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Establishment of Nutrition Unit in The Ministry of Agriculture, Food and Natural Resources Democratic Republic of Sudan

By:
Dr.M.Akaml Khan
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Food and Agriculture Organization of the United Nations,
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1. INTRODUCTION:

Despite the fact that the Sudan has been described as a country which has a comparatively comfortable food availability, malnutrition, in particular Protein-Calorie Malnutrition(PCM) in children, is one of the major public helath problems in the country. Several inter-related socio-economic factors are responsible for the problem and the Government therefore wishes to adopt an intersectoral approach to its solution. Agriculture plays a crucial role, being the dominant sector in the economy of the country and the main agency responsible for raising the living standards of the rural population. Major efforts in agriculture should therefore run parallel to those in health, education and other concerned Ministries.

In accordance with a request from the Government of Sudan for assistance in establishing a Nutrition Unit in the Department of Agricultural Extension, Ministry of Agriculture, Food and Natural Resources, the Food and Agriculture Organization of the United Nations, under the Technical Cooperation Programme, appointed Dr. M. Akmal Khan as Nutrition Consultant. The assignment was undertaken from 20 November 1978 to 2 June 1979. Actual stay in the Sudan covered the period 29 November 1978 to 30 May 1979. The Terms of Reference were as follows:-

- Carrying out a review of the nutrition problems, based on existing data, and of programmes relevant to improving nutrition particularly in the traditional sector.
- Carrying out one or two case-studies, at provincial or project areas level in one or two selected areas, of the present nutritional impact of extension services and relevant agricultural projects; the case-studies to include small scale surveys addressed to specific nutrition problems, as appropriate.
- Preliminary training of members of the Nutrition Unit; in the first two steps, certain trainee future members of the Unit will work closely with the consultant (including in survey work) thus receiving in-service training.
- On the basis of the work described above, proposals will be made for,
- the functions and specific objectives of the Nutrition Unit.

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- the institutional arrangements for the Unit, including links with other sections of the Ministry of Agriculture, with other concerned Ministries and with provincial Governments.
- Staffing of the Nutrition Unit.
- An outline programme for execution by the Nutrition Unit and other concerned Ministries, including an intial work plan for the Nutrition Unit itself as part of the overall programme.
- Future needs for external assistance.
- Conducting a national seminar to discuss and decide on the draft programme, including coordination, implementation and monitoring of the programme, and the needs for additional external assistance.
- If the time permits, additional training and orientation will be given to the members of the Nutrition Unit, either as a short course or as assistance in initiating their work plan.

2. BACKGROUND INFORMATION:

Sudan is the largest country in Africa with an area of 2.5 million square kilometers.

2.1 Population:

According to 1973 Population Census estimated the total population at 14.96 million [1] and projected a national population growth rate of 2.5% per year. On this basis, the World BanK [2] has estimated for 1977 the total population at 16.22 million. About 79% of the population live in the rural areas. Of the rural population about 40% is nomadic[3]. Over 80% of its people are illiterate. Life expectancy is 40 years. Per caput income averages US$110.

2.2. Land Use:

Of the total area of the country of 597 million feddans (1 feddan = 1.038 acres) about 34% desert, 40% grazing land, 14% arable land, 10% heavy forests and remaining is swamps, water surface and other unclassified areas. A significant portion of cultivable land in the Sudan is yet to be brought under cultivation.

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2.3 Food Production:

The Sudan has great potentialities for the production of food and by 1999, the Sudan aims to have become one of the world's most productive farming regions, providing about 40% of middle eastern needs and perhaps feeding hungry millions of Africa and Asia. The following foods are produced and commonly used in various parts of Sudan.

Cereals: They provide the bulk of an average Sudanese diet. The most important cereals are dura (sorghum), dukhn (bulrush millet), telebun (finger millet), wheat, rice and maize.

Starchy Roots: The most important are cassava, yam and sweet potatoes and are mostly grown in the south.

Sugar: Sugar products consititute an important item of Sudanese diet. At present the production is inadequate to meet the demand and about $\frac{1}{2}$ of the supplies are imported.

Pulses Nuts and Seeds: This food group includes dry leguminous, oil seed and nuts. The most important pulses are broad bean, haricot bean, chick peas, pigeon peas, cow peas, lima bean and green grams. The oil crops such as sesame, cotton seeds and groundnuts constitute an important source of protein and fat (cooking oil).

Vegetables and fruits: Although there are great potentialities for the production of various vegetables and fruits, local production is not sufficient and consequently some fruits and vegetables are imported. The most common vegtables and fruits grown are green pepper,spinach, pumpkin purslane, okra, egg plant, tomatoes and bananas, mango, water mellon, sweet mellon, guava, pawpaw, dates and citrus fruits respectively.

Animal food: The Sudan has 12 million cattle and 20 million sheep, goats and camels. Sudanese people generally consume considerable amounts of mutton and beef and to a lesser extent, meat from goats, camels,game and poultry. However the level of consumption varies from area to area . Milk from cow and goat is commonly consumed. Dairy products in Sudan include cheese, ghee and cultured milk. The consumption of eggs is low owing to the high price (about 2 eggs/caput/mon in 1966). The Sudan is an important supplier of meat to Middle East countries.

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Fisheries: Fish resources are virtually unlimited in the Sudan . Consumed either fresh or dried, in the south and the areas around the Nile where the price is low.

2.4 Food Availability:

The food supply of the Sudan is reported to be generally adequate and widespread famines have not occurred recently. The problem of localised food shortages in certain seasons is very common due mainly to lack of adequate transportation, storage and marketing facilities and occasionally can reach such serious levels as to produce starvation.

Table 1 shows the Food Balance Supplies for 1975 in the Sudan.

Table 1 Per Capita Food Availability and Energy and Protein Supplies, Sudan, 1975

	g/day	Calories Per day	Proteins(g) per day	Fat (g) per day
Cereals	351	1206	38.1	9.1
Starchy roots	44	44	0.6	o.1
Sugar products	57	221	-	-
Pulses/nuts/seeds	28	112	5.9	5.5
Vegetables	110	24	1.3	0.2
Fruits	109	64	0.8	0.4
Meat	67	115	10.0	8.1
Fish	3	3	0.6	0.1
Eggs	3	4	0.4	0.3
Milk products	106	88	4.8	5.1
Fats and oils	33	295	-	33.0
Beverages	73	231	0.7	-
Total	-	2201	63.1	62.1
Vegetable	-	1964	47.4	45.5
Animal	-	237	15.7	16.6

Source: Ministry of National Planning, Agriculture Section.

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Per capita food availability might be quite misleading since, due to lack of equitable distribution of food, lower economic segments are always badly affected. Actual comprehensive food consumption data are not available.

Energy and protein requirements of an individual are dependent upon climate, age, body size, sex and level of activity. The intake of other nutrients is related to the intake of particular food group e.g. requirements of vitamins, thiamine and niacin are dependent upon the consumption of carbohydrate and protein (for tryptophan) respectively.

Requirements for various nutrients have not been determined for the people of the Sudan. In the absence of these standards, the available energy and protein was compared with dietary allowances recommended for East Africa.[4]

The available calorie supply per caput per day was 2201, which is 94% of the recommended intake. The shortage probably reflects more the localised shortages in certain seasons rather than an overall year round situation. Cereals, starchy roots and sugar supplies 67% and foods of animal origin provide 10% of the total available energy.

The recommended protein allowance for East Africa[4] is 62.5 g per person. In view of the recent FAO/WHO report[5] this may be on the higher side. The reference protein requirement according to FAO, for Sudanese weighing 60 kg will be 34.2g. Since 25% of the avaiable protein in Sudan is supplied by animal source, the net protein utilization (NPU) of the diet is expected to be about 75. Thus the protein requirement for Sudan will be 46g ($34.2 \times \frac{100}{75} = 46$). The available protein supply is 63.1g per caput per day which exceeds the estimated recommended safe level of protein intake of 46g. The protein are mainly supplied by cereals (56%) supplemented by animal protein ($\frac{1}{4}$ of the total protein). The amount of animal protein consumed is variable, the rich urban dweller can eat as much meat as they want but the poor in the traditional sector cannot afford it.

The average protein intake in Sudan, in terms percentage of the total calorie intake derived form protein is 11.5%, and is more than adequate in quality in terms of protein.

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Fats are derived from oilseeds and nuts such as cottonseed, seasame seed and groundnuts. It is generally recommended that fat should contribute at least 20 percent of the total calories. Fat calories constitute 26 percent of the total calories intake of the people of the Sudan.

2.5 Food Consumption Surveys:

A few unsystematic surveys have been carried out in the country. In the northern parts of the Sudan, Corkhill, 6,7,8, indicated seasonal dificiencies of animal protein, vitamins A, B2, B12 and C. Culwick[9], in the Gesira area, reported that the intake of protein and calorie were higher than the requirements but deficiencies in vitamin A and C and calcium were common.

Similar findings in the areas of central[10], western Sudan[11], residential areas[12] and southern parts of Khartoum[13,14] have been reported. However, food consumption surveys conducted in the Gezira[15] and in the south of Khartoum[16] have indicated that the diets in most of theses villages were inadequate in energy and protein.

2.6 Nutritional Problem:

Despite the fact that country has a comparatively comfortable food availability, several cases of protein-calorie malnutrition (PCM) in young children have been reported[17]. 67% of the children (0-5 years) in Gezira were found to be malnourished[15]. Infant mortality is high at 140 per thousand. Kwashiorkor and marasmus are both common despite the apparent adequate protein supplies. This may be due to calorie shortage in which the proteins are utilised for energy purpose. El Sheikh[18] has reported 1265 cases of vitamin A deficiency W. 4.3% Keratomalacia in Wad Medani area. 13-62% of the population in Khartoum, Red Sea shore and southern Sudan are affected with goitre[19]. 77% of the children (0-5 years) were found to be anaemic in the Gezira.

There is no adequate information available regarding the nutritional status of the adult population, however it apprears from the findings of the present surveys that there are a variety of nutritional problems in all parts of the country. Malnutrition, particularly PCM in children, is one of the major public health problems in the country.

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There is a need to conduct a nation wide comprehensive food and nutrition survey including dietary, biochemical and clinical examination so as to d-termine the nutritional problems in different geographical areas, seasons, urban, rural, socio-economic group of the population and thus identifying the target groups at risk who deserve priority of attention.

2.7 Nutrition Activities:

Several Ministries and Instiuttions are concerned with helping to improve the nutritional situation in Sudan.

2.7.1. Ministry of Health:

A nutrition Division was established in 1966 with the following objectives:

a) Conducting nutritional status surveys in the different parts of the country to investigate the pattern of food distribution and consumption and to study the factors responsible for the high prevalence of malnutrition.
b) Integrating the preventive and curative nutrition activities into the regular health services.
c) Promoting nutrition education through various public and private institutions.
d) Creation of provincial nutrition units.
e) Laboratory Unit to evaluate the Sudancese meal and to carry out biochemical investigations for the detection of malnutrition.

Due to certain constraints such as, limited financial resources, lack of transportation, shortage of trained manpower etc. some of the above programme are not functioning.

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2.7.2. Ministry of Education:

Among the programmes sponsored by the Ministry of Education are the School Feeding, School Gardening and Nutrition Education . The Ministry of Education , through its School Gardening and Nutrition Education Division, is responsible for establishing and supporting the Nutrition Education Centres. This Division was started in 1964 with the assistance of FAO.

Eleven Provincial Centres with some 118 Sub-Centres have now been established. The activites include training in nutrition and food preparation , child care, sewing , needle work, and handicarfts. The Nutrition Education covers: In-Service Teacher Training, Village Guide Training, Kindergarten Guides, Training for Cooks and Kitchen Workers for boarding schools, rural and urban women training.

The School Feeding Programme sponsored by the World Food Programme is providing food to all boarders and supplementary feeding over 200,000 day pupils.

2.7.3. Ministry of Agriculture:

An Agricultural Extension Department was established in 1961. Within this Department a Home Economics Estension Section was initiated in 1974. At present four Home Economists working in this Section and supervising activities in five villages including literacy, sewing , needlwork , handicrafts, nutrition, food preparation and preservation and child care.

The Sudan Food Research Centre, situated at Shambat was established in 1965 under the Ministry of Agriculture, the purpose of the Centre is to provide research, educational and advisory services in the field of food preservation,processing, hygiene, sanitation and marketing to the personnel of the various Ministries and also to the students of Faculty of Agriculture (University of Khartoum), High Teaching Institute, Ahfad University College for women, Health College, and Shambat Institute of Agriculture. Recently, a project, to strengthen the agricultural and home economics extension services in Northern Sudan, has been initiated by the Netherlands under a Bilateral Aid Programme.

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2.2.4. University of Khartoum:

The faculty of Agriculture, Home Economics Department and the Faculty of Medicine are also involved in Nutrition Research Programme.

Several of the present programmes, although organised and conducted by different Ministries, are following a similar pattern and are therefore providing duplicate activities. There is lack of cooperation and coordination between Ministeries and Institutions with rural development programmes including nutrition. No evaluation studies have been conducted to find the impact of these programmes on nutritional status of groups at risk.

2.8 Six Year Food Plan (1977/78-1982-83):

The plan does not visualise containment of food consumption in the country. On the contrary, it seeks to increase per capita availabilities of various food items and improve the nutritional status of all segments of population. On an aggregate level, the country doest not have much of a food problem . The probel is mainly of localised and seasonal shortages, which are due to inadequate transport, marketing and storage facilities. The plan gives major emphasis to the removal of those bottlenocks.

The following major trends emerge from the projected consumption levels of various food items over the plan period:

1. The per capita consumption of sorghum and millet would tend to decline slightly over the plan period. On the other hand, the consumption of wheat and rice which are consumed generally in the towns is forecast to increase at a rapid rate.
2. The per capita consumption of starchy roots is expected to gorw at relatively high rates due to larger availabilities.
3. Sugar and sugar products, vegetable oils, pulses, fruits and vegetables are expected to record moderate growth rates in per capita consumption ranging between 1.8% and 3.3% a year.
4. Among the animal products, the per capita consumption of mutton, lamb, fish and eggs is expected to grow at relatively high rates ranging between 4.0% to 9.1% a year. Beef and veal, goat meat and milk are expected to record lower growth rates in per capita consumption between 2.1% and 3.1%.

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The projections of per capita consumption reflect mainly the effect of increasing incomes, larger availabilities of commodities and the rapid rate of urbanisation. A progressive shift is expected to occur in favour of better quality diet, including foods such as fruits and vegetables, eggs, fish, mutton and poultry meat as incomes during the plan. However, traditional foods especially cereals starchy roots and pulses would continue to provide the bulk of nutritional requirements.

The nutritional standards in the country are considered adequate on an aggregate level. According to the FAO/WHO adhoc Expert Committee, the per capita caloric supplies in 1970 were very close to the estimated requirements. In the case of protein, the daily supplies exceeded the estimated requirements by a large margin.

The daily per capita supply of calories and protein projected for the plan period is given below:

Daily Per Capita Supply of Calories and Protein

Unit	1976/77	1982/83	Average Annual Growth Rate
Calories Number	2352	2633	1.9%
Protein Grams	67.9	76.3	2.0%

3. The Impact of Agricultural Development on Diet and Nutrition in Gezira A Case Study

3.1 Introducation:

It is well established that poverty and under-development are the main causes of malnutrition in the developing countries. Most of these malnourished individuals are to be found in rural areas of these countries, depending on agriculture. In the past, efforts to improve nutrition in many parts of the world were aimed mainly at treating the symptoms of manifest undernutrition which had a marginal impact in combatting the problem. It is now clear that additional and intensified efforts need to be directed to the task of achieving sustained reduction in undernutrition.

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The agricultural and rural development programmes can play a major role in nutritional improvement of the people in developing countries. However, the failure of many such programmes[20-22] to significantly reduce poverty and malnutrition has prompted increasing demands for the explicit introduction of nutrition consideration into project preparation, appraisal, monitoring and evaluation. Such nutritian consideration may affect income, attitude and eventually food consumption of the target groups at risk of malnutrition.

The present study was undertaken in the Gezira. The Gezira scheme constitutes the largest mechanical farm (2,071,340 Feddans) inthe world under one Management, the Sudan Gezira Board. The scheme has been reported to raise the social, economic and political standard of the rural population in this irrigated area in particular and in the Sudan as a whole. The Gezira constitute 12 percent of the total area cultivated inthe Sudan and produces 75 percent cotton, 12 percent Durra (Sarghum), 60 percent Groundnut and 85 percent wheat of the total production of the country. This is a remarkable example of cooperation between three partners viz the Government, the Tenants and Gezira Board. The Government provides the land and looks after its irrigation, the Tenants (Family labour of 96,000 tenants is supplemented by casual labour of 400,000 to 500,000 per year), undertake production of crops, the Gezira Board, an overall coordinator and Manager, attends to financincing)fertilizer and plant preserver) and purchase of the crops.

The objective of the present study was to evaluate the impact of Agricultural Development Project (Seed Production and Certification SUD/71/550/C/01/12) on the food consumption and nutrition status of children (0-5 years) of the target group at risk of malnutrition in the Gezira Province.

3.2 Nature of the Project:

This is a technical assistance project aided by a UNDP contribution of US$ 1.43 million and executed by FAO in association with the Sudan Ministry of Agriculture, Food and Natural Resources. The Government's costs are estimated at £S.61.200 which is equivalant to US$122,400.

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Sorghum (durra) is the main staple food crop in Sudan, occupying 40% of the total cropped area. The average yearly production is 1.2 million metric tons. This would given 300g grain per capita per day. The introduction of high yielding varieties was expected to increase the cereal production which could meet the demand. The duration of the project was established as four years commencing the April 1975.

3.3 Objectives of the Project:

Following are the stated project objectives:

The long-range and immediate objectives of the project are as follows:

A. The project has the long-range objective of making a significant impact on the production of main food and oil crops through the establishment of appropriate seed production and control services. In particular, it aims to strengthen seed industry development through improving the technical and organization structure of PPD (Plant Propagation Department) and extensive training and promotional activities.

B. A comprehensive seed programme on sorghum and wheat leading to production of certified seed in cooperation with production entities such as agricultural schemes in general accordance with the targets set out:

i. Utilization of improved agronomic production practices;
ii. Establishment of a field inspection and seed extension service;
iii. Provision and utilization of adequate production, processing and storage facilities;
iv. Performance of seed-testing and certification activities.

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3.4 The Relevant Nutrition Problems:

The new high yielding varieties have been introduced in all the mechanized agricultural production schemes including the Gezira. In order to find the most affected group of malnourished in the Gezira, previous data on food consumption and nutrition status of tenants and agricultural labourers were collected.

The commonest occuption[23] in these villages were tenancy-holding (40-50%) followed by landless labourers (45%) while traders and other skilled occupations accounted for 20%.

The agricultural labourers who are the second biggest and economically homogenous group (employed by the tenants on daily wages basis) are considered to be the most undernourished due to their conditions of poverty and highest incidence of PCM among the children (59%).

The major problem is the low intake of food (Table 3). Since sorghum is the main source of energy and protein in the diet, there is no doubt that an increase in its intake will permit improved levels of dietary energy and protein. The deficiencies of calcium, vitamin A, riboflavin and vitamin C were also common in their dietary.

The malnutrition in these households is probably due to inpart to persistent infections and attacks by intestinal parasites. The generally poor sanitary environment also affects this very poor group living in overcrowded nature of houses where communicable infections spread easily.

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3.5 Probable Project Impact:

This brief study was conducted in January 1979 i.e. $3\frac{3}{4}$ years after the project started. Forty families (25% of total sample size) of the agricultural labourers settled permanently in four villages (Mobi, Faddasi, Baika and Wad ul Noor) were involved in the present study. For dietary survey a 24 hour recall and weighing method was adopted. Data of dietary intake were obtained by personnel trained in food weighing and interviewing by visiting the randomly selected households in the villages. Information regarding monthly income, family size were also recorded. The data on food intake were then converted into nutrients using food tables supplied by FAO.

All children (0-5 years) in these families were examined for their heights and weights. Procedures used were as outlined in the ICNND manual for nutrition surveys.

The production of sorghum and wheat has definitely increased due to high yields of these varieties. Production activities have been successfully strengthened e.g. the production of sorghum seed by PPD increased from 377 tons in 1975 to 1248 tons in 1978. In 1975 the production of wheat seed by PPD was 825 tons and this year it is expected to be 2,000 tons. The average income of agricultural labour family in the present survey was found to be £S.19.770 per month and the average wages per day were £S.0.500 as compared to £S.0.300 reported in 1973[25].

It is evident (Tables 2-6) that major nutriional prpblems of this group are PCM, calcium, vitamin A, riboflavin deficiencies. This indicates that an overall shortage of food exists in these families. Inspite of high intake of iron in their diet (Table 2) an incidence of anaemia is common[15,24]. This may be explained on the basis of low iron absorption in a cereal diet due to phytates, malabsorption due to diarrhoeal diseases, hook worm infestation, iron loss through sweat and impaired iron utilization due to low vitamin A.

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Although the present food consumption of agricultural labourers is far below their recommended dietary allowances there is a significant increase in their dietary intake(Energy and Protein) when compared with the intakes recorded in 1951 and 1973 in the Gezira (Table 3). The average cereal consumption per head per day has increased 102% (Table 4)resulting improvement in the intakes of energy (15%) and protein (10%). It appears that agricultural labourers used their increased income to purchase mainly cereals.

There were sixty one children (0-5 years) in forty labour families and their heights and weights measurements were better than the children of the same age group, living in the traditional village outside the Gezira (Table 5). The first, second and third degrees malnutrition in the children of labourers, in the present study was found to be lowered when compared with the mixed children of tenants and agricultural labourers of some other villages in the Gezira (Table 6).

All these findings indicate a positive impact of the present project on the food consumption and nutrition status of the children of the agricultural labourers in the Gezira Province.

3.6 Recommendations:

It is evident from the results of the present survey that the agricultural labourers in the Gezira Province are undernourished.

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It is well established that malnutrition lowers the resistance to infectious diases leading to higher death rate. It adversely affects mental development, physical development, productivity, the span of working yearsall of which significantly influence the economic potential of man. In order to improve the food supply and nutritional status of the agricultural labourers in theGezira Scheme it is recommended that:

1. More area should be allocated for the cultivation of high yielding varieties of cereals and legumes.

2. Some land may be given to agricultural labourers family for the cultivation of vegetables for their own use.

3. An Adequate social services should be extended to agricultural labourers.

4. Measures should be taken to counteract the very high incidence of malaria and bilharzia.

5. The livestock sector should be developed on cooperative basis for the production, processing and marketing of milk and milk products. This will provide not only new job opportunity but labourers will be provided with a steady source of income.

6. Nutrition Education should be included in the existing adult education programme.

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Table 2: Mean Dietary Intake (per capita per day) of Agricultural Labourers in Gezira, 1979.

No. of Persons = 320

F o o d	g/day	Eenergy kcal	Protein g	Calcium mg	Iron mg	Vitamin A I.U.	Thiamine mg	Riboflavin mg	Nicotinamide mg	Vitamin C mg
Cereals	410	1447	41.0	123.0	16.4	-	1.64	0.41	12.30	-
Sugar	55	214	-	-	-	-	-	-	-	-
Pulses	6	20	1.4	5.4	6.0	6.0	0.03	0.01	0.12	-
Vegetables	135	37	2.0	41.0	2.1	391.0	0.09	0.09	0.99	34.0
Meat	37	55	6.2	4.1	0.9	-	0.07	0.09	1.85	-
Milk	80	53	2.6	100.0	0.1	104.0	0.04	0.12	0.16	0.8
Oils and Fats	23	207	-	-	-	-	-	-	-	-
Total	746	2033	53.2	273.5	20.0	501.0	1.87	0.73	15.42	34.8
Percentage of RDA	*	87	85	55	133	13	165	56	106	139

Percentage Calories derived from Proteins = 10.5

Percentage Calories derived from Fats = 10.2

* Michael, L. Human Nutrition in Tropical Africa, FAO Publication, Rome. 1965.

Table 3: Dietary Energy and Protein Intake (per head per day)Recorded in Gezria

Number of villages	1	4	4
Number of households	8	-	40
Group	Agricultural Labourer	Tenant	Agricultural Labourer
Season	Cotton Picking	Clearing Cotton Fields	Cotton Picking
Year	1951[1]	1973[2]	1979[3]
Eenergy (Kcal)	1225	1772	2033
Percentage of RDA[4]	52	75	87
Protein (g)	42.0	48.4	53.2
Percentage of RDA	67	77	85
Calories from Cereals(%)	56.5	40.5	71.2
Protein from Cereals (%)	46.7	48.3	77.0

1. Culwick, G.M. Diet in the Gezira Irrigated Area, Sudan. Government Printing Press,Khartoum(1951)
2. Nutrition Division, Ministry of Health, Khartoum(1973).
3. Present Survey(1979).
4. Micheal, L. Human Nutrition in Tropical Africa, FAO Publication,Rome(1965).

Table 4: Changes in the Food and Nutrients Intake (per head per day) in Gezira (A comparison of the present data with food intake recorded in 1973)

	Percent	
	Increases	Decreases
Overall food intake	1	-
Cereals	102	-
Foods of Animal origin	-	47
Pulses	-	63
Vegetables	-	25
Oils and fats	-	18
Energy(kcal)	15	-
Protein	10	-

Nutrition Division, Ministry of Health, Khartoum(1973)

Table 5: Average Weight and Height, of the children inside(A) and outside(B)the Gezira

Age (Years)	Weight(kg)		Height(cm)	
	A	B	A	B
0-1	7.3	5.5	64.4	62.3
1-2	9.8	8.4	77.7	74.6
2-3	11.8	9.0	83.0	84.6
3-4	13.7	11.3	91.6	93.5
4-5	14.0	-	100.8	-

A. Present Survey (1979)

B. Nutrition Division,Ministry of Health (1977) Nutrition Survey in Abyei (South Dordofan Province).

Table 6: Nutritional Status of the Children in Gezira(according to GOME $\bar{Z}$ classification)

Survey	Normal (%)	Ist degree Malnutrition (%)	2nd degree Malnutrition (%)	3rd degree Malnutrition (%)
1977[1]	21.9	49.8	18.6	7.7
1979[2]	33.3	38.3	20	8.3

1. Paediatric Unit, Medani Hospital, Medani, Sudan (1977)
2. Present Survey (1979).

4. Organization of the Nutrition Unit:

4.1 Location of Nutrition Unit

The Nutrition Unit will be established in the Directorate of Agricultural Extension, Ministry of Agriculture, Food and Natural Resources. The Unit will function under the Director of Agricultural Extension. It is of paramount importance that financial and other necessary measures should be provided for well in advance of the establishment of the Unit, and the Ministry is recommended to give early consideration to these factors.

4.2 Functions of Nutrition Unit

- Studying and analysing the available data on food consumption,nutritional status, socio-economic and agricultural surveys, and to identify the nature and magnitude of nutrition problems including a functional classification of groups at risk of malnutrition.
- Monitoring the impact on nutrition of important agricultural and rural development programmes and when necessary providing advice on the inclusion of a nutrition component in such programmes.
- Providing nutrition information, advice,training to extension workers.
- Advising those responsible for planning and implementing agricultural programmes on nutrition.
- Supplementing the existing nutrition education activities through agricultural and home economics extension workers by advising families in the traditional sector on aspects related to home food production, preservation and processing such as:
  - estimation of family food needs;
  - growing the appropriate foods and raising animals to improve the food supplies to meet their nutritional needs;
  - proper food selection for the preparation of adequate family diets;
  - food preparation and preservation.
- Participating in joint undertaking with the other Ministries and Institutes that are concerned with the definition and solution of problems in the field of nutrition.

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4.3 Mechanism of Coordination:

Nutrition problems stem from a variety of causes and therefore require a multidisciplinary approach to their solutions. The Ministries most concerned are Agriculture, Health, Education and National Planning. However, nutritional problems can also be influenced by Ministries of Finance, Supply, Commerce and Co-operation, and communication. Therefore, cooperation at all levels in the Ministries involved is essential.

Coordination within the Ministry of Agriculture,Food and Natural Resources

Coordination has been defined as the means whereby different entities may achieve concerted action without losing their organizational identity. A close liaison between nutritionist and agriculturist is essential in the planning of food supplies and improved food production and consumption levels. The attainment of this liaison, however, was often hampered by the absence of the necessary technical unit and of the organizaion and administrative frame work in the Ministry of Agriculture, Food & Natural Resources. The creation of a nutrition unit in this Ministry would help bring about the desired closer association between nutritionists and agriculturists. Appropriate coordination with Agricultural Planning Administration of the Ministry of Agriculture is also essential. Under the present set up of the Ministry, this could be achieved either through direct contact at director level or through the Under Secretary of Agricultural Services.

The task of the nutritionist in the Ministry of Agriculture should be:

- To stimulate interest in nutritional problems within their own Ministry and to promote nutritional programmes undertaken by the Ministry; and
- To cooperate in all possible ways with their colleagues in other Ministries, both directly and through the coordinating machinery.

Interministerial Coordination:

A Technical Advisory and Coordinating Committee on Applied Nutrition (TACAN) was created in 1966. Though it was an interministerial body, coordination and the secretariat were both from the Ministry of Health.

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TACAN was expected to coordinate the various activities in the field of nutrition, in order to avoid duplications and omissions and to formulate a policy. Coordination could not be done in void and there were not many activities to coordinate.

In the last few years the Health Ministry has assumed leadership through the development of a full -fledged Nutrition Division with adequate expertise and comprehensive nutrition programme. The Ministry of Education on the other hand, has made significant progress in the field of nutrition education and extension through the development of a Training Centre for Nutrition Education, particularly women village level workers. The Ministry of Agriculture has also made considerable progress in food processing research and to some extent in the field of home economics. It is now proposed that the nutritional activities will be further increased with the establishment of a Nutrition Unit in the Ministry of Agriculture. There was need to establish at the national level a coordinating body representing the various disciplines involved and which has its own secretariat. A mechanism of coordination has been suggested in Fig. 1.

This coordination should embrace, not only Ministries directly concerned with nutrition, but others such as those concerned with economic development, social welfare and community development, and not least, governmental or public bodies concerned with Universities and/or medical and agricultural education and research. The formulation of integrated nutrition programmes will not be possible unless such inter-ministerial and interdepartmental coordination is affected by the formation of a statutory body with access to, and with powers to advise at the highest authorities of Government. Keeping in view the above considerations, it was recommended to set up a national body under a title of 'National Food & Nutrition Council' charged with the task of:

- a formulation of a national food and nutrition policy;
- advising the government as a whole in food and nutrition problems and on the desirable action to be taken;
- securing agreement on the ways and means through which the international and national programmes can be coordinated and implemented whether through the secretariat of the council,through the different individual Ministries or through other bodies (e.g. teaching or research institues).

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It is proposed that the composition of the National Food and Nutrition Council should be:

1.	Minister for National Planning	Chairman
2.	Under Sevretary (Health)	Member
3.	Under Secretary (Agriculture)	"
4.	Under Secretary (Education)	"
5.	Under Secretary (Planning)	"
6.	Under Secretary(Community Development)	"
7.	Director(Food and Nutrition Planning Unit)	Member/Secretary

The Council would meet regularly but not too frequently in order to make decisions or recommendations as appropriate.

Since all nutrition programmes require an allocation of state resources and, in some cases, requests to technical assistance agencies, ultimately decisions have to be made at political level within a cabinet, where the deciding voice may come from Ministry of National Planning. It is , therefore, recommended that a Food and Nutrition Planning Unit in the Ministry of National Planning may be established, with following functions:

- to work as secretariat of the National Food and Nutrition Council;
- to develop a Nutrition Plan chapter for the Annual Development Plan,
- to formulate a National Nutrition Programme and to suggest action programmes in the field of nutrition planning and research,
- To study and evaluate on going nutrition programmes and to recommend additional programmes in the field of nutrition;
- to maintain close cooperation and coordination with different international and national agencies doing research,teaching and extension on food and nutrition.
- to coordinate external assistance for the implementation of the policy and programme interventions.

The Unit shoudl be financially independent of the operating Ministeries and act on sufficiently high authority for it to be taken seriously, both within the Ministries and at higher policy-making levels The Food and Nutrition Planning Unit would need to have its own techcal expertise and analytical capacity, but it may need also to draw adhoc committees or working groups in such fields as nutrition,public health, economics and agricultural economics, statistics, education and extension, management and marketing.

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The meeting of the adhoc committees may be arranged from time to time to advise on specific questions. The recommendations of the National Food and Nutrition Council would be based on the advice of these adhoc committees and would be forwarded to the relevant Ministries for implementation, this would also help coordination among the Ministries concerned with nutrition. The Secretary of the National Food and Nutrition Council may also be the Secretary of the adhoc committees.

Coordination at provincial level:

Nutrition programmes formulated at the central level, cannot yield the desired results unless adequate machinery exist for their implementation at the provincial or local level. The strategy of delivering nutrition services through a package of related activities, however, requires full integration of nutrition with other basic health, agriculture and educational programmes. A nutrition sub-unit at each provincial level should be established with a trained home economist and a nutrition extension worker. This sub-unit will work in close liaison with the local agricultural extension officer and with the other nutrition units of Ministries of Health and Education. All the applied nutrition programme should be carried out through close cooperation of three agencies at provincial level.

The sucess of many nutrition programmes will depend greatly on the cooperation of the community. Unfortunately, in the past, this factor has often been neglected, with the result that there has not been self-generating and sustained improvement. It is thus especially important to involve the community to secure their cooperation and participation in nutrition programmes.

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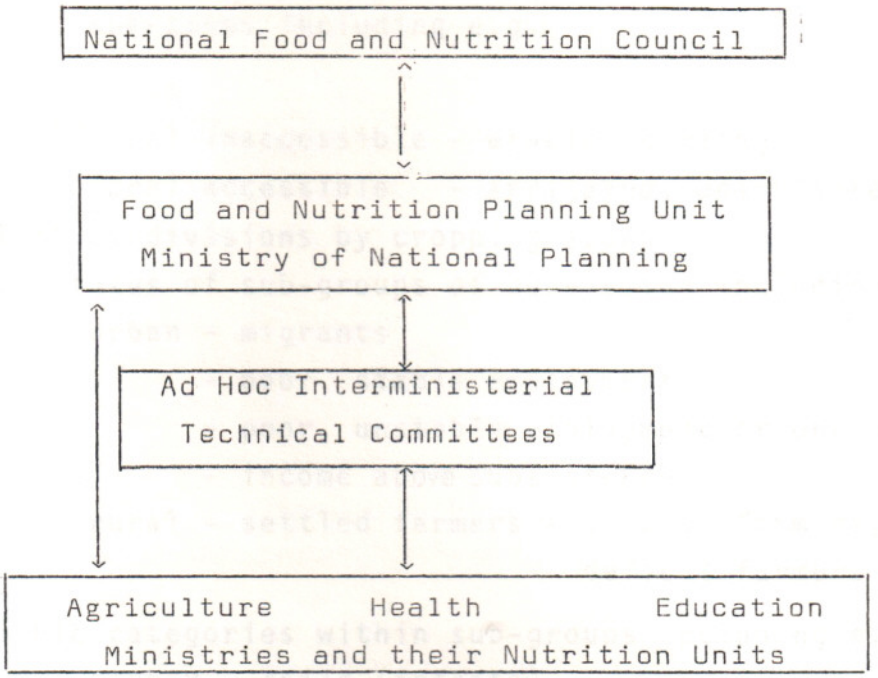

Fig. 1: Possible Scheme for Coordination.

4.4 Proposed Staff for the Unit

The following personnel are proposed for the Unit:

- 1 Nutritionist
- 1 Food Economist
- 1 Agricultural Statistician
- 1 Home Economist
- 1 Typist

4.5 Proposed Action Programmes for Nutrition Unit and other concerned Ministeries:

The following outlined programmes are recommended for the Nutrition Unit and the other concerned Ministries:

4.5.1. Nutrition Unit

(a) The Unit will collect, the available data on food production, consumption, nutritional status, socio-economic and agricultural surveys and will prepare reviews of food and nutrition situation particularly food supply avaialbility at national and regional levels and food consumption of the socio-economic groups of the population. The following information would be required for the functional classification of nutritional problems:

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- Regional provinces - based on administrative structure.
- Ecological sub-zones including e.g.

  urban
  rural inaccessible - arable, grazing
  rural accessible - irrigated, unirrigated

  as well as subdivisions by cropping areas.
- Economic status of sub-groups of population including e.g.

  urban - migrants
  - poor, stable employment
  - poor, unstable employment or unemployed.
  - income above subsistence

  rural - settled farmers - surplus farmers,
  deficit farmers.
- Demographic categories within sub-groups including e.g.

  mother - child (infants)
  preschool - children
  school-aged - children
  adults - male
  - female
  elderly
- Deficiency pattern

  chronic
  seasonal
  occasional
- Nutrient deficiency (or problem)

protein-calorie	calcium
vitamin A	iron
riboflavin	iodine
vitamin C	

b) <u>Introducing Nutrition considerations in Agricultural and Rural Development Programmes</u>:

The Unit will appraise the agricultural and rual development projects and would advise on the inclusion of nutrition consideration into project preparation, appraisal, monitoring and evaluajtion. For this purpose the following activities will be required :

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- the inclusion of a nutrition survey in the feasibility study, thus making it possible to diagnose the food and nutrition situation in the areas;
- an evaluation of the effectiveness of the development strategy and supporting measures, from the standpoint of reducing deprivation, eliminating malnutrition and improving living standards among the rutal poor;
- the development of a mix of programmes that will attack the root causes of the food and nutrition problems;
- the introduction of relevant applied nutrition programmes such as nutrition education, feeding programmes for the vulnerable groups, community and home gardens, village food processing projects, and others;
- monitoring the impact of the development strategy on the food consumptjon and nutritional status of the rural poor.

(c) Improving Nutrition of the Rural poor

A model at pilot level with the cooperation of other Ministries and Institutes will be prepared for improving nutrition of the poor in the traditional sector through the following package of services:

- Production Package:

  Villagers should be encouraged for:

  green leafy vegetables
  oil bearing crops
  leguminous plants
  keeping small livestock(hens, ducks, goats,sheeps,rabbits,etc)
  aquaculture
  appropriate technology for agricultural operations.

- Income Generation

  Income can be raised through the sale of surplus food crops, cash crops and animal products for which appropriate marketing meachanisms should be devised. Income may also be generated from cottagae industries (handicrafts, agrobased industry, food processing, etc.).

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- Human and Social Development

Practical nutrition education should aim at effective communicatjion of basic messages concerned with feeding of vulnerable groups, food production , preservation, preparation, storage, home improvement, family budgeting personal and environmental hygiene, family planning, organising women clubs, farmers cooperatives, village committee. Village infrastructure including a potable water source, washing facilities, anitation and disposal of waste is vital to improve the living conditions of the community.

- Monitoring and Evaluation:

Data should be collected in the project villages on agriculture, economics, demographic and nutritional status.

- Implementation of Programmes:

Maximum use of local institutions and resources should be made. International aid may be sought. Local expertise (home economists and agriculturists) and university students may be involved.

(d) Training:

The Unit will arrange in-service training programme for the extension personnels including the home economists covering the following aspects of nutrition education. The composition of locally available foods as their value in the diet, functions of different nutrients, dietary needs of the individual members of the family, factors influencing food availability and utilization, ways of preventing nutritional diseases.

4.5.2. Ministry of Health

(a) Food and Nutrition Survey:

There is a need to conduct a nation wide comprehensive food and nutrition survey including dietary, biochemical and clinical examination so as to determine the nutritional problems in different geographical areas, season, rural , urban, socio-economic groups of the population.

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(b) Preschool Protection Programme:

A nation wide"operation weigh-in" to find out the households with malnourished pre-school childern should be launched. This should involve weighing of all the children under age six, identifying those suffering from protein calorie malnutrition , calssifying each child by degree of severely of PCM and providing immediate treatment to at least the most severely malnourished.

(c) Weaning Food Development Programme:

The aim of this programme would be to reduce infant mortality and to improve the health of the children . A pilot project for the supply of cheap waning food should be undertaken. A low cost protein rich food mixture, based on locally available food ingradients should be developed in cooperation with the Food Research Centre. Food donations from WFP mav also be considered for this programme.

(d) Village Nursery School:

Nursery school, a means of reaching the pre-school child with better nutrition may be started at village level. The school would be responsible for supplementary feeding (parants should contribute by supplying foods available at home), immunization and periodical physical examination of the children. This would also provide opportunity of imparting nutrition education to the mothers.

(e) Food Fortification Programme:

This programme shoudl aim at the fortification of foods with nutrients to help combat specific nutritional deficiencies. Vitamin A deficiency: This is major cause of eyes damage and blindness . Special measures to remove vitamin A deficiency can consist of (a) massive doses of vitamin A to the children on the verge of blindness (b) change in eating habits (c) fortification of foods such as wheat or sorghum flour or tea with vitamin A.

Iodization of Salt

The incidence of goitre is very high in the western Sudan. Goitre is caused by the deficiency of Iodine and is reported to be prevalent to some extent in other parts of Sudan as well. Iodization of salt would prove a cheap, effective and popular method to check this disease.

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(f) Nutrition Education:

Health workers particularly women could provide a valuable service in improving nutrition by working directly with mothers. Areas of health education such as breast feeding, proper weaning feeding practices, nutritional needs of the family and personal hygiene could be emphasized. Education through the use of radio would be potentially effective, since most people have access to radios and listen frequently.

(g) Research Studies:

The following studies should be undertaken for filling the information gap:

- To determine the requirements of nutrients of various group of Sudan population.
- To study the interaction between infrection and nutritional status.
- To evaluate the nutritive value of Sudanese cooked food.

4.5.3. Ministry of Education:

There is an urgent need that the Ministry should take the following steps to strengthen the teaching and training facilities in the field of nutrition at various levels.

(a) School:

- A basic course on nutrition should be incorporated in the subject of home economics particularly for girls.
- An adequate and basic home economics (food preparation) equipment should be made available in school laboratories.
- School gardening programme should be expanded and encouraged for their educational value. More funds, tools and water pumps should be supplied to make this programme successful.
- There is a need to prepare a manual on food and nutrition for school girls .
- The subjects of nutrition and home economics should be considered as compulsory for all levels of schooling and students should be examined in these subjects for evaluation in the final examination.

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- Although school feeding programme exists in the country, insufficient attention has been given to developing a nutrition education component in conjunction with these activities. It is recommended that this programme be used as an incentive for creation of nutrition activities such as teaching the importance of good nutrition to health and also of encouraging better child feeding practices at home.

(b) Home Economics/Agriculture Institutes:

- Nutrition in home economics institutes should be strengthened and widened in scope. The food and nutrition laboratoreis should be equipped with modern equipment and apparatus.
- A basic course on human nutrition should be introduced at undergraduate level in the faculties of Agriculture, Shambat Institute of Agriculture and Agricultural Technical Training Institute, Yambio.
- A manual on Food and Nutrition for the students of home economic and agriculture should be prepared.
- A nutrition laboratory should be established in the Food Research Centre and this may be upgraded to National Institute of Food and Nutrition with responsibilities of research, training and extension in the field of food and nutrition.

(c) Teachers Training Institute:

There is need to strengthening the nutrition activities in all teaching training institutes by:

- Providing proper guidance and material aids in nutrition methodology.
- Organizing in service training in nutrition for the teachers at province level.
- Equipping the libraries with Arabic and English books on nutrition and home economics.
- Equippingthe food and nutrition laboratories with required appratus and equipment.
- Considering the subjects of nutrition and home-economics as compulsory as other subjects and evaluation be done at the end of the course.

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4.6 International Assistance Required:

- Fellowships

The following fellowships would be required for studies/ training abroad for the staff of the Unit:

1	for Nutritionist	12 months
1	for Food Economist	12 months
1	for Agricultural Statistician	6-12 months
1	for Home Economist	12 months

These may be arranged at the London School of Hygiene or Queen Elizabeth College, or Cornell University, or University of California, or University of Philippines at Los Banos.

- Transportation and Equipment

1	Landrover (station)
1	Typewriter
2	Electronic calculators
2	Height measures
2	Bathroom scales
4	Dietary scales
4	Cabinets

- Reference Books

To establish a small library, the Unit would require the latest books and journals on nutrition, food economics, agricultural statistics and home economics.

- Financial Assistance

The Unit will require financial assistance for implementing pilot project for improving nutrition of the rural poors. This project will be submitted to international agencies for consideration.

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5. Nutrition Training:

Preliminary Training of the counterpart, Mr. Mahadi Fadol Badri, and two other girls, Miss Khadiga and Miss Jalila, who have been working with the Consultant, was accomplished through the following approaches:

- Collecting data on food and nutrition and preparing a review of the nutrition problems.
- Participating in food and nutrition survey to study the impact of agricultural development on diet and nutrition in the Gezira Province.
- Giving some lectures on Basic Nutrition.

A great deal still needs to be done in the area of training . The counterpart and other members are basically graduates in agriculture and have no background in the subject of nutrition. They are not technically well equipped and need higher training in the respective fields. Mr. Mahadi and one of the girls may be sent abroad for higher studies in the field of nutrition and home economics respectively. Some members may be trained in community development at the Faculty of Agriculture, University of Khartoum.

The Director of Agricultural Extension will soon get transferred one Agricultural Economist and a Statistician from the other sections of the Ministry and both will be sent abroad for training in Food Economics and Agricultural Statistics.

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6. Seminars:

The National Seminar on Nutritional Improvement was organized by the Department of Agricultural Extension, Ministry of Agriculture, Food and Natural Resources, under the auspices of the Food and Agriculture Organization of the United Nations. Sixteen participants from the Ministries of Health, Education, Agriculture, National Planning and University of Khartoum, contributed the papers in the Seminar.

The purpose of the Seminar was to stimulate the nutritionists and development specialists to discuss food and nutrition problems facing the country and their solutions in order to achieve the goals of national development through improving the nutritional and health status of the population. The papers and discussions were focused on the food and nutrition problems as they affect both individual and the nation and the most feasible means of alleviating these problems, thus recommending priority programmes for different Ministries. The need for external assistance for implementing these programmes was also discussed.

6.1 Recommendations:

The National Seminar on Nutritional Improvement, after reviewing the recommendations of the first National Food and Nutrition Seminar held in Khartoum in 1972 and those of Nutrition Education Coordination Wrokshop held in Medani in February 1978, and in the light of the papers submitted and the deliberations of this Seminar, it was noted that there in an increased awareness about the importance of food and nutrition and its implications on special and economic development of the country in terms of health, learning capabilities and individual economic productivity levels.

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The Seminar reviewed the existing Food and Nutrition situation in Sudan and noted with concern the widespread of malnutrition among the vulnerable groups i.e. infant, young children, pregnant lactating mothers. The multisectoral factors that cause these nutrition problems are acknowledged and realising that the implementation of food and nutrition activities on a nationwide scale would require a positive commitment of various agencies concerned, the Seminar recommends:

1. Organisation:

- A high level National Food and Nutrition Council be set up at ministerial level to help in evolving a national food and nutrition policy and advise the Ministry of Planning in this respect.
- That this Council be composed of Ministers of:

National Planning	Chairman
Health	Member
Agriculture	"
Cooperation and Commerce	"
Education and Guidance	"
Industry	"
Representative of SSU	"
Sudanese Women Union	"
Relevant Experts	"

- That this Council should be supported by a full time Secretariat which will be located in the Ministry of National Planning.
- That a Technical Committee be drawn from the Head of the Nutrition Division/Units of the different Ministries and Experts in this field from Universities and relevant Institutions to advise the Council on specific technical matters pertaining to food and nutrition.
- The concerned Ministries i.e. Health , Agriculture and Education should strengthen their Nutrition Divisions/Units and two Nutrition Units be set up in:
  i. The Ministry of Cooperation and Commerce to monitor the consumer attitudes and seasonal variation in food availability as they are responsible for food importation and pricing systems.

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ii. The Ministry of National Planning to continually plan and monitor the improvement of nutritional status and act as a liaison office or secretariat for National Food and Nutrition Council and as coordinator for the different nutrition programme.

- As Sudan is embarking on a decentralization system of administration, the Planning Officer at the provincial level should act as a coordinator of the nutrition programmes assisted by a full time secretariat.

2. Policy:

That each Nutrition Unit in each of the Ministries concerned should set clear and definite objectives relevant to the role of each Ministry.

3. Health:

- Pre-requisite for implementation of any nutrition programme is the identification of the nutritional problems. The Nutrition Division of the Ministry of Health, in collaboration with other agencies,should compile the results of the past and additional surveys should be carried out to reveal food intake adequacy, nutritional deficiencies (clinical signs) and biochemical tests (sub-clinical deficiency).
- In view of the close interrelation between malnutrition and infection, the extended programme of immunization should be enhanced to reach the unprivileged rural children who are the most vulnerable groups.
- Expanding the nutrition and health education to mothers to cover all the Health Centres and should be made a major component in primary health care services at grass root level.
- In order to make the nutrition education effective, orientation training courses be organized for those workers belonging to all levels either at the peripheral level or headquarters and the staff should be well trained to use suitable audiovisual aids, including simple instruction manuals. Special emphasis should be given to the popularisation of nutrious home-made weaning foods prepared from locally available cheap ingredients.

Agriculture:

- A Nutrition Unit with the functions proposed by the FAO Consultant be set up to strengthen food and nutrition activities in the Ministry of Agriculture, Food and Natural REsources.

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- Emphasis should be placed on the collection of more data of reliable nature regarding food crop production and consumption in the country and thereby upgrading the agricultural economics and statistics systems.
- Measures should be taken to overcome the problems related to processing, storage and marketing with special reference to local markets of the food in the Sudan.
- Improving the nutrition ofthe rural poor in the traditional sector by providing credit facilities for rearing small livestock, appropriate agro-based industry, food processing for income generation.
- Practical nutrition education should aim at communication of basic messages concerned with balanced diet, food production, preservation, storage, home improvement, family budgeting, farmer cooperatives, improving living conditions of the villagers by safe water supply, improving sanitation and disposal of waste.
- An in-service training course for the Extension Officers, Home Economists to cover the composition of locally available, foods, factors influencing food availability and utilisation and ways of preventing nutritional deficiencies should be organised.
- Nutrition components should be introduced in the agricultural and rural development programmes.
- There is need for national food and nutrition policy, in order to assist the economic development and improve the quality of life of the population.
- There is need to adapt a long term policy to accelerate the exploitation of the existing national fisheries resources and introduce acqua-culture in mixed farming as integral part of rural development.

Education and Guidance:

- It is recommended that the School Gardening and Nutrition Education be strengthened in view of the fact that nutrition is included in the curricula of the primary and general Secondary schools.
- It is recommended that nutrition should be incorporated in the curricula of all relevant subjects in girls and boys schools and be examinable at all levels.

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- That the provincial Nutrition Centres should be strengthened by supplying with educational and audiovisual aid and training facilities.

- It is recommended that a Home-Economics Unit be established and attached to the directorate of curricula and that the revised Home-Economics syllabuses should be taught in girls'schools at all levels and be examinable subject and that suitable equipped home-economics classrooms be established in all girls' schools and teachers training institutes.

- School Gardening should be encouraged whenever feasible.

- School Feed Programme and School Gardening and Nutrition Education directorates should come under the same administration and that the School Feeding Programme should be revised to achieve the objective for which it was initiated, that is, by strengthening the administrative organization and continous evaluation process be a part of a revised plan of Action.

Universities:

- The Universities and relevant Institute should play important role for coordinating nutrition training and research especially in the field of Medicine, Agriculture and Veterinary Science.

- The medical curriculum needs to be reviewed in the areas of content and weight of nutritional instruction in relation to total training of medical graduates.

- More time and attention should be given for training in applied nutrition and introduccing elements of human nutrition in Faculties of Agriculture, Veterinary Science and Education.

3. Research:

- More attention should be given to research in the field of Avitaminosis i.e., Vitamins A, B, C, ect. and single nutrient deficie-cy i.e. iodine, so that fertification programmes should be planned.

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- The Nutrition Laboratories of Shambat Food Research Centre and that of the National Health Laboratory should be expanded and strengthened to be suitable for biological evaluation of the Sudanese cooked meals and for the improvement of it, instead of the chemical analysis alone carried out now.
- Research should be encouraged in the field of formulation of safe nutritions weaning foods from local cheap foods.

4. External Assistance is needed in the following fields:

- Training
- Developing weaning foods.
- Laboratory equipments.
- Improving nutrition of the rural poor.

5. Follow-up Committee:

A follow-up Committee was formed from the Ministries of Health, Education, Agriculture, National Planning and a Member from Khartoum University to meet the concerned Ministers for implementing the above recommendations.

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APPENDIX - 1

P R O G R A M M E

National Seminar on Nutritional Improvement to be held on the premises of the Ministry of Agriculture, Food and Natural Resources
Khartoum, Sudan
12-14 May, 1979

Saturday, 12 May 1979

INAUGURAL SESSION

8.30 a.m. - Delegates and guests take their seats in the meeting room.

8.45 a.m. - Chief guest arrives.

8.50 a.m. - Introducing the objectives of the Seminar
Dr. M. Akmal Khan, FAO Nutrition Consultant.

9.00 a.m. - Inaugural Address by the Chief Guest, Dr. Mohammed El Shazali Osman, State Minister for Agriculture, Food & Natural Resources.

9.15 a.m. - Thanks.
Mr. Ahmed El Dirdiry, Director, Agricultural Extension.

9.20 a.m. - Light REfreshments.

PRESENTATION OF PAPERS
10.00. a.m. to 1.30 p.m.

Chairman : Professor A.G.H. Khattab, Dean, Faculty of Agriculture.

Secretary: Mr. Ahmed El Diredіry, Director, Agriculture Extenson.

10.00 a.m. - Food and Nutrition Problems in Sudan.
Dr. Ali K. Osman, Nutrition Division, Ministry of Health.

10.30 a.m. - Factors influencing Food Consumption and Nutrition.
Miss. Asma Abdel Rahman, Nutrition Division, Ministry of Health.

11.00 a.m. - Protein Energy Malnutrition and Rehabilitation Programmes.
Dr. Kamal Ahmed, Nutrition Division, Ministry of Health.

11.30 a.m. - Break.

11.45 a.m. - Home-made Weaning Foods for Sudanese children.
Dr. Hafis El Shazali, Paediatrics Unit, Medani Hospital, Wad Medani.

12.15 a.m. - Impact of School Feeding Programme on the Nutritional Status of Children.
Dr. Ali K. Osman and Miss Asma, Nutrition Division, Ministry of Health.

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Sunday, 13 May 1979

PRESENTATION OF PAPERS
8.30 a.m. to 1.30 p.m.

Chairman : Dr. Abdul Sattar, Agricultural Advisor, Ministry of National Planning.

Secretary : Dr. Muddathie Ali Ahmed, Director, Agricultural Economics.

8.30 a.m. - Food and Nutrition Planning in the Sudan.
Dr. B.A. Azhar, Ministry of National Planning.

9.00 a.m. - Increasing Food Production through Agricultural Extension.
Mr. Ahmed El Diredíry and Mr. Mahadi Fadol Badri, Ministry of Agriculture.

9.30 a.m. - Break.

10.00 a.m. - The Role of Fish and Fisheries in Food Production and Nutrition.
Mr. T.T. George, Fisheries Research Centre, Agricultural Research Corporation .

10.30 a.m. - Nutritional Improvement through Processing, Marketing and Storage of Food.
Messrs. A.R. Ahmed, A.Y. Ali and B.H. Hamid, Food Research Centre.

11.00 a.m. - Nutrition in Agriculture.
Dr. M. Akmal Khan, FAO Nutrition Consultant.

11.30 a.m. - Break.

11.45 a.m. - Role of Home Economist in Rural Development.
Dr. Faiza Yousif Zumrawi, Department of Home Science, Faculty of Education.

12.15 p.m. - The Importance of Surveillance and Monitoring Systems in Nutrition Planning.
Dr. Awad Abu Zeid Mukhtar, Ministry of Health.

12.45 p.m. - Proposals for Developing a National Food and Nutrition Strategy for the Sudan.
Professor A.G.H. Khattab, Faculty of Agriculture.