance * .01 ** .001
Independent variables and their correlation coefficient which were statistically significant for each nutritional indicator in the non-coops are shown in Table 14.

Table 14 Correlation matrix of independent variables with specific nutrition indicators (non-coops)

<table>
<thead>
<tr>
<th>Variables</th>
<th>W/A</th>
<th>W/H</th>
<th>H/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land size in hectares</td>
<td>.0084</td>
<td>-.0113</td>
<td>.1608</td>
</tr>
<tr>
<td>Cultivated land in hectares</td>
<td>.0335</td>
<td>-.0633</td>
<td>.1173</td>
</tr>
<tr>
<td>Health service availability</td>
<td>.0672</td>
<td>.0098</td>
<td>.1770**</td>
</tr>
<tr>
<td>Distance to health service</td>
<td>-.1595*</td>
<td>-.0271</td>
<td>-.2342**</td>
</tr>
<tr>
<td>Illness</td>
<td>.1351*</td>
<td>.0496</td>
<td>.0588</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>.1786**</td>
<td>.0765</td>
<td>.0803</td>
</tr>
</tbody>
</table>

1 tailed significance * .01 ** .001

Tests of significance were done using Chi-square, Anova, Regression and Correlation. The amount of land available to the household was positively correlated with 1 tailed significance ** .001 but the correlation coefficient of H/A in the
correlation matrix was less than 0.2. The same variable was statistically significant by a Chi-square method with P value of less than 0.001. Likewise the correlation of health service availability with nutritional status indicator of H/A was 1 tailed significance ** .001. It was positively correlated and significant. But the correlation coefficient of H/A in the correlation matrix was less than 0.2.

It indicates that the health service availability is significant for H/A but weakly correlated. The nutritional status was obviously better in the Korata coop where there is health service unit and it is statistically significant.

The negative and positive outcomes of this investigation and factors attributables for the outcomes have been discussed in chapter six.
CHAPTER SIX

6.1 DISCUSSION

The immediate objective of this investigation was to compare the nutritional status of pre-school children of the cooperative and individual farmers in Gondar Region north west Ethiopia. The purpose of the study was to provide base line data upon which the policies of the agricultural sector could be formulated. For the purpose of this study two Agriculture Producers' Cooperatives were selected in Dera Awraja and four villages surrounding the coops. were chosen randomly. The target population for this investigation were households which had children under five years of age. Children 6-59 months of age were selected from the selected study households.

6.1.1 DEMOGRAPHIC CHARACTERISTICS

The age distribution of the study population was found to be similar to other developing countries characterized by more younger people. More than half of the population was found to be below fifteen years of age with dependency ratio of 1:1.3. The male female ratio was 1.03 :1 male and female. Zein and Mekonnen 1983 has similar findings.
In most developing countries the number of females is lower than males in the age group between 15 to 44 years; contrary to this, the number of females in this study was found to be greater than the number of males. Ethiopia has been campaigning for the last fifteen years to encourage economic development, political stability and mass education. During implementation of the recent development policies designed by the revolutionary government, Ethiopia has faced internal and external conflicts. It was probable that those men who were in the age group 15 to 44 years were participating in this campaign to tackle the internal problems in other parts of the country. Since the survey team undertook de facto census, those people who were outside of the area were not included.

6.1.2 EDUCATION

The education level of the study population is generally very low. Only adult education is given in the area to enable farmers to read and write. In fact, education is associated with great awareness of the importance of nutrition, the nutrient of food and nutrition options from market purchase or from home production (Chaudhury, 1986). Another study showed
that mothers who had only limited adult education had more stunted children than those mothers who had had secondary or college education (Swaziland National Nutrition Council. 1985). However, the education of mothers and fathers in the present study had no association with nutritional status of their children, possibly as there was only adult education. Since there was no difference in educational level of the two groups no comparison has been made between coops and individual farmers' households.

6.1.3 SOCIOECONOMIC STATUS

Since the revolution of 1974, the production structure has completely changed. By the land reform proclamation of 1975 all rural lands were nationalized. Farm families have been granted the users' rights over a maximum of 10 ha. of land (FAO 1983). The land distribution in the study area was not, however, uniform. One could have as small as 0.25 ha. and one could have as high as 4.25 ha. The income also varies from 30 Birr to 1,545 Birr annually. The average landholdings of the coops and non-coops was 3.63 ha. and 1.44 ha. respectively.

One of the most important obstacles limiting rural development in farming societies is the amount of land. The greater the amount of land
available to the small-scale farming families, the better the nutritional status of the young children in the families (Valverde et al., 1977). It is not only the land size but it is the cultivated land that has been related with nutritional status of preschool children in this investigation.

To implement the land reform proclamation and for future development, the farmers have been organized into Peasant Associations. The Peasant Associations were empowered and encouraged to set up cooperatives. There are 837 cooperatives in Ethiopia at present but only 67 are registered. Two of these registered cooperatives are found in Dera Aweraja where this investigation was done. Government policy has encouraged these coops which is evident by their average land size available compared to the individual farmers. The overall nutritional status of the pre-school children is very poor, but it was found to be better in cooperative households than in the individual farmers' households. The income, the type of houses they have, farm implements and other facilities are much better than the individual farmers'. Zein and Mekonnen (1983), found similar condition in Gondar Region.
Despite government incentives e.g. subsidized fertilizers and credit facilities, the growth of cooperatives has been slow and most members seem dissatisfied, many having grievances with the work allocation. Most of them struggled with physical work in the field, while some stayed in villages being officials of the Peasant Associations and Cooperative. Traditionally farmers in Ethiopia work on their land on an individual basis. Even though some farmers are organized and tried to implement the new system of farming, most of them are not in favour of it because of the above mentioned work allocation.

6.1.4 NUTRITIONAL STATUS

Prior to the survey, good nutritional status, in all areas, was expected as the survey was undertaken during harvesting season December to April 1989. But contrary to the expectation of the survey team, the nutritional status was found to be extremely poor, with malnutrition rates of 51.6%, 12.5%, and 55.9% (more than two standard deviations below reference figures) for weight for age, weight for height and height for age criteria respectively.

Stunting was particularly high in both groups of households, but significantly higher
amongst the individual farmers' children (p<.01). There was no statistically significant difference in nutritional status (P>0.10), between children in different age-bands, nor between male and female.

The nutritional status of the pre-school children of the individual farmers is abysmally low. The means of subsistence and income for the rural agricultural societies is the amount of land available to them. It is not difficult to imagine the living conditions of a peasant farmer, who has an average family size of five, and has to survive on 0.25 ha. of land. Apart from the restricted arable land, soil improvement is foreign to the area and fertility of the land is neglected. Low and erratic rainfall, poor tillage and soil erosion take their toll; fertilizers, crop rotation, seed and crop selection are not known.

Seventy percent of preschool children of individual farmers were malnourished according to the weight for age indicator. This is not surprising as these families own very small pieces of land, and the amount of land owned by rural families is one of the most important factors determining the nutritional status of farming families (Omawale, 1984).
The nutritional status of pre-school children of the producers' cooperatives was significantly better than the nutritional status of pre-school children of the individual farmers. The Korata (APC) was also found to be better than Jigna (APC) in nutritional status whereas Jigna has greater average annual income than Korata (APC). The study by Kidane et al., (1985). showed similar results in Harer Zuria District. In Korata (APC) there is a health station located within the coop and members of the coop do not have to walk more than fifteen minutes to reach the health service unit. It was found that all children under five years of age in this coop were fully immunized. This information was obtained from the health assistant in charge of the clinic. A week prior to the arrival of the survey team, immunization coverage evaluation had been done by the Southern Gondar Regional Health Department. They have access to the health service unit any time when they are in need of it.

In addition to the health service availability, the members of the Korata (APC) get fish every day as the village is located near Lake Tana. Either the villagers go to the Lake to catch fish for their own consumption or there is a fish
farming unit at this coop and this unit brings fish every day to the village and sells to the coop members at fifty cents per kilogram. This might have contributed to improvement of the nutritional status of pre-school children of this coop. Fish as food is generally valued for its nutritional and sensual qualities as a food; taste, texture and odour, and complements the meal and it helps in alleviating malnutrition. It has vital functions of helping to increase total food intake, including energy and protein. Fish makes an important contribution to micronutrient supplies; vitamins, minerals and fatty acids. (Teuscher. 1986)

There is no restriction to go to the Lake and catch fish. However, due to certain constraints like distance and time most farmers do not go to the Lake to catch fish for their own consumption.

6.1.5 WATER SOURCE

With the exception of a few, most households in the study area (86%) obtained water from unprotected rivers, wells and the lake. A minority (14%) in Jigna (APC) had tap water in their village. In Swaziland, families with their own piped water had least number of stunted children, whereas families who obtained their water from unprotected spring, rivers or stream had
highest prevalence of stunting in preschool children (Swaziland National Nutrition Council 1985). Even though it is difficult to tell the relationship between water and nutritional status, the water source may be contaminated and by consuming that contaminated water infection can be caused in one way or another hence the nutritional status can be affected. Table 8, and 9 show the types of water source available and distance in terms of time taken of coops and non-coops. It has been established that clean water supply close to the home and hygienic toilet are believed to be the cornerstones of those environmental and social changes which produced the dramatic decline in infectious disease in developing countries (Olenja, 1984), (Merrick, 1976). By improving the water source and reducing the distance to the water source one can have clean water near home, thus the rate of being infected through contaminated water will be reduced and nutritional status will be improved.

6.1.6 VILLAGIZATION

In addition to the small landholdings, low income and inaccessibility to social services of the individual farmers, the villagization programme took place in Dera Aweraja in 1987-88. Even though
the programme is intended to make the necessary social services such as roads, market, school and clinics available to the area, it is not an easy task for a peasant farmer to dismantle and reconstruct a house within a short time considering his limited resources. Since the programme requires money and time, the farmers in the four villages surrounding the coops have spent a lot of money for the new house construction and to resettle themselves according to the government policy. They could not prepare and cultivate their land on time. These factors might have contributed to the low agriculture yield in 1987. In addition, there were heavy rains in July-August 1988. Jigna and its surrounding villages were flooded and almost all food crops were destroyed. All these might have contributed and aggravated the current level of malnutrition of the pre-school children in the study area.

6.1.7 AGE OF MOTHER AT THEIR FIRST PREGNANCY, NUMBER OF PREGNANCY AND NUMBER OF LIVE CHILDREN IN THE FAMILY

Age range of mothers at their first pregnancy was 12-30 years, and the mean age was 16.8 years in the study area. Table 8 depicts the age distribution of the mothers at their first pregnancy by coops and non-coops. Most of them were young below 20 years of age. It indicates that
early marriage is being exercised and common. Because of early marriage, pregnancy two years after menarche is also common. Birth weight is one of the indicators of nutritional status. One of the causes of low birth weight is early pregnancy. However, there was no relationship between the age of mothers at their first pregnancy and the nutritional status of the pre-school children.

Number of pregnancies and number of live children was not significantly associated with nutritional status of the pre-school children.

6.1.8 MORBIDITY EXPERIENCE

Twelve and half per cent of the study children had been ill seven days prior to the survey team's arrival in the villages. The high prevalence of reported illness was found in the Korata (APC). The most frequent complaints were diarrhea and fever. Diarrhea had some relation with nutritional status, W/A, and H/A was affected whereas W/H was not affected but fever has no relation with nutritional status of pre-school children at all. One could not imagine that the children with that degree of malnutrition would have been healthy unless their mothers had some problem of identifying ill health from healthy condition, or can it be said that their children
are always sick and their parents have accepted it as normal?

Conclusion based on the result obtained and factors attributable for the outcomes and recommendations for future work is given in chapter seven.
7.1 CONCLUSION & RECOMMENDATION

7.1.1 CONCLUSIONS

The means for survival in rural societies is access to land. One of the most important aims of the Peasant Associations in Ethiopia from 1975 onwards was to implement the Land Proclamation, particularly in respect of land distribution. According to the Proclamation each farming family was supposed to get 10 ha. of land but the actual average land size of the study area was found to be 1.44 ha. for individual farmers and 3.63 ha. for each of the cooperative farmers. The distribution of land was not carried out according to the number of people in a household; it rather depended upon the individual leaders of the Peasant Association whether individual farmers would get land, whereas in the cooperatives the land was held in common, and they had enough land with fertile soil. The individual farmers have only minimal rights to complain about land disputes.

In addition to the small land holdings, there was poor agricultural production by individual farmers owing to lack of fertilizers and poor provision of social and other services such as transport, clinic, market facilities, grinding mills and schools.
Women have to travel more than 10 kms. carrying grains on their back to the mill for grinding at least once in a week. This consumes most of women's time and energy which could be used for other productive purposes.

Peasant Associations are intended to help individuals, but they are unable to do so because the majority of supplies are given to cooperatives. Any fertilizer that is available to the individual landholder is priced beyond his reach. As a result, the use of fertilizers is decreasing and the agriculture production of all types of food crops and cash crops are decreasing; the nutritional status of children has become very poor in this area.

According to the results of this investigation, the malnutrition rate is very high in all areas studied, but more so in the individual farmers' households than in cooperatives. Even though the immediate cause of malnutrition is poor food intake, there are other factors which contribute and aggravate the condition. In addition, due to superstitious beliefs, mothers do not give good food to their children like eggs and other animal products, which are good for growing children, and this can contribute to PEM.
In the study area parents do not take their children to the health center immediately when they get sick because of inaccessibility of health services. One of the coops and all individual farmers use the nearest health station which is about 20 kilometers from home. Apart from the distance, the money needed for treatment and the service itself are not readily available. So, they keep their children at home believing that they will get better in the course of time. This will affect the child's nutritional status very much, as malnutrition and disease are inter-related.

Most households use unprotected water sources like wells, rivers and the lake for drinking, cooking and washing. The water from these sources can be contaminated easily and children can be infected by consuming this contaminated water; as a result their nutritional status will suffer.

Mothers in the study area do not prepare weaning food especially for their children; the children have to compete for their food with adults. Sometimes because of the irritation of the gastrointestinal tract they may develop diarrhea and their nutritional status can be affected.

As has been revealed by this
investigation, the size of land holding, farm implements, agricultural production and annual income of the cooperative farmers was found to be significantly better when compared to individual farmers.

Social services like clinics, dry weather roads and transport, mills and schools were also available in the cooperatives, whereas these services were not available to the individual farmers. The nutritional status of the preschool children of the cooperative farmers was significantly better than that of individual farmers with respect to measures of stunting, which is a measure of chronic, long-term deprivation.

Organizing the farmers into cooperatives is a new system which has been introduced to Ethiopia after the revolution in 1974. This system was believed to improve agricultural production, the standard of living of the peasants and the nutritional status of their children. When we looked at the agricultural production, annual income, the social services and the nutritional condition of their children the coops seemed better off than the individual farmers. However, most members of the coops had grievances with the work allocation. Some struggled in the field with physical work and others remained in villages being
officials of the Peasant Associations.

Ethiopian farmers had been exploited for centuries by the feudal lords. The popular slogan of the Ethiopian students, during the reign of Haile Sellassie, was "Land To the Tiller". Thanks to the Ethiopian revolution, the action taken by the government after the revolution, and the land reform proclamation of Yekatit 1967 Ethiopian calendar, was appropriate, but it could not be implemented as designated by the proclamation.

Peasants are also increasingly burdened by obligation to the government and the Peasant Associations. There are taxes, and endless meetings at which political education and other issues not related to farming are discussed. Meetings that peasants are forced to attend, losing valuable hours that could be devoted to other productive activities.

The Agricultural Marketing Corporation (AMC) is a governmental organization designed by the revolutionary government. This organization is responsible for procurement of farm implements, fertilizers and other necessary materials needed for agricultural activities. It is through this organization that food security policy is being
exercised. This organization purchases food crops from the peasants, during harvesting season at a fixed low price to ensure enough food in the national granaries. It enables the government to supply food to the people in all areas, whenever there are food crises, at affordable prices regardless of income and geography. However, peasants in the study area were not in favour of it because of the low prices. The basics like salt, sugar, clothing and soaps are scarce in the rural areas, and even if they are available they are very expensive.

The villagization programme, even though it is genuine in terms of using the land intensively and extensively, should be gradual and not sudden as it has been in some parts of Ethiopia; so that the farmers can have enough time to arrange the necessary things for house construction.
7.1.2 RECOMMENDATIONS

1 Nutrition and health education should be given to parents together with literacy campaign. Mothers, in the study area, should be approached through women's associations and advised by professionals to prepare weaning diet for their children during weaning period.

2 Since government revenue is dependent on agriculture production, the government should support all farmers equally regardless of the system of farming they exercise. Meetings which are not related to farming should be avoided so that they can use their time to work on their farm for more production.

3 It is recommended that the peasants be organized into cooperatives, like many other developing countries, in order to distribute land, farm implements, draft animals and credit facilities. As there is no measurement of physical work, it is advisable that the farmers work on the plot of land that they get according to the allocation, on an individual basis so that they can put all their efforts on their farm to maximize agriculture production. As far as the
implementation of land distribution is concerned, the Ministry of Agriculture is appropriate to take the responsibility.

4 The Agricultural Marketing Corporation should purchase the food crop from the farmers at high price and sell to the consumers at reasonable price, as has been tried in many countries and found to be effective to inspire the peasants to use the land intensively and work hard to produce more.

5 Health service facilities should be available within their vicinity and with affordable charge for treatment since the farmers cannot afford to pay high prices for health services.

6 Most of the farmers in the study area have no access to clean water, they get water from unprotected water source such as rivers, wells and lake. Water development organization should help farmers to have protected, adequate and safe water supply near their home.
CHAPTER EIGHT

REFERENCES


Ebrahim J. G. Nutrition in Mother and Child Health. London School of Hygiene and Tropical Medicine 1983.


National Nutritional Council (1985)


PMPC (1975). Land Reform Proclamation

Ritchie, J. 1983. Nutrition and Families. Published with the support of the Swidish International Development Authority.


Food and Agriculture Organization of the United Nations.


Correlation Matrix of specific independent variables and nutritional indicators in the coops

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>Weight-for-age</th>
<th>Weight-for-height</th>
<th>Height-for-age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landhect</td>
<td>-.1506</td>
<td>.0408</td>
<td>-.1956*</td>
</tr>
<tr>
<td>Hectcult</td>
<td>.1867**</td>
<td>.0205</td>
<td>.1977**</td>
</tr>
<tr>
<td>Totincom</td>
<td>.0554</td>
<td>.0237</td>
<td>.0341</td>
</tr>
<tr>
<td>Agefirpr</td>
<td>.0480</td>
<td>.0387</td>
<td>.0697</td>
</tr>
<tr>
<td>Nopregn</td>
<td>-.0891</td>
<td>.0692</td>
<td>-.0062</td>
</tr>
<tr>
<td>Nolivch</td>
<td>-.0669</td>
<td>.0684</td>
<td>.0319</td>
</tr>
<tr>
<td>Foodcrop</td>
<td>.0266</td>
<td>.0334</td>
<td>.0212</td>
</tr>
<tr>
<td>Cashgrow</td>
<td>-.1443*</td>
<td>-.0590</td>
<td>-.1244*</td>
</tr>
<tr>
<td>Hserviv</td>
<td>.0672</td>
<td>.0098</td>
<td>.1770**</td>
</tr>
<tr>
<td>Hdist</td>
<td>-.1585*</td>
<td>-.0271</td>
<td>-.2342**</td>
</tr>
<tr>
<td>Illness</td>
<td>.1351*</td>
<td>.0496</td>
<td>.0588</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>.1786**</td>
<td>.0765</td>
<td>.0803</td>
</tr>
<tr>
<td>Fever</td>
<td>.0567</td>
<td>.0238</td>
<td>.0130</td>
</tr>
</tbody>
</table>

Correlation Matrix of specific independent variables and nutritional indicators in the individual farmers.

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>Weight-for-age</th>
<th>Weight-for-height</th>
<th>Height-for-age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landhect</td>
<td>.0084</td>
<td>-.0113</td>
<td>.1608</td>
</tr>
<tr>
<td>Hectcult</td>
<td>.0335</td>
<td>-.0633</td>
<td>.1173</td>
</tr>
<tr>
<td>Totincom</td>
<td>-.0728</td>
<td>-.1534</td>
<td>.0565</td>
</tr>
<tr>
<td>Agefirpr</td>
<td>.0480</td>
<td>-.0387</td>
<td>.0697</td>
</tr>
<tr>
<td>Nopregn</td>
<td>-.0891</td>
<td>.0692</td>
<td>-.0062</td>
</tr>
<tr>
<td>Nolivch</td>
<td>-.0669</td>
<td>.0684</td>
<td>.0319</td>
</tr>
<tr>
<td>Hserviv</td>
<td>.0672</td>
<td>.0098</td>
<td>.1770**</td>
</tr>
<tr>
<td>Hdist</td>
<td>-.1595*</td>
<td>-.0271</td>
<td>-.2342**</td>
</tr>
<tr>
<td>Illness</td>
<td>.1351*</td>
<td>.0496</td>
<td>.0588</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>.1786**</td>
<td>.0765</td>
<td>.0803</td>
</tr>
<tr>
<td>Fever</td>
<td>.0567</td>
<td>.0238</td>
<td>.0130</td>
</tr>
</tbody>
</table>

1 tailed significance * .01 ** .001
### Appendix II

**Result from Anova**

**Comparison of land size in hectares**

<table>
<thead>
<tr>
<th></th>
<th>Coops</th>
<th>Non-coops</th>
<th>F.value</th>
<th>P.value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>3.63</td>
<td>1.44</td>
<td>1137</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

**Result from Anova**

**Comparison of income in Birr**

<table>
<thead>
<tr>
<th></th>
<th>Coops</th>
<th>Non-coops</th>
<th>F.value</th>
<th>P.value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>1,017</td>
<td>329</td>
<td>526.76</td>
<td>0.0000</td>
</tr>
</tbody>
</table>
Result of multiple regression of land size and total annual income with nutritional status using the parameters weight for age.

Dependent variable weight for age

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE B</th>
<th>Beta</th>
<th>T</th>
<th>sign</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landhect</td>
<td>.07798</td>
<td>.02884</td>
<td>.13973</td>
<td>2.703</td>
<td>.0072</td>
<td></td>
</tr>
<tr>
<td>(constant)</td>
<td>2.15466</td>
<td>.08163</td>
<td></td>
<td>26.394</td>
<td>.0000</td>
<td></td>
</tr>
</tbody>
</table>

Landhect = the amount of land that each household has in the study area.

Dependent variable weight for age

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE B</th>
<th>Beta</th>
<th>T</th>
<th>sign</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landhect</td>
<td>.22670</td>
<td>.06043</td>
<td>.40624</td>
<td>3.752</td>
<td>.0002</td>
<td></td>
</tr>
<tr>
<td>Totincom</td>
<td>-4.74145E-04</td>
<td>1.69727E-04 · .30248</td>
<td>-2.794</td>
<td>.0055</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(constant)</td>
<td>.2.09628</td>
<td>.08354</td>
<td></td>
<td>25.092</td>
<td>.0000</td>
<td></td>
</tr>
</tbody>
</table>

Landhect = the amount of land that each household has in the study area.

Totincom = the total annual income in Ethiopian Birr of each household in the study villages.
Result of multiple regression of land size and annual income with nutritional status using the parameters height for age.

### Dependent variable height for age

<table>
<thead>
<tr>
<th>Variables</th>
<th>B</th>
<th>SE B</th>
<th>Beta</th>
<th>T</th>
<th>sign T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landhect</td>
<td>.07965</td>
<td>.03470</td>
<td>.11897</td>
<td>2.296</td>
<td>.0223</td>
</tr>
<tr>
<td>(constant)</td>
<td>1.95260</td>
<td>.09820</td>
<td></td>
<td>19.885</td>
<td>.0000</td>
</tr>
</tbody>
</table>

Landhect = the amount of land that each household has in the study area.

### Dependent variable height for age Z score

<table>
<thead>
<tr>
<th>Variables</th>
<th>B</th>
<th>SE B</th>
<th>Beta</th>
<th>T</th>
<th>sign T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landhect</td>
<td>.26601</td>
<td>.07262</td>
<td>.39736</td>
<td>3.663</td>
<td>.0003</td>
</tr>
<tr>
<td>Totincom</td>
<td>-5.94132E-04</td>
<td>2.039763E-04</td>
<td>-.31596</td>
<td>-2.913</td>
<td>.0038</td>
</tr>
<tr>
<td>(constant)</td>
<td>1.8794</td>
<td>.10090</td>
<td></td>
<td>18.719</td>
<td>.0000</td>
</tr>
</tbody>
</table>

Landhect = the amount of land that each household has in the study area.

Totincom = the total annual income in Ethiopian Birr of each household in the study villages.
### Nutritional status by age of the study children, W/A, W/H and H/A and Z-scores

**n = 376**

<table>
<thead>
<tr>
<th>Age in months</th>
<th>Weight for age &lt; -2 S.D</th>
<th>&gt; -2 S.D</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>6-11.9</td>
<td>17(42.5)*</td>
<td>23(57.5)</td>
<td>40(100)</td>
</tr>
<tr>
<td>12-23.9</td>
<td>50(59.0)</td>
<td>35(41.0)</td>
<td>85(100)</td>
</tr>
<tr>
<td>24-35.9</td>
<td>53(49.0)</td>
<td>55(51.0)</td>
<td>108(100)</td>
</tr>
<tr>
<td>36-47.9</td>
<td>44(47.8)</td>
<td>48(52.2)</td>
<td>92(100)</td>
</tr>
<tr>
<td>48-59.9</td>
<td>30(58.8)</td>
<td>21(41.2)</td>
<td>51(100)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>194(51.6)</td>
<td>182(48.4)</td>
<td>376(100)</td>
</tr>
</tbody>
</table>

$X^2 = 5.7$  
D.F = 4  
P = 0.68

* Figures in parenthesis are percentages.

### Weight for height

<table>
<thead>
<tr>
<th>Age in months</th>
<th>Weight for height &lt; -2 S.D</th>
<th>&gt; -2 S.D</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>6-11.9</td>
<td>6(15.0)*</td>
<td>34(85.0)</td>
<td>40(100)</td>
</tr>
<tr>
<td>11-23.9</td>
<td>11(12.9)</td>
<td>74(87.1)</td>
<td>85(100)</td>
</tr>
<tr>
<td>24-35.9</td>
<td>13(12.0)</td>
<td>95(88.0)</td>
<td>108(100)</td>
</tr>
<tr>
<td>36-47.9</td>
<td>12(13.0)</td>
<td>80(87.0)</td>
<td>92(100)</td>
</tr>
<tr>
<td>48-59.9</td>
<td>5(9.8)</td>
<td>46(90.2)</td>
<td>51(100)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>47(12.5)</td>
<td>329(87.5)</td>
<td>376(100)</td>
</tr>
</tbody>
</table>

$X^2 = 2.8$  
D.F = 4  
P = 0.95

* Figures in parenthesis are percentages.
### Distribution of the study children by sex and W/A, W/H and H/A and Z-scores

**n = 376**

<table>
<thead>
<tr>
<th>Age in months</th>
<th>Height for age</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt; -2 S.D</td>
<td>&gt; -2 S.D</td>
</tr>
<tr>
<td>6-11.9</td>
<td>13(32.5)*</td>
<td>27(67.5)</td>
</tr>
<tr>
<td>12-23.9</td>
<td>51(60.0)</td>
<td>34(40.0)</td>
</tr>
<tr>
<td>24-35.9</td>
<td>56(51.9)</td>
<td>52(48.1)</td>
</tr>
<tr>
<td>36-47.9</td>
<td>55(59.8)</td>
<td>37(40.2)</td>
</tr>
<tr>
<td>48-59.9</td>
<td>35(68.6)</td>
<td>16(31.2)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>210(55.9)</strong></td>
<td><strong>166(44.1)</strong></td>
</tr>
</tbody>
</table>

\[ X^2 = 14.9 \quad \text{D.F} = 4 \quad P = 0.06 \]

*Figures in parenthesis are percentages.*

### Weight for age

<table>
<thead>
<tr>
<th>Sex</th>
<th>&lt; -2 S.D</th>
<th>&gt; -2 S.D</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>99(54.4)*</td>
<td>83(45.6)</td>
<td>182(100)</td>
</tr>
<tr>
<td>Female</td>
<td>111(56.7)</td>
<td>83(43.3)</td>
<td>194(100)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>210(55.9)</td>
<td>166(44.1)</td>
<td>376(100)</td>
</tr>
</tbody>
</table>

\[ X^2 = 5.549 \quad \text{D.F} = 2 \quad P = 0.0624 \]

*Figures in parenthesis are percentages.*
### Weight for height

<table>
<thead>
<tr>
<th>Sex</th>
<th>&lt; -2 S.D</th>
<th>&gt; -2 S.D</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>26(14.3)*</td>
<td>156(85.7)</td>
<td>182(100)</td>
</tr>
<tr>
<td>Female</td>
<td>24(12.4)</td>
<td>170(87.6)</td>
<td>194(100)</td>
</tr>
<tr>
<td>Total</td>
<td>50(13.3)</td>
<td>326(86.7)</td>
<td>376(100)</td>
</tr>
</tbody>
</table>

\[ \chi^2 = 2.087 \quad \text{D.F} = 2 \quad \text{P} = 0.3529 \]

*Figures in parenthesis are percentages.*

### Height for age

<table>
<thead>
<tr>
<th>Sex</th>
<th>&lt; -2 S.D</th>
<th>&gt; -2 S.D</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>112(61.5)*</td>
<td>70(38.5)</td>
<td>182(100)</td>
</tr>
<tr>
<td>Female</td>
<td>111(57.2)</td>
<td>83(42.8)</td>
<td>194(100)</td>
</tr>
<tr>
<td>Total</td>
<td>223(59.3)</td>
<td>153(40.7)</td>
<td>376(100)</td>
</tr>
</tbody>
</table>

\[ \chi^2 = 0.9423 \quad \text{D.F} = 2 \quad \text{P} = 0.624 \]

*Figures in parenthesis are percentages.*
DISTRIBUTION OF W/A BELOW -2 Z SCORE OF STUDY CHILDREN BY AREA

Figure 2

Korata | Ind.v2 | Ind.v3 | Jigna | Ind.v6 | Ind.v6

Cooperative | Non-cooperatives

N= 376  (P= 0.0024)
DISTRIBUTION OF W/H BELOW -2 Z SCORE OF STUDY CHILDREN BY AREA

Figure 3

<table>
<thead>
<tr>
<th>Area</th>
<th>Cooperatives</th>
<th>Non-cooperatives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Korata</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ind.v2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ind.v3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jigna</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ind.v5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ind.v6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

N=376 (P=0.404)
DISTRIBUTION OF H/A BELOW -2 Z SCORE OF STUDY CHILDREN BY AREA

Figure 4

- cooperatives  - Non-cooperatives

N= 378  (P=0.007)
Distribution of W/A, W/H and H/A below -2 Z-score of study children

Figure 5

N = 376 (P=0.0024) (P=0.404) (P=0.0073)
**DEMOGRAPHY QUESTIONNAIRE**

Form 1, Page 1 of 1

1 Location_________ Village_________ District_________

2 Cluster_________ H.H. No._________ Date_________

3 Name of the head of the Household_________________

4 Name of the Interviewer_________________

5 Name of the Respondents_________________

<table>
<thead>
<tr>
<th>Seri. No.</th>
<th>Name</th>
<th>Age</th>
<th>Sex</th>
<th>Rel. to H.H.</th>
<th>Education</th>
<th>Occupation</th>
<th>Marital status</th>
<th>Religion</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>02</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>03</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>04</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>05</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>06</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>07</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>08</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>09</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sex</th>
<th>Occupation</th>
<th>Level of education</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Male</td>
<td>1 Farmer</td>
<td>1 Cannot read/write</td>
</tr>
<tr>
<td>2 Female</td>
<td>2 H. wife</td>
<td>2 Can read/write</td>
</tr>
<tr>
<td></td>
<td>3 Students</td>
<td>3 grade 1 to &lt; grade 6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Rel. to the H.H</th>
<th>Occupation</th>
<th>Level of education</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 Work in farm</td>
<td>4 &gt; 6 to &lt; 12 grade</td>
<td></td>
</tr>
<tr>
<td>5 Other</td>
<td>5 Above 12 grade</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sex</th>
<th>Occupation</th>
<th>Marital status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Head</td>
<td>1 Never married</td>
<td>Religion</td>
</tr>
<tr>
<td>2 Wife</td>
<td>2 Married</td>
<td>1 Orthodox</td>
</tr>
<tr>
<td>3 Son</td>
<td>3 Divorced</td>
<td>2 Catholic</td>
</tr>
<tr>
<td>4 Daughter</td>
<td>4 Widowed</td>
<td>3 Muslim</td>
</tr>
<tr>
<td>5 Grand mother</td>
<td>5 separated</td>
<td>4 Other.</td>
</tr>
</tbody>
</table>
SOCIOECONOMIC QUESTIONNAIRE

Form No. 2 Page 1 of 5

Circle Cooperatives/Individual

Cluster H.H.No. Date of interview

Name of the head of the household

Name of Interviewer

Name of the Respondents

LAND SIZE

How many hectares of land do you own? __:___.

How many hectares did you cultivate last season approximate area __:___.

What food crop do you grow?

Type of food crop Amount in madigas value in Birr

1 Teff
2 Wheat
3 Millet
4 Barly
5 Maize
6 Sorghum
7 Chick Pea
8 Other

Total

4 Does the food crop you usually get from the harvest last you until next harvest? 1 Yes 2 No

If no, do you buy food before the next harvest? 1 Yes
**Form No 2**

**Page 2 of 5**

5 Do you grow cash crops?
1 Yes
2 No

If yes, what cash crop do you grow?

<table>
<thead>
<tr>
<th>Type of cash crop</th>
<th>Amount in Kgs</th>
<th>Value in Birr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coffee</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sesame</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nigerseed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Linseed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other specify</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total

6 You own any animal?
1 Yes
2 No

If yes, how many and type of animals

<table>
<thead>
<tr>
<th>No.</th>
<th>Oxen</th>
<th>Cows</th>
<th>Goats</th>
<th>Sheep</th>
<th>Chicken</th>
<th>Donkey</th>
<th>Mules</th>
<th>Horses</th>
<th>Bee hive</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

7 Did you sell any animal last year?
1 Yes
2 No

If yes, which animals and how many?

<table>
<thead>
<tr>
<th>No. sold</th>
<th>Oxen</th>
<th>Cows</th>
<th>Goats</th>
<th>Sheep</th>
<th>Chicken</th>
<th>Donkey</th>
<th>Mules</th>
<th>Horses</th>
<th>Bee hive</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Do you get credit from the government? 1 Yes 2 No
Type of credit  Amount When did you receive
1 ___________  __________  __________
2 ___________  __________  __________
3 ___________  __________  __________
   1 Last planting 1988
   2 This planting 1989
   3 Never received any
   4 Other________________

9  Estimated total income (write actual amount per annum______Ethiopian Birr per year).

10  Do you ever receive any financial remittance 1 Yes 2 No
    If yes, from whom
    1 Son
    2 Daughter
    3 Husband
    4 Wife
    5 Other relatives
    If yes, how much_______Ethiopian Birr?
    If yes, when was the last time you received?

11 Have you received any remittance 'in kind'
    within the year? 1 Yes 2 No
    If yes, what was it? __________
    How much? __________
Cluster No____H.H.No______Circle(Coop/Individual)

Form No 2 Page 4 of 5

12 Materials used for house construction
   1 Wall  1=Wood and mud
        2=Bricks and Blocks ;___;
        3=Stone and mud
   2 Roof  1= Thatch
         2= Corrugated iron sheet ;___;
         3= Other
   3 No. of rooms  1, 2, 3, 4, 5, ;___;

13 Do you have latrine
   1 Yes
   2 No ;___;

If no, where do you deficate?
   1= on the open field
   2= near the stream
   3= near the lake ;___;
   4= other specify---------->

14 Fuel used for cooking
   1 Wood
   2 Charcoal ;___;
   3 Other---------->

15 Energy used for light
   1 Gasoline
   2 Wax
   3 Electricity ;___;
   4 Other---------->

16 Source of drinking water
   1 Tap
   2 Stream
   3 Spring
   4 Well
   5 River ;___;
   6 Lake
   7 Other---------->

17 How long does it take you to reach the water source you mentioned?
   1 >30 minutes
   2 30 minutes to an hour
   3 One hour to two hours ;___;
   4 More than two hours
18 Do you use the same water source for drinking/cooking and washing? 1 Yes 2 No __________

19 Where do you go for health service? 1 Closest health center 2 Traditional healer 3 Private practitioner 4 Hospital 5 Other, specify __________

20 How long does it take to reach? 1 Less than 15 minutes 2 > than 15 minutes to < 1 hour 3 An hour to two hours 4 More than two hours

21 When did you last visit the health station? 1 < than 1 week 2 > than 1 week but < than 1 month 3 > 1 month but < 3 months 4 > than 3 months

If the respondent has not been to the clinic in the past 3 months, continue with question 22

22 Why do you not go visit the health station more often? (write exactly what the respondent says)

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

23 Does someone in your household read and write? 1 Yes 2 No __________
ANTHROPOMETRY AND MORBIDITY DATA.
THIS FORM SHOULD BE USED FOR EACH CHILD UNDER FIVE YEARS OF AGE

Form No. 3 Page 1 of 2

Location________ Village________ District________

Cluster________ H.H.No________ Date________

1 Name of the Household________________________________________

2 Name of the Interviewer________________________________________

3 Name of the Respondent________________________________________
   child relationship(circle)
   1 mother
   2 Caretaker
   3 father
   4 other, specify-->

4 Name of the child________________________________________________

5 Exact date of birth ___________ ___________ ___________ ___________ ___________ ___________:__ D D M M Y Y
   Date verified: 1 Yes 2 No:__
   If not verified
   Approximate age in months :__ __ __

6 Sex of the child
   1 Male
   2 Female:__

ANTHROPOMETRIC MEASUREMENTS

<table>
<thead>
<tr>
<th>OBS. 1</th>
<th>OBS. 2</th>
<th>AVERAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 Weight (Kg) :__ __ __ __ __ __ __ __ __ __ __ __</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 Height (Cm) :__ __ __ __ __ __ __ __ __ __ __ __</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 Age of mother at first pregnancy __ __ __ __ (years)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 Number of pregnancies __ __</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 Number of live children __ __</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
MORBIDITY QUESTIONNAIRE

Cluster____H.H.No_______circle(coop/individual)

Form 3   Page 2 of 2

1 Has__________________________, age__________________________months, been ill in the last seven days?  1 Yes  2 No  ______

If yes, what has he/she suffered from (write what the respondent says)__________________________________________

2 Has the child had diarrhea within the last week
   1 yes
   2 no
   3 do not know  ______

If yes, when the diarrhea was worst?
describe No. of loose stools per day________

For how many days________________________________________________________

If yes, what was the first line of action?

   1 Home treatment
   2 Traditional healer
   3 Consult community health worker
   4 Health center/health station
   5 Hospital
   6 Did nothing  ______
   7 Other, specify------>

3 Has this child had fever within the last week?
   1 yes
   2 no
   3 do not know  ______

If yes, what did you do?

   1 Home treatment
   2 Traditional healer
   3 Consult community health worker
   4 Health center/health station
   5 Hospital
   6 Did nothing  ______
   7 Other, specify------>