THE ECOLOGICAL FACTORSOF MALNUTRITION IN UMUNWADA VILLAGE, IMO STATE OF NIGERIA

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BY

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THE ABSTRACT

The study examined prospectively for over a period of one year (1984–1985) the ecological factors which contribute to malnutrition through a case study of a village in Imo State of Nigeria. The ecological factors considered included the socio-economic status of the population, the seasonal effects on food production and consumption, food purchase, nutrient intake, morbidity and mortality among preschool children, and water supply system. The techniques used were a questionnaire comprising the socio-economic variables, a dietary assessment using both 24-hour dietary recall and weighing methods, anthropometric measurements of height, weight, arm circumference, skinfold and household farm product inventory. All data collected were analysed using statistical student "t" test, the correlation coefficient, and multiple regression techniques. A subsample of 12 households were also investigated in 1989.

Evidences of malnutrition by anthropometric assessment were shown with 44.7% of children 6–10 months old wasted and 46% stunted. The females exhibited less wasting than the males. The older children of 5–10 years old were less wasted than the adolescents; while the female adults exhibited more wasting, (though in mild form) than the male adults. 89% of ≧10 year oldexhibited wasting in 1989 than their counterpart (64%) in 1984 based on a supplementary study in 1989.

Convulsions (though a symptom of disease) assumed the highest prevalence (36%), followed by fevers (30%), respiratory tract infections (20%) and least by diarrhoea and vomitting (7.8% and 6.2% respectively). The preschool children recorded the highest death rate (222 per 1000), but death rate was relatively lower than that reported in similar communities. Harvest season recorded 60% while hungry season recorded 40% of total disease occurrences. Ascariasis (39.6%) and ankylostosomiasis (20.7%) assumed the highest prevalence.

The socio-economic status of 78% of households studied was generally low, being a peasant farming community. Similarly, the impacts of seasonal changes were not significant enough to effect drastic changes on production and consumption as well as on growth pattern, nor did the seasonal changes exert drastic impacts on the other related environmental factors.

The common foods crops were starchy roots (cassava, yam and cocoyam), palm products, and green vegetables and fruits. Starchy roots formed 66.9% production during harvest season, and 52% productions during hungry season; while livestock was the least produced (5.4% in harvest and 9.1% in hungry seasons).

The calorie and protein intakes were low, ranging from 62.1% to 80.0% of reference calorie intake, with 50.1% to 11.2% of reference protein intake (using 24 hour recall assessment); and also 31.0% to 98.6% of reference caloric intake with 20% to 87.4% of reference protein intake (using dietary weighing assessment).

The nutritional status of children ≤ 10 year old were related to the identified ecological factors using both multiple regression and correlation coefficient (r) analysis. With multiple regression, a significant association ($P < 0.05$) was found between the anthropometry of children ≤ 10 years and their nutrient intakes. And with correlation coefficient test, the influence of the socio-economic status (family income, family size and occupation), on the anthropometry was equally significant at $P < 0.05$. The association between crop production and the nutritional status was significant at $P < 0.03$, while the association between food crop consumption and food purchases were strong but not significant at $P < 0.05$ level.

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Most of all, I sing praises to my God, the Almighty for the life, the health, the strength and safety from all hazards during the entire period, Amen.

DEDICATION

Dedicated to my God for everything:

to my dear husband, Chief Maurice Keke

my brilliant children,

my loving sisters,

my father, Jonathan Emeruwa who turned me to academics and then –

to the late beautiful mother,

"Mama Eliza."

CERTIFICATION

I certify that this work was carried out by Christiana Chinatu Keke (Mrs) In the Department of Human Nutrition, University of Ibadan, Ibadan, under the supervision of Dr. I. O. Akinyele.

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GLOSSARY OF TERMS

Diarrhoea: The passage of watery stools more frequent than normal for the age of the child, usually four or more loose stools on any one day which usually last for 1—4 days. The new-born who has frequent stools about 5 times a day is not a case of diarrhoea.

H (Husband): The husband is the head of the family in the study. In a polygynous family there would be one husband (H) for as many wives (W) as are married by the husband.

HH (Household): A group of people living together, under a single family head, and under one house-wife, forming a functioning domestic unit, and feeding out of the same pot. The household members may include some relations, friends or house-helps, and may be a part of a polygynous family. The husband in this regard, may, for census or food consumption purposes belong to any of the wives' household by his own preference.

The word "household" and "family" are however used interchangeably.

INC: These are staple foods of the study village with high water content. These include fermented cassava paste, cassava tapioca, yam, cocoyam, maize paste (akamu), smoked frozen fish, and garri which were initially dried before the determination of their nutrient values.

Naira: This is the Nigerian hundred kobo currency note.

SES: Socio-economic status. This was determined through a scoring technique, (Appendix 14).

SDA: Seventh-Day-Adventists Church. This is one of the Christian (protestant) denominations.

STD: Standard deviation. This is a statistical term.

W (Wife): The wife. Each wife was the chief respondent for interviews on any household visited by the researcher.

Weanling Diarrhoea: This is a concept introduced by Gordon et al 1963, emphasizing the specific diarrhoea occurring in an infant during the transitional period from breast feeding to solid (family) foods.

V1–V13: V1–V13 is variables 1 to variable 13, Which are terms used in representing the ecological factors of nutritional status and these are also employed in the correlation and multiple regression analysis.(Appendix 21).

WFPHA: The World Health Federation of Public Health Association.

'U' village: Umunwaba village is the village of study.

LDCs: The less developed countries of the world.

N/I: Nutrient intake of the individual or group (see Correlation Coefficient (r) analysis.)

N/S: Nutritional status of subjects (see correlation coefficient (r) analysis).

EP: The edible portion of foods (raw or cooked) is the portion that is actually measured or eaten in a recipe preparation.

Preschool age: Preschool age bracket as used in this study, covers 6–60 months inclusive.

NCHS . National Centre for Health Statistics. This refers to the anthropometric standard as developed by this institute which is now used as international standard.

WHO: World Health Organization is an agency of the United Nation's Organization.

RDA: Recommended Dietary Allowance – a report of the Expert Committee on Dietary intake.

FAO: Food and Agriculture Organization is an agency of the United Nation's Organization.

The seasonality concept: This refers to the fluctuations in food production, food intake, food purchases, and disease incidences, during the harvest and hungry seasons of the study period (1984–1985). The seasons do not strictly coincide with the wet and dry seasons respectively as is observed in the unimodal climatic zones of the tropical and subtropical regions of the world.

Nutritional status (N/S): This represents the health status of the individual as determined by the growth pattern using the anthropometric assessment only, for the purpose of this study. The determination or nutritional status incorporating other variables is however appreciated. Poor nutritional status is equivalent to malnutrition.

CHAPTER ONE

INTRODUCTION

Good nutrition is essential for optimum growth, good health, increased productivity, and the orderliness of the social and economic development of a community, whereas, poor nutrition precipitates malnutrition with the attending ill-health and retarded physical and mental development.

Good nutritional status and therefore good health is a state of attainment of good nutritional level by the individual, through the consumption of a balanced diet that is enhanced by an appropriate intra-family food distribution system. Contributors to optimum nutrition include the acquisition of stable occupation with regular satisfactory income, the acquisition of optimum educational level that enhances social interactions to combat ignorance and promote enlightenment, the provision of good housing with hygienic and sanitary conditions free from over-crowding for the purpose of good health, the provision of necessary community infrastructures and amenities, for the maintenance of physical and emotional well being, and finally the provision of miscellaneous facilities that promote good standard of living as relative to the specific environment.

Malnutrition is composed of undernutrition, resulting from the consumption of an inadequate quantity of food; over nutrition resulting from the consumption of excess quantity of food, (or calorie), specific deficiency resulting from a relative or absolute lack of individual nutrient, or imbalance

resulting from a disproportion among essential nutrients. This state is clinically manifested, or detected by biochemical, anthropometric, or physiological tests (Jellife 1966). Nutritional diseases are precipitated by the condition of malnutrition.

Malnutrition socio-economically creates a state of unproductivity, low standard of living, poverty and underdevelopment of a community. Malnutrition physically, creates high morbidity and mortality rates in the community, particularly, amongst the risk groups of infants, children, pregnant and lactating mothers.

Malnutrition has also been described as an outcome of interactions between various ecological factors. These factors are multifactorial and closely interrelated, and pertain to the environment of the community where malnutrition flourishes (Hussain 1984). Malnutrition thus creates a vicious cycle which erupts as a chain of reactions, and operates equally in reversible fashion; for, the condition of malnourishment is either contributing to the adverse environmental factors causing malnutrition or that the environmental factors are contributing to a state of malnourishment. Malnutrition, is thus more than a medical problem because it causes dysfunctions in the economic, demographic, cultural and ecological processes of a community (Taylor and Taylor 1976).

Undernutrition rather than overnutrition is the major health problem in the developing countries of the world. The magnitude of this specific problem has been investigated (Bengoa 1970), and also, the Food and Agricultural Organization (FAO) of the United Nations (1973) estimates

that about half a billion (500,000,000) people are facing varying degrees of undernourishment and the associated nutritional diseases which range from protein-energy malnutrition (PEM) to various forms of avitaminosis.

For instance, Brock (1953) contended that for every one case of kwashiorkor in Nigeria, there were 100 cases of protein malnutrition in the prekwashiorkor condition. Working on this premise, it was estimated that about 20,000 to 30,000 cases of kwashiorkor children were present at any one moment in Ibadan, Ilesha and the environs, (Morley 1963). However, about 300 cases of kwashiorkor yearly had earlier been reported from the Wesley Guild Hospital Clinic in Ilesha (Collis et al 1962 (a).

A conservative number of 100 million PEM children in the world is estimated at any point in time, out of which 10-20 million are severely malnourished (Bengoa 1974). In Africa alone, 2.7 million children are estimated to suffer from severe PEM: while 16.2 million suffer from mild to moderate forms of malnutrition.

The ecological factors of malnutrition are those factors of environmental origin (excluding genetic factors) which predispose to the condition of undernutrition, overnutrition, deficiency, or nutrient inbalance in the body.

Among the socio-economic factors predisposing to malnutrition, income, family size, housing, water supply, sanitation, literacy level and many other socio-cultural attributes of the family are found to be

significandy related to malnutrition by many cultures in various countries (Wray et al 1969, Chavez 1974, Keilmann 1978; Hussain et al 1980, Chambers et al 1981).

Chavez (1974) wondered why in some rural communities of similar socio-economic resources, well-nourished children coexist alongside a large proportion of their counterparts suffering from second and third degree malnutrition. The study on the socioeconomic implications found a significant difference in adult/child relationships between the well-fed and the poorly-fed children's families. In this case the family sizes of the malnourished children were far in excess of the family sizes of the well-fed children.

Similarly a number of authors have found the prevalence of protein energy malnutrition (PEM) to be related to the maternal factors (Scrimshaw et al 1968, Wray and Aguirre 1969, Omololu 1972, 1974, Simmons 1976, Rowland et al 1977, Rosenbery 1977, Chen et al 1978 - 79, Nabarro 1981, and Whitehead at al 1982).

Amongst the infectious episodes, diarrhoea, measles, whooping cough and malaria have all been reported to lower the nutritional status. A longitudinal study using Gambian infants attempted to determine the relationship between growth and various infectious diseases (Rowland et al 1977). Results revealed that gastroenteritis had a significant effect on height ($P \leq 0.01$) and on weight gains ($P \leq 0.001$). Malaria likewise had a significant effect on weight loss of the children. However, such quanti-

tative studies on the effects of infection on nutritional status are few (Morley, and Woodland 1986; Rowland et al 1977, Mata 1978).

Nutrient intake appears to be a crucial determinant of nutritional status, and several studies have attempted to establish a direct relationship between food consumption pattern and nutritional status (Hauck and Tubruh 1963; Nicol 1959; Rodsdell 1964 and Awdeh 1976). A study on Uboma Community in Eastern Nigeria by the Rockfeller research team (1964) attempted to assess the relationship between nutrient intake and the health status of the people with a view to planning a priority assistance programme for the community. The dietary pattern and the anthropometric measurements of twenty sampled families were determined and physical examinations conducted. Several cases of marasmus were identified and results indicated that the community was badly fed due to seasonal food shortages. The effects of seasonality on nutritional status as reviewed by Longhurst and Payne 1979-81, concluded that the seasonal effects are primarily mediated through its influence on the production and the availability of food, in the tropical and sub-tropical regions. This has been further demonstrated in studies where food availability varied from one period to another during the same year (Chen et al 1979, Longhurst et al 1981). This scarcity was always accompanied by a fall in nutrient intake, and loss in body weight during periods of scarcity (Keilmann 1978, Onchere and Slooff 1981; Chen et al 1979; Chambers, Longhurst and Pacey 1981,

and Sabaro 1981. Nnanyelugo et al 1985). Similarly, changes in birth weight (Rowland et al 1977), disease incidences (Chambers et al 1981), and even breast milk production (Omololu 1974) have been reported to coincide with seasonality.

In Nigeria, there is a dearth of information available to relate these environmental factors (biological, physical, socio-economic) to malnutrition, particularly at the village levels. Most of the available studies are cross-sectional with the ecological study by Collis et al (1962(b), the Akufo village study (Gilles 1969), and the Uboma village study (Rockfeller Research team 1964) being the exceptions. These studies also do not include all the components within the environment in their studies.

The present study therefore attempts to investigate the interactions of these environmental variables as they affect the nutritional status of a village community. This is an effort to delineate the natural history of malnutrition so that effective means of prevention can be recommended for the amelioration of malnutrition in the community.

The Objectives of the Study:

The overall aim of the study is to identify the ecological factors which contribute to malnutrition in a selected village community.

The specific objectives are:

To study prospectively the natural history of malnutrition in a Nigerian village in Imo State.

To determine the ecological factors that contribute to malnutrition.

To determine the pattern of food production and consumption as affected by the harvest and hungry seasonal changes.

To determine the effect of the seasonal changes on nutrient intake and the nutritional status (through anthropometry) of pre-school children.

To determine the differences in nutrient intake between 1984 and 1989 period.

To suggest suitable intervention programme to correct any deficiencies identified.

CHAPTER TWO

REVIEW OF LITERATURE

The prevalence of malnutrition as observed in most developing countries of the world is of great concern to the nutritionists and development planners. Malnutrition does not often exert equal impact on all population groups. Certain factors and circumstances dictate the target of occurrences. The causes of malnutrition are multidimensional and include both food and non food factors which combine to form a complex web of biological, economic, socio-cultural and physical environmental deprivations.

A breakdown at any point within this complex system may result in malnutrition. (McLaren 1976, Taylor et al 1976; FAO 1985 1987). The economic factors in the web for instance, and seasonality effects can implicate food production and consumption pattern, social and cultural factors can influence family food distribution; while physiological conditions and diseases, and other physical factors do influence food preparation, utilization and productive ability. These and many more combine to form the ecological factors of nutritional status (or malnutrition).

Some selected food and non-food determinants are thus reviewed in this chapter as they particularly affect the less technologically developed nations. The specific areas of interest comprise the relationship between

food intake, infectious diseases, socio-economic factors (including food availability), seasonality and nutritional status. Also included are growth patterns and the methodologies employed in the assessment of ecological factors and nutritional status.

A. The Nutritional Status of the Individual :

The nutritional status is defined as the condition of the body resulting from the intake, absorption and utilization of food, and also from other pathologically significant factors (FAO 1985). The nutritional status is normal when there is a balance between intake and requirement, but is abnormal when the balance between intake and requirement is disrupted (Hussain 1984).

Primary malnutrition is composed of under-nutrition and over-nutrition. Under-nutrition is a result of defective food intake in quantity or quality or both and is exogenous in nature, caused by poverty, food shortage, catastrophies of war, food, drought and the like. While secondary malnutrition (or under-nutrition) is endogenous in character comprising those factors which interfere with the utilization of nutrients such as parasitic worms and diseases, despair or emotional stress, and malabsorption (McLaren 1976).

Poverty implies economic deprivation in which financial constraints limit the house-holds food purchasing power (particularly the highly prized first-class protein foods). It also implies subsistence agricultural production

system, limited land holdings and manpower inputs, and many such limitations characteristic of rural and urban poverty which limit food supply to the family (Longhurst 1984, Nabarro 1981, Chambers et al 1981, FAO 1987).

Refugees in a camp and war prisoners are characteristics of catastrophic phenomena in-directly precipitating poor food intake, hunger, malnutrition, pestilence and disease, and high death rate while floods operating inversely with drought (like in the Sahel region of Africa) characterize large scale food destruction and food shortage phenomena, with the corresponding ills of hunger and malnutrition (FAO 1985, 1987).

Similarly, individuals are nutritionally depleted by diseases and intestinal worms, and malabsorption syndromes (a condition characteristic of inadequate nutrient absorption from the intestinal tracts; and Bengoa 1974) while emotional stress exerts its negative influence on apetite, precipitating loss of apetite, nutrient denial and malnutrition (FAO 1987).

The availability of food is directly related to the nutritional status of the individual because a state of inadequacies predisposes to a state of under-nourishment and poor nutritional status while over-sufficiencies in food availability may predispose to a state of over-nourishment with the attendant complications on nutritional status. Food availability implies the production, distribution and utilization of food by man.

Food distribution in terms of food storage, food processing, transportation and marketing in the developing countries are limited by underdeveloped technology, while food sharing is influenced by cultural food habits and intra-family food distribution system. The distribution of foods produced is dependent upon the political, cultural and economic patterns surrounding the food, which consequently influence the movement of the food to the consumer. The political structure of the society for instance dictates the value and priority given to adequate and equitable distribution of food to its entire consumer population, through the provision of adequate storage, processing, preservation, and transportation facilities. This whole system has been described by Taylor (1978) as the rural agricultural sector of the economy whereby the government sets up crop prices, acquisition policies, rural investment programmes, input pricing policies (e.g. fertilizer and water subsidies) and the rural wealth and income distribution system.

However, food production being the prior source of food involves the interactions of the seed or animal, the soil, water, climatic conditions and man - the cultivator (McLaren 1976). In food production, the climate, soil and vegetation largely determine the quantity, nutritional quality and types of food grown. Some geographical areas are thus more susceptible than others to yearly fluctuations in food production as a result of natural climates such as droughts, floods and severe out-breaks of plant and animal diseases, leading to widespread hunger and malnutrition (FAO 1985).

Studies have shown the importance of seasonality in food production as an essential factor in malnutrition (Chambers et al 1981). Thus the concept of "rural poverty" is described later in the chapter in which the brunt of nutritional deprivations tend to fall on the rural and urban poor than on their wealthy counterparts resulting from inadequate food production processes.

The in-equitable intra-family distribution of the available food is the result of the prevailing traditional and religious practices in the rural community. (Atmma 1989). The financial position of the family equally dictates the quantity and quality of foods purchased irrespective of the family requirement (such as the inability to purchase the high biological protein foods which are expensive commodity: (FAO 1985).

In the food distribution network for instance, food shortage could result from food destruction and spoilage by pests and micro-organisms during poor storage. Evidences also indicate that food distribution within the family as dictated by cultural trends is generally related to hierarchical position, with the head of the household and its income-earning members receiving preference (FAO 1985). Mothers and young children generally receive smaller shares (Ferro-Luzzi et al 1980)

The traditional practice of sharing food by young children from common bowl in some societies also put the younger ones at a disadvantage to get enough food because the bigger children might eat faster and take bigger share. Additionally, certain bias in food sharing against females in the

family have been reported by many workers (Mathur et al 1961, Rockfeller 1964, Chen et al 1981, FAO 1985).

Food utilization is influenced by food preparation method, food habits (including cultural, religious familial and personal habits), and food ingestion. For instance, nutrient quality, palatability and acceptability, and digestibility of food are all affected by food preparation methods. For example, frequent reheating of cooked food as observed in certain cultures (Hauck and Tabrah 1963) destroys heat-sensitive vitamins B and C.

The preparation pattern is determined by the socio-cultural factors of the group, such that certain foods (e.g. green vegetables and fruits) are over-cooked or over-processed thereby causing nutrient loss. Others (such as cereals and legumes) are under-cooked or under-processed causing nutrient unavailability. The wholesomeness and digestibility of prepared foods (such as cassava and bean varieties) are affected by preparation method. In many parts of Africa where cooking fuel and water are scarce, the frequency of cooked meals is reduced, and such meals once cooked are consumed over a long period under improper storage or hygiene. This situation predisposes to serious food-borne infections and diarrhoea amongst children (FAO 1987).

Nutrient deficiencies are thus precipitated by inadequate availability of food nutrients to the body cells. During consumption of the prepared meals who consumes what in the traditional setting should not be over-

looked. Even the ingested foods may not be adequately utilized because of such physiological malfunctions and malabsorption syndromes and diarrhoea diseases, which tend to induce nutrient losses from the body (Beaton and Patwardhan 1976, Chen 1980).

The exclusive responsibility of water fetching by women and children as reported in certain parts of Africa, like in the South of the Sahara and East Africa imposes a negative impact on time and energy of the subjects (White and Bradley 1972, Longhurst 1984). It is estimated for instance, that the rural women in Cote d'Ivoire fetche about 600kg of water and fire-wood into the kitchen every week spending about 56 minutes a day in this activity alone. (White et al 1972, Lu ven 1983). Cooking practices equally affect nutrient availability. For instance, in many cultures like in Nigeria, vegetable foods are meticulously washed, cut into tiny pieces, soaked, overcooked and then reheated before serving. Elsewhere as in Bangladesh the cooking water from rice is discarded. Such a method reduces the water-soluble vitamins (B and C) by 40% (FAO 1985) thus rendering the nutrients unavailable to the body.

Food consumption especially in the developing countries is still influenced by complex socio-cultural factors such as poor food habits, food taboos, food fads and fallacies, and food idiocyncrazies (Atoyebi and Hussin 1985), cultural food sharing (Chen et al 1981, Abdullah 1983), and cultural attitudes towards various foods (Taylor and Taylor 1976, Atoyebi and

Hussain 1984). Studies in Nigeria have shown that in many societies some foods are culturally more highly prized than others and no meal is considered complete without them. When the preferred food is a root or a tuber the custom may be disadvantageous to the child who with their stomach capacity are weaned with diets based on roots and tubers of bulky contents but with low concentration of nutrients (especially proteins). The limited capacity of the stomach makes consumption of such bulky food insufficient in quantity to cover their requirement (Atoyebi and Hussain 1985). Cultural food beliefs and taboos usually concerning foods of animal origin often apply to women and young children. With a child on boarderline growth, such cultural practices as with-holding solids at first sign of diarrhoea (as reported in Punjab, India) can precipitate P.E.M. in the child (Taylor and Taylor 1976).

All the above factors form a complex web which interact negatively or positively to ultimately provide food to the body. Malnutrition thus occurs as a result of inadequacies of one or more of these factors (McLaren 1976).

Protein-Energy Malnutrition:

The nutritional status of young children as regards protein and caloric may be viewed as a continuous gradation from "normal" through mild and moderate degrees of malnutrition, to the advanced syndromes of which the two most known are kwashiorkor and nutritional marasmus (Jelliffe and Jean 1959, 1968). The term "protein-calorie malnutrition" of early childhood (PCM: also known as protein-energy malnutrition (PEM) is used to repre-

sent the whole range of classifiable and unclassifiable manifestations of inadequate protein and calorie intake (Jelliffe 1966, McLaren 1976) because it is claimed that kwashiorkor, marasmus as well as other lesser manifestations are associated with protein and calorie shortages in early childhood. PEM is an important public health nutritional problem in the developing world. It is mainly confined to preschool children belonging to the low-income groups. The prognosis of PEM have been documented by many studies (William 1935, Jelliffe and Dean 1959, Shakir et al 1974, Waterlow et al 1980). The causation for PEM is multidimensional and multifactorial.

Of the two major severe syndromes of PEM Williams (1935) employed the socially descriptive West African word kwashiorkor to explain the condition due to deficiency of protein (and of essential amino acids) in the body as prevalent in the second and third year of life. Kwashiorkor is however never exclusively dietary in origin. The description of clinical picture is given by Latham (1965), Jelliffe (1968), and the picture varies from one country or region to the other, and also in severity. The constant features of kwashiorkor include: growth failure and wasting of muscles (which might be concealed by the presence of oedema), dyspigmentation of the hair devoid of lustre, easily and painlessly pluckable; dyspigmentation of the skin which degenerate to "flaky-paint" dermatosis; oedema with moon or

puffy face; is apathetic irritable withdrawn and anorexic. Diarrhoea might occur as well as other deficiencies such as mouth and lip lesions.

Nutritional marasmus, the second major syndrome occurs much earlier in life than kwashiorkor (commonest during the first year of life). The causation is that of the deficiency of total caloric (or food) from the body (otherwise called starvation) predisposed by all the environmental factors already discussed. The clinical picture is that of varying degrees of starvation syndromes and growth failure as described in many texts including Latham (1965), Jelliffe (1968) and McLaren (1976). Nutritional marasmus presents the characteristics of severe undernutrition known as protein-caloric (energy) Malnutrition (PEM), invariably featuring growth retardation (with severe wasting of muscles and subcutaneous fat) exhibiting less than 60% of the reference value. Limbs are spindle-like and skin is loose presenting a picture of a wizened "little old man" (Jelliffe 1966). Variability in clinical picture do exist which poses more difficulty in the definition of signs. Such signs as associated with vitamin deficiencies (angular stomatitis and keratomalacia), diarrhoea and other infections are not uncommon.

B. Classification of nutritional status by anthropometry

The nutritional status is measured using various methods of anthropometric measurements of height, weight, and the chest, head, and muscle circumferences, and the skinfolds of the biceps, triceps, suprailiac, and

subscapular measurements. The combination of anthropometric indicators provides more precise information on the nutritional status than the use of single one. The most common combinations are, weight-for-age, height-for-age, and weight-for-height.

Weight as a sensitive indicator of small changes is used to assess the total body mass. Weight for age reveals acute wasting in the child though this relies on age data which are often subject to error when applied to the rural population where birth dates are not precisely known. (Waterlow et al. 1977). Arm circumference assess muscle mass, and changes indicated are relatively little with age. Between the ages of one and five years for instance, the mean change is less than 1cm. The nutritional status of the child is at risk of developing protein-energy malnutrition (PEM) when the arm circumference is below 12.5cm. The arm circumference is more useful in identifying severe (not border line) malnutrition. The upper arm as well as the mid calf muscles are suitable locations. It is quick to use and least affected by oedema in cases of kwashiorkor, but is subject to observer error (Anderson 1979, WFPHA 1985).

Length/Height measure assesses the degree, of skeletal and linear growth. Length/Height-for-age reveals a long term nutrient deprivation (or chronic malnutrition (Jelliffee 1966, WHO 1983, WFPHA 1985). Deficit

in linear growth is also referred to as growth stunting (WHO 1983, 1987). Changes in height occur relatively slowly, and is usually supplemented with another indicator like weight-for-age or weight-for-height for effective interpretation (Mart-o-rell et al 1980).

Weight-for-height, reflects more current malnutrition (Jelliffee 1966, Rowland et al 1977, Chen et al 1981, Latham et al 1981) and distinguishes the well proportioned from the thin or heavy-for-height (WHO 1983), the weight-for-height index is not age, dependent, and is relatively independent of genetic differences in absolute size (Waterlow 1972). The weight-for-height, and height-for-age are thus recommended for most purposes (FAO 1987). The skinfold assesses sub-cutaneous reserves indicating the degree of thinness or fatness but this measure is limited by lack of precision in the location of body sites, and also by the expensive nature of the equipment (WHO/FAP/79). A child may therefore fall into four broad categories of nutritional status - the normal (not wasted not stunted), the malnourished but not retarded (acute malnutrition or wasting), the malnourished and retarded (acute on chronic malnutrition), and the retarded but not malnourished (stunting or nutritional dwarfs) (Waterlow 1972). "Retardation" is, strictly defined by Waterlow (1972) as a reduction in the rate of linear

growth, and "stunting" as a reduction in the final stature while malnutrition in this context refers to wasting. Stunting and retardation can equally be used interchangeably. However, all except the first of the four categories are generally regarded as malnutrition or under nutrition.

Growth rate is the extent of growth – linear or mass, as exhibited by the individual over a predetermined period, the common assessment include height-for-age, height for age and the derived weight for height. Measurements thus obtained are then compared with a reference value like the Boston, the NCHS or local standard (WHO 1986, Morley 1968). Some nutrition experts feel that genetic background influences growth rates while some argue that growth rates are same for all children from birth till eighteen years of age. An infant doubles its birth weight at six months (at 679g monthly), gains half the birth weight from seven to twelve months (at 453g monthly), and gains one-third the birth weight from twelve to twenty-four months (at 226gm monthly, Jelliffe 1966). Where monitoring system is feasible, failure to gain weight or "faltering" weight (Marsden and Marsden 1965) could be identified and the determinants identified for intervention purposes. A variety of systems has been evolved to define a child's (or individual's) nutritional status and the aim is to identify the degree of malnourishment in comparison with a chosen reference. A list of standard and classification reported by various workers are summarized in table 1.

TABLE I

Classification system for malnutrition by indicators (WFPHA 1985)*

System	Reference	Classification of malnutrition :	Cut off point
Weight-for-age indicator			
Gomez (1956)	Boston: % of Median	> 90%	: normal
		90–75%	: mild
		75–61%	: moderate
		< 60%	: severe
Jelliffe (1966)	Boston: % of Median	110–90%	: normal
		90–81%	: mild
		80–61%	: moderate
		< 60%	: severe
Bengoa (1970)	Boston: % of Median	Gomez classification with all cases of oedema added to the category of severe malnutrition	
W.H.O. (1978)	NCHS: Percentile	50th – 3rd Percentile = normal	
		< 3rd Percentile = Malnourished	
Height-for-age Indicator			
Kanawati & McLaren (1976)	Boston: % of Median	> 95%	: normal
		95–90%	: mild
		90–85%	: moderate
		85%	: severe
Weight-for-height and Height-for-age indicator			
Waterlow (1977)	Boston: % of Median	Adequate weight-for-height and height-for-age = normal	
		Low weight-for-height and height-for-age = acute malnutrition	
		Normal weight-for-height and height-for-age = chronic malnutrition	
		Low weight-for-height and height-for-age = chronic and acute malnutrition	
Waterlow (1977)	Boston: % of Median	Adequate weight for height and Height-for-age = normal	
NCHS (1977),	NCHS: Percentile	75th–25th Percentile = normal	
		10th–5th Percentile = moderate	
		5th percentile = severe	
Waterlow (1977)	Boston: % of Median	110–90% = normal	
		90–80% = mild	
		80–70% = moderate	
		< 70% = severe	

*Adapted from World Federation of Public Health Association 1985 Tables 3–7.

The Boston (Harvard) standard which is based on a study of age, weight and height of Boston (USA) children as compiled by Stuart and Stevenson (1959) is considered suitable for young children. The Baldwin–Wood (1923,) standard is considered suitable for the pre-school and School children while the values compiled by the Society of Actuaries (1959) are considered suitable for adults (Jelliffee, 1966). The Boston standard which is considered suitable for all populations has been employed by Gomez, Jelliffe, Waterlow, and Kanawati, in their various systems and at various cut off points of the median to suit their study objectives. Cut off points can be expressed in three ways. Percentiles of median, percentages of reference values, and standard deviations from the median.

The National Center for Health Statistics (NCHS, 1977) standard was determined from a population of various ethnic groups (in the USA) and this standard is adopted by the WHO for its clarity and wide population representation (Cutting 1977, WHO 1987). The NCHS standard utilizes the percentile and standard deviation cut off expressions and is also a widely used reference. The 50th and 3rd percentiles are closely represented by 120% and 75% respectively of the Boston median values indicating that NCHS median (50th percentile) is greater than Boston's median. Though the choice of classification system and the cut off lines are dependent on the users, the 1981 recommendation for preferential use of NCHS values for comparison (WHO 1986) has been recommended.

Methodologies in Anthropometry:

The guidelines for accurate measurements of height, weight, muscle circumferences and skinfold are described in detail by Jelliffe (1966), WHO/FAP/79, WFPHA (1985), Morley (1984), WHO (1986), and several others.

Changes in nutritional status could be determined by biochemical assessment which is useful in detecting deficits prior to appearance of Physical lessions (Kanawati 1976), for example in Kwashiorkor cases where blood is tested to determine plasma proteins, and urine tested for nutrient depletion (i.e. protein, lipids, vitamins, A, B, and C, iron and calcium depletion). But resistance in the collection of samples (blood, urine etc.) from subjects and problem of transportation of fragile equipments and reagents to the survey limit the use of this method in the field.

Clinical or physical examination is also employed in the determination of nutritional status. It confirms advanced or observable stages of nutritional deficiencies. Clinical signs are simple to identify, but sub-clinical signs are difficult to detect. However, Herpretation of observed signs require careful judgement because observer error is usually high, as definition of signs and reporting method are not standardized. Some common clinical signs associated with nutritional disorders as observed in the field surveys are given in Jelliffe (1966), and Mclaren (1976 Table 4).

Others but uncommon methods of nutritional status assessment include radio-graphic examination (WHO 1983). Skeletal deficiencies such as rickets,

osteomalacia, florosis and beriberi could be identified using this radiographic examination method. Tests of functions are devised to determine functional deficiencies of body such as the deviations in visual acuity, nervous and muscle incoordination in cases of vitamins A, B1, B2, and calcium deficiencies respectively (Sinclair 1948). Other biochemical assessment not elaborated here include the cytological method of bucal mucosal smear, and amino-acid imbalance tests (Jelliffe 1966).

C. Socio-economic influence on nutritional status :

Socio-economic factors are those variables relating to the social and economic environment of the household or the community. Such factors include the financial and occupational status, the literacy level, the reproductive pattern and family size, the food production, distribution and consumption pattern, the general standard of living and social status, and many more of such as applicable to the particular culture or society (McLaren 1976 Nnanyelugo et al 1985)

The impact of these factors on the growth and health status has been substantiated in which one or more in combination predispose to malnutrition in the risk group. Successive and multiparous births for instance, predispose to maternal depletion, deficit in nutritional status; and also the inability to cater for the numerous offsprings. Similarly, large family size deplete family financial resources and limit the purchasing power and the family's quantitative and qualitative food consumption. Poor housing predispose to poor environmental sanitation, to infection and thus to nutrient depletion.

Ignorance and illiteracy of parents predispose to poor choice of food amidst plenty, faulty food preparation and consumption pattern.

Malnutrition could be manifested through substandard growth in children especially in the developing countries. Until recently the substandard growth of children particularly from the third world countries was attributed to genetic influences with little emphasis on nutritional and environmental factors, but similarity of growth characteristics in children of varying ethnic groups living under optimal environmental conditions have proved the later (Gokulanathan and Karakat 1969). Growth failure for instance, has been observed amongst children of privileged or financially stable groups who had partially retained the cultural value of the agrarian community. The growth failure in this instance was due to factors other than lack of food.

There is thus an interplay of both socio-economic and socio-cultural factors on food intake and nutritional status of a people. Many studies have reported the effects of the family socio-economic or biosocial variables on the growth and development of the child, and these variables are so interrelated that the effect of one determines the effect of the other (Tomkins 1978, Mata, 1978, Nabarro 1981, Nnanyelugo 1980 Hussain 1984, Nnanyelugo and Ngwu 1985). These variables differ from culture to culture but the most consistent ones include family food expenditure, family size, child spacing, crowded dwellings and sleeping conditions, parents ages and

sizes, over-population and sanitation, age and sex discrimination in siblings birth weight, and energy , and protein intakes (Keilmann . 1978, Morley 1963, Wray and Aguirre 1969 and Hussain, et al 1983, Nnanyengo and Ngwu 1985). These variables only explain about 10-40% of the growth deficits.

Wray and Aguirre found PEM more prevalent in the first and second year of life, in girls than in boys, and more in infants with mothers aged less than 35 years. Morley et al (1986) referring to a rural Nigerian study reported some seven risk factors for childhood malnutrition amongst which were maternal weight below 43kg and the birth order of siblings.

In Africa the ecology of childhood malnutrition is said to be associated with the deposed or a "rejected" child (WHO, 1984). This fact is significant and exposes the attitude of negligence in child care as a result of a subsequent pregnancy by the mother. This abandonment of the child after weaning is highly associated with the protein energy malnutrition very often referred to as "Kwashiorkor". Hauck and Tabrah (1963) in Awo-omama (Nigeria) reported the fact that infants were normally a bandoned to the care of the older siblings or hirelings, while the mothers go back to their traditional farming; an act which portrays negligence of the child.

The maternal environment is an important factor in assessing the nutritional status of the child. Such environment includes the socio-economic

status, the obstetric history such as fertility rate and child spacing, the breast feeding pattern, maternal health and nutrition, and maternal stature and age. All these factors were found to be highly interrelated. For example Muta (1978) found that short birth intervals of less than nine months correlated with maternal depletion, low birth weight, retarded growth of siblings and high mortality rate. Similarly successive births, young maternal age, and poor maternal nutrition were all associated with low socio-economic status, of the community and these contribute in no small way in determining the child's growth and nutritional status.

Prolonged breast feeding enhances child spacing but depletes mothers nutrients especially when mother is underfed. The maternal under-nutrition which is common in most African countries, accounts for maternal underweight of about 43kg. Omololu (1974) had stated that maternal undernutrition was a rule rather than the exception and that the problem in Nigeria was more than mere maternal underweight. For instance, the average weight gain during pregnancy in the African mother is 6kg in pregnancy, in contrast to the average weight gain of 12kg for the developed countries. As much as 20% of the neonates have birth weight of 2.5kg in contrast to 50% in developed countries.

Hussain and Abdullah (1980) in a Pakistani village identified several ecological factors as precipitating malnutrition. These included early mar-

range (at 17.5 year average) early and quick succession of pregnancies complicated with illiteracy which had profound adverse nutritional implications on the mother.

The weaning processes in developing countries significantly contribute to malnutrition. Omololu (1974) in Nigeria reported that about 96% of the elite women, 88% of the middle class counterpart, and 45% of the illiterate women use both bottle and breastfeeding, while 100% of the rural women breast feed their babies for the first 12–24 months. Preferential use of bottle feeding had a negative effect on child nutrition, morbidity rate, and the nutritional status.

However, long period of breastfeeding as employed by the Nigerian mother compensates for weaning deficiencies (Omololu 1974). The weaning foods constitute predominantly of a gruel of corn or sorghum which provides about 90% water, 10% protein, and 30 Kcal for every 100ml of the gruel. The weaning often starts at 4 months, but with the nature and composition of the weaning diet, the growth rate is reduced, and the retardation is often complicated with the exposure to parasitic infections and PEM by the second year of life (Gilles 1963). Some African weaning practices do not even advocate the use of solid food till the child has walked (Omololu 1974).

Consequent on maternal ignorance, food supplementation practices during weaning result in nutrient insufficiency or food contamination which in turn results in gastroenteritis, nutrient depletion and reduced growth (Nabarro 1981). Keilmann et al (1978) in Narangwal (India) found the variables in child growth related to the basic socio-economic status of caste system and sex which created a significant impact on growth rate and the overall morbidity of children.

The concept of rural poverty has been attributed to the process of under development which include amongst others insufficient food production (as a result of poor agricultural mechanization) famine complicated with increased population growth, poor nutrition and ill health, loss of weight and retarded growth. This process of under development is also associated with tropical wet and dry season and the accompanying fluctuations in food availability, food consumption and other adverse multiple seasonality effects which have been discussed at length by Chambers et al (1981), Longhurst and Payne (1981) and Nnanyelugo et al 1985. The common risk-groups were usually the womenfolk who were already over burdened and often pregnant, the infant and children and poorer households, whereas the wealth counterparts (due to socio-economic organization of the community) did not feel

such adverse effects and were able to cope with the acute seasonal hardships. Raike (1981) found that problems related to social structure favoured the wealthy minority who had preferential access to most seasonal resources including land and labour. As part of the strategy, poor peasants were forced to sell their lands and labour to the rich in order to survive. This practice is common in many parts of India and Africa.

D. Nutrient intake and nutritional status

The body requires food nutrients for growth, maintenance and physical activities. Such nutrients include the proteins, carbohydrates, fats, vitamins, and minerals. The quantity and quality of the nutrients so consumed affect nutritional status for when the total nutrient and energy are low the body's activity is reduced, growth is retarded, body nutrient store is depleted, the homeostatic immunological and cardio-vascular functionings are disrupted, and a chain of body dysfunctions are precipitated (Nabarro 1981). A state of hypoglycaemia, electrolyte imbalance, low resistance to infection, and many more ailments are set in motion. But the availability of energy for body functions depends on consumption of foods containing carbohydrates, fats, and proteins, provided the digestive, absorptive, metabolic and storage processes of the body are operating adequately.

Problems do arise as to what constitutes adequate diet, the safe level of intake and the onset of nutrient inadequacies. This is because symptoms of inadequacies are exhibited even in the absence of signs of severe malnutrition. Thus diet assessment should be independent of symptoms of malnutrition (Longhurst and Payne 1979). A safe level of intake is an amount that will meet or exceed the requirements of practically all individuals in the group explicitly taking into account individual variations in requirement (FAO/WHO 1985). Table 2 shows the daily recommended allowance by the FAO/WHO (1974). Expert Committee on Nutrition as compiled by Passmore et al (1974).

The safe level of protein intake is based on milk or egg protein which has a high biological value. The recommended intake is 29gm for a reference woman, and 37gm for a reference man per day. This suggests that non milk/egg proteins should be taken in a larger quantity to compensate for the deficiencies in essential amino-acids of the later. A diet on a mixture of vegetable proteins (e.g. cereals and legumes) possess a protein nutritive value that is higher than those based on the consumption of a single vegetable protein source (FAO/WHO 1974). However, the issue in this paper is concerned with the nutritive value of the entire diets and not on individual foods taken. The protein value of diets of the developing countries have

TABLE 2

Recommended nutrient intakes (FAO/WHO 1974, FAO 1985)a

Age range	Body weight kg	Energy (a) Kcal	Energy (a) MJ	Protein (a, b) g	Vitamin A (c, d) ug	Vitamin D (e, f) ug	Thiamine (c) mg
Children							
< 1	7.3	880	3.7	14	300	10.0	0.3
1 – 3	13.4	1250	5.2	14.5	250	10.0	0.5
4 – 6	20.2	1850	7.7	21.0	300	10.0	0.7
7 – 9	28.1	2100	8.8	27.0	400	2.5	0.9
Male adolescents							
10 – 12	36.9	2200	9.2	34.0	575	2.5	1.0
13 – 15	51.3	2500	10.5	47.5	725	2.5	1.2
16 – 19	62.9	2850	11.9	56.0	750	2.5	1.2
Female adolescents							
10 – 12	38.0	1950	8.2	36.0	575	2.5	0.9
13 – 15	49.9	2100	8.9	45.0	725	2.5	1.0
16 – 19	54.4	2150	9.0	43.0	750	2.5	0.9
Adult man (moderately active)	65.0	3000	12.6	48.7	750	2.5	1.2
Adult woman (moderately active)	55.0	2418.8	10.1	43.1	750	2.5	0.9
Pregnancy (later half)		2658.8	11.1	49.1	750	10.0	+0.1
Lactation (first 6 months)		2918.8	12.2	60.6	1200	10.0	+0.2

a* Energy and protein requirements. Report of a Joint FAO/WHO UNU Expert Group, FAO, Rome 1985.

b As egg or milk protein

c Requirements of vitamin A, thiamine, riboflavin and niacin. Report of a Joint FAO/WHO Expert Group, FAO, Rome, 1965;

d As retinol

e Requirements of ascorbic acid, vitamin D, vitamin B^{12}, folated and iron. Report of a Joint FAO/WHO Expert Group, FAO, Rome, 1970.

f As cholecalciferol

g Calcium requirements. Report of a FAO/WHO Expert Group. FAO. Rome 1961

h On each line the lower value applies when over 25 percent of calories in the diet come from animal foods, and the higher value when animal foods represent less than 10 percent of calories.

i For women whose iron intake throughout life has been at the level recommended in this table, the daily intake of iron during pregnancy and lactation should be the same as that recommended for nonpregnant, nonlactating women of childbearing age. For women whose iron status is not satisfactory at the beginning of pregnancy, the requirement is increased, and in the extreme situation of women with no iron stores, the requirement can probably not be met without supplementation.

(contd.)

Age range	Ribo-flavine (c) mg	Niacin (c) mg	Folic acid (e) ug	Vita-min B12 (e) ug	Ascorbic acid (c) mg	Cal-cium (g) g	Iron (c, h) mg
Children							
< 1	0.5	5.4	60	0.3	20	0.5–0.5	5–10
1 – 3	0.8	9.0	100	0.9	20	0.4–0.5	5–10
4 – 6	1.1	12.1	100	1.5	20	0.4–0.5	5–10
7 – 9	1.3	14.5	100	1.5	20	0.4–0.5	5–10
Male adolescents							
10 – 12	1.6	17.2	100	2.0	20	0.6–0.7	5–10
13 – 15	1.7	19.1	200	2.0	30	0.6–0.7	9–18
16 – 19	1.8	20.3	200	2.0	30	0.5–0.6	5–9
Female adolescents							
10 – 12	1.4	15.5	100	2.0	20	0.3–0.7	5–10
13 – 15	1.5	16.4	200	2.0	30	0.3–0.7	12–24
16 – 16	1.4	15.2	200	2.0	30	0.5–0.6	14–26
Adult man (moderately active)	1.8	19.8	200	2.0	30	0.4–0.5	5–9
Adult woman (moderately active)	1.3	14.5	200	2.0	30	0.4–0.5	14–28
Pregnancy (later half)	+0.2	+2.3	400	3.0	30	1.0–1.2	(i)
Lactation (first 6 months)	+0.4	+3.7	300	2.5	30	1.0–1.2	(i)

been assessed as 70% to 80% of egg protein as against 80%—90% for developed countries (McLaren 1976), while 65% was equally suggested by Pellet 1976.

The energy requirement of individuals vary according to the occupation, age, size and sex and physiological conditions. The energy intake of a child is expected to allow for satisfactory growth and physical development, and for the high degree of activity characteristic of a healthy child. During adolescence likewise both girls and boys grow at a faster rate than at any other time except in infancy. Thus the caloric requirements of a boy approaching manhood is higher than at any other time in his life, and those of girls approaching womanhood are exceeded only during pregnancy and lactation (FAO/WHO 1974).

There are difficulties encountered as to the best method of assessing correct nutrient intake in individuals. Many studies have tried various dietary methods but each method has its own short comings. Whitehead et al (1982) affirm the following methods:

Dietary history + 24-hour recall + three-day, prospective record in household measures: That is, a dietary history of the household is taken; a record is also taken of the previous 24 hours food intake, supplemented with a daily record (for three days) of quantity of foods consumed.

Three-day record of amounts: That is the measurement and recording of the quantity of food consumed in the household for a period of three days.

Seven day weighing record in 50% of the study population: That is the weighing and recording of the daily amounts of food intake in 50% of the study household population

Seven day record, weights + household measures: That is, the daily record of food consumed by a household using weighing method as well as using household measures, for a period of seven days.

Seven day diary of amounts: That is, a daily record kept for a period of seven days on the amount (in household or weight measure) of foods consumed.

Seven day record description: That is, a record taken daily on the amount and types of food consumed for seven days by the household.

Seven day record standard measures and servings: That is a daily record kept for seven days using standard household measures of average servings of meals.

Seven day prospective record + diet history by interview on usual intake: That is, a diet history is taken on the usual foods consumed, in addition to the continuous monitoring and recording of the foods consumed by the household, for a period of seven days.

All the methods shown above basically attempt to assess the daily amount of foods consumed by the household or the subjects.

Certain methods however tend to suit certain environments due to the cultural eating pattern, as for example, in the developed countries food portions and nutrient contents have been evaluated qualitatively where food portions are individualised. Weighing method of food plates in this case do apply effectively. In certain developing areas, as for example, in some

parts of Nigeria feeding pattern demands communal dining by family members (Rockfeller 1964, Huuch and Tabrah 1963). Weighing methods in this case tend not to apply precisely because the accurate proportioning of foods portions to individuals is not feasible. Hussain et al (1980) commented on the wasteful efforts involved in the weighing method over a long period of 7 days in certain areas like in India, Bangladesh and Pakistan where diets are monotonous due to scarcity of food or lack of money.

However, most food consumption studies report only the aggregate consumption at household level. Qualitative evidence do indicate that the distribution is generally related to hierarchial position, with the head of the household and its income-earning members receiving preference (FAO 1985). Also information from Bangladesh and Papua, New Guinea indicate that mothers and young children generally receive a small share of the family food (Ferro-Luzzi, Norgan and Paci 1981), showing larger deficits in weights and heights in young children.

Data available on food distribution are too scarce for definite conclusion to be reached (FAO 1985). There were no statistically significant difference between weighing and recall methods in a study carried out in a typical rural population of Pakistan (Hussain 1980). A combination of methods could be employed to assess as near accurate as possible the consumed food nutrients.

The result of the comparison of protein intake by Nigerian peasant farmers from 7 rural areas were made (Nicol 1959). Results showed that subjects from cereal/grain areas consumed better quality and more quantity of proteins, and PEM was found to be higher in yam areas than in grain/cereal areas (as shown in Table 3 below).

TABLE 3

Comparison of Protein intake by Nigerian peasant farmers by Nicol (1959)*

Age	Vegetation Area	Protein:gm/day	Protein Score
Children 7–9 yrs	Grain/cereal (N. Nigeria)	50 gm	77
	yam (S. Nigeria)	37 gm	50
Male over 12 years	Grain/cereal (N. Nig.)	101 gm	77
	yam (S. Nig.)	55 gm	50
Female over 12 years	Grain/cereal (N. Nig.)	74 gm	77
	yam (S. Nig.)	48 gm	50

*Nicol (1959) Table 6

While 50gm protein intake was reported by Nicol (1959) in Nigeria for the 5–12 year olds, 35.9 gm of protein was reported by Longhurst (1984) for similar age groups. (Protein score indicates a higher quality protein than that obtained . from yam, cassava, cereal and grains.

A dietary and medical survey conducted by Collis and Associates (in the Institute of Child Health, University of Ibadan, Nigeria) in Ilesha Division of Western Nigeria (Collis et al 1962) reported the prevalence of high death rate (468/1000 births) on children. Yam and cassava provided the staple foods which were habitually poor in protein, and only occasionally adequate in kilocalorie, and similar to Longhurst(1984) findings that seasonal variations in calorie and protein intake was found to be related to harvest and economic conditions of the community. Growth pattern was equally low.

On food production an e consumption a survey was conducted on 5% sample of the Kainji Lake area households. (Adekolu-John et al 1985) Findings showed some nutrient adequacy as a result of mixed farming yield with self sufficiency in food

production. There were however some regional, ethnic, and age differences in this adequacy which was found to be lowest amongst the under fives. Higher quality in nutrient intake was observed more in the "northern" than in the "southern" villages. Caloric intake was slightly less also in the "southern" villages than in the "northern" counterparts (1444 – 1693, and 2062.0–2311 kcal. respectively) with the corresponding 40.6–57.4gm and 58.0–80.6 gm protein intake (Adekolu-John et al 1985). Similar to Nicol's (1959) findings, the southern ethnic groups were dependent on cassava and yam while the northern counterparts were dependent on cereals and legumes as their staples. And as the food provider and household heads, the adult men received the most expensive nutrients unlike the women and children who invariably received less nutritious diets.

The 1965 survey on the nutritional health of Nigerian population utilized samples from the military, the schools and civilian samples (Nigerian nutrition survey 1965). Amongst other investigations, dietary survey was conducted by weighing and recording of dietary intakes (recipe method) from 68 selected families. Confirming Nicol's reports the primary foods of Nigeria was found to be starchy roots in the south, Sorghum, groundnut, millet, maize and rice in the north.

E. Infection and Nutritional Status

Infection means the invasion of the body by pathogenes which alter normal processes within the system. Such pathogenes could be bacterial, viral, fungal, protozoal or intestinal parasites. These pathogenes exert their effects in a number of ways. Frequent episodes of infections such as diarrhoeal diseases respiratory infections and acute fevers increase catabolic reactions which lead to a negative nitrogen and energy balance, and consequent nutrient depiction of the body stores, particularly the muscle protein and the fat desposits, thereby precipitating body wasting. It has been estimated that nitrogen loss from an infected individual was 3–4 times that of a normal fasting man (Awdeh 1976, FAO/WHO 1985).

The presence of infection causes anorexia, ultimately leading to a reduced nutrient intake, and the physiological reactions associated with illness might induce malabsorption syndromes, nausea, vomiting or diarrhoea which lead to extensive loss of ingested nutrients (Einstein et al 1972, Rosenberg 1977, Hussain 1984). In addition to catabolism, certain emergency anabolic activities are created in order to prop up body defences and such reactions demand extra intake in order to facilitate proper metabolism during infection. It has been shown for instance, that certain amino acids such as alanine) are shunted into the liver to accelerate gluconeogenesis (Harper et al 1975, Hussain 1984, and Rosenberg et al 1977).

Cultural and religious food practices institute food restrictions during illness (especially on children and women) on therapeutic grounds thereby

altering the consistency, the type and quantity of food consumed, thus reducing nutrient intake (Wray and Aguirre 1969, Omololu 1972). Furthermore the impact of inadequate nutritional care in illness contribute immensely in the development of under nutrition.

The foregoing factors acting singly or in combination increased the nutrient requirements of the infected individual at this period of reduced food intake, thus adversely affecting the nutritional status. The increased requirements of an infected individual have been estimated at 1.5g/kg/day for a child, and 0.3–0.5g/kg/day for adults above their minimal protein needs until deficit is corrected.

Water scarcity:

The importance of water has placed a high demand on people since human beings cannot survive water deprivation for more than a few days. This is because water is needed for many vital biological, and socio-economic functions essential for human survival. In developing countries like in Africa the proximity of water supply would save time and energy for the nutrition of all vulnerable groups of children and women, thereby reducing energy depletion and agony confronting them when searching for water This will help promote better nutritional status. Studies in Africa and other developing countries (Hussain 1984) have shown that in the dry season,

water scarcity compels people to travel long distances amidst intensive struggling in order to collect water. This persistent routine exertion saps the energy and disrupts the nutritional status of those concerned, particularly for women and children whose role it is to fetch water. (White, 1972, Hussain 1984, Longhurst 1984). White(1972) calculated that an average of 1004–2000 kcal is expended daily on fetching water. Similarly in Asia, Africa and Latin America, four fifths of the rural population and one third of the urban population scarcely have access to good water supply (Hussain 1984).

Environmental sanitation does implicate water supply, since contaminated water is a source of poison which leads to water associated and water-borne diseases ultimately resulting to high morbidity and mortality. It is expected that the improvement of these environmental components, will reduce the incidence of water, food associated and other enteric diseases and directly improve the nutritional status of the community.

Matu (1978) reported the poor household environmental hygiene in his Santa Maria Cauque study where water scarcity led to poor hygiene and sanitation, poor garbage and animal waste disposal system, over-crowdedness and poverty as reflected in the traditional habits and illiteracy. These

conditions precipated the disease processes of low grade PEM which occurred. The insanitary condition was such that the first week of birth of children in the study was characterised by recurrent diarrhoea and upper respiratory tract infections.

Buck et al (1968) reported the morbidity and mortality effects of water associated diseases resulting from indiscriminate defecation and refuse dumping in villages in Africa.

The incidence of diarrhoea diseases in Nepal was observed to be highest at the start of the rainy season, when early rains caused a high degree of environmental contamination with faecal bacteria. Peak prevalence of diarrhoea thus preceeded peak wasting period (Nabarro 1981). It is therefore assumed that where water supply and sanitation are improved over a long period of 25–30 years infant morbidity will be greatly reduced.

Gastroenteritis which is associated with acute diarrhoea occurs throughout the world but is a very serious problem in the developing countries. Globally, it affects millions of children below the age of 5, and many of these die as a result of the attendant complications such as dehydration starvation, secondary infection and malnutrition. In Nigeria it is estimated that about 300 children die every day from dehydration due to diarrhoea (UNICEF(1985). Several studies have shown that 25% of cases in many parts of the world are due to viral and mostly bacterial organisms (Rowland

1978, Wamola 1980, Okeahialam 1983) and the most susceptible period is 6 months to 36 months of age. The predisposing causes of diarrhoea is the unhygienic environment surrounding the child as in cases of water and food preparation (e.g. weanling diarrhoea and travellers diarrhoea, (Okeahialam and Grange 1984), and particularly during weaning. The highest incidences are reported between the months of May and July in Nigeria (Tomkins 1981). Other associated diarrhoeal diseases include typhoid and paratyphoid, cholera and other enteric fevers (Fraser et al 1981). But these seem not to be common in Nigeria.

F. Seasonal Variations and Nutritional Status

Nutritionists recognise the fact that different seasons bring about changes in both nutrient availability and nutrient requirements, but seasonal changes impose varying impacts on different populations, depending on the severity of the variations.

The seasonality concept in this context implies the harvest and hungry seasons of the study period (1984/85) which coincide with the dry and wet seasons as each affects food availability and consumption, seasonal prevalence of endemic diseases and

infections, climatic periods of wet and dry seasons or hungry and harvest seasons respectively which affect energy expenditure, food availability and food consumption (Hussain 1984). Studies in which seasonal variations, are particularly investigated are few but the impact of this concept on nutritional status cannot be over-emphasized, (Chambers et al. 1981, Nnanyelugo et al 1985).

The three climatic variables influencing food productivity are rainfall, evaporation, and solar radiation. Rainfall and evaporation affect the availability of water for plants and animals, while the solar radiation is the ultimate source of their energy. Thus the significance of climatic seasonality is its impact on food production, distribution and consumption.

A unimodal climate is characterized by distinct wet and dry season and experiences distinct periods of harvest and hungry seasons. Such climatic seasons prevail in certain zones of Gambia, Ghana, Nigeria and Swaziland in the African region (Hussain 1984, Longhurst and Payne 1981, Walsh 1981). Such areas enjoy satisfactory food supply and food intake during and after harvests which coincide with the beginning of dry season, and gradually decline in food supply towards the end of dry season. The wet

season conversely heralds the planting or hungry period with a peak labour demand, increased work load and physical exertion on farm work but with dwindling food stock and declining consumption rate (Schofeild 1979, Chambers et al 1981, Hashwell 1981). This season is a period of great concern to the rural and poor farmers who are at a greater risk of mulnutrition particularly for those on subsisting food intake (Chowdary et al 1981, Chen et al 1979, Hussain 1984). Chen et al (1978) and Longhurst and Payne (1981) reported about 15 African villages who received 100% calorie intake in dry (harvest) season, but had 88% calorie fulfilment during the wet (planting) season.

The impact of distinct wet and dry season amongst the rural community (unimodal climate) which is evidenced by increased work load, low nutrient intake, weight loss, and retarded growth(especially in infants), are observed in Northern Nigeria (Longhurst 1984), in the Northern zones of Gambia (Marsden and Marsden 1965, Rowland et al 1979, Walsh 1981, Jackson 1977, in Uganda (Poskitt 1972), in Sekuhukumi-land-South Africa (Waldemann 1973), In Ghana (Davey 1962, Hunter 1967), in Zambia (Khan

and Gupta 1977), and in Bangladesh (Chowdhury et al 1981). Food distribution systems are disrupted as a result of inaccessability of roads and unavailability of other infrastructures in the food producing zones. A few communities in the unimodal climatic zones however indicate no difference in nutrient intake and in nutritional status during the wet season such as in Thailand (Houck et al 1960) and in Jamaica (Standard 1969); while Simmons (1981) reported increased food consumption by women in Zaria (Nigeria).

The dry season with the accompanying harmattan in Nigeria heralds cold dry air predisposing to infections and dehydration of materials - (Simmons 1976).

The biomodal climate is experienced more on the Southern zones near the coasts of the tropical and subtropical regions, while the reverse seasonality effects of unimodal climate are experienced in this area. The distinct variations in food production are thus minimal here (Cohdal 1968, Ruthenauer 1974, Longhurst and Payne 1979).

Disease pattern also tends to assume a seasonal dimension during wet season, and in many tropical parts of the world the most prevalent

seasonal infections include malaria, diarrhoeal diseases, respiratory tract diseases, and worm diseases (Chambers et al 1981, Tomkins 1981). Common health problems increase with the onset of wet season with water related diseases of typhoid fever, cholera, gastro-enteritis; (Drasar et al 1981, Cutting, 1981), and parasitic worms and Schistosomiasis (Sutton 1981), while dry season infections (Dec.–March) was typified by mucosal surface exposure to dry air predisposing to such diseases as (cerebrospinal-meningitis) (CSM) measles (Sutton 1981, Morley 1977) and malaria (Bray 1981) in Nepal which preceeded peak wasting period.

The seasonality of diarrhoeal infections had been fully documented in which such incidences were associated with certain periods including both dry and wet seasons and common with the age group of one to two years (Darsar 1981, Longhurst 1979 and Nabarro 1981). This diarrhoea could be attributed to gastro-enteritis during festivity and harvests as a result of overeating, weaning processes (weanling diarrhoea) and inadequacy of immunity in infants. Rowland, et al (1978) quantified the effect of diarrhoea on the growth of children in Gambia and found monthly diarrhoeal prevalence to be significantly associated with 4.2mm and 746gm

deficit in linear and weight growth is respectively. Mcgregor et al (1968) in Gambia Moore (1966) in Guatamela, and Nabarro in (1981) Nepal found an association between infection and seasonality.

Summer diarrhoea was once found to be prevalent in developed country like Britain, which ultimately ebbed with unproved faecal disposal and water supply systems. Adult diarrhoea has been associated mostly with food poisoning occurring in epidemics (Drasar 1981).

The first sign of undernutrition as evidenced in developing countries is growth failure which is identified through anthropometric assessment.

The effect of seasonal variations on food availability in developing countries has been greatly associated with the levels of technological and health services development. Thus in the natural settings different seasons produce changes in both nutrient availability and nutrient needs for various individuals, though the extent of nutrient imbalance cannot easily be determined because of the technicalities of assessment employed.

Under normal circumstances a balance is expected between food consumption and energy expenditure in order to compensate for the heavy work load during the peak farming season. Thus more energy food is required to avert body depletion. Hashwell (1981 reported that the consump-

tion rate decreased as food stock dwindled in the post planting period. Hussain (1984) categorised Gambia, Ghana, Nigeria and Swaziland (in Africa) under unimodal climate with the low energy intake at planting season, with the exception of Zaria (Northern Nigeria) where energy intake was relatively high 2453 Kcal at planting season (Simmons 1976, Annegers 1973) and with the highest energy intake in West Africa during November – December declining in- July, and August.

The rate of growth in children when studied longitudinally presents an individual indicator of seasonal changes. Studies have shown reduction in growth rate during the adverse weather conditions or wet season, and acceleration in growth during the improved weather conditions of dry season as in most developing countries (Rowland, Cole and Whitehead (1977).

Even in the favourable environmental conditions as in developed countries there have been evidences of seasonal changes in growth rate like in some Northern zones (such as Boston) where there is the accelerated growth in height velocity during Spring and Summer but increased weight velocity in Winter and Autumn (wet season)(Longhurst and Payne 1979).

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In Gambian children it has been shown that increase in mean weight for age did not follow a smooth pattern because growth pattern was higher during dry season and lower or negative during wet season (Marsden et al 1966 and Mcgregor 1968). Weight decreases were particularly dramatic as shown by Longhurst and Payne (1979), Rowland et al (1979) during the first year of life, while that of height dragged on for 2 years after birth. Gambian infants born during the wet season grew satisfactorily till the following rainy season when there was a set back while those born in the dry season had a retardation of growth rate soon after entering the rainy months, with breast milk intake also decreasing at this season (Rowland et al 1979). Keilmann et al (1978) highlighted the fluctuation of growth pattern during the wet seasons of April to September in Narangwal children. There were found no significant differences in respect of weight between the male and female infants, and differences in growth rate disappeared by the age of two years.

Low birth weight and premature delivery are world-wide problems affecting the lower socio-economic groups which is prevalent following wet or winter seasons. It has much impact in developing countries with public health implications and low birth weight is associated with neonatal death, impaired physical growth, and intellectual performance. Matu, (1978) found that the mean birth weight of 2.8kg for Santa Maria Couque School children was among the lowest recorded anywhere.

involves the use of survey techniques with a view to determining the nature, the dimension and geographical location, the risk population and other interacting forces in the particular ecology (Jelliffe 1966). The diagnostic tools of questionnaire, interview, observation, clinical examination, anthropometry, biochemical assay and others such as are relevant to individual objectivesof a study (FAO 1987).

A survey could assume either a prospective (Cohort) approach, involving a lengthy study period or a retrospective (case-study) approach, involving a short study of past events (Fox et al 1953).

Prior to a survey background data are usually obtained through enquiries from various governmental agencies or resource persons who are experts in their own disciplines. For a prospective study approach a baseline (pilot) study is usually conducted to get acquainted with the target population location and available resources which facilitate operation. For which ever survey design, a proforma appropriate for recording of data is used. Analysis of collected data is carried out statistically and interpretation and conclusions then obtained (Jelliffe 1966).

Previous studies on food consumption employed a combination of techniques including dietary recall, anthropometry, questionnaire and interview, food supply inventory and socio economic class stratification. Such collected data were finally analysed using such statistics as correlation, regression and comparative (chi square) analyses. Certain techniques however tend to suit certain environment due to varying cultural back grounds.

Nicol (1959) conducted a food consumption study on the protein requirements of seven rural Nigerian farming communities by estimating on comparative basis the caloric intakes amongst the community households and then comparing with reference intakes. Nutrient conversion

was then determined using the F.A.O. (Chatfeiled 1953, , .) conversion tables and also the laboratory analysis of certain other foods. Height and weight of subjects were taken and comparisons made by sex and age group Results using means and percentages indicated that subjects from cereal areas tended to be taller than subjects from yam eating zone. High per-caput quality protein (81gm) intake in contrast to lower intake (51gm) were reported between cereal consumers in the North and yam consumers in the South. Clinical conditions however exhibited only little differences on the subjects.

The Rockfeller research team (1962-63) assessed the nutritional status and food consumption pattern of Uboma (Eastern Nigeria) households. The techniques involved anthropometric measurements – household meal weighing for seven days and biochemical analysis of blood, urine and stool. Comparisons were made in means and percentages of the FAO references, and values revealed below average growth trend. Per caput kilo-caloric intake (2110 kcal) was equally low.

A study on seasonal food consumption, work out-put and nutritional status was conducted by Longhurst (1984) and earlier on by Simmons (1976) in Zaria (Northern Nigeria) rural households. While Simmons employed weighed dietary intake technique, Longhurst used the 24-hour recall system which was converted into nutrients using tables of nutrient values;

and estimated physical energy expenditure was compared with total energy intake. Longhurst equally employed anthropometry and socio-economic assessment of households, and using regression analysis related nutrient intake with other variables. Seasonal per caput nutrient intake was found lower in pre-harvest period (1931 kcal) (Longhurst 1984) in contrast to Simmons (1976) findings with higher intake at pre-harvest period. The peasant farmers were found however worse off than the wealthy farmers (Longhurst 1984).

The Akufo village (Western Nigerian) study (Gilles 1961–63) investigated the interplay between diet, environment and social structure of households. A combination of techniques of dietary weighing assessment, anthropometry of children, biochemical assays, clinical examination was employed and findings revealed lower calorie intake (1943 kcal) than in Ilesha (Nigeria, with 2487 kcal) and of the FAO values.

A dietary survey conducted earlier by the Interdepartmental committee on nutrition for national defence (ICNND, 1963) in Nigeria utilized weighing method of individual meals as were collected from institutions like the army and the school population. Comparisons were made using the FAO references.

In the developing countries studies on the use of combination of techniques in identifying the ecological determinants of nutritional status abound, and such combination of techniques have been used in previous

studies by renowned nutritionists such as, Wray and Aguirre (1969) in Columbia, Chavez (1974) in Mexico. Rowland et al (1977) in Gambia; Hussain et al (1980) in Pakistan, Chen et al (1979) in Mathlab (Bangladesh); Letham et al (1977) in Kenya and many more.

A quantitative study, for example, on the relationship between infection and nutritional status of children was conducted in Keneba (Gambia) by (Rowland et al 1977) in which were employed clinical examinations, biochemical examinations of blood for disease pathogen and anthropometric measurements (height and weight); regression analysis used to categorise the effects of disease prevalence on the nutritional status of children revealed deficits in comparison with references (as earlier discussed).

A Kenyan (Kwale) study (Letham 1977) revealed the impact of deworming and malaria treatment on the improvement of haemoglobin and nutritional status. Technique involved anthropometry, biochemical analysis and multiple regression analysis, on the extent of association between intestinal parasites and nutritional association.

Chavez (1974) had similarly investigated the biological and cultural determinants of malnutrition in a Mexican village using socio-economic questionnaire, weighing method of dietary assessment and anthropometric measurements in comparison of families. Mother-child relationship in favour of males and poor weaning processes were some of the facts revealed in the study.

A study also in a Pakistani village (Hussain et al 1980) investigated the ecological setting and the local characteristics of malnutrition using a combination of clinical assessment, anthropometry and socio-economic questionnaire. Results also revealed the characteristics of general low socio-economic standard and retarded growth in children.

CHAPTER THREE

MATERIALS AND METHOD

Materials:

The materials employed in the survey included equipments for anthropetric measurement, stool examination, food and diet assessments, and food stock inventory.

The following instruments were also developed and tested during the pilot study.[1]–

A map of the study village, "Umunwada" (figure 1) which was developed by the Ministry of Survey and Town Planning, Owerri, Imo State of Nigeria (1984) for the study purposes. The map indicates all the twenty-six kindred units comprising the village, and the demarcations with the neighbouring villages.

The questionnaire: a standard unstructured socio-economic questionnaire with 45 questions was prepared and tested (appendix 4).

Dietary recall from: A proforma for recording the 24 hour dietary recall was prepared and tested. Columns were provided for breakfast, lunch, supper (dinner) or any food consumed at other times (appendix 5.).

Weighing of meals: Similarly, equipment for daily weighing of both raw and cooked foods was assembled, such as the Salter Diet and Food scales of 5 - 10 gm and 25 gm accurancy limits respectively.

Food stock conversion table: A proforma was prepared for conversion of local measures to the standard units of cups, spoons and weights

(appendix 12).

Others:

The maps of the State and the Local Government area are also provided (appendices 1,2). Also provided are the survey work plan, nutrient composition of foods as complied by Oyenuga (1968), FAO (1968), Platt (1972), Tindall and Sai (1976); a conversion table of local measures and of the high water content staples; and some recipes of local dishes (appendices 3,9,10,15,19 respectively).

The study area Imo State:

Imo State is situated East of the Niger, as a former components of the defunct Eastern Region of Nigeria. Imo State is densely populated with a limited land space, but the State is endowed with a forest vegetation which promotes the growth of root-crops such as cassava, yam and cocoyam as its staple foods as well as green vegetable and fruit, but the State produces less of meat, fish and poultry products.

The state occupies an areaof about (12689 sq km) and harbours about 6,000,000 (5,871,473) inhabitants. (Nwosu et al 1980, Anonymous 1987). The State is divided into 21 local government areas (LGAs), and the Etiti LGA which is centrally situated , is the LGA of sudy (appendix 1 ,fig 1) Like other parts of Nigeria, two major climatic periods (wet and dry seasons) exist which coincide with the planning (hungry) and harvesting seasons respectively in the southern part of the country. The wet season extends from April - November, while the dry

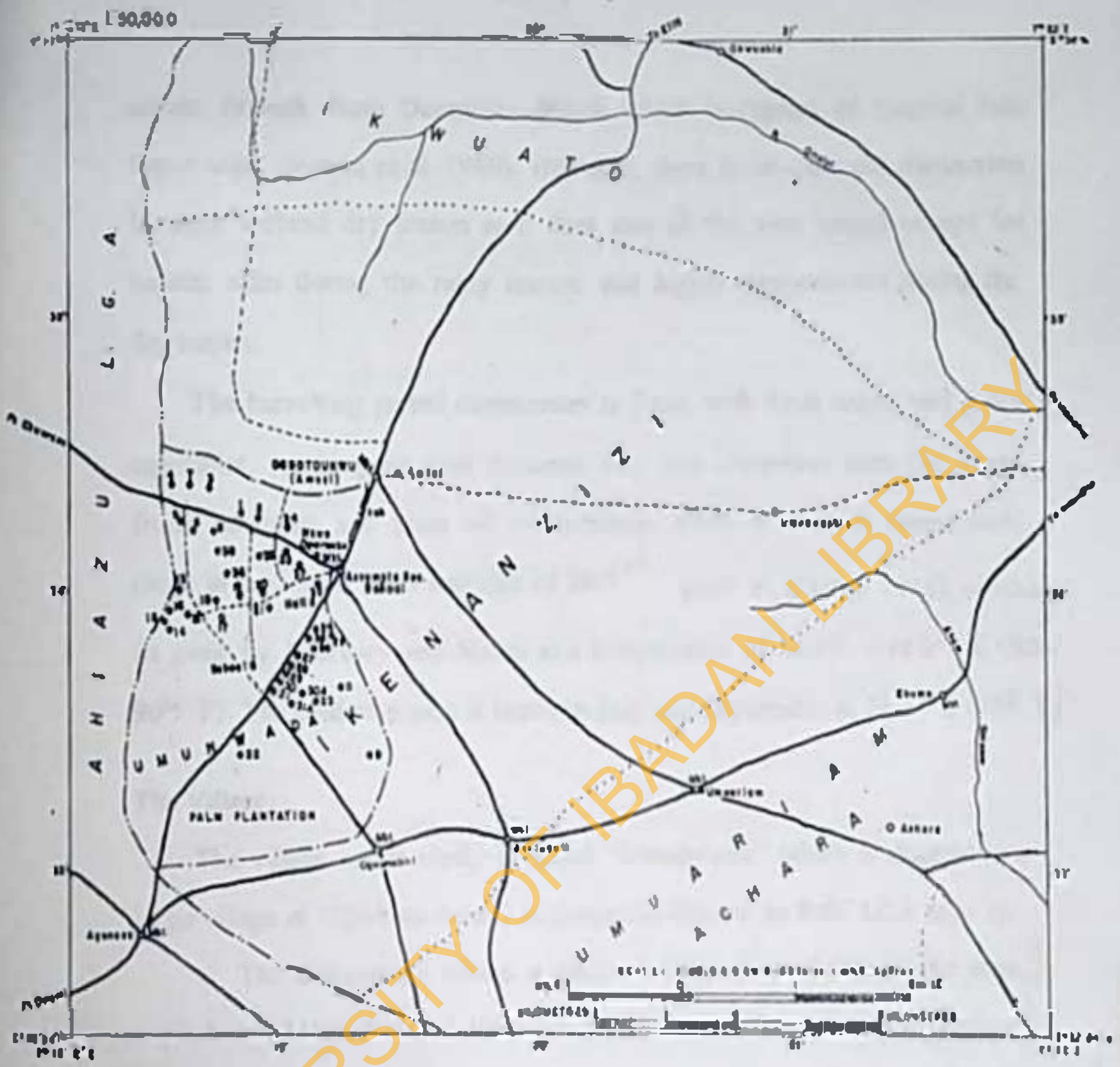

Figure 1: Map of Ikeanizi showing Umuowalu Village

season extends from December–March which is typical of tropical rain forest area, (Nwosu et al. 1980). However, there is no clear cut distinction between wetand dry season as it does rain all the year round except for heavier rains during the rainy season, and higher temperatures during the dry season.

The harvesting period commences in June, with fresh maize and green vegetables, reaching its peak between July and December with the yams, fruits, cocoyam and plam oil productions. There is a small temperature range in Imo State with averages of 26.7° C (80° F; ICNND 1965), reaching its peak by February and March at a temperature of 26.6° –32.2° C (80–90° F). The coldest season is between July and September at 21.1° C (70° F).

The Village:

The village under study is called "Umunwada" which is situated in a larger village of Ndiokwu-Amuzi in Ikenanzizi-Obowo in Etiti LGA (Fig. 1).

The Umunwada village is situated 40km East of Owerri, the state capital and 24km West of Umuahia the nearest urban area. It is bordered on the south by the rest of the villages of Ikenanzizi and Obowo and on the North by Ahiazu LGA and Etiti town. The area covers 5·2km in length and 2km in width. The entire village (like the neighbouring ones) is densely covered by wildly growing oil palm trees among dwellings, and with sparse bushes.

The entire land surface is flat with no hills, valleys nor streams and is not very fertile. The nearest stream, Iyi-Ekeala is 3 km distant and is situated in a neighbouring village (Umuebubem) thus making water supply scarce.

The rural water supply scheme makes tap water available about once in two weeks. The rains are heavy and last for eight or more months yearly (April to November) and contributes greatly to water supply. The rest of the year tends to be dry and hot.

Other infrastructures available within reach include a maternity home (Afugiri maternity) situated 2km away and shared with the neighbouring village, a Health Centre (Ikenanzizi Health Centre) situated 2km away in Alike, with a maternity attachment, and staffed with a medical doctor, a Health Sister, Health Superintendents, Staff Midwives, and Public Health Assistants. The Health centres as well as the maternity homes are sparsely equipped.

Three nearby markets of Nkwo-Umualoma, Ogbotoukwu and Ogwuma-biri are shared with neighbouring villages.

The village is composed of about 26 settlements which coincide with kindred units, or household clusters. These settlements are composed of about 160 households linked in close habitation with itself as well as with neighbouring villages of Ikenanzizi and Ahiazu LGA; – yet making for intra-village farms and what is known as "Distant farms" (Ala Mbara). Figure I shows the distribution of household clusters.

A house-to-house census carried out showed that the village commu-

nity has a population of 502 for those permanently resident at home and are distributed as shown:-

Birth	–	5 year olds	103 (58 males : 45 females)
5·1	–	10 year olds	140 (56 males : 84 females)
10·1	–	18 year olds	73 (30 males : 43 females)
18·1	–	30 year olds	59 (19 males : 39 females)
30·1	–	55 year olds	87 (35 males : 52 females)
	>	above 55 year olds	41 (26 males: 15 females)

Socio-economic activities:-

The major occupations include subsistent farming, petty trading and cash cropping of palm oil and palm kernel and such crafts as basket making, blacksmithing, and livestock keeping of goats and poultry. The major food staples include cassava prepared in various methods, yam and cocoyam and green vegetables, maize, fluted pumpkin, (Telferia or ugu), "Uha" and also palm oil and kernel, as seen during the harvesting or hungry seasons. The major cash crops include palm oil and kernel and these are harvested mostly during the dry season.

Taboos and superstitious beliefs on foods are minimal since the shift has been from the traditional religious worship to current christian religious worship.

Major festivities include the Christmas, Easter and Wrestling festivals. Others are "manhood ceremony" (Iwa Akwa), "Ekpe masquerade" ceremony, "Ntumaka" or Annual reunion and harvesting ceremony (Ogoke, 1978) and also the "Multi-parity" or multiple births ceremony (,,Igbu-Eghu-Ukwu") for having had ten or more births by a mother.

Methods:

A standard socio-economic questionnaire was prepared and prested on 10 households outside the area of study. The aim of pretesting the questionnaire was to ensure adequate coverage of required information, the comprehension of questionnaire contents, and to ensure that the questions would achieve the study objectives. The responses received facilitated appropriate modifications on the questionnaire contents(appendix 4).

The socio-economic questionnaire based on nutritional ecological factors consisted of 45 questions. The contents with 11 variables sought to investigate the following: the income, the occupation, the education, family size, housing structure and community amenities, reproductive history, breast-feeding pattern, nutrient intake, food production and consumption and food purchasing patterns.

The dietary intake measurment was recorded in a separate form which was prepared to consider the feeding pattern of the family and which employed the 3 day-24-hour-dietary recall system. This system tested both the harvest and hungry season feeding pattern (appendix 5). A weighing method was also employed to supplement the recall method. Household measures were used to quantify the amount consumed.

Pretesting the dietary assessment techniques:

The aim was to select applicable methods for use in the study community, and two assessment methods were tested: the weighing method and the 24-hour recall method as described in the ICNND (1969). The 24-hour recall method was used in the assessment of larger household population of 110; while a weighing method was applied on a subsample of twelve households to supplement the recall method. A common practice however exist in the community of central dining system whereby the entire family eat from one dish.

The list of foods available in the locality and their nutrient values were compiled using the FAO food table-for-use-in Africa (1968), Oyenuga (1968), Platt (1972), Tindall and Sai (1976), and Mitchell et al (1976) (Appendix 9).

The dry weight equivalent of staple foods with high water contents (HWC) such as the fermented cassava paste, yam, cocoyam, fresh cassava tapioca and corn-starch paste were determined by drying in an Extraction Oven as described by Oyenuga (1968), (Appendix 10).

All food crops were identified, and their local food measures were determined and reconciled with the standard measures of the cups, spoons, and weights (Appendix 20).

Procedure for data collection:

The unit of observation was the household where all measurements on food consumption and athropometry were carried out. Numerous visits were made to each of the households during the study to administer the questionnaire and collect other relevant information. One of the households was used as the base for some of the laboratory work.

The actual survey work covered a period of 12 months (15 July 1984–15th June 1985). During the survey period the work plan (appendix 3) was closely followed viz: all survey instruments were carried out in the study village. The housewife was the respondent because she was responsible for feeding and maintaining the family. Thus the housewife and those family members whom she fed from her kitchen formed the households. A polygynous family constituted as many households as there were housewives. In such a case the husband was allocated to the housewife of his choice. A total of 110 households comprising 527 subjects from the village served as the study population.

The community was a subsistent (peasant) farming unit who depended mainly on crops they produced and the subsequent consumption of such crops. Monthly food stock was thus recorded on all crops produced, by means of monthly visits to 50 sample households. The visits were carried out at the last week of every month for the 12 months period, commencing at the end of July 1984. The food crops were initially recorded in standardized local household measures (such as Abo, Nkata etc.) and finally translated into kilogram (kg) weight (appendix 19). The monthly food stocks

are presented in chapter four and in appendix 19.

Incidences of infectious diseases were identified by the end of every month (for 12 months) by personal visits to the 110 households. The diseases identified included the signs and symptoms of gastroenteritis such as diarrhoea and vomitting, those of fever (or signs and symptoms of malaria), dysentery and worm infection. The signs and symptoms of marasmus, kwashiorkor and other deficiencies in their various severity states were however not overlooked in the reporting system. Identification was done by observation of subjects, physical examination and interrogation of the housewives and the disease victims. Preschool children were the target population for infectious disease identification (6 –60 months) since they were the most infection – risk group.

Specimen of water supply was collected with a specimen bottle every two months and examined under the microscope for identification of intestinal worms and their ova. The water sources included tap water, stream and pond water. Results were recorded, samples of stools were also collected from preschool children once during the study. The samples were preserved with formo-saline solution and packed in special specimen containers,

and transported to the departmental laboratory at U.I. for the identification of worms and their ova. The venue for stool and water examination was later shifted from the department to the investigator's compound, by setting up a micro-laboratory because of transportation problems. Thus the examination of fresh stools and water were concluded, and results recorded. The stool examination technique and the identification of micro-organism had been previously mastered under the supervision of the departmental laboratory technicians, and the supervisor at the departmental laboratory during the pilot study and as described in Wilcocks et al (1978).

Anthropometric measurement:

The assessment was carried out during harvest season (September–October 1984), and during hungry season (April–May 1985), following the technique set out in WHO/ FAP/79.1, and Jelliffe (1966) The height, weight, mid arm muscle circumference and the triceps skin fold of the left arm were measured. Supine length of infants rather than heights were measured in cm (using the infantometer) while older children and adults height were measured with a vertical wooden measuring scale. Weights were measured using bathroom weighing scale for adults, and salter spring balance weighing scale attached to a carry-cot for infants. Arm circumference was measured using a tape measure (for all subjects) and triceps skinfolds were determined using a pair of callipers (all subjects). All assessments were made by visits to individual households, the investigator's compound. Infants

weights were taken naked while adults weights were taken standing with the barest clothings and no head gear to minimise inflation of results. Heights were taken without head gear and foot wear. All efforts were made to obtain the measurements of all infants and children, while only a few adults responded for measurement. Similar assessment on height and weight was repeated on a 12 corresponding subsample households in 1989 as a followup assessment on the population.

The measuring equipments were standardised at the commencement of each session. All measurements were taken twice and the mean recorded. A known weight (a stone of 1.25kg) was used for checking the instniment. The use of each equipment by the same investigator was mainained in order to enhance the mastery of the use of such equipment and also improve the uniformity of results recorded. Height was measured to nearest 0.1cm, and weight to the nearest 0.1kg. The skinfold was also measured to nearest 0.5nim, and the arm circumference was measured to the nearest 0.1cm.

Questionnaire administration:

One hundred and sixty questionnaires were eventually administered to the housewives of the households originally mapped out, by personal visits between September and November 1984. The questionnaire was administered once during the study. Since the respondents were predominantly illiterates, the contents of the questionnaire were orally administered and responses recorded in the prepared form by the researcher.

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Interpretation of contents were made in the simplest language, for better comprehension of idea for the respondents.

One hundred and ten housewives responded adequately and cooperated fully in the completion of the forms and the 110 questionnaires were finally completed and collected. However, 0 households (%) refused cooperation for various reasons including political biases.

Dietary intake measurement – the recall method:

A three day-24-hour dietary recall measurement was carried out on each household. For uniformity, the 3 selected days within the week included Monday, Wednesday and Friday during September and November 1984 for the harvest season; and same repeated during April and May 1985 for the hungry season. Monday reflected Sunday's consumption, as Sunday meals reflected the best meal of the week during April and May 1985 for the hungry season. A total of 6 intake forms per household were completed during the entire survey period. The administration of each form involved conducting a rigorous enquiry (lasting 45–60 minutes) from the housekeeper concerning all meals and foods eaten by a household during the previous 24 hour. That is, an account of foods eaten on Sunday was taken on Monday. That of Tuesday was taken on Wednesday and that of Thursday was taken on Frida. The 24 hour food recall commenced from the time of interview to the same period on the previous day. For example, interroga-

tion by 8 a.m indicated foods taken from that 8 a.m. till the 8 a.m. of the previous day. The number and amount of ingredients used in preparing a meal or food was determined in standardized household utensils. These amounts were recorded and later converted into standard measures and weights, and into the corresponding nutrient values, using the compiled list of food nutrients and their values. Information was collected on all foods consumed inside and outside the household during the 24 hour period. Methods of calculation and conversion into nutrient values, of foods with high water content are shown in appendix 14. The recipes of some sample meals have equally been prepared (in appendix 15). Thus, during the pilot study all ingredients were weighed, the household measures and the equivalent weights were established so that during the recall interview all foods were readily translated into the equivalent quantity. Over 660 dietary forms were completely filled out at 6 for each household for both lancan and hungry seasons.

The individual food portioning was based on allocation (to consumers) of any meal eaten within the household, and this method which was incorporated into the dietary form was effected in the field through a rigorous enquiry from the housewife as to the dining style of each member. Based on the allocation technique foods and their nutrients were portioned to each consumer.

To supplement the recall method used in assessing the larger household population of 110, a weighing method and a recall method were both used in the dietary measurement of a subsample of twelve selected households. Comparisons were made on both methods, thus further validating the recall method generally employed in the study.

Dietary intake measurement – the weighing method:

Twelve households (out of the original 110 households previously employed in the 24-hour dietary recall assessment) were used for the weighing method (of dietary assessment). The 12 subsample households consisted of 62 subjects.

The list of foods available in the study area and their nutrient values were compiled as previously described. The dry weight equivalent of staple foods with high water contents such as the fermented cassava paste, yam, cocoyam, fresh cassava tapioca, and corn starch paste were previously determined by drying in an extraction oven as described by Oyenuga (1968) (Appendix II).

Procedure:

A detailed weighing technique as described by Hussain and Abdullah (1980), Olusanya (1979 and 1985) was carried out daily for three selected days of the week (Sunday, Tuesday and Thursday) on each of the twelve subsample households. By this method all meals (including snacks) eaten by each of the household members were recorded daily under each household column. All raw ingredients and the quantities used in each meal (or snack) preparation were weighed and recorded. The quantity of cooked meal, the meal portion as consumed by each household member, and left-over meal were all determined in gramme weight. The respective nutrient values of each cooked meal were determined using the food composition tables, and according to the meal portions of individual household members. A twenty-four hour recall interview followed each days weighing.

Conversion values:-

The actual quantity (in gramme) of the raw ingredients used in each

meal was determined by calculating the dry matter proportion of the staple foods with high water contents (HWC) as shown:

Percentage dry matter of the calculated food, divided by the percentage dry matter of the corresponding food on the food table, and then multiplied by the quantity of raw food:—

$$\frac{\text{(\% dry matter of calculated food}}{\text{(\% dry matter on food table}} \times \frac{\text{weight of raw food}}{1}$$

(Olusanya 1977, 1985)

Correction was made for protein quality by using an NPU of 65% score on each mixed protein values of the meal (Pellet 1976, Olusanya 1985, Nnanyelugo 1985, FAO 1985).

The carotene value of each food was divided by six to reflect the retinol equivalent as vitamin A.

It was assumed that all ingredients consumed in a meal was shared in the same proportion except for meat or solid fish servings which were shared and weighed separately. It was assumed also that losses due to evaporation in any cooked meal were insignificant.

Calculation:

Calculations were made to determine the total nutrients in each meal or food, the total nutrients for all the meals of the day, and the total nutrients per consumer as derived from the total nutrients of the day. Finally, the total nutrients consumed per person for each of the three days were calculated, and the mean consumption for three days obtained (Appendix 15).

Comparisons were finally made between the nutrient values from the weighing and those from the recall methods using a student "t" test (Appendix. 13.). Comparisons were also made between values from the weighing method and the FAO (1974) and (1985) reference values according to age groups in 1974 and 1985 FAO references. Results are given in chapter four.

Livestock assessment:

The kilogram weights of livestocks chicken and goats were obtained by converting their numbers – into weights using the following methods: Chicken– The weight of 3 slaughtered and "dressed" chicken were recorded as 2kg. 2.2kg and 2kg respectively. Dressed livestock refers to the slaughtered and cleaned whole carcass including the cleaned entrails, trottles, and head. The average weight of 2kg (2.06kg) was used as the weight for one chicken.

Goats– Likewise. the "dressed" weight of 2 slaughtered goats were recorded as 12.5kg for the she-goat, and 12.5 for the he-goat (Mkpi). The average weight of 12.5kg was used as the weight of one goat in the study. These livestocks were however of local breeds.

Food crop inventory:

Food stock inventory was done in order to determine the food production and consumption pattern particularly as affected by the harvest and hungry seasons, crops were measured in their natural cleaned state. By the month of June though a hungry season, the early cultivators had started to harvest the early crops like maize and green vegetables. The food production measurements were recorded in known local household measures and were converted into kilogram (kg) weight measures as given

in appendices 19, and 20. Palm-nut is covered and recorded as palm oil and palm kernel using the coversion table (apendix 20)

Corp productions are ranked for harvest and hungry seasons to facilitate comparison between seasons. The preccntage ranking is derived from the quanity of each food-crop, in relation to the total quanity of crops produced by a household in that same season.

Monthly food production per household is shown in figure 5. The figure is derived from monthly records of food crops. The food productions of a sub-sample of 22 randomly selected houscholds were compiled on monthly basis. Percentages from total productions were determined as shown in figure 5.

Method of data analysis:

All data collected from the 12 month field work viz the socio-economic, food production and consumption, morbidity pattern, food intake and the anthropometry were compiled and tabulated, first as comprehensive list of tables and then separately as summary tables. The comprehensive tables are shown in the appendices.

The socio-economic variables:

For the analysis of the socio-economic data on the questionnaire a scoring system based on eleven key socio-econonic variables was devised. The weighting of each variable on the scale and assigning of points to each variable was based on arbitrary weighting system depending on their assumed influence on nutrition of the population.

The anthropometric data:

The height-for-age and weight-for-height are predominantly used in assessing the nutritional status of children according to age groups and sexes. While weight-for-height indication is used in assessing the older children and the adults. Weight-for-height index for 6–60 months old children was also used (as in the multiple regression analysis).

The observed values of the nutritional status using the WHO (1983) references and the standard deviation and percentile systems are then compared between the harvest and hungry season, and between the mean-observed values and the WHO (1983) reference.

The extent of growth in the 6–24 month old infants was assessed by calculating the difference in their weights between the harvest season (1984), and the hungry season (1985) indicating only a six month assessment interval (table 24).

Limitation on dietary intake measurement:

Every effort was made to determine the nutrient intake of the individual during the study. But the problem still remains on the accuracy of individual food portions in a situation as found in the study village where central dining from one plate by household members obtained, as reported by Passmore et al (1974) and Rockfeller (1963) at Uboma. Information was therefore obtained largely through 24-hour dietary recall, supplemented by direct food weighing of a subsample of twelve households.

Determination of morbidity:

To assess the gravity of infectious disease incidences in the population, some selected disease patterns on the risk population (the children), were

investigated monthly during the study period. Stools and water supply were examined for probable contamination by intestinal worms.

Monthly visits were made to each household usually towards the end of the month to take stock of the occurences of each of the selected five diseases on the target group (birth – 5 years). The selected diseases were fever (indicative of malaria), cough, catarrh, and fever (indicative of respiratory tract infection) and diarrhoea and/or vomitting (indicative of gastro intestinal infection). In recording disease incidences a bout of each disease lasting for a particular period (a week–4 weeks) or a disease which relapsed and reoccurred was regarded as one incidence. As many victims as contracted the diseases in each household at any single period were recorded under one periods as one incidence (see appendix 18).

Stools were collected in a container and either preserved with formol-saline solution till ready for examination or examined fresh. For examination a little scoop of faeces was deposited at the centre of a clean slide. A drop of lugols iodine added for clearity of inspection and finally covered with a slide cover. The microscope (1x400) magnification was adjusted for better viewing and the slide examined thoroughly all through the slide for the presence of any of the worms or their ova, viz – Ascaris Lombriocoides, Ankylostoma (hook-worm), tape worm, and Trichuris–Trichiuria.

Samples of water sources, tap, stream and pond water were each examined under the microscope for the presence of intestinal worms or their ova.

The water sample was taken in a small test-tube, centrifuged and the excess water decanted. A drop of the sediment was examined using the above described method and the presence of worms searched for: tests were repeated for further confirmation and the results recorded.

The monthly disease distribution pattern of the preschool children (birth—5 years) for both harvest and hungry seasons are shown on tables 27 and 28.

Comparisons were made using percentages, and statistical technique (of "t" test) in differentiating between the harvest and hungry variations. The correlation and regression analysis were employed in identifying the contributory factors to malnutrition.

The correlation and regression analysis:

In order to assess which factors were more contributory to malnutrition in the study village, some selected variables were regressed against the nutritional status and the nutrient intake of the target groups — the children < 10 year olds. A test of association using Correlation (r) technique was also carried out, between each independent variable, and each dependent variable, in order to determine the degree of association between each pair (appendix .!A..).

Variables used in the analysis include the nutrient (caloric) intake and nutritional scores of children < 10 year olds.

The nutrient (caloric) intakesof the risk group (children ≤ 1 – 10 year old) were used as the nutrient intake indicators.That is, the households with the target age group consisting of (sixty) 60 out of the total 110 households were selected as the new sample size for the correlation and regression analysis. The percent (%) of observed over the expected (FAO/ WHO 1985) kilo-calorie intakes of ≤ 1 year to 10 year age range formed the score for each age range and this score was reduced to a 10 point maximum score for the expected intake.

Similarly, the observed weight for height indices of the ≤ 10 year olds (combined sexes), (WHO 1983) were used. That is, the percentage ratio of observed over the expected values formed the nutritional status score for each eligible child. Each score was further reduced in proportion to the expected maximum value of 10 points.

The variables were derived from the socio-economic scores of income, occupation, education, family size, food crop production, food crops consumed, extra foods purchased, and those of caloric intake score for ≤ 1 year, 1.1–3 year, 3.1–5, 5.1–7, 7.1–10 years as independent variables, as well as the nutritional status scores of the corresponding age group as dependent variables.

Computer analysis (using the SPSS package):

A computer analysis was done using the regression variables to determine the association between each of the determinants of malnutrition (i.e. the independent variables), and the nutritional status and the nutrient intake respectively of each of the age group of children ≤10 years old.

For the regression and correlation analysis, the eligible households composing the sample size were those households with children or a child aged ≤10 years, and of the children who equally had complete nutritional status and nutrient intake data requirements. 60 households on this basis formed the sample size for the analysis.

The results of the correlation and the multiple regression analysis are shown in chapter 4.

CHAPTER FOUR

RESULTS

The chapter presents the findings of the study conducted in the rural community of Umunwada village (in Imo State) in 1984/85 and 1989 periods, it shows the demography, the socio-economic characteristics, the food crop production and consumption pattern of the community, and indicates also the nutritional status of the population (assessed through anthropometry), and the relationship of those ecological factors on the nutritional status. The results are thus shown on tables 4 to 32.

The demography of the village

The demographic survey showed that there were about 26 clusters composing the Umunwada village, and these were comprised of about 160 households. Out of the 160 households useful data was obtained from 110 (68.8%) households. The total population from the households were 527, with 238 (45.2%) male, and 287 (54.8%) females (Table 4).

The preschool age population was 128 (24.3%); the school age population of 5.1 – 18 years old was 191 (36.2%), while the adult population (18.1 – 60 years) was 188 (35.7%), and that of the aged ($\geq$ 60 years) was 22 (4.2%) (Table 4).

TABLE 4

Distribution of population by age (yrs) and sex

Age (yr)	Sex	No.	%
≤ 1	Combined	19	3.6
1·1 – 3	Combined	53	10.1
3+ – 5	Combined	56	10.1
5/– 7	M	17	3.2
	F	21	4.0
7/– 10	M	26	4.9
	F	20	3.8
10/- 18	M	38	7.2
	F	67	12.7
18/- 30	M	15	2.8
	F	13	2.5
30/- 60	M	57	10.8
	F	103	19.5
> 60	M	14	2.6
	F	8	1.5
Total		527	100%

Appendix 6 also reveals that the entire community was predominently of Roman Catholic denomunction with the exception of 4 (3.6%) protestant households.

Socio-economic activities:—

From the pilot study it was observed that the major occupations include subsistent farming , petty trading and cash cropping of plam oil and palm kernel and such crafts as basket making, blacksimthing, and livestock keeping of goats and poultry. The major food staples include cassava prepared in various methods, yam and cocoyam and green vegetables of maize, fluted pumpkin, (Telferia or ugu), "Uha" and also palm oil and kernel, as seen during the harvesting or hungry seasons. The major cash crops include palm oil and kernel and these are harvested mostly during the dry season .

Taboos and superstitious beliefs on food are minimal since the shift has been from the traditional religious worship to current christian religious worship.

Major festivities include the Christmas, Easter and Wrestling festivals. Others are "manhood ceremony" (Iwa Akwa), "Ekpe masquerade" ceremony, "Ntumaka" or Annual reunion and harvesting ceremony (Ogoke, 1978), and also the "Multi-parity" or multiple births ceremony "Igbu-Eglu-Ukwu") for having had ten or more births by a mother.

Figure 2 Distribution of socioeconomic scores of households (by % scores) N =410 (100%)

Socio-economic scoring:

The maximum scores for the absence of malnutrition traits from any of the 110 households is equivalent to 100 points (100%). The overall scores from the 110 households are shown as:-

Maximum score	–	100 points (100%)
Highest score	–	65 points (65%)
Lowest score	–	30 points (30%)
The range	–	65 – 30 (25%)

(Appendix 6)

Figure 2 shows that 78(70.9%) households scored ≤ 50%, 27 (24.6%) households scored 51% – 60%, while 5(4.6%) households scored 61%–65%.

The occupation level:

Table 5 and figure 3 present the overall view of occupational pattern, while Appendix 7 is a summary of occupational levels.

Petty trading and peasant farming were the prevalent occupation in the community, and female spouses dominated these occupation. Employee occupation and unemployment were the least occupation Male spouses dominated the self-employment sector while the deceased male spouses accounted for 95% (20 out of 21 dead spouses) of spouse mortality.

Three hundred and sixty two (56.9%) out of a total of 636 (100%) were educated, while 274 (43.08%)were uneducated. The literacy level tended to be high with over 50% as literate population (Table 5).

Of the 362 (100%) educated population, 248 (68.5%) attained primary education level. 90 (27.1%) attained the secondary level of education, while 16 (1.0%) attained the post secondary level of education. This indicates that the high level of literacy notwithstanding, the majority of the population attained the primary level of education. A reasonable number attained secondary educational level, 108 (27.1%), while only a minute proportion (4.4%) attained a post secondary education level. The offspring's literacy ratio did not appear discriminatory since primary school attainment revealed that 142(57%) were males while 136 (48.9%) were females. The secondary school level attainment reveals 13(81%) to be males, while 3(19%) were

TABLE 5

Socio-economic characteristics of the community

Occupation of Households

Occupation	No. of spouses	%
Farming	57	27.40
Trading	62	29.81
Employee	14	6.73
Self employed	36	17.31
Unemployed	18	8.64
Deceased fathers	20	9.6
Deceased mothers	1	0.05

Level of education	Population	%
Total population	636	100
Educated population	362	56.9
Uneducated population	274	43.1
Educated population:		
Primary education	248	68.5
Secondary education	98	27.1
Post secondary education	16	4.4
Uneducated population:		
Uneducated fathers	45	16.4
Uneducated mothers	68	24.8
Uneducated offsprings	130	47.5
Uneducated relations	31	11.3
Households with no education at all	11	10.0%

Income level of households

Income (₦)	No. of HH	%
1 – 50	17	15.5
51–100	19	19.3
101–200	31	28.2
201–300	24	21.8
301–400	17	15.5
401–500	02	1.8

Family size

No. per HH	Freq. of HH	%
1 – 4	38	34.55
5 – 8	56	50.91
9 – 11	16	14.55

Distribution of live offsprings

No. per HH	Freq. of HH	%
0	3	2.73
1 – 2	17	15.45
3 – 4	25	22.73
5 – 6	38	34.55
7 – 8	19	17.27
9 – 10	8	7.27

Mortality of offsprings

No. of death/wife	Freq. of wife	%
0	47	42.73
1 – 2	39	35.45
3 – 4	18	16.36
5 – 6	5	4.55
≥ 7	1	0.91

(Contd.)

Age of offspring at death

Age range (yr)	Freq. of IIIi	%
Less than 1	12	10.91
1 – 2	23	20.91
3 – 4	9	8.18
5 – 6	9	8.18
7 – 14	15	13.64
No death occurred	47	42.72

Housing structure

Structure	No. of HH	%
Roof		
Zinc	90	81.82
Thatch	15	13.64
With Ceiling	5	4.55
Wall		
Cement	80	72.73
Mud	25	22.72
Special decoration	5	4.55
Floor		
Cement	73	66.36
Mud	37	33.64
Special decoration	nil	—
Compound		
Cement fencing	29	26.36
Stick fencing	28	25.46
Open fencing	59	48.18
Special decoration	—	—

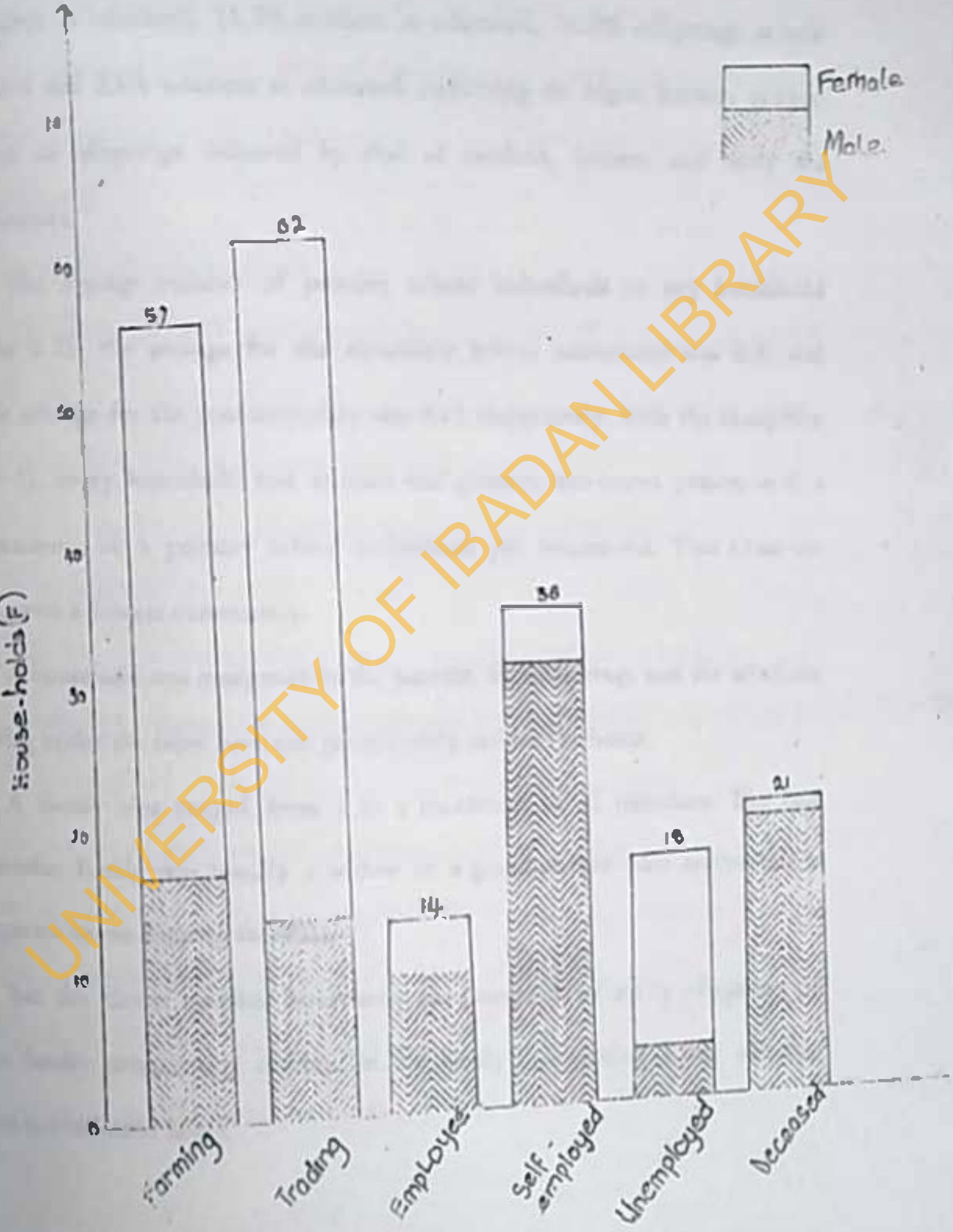

Figure. 3 Distribution of occupational Levels of households n=110

females. The literacy proportion of the entire households reveals 9.1% fathers as educated, 11.3% mothers as educated, 76.8% offsprings as educated and 2.8% relations as educated, indicating the higest literacy proportion of offsprings, followed by that of mothers, fathers, and lastly the relations.

The average number of primary school individuals to any household was 2.35; the average for the secondary school attainment was 0.8, and the average for the post-secondary was 0.15 respectively. With the exception of 11, every household had at least one primary education person with a maximum of 6 primary school individuals per household. This situation suggests a literate community.

A household was composed of the parents, the offsprings and the relations living under the same roof and permanently resident at home.

A family size ranged from 1 to a maximum of 11 members. The one member family was usually a widow or a grandmother who maintained a separate house-keeping facilities.

But the eleven member household was composed of many offsprings of the family permanently resident in the family. (A visiting family member was not included here).

The socio-economic scoring reveals the negative tendency towards an optimum socio-economic level of the population With such a non positive status the tendency increases towards a negative nutritional status of the community.

The socio-economic variables:

The income of the community members as represented by 110 households were graded as low, moderate, or high, and the income distribution pattern of the studied households is shown in table 5

Following the Nigeria Government salary scale grading, 67 (61%) household population was on low income segment of N1–N200 per month; 41 (37.3%) were on the middle income segment of N201–N400 while only 2 (1.8%) were on the high income segment of N401–N500. The calculated figures apparently indicates a maximum earning capacity of N450 per month. A tendency towards low income status of the population is readily observed. However, most of the population was distributed along the N101–N200 income level. That as much as 17 (15.5%) was on ≤ N50 per month is significant in the community.

Table 5 presents the frequency of household sizes with their percentages. Two households only were composed of 11 members while majority of households were distributed between 5–8 and even 9 member households, indicating large family size patterns.

Included amongest these parity pattern are, the number of pregnancies (fig. 4), the distribution of live offsprings, the number of dead offsprings for each housewife (Table 5) and the number of abortions per wife.

The generality of wives were gravida 6–10 while one wife belonged to gravida 15, another gravida 1, and one was not pregnant (fig. 4).

One wife had 10 offspring with all alive. The average number of live offsprings was between 5–6 per wife and 7 wives had 9 offsprings each.

Male to female ratio for all offsprings was 276:265.

The mortality pattern of offsprings indicates that 47 (42.73%) of the households had no death at all. 22 (20%) households had the average of 2 deaths each while 17 (15.46%) had one death each, and 1 (0.91%) household had up to 7 offsprings deaths. /Table 5). the household with 7 deaths during childhood had 14 pregnancies with no abortion during childhood.

Convulsion appeared to be the major cause of death, but the origin of

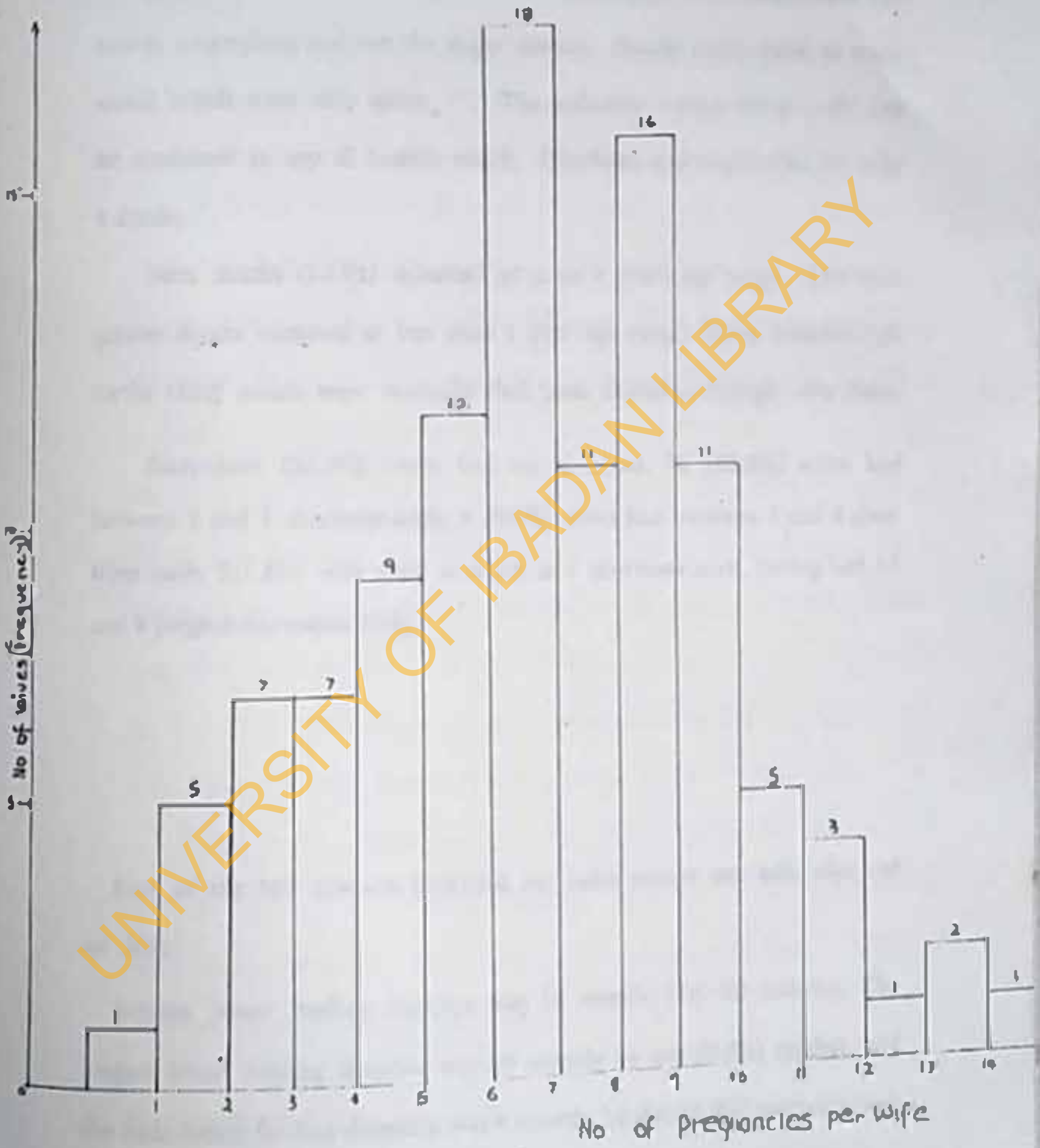

Figure 4: Distribution of parity level

convulsions in the children could not be determined since convulsions was merely a symptom and not the major disease. Deaths attributable to traditional beliefs were only seven , '. The unknown causes which could not be attributed to any ill healths was 9. Diarrhoea was responsible for only 4 deaths.

Most deaths (20.9%) occurred at 1 to 2 years age range. The next greater deaths occurred at less than 1 year age range. These included still births (SBs) which were normally full term deliveries though born dead.

Sixty-three (57.9%) wives had no abortion. 36 (32.8%) wives had between 1 and 2 abortions each; 9 (8.2%) wives had between 3 and 4 abortions each, 2(1.8%) wive shad as much as 7 abortions each, having had 14 and 9 pregnancies respectively.

Each of the 109 mothers breastfed her baby except one wife who had no child.

Average breast feeding duration was 18 months (16–20 months). The longest breast feeding duration was 60 months by one (0.9%) mother, and the least breast feeding duration was 4 months by one (0.9%) mother whose baby voluntarily stopped breast-feeding..

Fifty-eight (52.7%) wives started weaning at 3-4 months, 21 (19.1%) started at 6 months, while 4 mothers weaned abruptly at 12 months. Food supple–

mentation therefore commenced at 3–4 months by majority of mothers.

The common weaning foods were agidi (corn starch pudding) and cassava foofoo, which was of much softer consistency than that of adults. The common weaning foods included– corn pap, or corn pudding (agidi) by 87 (36.7%) mothers, corn pap, and cassava fufu with soup by 68 (28.7%) mothers, palm wine to supplement the above foods by 12 (5.1%) mothers, the addition of egg or meat by 8 (3.4%) mothers, the addition of milk by 28 (11.8%) mothers, the addition of tea Bournvita or Ovaltine with milk and sugar by 10 (4.2%) mothers, the addition of bread by 9 (3.8%) mothers, and other foods which include (custard, yam, cocoyam, rice and plantain by 15 (6.3%) mother. Most of these foods were not used in isolation however. Baby milk (Baby formular) was sparingly used as a weaning diet.

Other weaning foods included rice, corn-custard, yam, cocoyam and plantain. The yam and cocoyam could be mashed or pounded into foofoo along with plaintain and given with soup modified from the adult's soup. Meat and eggs were very sparingly used.

Food purchases:-

Types of foods commonly purchased are shown in tables 6. Areas of greater purchases were on the meats and fish (including crayfish) where

an average of N20.8 was spent monthly by a household (table 6). This was so because meat and fish were not produced in the locality and were equally expensive. However, alot of money is expended on starchy foods and mostly on cassava, which indicates the greatest demand placed on cassava foofoo since cassava was the staple for the community. Palm oil was least purchased probably because it was produced locally in large quantities. The average household spent N63.2 per month on food purchases.

TABLE 6

Mean monthly allocation of food money (in N) per household

Foods	Mean allocation (in N) per houschold	SD
Root starches	26.5	± 8
Cereals	8.5	± 4
Legumes	3.3	± 0.8
Oils	1.0	± 0.70
Green vegetaliles	1.8	± 1.0
Fruits	1.3	± 0.4
Meat/Fish	20.8	±10.0
Total	63.2	

Housing structure:

Most houses in the village were constructed with zinc (corrugated iron sheeting) and a few others with thatch for the roofing, mud and cement with or without extra decorations were used for the walls, and mud or cement with or without extra decorations was used for the floor. Each compound was normally protected by fencing with stick or cement, while a few others had no fencing, (Table 5).

Where a household was unable financially to construct a modern building, using cement, efforts were made to use zinc for roofing. However, few households still used both thatched roof, mud wall, and mud floor components to construct houses.

The housing enclosure which demarcated the boundary of the housing structure did not strictly determine the type of housing structure as shown on Table 5 where 29 (26.36%) households used cement walling, 28 (25.46%) used stick fencing, while 53 (48.18%) used no enclosure. The use of cement might indicate better financial standing of the owner, and therefore the superiority of the housing structure. Conversely, the use of stick fencing or an open compound might indicate poorer financial standing and therefore inferior housing structure. "Special" type of enclosure indicated extra decoration on a cement walling such as the use of fancy blocks, or decorative paintings.

Physical amenities:-

The physical amenities considered here are water supply and toilet facilities.

Water supply:-

All the 110 households with no exception used all the four sources of water supply. This is because each source had its peak season of availability. Well water was the only exception which was not available at all within the locality. Tap water for instance, was available but irregular. Rain was abundantly used during rainy season. Stream water was not very accessable because of the long distance to the source but was used when the others were not available. Pond water was more available during the rainy season. In the absence of all other sources it was mostly used for dirtier work like cleaning of farm products. When left to settle over a very long period, pond water was equally used for other household purposes.

Toilet facilities:

No household used water closet toilet. 40 (36.36%) households used open pit latrine. 43 (39.09%) used cover pit latrine; while 27 (24.55%) made use of bush.

Covered pit latrine involved the erection of small hut over the pit toilet, with a door or improvised door attached.

The distribution of types of toilet followed a particular obvious pattern like the household with mud housing structure who tended to make more use of the bush than the other types.

Food productions:

Figure 5 shows the peak monthly production as August (11.6%), closely followed by December (11.2%), September (11.2%), and July (10.4%) which were the harvesting months of 1984. The month of March recorded a peak production of (8.8%), followed by January (7.9%) during the hungry season in 1985. The highest productions during the hungry season were mainly green vegetables, fruits, palm products, cocoyam and the early maize production by June.

The mean production for a household during the harvest (July – December) was 1522 kg (100%), with 701.3 kg (51%) consumption; while mean production for hungry season (January–June) was 819.4 kg (100%) with 552 kg (67%) consumption (Table 7).

Within the harvest season 1018.2 kg (66.9%) of starchy foods (all root crops) were produced, with 600.9 kg (76.9%) consumption. Starchy food production was followed by green vegetables, palm products, livestock, legumes, and fruits respectively (Table 7, figs. 6, 7).

During the hungry season, starchy food production also predominated, followed by palm products, livestock, green vegetables, legumes and fruits. Consumption followed production pattern except for livestock which remained unconsumed.

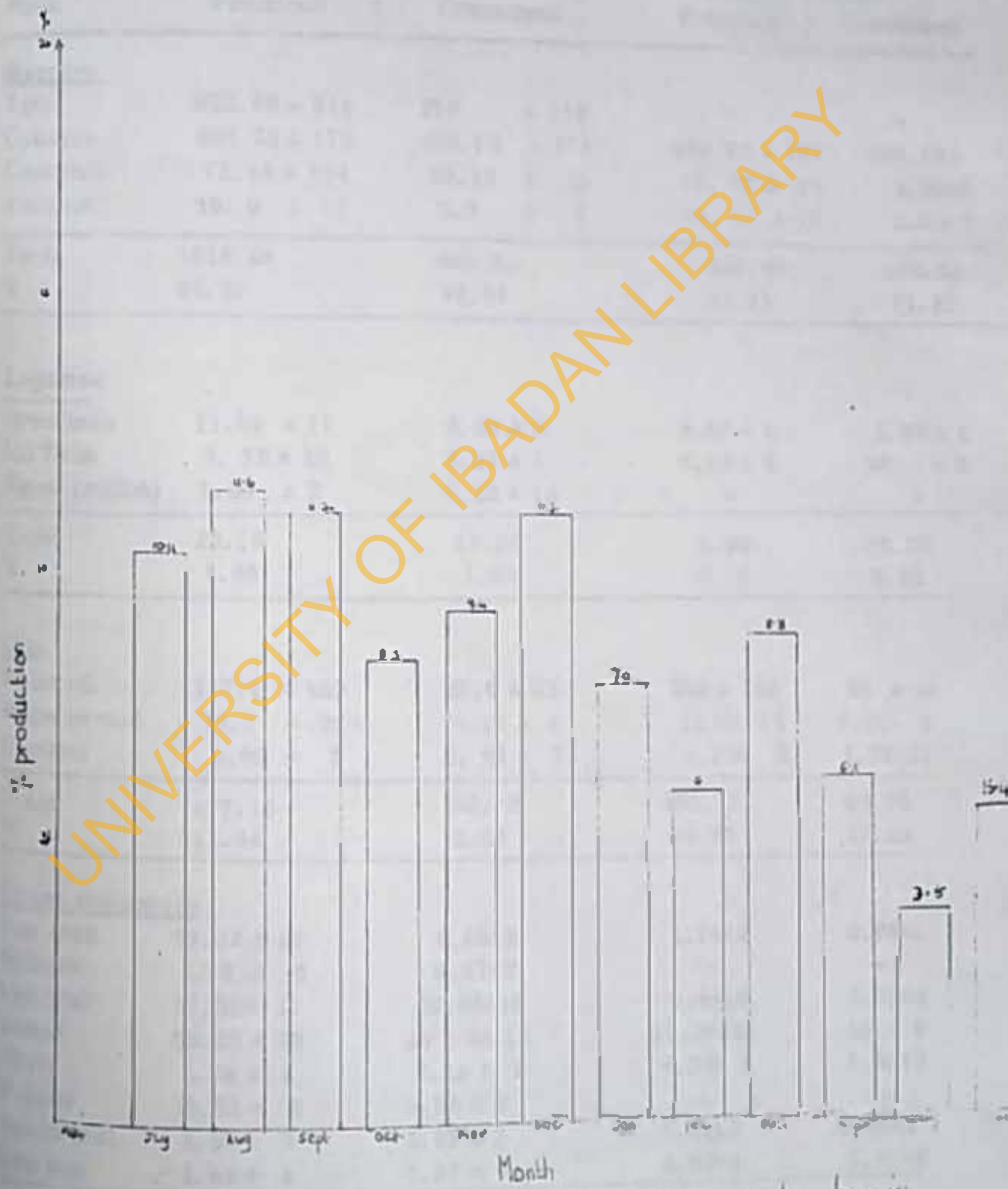

Figure 5 percentage production of crops on monthly basis

(Contd.)

Food	Harvest season Produced	Consumed	Hungry season Produced	Consumed
Fruits				
Pawpaw	0.91 ± 3	0.91 ± 3	6.0 ± 11	2.0 ± 6
Orange	14.51 ± 29	3.91 ± 8	0.30± 1	0.22 ± 1
Guava	0.78 ± 2	0.48 ± 2	1.05 ± 2	0.87 ± 1
Pear	2.26 ± 7	2.52 ± 5	-	-
Total	19.46	7.82	1.05	3.09
%	1.2	1.0	0.24	0.56
Livestock				
Goat	63.13 ± 25	0.0 ± 0	55.83±23	0 ± 0
Chicken	19.02 ± 16	0.54±2	18.37±13	0.65±2
Total	82.15	0.54	74.2	0.65
%	5.4	0.07	9.05	0.12
Grand total	1522.43	781.29	819.79	551.77
%	100	100	100	100

741kg (48.68%) 268.02 kg (32.69%)

Unconsumed (harvest/hungry) = (2342.22 -1333.06kg) = 43.09%

The production and consumption patterns for both seasons were similar in which starchy food production and consumption predominated. Palm oil production was higher in hungry than in harvest. (figs 6 and 7).

Tables 8 and 9 rank in descending order the percentage quantities of food productions and consumptions in harvest and hungry seasons respectively, in which yam production ranked first (41.85%) in harvest season followed by cassava production (19%), and then palm oil, fruits, vegetables and legumes in less percentage proportions. In consumption, cassava ranked first (37.34%) followed closely by yam (35.8%), and the rest of the crops in little proportions.

During hungry season cassava production ranked first (48.67%), followed by palm oil (37.79%) and then the rest of the crops (Table 9). Cassava also ranked first (74.95%) in consumption, followed by palm oil and the rest of the crops.

While yam and cassava were both major harvest season products, cassava and palm oil were both mainly hungry season products. Livestock (Goat and chicken) production though ranked higher than other crops, were of static production, and of nil consumption.

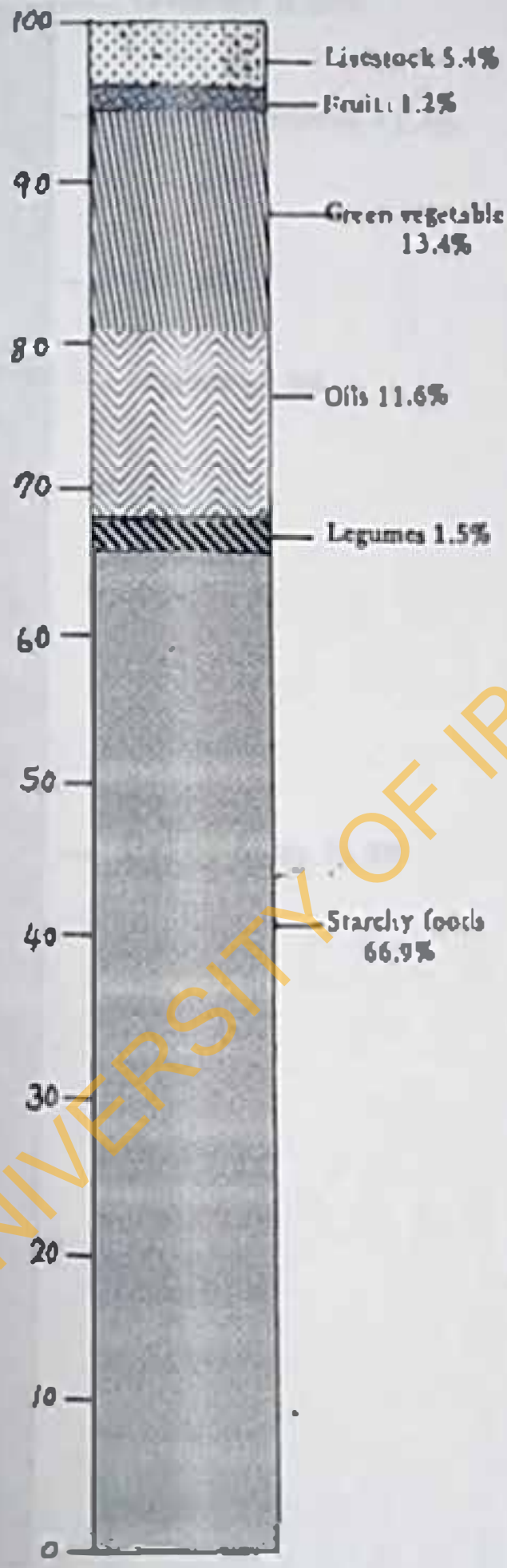

Fig. 6: Harvest Season

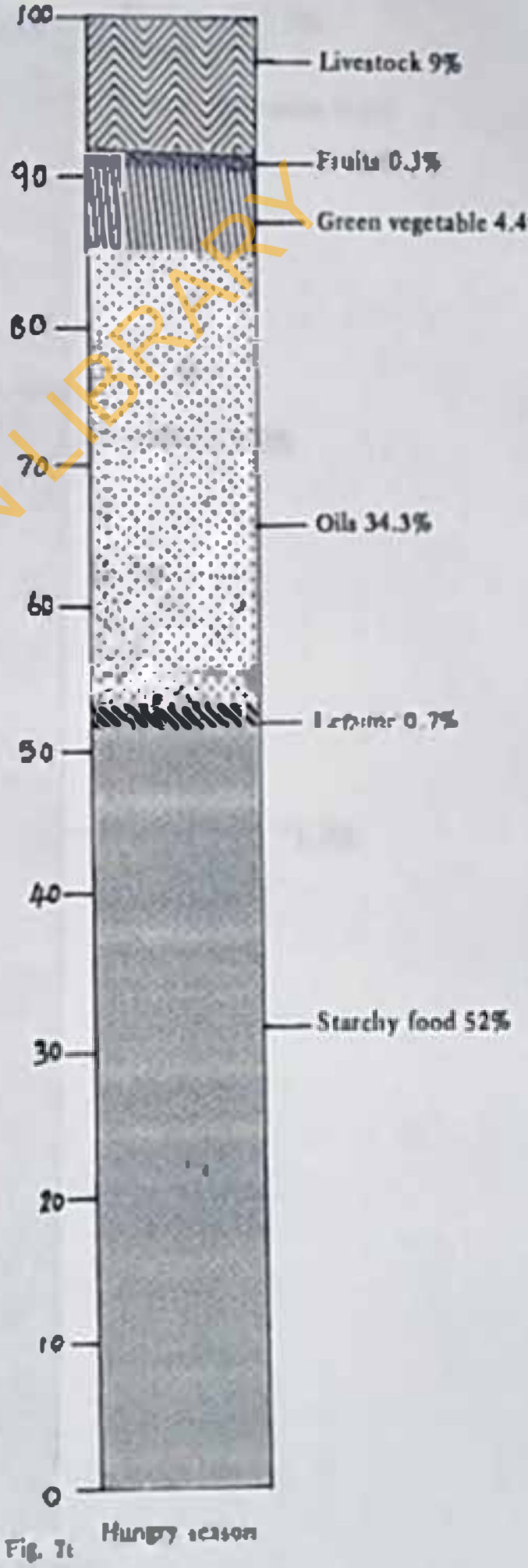

Fig. 7: Hungry season

Figure 6, 7. Percentage Production of each food type

TABLE 8

Ranking of food productions and consumptions: Mean per household: Harvest season n = 50 t/t1

S/N.	Total Mean food production per household/day = 1511.18 kg (100%) Food	% Produced	Rank	Percentage consumption per household/day = 776.15 kg (100%) Food	% Consumed	Rank
1.	Yam	41.85	1st	Cassava	37.34	1st
2.	Cassava	19.87	2nd	Yam	35.82	2nd
3.	Palm oil	10.39	3rd	Palm oil	7.34	3rd
4.	Cocoyam	4.99	4th	Ugu leaf	6.50	4th
5.	Ugu fruit	4.57	5th	Maize	3.93	5th
6.	Goat	4.18	6th	Cocoyam	3.62	6th
7.	Ugu leaf	3.80	7th	Breadnut	1.07	7th
8.	Maize	3.65	8th	Pepper	0.68	8th
9.	Palm kernel	1.29	9th	Palm kernel	0.66	9th
10.	Chicken	1.26	10th	Ugu fruit	0.56	10th
11.	Orange	0.97	11th	Oil bean	0.50	11th
12.	Pepper	0.88	12th	Orange	0.50	12th
13.	Breadnut	0.75	13th	Pear	0.33	13th
14.	Oil bean	0.63	14th	Okro	0.27	14th
15.	Pear	0.22	15th	Uha	0.25	15th
16.	Okro	0.21	16th	Anara leaf	0.20	16th
17.	Uha	0.13	17th	Paw-paw	0.12	17th
18.	Green	0.12	18th	Green	0.09	18th
19.	Anara leaf	0.10	19th	Coconut	0.08	19th
20.	Paw-paw	0.06	20th	Chicken	0.07	20th
21.	Guava	0.05	21st	Guava	0.06	21st
22.	Coconut	0.04	22nd	Goat	00	22nd
	Total	100%			100%	

TABLE 9

Ranking of food production and consumptions, mean per household::
Hungry season n = 50 H/H

S/N.	Total mean food production per household/ day = 814.79 (100%) Food	% Produced	Rank	Percentage consumption per household/ day = 515.12 (100%) Food	% Consumed	Rank
1.	Cassava	48.67	1st	Cassava	74.95	1st
2.	Palm oil	31.79	2nd	Palm oil	16.70	2nd
3.	Goat	6.85	3rd	Maize	1.94	3rd
4.	Chicken	2.26	4th	Palm kernel	1.49	4th
5.	Palm kernel	2.15	5th	Cocoyam	0.96	5th
6.	Maize	2.12	6th	Ugu leaf	0.79	6th
7.	Cocoyam	1.86	7th	Uha	0.74	7th
8.	Ugu leaf	0.09	8th	Breadnut	0.63	8th
9.	Breadnut	0.68	9th	Plantain	0.49	9th
10.	Okro	0.56	10th	Okro	0.38	10th
11.	Uha	0.56	11th	Coconut	0.25	11th
12.	Coconut	0.52	12th	Ugu fruit	0.19	12th
13.	Plantain	0.51	13th	Pineapple	0.17	13th
14.	Ugu fruit	0.21	14th	Chicken	0.13	14th
15.	Pineapple	0.20	15th	Anara leaf	0.09	15th
16.	Anara leaf	0.17	16th	Oil bean	0.07	16th
17.	Oil bean	0.06	17th	Guava	0.04	17th
18.	Guava	0.04	18th	Goat	00	18th
	Total	100%			100%	

Production by food type indicated that yam, cassava and cocoyam dominated starchy products, palm nut was the sole oil source, Ugu leaves and fruits and fresh maize dominated green vegetable crops, orange dominated fruit crops, legumes composed mainly of breadnut and oil-bean were very minimally produced while chicken and goats were the sole livestock products which served in dynamic production (Table 7). A mean portion of 43.09% of the total productions were unconsumed.

In summary, therefore, various crops were produced but 22 crops which were recorded were the crops produced in larger quantities (Appendix 20). Starchy roots, palm oil and green vegetables dominated all productions (figs. 6, 7). Production continued during the hungry season with cassava and palm products topping the list. Production and consumption of crops did not vary significantly amongst the 110 households, (except perhaps in yam and cassava productions) during the harvests and hungry seasons. (figs. 8, 9). Yam was, however, more of harvest season produce.

Food and nutrient intake pattern:

Five hundred and twenty-seven consumers (from the 110 households) were recorded, with consumers ranging from 1 to 9 persons per household (Appendix 11). Not every household member necessarily concerned every family meal however. A sample of typical ingredients and the amounts (in gm) used in a meal preparation is shown in Appendix 15. The nutrient values of food ingredients are compiled and presented in Appendix 9.

The daily mean food intake per household was 2132.9 gm ± 619 during the harvest and 2221 gm ± 825 during the hungry season respectively, (Appendix 13). The variations (SDs) in the mean daily intake (for the three days consumptions), indicated the large variations in quantities consumed in each day's meals. It is known for instance, that Sunday meals were much larger than the week days' meals. Therefore mean quanity consumed by any individual was 409 gm of food per day during harvest season, with 422 gm consumed per person during the hungry season.

The variation in food intake (in gm) between harvest and hungry seasons proved statistically insignificant (at $P \leq 0.05$ level), (Appendix 13).

Nutrient intake (1984/85 period) – recall method:

Table 10 is a summary table showing the mean nutrient intake per person for both harvest and hungry seasons of the study period. The nutrients under consideration include the kilocalorie, (the energy) the protein, vitamins A, (as Retinol) B2, C, Calcium and Iron contents of foods consumed.

The major sources of calories were the staples such as palm oil, cassava products, yam, cocoyam and palm kernel (fig. 10); while the major sources of protein were crayfish, smoked fish, palm-kernel, oil-bean and breadnut (fig. 11). Comparison of calories indicate minimal variations between the two seasons (fig. 12).

The observed nutrient intake per person and per season is also shown in

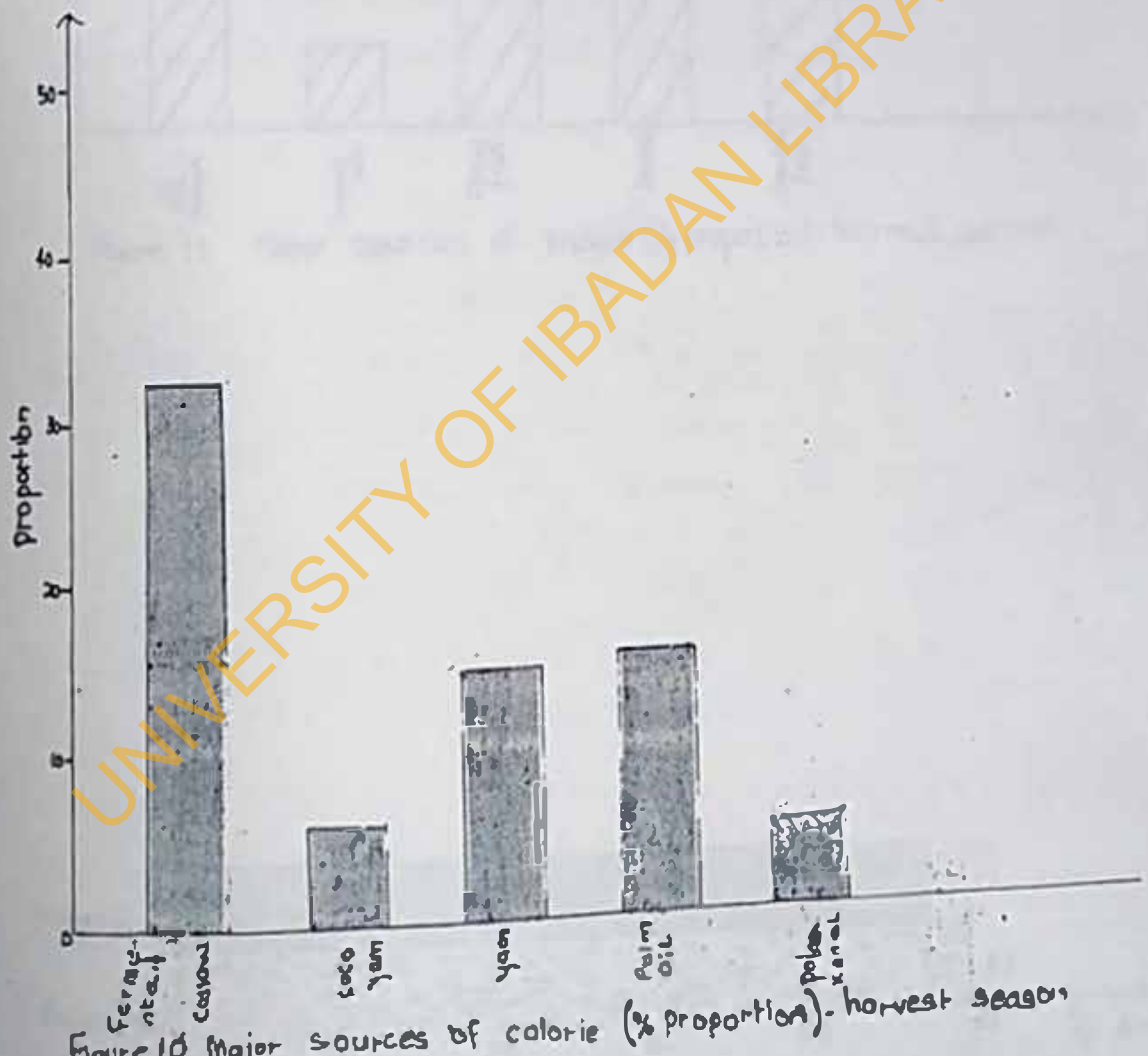

Figure 10 Major sources of calorie (% proportion) - harvest season

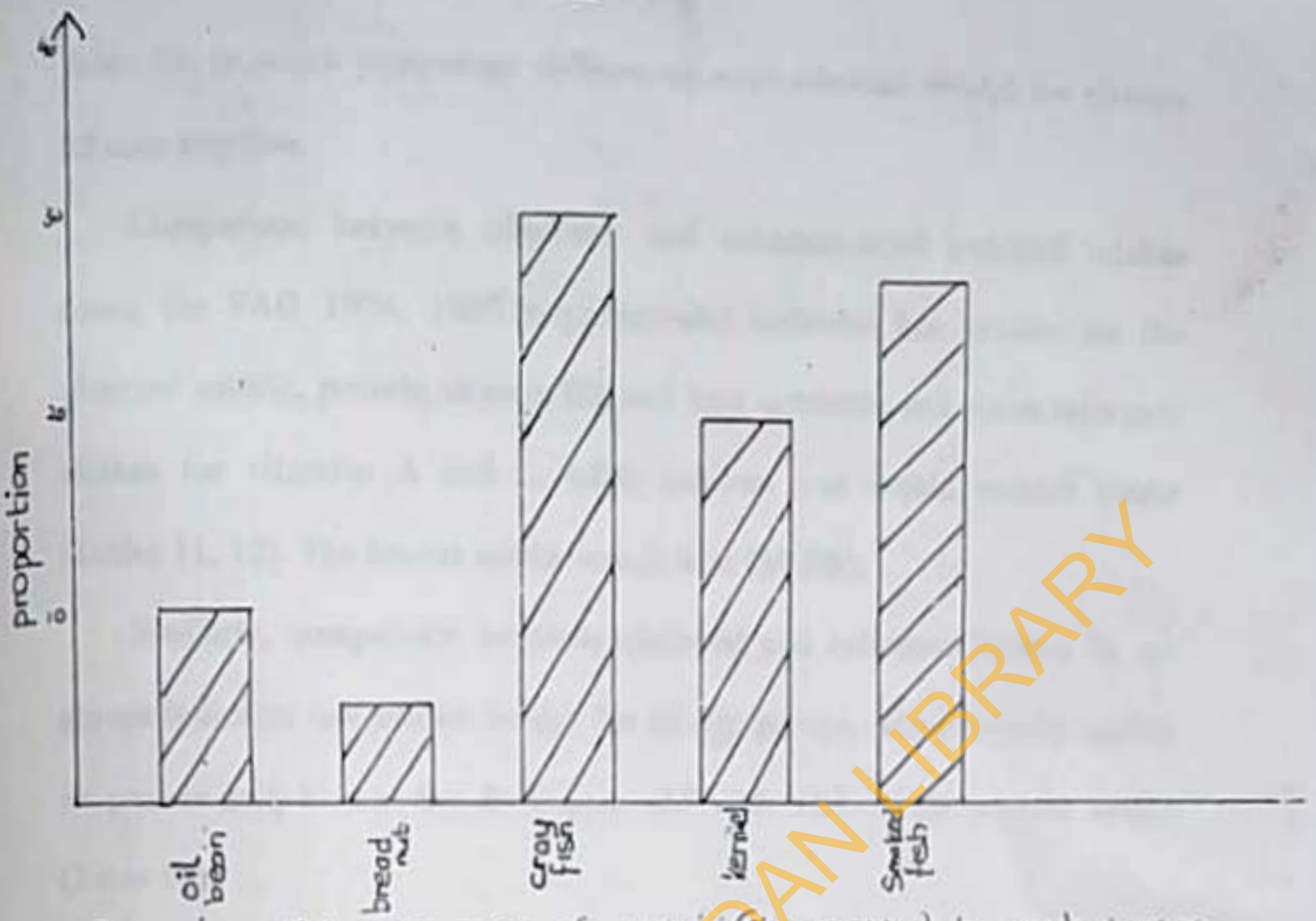

Figure 11 Major Sources of protein (% proportion) - harvest season

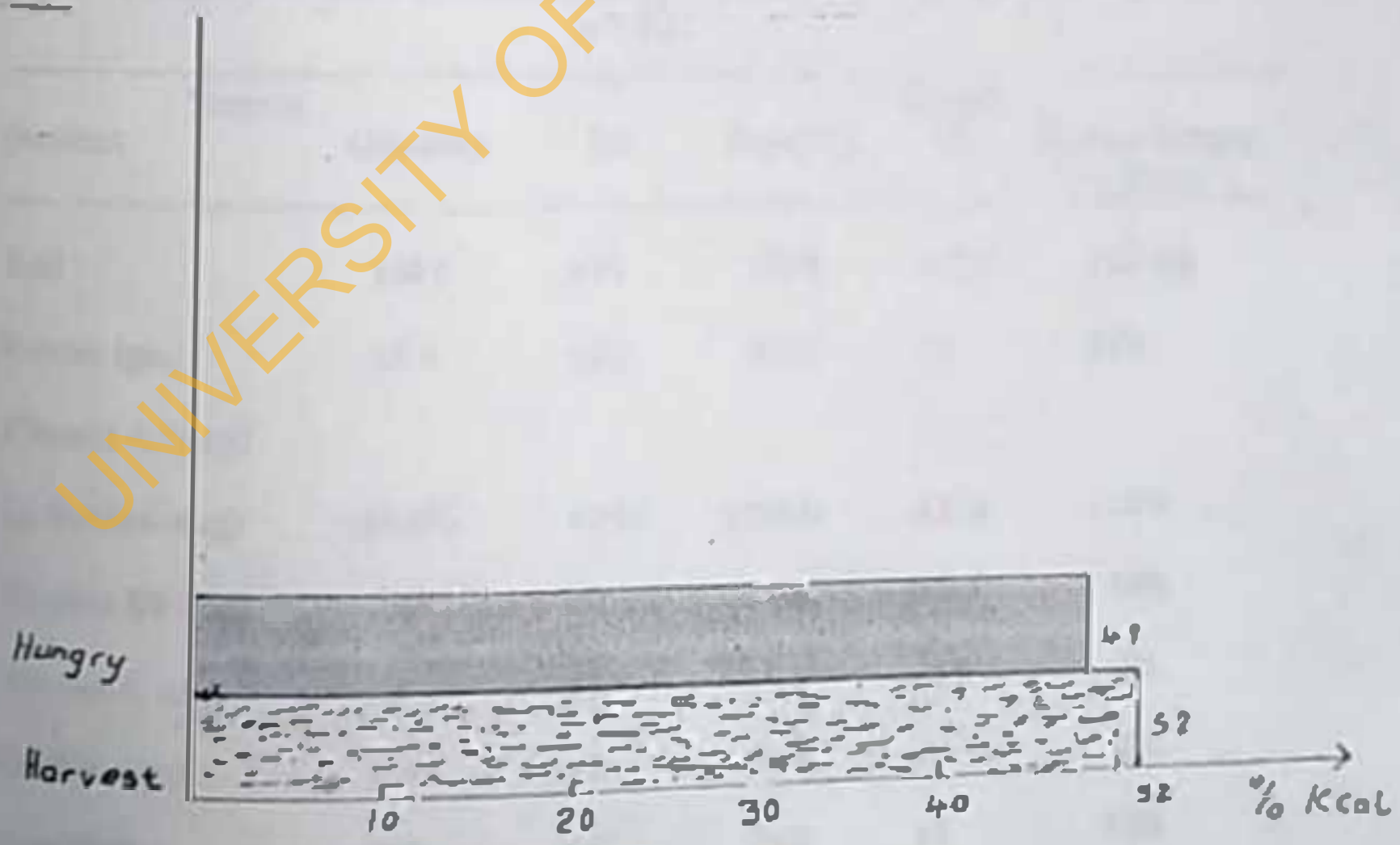

Figure 12 Mean Kcal intake - Harvest Vs Hungry Season

Table 10, in which percentage differences were minimal except for vitamin B2 consumption.

Comparison between observed and recommended nutrient intakes (using the FAO 1974, 1985 requirements) indicates low intakes for the observed caloric, protein vitamin B2, and iron nutrients, but above reference intakes for vitamins A and C; while calcium was within normal intake (Tables 11, 12). The lowest intake was in iron (59.8%).

Similarly, comparison between observed and reference intakes by age groups indicates low caloric intake for all age groups, which equally applies to protein except for the 3–7 year old with 104–112% protein intake (Table 12).

TABLE 10

Summary of mean nutrient intake per person (1984 recall method)
n = 527

Nutrient	Harvest Quantity	SD	Hungry Quantity	SD	Harvest/hungry % Ratio
Kcal	1681	±91	1558	±176	107.8%
Protein (gm)	18.4	±30	20.6	±5	89%
Vitamin A (mcg)					
(as Retinol-mcg)	(4467)	±239	(3961)	±212	112%
Vitamin B2 (mg)	0.65	±0.3	1.7	±0.7	38%
Vitamin C (mg)	52	±14	44.0	±14	118%
Calcium (gm)	0.65	±1	0.49	±0.1	132%
Iron (mg)	9.0	±1	10.0	±1	90%
Mean kcal intake/person/day for combined harvest and hungry				1619.6	±62 kcal

TABLE 11

Comparison of (1984 combined harvest and hungry) intake with the reference (FAO 1974, 1985) nutrient intakes; n = 527

Nutrient	Observed intake	Recommended intake	Observed/reference %
Kcal (mj)*	1620	2398	67.8
Protein (gm)	19.5	30	75.0
Vit. A as Retinol (mcg)	4214	636	662.6
Vit B2 (mcg)	1.2	1.4	85.7
Vit. C (mg)	48	25.3	189.7
Calcium (gm)	0.6	0.6	100
Iron (mg)	9.5	15.9	59.8

* 1 Megajoule (MJ) = 239 calories.

Nutrient intake using supplementary weighing and recall methods (in 1989):—

A days menu of a study household (code 125) as obtained by weighing method of assessment is shown in Appendix 15. The quantity of ingredients (in gm), the weight of the total cooked meal, and the portion consumed by a household member are all shown (in gm). The total nutrients from each meal and the nutrients consumed per person (as calculated from real portions) are also shown (Appendix 15). The mean nutrient intake per meal and per day is shown in terms of the caloric, the protein, vitamins A, B2, and C, calcium, and iron, while Appendix 16 shows the mean intake per participating household.

Table 13 shows the mean caloric and protein intake by age and sex by weighing method of dietary assessment of 12 subsample households in 1989 while the intakes were lowest in the ≤ 1 year old (31% kcal and 20% PR), It was highest in the 1.1—3, 5.7—7 and 7—10 year olds were also low (31—86% and 20—87% respectively) when compared with the FAO (1985) requirements. Results of 1989 intakes using both weighing and recall method on the same 12 subsample households proved that there were no significant differences (at 95% and 99% levels) between weighing and recall methods of dietary assessment since nutrient intake of various age groups obtained from the two methods were not significantly different (Appendix 17).

Comparison also using percentage requirements of caloric and protein intakes between 1984 and 1989 indicates no significant difference within the same age groups (table 15), rather, greater percentage intake was observed amongst 1.1—7 year age groups in 1989 (at 67.4%—98.6%).

Percentage protein values indicates greater intake in 1984 (at 58.2%—112%) amongs all age groups than in 1989 (at 20%—87.4%) (Table 16).

TABLE 12

Comparison of 1984 Kcal and Protein intake with reference (FAO, 1985) (by age group) n = 527

Age (yr)	Sex M : F	Observed Value Kcal	(SD) (±)	Protein (mg)	SD (+)	Reference Kcal	Reference Protein (gm)	Percentage of Ref % Kcal	% Protein
≤ 1	Combined	528.8	(66)	8.0	(0.3)	880	14	60.1	57
1-1 – 3	"	884 0	(184)	14.9	(3)	1250	14.5	70.7	96.6
3+ – 5	"	1217. 1	(52)	19.6	(3)	1550	17.5	78.5	112
5+ – 7	M	1427.2	(34)	22.0	(2)	1850	21.0	77.2	104
5 – 7	F	1395.1	(121)	22.0	(1)	1750	21.0	79.7	104
7+ – 10	M	1348.3	(202)	18.7	(2)	2100	27.0	64.2	69.3
7+ – 10	F	1249.5	(48)	19.7	(2)	1800	27	69.4	73
10+ – 18	M	1682.6	(112)	30.9	(7)	2525	46.3	66.6	66.1
10+ – 18	F	1641.5	(254)	27.9	(6)	2085.5	42.5	78.8	65.7
18+ – 30	M	1690.3	(179)	28.8	(3)	3000	48.7	56	59
18+ – 30	F	1516.5	(145)	24	(4)	2418.8	43.1	62.7	55.7
> – 30	M	1869.4	(336)	38	(17)	2703.6	48.7	69.2	78
> – 30	F	1517.0	(299)	25.6	(4)	2284.4	43.1	66.4	59.4

• Observed values are obtained from 1984/85 dietary assessment (by recall method).

TABLE 13

Mean nutrient intake by age group — 1989 weighing method n = 62

WEIGHING METHOD																			
	Age Group	0–1	0–1	1.1–3	1.1–3	3.1–5	3.1–5	5.1–7	5.1–7	7.1–10	7.1–10	10.1–18	10.1–18	18.1–30	18.1–30	30.1–60	30.1–60	>60	>60
	Sex	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
S/No.	No. of Sub. Student	1 Combined		2 Combined	3	5	9	4	4	4	5	2	8	–	3	5	9	1	–
		Mean SD	Mean SD	Mean SD	Mean SD	Mean SD	Mean SD	Mean SD	Mean SD	Mean SD	Mean SD	Mean SD	Mean SD	Mean	Mean SD	Mean SD	Mean SD	Mean SD	Mean SD
1	Kcal	273.2	–	1231.9	–	1064.4	1067.3	154.1	1135.3	1386.3	1365.1	1547.9	1359.4	–	1963.2	268.7	1669.8	1103.5	–
		–	–	1100.0	–	544.3	210.7	778.7	250.0	140.3	24.9	135.3	341.7	–	262.1	778.2	559.7	–	–
2	Protein (gm)	2.8	–	7.8	–	12.3	16.0	16.6	13.8	17.7	13.6	17.6	16.8	–	22.7	24.4	20.9	14.3	–
		–	–	1.7	–	5.3	5.1	7.2	2.8	3.8	0.3	0.4	11.7	–	9.4	6.2	10.7	–	–
3	Vit A (mg)	156.0	–	313.5	–	408.8	621.9	599.8	582.4	556.7	642.5	780.4	644.3	–	887.7	796.7	899.3	629.2	–
		–	–	152.4	–	136.0	154.3	246.6	186.0	77.0	67.8	51.5	199.0	–	402.1	138.7	127.2	–	–
4	Vit. B_2 (mg)	1.9	–	11.4	–	37.4	15.5	18.4	21.6	23.2	50.2	31.8	42.8	–	76.4	26.6	44.4	67.9	–
		–	–	6.4	–	26.1	10.0	9.1	15.1	3.6	45.7	43.4	39.7	–	74.1	9.2	32.2	–	–
5	Vit C (mg)	14.9	–	21.5	–	32.4	47.7	47.0	51.3	44.1	56.5	70.4	55.2	–	82.9	58.4	70.3	67.1	–
		–	–	11.9	–	10.1	12.8	22.6	12.9	5.2	7.6	39.7	16.1	–	23.5	8.8	21.9	–	–
6	Cal (mg)	100.5	–	244.6	–	336.5	432.4	461.0	496.6	470.8	589.0	734.7	508.4	–	877.2	762.3	761.1	608.3	–
		–	–	145.7	–	76.2	150.7	185.6	183.3	95.3	144.4	34.8	132.3	–	7.3	329.8	309.2	–	–
7	Iron (mg)	1.8	–	2.9	–	5.8	5.4	7.0	6.6	7.6	8.7	15.2	9.9	–	13.4	10.7	11.7	17.4	–
		–	–	1.1	–	1.1	1.1	2.0	2.1	2.4	1.6	6.1	4.7	–	1.3	3.2	5.6	–	–

TABLE 16

Comparison of 1989 calorie and protein intake with reference*(a) (by age and sex). n = 62

Age (yr)	Sex	No.	Observed*(b) Kcal	Observed*(b) Pr(gm)	Reference Kcal	Reference Pr(gm)	Percentage of Ref. Kcal %	Percentage of Ref. Pr(gm) %
≤ 1	Combined	1	273.2	2.8	880	14	31.0	20.0
1-1 – 3	Combined	5	1231.9	7.6	1250	14.5	98.6	52.4
3+– 5	Combined	14	1064.4	12.3	1550	17.5	67.4	82.7
5+– 7	M	4	1514.2	16.6	1850	21.0	81.9	79.0
5+– 7	F	4	1135.3	13.8	1750	21.0	64.9	65.7
7+– 10	M	4	1386.3	17.7	2100	27.0	66.0	65.6
7+– 10	F	5	1565.1	23.6	1800	27.0	86.9	87.4
10+– 18	M	2	1547.9	17.6	2525	46.3	61.3	38.0
10+– 18	F	6	1562.3	16.8	2085.5	42.5	74.9	39.5
18+– 30	M	–	–	3	3000	48.7	–	–
18+– 30	F	3	1963.2	22.7	2418.8	43.1	72.6	52.7
30+– 60	M	5	2138.7	22.9	2703.6	48.7	79.1	42.9
30+– 60	F	8	1669.8	24.4	2284.4	43.1	73.1	56.6
> 60	M	1	1103.5	14.3	2703.6	48.7	40.1	29.4
> 60	F	–	–	–	–	–	–	–

(a)*Reference values are taken from FAO/WHO/UNU 1985
(b)*Observed values are obtained by weighing method of dietary assessment in 1989.

TABLE 15

Percentage of reference intake of caloric and protein by same sample households in 1984 (n = 66) and 1989 (n = 62)

Nutrient	% Kcal		% Protein	
Age group/sex	1984	1989	1984	1989
≤ 1 combined	62.1	31	60.8	20.0
1·1 – 3 combined	70.0	98.6	86.6	52.4
3·1 – 5 combined	78.5	67.4	101.2	82.7
5·1 – 7 male	70.1	81.9	102.4	79.0
5·1 – 7 female	78·5	64.9	112·0	65.7
7·1 – 10 male	65.2	66.0	72.3	65·6
7·1 – 10 female	60.8	86.9	72.6	87.1
10·1 – 18 male	69.4	61.3	70.2	38.0
10·1 – 18 female	80·0	74.9	66.7	39.5
18·1 – 30 male	61·7	–	69.7	–
18·1 – 30 female	62.5	72.6	50.5	52·7
>30 male	68·2	79.1	76·8	42.9
>30 female	68·7	73.1	58·2	56·6

Tables 16 and 17 differentiate between intakes of other nutrients in 1984 and 1989 from all the 12 household members and reveal greater percentage intake in 1984 than in 1989 period with vitamin A ranging from 200%–1000%, vitamin C ranging from 150%–226%, and calcium from 40% – 150% Vitamin B2 intake was however greater in 1989 (1300% – 2154%), while iron intake remained low in both periods (40% –80%) in 1984 and 40% – 82% in 1989)

TABLE 16

Percentage of reference (FAO 1974) intake of nutrients in 1984*
n = 66

Age range (years)	n	Vit. A(%)	Vit. B2(%)	Vit. C (%)	Calcium %	Iron %
<1	2	200	40	150	40	40
1 – 3	4	400	60	150	100	55
4 – 6	9	500	90	200	100	55
7 – 9	5	600	84.6	200	100	60
10 – 12 male	5	800	85.7	200	100	60
13 – 15 male	5	1000	98.2	226	100	75
16 – 19 male	5	1000	93.2	226	150	80
10 – 12 female	3	600	88.8	166.7	100	50
13 – 15 female	4	600	100	200	100	60
16 – 19 female	6	800	107	200	100	60
Adult man	6	800	86.7	200	120	70
Adult woman	12	700	92.0	166.7	100	60

*Data is drawn from same 12 subsample households in 1984.

TABLE 17

Percentage of reference (FAO 1974) intake of nutrients in 1989* n = 62

Age group (years)	(A)	Vit. A(%)	Vit.B2(%)	Vit. C(%)	Calcium(%)	Iron(%)
≤ 1	1	60	1300	110	60	40
1 - 3	5	164	1937	150	60	52
4 - 6	10	140	2000	150	80	50
7 - 9	5	153	1961	200	92	62
10-12 M	8	104	1562	240	71.4	70
13-15 M	3	110	1647	166	92	51
16-19 M	3	133	1667	200	100	50
10-12 F	10	104	1716	200	64.4	42
13-15 F	4	82	1580	162	71.4	50
16-19 F	3	104	2000	167	100	00
Adult man	3	94	1944	166	120	82
Adult woman	7	93	2154	200	100	50

*Data is drawn from 12 subsample households in 1989.

Percentage (of reference) intake amongst children ≤ 10 years:

The percentage of reference intake in calorie and protein amongst the ≤ 10 year old from the subsample households did not significantly differ between 1984 and 1980 periods (at 60% - 78.5% and 31% - 88.3%) respectively though intake by ≤ 1 year olds tended to be very low (31%). On the other hand, protein intake was larger in 1984 (59.3% - 102.9%) than in 1989 (20 - 82.7%) (Table 18).

Percentage (of reference) intake of other nutrients indicates larger intake of vitamin A and calcium in 1984, but larger intake of vitamin B2 in 1989 (Table 19). while intake of vitamin C and iron did not present

significant differences in in-takes (40 – 62%) was however low for all age groups in both periods.

TABLE 18

Percentage (of reference*) intake of calorie and protein in children ≤ 10 years for 1984 and 1989 (drawn from some 12 subsample households)
n = 35; n = 37 respectively

Age	≤1		1:1–3		3.1 – 5		5.1 – 7		7.1 –10	
Nutrient	1984	1989	1984	1989	1984	1989	1984	1989	1984	1989
Kcal	60.3	31.0	70.4	88.8	78.5	62.4	77.9	73.4	71.7	76.5
PR (gm)	59.3	20.0	89.0	52.4	102 9	82.7	96.7	72.4	66.7	65.7

*Reference is the FAO 1985 calorie and protein requirement

TABLE 19

Percentage (of reference*) intake of other nutrients in children ≤ 10 years old in 1984 and 1989 (drawn from same household samples n = 35, n = 37 respectively

Age:	1		1 – 3		4 – 6		7 9		10 12	
Nutrient	1984	1989	1984	1989	1984	1989	1984	1989	1984	1989
Vit A (mcg)	200	60	400	164	500	140	600	153	700	104
Vit.B2 (mg)	40	1300	60	1937	90	2000	84.6	1961	87.3	1639
Vit C (mg)	150	110	150	150	200	150	200	200	183.3	220
Calcium (gm)	40	60	100	60	100	80	100	92	100	67.9
Iron (mg)	40	40	55	52.5	55	50	60	62	57.5	56.01

*Reference is FAO (1974) nutrient requirement.

Anthropometric data:

In order to assess the extent of malnutrition (or nutritional status deficit) on the target population of infants and children, certain international standards such as the National Center for Health Statistics (NCHS) (WHO 1983 and FAO 1985) were used as references for comparison with observed indicators of weight–for–height, height–for–age, and others.

Appendix 8 shows the comprehensive anthropometric measurements of children 6–60 months in their respective sexes and ages

Stunting was identified in the 6–60 months old children by using the standard deviation (SD) units (or the Z score distribution), in which 52 (46%) of this age group was below (–1 SD to –3 SD) the reference median with 34 (29.8%) boys and 18 (15.8%) girls. Evidence of stunting is thus exhibited more in boys than in girls in relation to the reference population (WHO 1983) The peak frequency for boys was below the first standard deviation (–1 SD), while that of the girls was on the median The degree of severity (at–2 to–3 SD) was greater on boys (8.5%) than on girls (3.6%) (Fig.13), while the growth for girls tended to extend above the 2 standard deviation (+2 SD).

However, the percentage of observed population on the median range was much below the reference median.

Evidence of wasting (weight-for-height) was more severely, exhibited in boys than in girls in the 6–60 months age group, in which 51 (44.7%) children of both sexes were below the reference median (-1 to -3 SD), with 33 (29%) girls and 18 (15.7%) boys. (Fig. 14) .22 (19.3%) children of both sexes were actually wasted (at -2 to -3 SD) based on the WHO (1983, and 1986) standard, with 17 (14.9%) boys and 5 (4.4%) girls.

The peak growth for girls corresponds to the reference median, while the peak growth for boys was below the 1 standard deviation (-1 SD).

Generally, therefore, girls were much less wasted than boys.

Degree of wasting (weight-for-height) of the target group which was compared with the NCHS (1983) reference (and using Waterlow 1977 classification) indicates that 17 (89.5%) of the ≤ year old were mildly wasted, 18 (39.1%) of the 1.1-3 year were moderately wasted, and 38 (77.6%) of the 3.1-5 year olds were more severely wasted. This indicates a majority (73; 64%) of under weight age group.

The arm circumference indicates that 18 (94.7%) of the ≤1 year old were more severely wasted, 27 (58.7%) of the1-3 year old were moderately wasted, and 48 (98%) of the 3-1-5 year old were also more severely wasted, confirming the weight for height pattern of wasting (tabel 22).

wasted, and 48 (98%) of the 3–5 year old were also more severely wasted, confirming the weight for age pattern of wasting.

The skinfold measurements confirms the arm circumference status, in which 18(94.7%) of the < 1 year old exhibited wasting, 27 (58.7%) of the 1–3 year old were wasted, while all (100%) of the 3–5 year olds were wasted mostly on the third degree level (Table 22).

In figure 15 in which girls tended to be less wasted than boys with values distributed mainly along the median of the reference and with 5 (17.2%) of the population extending above the 2 standard deviation (+2SD). The percentage population of the boys above the median declined steeply, while that of the girls rose steeply, indicating a unique distribution curve, and confirming the sharp increase in growth from the 3rd to the 75th percentile as presented in figures 16 and 17. Wasting therefore inclines more on the boys than on the girls.

TABLE 20

Extent of wasting (weight-for-height; using Z score) on children 10–18 years; n = 17

Nutritional level Median*	Boys No.	Boys % frequency	Girls No.	Girls % frequency
Median reference	—	—	—	—
Above 2 SD	1	10%	1	10%
Above 1 SD	2	20%	—	—
Below 1 SD	1	10%	4	40%
Below 2 SD	1	10%	—	—
Below 3 SD	5	50%	2	20%
	10	100%	7	100%

*Median reference from NCHS (FAO/WHO/UNU 1985, Annex 2). (as taken from Baldwin 1925).

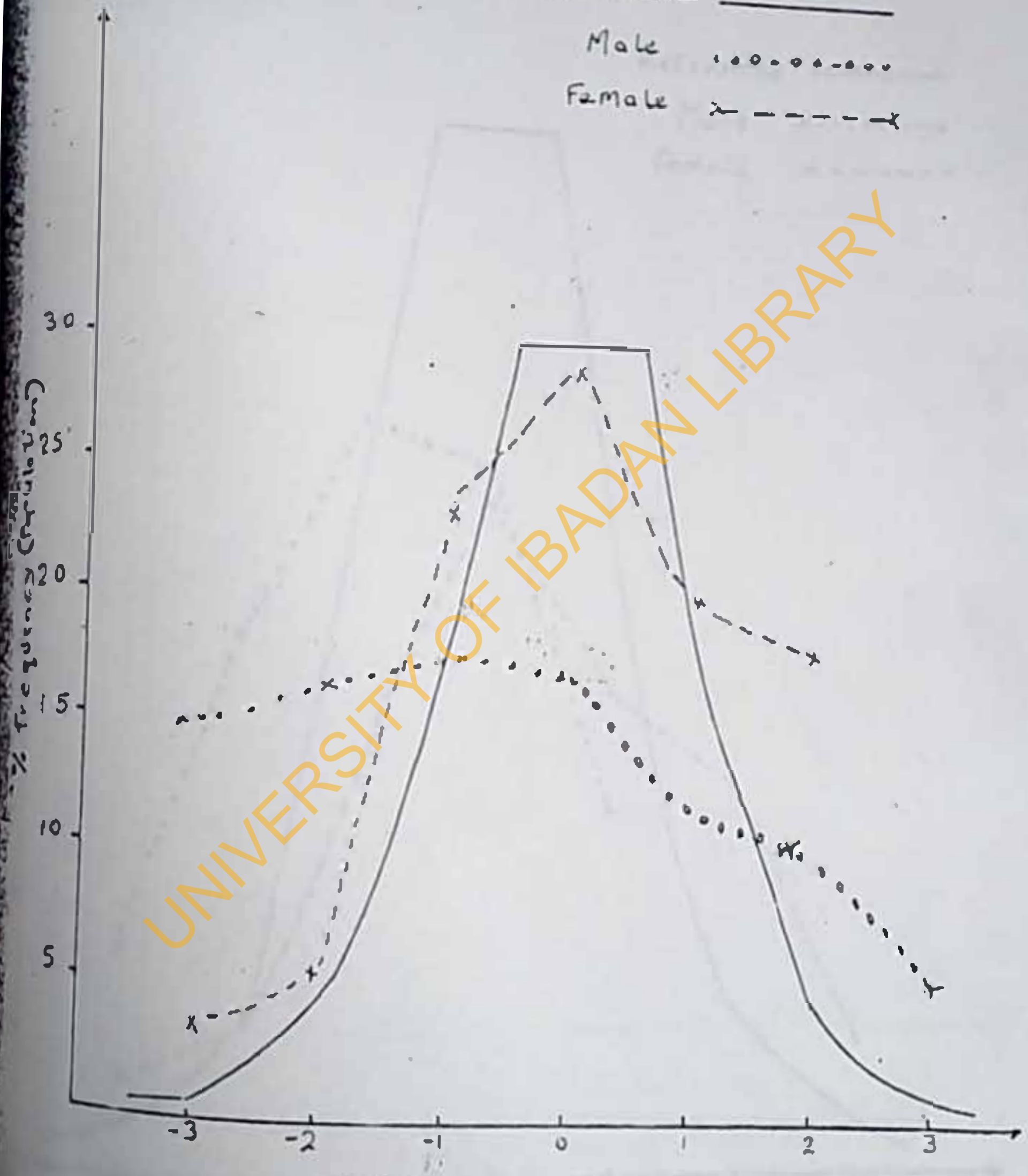

Fig 14: Distribution curves of weight-for-height of children 6–60 months (in relation to reference –(WHO 1983) n = 114

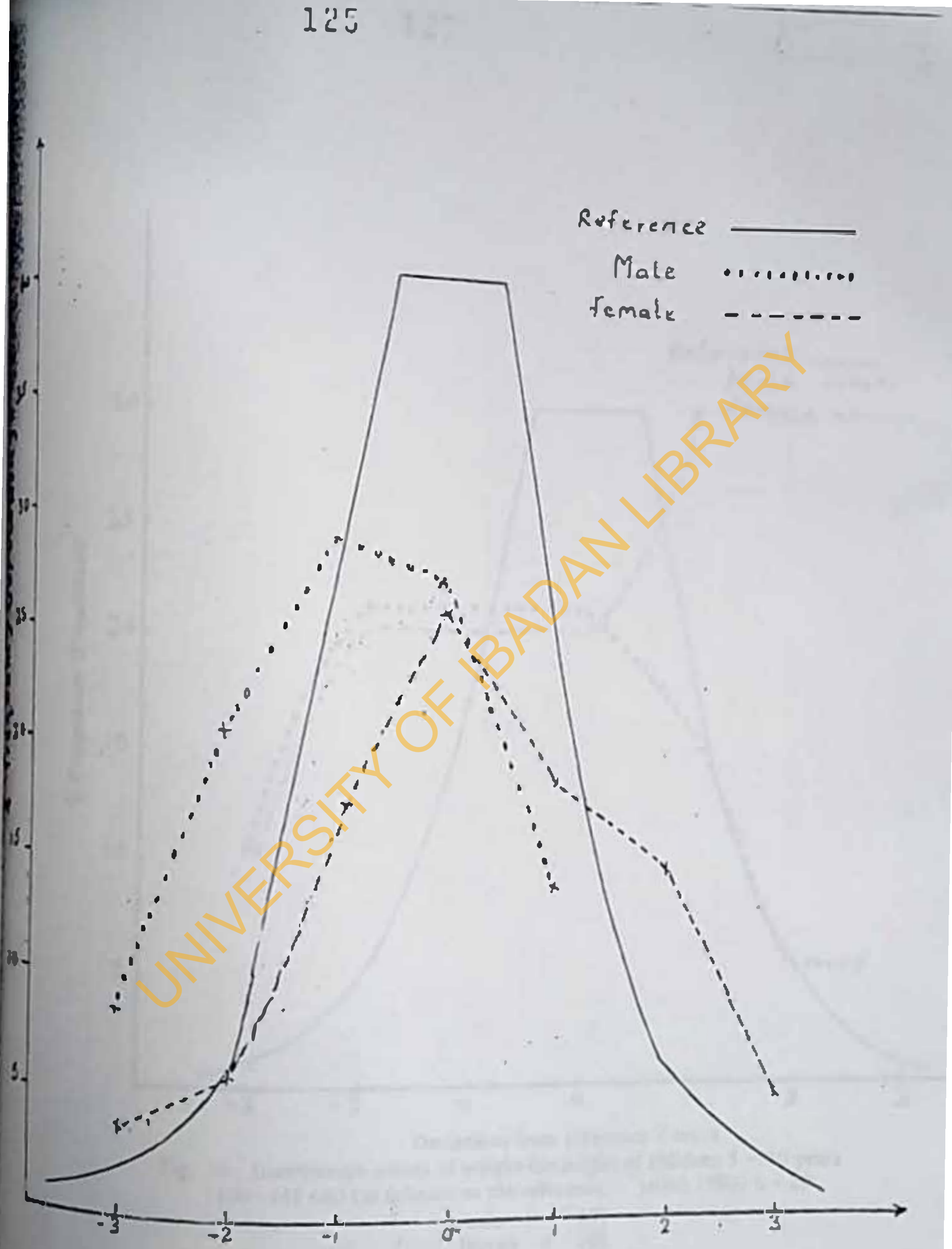

Fig 13: Distribution curves of height-for-age of children 6–60 months (in relation to reference – (NHS. 1983) n = 114

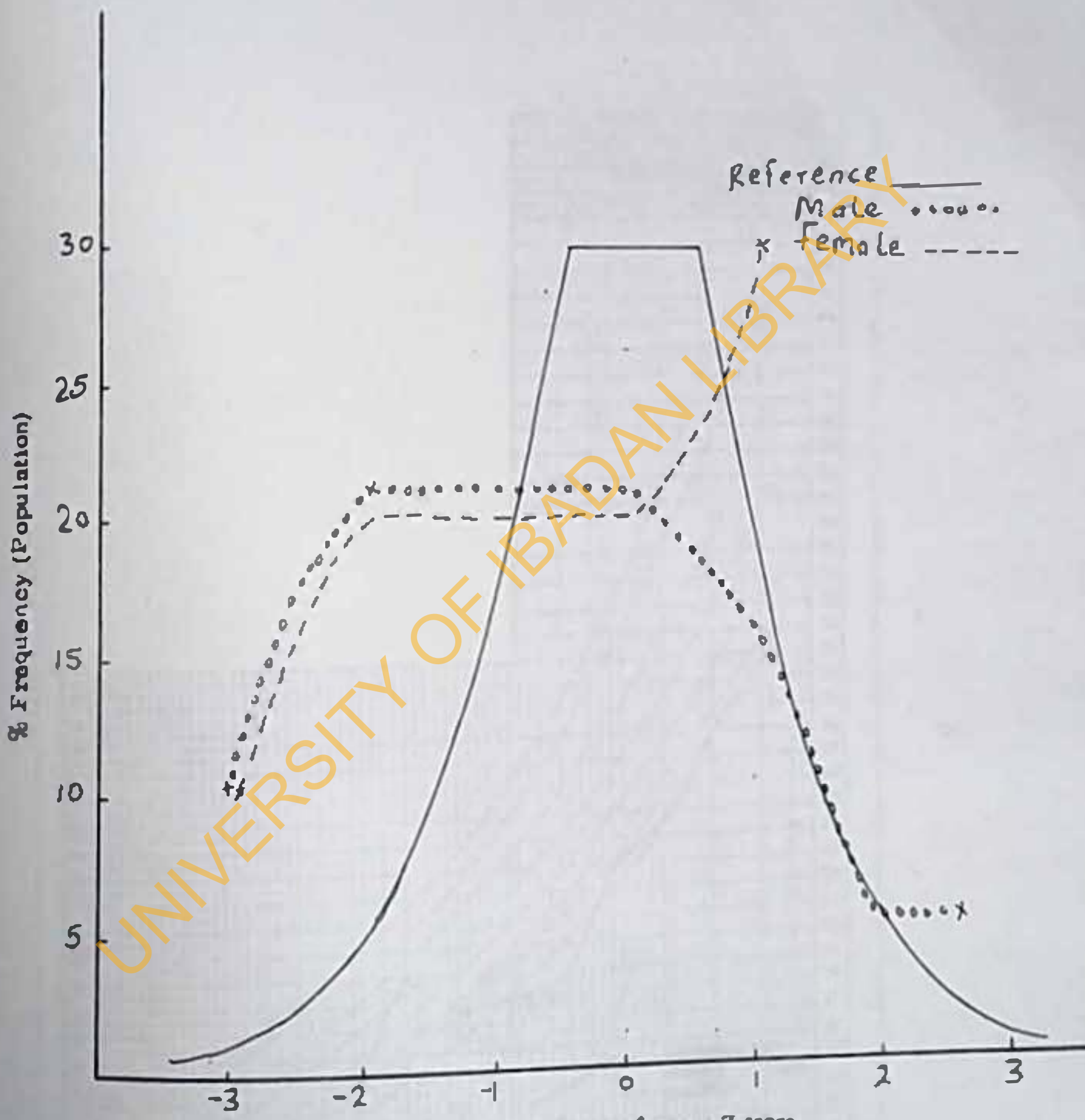

Fig. 15: Distribution curves of weight-for-height of children 5 – 10 years (100–145 cm) (in relation to the reference – WHO 1983) n = 29
male = 19)
female = 10)

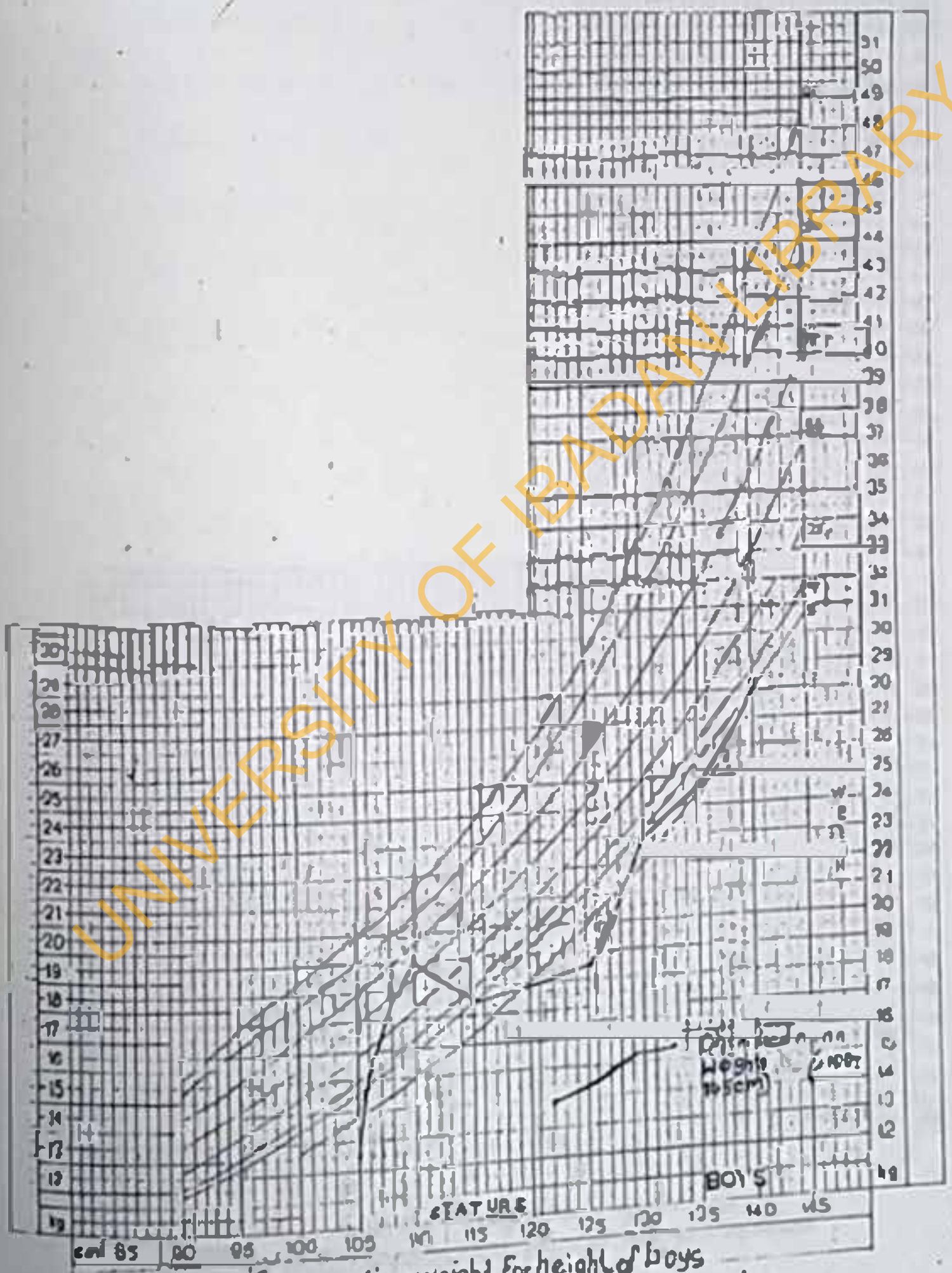

Figure 16 Comparative weight for height of boys 100-145 cm (5-10 years) using WHO (1983) Percentile values.

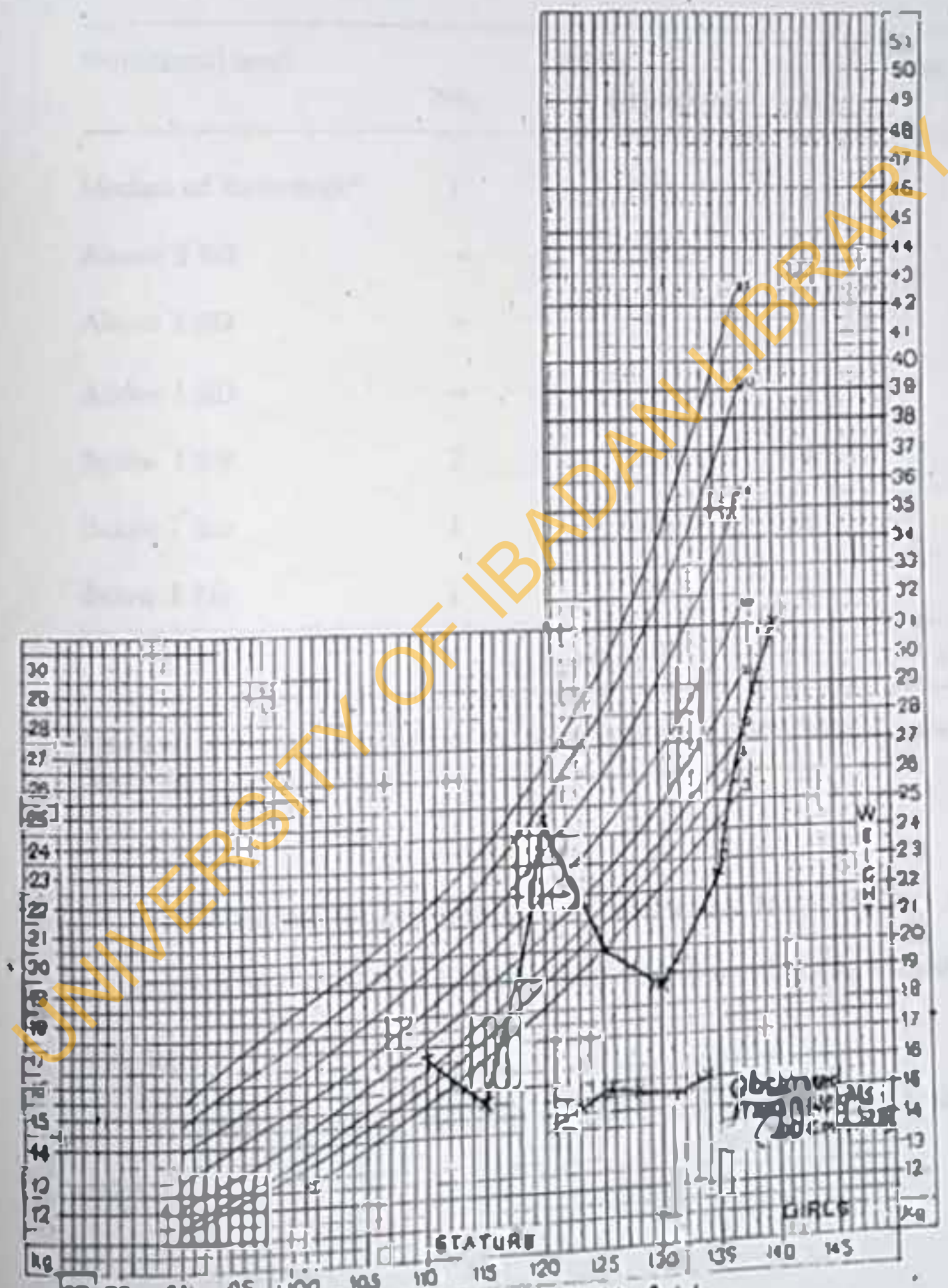

Figure 17 Comparative weight for height of girls 100-145 cm (5-10 years) using WHO (1983) Percentile values

TABLE 21

Extent of wasting (weight-for-height; using Z score) on adults (≥18 years) n = 18

Nutritional level	Males No.	Males % frequency	Female No.	Female % frequency
Median of Reference*	1	20%	3	23%
Above 3 SD	–	–	–	–
Above 2 SD	–	–	–	–
Above 1 SD	–	–	1	8.0%
Below 1 SD	2	40%	4	31%
Below 2 SD	1	20%	2	15%
Below 3 SD	1	20%	3	23%
	5	(100%)	13	(100%)

*Median reference taken from NCHS (FAO/WHO/UNU 1985 Annex 2), (as given by Metropolitan life insurance Co. 1960).

The observed weights for girls are below the 3rd percentiles but rises to the 25th and 75th percentiles respectively, thus exhibiting similar pattern as in figure 17

Generally, majority (62.1%) of the 5–10 year age group are underweight.

TABLE 22

Degrees of malnutrition using various indicators – children 0.5 – 5 years, n = 114*

	Age (years)	Normal (Standard) > 95%		Malnourished (in %) 1st 90 – 94		2nd 85 – 89		3rd < 85		Total Subjects	
		No.	%	No.	%	No.	%	No.	%	No.	%
Arm Circum-ference for age	< 1	1	(0.88)	4	(3.51)	8	(7.02)	6	(5.26)	19	: 16.67
	1 – 3	19	(16.67)	6	(5.26)	4	(3.51)	17	(14.91)	46	: 40.35
	3.1 – 5	1	(0.88)	6	(5.26)	19	(16.67)	23	(20.18)	49	: 42.98
										114	: 100.00
Triceps skinfold for age	< 1	1	(0.88)	4	(3.51)	8	(7.02)	6	(5.26)	19	: 16.67
	1 – 3	19	(16.67)	6	(5.26)	4	(3.51)	17	(14.91)	46	: 40.35
	3.1 – 5	0	(0.0)	0	(0.0)	1	(0.88)	48	(42.11)	49	: 42.98
										114	: 100.00

*WHO (1983) standard - using Waterlow 1977 classification.

Extent of wasting in the adult (10.1-18 years old) is indicated in Table 20 which shows that the boys 5 (50%) in the 10-18 year age group were more severely wasted (-3SD) than their female 2(28.6%) counterparts (at -3SD). The percentage of the population in the median weight range were nil (0%) for both sexes.

Extent of wasting in the adults (>18 year old) is shown in Table 21 which indicates that the females were less wasted than the men. While 3 (23%) of the women were on the median weight range, 3(23%) were conversely on the -3SD weight range. However, the smallness of the adult group makes comparison difficult.

Wasting of the subcutaneous tissue (skinfold measurement) of the target group (Table 22) follows similar weight-for-height pattern in which 18 (94.7%) of the ≤1 year old were wasted, 27 (58.7%) of the 1.1-3 year old were wasted and all the 49 (100%) of the 3.1-5 year old were more wasted than the preceeding age groups.

In table 23 is shown the variations in seasonal growth between harvest and hungry season in the 6–60 month age group, which indicates that the females (40%) tended to be more sensitive to seasonal changes than the males (20%). There were generally weight gain during the succeeding season (the hungry season).

Similarly, the deficit in weight between the two seasons in the 6–24 month age group was exhibited in 30% of the population (Table 24), and the deficit was more manifested in the boys (at 35%) than the girls (at 25%), though the 24 month age group exhibited no weight deficit.

TABLE 23

Variation in weight —— harvest (1984) to hungry (1985) season; 6–60 months old children, n = 114

Age	Sex	Mean weight differentials % weight gain	% weight loss
6	male	25%	
6	female	21%	
12	male	6%	
12	female	18%	
18	male	7%	
18	female	–5%	5%
24	male	12%	
24	female	8%	
30	male	9%	
30	female	17%	
36	male	11%	
36	female	–27%	27%
42	male	03%	
42	female	–06%	6%
48	male	–08%	8%
48	female	10%	
54	male	–12%	12%
54	female	4%	
60	male	21%	
60	female	–5%	5%

TABLE 24

Wasting between harvest (1984) and hungry (1985) seasons - children 6 - 24 months - n = 47

Age (mth)	Sex	Weight in harvest season (kg)	Weight in hungry season (kg)	gain in Wt. kg(gm)	Expected gain in Wt. gm	Deficit in growth (gm)	% Deficit
6	Male	6.1	8.1	2 (2000)	4047	2047	50%
12	,,	7.6	8.1	0.5 (500)	1356	856	63.1
18	,,	13.0	14.0	1.0 (1000)	1356	356	26.3
24	,,	13.0	14.7	1.7 (1700)	—	—	—
6	Female	6.3	8.0	1.7 (1700)	4047	2347	58
12	,,	8.4	10.1	1.7 (1700)	1356	+244	+25.4
18	,,	12.8	12.0	0.8 (800)	1356	556	41.0
24	,,	12.7	13.8	1.5 (1500)	—	—	—

*a Weight in hungry season was taken six months after the assessment in harvest season.

Nutritional status (using anthroponetry) of children ≤10 years (drawn from the 12 subsample households:

The weight for height between 1984 and 1989 of children ≤10 years from the sampled households in 1984 indicates various degrees of wasting (-1SD to -3SD) (WHO 1983) (Table 25) because 8(53.3%) of the boys and 5(25%) of the girls populations were wasted. Similarly in 1989 children from the corresponding age groups suffered from various degrees of wasting in which 14 (73.7%) of the boys and 7 (38.9%) of the girls were wasted. The boys however were more severely malnourished than the girls (Table 26).

In comparing the two periods 8(22.9%) out of the 35 (100%) children were on the median (weight-for-height) in 1984, 12 (34.3%) children were severely wasted, and 14 (40%) were above the median range, while in 1989, 3 (8.1%) out of the 37 (100%) children were on the median range, 12 (32.4%) were mildly wasted, 6 (16.2%) were more severely wasted and 14 (37.8%) children were above the median ranges. This indicates a very slightly increased weight (for the age group) in the previous 1984 period.

TABLE 25

The nutritional status (weight-for-height) of children ≤10 years from 12 subsample households in 1984 n = 35

National level (Deviation from median*)	Boys No.	Boys % frequency	Girls No.	Girls % frequency
Median	3	20	5	25
Above 2 SD	–	–	2	10
Above 1 SD	4	27	8	40
Below 1 SD	5	33	3	15
Below 2 SD	2	13	2	10
Below 3 SD	1	7	–	–

*Median refers to WHO (1983) reference.

TABLE 26

The nutritional status (weight-for-height) of children ≤10 years, from same 12 subsample households (1989) n = 37

Nutritional level (Deviation from median*)	Boys No.	Boys % frequency	Girls No.	Girls % frequency
Median	2	10.5	1	5.6
Above 2 SD	–	–	2	11.1
Above 1 SD	3	15.8	8	44.4
Below 1 SD	8	42.1	4	22.2
Below 2 SD	4	21.1	3	16.7
Below 3 SD	2	10.5	–	–

*Median refers to the (1983) reference.

Relationship between nutrient intake and the nutritional status of children ≤10 year from the sampled households indicates that though caloric intakes were low in 1984, better and higher intakes were generally indicated and were more evenly (60–78.5%) distributed amongst the age groups than in 1989 intakes (31–88.6%). (Tables 18 and 19). Protein intake followed similar pattern. Likewise the extent of wasting on the target group in 1984 was a little less than in 1989 (14.3% versus 16.2% for 1984 and 1989 respectively).

Morbidity pattern:

The total disease incidences for the study period was 158 and 106 during the harvest and hungry seasons respectively.

Fever was most prevalent in August and September (at 18 incidences each). Cough and catarrh were most prevalent in October, December, and February (at 10, 10 and 14 incidences respectively). Diarrhoea and or vomitting were most prevalent in August, September and March at 6 incidences each The prevalence of isolated vomiting or catarrh was very minimal with 3 incidence each in August. However, each disease tended to cut across the harvest and hungry season (or the wet and dry season).

Table 27 indicate the prevalence of infectious diseases in the children in September (wet season), which was repeated in March (dry season). However, the least periods of disease incidences were July (1984) and June (1985) (all in wet season).

TABLE 27

Ranking of disease prevalence by season

Harvest	No. of incidences	Hungry	No. of incidences
Sept.	40	Mar.	39
Aug.	34	Feb.	23
Dec.	32	Apr.	20
Oct.	24	Jan.	10
Nov.	21	May	8
July	7	June	6

TABLE 28

Parasitic infestation (children 0.5 – 5 years)*

Parasites	Harvest July–December (1984) No. Exam.	No. Infested	% Infested	Hungry January-June (1985) No. Exam.	No. Infested	% Infested
Hookworm	62	24	38.7	58	12	20.7
Ascaris	62	13	20.8	58	23	39.6
Trichirius	62	11	17.7	58	8	13.9
Tape worm	62	1	1.6	58	–	0.0.
Total	62	49	79.0	58	43	74.2

*Total examined = (62 + 58) = 122

Total infested = (49 + 43) = 92 (75.4%)

Harvest: Hungry infestation ratio = 49 : 43 (114%)

Parasitic infestations:

During the entire study period, Ascaris infection (30.2%) predominated, followed closely by Ankylostomiasis (70%), and least by Trichirius (5.8%) infection. Tape worm infection was very minimal (0·8%).

Ecological factors associated with malnutrition in the village:

Table 6 and figure 2 indicate that the socio-economic status of the community was generally low in which 78 (70.9%) scored ≤50% (Appendix 6). Table 5 also reveals that 67 (62%) of the households were on the low income of N1–N200 per month) and only 2 (1.8%) were on high income. The occupational pattern indicated that 63.6% households were petty traders or peasant farmers or both (Appendix 7), (figure 3), while the rest were either low scale tradesmen or employees on daily paid basis. The literacy pattern indicates that only 56.92% were literate and mainly on the primary and post-primary level (Tables 6). An average family size of 6 was considered large for adequate maintenance (Table 5).

The calorie and protein intake of the individual was equally shown to be low at 67.8% and 75% respectively per person in 1984 and 31%–98.6% of calorie with 20%–87% of protein (in all groups) in 1989 (Tables 10–15).

The multiple regression analysis:

The aim of the analysis is to determine the influence that each of the independent variables (the household socio-economic status, the source of food supply, and the nutrient intake) has on the dependent variable (the nutritional status of children ≤10 years). A sample of qualified 60 households who participated in the analysis (appendix 14) indicated that.

On socio-economic status and food supply, income and food supply system significantly ($P \leq 0.05$ and $P \leq 0.01$) influenced the nutritional status of the ≤1 year olds.

Family occupation and food purchasing system influenced the nutritional status of the 1.1-3 year old, (though not at a significant level of $P \leq 0.05$).

Family income, family size, and crop consumption and food purchases influenced the nutritional status of the 3.1-5 year old (though not at significant levels of $P \leq 0.05$).

Family income, family size, and crop production system influenced the nutritional status of the 5.1-7 year old (though not at significant levels of $P \leq 0.05$).

While finally crop production system, and the socio-economic variables of income, occupation and education (on equal levels) influenced greatly the nutritional status of the 7.1-10 year olds.

In summary therefore, income, family size and occupation greatly influenced the nutritional status of 1.1-7 year olds, though not at significant levels of $P \leq 0.05$; except the ≤ 1 year olds where their nutritional status was significantly ($P \leq 0.05$, and $P \leq 0.01$) influenced by family income, family education, and food production system respectively. Similarly food crop production and food purchases greatly influenced (though not at $P \leq 0.05$ significance) the nutritional status of 1.1-10 year old.

The effects of nutrient intake on the nutritional status of children ≤ 10 year shows that the nutritional status of the entire children was very significantly influenced ($P \leq 0.05$ – $P \leq 0.01$) by their respective nutrient intakes.

Test of correlation:

The association between the nutrient intake and the socio-economic, factors and food supply are not strong for any of the age groups (Table 29).

TABLE 29

Correlation coefficient (r) analysis

The correlation coefficients for the association between the nutrient intake of children (≤ 10 years), and the socio-economic status and food supply

	N.1 ≤1 Var 08	1-1 – 3 Var 09	3-1 – 5 Var 10	5-1 – 7 Var 11	7-1 - 10 Var 12
VAR 01	– 0.26370	0.15935	0.41847	0.11959	0.11519
VAR 02	0.04323	0.17969	0.24153	0.11467	0.09204
VAR 03	0.02566	0.14113	0.30560	0.00537	0.26929
VAR 04	– 0.08875	0.07853	0.38687	0.16299	0.15383
VAR 05	– 0.03029	0.17960	0.23824	0.22150	0.29099
VAR 06	– 0.06353	0.22909	0.12811	0.18617	0.22850
VAR 07	– 0.20794	0.01509	0.19819	0.00591	0.08430

TABLE 30

The correlation coefficients for the association between the anthropometric status of children (≤ 10 years) and socio-economic status, sources of food supply, and nutrient intake

	N.S≤1 Var 13	N.S 1-3 Var 14	N.S 3-5 Var 15	N.S 5-7 Var 16	N.S 7-10 yrs Var 17
VAR 01	– 0.28730	0.12494	0.27250	0.36316	– 0.01403
VAR 02	– 0.34980	0.34970	0.33209	0.01303	– 0.17312
VAR 03	– 0.31906	0.23001	0.31268	0.21607	0.05072
VAR 04	*0.65308	0.03112	*0.45048	0.08372	– 0.08018
VAR 05	– 0.22877	0.11474	0.38082	*0.42448	0.23624
VAR 06	*0.38786	0.11322	0.26947	0.39638	0.05336
VAR 07	0.35500	0.20844	0.24338	0.20972	– 0.16333
VAR 08	0.19211	0.05955	– 0.08682	– 0.30905	– 0.24668
VAR 09	– 0.25698	*0.82191	0.01810	– 0.22896	– 0.09281
VAR 10	0.30463	0.02172	*0.79934	0.13499	0.31448
VAR 11	0.01563	0.30759	0.13321	**0.81746	0.12980
VAR 12	0.10374	0.10381	*0.46285	– 0.03476	*0.75488

*Significance ($P < 0.05$)
**Significance ($P < 0.01$)

TABLE 31

The association (r) between nutrient intake of children and socio-economic status and sources of food supply

Age (years) ≤ 10 year old.

The level of significance of association for all age group is negligible.

TABLE 32

The association (r) between the anthropometric status of children (≤10 years) and socio-economic status, food supply, and nutrient intake

Age (years)	Level of association:	
≤ 1	food consumption significant negatively	$P < 0.05$
1-1 – 3	nutrient intake of 1-– 3 significant	$P < 0.01^{**}$
3-1– 5	Family size significant	$P < 0.05^{*}$
	Nutrient intake of 3-5 year significant	$P < 0.01^{**}$
5-1– 7	Crop production significant	$P < 0.05^{*}$
	Nutrient intake of 5-7 year significant	$P < 0.01^{**}$
7-1– 10	Nutrient intake of 7-10 year significant	$P < 0.05$

Degree of freedom – dr = 58

*Significant level 0.95 = 0.388

**Significant level 0.99 = 0.496

The nutritional status of the children related strongly with the socio-economic status and the sources of food supply to the families. (Table 30). However, the strength of the association varied with the factors and among the age groups. Thus significant correlation was observed between nutritional status and food consumption of ≤ 1 year ($P \leq 0.05$), nutrient intake of 1-3 year ($P \leq 0.01$), in family size and nutrient intake of 3-5 ($P \leq 0.05$), in crop produced and nutrient intake of 5-7 year ($P \leq 0.05$), and in nutrient intake of 7-10 year olds ($P \leq 0.05$). The nutrient intake was not however significantly correlated to the anthropometric status of ≤ 1 year olds (Table 29, 32).

Limitations in the study:

A case study of this nature though an indepth investigation provides a focus on only a lone community amongst numerous other communities comprising Imo State. This study is therefore bound to be limited in its representativeness of the state. The following areas are worthy of note in this regard.

Determination of income level of population:

The problem one is likely to encounter in the determination of monthly earnings of a rural community, bearing in mind the socio-cultural factor existing there should be appreciated. For example, the difficulty in extracting facts on the sources of income and the amount made by the individual is increased by the fear that the interviewer would expose the facts and attract increased taxation on them, and also the fear of extra demand from dependants. However, the source of income in a rural community is never regular considering the subsistence economy, thus there is no doubt that a small helpless household like that of a widow would make less than N50 monthly.

Food and nutrient intake determination:

Efforts were made to determine the nutrient intake of the individual during the study. But the problem still remains on the accuracy of individual food portion in a situation like in the study village where central dining from one plate by household members obtained (Passmore et al 1975, Rockfeller 1963).

Individual nutrient intake determination was therefore based on the assessment of the individual percentage intake of the whole meal according to the information obtained from the housewife or housekeeper, using a 24-hour dietary recall method. However, since weighing method of assess

ment is more reliable than recall a subsample of all the households was surveyed using the weighting method to supplement the recall method.

The staples with high water content (HWC):

Efforts were made to provide comparable edible portion (EP) of local foods to the nutrient values of a recommended table (FAO 1968) by means of drying the HWC local foods. However, the variations in water contents of the staple foods of a region must be appreciated, for example the fluctuations in water contents that exist in seasonal foods (particularly the starchy root crops like yam, cocoyam and others). In determining the HWC, neither the very fresh foods nor the very dry foods were used, but rather the moderately dry ones were used. Likewise the size (quantity) of the fresh crop was equated adequately with the size of the dry crop as during the storage period, (eg. 1½ fresh maize on the cob was equivalent to 1 moderately dry maize on the cob.)

Moisture content conversion values were used such as:-

$$\frac{\text{\% dry matter of survey food}}{\text{\% dry matter of reference food}} \times \frac{\text{food (in gm)}}{1}$$

Vitamin A determination:

Since most vitamin A sources were from vegetable origin (red palm oil, and dark green vegetables), and very little from animal sources (crayfish,

fish and milk), Vegetable sources were converted to Retinol equivalent (by dividing with 6) during the calculation of nutrient values.

The protein quantity:

In compiling the protein intake in gm, the protein quality theory (FAO/WHO 1974, FAO 1968), was taken into consideration by reducing the mixed protein content of a meal to 65% during calculation since the study community consumed diets based on mixed vegetable proteins diets (maize, legumes, green vegetables, crayfish and fish).

Height versus length values in anthropometry:

It is appreciated that the recumbent length value used for younger children is greater than the standing height value by 1 cm (approx.) for younger children, decreasing in magnitude (0.5–0.7cm) in older children and adult. The conversion formular (Height, cm = length, cm minus) (3 – 0.03864 x age, month) as given by Stephenson et al (1983) was however not employed in the presentation of height/length values in the present study.

The nutritional status:

That the nutritional status is determined using many variables (such as clinical examination, radiological, and laboratory examinations) including anthropometric measurements is appreciated. This study uses primarily the anthropometric technique.

CHAPTER 5

DISCUSSION

The objective of this study is to trace the natural history of malnutrition in a village by identifying the ecological factors. The determinants of malnutrition are known to include some selected socio economic factors, food production and consumption tendencies, seasonality effects on food production, food intake and disease pattern. This chapter considers the entire situation as it affects the extent of malnutrition, the impact o reach factor on the nutrient intake, and therefore on the nutritional status particularly on infant and children and discussed in relation to the socio-economic situation of the study community in relation to other similar rural communities.

The existence of the study population on the basis of kindred units pattern of dwelling enhances protection of households and facilitates the execution of village projects (Gilles, 1969).

The demography of the study population indicates that the preschool (23%) and the school age population constitutated 60% of the total population while the adult (7/ 18 years) constituted 40%, thus indicating a preponderance of children population which increases the population of the unproductive sector over the productive ones thus creating a gap in productive processes. This situation is similar to reports on Akufo village (Gilles 1969) and on a Bangladesh village (Hussain et al 1986).

The presence of 34.4% of older adult in the community is suggestive of elderly population including the 4.20% of the >60 years old which also included 5 centinarians. This findings also confirm the report of 2.7% elderly population of the Akufo village, and also reveals thelongerlife span existing in such villages. However, the age trend indicated a greater population of adults, (>18 years) (39.7%) followed by that of preschool age group (24.1%). The primary and post primary school age were each the least in population following the outward drift of these adolescents to urban areas, and thus from rural occupation (farming, trading) to that of schooling, domestic jobs or job apprenticeship – the trend which was also reported by Gilles (1963) in Akufo village–Nigeria, and Hussain and Abdullah (1980) in Bangladesh. The preponderance of female adults (>30 years) over the male counterpart (at 12.5:86 ratio) is usually found within the Nigerian culture, following the polygynous nature of families (Gilles 1963), otherwise the overall variance between male and female population was generally minimal (238:289).

The socio-economic status of the community:

The socio-economic assessment showed that 78% of the household population was rated as of low socio-economic status, 24.6% rated as of middle, and 4.6% rated as of high socio-economic status. These ratings were however in relation to the socio-cultural assessment of thecommunity members and cannot be equated to identical socio-economic status in a metropolis or in the developed countries. Similarly, the socio-economic rating has

no bearing on the class statification observed in certain tropical or sub-tropical regions as reported in Nepal (Nabarro 1981), in Bangladesh (Chen et al 1979) or in Zaria, Nigeria (Tomkins 1981; Longhurst, 1981) where the land tenure system created wealthy landlords over poor peasants.

The income of the community members was essentially derived from petty occupation (such as combination of peasant farming and petty trading) and the small scale artisan jobs. The problem therefore in determining the income of such a family should be appreciated.

It was however observed that over 60% of the households were on low income (1—N200) by their own standard out of which 15.5% were on ±N50 per month. This tendency is obvious since occupation are subsistent in nature. The income for example was derived mainly from farm product sales, gifts from relations and petty trading. The peasant economy obtaining in the study village is thus synonymous with rural poverty as discussed by Chambers et al (1981) and Longhurst (1981) in which the characteristics of rurality kept revolving and perpetrating poverty and inadequacies.

In a rural community as obtained in the study village both husband, wife and even the offsprings (except for schooling) contributed in the maintenance of the family; the wife was responsible for household expenses while the husband was responsible for major expenses like school fees and commu-

nity contributions, and also complemented domestic expenses where necessary.

The female spouses engaged in similar occupation as their male counterparts because the wives were not culturally restricted to only households chores in contrast to their counterparts in Northern parts of Nigeria (as reported by Simmons 1981) and Longhurst (1981) where socio-cultural factors limit the choice of occupation to only traditional food processing and food preparation.

The high income earners (21.8%) who were on N450 per month, were on paid employment (such as civil servant), and the wealthy farmers (who were on middle income cadre of N201–400 per month) cropped on yam and palm products a little more than the rest of the community members and were not comparable to the wealthy farm land holders who farmed vast lands on livestock, groundnuts, and cotton (Chambers et al 1981, Chen et al 1979, Nabarro 1981), or on cocoa, coffee and cola-nuts (Collis et al 1962) thereby employing in their farms the peasants or the landless farmers.

In summary therefore, the occupational pattern in this community, indicates that majority (male and female) engaged in peasant farming being complemented with petty trading which placed majority on low monthly earnings. Likewise, the self employed artisans were mostly engaged in

masonry, carpentery, automobile engineering (mechanic), tailoring and hair dressing. The style of the economy, the land holdings from the scarce lands, and soil type all contributed immensely to the subsistent farming system and the low socio-economic status of the community as a whole, in contrast to certain other parts of Nigeria with vast farm lands facilitating large farm holdings that make for improved cash croping.

A polygynous family was composed of two or more wives, each constituting a household though with one husband as the head of the extended family. The community was a christian one and was not a highly polygynous one. The impact of a large family size on a household is the limited per capital income allocation, limited education resources, and house keeping resources including feeding resources, and also the increased demand from family members. These precipitated to poor feeding and poor nutritional status. The average (67.2%) household size was 5–8 though a few cases of 11 and 1 member family did exist. However, a typical Nigerian family of 7–8 members composed of the father, mother, 5 living offsprings and 1 house help like in the study village is considered normal, but problems do arise as to the distribution pattern of household resources particularly the food (Rockefeller, 1963) for it is a general knowledge that the intra-family food distribution system in the Nigerian society is discriminatory (more so on the distribution of animal protein food like meats, poultry, and egg)

in favour of the husband (Chambers et al 1981, Rockefeller 1963, Hussain and Abdullah 1980) who is the head of the house, the adult male offspring (if any), the wife, and lastly the children who are given the last bit without the meats or fish because as the culture has it, giving the young children meat, fish or egg will induce them into stealing food (Rockefeller 1963). This point is of particular significance in the study village where meal consumption was from common feeding pot. The food intake of the younger sibling was thus bound to be deficient. The family size issue and the deficient feeding pattern even with the elite socio-economic classes have been reported by Longhurst (1981) in his study and also in the Uboma (1963) village study.

The adverse effects of successive births or multiparity on a mother with large family is obvious (granting limited income) and this results to maternal nutrient depletion and poor nutritional status. This notwithstanding mothers in the study area and the environs aspired to have up to ten or more pregnancies to ensure the survival of at least 10 offsprings. Culturally, this was the highest prestige accorded a mother which culminated in a celebration of "Igbu eghu ukwu" (slaughtering a goat in appreciation) for the mother. The rearing of the offsprings was not taken into consideration, since relations could adopt some for rearing or as domestic helps. However, christianity and modernization are both modifying this culture.

The housing pattern in the village seemed not to have portrayed the true socio-economic status of the community, this is because the level of

the housing structure was above the income level, where 66%–82% of households constructed modern houses (with cement/zinc and windows, and only 13% still had mud/thatched housing. This situation also revealed the appreciation of good sanitation by the community which was very high, equally so was the refuse disposal system. These observations were in contrast to reports from some rural villages such as those in Guatancla, (Mata 1978). It would also appear that the aesthetic value of community was quite high as indicated in the competitive housing structure.

To further prove the sanitation level, tap water supply though not regular to the community existed nearly a decade ago and has since been supplemented by other sources of water supply – rain in rainy season, stream water in dry season and pond water for preparing farm products during harvest season. Water supply therefore did not require much energy expenditure on women and children such as created a threat to energy depletion on their counterparts in certain rural villages seen in Northern Nigeria (Fox 1953, Longhurst 1981, Tomkins 1981, Simmons 1981) or in Indian villages (Chen et al 1981).

As a predominantly vegetable crop producer, such foods as meat and fish, poultry, eggs, grains and cereal products were purchased to complement the staple foods. Considering the village subsistence economy, such basic but essential foods as crayfish and smoked fish were more commonly

purchased than meat, milk or egg because of the expensiveness of the later, while eggs were rather sold than consumed. Beef was sparingly purchased for special Sunday dish, or during celebrations. But sugar, rice, bread, ogbono, cow pea and such others not produced were all purchased (Table 6).

Comparison could not be made between purchases in this study, and purchases in other studies like Uboma Study because of currency exchange differences and time lag (1963 versus 1984). Equally so, the quantity of equivalence in Naira (N) would not be strictly reliable and realistic since price fluctuations and inflations were prevalent at the period of study. Fermented cassava and garri amongst root starches were purchased most by households (N26.50 per month per household), despite the extensive production of cassava in the area. Meat and fish purchases followed at N18.3 per household per month, and fruits and vegetables last because these were grown in large quantities.'

The nutritional status of the community:

The question is whether there were evidences of poor nutritional status (malnutrition) observed in the community. The anthropometric assessment done on the subject shows that there were deficits in growth as obtains in many rural communities of the developing countries. The comprehensive anthropometric data was compiled using the internationally accepted references like the NCHS (WHO 1983, WHO 1980) Appendix 8, and also the Waterlow (1977) standards and references. For example the height-for-age

which indicates the degree of retardation or stuntedness reflects the long term nutrient deprivation, while the weight-for-height reflects current wasting (or malnutrition), according to Jelliffe (1963), Waterlow (1977) and WHO (1983, 1986). The above references are thus employed in comparison with the observed indicators on the infants, children and the adults in order to determine the extent of deficits in the various anthropometric indicators used in the study population.

Considering the NCHS (WHO 1983) reference, 45.6% of the preschool children suffered various degrees of wasting in which the severity of wasting (-3 SD, weight-for-height) was more obvious in boys (8.5% of their population) than in girls (3.6% of the population).

Sixty-four percent of this age group (both sexes) were similarly observed to exhibit various degrees of wasting (weight-for-height) using Waterlow (1977) classification, in which the 3-4.5 year olds exhibited the most severe wasting while the 1 year olds exhibited the least wasting.

Evidence of severe stunting (at -3 SD) was also exhibited more in boys than in girls. .46% of this age group (both sexes) on the whole were observed to be mildly to severely stunted, especially on the 1.1-3 year olds. The muscle and subcutaneous wasting equally followed the weight index pattern.

In comparison with other communities the extent of PEM revealed less wasting in the study preschool children (at a population percentages of 44.7% than reported in their counterparts in Dayi (81.4% population) and Gamzago (89.4% of population) in Northern Nigeria (Simmons 1981, Longhurst 1984). But the reverse was the case where only 10.1% of the Nepalese counterparts were reported wasted (Nabarro 1981).

In the study population wasting was observed more in the 12–36 month olds especially in the 24–36 month group (Waterlow 1977). This observation is consistent with reports by Rowland et al (1977) in Gambia, by Gilles (1963) in Akufo village, (Western Nigeria), by Longhurst (1984) in the Caribeans, and by Nabarro (1981) in Nepal.

Considering similar communities data also reveals that while 46% of the study population exhibited various degrees of stunting 35.5% of Dayi (Nigeria) and 52% of the Nepalese counterparts exhibited similar stunted-ness. That stunting was more common on the 1–3 year olds in the study population was confirmed by Gilles study in Akufo village and Rowland's et al report in Gambia (1977).

Growth pattern 5.1 years to >18 years:

Over 51% of the 5.1–10 year age group suffered from mild to moderate wasting (weight-for-height), while 50% of the boys in the 10.1–18 year olds were severely malnourished (–3 SD) in contrast to the girls with

20% of the girls malnourished. Wasting was however more severe on the 10.1–18 year age group than on the 5.1–10 year age group, as is consistent with Nicols (1959) findings on the 7.1–9 year old (Northern Nigeria).

In the > 18 year old adults mild wasting was observed in 72% of the population. But the womenfolk exhibited more severe wasting than the men. This observation is also in agreement with Nicols (1958) findings on the Nigerians subjects in which subjects from the southern zone tended to be smaller than their northern zone counterpart. It will be observed that growth pattern of subjects tended to deteriorate with increasing age up to adulthood and this might be attributed to increased physical activity (toiling) (particularly the womenfolk) that is associated with subsistent economy.

In summary, the presence of malnutrition has been established in the community but in a mild to moderate level particularly in the preschool children. The general nutritional status was however higher than in many other comparative developing countries, where anthropometric status was influenced by the harsh seasonal changes in food consumption pattern, and also the poor weaning practices or breast feeding pattern as reported by Hauck and Tabrah (1963) in Awo-omama, and Omololu (1972) in Western Nigeria.

The seasonality effects:

Climatic variations refer to variations in the wet (rainy) and dry season observed in the study area which in turn effected changes on crop production and consumption pattern. The synergetic functionings of rainfall, temperature, winds, relative humidity, and the solar energy on food production processes must however be appreciated since rainfall does not operate in isolation in controlling plant growth or food crop production. The climate in the study village and the entire eastern zone of southern Nigeria exhibit a biomodal character (Chambers et al 1981) in which a prolonged rainfall (wet season) with short dry season are evidenced within the year. There was for instance a peak rainfall in May and August (336mm and 350mm respectively) in 1984, with an intervade of short dry season in November – February (51mm–5. 1mm per month) in 1985, (Federal Meterological Department, Imo State, 1985). This is typical of a tropical climate, as confirmed by Nwosu et al (1980) reporong on tropical rain forest region with more than eight months of rain in the year. It may therefore be assumed that the rain was adequate for the growth of the tropical crops- starchy roots, fruits, and green vegetables – throughout the year of study.

Wet season (April–November) in the study area and the environs is not synonymous with hungry season nor is dry season snynonymous with harvest season as obtains in the uninodal climate (Davey, 1962, Chen et

al 1979: Simmons 1981, Hussain 1984). This is because the two climatic periods are not distinct from each other since periods of heavy rains alternate with periods of light rains during the year (as observed from August--June 1984/85). Similarly, the wet and dry seasons do not strictly coincide with planting and harvesting seasons respectively though the rains are required to initiate plant growth. For example, March through October were periods of heavy rains, as well as periods of planting and harvesting such crops as maize, vegetables and yams and palm fruits (for consumption), while November 1984 to March 1985 – a period for dry season was a harvesting period for yam, palm oil cocoyam and some vegetable. This is in agreement with the study in Uboma in 1963–64 (Rockfeller 1964) showing the production of similar crops.

Seasonality and food production:

During hungry season (January–June) food is expected to be scarce because food crops have all been planted except for stored foods. But the hungry season in the study village did not exhibit a truly hungry effect because as a region with a biomodal climate food production such as cassava, cocoyam, palm oil green vegetables and maize continued. The harvest season merely served as a period of increased production of these staple

foods. Palm oil production which dominated other crop production during the dry or hungry period formed the cash crop for the community, but the palm kernel which contributed a major export product some three decades ago was at this period rendered irrelevant economically, except for consumption (25%) or as firewood for cooking.

Some sub-tropical countrieslike the Indian sub-continent have reported distinct wet, dry and monsoon seasons. (Chen et al 1979, Walsh 1981), while others reported distinct long dry season and shorter wet season in the northern zones of the sub-tropical countries like Nigeria (Longhurst 1981, Tomkins 1981), in Kenieba-Gambia (Fox 1953, Rowland et al 1977), in Ghana (Davey 1962, Longhurst 1981) in Zambia (Khan and Gupta 1977), in Uganda, (Rustishauser 1974) and in Kenya (Eohdal et al 1968). These are characteristics of unimodal climate with distinct planting (wet) and harvesting (dry) seasons. These regions fall within the cereal/grain/legume producing areas which require the long dry seasons for ripening and drying, and for storage of crops.

In effect therefore, the unimodal effects are observed in the northern zones of the countries, while the bimodal effects are observed in the southern zones particularly along the coastal region of Nigeria forexample

Though the harvest and hungry season observation in the study village (1984/85) are used in comparison with other established seasonality, this seasonal pattern under study may require a longer span of observation for seasonal confirmation.

The production/consumption pattern in the study village did not vary significantly since 40%–50% of all food crops produced were consumed. However, grains and cereals (except maize) were not produced and were therefore not very much consumed. This is in contrast to the staple food production and consumption of maize, millets, rice and legumes on the northern zones of Nigeria and West Africa (Nicol 1959, Tomkins 1981, Longhurst 1981, Davey 1962). With a modified climate.

In the study village also fish was not produced and therefore was poorly purchased and consumed. Livestock was very inadequately produced, and such were the West African dwarft goat, and chicken which were cash products and therefore were sparingly slaughtered for mere consumption except for special ceremonies. This short fall affected adversely the consumption of livestock and animal protein foods since they were not produced. This is in contrast to the production of large quantities of cattle and poultry as major cash earners in Northern Nigeria, and the consequent consumption of these products.

In summary, the climatic conditions which is biomodal in nature facilitated all the year crop production, and therefore all the year round consumption of food crops of root starch origin. Except for the quantity and perhaps for a few crops like yam, food was available through the year creating a situation of no distinct harvest or hungry period.

On morbidity and mortality pattern, convulsions as a symptom of acute diseases ranked highest (10.9%), followed by fevers and malaria (5.5%) in the cause of offsprings deaths. Malaria as associated with convulsions or fever was most prevalent in August and September (1984) being a wet season repeating its prevalence in March and April being a dry season, indicating that the disease occurred in all seasons since it is endemic in Nigeria and West Africa as a whole.

Cough, catarrh and fever in combination which was assumed to be the symptoms of respiratory tract infection, was observed to be the next prevalent disease occurring mainly during December (1984) and February (1985) which were the dry and cold harmattan period. The incidence was logical considering the dusty atmosphere which was conducive to droplet disease transmission as in cases of air-borne diseases of pneumonia, cerebrospinal meningitis (CSM) etc. that were prevalent in Zaria region (Tomkins 1981) during the dry season. No cases of (CSM) was however observed in the study village.

Diarrhoea and vomiting (as food and water-associated infections (Buck et al 1968) were associated with gastroenteritis. The incidence of one or both symptoms was minimal and did not seem to occur in epidemics, nor was diarrhoea or vomiting associated with any particular season, thus confirming the questionnaire responses in which diarrhoea ranked least (3.6%). This is in contrast to other reports which associated diarrhoea and vomitting with wet season resulting from contaminated water and refuse disposal inadequacies in the Zaria zone of Nigeria (Tomkins 1981, Simmons 1981), or in Africa (Gambia) (Rowland and Whitehead 1978), and in Nepal villages (Nabarro 1981).

The low incidence of gastroenteritis in Umunwada village was not unrelated to the relatively high standard of environmental sanitation in which refuse disposal was highly organized), in contrast to Mata's (1978) findings. Also, the acceptable weaning pattern of prolonged breast-feeding tended to reduce the incidence of gastroenteritis in the village since there was no bottle feeding which was usually implicated with weanling diarrhoea and the consequent episodes of PEM in children in developing countries (Wray and Aguirre 1969, Omololu 1972, Morley 1968, Gordon et al 1963, Rowland and Whitehead 1978). However, whatever diarrhoea did occur in the wet season (August–September) was consistent with studies by Okeabialam & Grange (1981), and Gilles (1963). The incidence of diarrhoea in the dry season (March and February) is equally consistent with the findings of Chen et al (1979).

Therefore, the period with the greatest prevalence was the transitional period between August–September being the end of the wet season and also October–December being the beginning of dry season. This is in agreement with the community's general belief that the change of climatic season was always marked with increase in disease episodes.

Intestinal parasitic infection is described as a threat to nutritional status because of its depletion of nutrients in the intestinal tract. Hookworm and roundworm infections were observed to be the most prevalent (20.7% and 39.6% respectively) though not as heavy as was reported by Gilles in Akufo village with hookworm (71%) and Ascaris (70%). Infestation tended to be heavier during wet season (78.8%) than during dry season 64.2%. This observation is consistent with reports from some developed countries but is not explainable. The prevalence of hookworm and ascaris infestations during wet season was also reported by Lathan et al (1983) in Gambia. Trichiuris-Trichuriura infestation tended to be minimal (3.9%) while tape worm infestation was almost nil. The death rate per 1000 for 1.1-3 year olds was 222 giving 46.5% of the offsprings death, and the age at which most deaths occured was 1.1-2 years. The preschool age group thus recorded the highest death rate in the village. This is consistent with reports of the prevalence of childhood mortality from other developing countries. The death rate of the study population appeared higher than was reported in certain parts of the developing nations like Matlab–Bangladesh with 154/1000 (Chen et al 1977), but was lower than that in Zaria village – 196/1000

(Longhurst 1981). The predisposing factors in all deaths are similar being a factor of under development. In Akuso village, it was 430/1000 in Gambia, 400/1000 (Gilles 1963) such as ignorance, poverty, poor environmental hygiene and sanitation and poor nutrition. The female mortality in the study was sligiitly higher than that of the male counterpart and this is consistent with Matlab (Bangladesh) report of higher female death rate, though causes of death differed significantly. Those with more pregnancies tended to have offspring mortality, a situation which confirms the idea that poor nutrition as a result of a large family does increase predisposition to infectious diseases. Some poor child rearing practices, however, are known to contribute to the increased infant mortality (Omololu 1972, Wray and Aguirre 1969). The adverse effects of these on food intake have been reported.

The impact of morbidity on mortality rate in childhood has been discussed (in Chapter Two) by Davey (1962) in Ghana, Einstein et al (1972) in Pakistan, and also by Rosenberg (1977), and Hussain (1984).

The cluldhood morbidity in the village notwithstanding the percentage proporaon of wives with neither offspring mortality nor abortion was still much higher than the reverse.

The high mortality ratio of male spouse over the female (20:0.05) was not explanable except that the life span of men is known to be shorter than that of women (McLaren 1976).

There are evidence of changes in body size resulting from variations of distinct harvest versus hungry (unimodal) season in certain tropical and subtropical regions of the world. During the hungry or planting season with the peak physical exertion in farm work, coupled with reduced food intake various degrees of weight loss are evidenced particularly on the toiling male and the growing children as reported by Longhurst, Simmons and Fox in their Nigerian studies, and by Nabarro, Chen and Chaudry in the Indian sub continent studies. Conversely, there is little or no change in body size (weight) on regions with little or no distinct harvest or hungry season (bimodal season) since there are available foods to compensate for the peak physical exertion during farming. Such regions as are found on the coastal or southern zones of the countries have been equally investigated (Hussain 1984, Chen et al 1979).

These minute changes in body sizes involve weights which are the most sensitive indicators of malnutrition and which exhibit acute wasting symptoms in the study village. Changes in weight in the preschool subjects during harvest and hungry periods indicated minimal differences which also indicate the unimodal regions whose population had reduced weight in hungry and increased weight in harvest season, a contrasting report from for example (5.3%) of 114 preschool children lost weight during the hungry season (in 1985) in which 4 (3.5%) were girls, while 108 (94.7%) other gained weight significantly. The hungry season period in the study village

also revealed wasting only on the first degree level. The females tended to be more sensitive to negative weight changes than the males, an observation more consistent with Nepal study (Nabarro 1981), where female siblings exhibited more weight changes than the males.

In contrast to Nepal study (Nabarro 1981) hungry season in the study village did not appear to have induced weight loss on the subjects. That 5.3% of the children population had weight deficit could possibly be a function of factors other than the effects of variation in hungry or harvest season. These changes of weight deficit were also reported in such regions as experienced the distinct wet and dry, (hungry and harvest) seasons like in Keneba (Rowland et al 1977, Ghana (Davey 1962), Zaria province (Simmons 1979, Longhurst 1981, Tomkins 1981) and many more.

In summary, the study area tended to exhibit bimodal climatic functions and therefore the harsh effects of distinct harvest and hungry seasons were not very pronounced. Equally so, the seasonal disease pattern did not exhibit distinct differences except in confirmation that such disease as Malaria tended tended to be endemic, and that diarrhoea and vomiting (gastroenteritis) did not assume an epidemic proportion except on individual family basis and such incidences were minimal.

Generally, the growth pattern of the child did not exhibit negative changes as a result of hungry season of that period rather, there were consistent weight increases. There were evidences of weight deficits in adults —

which were not the consequences of seasonal changes. These observations were in contrast to reports from other countries particularly on the Northern zones of West Africa which exhibited unimodal climatic effects, and which therefore suffered the effects of drastic disonct hungry and harvest seasonal effects which evidence acute malnutrition during the hungry (planting) season.

The mean food intake per person for the harvest season did not vary significantly (409.8gm and 422.0gm respectively) though, there were larger variations (in SDs) in quantity intake amongst the households. This situation seemed to be influenced by the household sizes. For example the household with larger family size tended to consume a daily mean of 200–300gms of food per person, while the smaller member household group tended to consume a daily mean of 400–600 gm per person.

The energy intake was on the deficit for individuals particularly on the children because of the low per unit increased requirement by this growing age groups and more especially in protein intake which was observed to be very low (20%–87%) and more likely to predispose to PEM or Kwashiorkor.

The energy intake deficit has always been a problem facing the developing countries because of the prevailing causative factors, but the extent

of the deficit varies for various reasons in various regions. Below, for example, are varying quantities of energy intake per head per day by different regions.

Uboma–Eastern Nigeria – 2110 Kcal with 45.4 gm protein (Rockfeller 1964); Tangaza–Northern Nigeria – 1984 calorie with 64.3 gm protein (Nicol 1959); Dayi–Northern Nigeria 1981; calories with 64.3 gm protein (Loughurst 1981). "U" village–Eastern Nigeria 1620 calories with 19.5 gm protein (the study village 1984). Matlab–Bangladesh 1963 calorie with 50.3 gm protein (Chen et al, 1981); Akufo–Western Nigeria 1943 calories with 35.0 gm protein (Gilles 1963); and the FAO (1985) reference intake of 2398 calories and with 30 gm protein.

The above indicates that the study village consumed a net energy comparatively lower than the other counterparts. Nicol (1959) did report of caloric intakes larger than the requirements. For example in Tangaza 2398 to 2910 calories were consumed in various villages in northern Nigeria with the accompanying high protein intake (103 gm), almost consistent with the types reported by Simmons (1976). This goes to indicate the large calorie intakes in the north than in the south. However, Nicol

equally reported the larger body sizes of his subjects than in the south, while Longhurst (1981) reported of the extra energy expenditure by these subjects during farm labour. But since individuals require various amounts of energy considering their various sizes, occupation or climate, it becomes difficult to assess precisely individual needs, (FAO/WHO 1985). The adequacy of caloric intake cannot therefore be decisive.

The mean daily caloric intake per person (considering both seasons) was 1620 (6.8 MJ.). This indicated 67.6% of the requirement of 2398 kcal (FAO 1985) showing an overall deficit in energy intake

The major sources of caloric in the village are palm oil (42%), cassava products (32%), yam (13%), and cocoyam (6%). (Palm oil ranked first because of its caloric potentiality and also palm kernel. (Fig. 10).

A no-significant difference in energy intake between the seasons was confirmed by a student "t" test at $P<0.05$). The test confirms the fact that similar food quantities were available for both seasons, and that the households consumed the food alike granting the seasonal effects on food production. For example, fermented cassava, and garri – the main staples were available in both seasons. Yam was however more available in harvest season than in hungry season. While the stored yams in yam barns were still available to augment consumption (Rockfeller 1963), palm oil, another staple, (as well as a cash crop) was more available in the hungry season, to augment caloric intake. Green vegetables were eaten in very

large quantities as different types were available at different seasons of the year, "ugu" (Telferia) in harvest and "uha" in hungry season, hence the increased percentage (of reference) intake of vitamins and minerals (except for iron) by individual age groups.

It has been reported that diets of the developing countries have a protein value of 70% – 80% relative to egg protein (McLaren 1976) in contrast to those of the developed countries with 80%–90% value. This estimate would appear to further lower the protein intake of the study village relative to egg protein, granting precise chemical determination However, the percent of reference protein intake has indicated a deficit of 65%.

The protein intake pattern showed that there were no significant differences between the harvest (18.4 gm 3) and the hungry 20.6gm 5) seasons. The sources of protein in both seasons were similar. But crayfish was the major animal protein source because of its cheapness and its use in every dish, this was followed by smoked (ice) fish because of its cheapness too. Other vegetable protein sources were palm kernel (consumed as regular snacks), oil-bean and breadnut (a popular delicacy for the community).

It was observed that there was an overall deficit of energy and protein intakes in all age groups. The percentage protein intake was near normal

(87% – 113%) for the 1.1–7 year olds but tended to be lower in the older children and the adults (56%-69%, and 52%–67% respectively). The female adults who were mostly housewives had a relatively lower intake of protein and calorie than the male counterparts. This situation may not be unconnected with the socio-cultural obligation by wives to offer better share of the meal to the males (husbands and adult males), and equally to abandon a larger proportion of meal in the plate for the younger children, resulting to a cumulative less intake by the wives. The energy and protein intake of the ≤ 1 year old were relatively lower than that of 1.1–7 year olds. The breast milk intake which complemented the intake of the ≤ 1 year old was however not accounted for in this analysis, and this breast feeding might have contributed much in complementing the nutrient intake since a relatively normal growth was observed on that age group.

Results obtained from dietary assessment by using weighing method 1989 on the twelve subsample households in the community reveal general low intake of calorie and protein reference intake. Being a peasant farming community such low intakes are consistent with reports from other peasant or rural communities in other developing countries (Longhurst 1984, Nicol 1969, Nabarro 1981, Hussain 1984). The risk group of <1–5 years

are more affected in the low intake, particularly the ≤1 year age group (31% of calorie, and 20% of protein intakes). The low intake in this age group is not however decisive results since most of the members of the age group might still be breast feeding as supplementary nutrient intake.

Vitamin and mineral intakes tended to be more adequate because of the all – year round availability of green vegetables and fruits, and the dependency on starchy vegetable staples, a consequential rain forest climatic conditions 'Such adequacy in intake of vitamins is observed in reports on Uboma (Eastern Nigeria) village study (Rockfeller 1963). Also results of the dietary assessment using both the weighing and the 24-hour recall methods proved a test of no significant difference ($P \leq 0.05$) between the two methods. This was a further confirmation on previous studies that there are no significant differences between the two methods (Hussain and Abdullah 1980(a), Olusanya 1985).

Results of the supplementary study in 1989 also indicated no significant differences between intakes (by age and sex) in 1984 and intakes in 1989, which goes to reveal that in a subsistent agricultural setting as in the study village, production of food crops persisted on equal level

irrespective of time lag or economic depression as occurred by the year 1989.

However, the communal dining practices in the study village, which determine the individual nutrient intake, especially amongst siblings makes results inconclusive because of biases in intra family food distribution system. This has also been reported by Hussain et al (1980), and Atinmo and Akinyele (1983).

The ecological factors of nutritional status:

The multiple regression analysis has provided useful evidence to support the findings on the determinant factors of malnutrition in the village particularly, on the family socio-economic status and sources of food supply to the subjects. Though the anthropometric status of the risk-group (the children) were given emphasis and tested, similar effects would be expected to prevail on the adolescents and the adults who were still part of the socio-cultural system. Using the regression and correlation analyses it has been possible to identify the extent of the association of each determinant variable with the nutritional status of each group.

Firstly, using the test of correlation (r), the association has been established between the anthropometric status and the family socio-economic status, and the sources of food supply, and also between the anthropometric status and the nutrient intake of the children (≤10 years old). Thus the nutritional status and the socio-economic status and the food supply system

were found to be positively and strongly related at varying significant levels. For example, the nutrient intake and family size of the 3.1–5 year olds were significandy related P≤0.05) to their nutritional status. The nutrient intake and the nutritional status of 1.1–3 year olds were strongly related (P≤0.05). The nutritional status of 5.1–7 year olds, and the family food productions and nutrient intake were strongly related (P≤0.05), except the case of the ≤1 year olds which was not significant at P≤0.05. The relationship between socio-economic status and the food supply system, and the nutrient intake of the respective age groups were not strongly correlated.

It is observed from the regression analysis that occupation of the family had the greatest influence on the nutritional status of the children (reference to socio-economic status) which was followed by parents income. The influence by family size and education were minimal.

On food supply system, it was also observed that crop production pattern ranked highest in influencing the nutritional status, followed by food purchases pattern and the consumption of food crops. All the above effects on the nutritional status were however not significant at P≤0.05 level. But socio-economic status however, had a significant effects on the nutritional status of the ≤1 year olds at P≤0.05.

But in all, the nutrient intake of the children (≤10 years) had very significant effects (P≤0.05) on their nutritional status.

The nutrient intake influence is quite a logical phenomenon because it is the actual net nutrient intake rather than the socio-economic status or food sources supply that is directly influential on the nutritional status of the individual. The effect of the sources of food supply on the ≤1 year old should be appreciated rationally, because the nutritional status of the under one year old was more influenced by the breast milk feeding (in this village) than the family foods (and breast feeding was not investigated in this study).

Investigation on growth pattern of the children in the village identified wasting most on the 6–12, and 30–36 months olds.

In summary, the deficit in the nutritional status of the children (≤10 year old) were strongly associated with the family socio-economic status especially the occupation and income of the family. It is logical that with low level occupation, the income of the family was bound to be low, so also the net income allocated to sources of food supply.

The food supply and the family size factors which were associated with the nutritional status of the children were significant factors as regards the food distribution of the available food within the family, to which was disadvantageous to the nutritional status of the younger ones.

The food production factor refers to the type and the quantity produced, such as the predominant production and consumption of starchy root-crops. These also were bound to influence the protein quality and the vitamin B2 quantity. The proportion of the produced foods that was consumed (52%): could be considered as insufficient granting a peasant farming household.

CHAPTER SIX

SUMMARY, CONCLUSION AND RECOMMENDATION

The summary:

This study attempted to identify the ecological factors which contribute to malnutrition in the village of Umunwada in Ikeduzizi-Okowu. To this end, a prospective study was conducted for twelve months (July 1984–June 1985) in order to monitor some selected ecological factors that contributed to malnutrition in the village viz, the socio-economic status of households, seasonal changes in food availability, infectious disease incidencies, the nutrient intake pattern (using 24-hour dietary recall and dietary weighing methods), and anthropometric status of subjects, and finally to suggest intervention processes for the amelioration of the deficiencies identified.

Several strategies were employed in data collection and such included, the baseline information on the village, the seasonal anthropometric assessment of subjects, to determine the nutritional status, a socio-economic questionnaire administration to determine the household socio-economic status, a 3-days-24-hour dietary recall, supplemented by a weighing method on a subsample in order to assess the nutrient intake, a monthly inventory of household crop production and consumption, and a monthly monitoring of some selected infectious diseases on children, including intestinal worm infestations.

A pilot study had initially been conducted to assess the research locality, to pretest the questionnaire, and the dietary recall forms, and to get acquainted with local food measures. The master plan which was developed facilitated the collection of data on schedule. The housewife in a household was the major respondent to interviews regarding the questionnaire, dietary assessment and food crop inventory, and the children 6–60 months were the target group for nutritional status determination and disease identification. Procedures were carried out on harvest and hungry season basis. This anthroponietry considered the weight, height, arm circumference and triceps skinfold measurements. Intestinal worm infestations were identified through microscopic examination of stools of the target group (6–60 month olds) and water supply equally was tested using the microscope, for possible parasitic contamination.

Data were complied and analysed in percentages and statistically. The result of the anthropometric assessment revealed that of the 114 preschool children (6–60 months old), 55.3% recorded mean normal lineal growth (height-for-age), while 44.7% suffered from mild to severe wasting (weight-for-height). The females relatively recorded more normal weights than the males. 50% of the 3-4.5 year olds, were most affected by acute wasting in weight for height, muscle circumference and subcutaneous tissue. Weight gain continued through the seasons irrespective of the hungry season, though there were very few cases of weight loss which might not be a function of hungry.

seasonality. Based on height for age (WHO 1983), 47% were of normal stature, with 12—36 months age group more stunted than others and within the females recording higher proportion of normal height than the males. The 5.1—10 year olds however exhibited more normal growth pattern than the 10.1—18 year olds and the adults (>18 year olds) who were equally mildly malnourished with the women adult recording greater weight deficit. More ≤ 10 year olds (89%) exhibited wasting in 1989 than their counterparts (64%) in 1984.

On the socio economic level, 78% of the household population was rated low. Over 60% were on low income (by the community standard). Over 64% were peasant farmers and petty traders combined; 27% were low level artisan employee or self employed, while 9% were unemployed being the elderly population. The community was generally literate with 57% having primary minimum education.

The average family size was 5—8, and a few 11 and 1 members households. The average pregnancy was 7, while the highest was 15 though the later were very few proportionately. The mortality rate in the 1—3 year olds was 222 per 1000 which was relatively lower in comparison to some other rural communities and most deaths occurred at 1—2 year age group, with the female mortality slightly higher than the males. Convulsions and fevers were more prevalent than other investigated diseases, occurring at both seasons alike which indicated endemic malaria, and these were the causes of most deaths. This was followed by respiratory tract infections

(more prevalent in dry and harmattan season). In addition, ankylostomiasis and ascariasis were prevalent.

On seasonality functions, there were more wet season (April–November), than dry season (December–March) though differences in rainy periods were not clear cut, as was equally the case between harvest and hungry season, since food crop productions (mainly root crops) and food crop consumptions continued through the year round except for the type. Food purchase pattern was considered low, and being a subsistence farming community, it was the non-produced foods (fish, meat, rice, legumes etc.) that were mostly purchased but at low rate granting the low percentage income allocation for food purchases.

The mean caloric intake for both seasons was 1620 (67% of FAO/WHO 1985 reference), with only 19.5 gm protein (65% of reference).

Statistical analysis found no significant differences ($P<0.05$) in caloric intake between seasons.

Energy intake by age group was generally on the deficit except for the 3+7 year olds. But the protein intake percentage proportion was higher amongst 1·1–7 year olds than in the adolescents, and lower in the ⩽1 year old though not decisive in this age range.

Finally, the correlation analysis found strong association ($P<0.05$) between nutrient intake and the anthropometric status of the target groups (1.1–10 year).

A multiple regression analysis indicated a significant ($P \leq 0.05$) influence of nutrient intake on the anthropometric status of children ≤ 10 years old. The influence of socio-economic status and the sources of food supply on the anthropometric status was also strong though not significant at $P \leq 0.05$ level. The regression analysis indicated the fact that the anthropometric status decreased as the socio-economic status and sources of food supply decreased. But all notwithstanding, the anthropometric status of the family was highly influenced by the net nutrient intake of the family.

Conclusion:

From the analysis of the findings, the presence of growth failure or PEM has been established, and this was more manifested in the 3.1 - 5 year age group. There were similarly evidences of stunting (chronic malnutrition) in the older children 5.1—10 year olds, but severe cases of wasting and stunting were rare. The adolescents and adults were equally mildly malnourished (weight for height).

What appeared to be signs of gingivities was rampant on both children and adults and was not explainable granting the large intake of fresh fruits and vegetables. The low socio-economic status exhibited by low level occupation and income and also large family size (a sign of rural poverty) were found to be greatly contributory to malnutrition. But the direct contributory causes were the low net nutrient intake in terms of overall energy and protein quantity, and quality.

The predominant root starch cropping, coupled with poor food purchases pattern contributed to poor food consumption pattern and poor nutrient intake which precipitated to poor anthropometric status.

Results also indicated similar nutrient intake all the year round strongly suggesting a no distinct seasonal differences in food consumption in this peasant farming community. Cases of malaria, respiratory tract infection, parasitic infection (ascariasis and ankylostomiasis) constitute some of the contributors to poor nutritional status. Though morbidity and mortality rates were fairly high but they were not as high as reported in many similar rural areas.

With these findings, government and community efforts should be geared towards the improvement of socio-economic status and cropping pattern to eliminate or reduce malnutrition in the area.

Contribution to knowledge:

Significantly, this study has proved through analyses that a peasant farming community tends to remain in his low socio-economic status because of the persistent environmental factors that are deeply bound by their traditional life style. Similarly, the impact of seasonal variations on nutrient intake and nutritional status of the population was very minimal and this was in consonant with reports that the southern zones of Nigeria do not experience the harshness of extreme seasonal climatic changes as is the case in the Northern zones.

Finally, this study provides the nutritionists and other health personnel with the baseline data for planning further community development and health programmes in similar localities in Imo State and environs. It thus provides a stimulus for further research on these areas, particularly, with the available information on such concerned areas of nutrient-intake determination, food production pattern, as well as anthropometric data.

The study provides opportunity for further periodic evaluation of data and comparison with data from similar communities. It serves a useful contribution for future compilation of nutritional status and nutrient intake data for the locality or state.

Recommendation:

Based on the findings from the study, the following suggestions are made with a view to ameliorating the poor nutritional status in the village population which can also be applicable to similar communities. Firstly, all the implications of the deficiencies as investigated must be appreciated by the community through enlightenment strategies.

Integrated community development activities:

An integrated community development activities must be planned to raise the standard of living in terms of the occupation, education, income and health services. The plan is a long term process which will involve the support of the community leaders – the Ize, Chiefs, Ness, Ichies, the elites, Church and women organizations and the youth – because their co-operation is essential, as such plans take years before yielding dividends.

Such plans are taken in phases and will require the assistance of the local government (LGA), other government agencies like the agricultural extension department in terms of personnel and technical know how. For example agricultural programmes should facilitate the improvement of crop yields, introduce new nutritious varieties like legumes, nuts, hi-breed livestock; and should also make it possible to form co-operative societies to attract funding. There is need for improvement of storage of harvests using perhaps the traditional yam barn (for men), and cocyam barn (for women). Small scale food processing industries should be developed as has been done with the palm nut, garri and melon seed processors.

Improving the socio-economic status:

With the improved crop production, (on co-operative farming basis) and the esterblishment of small scale mechanized processing and storage, unit there will be increase in yields, in sales and in income. Increased literacy programme will facilitate better job opportunities or artisan apprenticeship for self employment, particularly with the present high rate of unemployment.

Occupation complementation by involving in more than one trade generates income. Rural electrification and improved water supply (on the existing ones) will attract back emigrants to establish industries and acculturate the home based population thus raising the standard of living.

improved health services and nutrition program:

The integrated community development programme will make health and nutrition education a priority (particularly to the mothers and children) incorporating in the primary health care delivery a "child survival programme" while utilizing the existing government health delivery. Family planning to control large family sizes, well-baby clinics to facilitate immunization (EPI) to children, improved weaning and food complementation programme, and growth monitoring system to identify impending PEM (Morley 1986), oral rehydration therapy by mothers themselves to control dehydration on infants (a fast killer) will be provided for. The nursing and public health personnel, the community-based workers and possibly the traditional midwives will be utilized for the program. To initiate these program it might require community fund raising activities.

With these suggestions, it is expected that mothers on the long run will appreciate the use of family planning, to control family size and adequate food availability; weaning foods can be enriched in addition to breast feeding. Also, mixed farming to improve protein and caloric quality will improve nutritional status, while expanded health care will decrease morbidity and mortality rates on children, and the standard of living will increase.

A study might be useful to assess the utilization of excessive vitamin A (B-carotene) sources such as obtained in the study village.

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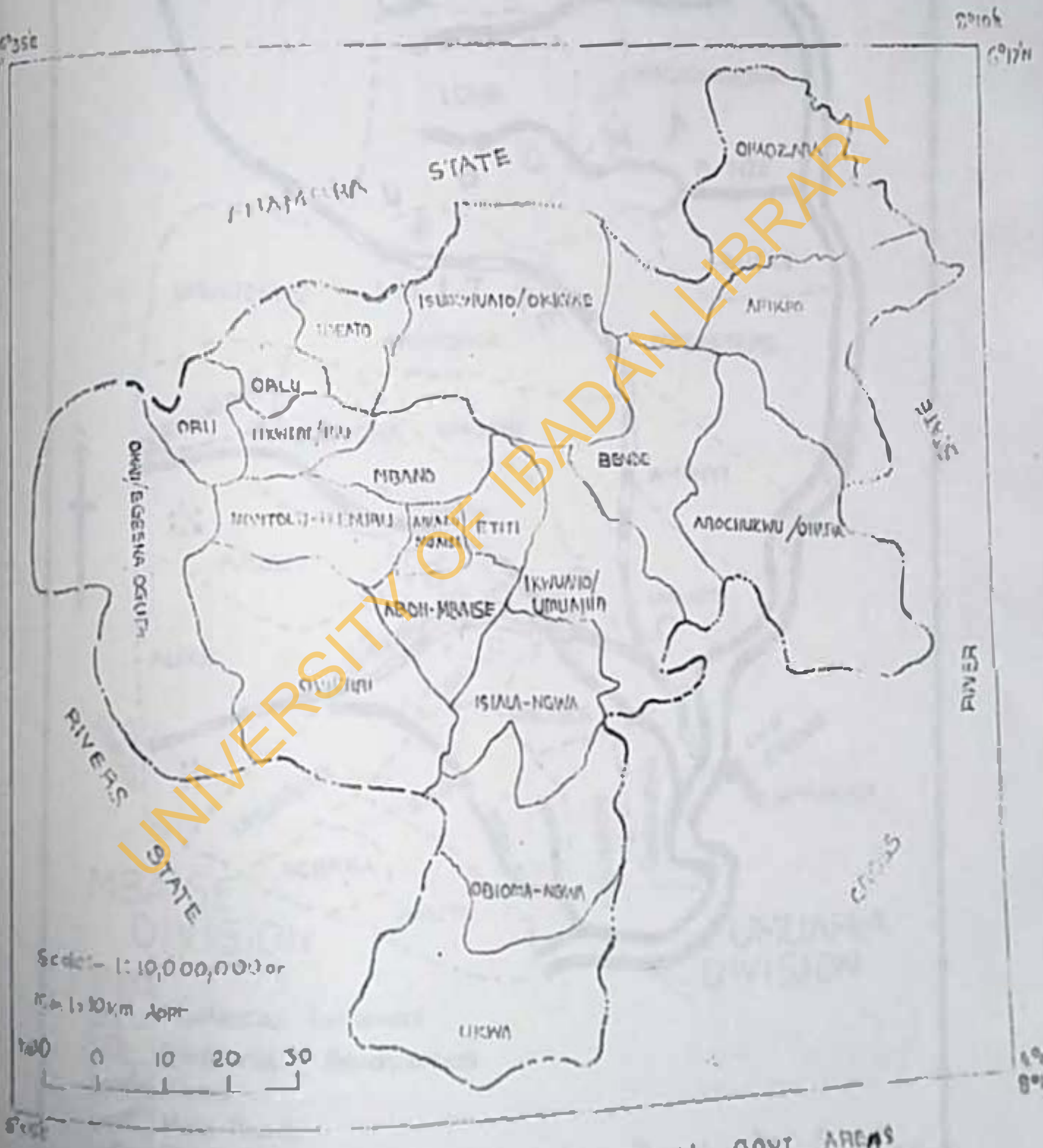
THE APPENDIX

APPENDIX 1

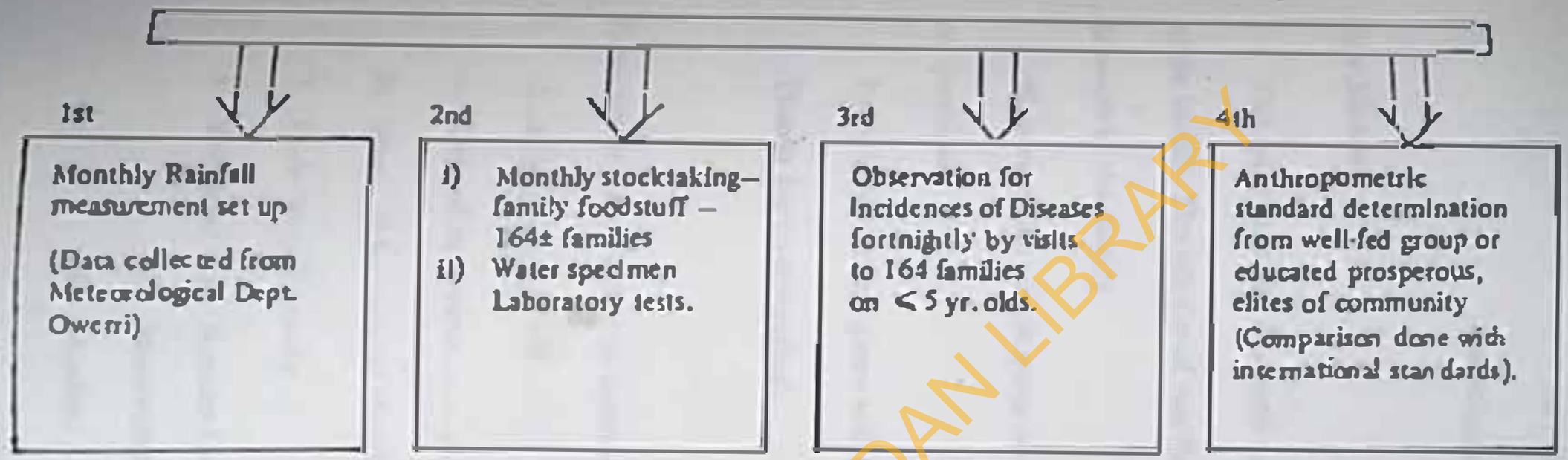


MAP OF IMO STATE SHOWING LOCAL GOVT AREAS

MAP OF ETITI DIVISION

APPENDIX 9

Main Survey — Work Plan



APPENDIX 4

Questionnaire Proforma

Dear Madam,

This questionnaire is aimed at finding out the state of health of every member of the family. The results of our findings will help us find a solution to the chronic ill-health in the family.

We very much solicit your co-operation by responding honestly to the following questions.

Every information given will be treated with confidence.

Thanks for co-operating.

Mrs. Keke.

Please circle (O) or fill in as necessary.

1. (1–4) Basic Data

   1. Date of interview.....
   2. Name of household (family).....
   3. Code No. of family.....
   4. Religion: (i) Roman Catholic.....
      (ii) Protestant (specify).....
      (iii) Muslim.....

Contd.

(iv) Pagan.....

(v) Others (specify).....

II. (5 - 14) Socio-Economic Data:

5. Father's (husband's) occupation:

(i) None

(ii) Petty farmer

(iii) Big farmer

(iv) Petty trader

(v) Big trader

(vi) Unskilled Employee

(vii) Skilled Employee

(viii) Skilled self employee.

6. Father's (husband's) income per month in Naira:

(i) ≤ 50

(ii) 51–100

(iii) 101–200

(iv) 201–300

(v) 301–400

(vi) 401–500

7. Any extra income per month:

(i) Yes (state). . . . . .

(ii) N. . . . . .

8. Mother's (wife's) occupation:

(i) Full housewife

(ii) Petty farmer

(iii) Big farmer

(iv) Petty trader

(v) Big trader

(vi) Unskilled employee

(vii) Skilled employee

(viii) Skilled self employed

9. Mother's (wife's) income per month (in Naira):

(i) ≤ 50

(ii) 51–100

(iii) 101–200

(iv) 201–300

(v) 301–400

(vi) 401–500

10. Any extra income per month:

(i) Yes (state). . . . . .

(ii) No. . . . . .

Contd.

11. Children's Occupation:

	No.	Sex	Age	Comment
(i) Schooling	1			
	2			
	3			
	4			
	5			
	6			
	7			
	8			
(ii) Gainfully Employed	1			
	2			
	3			
	4			
	5			
	6			
(iii) Domestic help outside home	1			
	2			
	3			
	4			
	5			
	6			

Contd.

11. (contd.)

Children's Occupation:

	No.	Sex	Age	Comment
(iv) Doing nothing	1			
	2			
	3			
	4			
	5			
	6			
(v) Others (specify)	1			
	2			

12. **Relatives Occupation:**

	No.	Sex	Age	Comment
(i) Schooling	1			
	2			
(ii) Gainfully Employed	1			
	2			
(iii) As domestic help	1			
	2			
(iv) Doing nothing	1			
	2			

Contd.

III. Education Level:

13. Father (husband).

(i) None

(ii) Primary

(iii) Secondary

(iv) Post-Secondary (specify)

.....

14. Mother (Wife):

(i) None

(ii) Primary

(iii) Secondary

(iv) Post Secondary (specify)

15. Children's Education Level:

	No.	Sex	Age	Comment
(i) Pre-school	1			
	2			
	3			
	4			
(ii) Primary School	1			
	2			
	3			
	4			
	5			

Contd.

15. (contd.)

Children's Education Level

	No.	Sex	Age	Comment
(iii) Secondary School	1			
	2			
	3			
	4			
	5			
	6			
(iv) Post Secondary	1			
	2			
	3			
	4			
0 (v) Others (specify)	1			
	2			

16. Relatives Educational Level:

	No.	Sex	Age	Comment
(i) Not schooling	1			
	2			
(ii) Primary School	1			
	2			
	3			
	4			
(iii) Secondary School	1			
	2			
	3			
	4			

Contd.

16. (Contd.) Relatives Educational Level:

	No.	Sex	Age	Comment
(iv) Post Secondary	1			
	2			
(v) Others (specify)	1			
	2			

IV. Family Size and Ages (Years):

17. Father (husband) present (i) Yes (ii) No.

18. Father's (husband's) Age:.....

19. Mother (Wife) present (i) Yes (ii) No

20. Mother's (Wife) Age:.....

21. Total No. of Children living with you.....

22. Total No. of relatives living with you.....

23. Total No. in household.....

V. Housing:

24. Roof:

(i) Corrugated iron (zinc)

(ii) Thatch

(iii) Others (specify).....

25. Wall:

(i) Cement

(ii) Mud

(iii) Others (specify).....

26. Floor: (Contd.)

(i) Cement

(ii) Mud

(iii) Tile

(iv) Others (specify).....

27. Compound:

(i) Cement fencing

(ii) Stick fencing

(iii) Open

(iv) Others (specify).....

28. Physical Amenities:

Water source:

(i) Well: (a) Yes (b) No

(ii) Water tap (a) Yes (b) No

(iii) Others (specify).....

29. Toilet facilities:

(i) Water system (a) Yes (b) No

(ii) Pit laterine (a) Yes (b) No

(iii) Covered pit (a) Yes (b) No

(iv) Use of Push (a) Yes (b) No

VI. Reproductive History:

30. No. of pregnancies.....

31. No. of abortions.....

32. No. of live children.....

33. No. of dead children.....

Contd.

34. Age of which most of the children die. . . . . .

35. Cause of most deaths (if known). . . . . .

. . . . . .

36. Is housewife at present:

(i) Pregnant

(ii) Not Pregnant

(iii) Lactating

(iv) Menapausal

37. No. of multiple births. . . . . .

VII. Breastfeeding:

38. Do you breastfeed your babies (a) Yes (b) No

39. Age weaning starts (months). . . . . .

40. Duration of breastfeeding (months). . . . . .

41. Common weaning foods given. . . . . .

. . . . . .

42. Food Measurement – Recall System
(See separate form)

VIII. Food Production:

43 Rank the following foods in descending order of large quantity production below – Starchy roots (yam, cassava, etc.)

Cereals (Rice, etc.)

Grains (Maize, etc.)

Legumes/Nuts (Beans, Breadnuts, etc.)

Animal foods, (animals, eggs, poultry, insects etc.)

Oils

Greens

Fruits

Contd.

43

Rank Order	Food Group	Types
1st		
2nd		
3rd		
4th		
5th		
6th		
7th		
8th		

44. Estimate proportion of farm products consumed:

(i) Starchy roots – Type. . . . . %
(ii) Cereals – Type . . . . . %
(iii) Grains – Types . . . . . %
(iv) Legumes/Nuts–Types . . . . . %
(v) Animal foods – Types . . . . . %
(vi) Oils – Types . . . . . %
(vii) Greens – Types . . . . . %
(viii) Fruits – Types . . . . . %

45. Food Purchases:

Amount (Naira) spent per month on the following:

(i) Starchy roots (Cassava, Yam, Cocoyam) ₦
(ii) Cereal (Bread and flour products, Rice) ₦
(iii) Grains (Maize, etc.) ₦
(iv) Legumes/Nuts (Beans, breadnut) groundnut) ₦
(v) Meats – Types. . . . . ₦
(vi) Fish – Types . . . . . ₦
(vii) Other animal food (specify). . . . . ₦
(viii) Greens . . . . . ₦
(ix) Fruits. . . . . ₦
(x) Oils . . . . . ₦

Appendix 3

24-Hour — Dietary Recal Form

1) Name of Household..... 2) Household No.....
3) Total Number in household..... 4) Date of Interview.....
5) Interviewer..... 6) Respondents Name.....
7) Resp's marital status..... 8) Resp's Age.....
9) Father (Husband's) Occup..... 10) Mother (wife's) Occup.....

Meal	Person(s)	Menu	Food Items (EP)	Amt.	Nutrients (gm)/ Total) C Pr/v Pr/A F Cal.	Ind. Menu Portions Age % Cal.	Comment
Breakfast						Father	
						Mother	
						Children	
						Relative	

Contd.

	Meal	Person(s)	Menu	Food Items (EP)	Amt.	Nutrients – gm/Cal C Pr/V Fe/A F Cal	Ind. Menu Portion Age %	Cal.	Comment
	Lunch						Father		
							Mother		
							Children		
							Relative		
	Supper						Mother		
							Father		
							Children		

Contd.

	Meal	Person(s)	Menu	Food Items (EP)	Amt.	Nutrients — gm/Cal C Pr V B A F Cal.	Ind. Menu Portion Age %	Cal.	Comment
	Lunch						Father		
							Mother		
							Children		
							Relative		
	Supper						Mother		
							Father		
							Children		

Contd.

S/No.	Meal	Person(s)	Menu	Food Items	Amt.	Nutrients—gm/Cal					Individual Menu Portion		Comment
						C	Prv	PrA	F.	Cal	Age	Cal.	
	Other Items										Father		
											Mother		
											Children		

Modified from ICNND (1968) 37, 188

EP = Edible portion cooked or raw.

C = Carbohydrates: Pr V = Protein Vegetable: Pr A = Protein Animal F = Fat/Oils: Cal = Kilocaloric

Resp. = Respondent

APPENDIX 6 A

Score sheet for households' socio-economic variables

Code No.	Name—Initials	V. 1 = (6) Income Low	Med.	High	V. 2 = (8) Occup	V.3 = (21) Edu.
1	Madam S.K.O.	1			6	9
2	Mrs. R. O. O.	1			5	15
3	,, M. F. C.			3	4	11
4	,, S. V. O.	1			1	10
5	,, H. J. E.		2		2	6
6	,, E. I. O.	1			1	0
7	,, J. U. O.	1			4	3
8	,, S. I. O.		2		6	5
9	,, A. J. O.	1			3	8
10	,, V. R. O.	1			1	4
11	,, E. R. O.		2		3	5
12	,, R. R. O.		2		3	6
13	,, R. F. A.		2		3	5
14	,, M. F. O. E.	1			3	6
15	,, B. S. E.	1			3	7
16	,, B. A. E.		2		5	8
17	,, A. A. E.		2		3	9
19	,, M. O. O.	1			3	4
20	,, P. A.	1			1	1
22	,, A. A.	1			1	6

(contd.) B.

Code No.	V.4=(16) Family Size/Age	V.5=(13) Housing	V.6 = (6) Ameni.	V.7 = (8) Reprod.	V.8=(4) Breast fed	V. 9 = (6) Food crop produced
1	10	11	5	3	2	3
2	12	10	5	2	2	3
3	15	9	5	3	3	3
4	13	4	5	4	3	2
5	7	7	5	6	3	3
6	10	8	5	5	3	2
7	8	6	5	4	4	3
8	14	5	4	10	2	3
9	9	6	4	4	3	3
10	7	5	4	5	3	2
11	15	4	5	4	3	3
12	14	5	5	2	3	3
13	13	3	5	7	3	3
14	11	6	5	2	2	3
15	14	6	5	8	2	3
16	11	6	5	5	3	3
17	13	6	3	2	3	1
19	13	8	3	2	1	3
20	14	4	5	4	0	3
22	14	4	5	2	2	3

(contd.) C.

Code No.	V. 10 = (6) Food crop consumed	V. 11 = (6) Food Purchased	Max. score 100	Religion	Matrimony
1	4	4	58	RCM	Married
2	4	4	62	"	"
3	4	4	65	"	"
4	3	2	48	"	Widow
5	3	2	46	"	Married
6	2	2	39	"	"
7	2	3	43	"	"
8	3	2	56	"	"
9	3	3	47	"	"
10	2	5	39	"	Widow
11	3	4	50	"	Married
12	3	6	52	"	"
13	3	5	52	"	"
14	3	4	46	"	"
15	3	4	56	"	"
16	3	4	55	"	"
17	3	5	50	"	"
19	3	1	42	"	Widow
20	3	3	39	"	"
22	3	3	44	"	"

Contd. A.

Code No.	Name—Initials	V1	V2	V3	V4	V5	V6	V7	V8
23	Mrs. A. O.		3	3	14	5	4	3	3
24	,, V. D. C.	1	2	3	14	6	5	7	3
25	,, B. O. O.	1	5	14	14	9	5	3	2
26	,, C. C. O.	1	2	7	15	9	5	3	2
27	,, M. O. O.	1	3	9	13	6	5	4	2
29	,, M. A.	1	3	2	10	8	5	7	1
30	Madam D.A.C.	1	3	5	9	5	4	3	0
31	Mrs. R. J. K. C.	1	5	7	14	7	3	2	1
32	,, A. C. A.	1	1	3	13	3	3	8	2
34	Madam E. A. N.	1	2	1	13	5	5	3	3
35	Mrs. M. T. A.		2	3	13	5	5	4	3
36	,, C. C. A.		2	3	13	4	3	2	4
38	,, A. U.	1	1	4	10	6	4	8	0
39	,, C. L. K.		5	14	13	9	5	3	3
41	,, A. K.		3	3	11	6	4	6	3
46	,, T. K.	2	3	3	12	7	3	5	2
47	,, C. A.		3	6	12	8	5	6	4
48	Madam C. A.	1	4	2	7	6	4	3	2
51	Mrs. L. O.		3	6	13	6	5	3	2
52	,, A. A.	1	2	4	15	5	5	4	1
53	,, S. O. A.	1	3	3	6	3	3	3	3

Contd. B.

Code No.	V9	V10	V11	Max Score 100	Religion	Matrimony
23	3	3	5	48	RCM	Married
24	2	3	3	49	"	"
25	3	3	4	63	"	"
26	3	3	4	54	"	"
27	2	3	5	54	"	"
29	3	3	4	47	"	Widow
30	3	3	5	41	"	Married
31	3	3	4	50	"	"
32	2	3	4	43	"	Married
34	2	2	4	41	"	"
35	22	2	4	46	"	"
36	2	2	4	42	"	"
38	1	1	5	45	"	"
39	3	3	2	62	"	"
41	3	3	5	49	"	"
46	3	3	5	48	"	Widow
47	3	3	4	59	"	"
48	4	3	4	39	"	"
51	2	2	4	35	Sabbath	"
52	3	3	4	47	"	"
53	2	3	4	34	"	"

Contd. A

Code No.	Name—Initials	V1	V2	V3	V4	V5	V6	V7	V8
54	Mrs. J O. A.	1	1	4	10	3	3	5	3
55	,, J. J. U.	1	2	9	12	4	4	2	2
57	,, C. F. U.	1	1	2	9	6	4	7	3
60	,, C. A.	1	3	3	9	4	3	4	2
61	Madam M. D. A.	1	6	5	11	6	5	5	3
64	Mrs. I. E.	2	8	12	3	3	6	4	3
65	Madam R. E.	1	5	4	9	3	3	3	2
67	Mrs. I. M. O.	1	4	7	9	4	3	5	2
68	,, C. A. O.	2	3	6	13	8	4	7	0
70	,, X. E. O.	2	3	10	10	7	4	6	3
74	,, C. D. E.	1	2	4	14	8	4	3	3
75	,, P. M. A. K.	1	2	6	13	7	4	6	3
76	,, C. S. A. K.	1	2	2	13	6	3	3	3
77	,, J. E. I.	1	2	1	10	6	4	8	4
79	,, C. O.	1	3	2	13	6	4	3	3
80	,, X. O. A.	1	2	8	12	6	4	3	3
81	,, E. O.	1	3	9	15	6	4	5	2
82	,, B. A.	1	3	6	14	6	4	6	2
89	,, F. O.	1	7	4	11	4	4	4	3
85	Madam I. I.	1	4	4	15	6	3	4	1
86	Mrs. H. L. I.	2	3	3	13	7	3	5	2
87	,, E. L. A.	2	2	2	11	7	4	6	3
88	,, F. E.	1	1	1	11	4	5	6	2
89	,, E. E.	2	3	4	14	4	5	3	2

Contd. B.

Code No.	V9	V10	V11	Max Score	%age Score	Religion	Matrimony
54	3	3	2	38	38	RCM	Widow
55	3	3	2	48	48	"	Married
57	2	2	5	38	38	"	"
60	2	3	4	38	38	"	Widow
61	4	3	4	53	53	"	Married
64	3	3	2	49	49	"	"
65	1	3	4	38	38	"	"
67	2	2	4	43	43	"	"
68	3	3	4	53	53	"	"
70	3	3	4	55	55	"	"
74	3	3	5	50	50	"	"
75	3	3	4	53	53	"	"
76	2	2	2	40	39	"	"
77	3	3	2	44	44	"	"
79	3	3	5	46	46	"	"
80	2	2	2	45	45	"	"
81	2	2	4	53	53	"	"
82	2	2	4	50	50	"	Widow
83	3	2	4	43	43	"	Married
85	3	3	4	50	50	"	"
86	3	3	5	49	49	"	"
87	3	2	4	49	49	"	"
88	3	2	4	42	42	"	"
89	3	2	3	49	49	"	"

Contd. A.

Code	Name — Initials	V1	V2	V3	V4	V5	V6	V7	V8
90	Mrs. A. M. O.	2	4	9	14	8	4	3	2
92	,, F. E. O.	1	7	5	13	7	4	3	2
95	Madam J. I.	1	4	5	14	7	3	4	2
97	Mrs. M. A. O.	2	4	5	11	8	4	4	1
98	,, N. A. O.	2	3	3	13	7	4	3	3
99	,, A. O.	2	3	5	11	8	4	4	4
100	Madam M. E. O.	1	4	6	15	7	3	3	2
102	Mrs. E. E. O.	1	2	2	12	4	3	4	2
103	,, C. C. E. O.	1	2	3	10	6	5	7	3
104	,, A. N. O.	1	2	2	9	4	3	5	2
105	,, O. O.	1	2	0	12	5	3	6	2
106	,, T. B. I.	2	4	5	14	8	4	4	1
107	,, C. I.	2	3	5	16	7	3	7	2
108	,, M. B. I.	2	3	7	11	7	4	6	3
114	,, I. A.	1	1	3	11	5	4	6	2
118	,, M. L. I.	2	4	8	12	11	5	6	4
119	,, I. T. M. E.	2	6	5	15	7	4	3	3
120	,, P. F. E.	1	2	4	11	7	4	8	3
121	,, H. E.	2	2	3	15	5	4	4	2
122	,, D. U. K.	1	3	4	10	6	3	4	2
123	,, A. V. O.	2	3	3	15	7	5	7	4
124	,, M. A. O.	1	6	5	15	5	4	7	0

Contd. B.

Code	V9	V10	V11	Max Score	Religion	Matrimony
90	3	3	4	56	RCM	Married
92	3	3	4	52	"	Widow
95	3	3	2	48	"	Married
97	3	2	2	46	"	"
98	2	2	2	44	"	"
99	2	3	2	48	"	"
100	3	3	5	52	"	Widow
102	2	3	5	58	"	Married
103	3	3	4	47	"	"
104	3	2	2	34	"	Widow
105	2	2	4	39	"	Married
106	3	2	4	56	"	"
107	2	3	4	54	"	"
108	2	3	4	52	"	"
114	2	2	2	39	"	Widow
118	3	3	14	63	"	Married
119	3	3	4	56	"	"
120	3	3	4	51	"	"
121	2	2	3	45	"	"
122	2	3	2	40	"	Widow
123	4	3	4	58	"	Married
124	2	3	7	69	"	"

Contd. A

Code No.	Names—Initials	V1	V2	V3	V4	V5	V6	V7	V8
125	Mrs. F. O.	1	2	2	12	6	4	7	3
126	Madam F. O.	1	2	3	10	3	4	6	2
127	Mrs. E. I.	1	1	2	8	3	4	7	3
128	,, B. O.	2	3	3	12	6	5	5	3
129	,, F. M. A.	2	1	2	13	6	5	5	4
130	Madam M. A. A.	1	2	3	10	7	5	4	2
131	Mrs. P. L. O.	2	2	7	16	6	4	6	4
134	,, C. I. K.	1	1	5	9	7	3	6	3
135	,, C. K.	1	2	5	11	4	5	6	2
136	,, J. U. K.	1	2	1	12	6	5	3	2
137	,, U. A. I.	2	3	2	7	6	4	3	3
138	,, S. O.	2	2	0	7	5	5	3	2
139	Madam M. K.	1	4	2	10	7	4	5	2
141	Mrs. T. L. I.	2	3	2	11	7	4	3	4
143	,, D. F. C.	1	3	4	10	9	3	5	2
144	,, A. O.	2	2	1	17	8	5	8	0
150	,, R. T. E.	2	4	5	17	6	4	6	3
151	,, V. K.	1	3	7	13	8	2	3	4
155	,, E. A. K.	1	2	2	12	7	4	3	2
157	,, D. T. E.	2	3	6	13	5	4	5	2
158	,, T. K.	1	1	5	11	8	2	7	2
161	,, R. E.	2	3	5	10	7	4	4	2
169	,, R. E. U.	1	1	0	11	8	4	7	1

Contd. D

Code No.	V9	V10	V11	Max Score	%age Score	Religion	Matrimony
125	2	3	3	46	46	RCM	Married
126	3	2	4	40	40	"	Widow
150	3	2	2	37	37	"	"
128	3	3	4	56	56	"	Married
129	3	3	4	48	48	"	"
130	3	2	2	41	41	"	"
131	3	3	5	58	58	"	"
134	2	2	4	43	43	"	Widow
135	2	3	4	45	45	"	Married
136	2	2	4	40	40	"	"
137	1	1	5	37	37	"	"
138	1	1	2	30	30	"	"
139	2	2	4	43	43	"	Widow
141	2	2	4	45	45	"	Married
143	2	2	2	43	43	"	Widow
144	0	0	5	48	48	"	Married
150	3	2	4	59	58	"	"
152	1	1	4	50	49	"	"
155	3	2	4	43	43	"	"
157	3	2	4	53	52	"	"
158	2	2	4	46	46	"	Widow
161	3	2	2	46	45	"	Married
163	0	0	5	37	37	"	"

APPENDIX 7

The occupational levels of households

Occupation	Type	H	W	Total	%	Grand Total	%
Farming	Peasant	16	39	55	29.41	57	30.48
	Big	2	–	2	1.07		
Trading	Petty	8	48	56	29.95	62	33.16
	Big	6	–	6	3.21		
Employee	Unskilled	5	3	8	4.28	14	7.48
	Skilled	5	1	8	3.21		
Self Employed	Unskilled	1	–	1	0.53	36	19.25
	Skilled	31	4	35	18.72		
Unemployed		4	14	18	9.63	18	9.63
Total		78	109	187	100.01	187	100.00
Deceased		20	1	21	–	21	10.1 (of the supposed 208 spouses)
Total		98	110	208	–	208	10.1

APPENDIX 8

Comprehensive height and weightfor-age values—

children 6 — 60 months n = 114

Harvest season				Hungry season			
Age (months)	Sex	Observed Height (cm)	Observed weight (kg)	Age (months)	Sex	Observed Height (cm)	Observed weight (kg)
6	M	62.2	6.0	12	M	75	7
6	,,	62.2	7.0	12	,,	72.6	7.2
8	,,	67	7.0	12	F	73.6	6.8
6	,,	64.8	5.5	12	,,	74.5	8
10	,,	75	7.8	12	,,	72.4	8.2
10	,,	77.5	7.8	12	,,	74	8.8
6	F	76	7.0	18	M	76.2	13
6	,,	61.2	6.8	18	,,	77.5	14
6	,,	60.2	6.8	20	,,	79	13
6	,,	60.5	5.8	20	,,	77	12
8	,,	62.1	6.5	18	F	72	12
10	,,	66.0	7.2	18	,,	76.4	13.6
9	,,	64.3	7.0	18	,,	74.4	12.2
10	,,	69.2	9.0	20	,,	74.6	12.5
10	,,	75.5	6.1	22	M	75	12
10	,,	76.0	7.0	24	,,	79	13
10	,,	75.5	8.8	24	,,	80.4	12
10	,,	69.4	8.8	24	,,	80	14
12	M	74.0	9.0	24	,,	83	13
12	,,	74	7.2	24	,,	80.1	13
12	,,	74.0	7	22	F	81.4	13
12	,,	74	7.2	20	,,	80.1	12

(contd.)

Age (month)	Sex	Observed Height (cm)	Observed weight (kg)	Age (month)	Sex	Observed Height (cm)	Observed weight (kg)
24	F	81	14	34	F	88.4	14
24	"	80	12	40	M	95.5	14
24	"	82.8	13	42	"	95.4	13.5
30	M	80.5	11	42	"	96.4	16.5
30	"	81.2	9.8	42	"	96.1	14
32	"	80	11	40	F	95.5	14
30	"	82.2	11	42	F	98.5	13.3
34	"	81.2	12	42	"	98.2	16
30	F	79	16	42	"	99.5	15.5
34	"	83.2	14	46	M	100	12
30	"	83	13	46	"	100	12
30	"	81.2	13.4	46	"	100	15
36	M	89.1	12	48	"	102	15
36	"	93	11	48	"	101	14
36	"	90.5	14	48	"	100	15
36	"	91.2	14	48	"	105	18
35	"	88.1	13	48	"	105	13
36	F	88.5	13	48	"	100	15
36	"	93	15	48	"	102	15
36	"	94.5	16.5	48	"	104	15

(contd.)

Age (months)	Sex	Observed Height (cm)	Observed weight (kg)	Age (months)	Sex	Observed Height (cm)	Observed weight (kg)
48	M	102	13	48	F	103.5	16
48	"	103	15	48	"	102.5	15
46	"	102.2	15	50	M	104	16
48	"	102	12.5	52	M	104	16
48	"	103.5	14	52	F	108	20
45	F	101.5	14	54	"	107.5	15
46	"	102	15	54	"	105.7	16
46	"	102	14	54	M	106	18.8
48	"	103.3	15	60	"	105.6	14.5
48	"	104	15	60	"	107	15
48	"	101.6	15	60	"	108.3	13
48	"	103	16	60	F	106	16.2
48	"	102.5	14	60	"	104.5	15
48	"	102.2	14	60	"	109	19
48	"	103.5	14	60	"	104.5	18

APPENDIX - 9

Nutrient values of foods commonly consumed (in Ikenanzizi–Etiti LGA Imo State)—per 100gm

Foods	Kcal	Pr. Gm	Vitamins Vit. A Mcg.	B2 Mg	C Mg	Minerals Cal Mg.	Iron Mg	Source	Page
Starchy Foods									
Fermented cassava	344	1.6	0	.05	0	66	3.6	FAO	34
Cocoyam	133	2	0	103	10	20	1.00	FAO	39
Yam	335	3.4	—	.08	—	20	1.1	FAO	98
Maize (fresh)	152	5	0	0.08	—	18	1.8	FAO	109
Corn pap	360	0.5	—	—	—	10	4	Platt	7
Garri	331	1	trace	.03	0	45	1.6	FAO	34
Tapioca–fresh	160	0.7	—	—	—	127	—	FAO	226
Bread	261	—	—	—	—	—	—	FAO	10
Rice	362	6.8	—	0.03	—	11.0	1.8	FAO	20
Sugar-cube	400	—	0	0	0	0	0	FAO	20
Legumes									
Breadnut-Ukwa	377	12.6	—	—	—	127	—	FAO	60
Oil bean	544	26.0	—	0.30	0	190	16.00	Platt	12
Dika nut (ogbono)	670	7.5	—	.08	—	126	3.4	FAO	66
Cow pea	342	23.1	70 C	0.18	1	101.0	7.6	FAO	44
Melon	581	25.0	—	0.15	—	0	8.0	Platt	12

C = β–carotene
R = Retinol (β-carotene ÷ 6)

Food	Kcal	PN(gm)	Vitamin A (mcg)	Vitamin B2 (mg)	Vitamin C (mg)	Calcium Cal	Iron	Source	Page
Animal Protein									
Fish-smoked	340	74.5	–	–	–	228	–	FAO	193
Crayfish	320	57.5	–	–	–	2700	–	FAO	197
Milk-tinned	140	7.0	320[R]	0.32	1.7	760	0.2	Platt	26
Beef (fresh)	237	18.2	–	–	0	11	3.4	FAO	165
Ice fish/fresh	111	20	100[R]	11	–	44	1.2	FAO	193
Green Vegetable									
Ugu–Telferia	27	4	3600[C]	.00	80	477	0.8	(Rockfeller) Uboma	7
Uha	28	2.0	1200[C]	0.2	50	80	2.5	Platt	14
Pepper	347	13.8	1060[C]	.27	180	130	–	FAO	117
Onion	41	1.2	0	0.04	11	27	0.8	Platt	16
Okro	36	2.1	185[C]	0.08	47	84	1.2	Platt	16
Tomato-fresh	22	1.0	1040[C]	0.04	50	29	1.7	FAO	129
Tomato-puree	99	2.0	1000[C]	0.05	33	13	1.7	Mitchell et al	547
Fruit									
Pear-native	263	4.6	–	–	19	43	0.8	FAO	136
Cola-nut	350	9.0	–	2.0	–	15	6.0	Platt	32
Oil									
Palm kernel	441	20	–	50	–	–	–	Oyenuga	77
Palm oil	900	0	6000[C]	0	–	–	–	Platt	22
Coconut	388	3.6	25[C]	0.05	0.2	21	2.5	FAO	64
Beverages									
Palm wine	17	0.02	–	0.01	145	–	0.32	Platt	31
Tea leaf	40	10.5	–	0.9	–	–	–	Plat	30
Beer	35	0.3	0	0.05	0	8.0	0.1	Mitchell et al	522
Miscellaneous									
Maggi cube	116	9.5	–	–	–	180	24.5	Platt	30

Contd.

Food	Kcal	PR (gm)	Vitamin A (mcg)	Vitamin B2 (mg)	Vitamin C (mg)	Minerals Cal	Minerals Iron	Source	Page
Beverages									
Palm wine	17	0.02	—	0.01	145	—	0.32	Platt	31
Tea leaf	40	10.5	—	0.9	—	—	—	Platt	30
Beer	35	0.3	0	0.05	0	6.0	0.1	Mitchell et al	522
Miscellaneous									
Maggi cube	116	9.5	—	—	—	160	24.5	Platt	30

APPENDIX 10

Drying of local staple foods with high water content (HWC) and Conversion factor*

Food	Local measure (fresh)	Wt (gm)	Local measure (dry)	Wt (gm)	% Dry matter	% moisture	% dry matter of food table	Conversion factor (cf)	References	Page
Breadnut	1c	200	¾c	150	75	25	83	0.9	Oyenuga(1968)	4
Fresh corn	1c	95	¼c	20	21	79	18.8	1.1	FAO(1968)	15
Fermented cassava (fresh)	3c	500	1¾c	250	50	50	37.0	1.35	FAO(1968)	34
Smoked (iced) fish	1 med	200	1 med	135	67.5	32.5	81.0	0.8	FAO(1968)	192
Cocoyam (peeled)	1 med	100	1 med	45	45.0	55.0	36.0	1.25	FAO(1968)	37
Yam (peeled)	½ med	410	1 med	180	44.0	56.0	27	1.6	FAO(1968)	39
Gari	1c	180	¾c	140	77.8	22.2	86.5	0.9	Oyenuga	9
Fresh cassava (tapioca)	3c	360	¾c	80	22.2	77.8	—	—	—	—

$$\text{*Conversion factor (cf) of water} = \frac{\%\text{ Dry matter of survey food}}{\%\text{ Dry matter of food table}} \times \frac{\text{wt.(gm) of food}}{1}$$

APPENDIX II

Households and the respective number of consumers

Code	Consumers:	Code	Consumers:	Code	Consumers:	Code	Consumers:
1	3	26	3	75	8	108	9
2	9	27	7	80	6	118	9
3	5	29	2	81	4	119	7
4	5	31	5	82	3	121	6
5	3	39	6	85	2	123	6
6	6	46	8	86	6	124	5
7	3	47	3	89	2	128	8
8	6	51	3	90	4	131	6
9	7	52	5	92	2	144	3
10	4	53	2	95	3	150	4
11	5	55	9	97	9	151	6
12	6	61	4	98	4	157	8
13	5	64	8	99	3	159	3
14	3	68	5	100	2	161	9
15	6	70	9	87	2	134	3
16	5	74	6	88	3	135	5
17	6	41	5	102	6	136	6
19	6	48	4	103	5	137	7
20	7	54	3	105	5	138	1
22	6	57	2	114	6	139	1
23	5	60	2	120	3	141	8
30	5	65	2	122	8	143	4
32	4	66	2	125	6	155	8
34	1	67	7	126	1	158	5
35	5	76	6	129	5	163	4
36	4	77	1	130	3	104	2
38	2	79	5	106	6		
25	4	83	4	107	5		

Total consumers = 527

APPENDIX 12

Proforma for nutrient intake compilation from food items

(for recall method) Season

Code: Pers. Day:

Foods	Total Qty. gm.	Cal	Pr(gm)	A(mcg)	B2 (mgm)	(mgm)	Calcium (mgm)	Iron (mgm)
STARCHY FOOD		Per	gram	Consumption				
1. Fermented Cassava	500	3.44	0.02	0	0.001	0.04	0.66	0.04
2. Cocoyam								
3. Yam								
4. Maize (Immature)								
5. Corn Pap								
6. Garri								
7. Tapioca-dry								
8. Bread								
9. Rice								
10. Sugar-Cube								
LEGUMES								
11. Breadnut-Ukwa								
12. Oil bean								
13. Dika nut-Ogbono								
14. Cow Pea								
15. Melon								
ANIMAL PROTEIN								
16. Fish-Smoked								
17. Crayfish								
18. Fish-Canned								
19. Beef								
20. Ice Fish/fresh								
GREEN-VEG.								
21. Ugu-Telferia								
22. Ulu								
23. Pepper								
24. Onion								
25. Okro								
26. Tomato-fresh								
27. Tomato-Puree								
FRUIT								
28. Pear-native								
29. Coconut								
OILS								
30. Palm kernel								
31. Palm Oil								
32. Coconut								
BEVERAGES								
33. Palm wine								
34. Tea leaf								
35. Beer								
MISCELLANEOUS								
36. Maggi Cube								

APPENDIX 13

A comparison of mean food intake (in gm) between the two seasons (1984–85) That is, to test whether there is a significant difference between the seasons intake: at $P \leq 0.05$ (A two-tail test)

Harvest season (A)

2132 ± 619

$$196\frac{S^2}{n} = 619$$

$$S^2 = \frac{619\,(n)}{1.96} =$$

$S^2 = 34739.8$

$\therefore S = 186$

Hungry season (U)

2221.2 ± 825

$$S^2 = \frac{825\,(n)}{1.96}$$

$S^2 = 46301.02$

$S = 215$

Ho: $\mu_A = \mu_0$; Hi : $\mu_A \neq \mu_u$ $\alpha = 0.05$

$$Z = \frac{\overline{X}_A - \overline{X}_U}{\sqrt{\left(\frac{O_A^2}{n_1} + \frac{O_u^2}{n_2}\right)}} \qquad \frac{2132 - 2221.2}{\sqrt{(315.8 + 420.9)}}$$

$$= \frac{-89.2}{\sqrt{(766.7)}} = -0.1163$$

Z^* calculated $= -0.1163$

Since $-Zt < -Z^*$ or $Zt > Z^*$

We accept the null hypothesis ie $\mu_A = \mu_u$ ie. $X_A = X_u$

Interpretation: The quantity of food intake between the two seasons (Harvest and hungry) is the same.

Note: The Z–test of difference between two means is used. Why? because n = 110, ie. n is large. The test is a two tailed test.

APPENDIX 12

*Household (H/H) scores for correlation/regression analysis**

Variables		S.E. status				Foods supply		Nutrient intake					Nutritional status				
	V_1	V_2	V_3	V_4	V_5	V_6	V_7	V_8	V_9	V_{10}	V_{11}	V_{12}	V_{13}	V_{14}	V_{15}	V_{16}	V_{17}
Max. Score	(6)	(8)	(21)	(16)	(6)	(6)	(6)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)
39	2	3	6	13	2	2	4	—	4	6	8	5	—	7	9	—	10
90	2	4	9	14	3	3	4	—	—	10	—	5			9		8
106	2	4	5	14	3	2	5	8	10			8	8	10			8
118	2	4	8	12	3	3	4	—	8	4	8			8	8	10	8
9	1	1	4	7	3	3	3				9	8	8		8	9	10
11	2	3	5	15	3	3	4	6		6	10	5			9	7	7
12	2	3	6	14	3	3	5		3	5	4	—	—	7	9	10	—
13	2	3	5	13	3	3	5				10	—	—	—	—	10	—
14	2	3	7	14	3	4	8	8	5	5	9	8	8	7	8	9	8
15	1	3	7	14	3	3	4	—	10	10	10	—	—	10	8	8	
17	2	3	9	13	1	3	5	—	7			—	—	10	—	—	—
19	1	1	1	14	3	3	3	—				5					6
23	2	3	3	14	3	3	5	9	7				8	10			
27	1	3	5	9	3	3	5	10	6	—	9	—	9	10		8	
46	2	3	3	12	3	3	5	10			8		9				10
52	1	2	4	15	3	3	4	9	10				10	8			
64	1	7	4	15	3	2	4		6	5		4		10	10		7
70	2	3	10	10	3	3	4	—		7	6	6	—	8	9		10
74	1	2	4	14	3	3	5	4	—	5		10	8	9			9
75	1	2	6	13	3	3	4		7	6	5	9		7	8	9	10
86	2	4	3	13	3	3	4	—	10	10	10	—	7	10	8		

Total no. = 60 selected households

APPENDIX 14

Household (H/H) scores for correlation/regression analysis*

	S.E. status				Foods supply			Nutrient intake						Nutritional status			
Variables	V_1	V_2	V_3	V_4	V_5	V_6	V_7	V_8	V_9	V_{10}	V_{11}	V_{12}	V_{13}	V_{14}	V_{15}	V_{16}	V_{17}
Max. Score	(6)	(8)	(21)	(16)	(6)	(6)	(6)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)
39	2	3	6	13	2	2	4	–	4	6	8	5	–	7	9	–	10
90	2	4	9	14	3	3	4	–	–	10	–	5			9		8
106	2	4	5	14	3	2	5	8	10			8	8	10			8
118	2	4	8	12	3	3	4	–	8	4	8			8	8	10	8
9	1	1	4	7	3	3	3				9	8	8		8	9	10
11	2	3	5	15	3	3	4	6		6	10	5			9	7	7
12	2	3	6	14	3	3	5		3	5	4	–	–	7	9	10	–
13	2	3	5	13	3	3	5				10	–	–	–	–	10	–
14	2	3	7	14	3	4	8	8	5	5	9	8	8	7	8	9	8
15	1	3	7	14	3	3	4	–		10	10	10	–	–	10	8	8
17	2	3	9	13	1	3	5	–	7			–	–	10	–	–	–
19	1	1	1	14	3	3	3	–				5					6
23	2	3	3	14	3	3	5	9	7				8	10			
27	1	3	5	9	3	3	5	10	6	–	9	–	9	10		8	
46	2	3	3	12	3	3	5	10			8		9				10
52	1	2	4	15	3	3	4	9	10				10	8			
64	1	7	4	15	3	2	4		6	5		4		10	10		7
70	2	3	10	10	3	3	4	–		7	6	6	–	8	9		10
74	1	2	4	14	3	3	5	4	–	5		10	8	9			9
75	1	2	6	13	3	3	4		7	6	5	9		7	8	9	10
86	2	4	3	13	3	3	4	–	10	10	10	–	7	10	8		

Total no. = 60 selected households

(Contd.)

Code	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	V12	V13	V14	V15	V16	V17
97	2	4	5	11	3	2	2	4	7		5	4	9	10		8	8
98	2	3	3	13	2	2	2		10		10				8		8
100	1	4	6	15	3	3	5			10					8		
108	2	3	7	11	2	3	4	5	8	7	6	9	7	8	9	8	10
121	2	2	3	15	2	2	3			8	7				10	10	
132	2	3	3	15	4	3	4			4	7	6			8	9	10
131	2	2	7	16	3	3	5		10	10		10		9	9		9
152	1	5	7	13	1	1	4		7	5				8	7		
157	2	3	6	12	3	2	4	10	10	10		10	9	8	7		8
161	2	3	5	10	3	2	2	7	10	9	8	8	9	8	10	7	8
6	1	1	0	10	2	2	2	—	10	9	9	—	8	8	8	10	
10	1	3	5	15	3	3	3	—		8	9				9	10	
20	1	1	1	14	3	3	3		6	5				10	9		
48	1	4	2	7	4	3	4	10	10		10			8		8	8
54	1	1	4	10	3	3	2		10		10				7	—	7
57	1	1	2	9	2	2	5		10					10			
61	1	6	5	11	4	3	4	—		9	8		—	—	9	10	—
66	2	3	6	13	3	3	4					6	—	—		—	10
67	1	4	7	9	2	2	4	5	—	3	10	5	9	—	9	9	
76	1	2	2	13	3	3	3			5		8	—		9	—	
79	1	3	2	13	3	3	5		6	10	9			8	9	9	—
83	1	3	4	11	3	2	4					9	—	—	—	—	8
102	1	2	2	12	2	3	5	—	5	9	4	4	—	10	9	8	8
103	1	2	3	10	3	3	4	—	7	9	—	—	—	10	8	—	—
114	1	1	3	11	2	2	2		7	6	6	6	—	10	9	7	7
122	1	3	4	10	2	3	3		8	3	6	5	—	7	9	8	8

(Contd.)

Code	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	V12	V13	V14	V15	V16	V17
123	1	1	3	10	0	2	4	–	6	–	6	5	–	–		7	7
129	1	1	3	10	0	0	4		–	5	–	–	5	–	–	7	7
125	1	2	2	12	2	3	3		5	4	–	6	–	10	8	9	10
128	2	3	3	12	3	3	4		8	7			—	10	10	–	
135	1	2	5	11	2	3	4	–	6	8	–	-		10	9	–	–
136	1	2	1	12	2	2	4	–	8	6		6		9	10		10
137	2	3	2	7	1	1	5	4	3	2	4	–	9	10	10	9	–
141	2	3	2	11	2	2	4	–	5	7	4	6	–	10	10	8	9
143	1	3	4	10	2	2	2	7	–	10	-	9	7	-	8	–	8
155	1	2	3	12	3	2	4										
158	1	1	5	11	2	2	4	–	7	6	7	8	–	10	9	8	9
163	1	1	0	11	0	0	5	–	10	–	8	8		10	–	8	9

Instruction for Regression/correlation

1. Regress V1, 2, 3, 4, 5, 6, 7, and V8 9, 10, 11, 12
   With V13–V17 (NS) (V13 V14 V15 V16 V17) individually
2. Regress also:
   V1, 2, 3, 4, 5, 6, 7 and V13, 14, 15, 16, 17 with (N1) V8, 9, 10, 11, 12 individually (as in V13 – V17)
3. Regress also N1 (Nutrient Intake V8–V12) with
   NS (Nutritional Status, V13–V17)
4. Perform also the correlation of the same factors.

APPENDIX 15

A sample menu (Recipe) calculated by a weighing method of dietary assessment *(a)

Nutrient intake for household (code) 125

Day 1

Breakfast – Nil.

Lunch

Menu: Yam Portage

Recipe: *(b)

Yam ½ med. (420 gm fresh) 200 gm dry – Conversion:- 1.6 x 200 = 320 gm

Palm oil 2 ssp. – 135 gm.

Ugu leaf. ½ hd. – 100 gm

Pepper ½ ssp. – 30 gm

Salt – to taste

Water – 6 cups

Cooked portage: 1500 gm

*(a) Recipe is composed of all edible portion (EP):–

SSp – soup spoon of a standard size.

Hd. – a head or a bunch

Cup "c" – a standard cup of 225 ml.

Yam or cocoyam is peeled and dried

Ugu leaves are picked

Pepper is dried and ground.

Crayfish is dried and ground.

*(b) For conversion factor for water content of staple foods, see Appendix 6.

Contd.

Portions consumed per person

Person	Age (year)	Portion (gm)	%
Mother (P2)	40	420	28
Female	6	450	30
Female	4	375	25
Male	2	255	17

Nutrient value of yam porage

Food	Gm	Kcal	Pr (gm)	Vit. A (U)	Vit. B2 (mg)	Vit. C (mg)	Calc. (gm)	Iron (mg)
Yam	320	1072	10.9	–	–	–	70	3.2
P. oil	135	1215	0	1350	–	–	–	–
Pepper	30	104	0.4	315	–	54	46	–
Ugu leaf	100	27	4.4	600	–	80	477	0.8
		2418	14.4	2265	–	134	523	4.0

65% = 9.4

Nutrients consumed per person

Person	Age(year)	Kcal	Pr (gm)	A(U)	B2 (mg)	C (mg)	Calc. (mg)	Iron (mg)
Mother	40	677	2.6	634	–	37.5	146.4	1.2
Female	6	725	2.8	679.5	–	40.2	157.0	1.2
Female	4	604.5	2.4	566.3	–	33.5	130.8	1.0
Male	2	411.1	1.6	385.1	–	22.8	88.9	0.7

Supper – Day I

Menu: Cassava foofoo with Ugu soup

Recipe:

Fermented cassava (a meal) ("Akpu") – 10 ssp = 185 gm.

Conversion:- 1.35 x 185 = 250 (249.8)

Hot water – 10 cups

Cooked cassava = 2000 gm.

(Contd.)

Portion of cassava consumed per person

Sex	Age (year)	Gm	%
Mother	40	600	30
Female	6	600	30
Female	4	500	25
Male	2	300	15

Nutrient values of cassava foofoo

Food	Gm	Kcal	Pr	V/A	V/B2	V/C	Calcium	Iron
Cassava	250	860	4	0	0.1	0	171.6	9
			65% = 2.6					

Nutrient intake per person

Sex	Age	Kcal	Pr	V/A	V/B2	V/C	Calcium(gm)	Iron(mg)
Mother(P2)	40	258	0.8	0	0.03	0	51.5	2.7
Female	6	258	0.7	0	0.03	0	51.5	2.7
Female	4	215	0.7	0	0.03	0	42.9	2.3
Male	2	129	0.4	0	0.02	0	25.7	1.3

Recipe: (Ugu soup)

Ugu leaves	1 head	–	200 gm
Pepper	½ ssp.	–	30 gm
Crayfish	2 ssp	–	40 gm
Cocoyam (ede)	2 med.	–	(110 gm)
Conversion:	1.3 x 110 = 143 gm.		
P. oil	1 ssp	–	65 gm
Maggi cube		–	4 gm
Salt to taste			
Water.			

Cooked soup = 1610 gm

(Contd.) 251

Soup portion consumed

Sex	Age (year)	Gm	%
Mother	40	500	31
Female	6	465	29
Female	4	400	25
Male	2	240	15

Nutrient value of Ugu soup

Food	Gm	Kcal	Pr	V/A	V/B2	V/C	Calc.	Iron
Ugu leaf	200	54	8	1200	0	160	954	1.6
Pepper	26	90	5	45	0.1	47	35	—
Crayfish	40	128	23	—	—	—	1080	—
Ede	143	190	2.9	0	151	28	1.40	1.0
P. oil	65	605	0	705	—	—	—	0
Maggi cube	5	6	0.4	—	—	—	7.2	1.2
		1072	39.3	1950	151.1	235	2077	3.8

65% = 25.5

Nutrients consumed per person

Sex	Age	Kcal	Pr	V/A	V/B2	V/C	Calc.	Iron
Mother	40	332.5	7.9	604.5	46.8	72.9	644	0.8
Female	6	310.9	7.4	565.5	43.8	68.2	602.5	0.8
Female	4	268	6.4	487.5	37.8	58.8	519	0.7
Male	2	160.8	3.8	292.5	22.8	35.3	311.6	0.4

Total nutrients consumed per person—Day 1

Person	Age	Kcal	Pr(gm)	V.A(U)	V.B2(mg)	V.C(mg)	Calcium(gm	Iron(mg)
Mother	40	1257.5	11.3	1238	46.8	110.5	842	4.7
Female	6	1293	10.9	1199.5	43.8	152.2	811	4.7
Female	4	1087	9.5	1053.8	37.8	92.3	692	4.0
Male	2	701	5.8	677.9	22.7	81.0	426	2.4

APPENDI

Mean kcal and protein intake by ho

n = 62

MALE

Age Group	0 - 1		1.1 - 3		3.1 - 5		5.1 - 7		7.1 - 10		10.1 - 18		18.1 - 30		30.1-60		>60	
H/H Code	Kcal	Pr	Kcal	Pr	Kcal	Pr	Kcal	Pr	Kcal	Pr	Kcal	Pr	Kcal	Pr	Kcal	Pr	Kcal	Pr
118			551.1	7.1					1569.3	21.5					1837.5	23.5		
20							1297	21.0										
15					434	6.7					1412.6	18.0					1103.5	14.7
6															1834.6	25.2		
66	273.2	2.6					1450	15										
121					635.7	6.3	5743	5.7	1255.8	11.5	1693.1	17.1			1942.1	19.1		
103			1150.4	5.8														
11									1243	17.3					1435	20.4		
114			1834.8	10.3	2006.9	16.3	2735.2	24.7							3654.2	26.2		
126					1221.8	19.7												
17			1356.8	6.1	938.5	12.3			1477	20.3								
125			1267.0	8.7														
Z	273.2	2.8	6159.9	38	5236.9	61.3	6056.5	66.4	5545.1	70.7	3095.7	25.1	-	-	1063.1	104.6	1103.5	14.7
$\bar{X}$	273.2	2.8	1231.5	7.6	1047.4	72.3	1514.5	16.6	1336.3	17.7	1547.9	17.6	-	-	2136.7	22.9	1103.1	14.7
σ_n	-	-	412.4	1.7	549.3	5.3	778.7	7.2	140.8	3.8	135.3	0.4	-	-	778.2	6.2	-	

PENDIX 16

e by household (1989): weighing method
n = 62

FEMALE

Age Group (years)	0 - 1		1.1 - 3		3.1 - 5		5.1 - 7		7.1 - 10		10.1-18		18.1 - 30		30.1 - 60		>60	
H/H Code	Kcal	Pr	Kcal	Pr	Kcal	Pr	Kcal	Pr	Kcal	Pr	Kcal	Pr	Kcal	Pr	Kcal	Pr	Kcal	Pr
118					920.4	11.4	1275.2	15.1			2653.0	16.9			1739.2	21.2	-	
20									1259	20.1					2092.6	32.2	-	
15							709.3	9.2			1329.0	17.4			1636.0	26.0	-	
6					929	12.8			1625	24.3					1900.3	25.7		
86					874.7	11.6							1851.9	14.9				
121					962.4	10.9							1712.6	17.4	1526.2	25.7	-	
103					1031.8	14.7												
11					1284.5	19.3									2520.6	25.2	-	
114					1191.8	20.2	1255	16.7	1373	19.6	1131.6	19.6						
126					1164.9	20.2			1103.2	27.4	1232.8	20.6	2325.1	35.9	1575.3	25.3	-	
17									1762.6	20.7	1461.4	22.9						
125											1518.9	20.8			1779	20.3	-	
Z	-	-	-	-	1483.8	14.6	1351.1	14.3							3359	195.0	-	
$\bar{X}$	-	-	-	-	9875.1	14.6	4541.1	55.3	1825.5	11.3	9615.8	17.9	5889.6	63.2	1669.8	24.1	-	
σ_n	-	-	-	-	1097.2	16.0	1135.3	13.6	1365.1	23.6	1636.3	11.8	1963.2	22.9	629.7	10.7	-	
	-	-	-	-	210.7	5.3	250.0	2.8	214.9	3.3	341.7	11.7	262.1	9.4				

PENDIX 16

e by household (1989) weighing method
n = 62

FEMALE

Age Group (years)	0 - 1		1.1 - 3		3.1 - 5		5.1 - 7		7.1 - 10		10.1-18		18.1 - 30		30.1 - 60		>60	
H/H Code	Kcal	Pr	Kcal	Pr	Kcal	Pr	Kcal	Pr	Kcal	Pr	Kcal	Pr	Kcal	Pr	Kcal	Pr	Kcal	Pr
118					920.4	11.4	1275.2	15.1			2653.0	16.9			1739.2	21.2	-	
20									1259	20.1					2092.6	32.2	-	
15							709.3	9.2			1329.0	17.4			1636.0	26.0	-	
6					929	12.8			1625	24.3					1900.3	25.7		
86					876.7	11.8							1851.9	14.9				
121					992.4	10.0							1712.6	17.4	1526.2	25.7	-	
103					1051.2	14.7												
11					1204.3	19.3												
114					1151.5	20.2									2520.6	25.2	-	
125					1164.0	20.3	1255	16.7	1373	19.6	1431.6	19.6						
17									1164.2	27.4	1232.8	20.6						
125									1162.9	26.7	1281.6	23.8	2325.1	35.9	1875.3	25.3	-	
											1218.8	20.8						
Z					1483.8	14.6	1351.1	14.3							1779	20.3	-	
$\bar{X}$	-	-	-	-	9875.1	14.6	4541.1	55.3	1625.5	11.3	9815.8	17.9	5889.6	63.2	3359	195.0	-	
σn	-	-	-	-	1097.2	10.0	1135.3	13.8	1365.1	23.6	1636.3	11.8	1963.2	22.9	1669.8	24.4	-	
	-	-	-	-	210.7	5.3	250.0	2.8	214.9	3.3	341.7	11.7	262.1	9.4	629.7	10.7	-	

Test of Significance

WEIGHING METHOD

S/No	Age Group	0 – 1	0 – 1	1.1 – 3	1.1 – 3	3.1 – 5	3.1 – 5	5.1 – 7	5.1 – 7	7.1 – 10	7.1 – 10	10.1 – 18	10.1 – 18	18.1 – 30	18.1 – 30	30.1 – 60	30.1 – 60	>60	>60
	Sex	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
	No of sub bjs	Combined 1	–	Combined 5	–	5	9	5	4	4	5	2	8	–	3	5	9	1	–
	Nutrient	Mean SD	Mean SD	Mean SD	Mean SD	Mean SD	Mean SD	Mean SD	Mean SD	Mean SD	Mean SD	Mean SD	Mean SD	Mean SD	Mean SD	Mean SD	Mean SD	Mean SD	Mean SD
1	Kcal	293.2	–	1231.9	–	1064.4	1067.3	1514.1	1135.3	1386.3	1365.1	1597.9	1339.4	–	1403.2	258.7	1669.8	1103.5	–
		–	–	1100.0	–	544.3	210.7	778.7	250.0	110.9	214.9	135.3	341.7	–	262.1	778.2	639.7	–	–
2	Protein (gm)	21.8	–	7.6	–	12.3	16.0	16.6	13.8	17.7	13.6	17.6	16.8	–	22.7	24.4	38.9	14.3	–
		–	–	1.7	–	5.3	5.3	7.2	2.8	3.8	3.3	0.4	11.7	–	9.4	6.2	10.7	–	–
3	A (mg)	156.0	–	313.5	–	408.8	621.9	599.8	582.4	596.7	692.5	700.4	644.3	–	887.7	798.7	849.3	620.2	–
		–	–	152.4	–	136.0	134.3	246.6	156.0	77.0	67.8	51.5	99.0	–	102.1	134.7	122.2	–	–
4	B_2(mg)	1.9	–	11.4	–	37.4	15.5	18.4	31.6	23.2	50.2	62.8	44.8	–	78.4	28.8	46.4	87.9	–
		–	–	6.4	–	26.1	10.0	9.1	15.1	3.6	45.7	43.6	36.7	–	74.1	9.2	22.2	–	–
5	C(mg)	14.9	–	21.5	–	32.4	47.7	47.0	51.3	44.1	36.5	70.4	53.2	–	82.8	58.6	78.3	67.1	–
		–	–	11.9	–	10.1	12.3	22.6	12.9	5.2	7.6	18.7	14.1	–	23.5	6.8	22.8	–	–
6	Ca (mg)	100.5	–	244.6	–	334.5	432.4	461.0	496.6	470.8	589.0	734.7	508.4	–	877.2	762.3	761.1	608.3	–
		–	–	145.7	–	76.2	150.7	185.6	183.3	95.3	194.4	34.8	132.3	–	2.3	229.8	300.2	–	–
7	Iron (mg)	1.8	–	2.9	–	5.8	5.4	7.0	6.6	7.6	8.7	15.3	9.9	–	11.4	10.7	13.7	17.4	–
		–	–	1.1	–	1.1	1.1	2.0	2.1	2.4	1.6	6.1	4.7	–	2.1	3.2	5.9	–	–

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ce for the Weighing and 24-hour Recall Methods of Determination of Nutrient Intake (1989)

24-HR RECALL METHOD																		Mean		STATISTICAL SIGNIFICANCE			
0 - .1	0 - .1	1.1 - 3	1.1 - 3	3.1 - 5	3.1 - 5	5.1 - 7	5.1 - 7	7.1 - 10	7.1 - 10	10.1 - 18	10.1 - 18	18.1 - 30	18.1 - 30	30.1 - 60	30.1 - 60	>60	>60	Weigh Meth.	Recall Meth.	T. Value	P. Value		
M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	SD	SD				REMARK
1	-	5	-	5	9	5	4	4	3	3	8	-	3	5	9	1	-				5%	1%	
Mean SD	Mean SD	Mean SD	Mean SD	Mean SD	Mean SD	Mean SD	Mean SD	Mean SD	Mean SD	Mean SD	Mean SD	Mean SD	Mean SD	Mean SD	Mean SD	Mean SD	Mean SD						
268.0	-	110.0	-	1101.5	1091.2	1493.5	1317.5	1462.4	1350.1	1568.8	1405.4	-	1963.3	2632.5	1661.8	1065.3	-	1541.28	1338.90	0.0172	<2.056	2.779	Not Significant
-	-	152.2	-	351.5	161.2	225.2	295.3	211.2	293.3	266.3	139.5	-	282.2	242.8	235.3	-	-	450.09	442.66				
1.5	-	6.6	-	13.8	15.8	16.5	15.0	17.1	15.0	18.7	15.0	-	15.2	24.5	20.2	12.8	-	15.51	15.37	0.062	<2.056	2.779	Not Significant
-	-	1.6	-	4.5	4.3	7.7	2.8	3.0	2.2	0.3	3.3	-	5.2	5.7	5.3	-	-	3.65	6.16				
125.0	-	304.1	-	312.4	629.4	473.9	561.3	594.4	504.1	400.5	605.6	-	797.7	659.9	718.5	191.4	-	638.51	483.6	1.5857	<2.056	1.706	Not Significant
-	-	104.3	-	179.3	190.5	196.0	375.0	146.3	133.9	137.0	143.1	-	300.1	96.8	198.6	-	-	208.59	208.25				
1.9	-	9.1	-	7.7	110.9	12.7	27.9	39.6	12.1	28.0	26.6	-	15.7	33.2	50.8	12.3	-	30.39	32.82	1.349	<2.056	1.706	Not Significant
-	-	4.0	-	4.4	177.3	4.1	20.4	25.1	8.7	31.9	19.7	-	13.0	12.1	66.1	-	-	39.86	27.54				
12.9	-	15.3	-	33.1	46.9	37.1	69.0	41.3	45.3	62.9	56.2	-	76.4	51.4	65.2	72.8	-	51.41	47.57	0.538	<2.056	1.706	Not Significant
-	-	8.8	-	19.5	15.1	21.9	15.8	11.3	15.7	33.6	20.2	-	39.0	16.6	26.4	-	-	19.05	15.8				
79.4	-	182.5	-	261.3	347.8	321.3	400.0	443.3	487.4	547.0	472.3	-	601.2	693.0	570.3	421.9	-	333.19	423.8	1.310	<2.056	1.706	Not Significant
-	-	70.7	-	153.8	124.4	130.1	237.8	312.5	279.3	79.0	178.7	-	169.2	294.1	328.9	-	-	195.98	183.3				
1.3	-	4.3	-	5.4	50.9	4.2	4.5	8.8	7.4	5.1	9.8	-	10.9	9.4	3.9	3.0	-	8.72	11.14	-0.3456	>2.056	-1.706	Not Significant
-	-	4.5	-	3.9	66.3	3.8	2.6	4.8	4.9	0.9	5.2	-	4.5	4.3	85.0	-	-	43.7	13.49				
																				40.28			

APPENDIX 18

Criteria for scoring the socio-economic variables

Variable 1 — low-income level: (questions 6, 7, 9, 10).

The lower the income quota allocated to feeding on nutritious foods (particularly the protein foods which were scarce commodities and were also more expensive), the more, the probability of the development of malnutrition in such a family.

Low-income-level was fixed at N1—N200 of monthly income to fall within the government approved income of messenger cadre (GL. 01–03). Middle-income level was fixed at N201—N350 per month, to represent the clerical officers cadre (GL. 04–06) with earnings from N151—N350 per month.

High income-level was fixed at N351—N799 per month, to represent the senior service cadre (GL. 07–12) who earns N670—N724 per month. The Nigeria super scale level of (GL. 13 +) stands at about N800.00 and above per month and did not apply to the study population.

If the income of one parent or a breadwinner fell within a stipulated level such income was scored in accordance with low, medium, or high income level by the Nigerian standard. Low to high income level therefore scored 1, 2, 3, points respectively. Maximum score for variable 1 was 6 points where both parents earned high income at 3 points each.

Variable 2 — Occupational level (questions 5, 7, 8, 11, 12):-

Improved educational level guarantees good occupation with good income, improved standard of living, improved health status with reduced malnutrition incidences in the family. A skilled occupation is equally associated with a regular and improved income.

The gainful employment of father, mother, a maximum of 4 children and one relative scored 8 points at 2 points each. Conversely the unproductive family members such as school children who were not gainfully employed scored no point. Offsprings numbering more than four scored no point (appendix 6). It is assumed here that the efficient running of the home requires the combined earnings from both parents or alternative breadwinners. The familys daily demand would otherwise not be met. Thus, the less the number of breadwinners, the less the income accruing to the family, the lower the socio-economic status, and the greater the risk of undernutrition.

Variable 3 – The educational level (questions 13–16):

The improved educational level of a household is often associated with the improved occupational level, improved earning capacity, improved healthy living, and improved feeding pattern. Besides, higher education exposes the individual into imbibing external culture which augment the existing living standard towards the right direction. The more extended the education, therefore the more enlightened, the household, and the less tendency to develop diseases and malnutrition.

Based on the above rationale a total of 7 household members (composed of the father, mother, a maximum of 4 children, and one relation) were scored 21 points for each household. For example, a maximum of 3 points was scored by each individual with a post secondary school level of education (see criteria for scoring).

Based on these Premises educational level was scored as shown:

Scoring the educational levels:

Family Member	Primary Education	Secondary Education	Post. Sec. Education
Father	1	2	3
Mother	1	2	3
First child	1	2	3
Second child	1	2	3
Third child	1	2	3
Fourth child	1	2	3
Any one relation	1	2	3

Total for 7 members scored 21 points.

The choice of a maximum of 4 children to the family is based on the assumption that each family had an average of 4 children in their household.

The inclusion of one relation to a family was to make allowance for any one relation who was most closely involved in the family affair. No education at all in the household scored no point.

Variables 4 – Family size and age (questions 17, 23 and 39):-

The community's standard household consisted of father, mother, 4 children and one househelp – a relation, totalling 7 members.

The family was obliged to fulfill the members food and health demands particularly if members were of the productive group. Good feeding places a great demand on the family income, particularly for the purchase of protein foods. Thus the less the members of the household, the less demand on feeding expenditure.

Conversely, the more members there are in the household the more demand on food money, and the more overcrowding, the greater risk of contracting infectious diseases.

A household of 7 members scores a maximum of 7 points. Any additional member scores the family down by 1 point until a maximum of 7 points reduction to 0 point.

Ages of members:— Since the greatest nutrition —risk group is the children with the exception of the two parents, any family member above 5 years of age scores 1 point to a maximum of 5 points representing the four children and one relation.

Deceased family members:- With both parents alive scores 2 point maximum. But with one parent deceased scores — 1 point.

With both parents less than 65 years scores 2 points, maximum

But with a parent more than 65 years scores — 1 point.

Variables 5 — Housing facilities (Questions 24 — 27).—

The type of housing provides an insight into the socio-economic status of the family like the income and the occupation. A family house composed of aesthetic and comfortable roofing. flooring. walling and enclosures scores as follows:—

roof	ceiling	tin	thatch		max. score
	3	2	1		3
Wall	special decoration	cement	mud		
	3	2	1		3
Floor	Tile	cement	mud		
	3	2	1		3
Compound	special	cement	stick	open	
	4	3	2	1	4

(The term "Special" (Sp) implies extra decoration on the housing structure such as painted walls, roofing with ceiling, fencing with decorated cement walling).

Variable 6 — Physical amenities (questions 28 and 29).—

These refer to all the facilities available in the immediate surroundings which enhance good sanitation and promote healthy living thus eliminating infection. Such amenities include water supply, refuse disposal including toilet facilities.

Water sources:—

Tap water = 3, Rain/Stream/Well water = 2; Pond water = 1 Total = 6.

Toilet facilities:—

Water system = 3, Covered pit latrine = 2; Uncovered latrine = 1. Use of bush = 0 Total = 3.

Variable 7 — Reproductive history (questions 30 — 37):-

This is with particular reference to mothers. Multiparity depletes the nutrition, blood and energy of the mother thus precipitating her to malnutrition, infection and death. It is assumed that 4 pregnancies and 4 live offsprings score maximum points.

Scoring:—

No. of pregnancies 4 or less = 1 point maximum

No. of pregnancies more than 4 = no point

Not pregnant, or menopausal = 1 point

Pregnant or lactating = no point

Abortion or miscarriage = no point

No abortion = 1 point

If all pregnancies result to live births = 1 point

Death of any child = no point

If all children born are living = 1 point

Death of a child at five or less = no point

Death of a child after five years of age = 1 point

Cause of death if not a factor of malnutrition = 1 point

Cause of death if a factor of malnutrition = no point

If cause of death is not known = no point

If no incidence of multiple birth = 1 point

Total = 8 points.

Breast feeding (questions 38 – 41).-

If baby is breast fed = 1 point

If complete weaning starts at or about 9 months = 1 point

If complete weaning starts before 6 months or after 12 months = no point

(Dependence on breast feeding alone after 12 months with no supplementation does not guarantee adequate nutrient).

If breast feeding is terminated between 12 to 18 months = 1 point

If breast feeding terminates before 12 months = no point

If weaning foods include milk, fish, meat, green vegetable and fresh fruits = 1 point.

Total = 4 points.

Variable 8 – Daily total caloric intake (question 42).-

(see section on food intake) Food intake is determined separately

Variable 9 – Food production and consumption (questions 43a. and b).–

To control or prevent undernutrition of various types certain foods are re-

quired to be produced and consumed in larger quantities than the others. These include, the body building, maintaining and protecting foods and then the energy giving foods.

The protein group of foods which is taken as the first group score 3 points. These include animal and vegetable protein foods (animals, grains, cereals legumes and nuts) second group of foods scores 2 points. These include vegetables (cereal, grains, legumes and nuts fruits and green vegetables).

Third group of foods score 1 point. These include all root starches, fats and oils (yam, cocoyam, potatoe, oils fats).

Variable 10 – Proportion of farm products consumed (question 44)

The production of proteinous foods fulfills double purposes. It provides protein for growth and the replenishment of tissues, as well as providing energy. Such are vegetable proteins and animal proteins. But production of carbohydrate-rich foods such as root crops fulfill the main purpose of producing energy and fuel, while fatty foods provide mainly fuel for the body.

If highest proportion of food produced is protein-rich, this scores is 3 points

If highest production is carbohydrate-rich, this scores is 2 points

If highest production is fat-rich or olly foods the score is 1 point

If a food product contains all the three nutrients equally e.g. soya bean or milk, the score is 3 points

If none is produced the score is Nil

NB: As a farming community the scoring did not take into account the foods purchased since it is assumed that the community's staple foods were those foods they produced in large quantity. Maximum point 6 points

Variable 11 – Food purchases – amount in naira spent on food per month (Q.45):-

Question 45 of the questionnaire investigated the type of food purchases made and the amount spent on food types. Each food purchased and the amount spent on purchases monthly by each household were compiled on socio-economic group basis. Food purchases were also arranged according to food types. The mean amount spent in purchasing each food type by each household in each socio-economic group was calculated. The percentage proportion of the amount for each purchase was calculated.

The significance therefore of the scoring system is that it permits the scaling and visualization of the entire socio-economic pattern as it operated within the households of the community. (Fig. 2 and Appendix 4) furnishes information on the socio-economic status of the households as collected and scored from the questionnaire.

APPENDIX 19

Equivalent measures of foods commonly produced in Umunwada village 1984/85*

Food	Household measures	Net weight(kg)
Cassava Tubers	1 L/Bskt L/Bskt Tuber = ½ bag garri = 60 cupt	30 kg = 9kg Garri = 30kg Tuber
Garri–fried cassava meal	2 L/Bskt Tuber = 1 bag = 120 cups	18 kg
Akpu (fermented cassava)	1 L/Bskt Tuber = ½ bag paste	28 kg
Yam tubers	1 L/Basin or L/Bskt	48
Cocoyam	1 L/Bskt	35
Plantain/Banana	1 med. bunch	10
Maize (corn on cob)	1 L/Bskt	10
Breadnut (ukwa)	1 S/Bskt	8
Beans (all types)	1 S/Bskt	4.5
Oil beans – unshelled	1 S/Bskt	4
Groundnut–unshelled	1 S/Bskt	2
Melon (Egusi)	1 S/Bskt	2.5
Palm nut (picked)	1 L/Bskt	27
Palm kernel	1 S/Bskt	5

*L/Bskt –Large basket–"Abo"
S/Bskt –Small basket "Ekete"
Med. bunch –Medium bunch or head
Gal. –Gallon. 40 litres content
Hd –Head a (bundle)
1 large basin –1 large basket
1 large basket –4small baskets

Contd.

Food	Household measure	Net Weight
Palm oil	1 bunch palm nut = ½ L/Bskt	
	1 L./Bskt	8
	1 gal. (40 litres)	4
Coconut	1 med.	1 kg.
Pear (native) Bush butter	1 S/Bskt	10
Okro	1 S/Bskt	4.0
Ugu (fluted pumpkin leaf)	1 hd	2
Ugu fruit – a whole fruit	1	5 kg
Anara leaf (egg plant)	1 hd	1
African spinach (green)	1 hd	1
Pepper (fresh)	1 S/Bskt	4
Pear		
Udara (a plum)	1 S/Bskt	1
Pineapple	1 med. size	2.0 kg
Oranges	1 L/Bskt.	21
Guava	1 S/Bskt	4
Paw-paw	1	1.0
Chicken	1	2 kg.
Goat	1	7.5 kg.

APPENDIX 20

Food production inventory—harvest and hungry seasons 1984/85: summary table

A

N = 50	CSS Pr/Cons	YAM Pr/Cons	CY Pr/Cons	PL	MZ Pr/Cons	BR/NT Pr/Cons
H/hold Total	6905/5665	14547/6394	1736/647	—	1270/701.5	262/191
Mean	800.22/289.78	692.48/278	75.48/28.13	—	55.22/30.5	11.39/8.30
SD	±177.82/±174	±315/±118	±103.71/18.53	—	±23.47/14.22	±10.7/8.57
% Cons	96.52%	43.95%	37.27%		55.23%	72.87%

Hungry

N = 50	CSS	CY	PL	MZ	BR/NT	O/UN
H/hold Total	9120/8880	349/114	100/60	398/240	128/74	12/8
Mean	396.52/386.09	15.17/4.96	4.17/2.5	17.30/10	5.57/3.22	0.52/.360
SD	±192	±14.38/6.01	±11.15/6.61	±9.20/5.95	±6.21/3.86	±1.74/1.68
% Cons	97.37%	32.70%	59.95%	57.80%	67.31%	67.31%

(contd.)

3

	O/HN Pr/Cons.	EGUSI	PK Pr./Cons.	P/OIL Pr/Cons.	CCNT Pr/Cons.	PEAR Pr/Cons	OKRO Pr/Cons.
H/hold Total	219/90	–	448.5/118	5601/1315	15/15	75/58	
Mean	9.52/3.91	–	19.5/5.13	157/57	0.65/0.65	3.26/2.52	3.09/2.11
SD	±10.26/6.96	–	±26.79/6.25	±160/62	±2.24/2.24	±6.51/4.86	
%Cons.	42.07%	–	26.31%	36.31%	100%		

Hungry

	PK	P/OIL	CCNT	OKRO	UHA	UG/L
H/hold Total	402.5/176	5958/1971	98/30	104/45	104/88	148/94
Mean	17.5/7.65	259/86	4.26/1.30	4.52/1.96	4.52/3.83	6.44/4.09
SD	±13.67/6.09	±185/40	±2/61.2	±3.24/1.71	±3.47/3.20	±5.07/3.48
%Cons.	43.71%	33.21%	30.52%	43.36%	84.74%	63.51%

(contd.)

C

N = 50	UHA Pr/Cons.	UG/L Pr/Cons.	UG/FR Pr/Cons.	AN Pr/Cons.	GREEN Pr/Cons	PEPPER Pr/Cons.
W/H Total	44/44	1920/1161	1587.5/100	36/91.5	41/16	307/121.5
Mean	1.91/1.91	57.39/50.48	69.02/4.95	1.57/1.57	1.78/0.7	13.35/5 28
SD	±4.23/ 1.28	±16.79/16.98	±17.52/2.25	±2.46/2.37	±4.7/1.8	±12.49/5.46
%Cons.	100%	87.96%	6.3%	87.26%	39.39%	39.55%
Hungry						

N = 50	UG/FR	AN/L	PINEAPPLE	GUAV	CHICK
W/H Total	40/22.5	32.5/10.5	38/20	7/5	422.5/15
Mean	1.74/0.98	1.41/0.45	1.65/0.87	0.30/0.22	18 97/0.65
SD	±0.81/0.5	±2.23/0.62	±1.71/0.97	±0.91/057	±19.01/1.84
%Cons.	57.14%	31.92%	51.81%	79.99%	9.54%

(contd.)

D.

N = 50	ORNG Pr/Cons.	GUAV Pr/Cons.	PAWPAW Pr/Cons.	CHICK Pr/Cons.	GOAT Pr/Cons.	TOTAL Pr/Cons
H/H Total	333/00	11/18	21/21	437.5/12.5	1452/0	1511.18/776.1
H/hold Mean	14.61/5.91	0.78/0.43	0.91/0.91	19.02/0.54	63.13/0	
SD	±28.67/7.98	±1.98/1.7	±2.60/2.60	±15.72/1.47	±25.99/0	
% Cons.	26.76%	61.54%	100%	2.84%	0%	

H/H Total = 1284/0
Mean 55.83/0 811.79/515.12
SD ±29.97

Contd.

D.

Footnote

1.	CSS	—	Cassava	2.	YM	—	Yam	3.	CY	—	Cocoyam	4.	PL	— Plantain
5.	MZ	—	Maize	6.	BR/NT	—	Breadnut	7.	O/BN	—	Oil Bean	8.	EGU	— Egusi
9.	PK	—	Palm kernel	10.	P/OIL		Palm oil	11.	CCNT	—	Coconut	12.	PR	— Pear
13.	OKR	—	Okro	14.	UH	—	Ukia	15.	UG/L	—	Ugu leaf	16.	UG/FR	— Ugu fruit
17.	AN	—	Anara leaf	18.	GREEN	—	Green	19.	PEPP	—	Pepper	20.	PIPP	— Pineapple
21.	ORNG	—	Orange	22.	GUAV	—	Guava	23.	PAWP	—	Pawpaw	24.	CHICK	—Chicken
25.	GOAT	—	Goat											

Household = H/holds
PR = Produced
CONS = Consumed

Food stock inventory; method of compilation

The monthly food stock inventory of a sample of 50 households were compiled into harvest season crop productions (July—December 1984) and the hungry season productions (January—June 1985). A maximum of 22 common crops were compiled according to S.E. groups.

Total quantity of crops for the 6 months of harvest season, and 6 months of hungry season were compiled for each group. The mean production for a household per sample household for the harvest or hungry season were compiled with the standard deviations (SDS). The first digits of crop quantity indicates quantity produced. The second digits separated by a stroke is the corresponding quantity consumed and also the % consumption. 1 large basket of palm fruit gives about 1 gallon (40 litres) palm oil (+ palm kernel).

APPENDIX 21

Notations for the household variables for regression analysis:-

Variable 1	income
Variable 2	occupation
Variable 3	education
Variable 4	family size
Variable 5	food crop productions
Variable 6	food crop consumption
Variable 7	food purchases
Variable 8	caloric intake, child ≤ 1.1 year
Variable 9	caloric intake, child 1.1–3 years
Variable 10	caloric intake, child 3.1–5 years
Variable 11	caloric intake, child 5.1–7 years
Variable 12	caloric intake, child 7.1–10 years
Variable 13	nutritional status, child ≤1 year
Variable 14	nutritional status, child 1.1–3 years
Variable 15	nutritional status, child 3.1–5 years
Variable 16	nutritional status, 5.1–7 years
Variable 17	nutritional status, child 7.1–10 years