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HEALTH/NUTRITION

PART

HEALTH SYSTEM IN MAURITANIA

ANALYSIS OF PROBLEMS AND ALTERNATIVE SOLUTIONS

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## FOREWORD

The state of health influences socio-economic factors and is also influenced by them, notably at the level of revenue, standard of living and, especially nutrition.

Gunnar Myrdal (1)

Health is an essential factor in development, being both an instrument for development and its consequence. There are complex relationships between health and other socio-economic factors, including such well-known examples as interactions with education, nutrition and population growth. Given these interrelations, health must not be isolated from the entire development process in order to simplify analysis of problems or to facilitate planning at the national, regional or local level. Health planners must assume the responsibility of carefully identifying the objectives of health programs on the basis of a choice of alternatives which takes into account not only the cost/benefit estimates of health services but also a qualitative evaluation of their efficiency. In a developing nation such as Mauritania, a good health program can only exist in conjunction with increased agricultural production, improved education and, in a general manner, the alleviation of the poverty of the masses.

Public health programs must contribute to the development process by improving the quality and quantity of the labor force. Economic development is also aided when more arable land can be worked by man, due to control of malaria, schistosomiasis or dracunculiasis (to cite the most widespread tropical diseases in Mauritania). A successful health program will have the advantage of improving the populations' attitudes, allowing them to realize that change is possible; this encourages innovative thinking, a faculty which can not be exercised by weakened or ill persons. The positive effects of these health programs on development will, in general, far outweigh their so-called negative effects on population growth.

Health investments may also be considered as investments in the quality of life of the population. It may be asked what contribution is brought to economic development by changing the quality of life? The answer includes at least three aspects: the first being the loss, through the death of a child, of the investment to raise him (productive labor potential), the second being the positive contribution of health programs to economic development and productivity, and the third being the real value of future work which can be preserved due to improved health. (2)

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(1) Gunnar Myrdal, "Asian Drama": An Inquiry into the Poverty of Nations" (New York: Pantheon, 1968) p. 1618.

(2) Selma J. Mushkin, "Health as an Investment" Journal of Political Economy, 70 supp. (1962): 129 p. 157

In a country like Mauritania, the problem is not a lack of investment but rather a surplus of unproductive investments. On a political level, large investments (consumption in the strict economic sense) are made in subsistence (food), maintaining new generations before they are able to provide productive work. The high mortality and morbidity rates render these enormous investments unproductive.

If we wish to measure the contribution of health programs to economic development, the major problem would be to measure the direct relationship between health services offered and the resulting work produced. In other terms, the effects of illness on the quality and quantity of productive work can be measured by the number of deaths (loss of workers), incapacity due to illness (loss of work hours) or weakness (loss of productive capacity during work). The life expectancy index at birth for a nation is, in fact, an index of the quality of its health system.

Thus, we may consider that part of the existing Mauritanian labor force would not be active today had it not survived due to decreased mortality brought about by past health and sanitation measures. It is, therefore, possible to calculate (for example) for the year 1980 in Mauritania the productivity of labor which can be attributed to those workers added to the labor force by decreased mortality since, say, 1960. These workers contribute, at present, to the national income and will continue to do so in the years to come; thus, the real value of their future production can be expressed in terms of capital goods.

While these examples of investment in human well-being can help to understand certain implications of health spending, they can not, unfortunately, guide administrators and health managers in planning the use of limited resources. A more useful instrument for planning would be the information supplied by cost/benefit analysis, especially of reduction of economic costs associated with illness. (3)

However, at the present time in Mauritania, sufficient data to allow cost/benefit calculations of health programs are not available and, therefore, it is not possible to use this efficient technique for the preferential allocation of health resources in different types of programs. Fortunately, there are other methodologies for the analysis of a series of alternative strategies to permit policy decisions as to resource allocation in the health sector. The discussion of these strategies (or "options") is the main objective of this report.

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(3) Vincent D. Taylor, "How Much is Good Health Worth?" (Santa Monica: Rand Corp., unpub. MS, 3945, Oct. 1968) p. 26.

The presentation of the Health/Nutrition options is divided into two parts: Part One will analyse the problems inherent in the Mauritanian health system on the basis of the results of the Third Health Plan (1976-1980), the objectives of the Fourth Health Plan (1981-1985), and the bottlenecks which have so far prevented efficient implementation of a national health plan. On the basis of these analyses, five alternative options will be presented to the Mauritanian government; these options vary from a projection of the Fourth Health Plan objectives (1981-1985) up until the year 2000 (Option C), to the operation of a Health/Nutrition system within the framework of multisectorial development (Option A), with two intermediate options (B<sub>1</sub> and B<sub>2</sub>).

In addition to these basic options, this report presents the possibilities of progressive application of each option over five-year periods (Combined Option). The first part of this report also presents a discussion of the financial, technical and political feasibility of each option; it is concluded by a summary of the main aspects of each option.

Part Two of this report presents data on both the quantitative and qualitative aspects of food requirements, the need to balance food rations and diversify subsistence production, as well as the necessity for an integrated approach to solving food/nutritional and basic health care problems. Part Two will be concluded by alternatives for the improvement of food and nutrition actions within the framework of existing structures. A set of annex tables will give detailed information concerning the volume of food requirements by region for the years 1980, 1985, 1990, 1995 and 2000, according to projection of regional populations, divided into urban and rural (both sedentary and nomadic) groups.

Calculations of the minimal balanced rations are based on agricultural production and predominant dietary habits of each region concerned, drawn from the results of the consumption survey conducted by RAMS in 1980. (4)

It should be understood that the subject of food requirements which is discussed in Part Two does not present options or choices. Given the cereal production forecast for Mauritania over the next two decades, there is no other option but to attempt to satisfy basic nutritional needs. However, since health and nutrition programs are to be fully integrated in the services concerned, food requirements must be a part of the different options presented in Part One of this report.

In orienting food production, it is necessary to determine not only the food products available (the work of the agronomist and the economist) but also to analyze current food consumption levels and the nutritional state of the population (the work of the nutritiona-

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(4) RAMS Food and Nutritional Situation in Mauritania, 1981.

list); therein lies the importance of this study. Given the size of the production deficit in Mauritania over recent years and the urgency of the problem due to rapid population growth (2.5% year), food requirement problems must be stressed and priority given to solving those deficits most seriously affecting the population. It is with this objective that the recommendations were formulated.

Finally, it should be emphasized that good health is intimately linked to good nutrition, as well as to the availability of sufficient water. Preventive and curative health care programs must take these interrelations into account and create acceptable hygienic habits through appropriate health education.

In Mauritania, basic health care services represent the only hope of attaining reasonable coverage in rural zones. However, these services must be based on an understanding of social values and beliefs as well as the social organizations of the different ethnic groups and their interrelations. This knowledge, which may be increased by anthropologists and sociologists, is an indispensable prerequisite for the definition of health and health education programs for the choice of such programs and for the efficiency of a valid nationwide health/nutrition system.

The options presented in this report cover the range of possible alternatives. The choice of a given option will depend essentially on government policy concerning the improvement of the Mauritanian quality of life. This choice will necessarily cause modifications, which may be appreciable, in other sectors of social and economic development, given the interdependence between health and other sectors. At least three variables affect health and are affected by it: nutrition, education and fertility. The major health options for health coverage (A and B<sub>1</sub>) will contribute most greatly to improve certain socio-economic problems associated with these variables.

PART ONE: HEALTH SYSTEM IN MAURITANIA : ANALYSIS OF PROBLEMS  
AND ALTERNATIVE SOLUTIONS

A. OBJECTIVES AND RESULTS OF THE THIRD HEALTH PLAN (1976-1980)

Because of an absence of specific objectives, the Third Plan did not provide a valid guide to health orientation and policy; this Third Plan rather was an extension of the activities and infrastructure which had not been undertaken during the Second Plan. Therefore, the Third Plan was not based on quantifiable objectives, did not recommend long-term strategies to resolve health problems, and did not establish stages or targets to be attained during the given period. In fact, it is difficult to speak of it as a "health plan" -- and, in this sense, evaluation of its results is impossible; it presents no basic policy which would permit comparison of projections and results.

During this period (1976-1980), 1,339 million Ouguiyas were allocated for health programs; however, only 709 million (or 53%) were expended. Current costs for construction, equipment and training of personnel have so greatly increased due to inflation that the allocations envisaged, but not executed, have become more and more expensive, and may soon be in competition (often unfavorably so) with other projects on which present circumstances may confer higher priorities. This situation reflects the rather heavy bureaucratic structure and the inadequate management capacity of the Ministry of Health, as well as the low priority given to health programs in the general Third Plan.

The table below provides the Third Plan's allocations and expenditures for the health/nutrition sector:

Table 1. Allocations and Expenditures of Third Health Plan (1976-1980)

Title of Projects	Allocations		Expenditures	
	(in millions UM)	%	(in millions UM)	%
Extension of Nouakchott Hospital	464	34	553	78
Nouakchott Hygiene Center	35	3	35	5
Kaédi National Hospital	296	22	20	3
Regional Health Centers	179	13	100	14
Training of Personnel	265	20	0	-
23 Mobile Teams	50	4	0	-
Integrated Nutrition Protection	50	4	0	-
Total	1,339	100	708	100

This table shows that out of the allocations 37% were for construction in the city of Nouakchott; however, out of total expenditures, 83% were for this construction. In other words, capital projects for Nouakchott were completed at a rate of 117% as compared to the rate of only 25% for proposed regional construction. Projects to train personnel, create and equip mobile teams and to undertake the integrated nutrition program were so slow that it was necessary to postpone them until the Fourth Plan (1981-1985).

A study of these achievements also raises serious doubts as to the planning and implementation capacities of the services of the Ministry of Health during the period 1976-1980.

A certain number of other projects, not proposed in the Plan, were completed during the 1976-1980 period. It should be noted that the total cost of these projects is equivalent to 25% of the Third Plan earmarkings (176 million out of 708 million for the Third Plan). The list of these projects follows:

Million UM

12.5	Polyclinic - 5th Arrondissement, Nouakchott, finished at the end of 1979, operational in March 1980.
13.5	The Mother-Child Center of the First Arrondissement, Nouakchott, finished in July 1980 and operational in November 1980.
135.0	The Sabah Anti-Tuberculosis Hospital (in Nouakchott) (90 beds) is finished and now awaits medical and technical equipment to begin operations.
3.8	Dispensary of 1st Arrondissement, Nouakchott, finished at the beginning of 1980 and operational at the end of 1980.
10.8	Renovation of the Atar Hospital, terminated in September 1980.
<hr/>	
175.6	

These projects were almost exclusively limited to Nouakchott (94%), demonstrating the enormous influence of pressure groups in the country's capital and the basic problem of administrative centralization. Under these conditions, how is it possible to invest sufficiently in the rural zones where 80% of the Mauritanian population lives?

## B. DESCRIPTION AND ANALYSIS OF PROPOSED FOURTH HEALTH PLAN (1981-1985)

### I. Introduction

For the first time, the draft Fourth Health Plan contains the essential elements of a health plan: general objectives and well-defined specifics, as well as a detailed budget. In 1980, the Ministry of Labor, Health and Social Affairs published the first edition of the Plan in French. (5) In January 1981, the second edition was published in Arabic. (6) These two versions differ slightly as to budget and total cost estimates (operating expenses, investment costs, special programs).

In general, the approach of the Fourth Plan is fairly good in both administrative and conceptual aspects. It is more technical than the preceding Plan. Logistic difficulties have been identified. However, certain methodological aspects are not sufficiently specified; it is not easy to understand, for example, how the Ministry of Health will approach basic health care or personnel training programs.

A detailed study of the budget (see B.IV, below) leads one to suppose that the Fourth Plan will attempt, over the five-year period, to fill in all the gaps left by preceding Plans. (7)

The population projections for the 12 regions and Nouakchott (1,521,334 inhabitants in 1980) are given in this document as the result of a yearly growth rate of 2.4%, based on the results of the general population census of 1977 (1,336,830 inhabitants). In reality, the calculation presented is 66,526 persons higher than the growth rate indicated in the report. In addition, in the

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- (5) Ministère du Travail, de la Santé et des Affaires Sociales: "Plan de la Santé (1981-1985)". September 1980, mim. 54 pp, Annex 1: Equipe Médico-Technique. 32 pp and Annex 2: Dotations et Médicaments, 12 pp.
- (6) Ministère du Travail, de la Santé et des Affaires Sociales: "Plan pour le Développement des Services de Santé (1981-1985)". Nouakchott, January 1981, mim. 72 pp.
- (7) 1980 Budget Distribution: 875 million UM, of which 39.4% corresponds to capital costs.  
1981 Budget Distribution: 1,025 million UM, of which 43.4% corresponds to capital costs.  
All prices expressed in constant 1980 prices; the real increase is 17.1% in 1981.

regional projections given by the Ministry of Health, the estimates are too high for the regions of Hodh Oriental, Hodh Occidental and Brakna. (8) It should be emphasized that the quality of a plan's programming will depend greatly on the quality of data on which it is based, of which demographic data are one of the principal elements.

Although 1980 demographic data are included in this report, they are not utilized for programming: no other projection is presented. Similar remarks may be made concerning vital statistics (mortality, morbidity, migration) and the rate of urbanization or sedentarization of nomads. As to distribution of the population by age groups, a primordial element to determine health actions for the target groups (fertile women, married women, children less than 1 year old, children from 1 to 5, etc.), one wonders how it was calculated; it appears greatly different from the distributions determined by the census three years earlier. (9)

In summary, the Fourth Plan as a whole presents a good general conception of health problems in Mauritania. However, there are shortcomings in programming due to (a) inadequate use of demographic data, (b) lack of long-term objectives to provide a more meaningful and realistic view of the figures cited, (c) lack of evaluation of possible future impacts of recurring costs resulting from proposed projects, and finally (d) the absence of detailed descriptions of measures required to translate strategies into working programs, such as the basic health care program for 571 villages or the strategies for preventive medicine, which constitutes the keystone of these actions. In general, the objectives presented by the Plan constitute a gigantic task, to be accomplished over a short period of time and which must take into account all manner of constraints, especially of a socio-cultural order. This document makes no mention of bottlenecks; the details of programming, operations or evaluations are not included. Aspects of management or the collection and analysis of data are not discussed. Even more serious is the fact that this Plan does not mention the cost of training the professional, para-professional or basic health care personnel required, nor of the massive community participation campaign which must be implemented for the basic health care program.

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- (8) Projection of the 1,338,830 at an annual rate of 2.4% (from January 1, 1977 to July 31, 1980) results in 1,454,808 persons instead of 1,521,334 (4.6% excess). Hodh Oriental would have 170,297 persons instead of 219,627 (29% excess); Hodh Occidental would have 134,953 persons instead of 143,826 (6.6% excess) and Brakna 164,464 persons instead of 172,200 (4.7% excess).
- (9) Census results: 0-14 = 44.0%; 15-64 = 52.2%; 64+ = 3.8%. Fourth Plan projections: 1-14 = 45.2%; 15-64 = 51.7%; 64+ = 3.1%. Changes of this order are unlikely over a 3½ year period. Precise calculations would be possible only if there were correct registration of births, death and international migrations.

## II. Objectives of the Fourth Plan

The general objectives of the Fourth Health Plan, in the document cited (5), are:

1. Health for all in the year 2000, and
2. Improvement of social well-being.

These objectives are based on the Alma Ata Declaration (10) which the Mauritanian government has adopted: "To obtain, around the year 2000, for all inhabitants, a level of health which will permit a productive life from both social and economic standpoints. Basic health care services will be the key to attaining this objective." Thus, the plan makes the following recommendations:

priority to preventive medicine  
orientation of health actions towards rural zones  
generalization of basic health care services  
improvement of the management and health statistics in all health services of the country.

Three other objectives are considered in the Plan and include specific strategies. These are described below (the number corresponds to the objective and the letters to the strategies):

1. To extend from the present until the year 1985 health coverage to 60% of the population
  - a. construction of rural health stations in 143 villages of between 600 and 2,000 inhabitants which do not at present possess any health services
  - b. promotion of health care in 428 villages of between 300 and 600 inhabitants which possess no health services
2. To give priority to Preventive Medicine
  - a. to vaccinate over the next 5 years 85% of the nation's children against tuberculosis, dyptheria, tetanus, polyomelitis, rubella and whooping cough
  - b. to develop and implement:
    - i. a program for integrated health education
    - ii. a program for sanitation and hygiene, as well as health legislation appropriate to Mauritanian conditions
    - iii. a program to control, at a national level, urinary schistosomiasis, malaria and dracunculiasis.

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(10) Alma Ata Declaration: International Conference on Basic Health Care, WHO, UNICEF, Alma Ata, URSS, September 1978.

- c. to control pulmonary tuberculosis in the country
- d. to give priority to mothers, children, rural and slum inhabitants
- e. to promote nutritional activities and participate in national planning for food self-sufficiency.

3. To optimize the efficiency of existing health structures

- a. to adopt a modernization and re-equipment plan for the health services which will include renewal of medical equipment every five (5) years, as well as renewal of vehicles every three (3) years due to climate and road conditions.
- b. to quantitatively and qualitatively improve the supply and distribution of medications
- c. to plan the training of personnel so as to eliminate the deficiencies of (from the present to 1985) para-medical and technical personnel and (from the present to 1990) physicians
- d. to extend and modernize the health infrastructure
- e. to create a service for repair and maintenance of medical equipment.

III. Analysis of the Objectives of the Fourth Plan

1. General Objectives

The general objectives of the Health Plan (that the nation's population, without exception, have access to basic health care services around the year 2000) are quite acceptable and appear plausible. The concept of low-cost basic health care, both integrated and acceptable to the majority of the nation's population, appears logical. Indeed, there is no controversy about the need for social justice, humanism, fraternity of mankind; the provision of minimal health care for the entire population is an easily accepted concept in the context of the right to human dignity, to basic needs, etc.

However, closer analysis of the enormous task to be undertaken, in the case of Mauritania alone, shows the enormous cost required for such a program to provide basic health care to a population (in the year 2000) of almost 1,700,000 persons (rural population plus 20% of urban population): the cost of training sufficient health personnel, of distributing medications, of vaccination programs, of sanitation and health education.

Due to inflation and the high cost of energy, developing nations are experiencing great difficulties in meeting demands for employment, education, payment of public debt, to mention only the most priority expenses and deficits. How can these nations find

the means and the time to improve a sector which economists may consider one of the less productive?

Providing basic health care to the least-favored members of a society is a viable objective only when the society's leaders consider health a priority development objective. Unfortunately, in some developing nations, objectives of a political, military or purely economic nature take precedence over human concerns, such as aiding the population to improve health as a means to developing full potential.

Thus, the success of any health improvement program in Mauritania will depend on the government's will to give priority to improvement of the population's quality of life. The entire community and the private sector must also participate if the plan is to be feasible.

The specific objectives presented in the Fourth Plan are designed to rationalize the use of health resources; they can be classified into two categories:

a. Efficiency Objectives (coverage/cost)

- i. increasing coverage by establishing basic health care services in 571 villages having no health services,
- ii. optimizing health services by extending and improving health care: creation of new health units and renovation of those in poor condition; renewal of equipment in all health services; provision of sufficient well-maintained vehicles; purchase and distribution of medication in sufficient quantity and of sufficient quality; training of professional and para-professional personnel required to meet the objectives of the plan; creation of certain professional, salaried, social and administrative benefits designed to keep health personnel in the country and in the public sectors.

b. Effectiveness Objectives (Preventive Medicine and Public Health and their impact on morbidity, mortality and fertility)

- i. priority attention to vulnerable groups: pregnant or nursing women, children under 5 years of age, rural populations far from distribution centers and water supplies, inhabitants of urban slums, etc.
- ii. campaign for health and nutritional education using all means of communication, health agents, State officials and both official and unofficial leaders of the community.
- iii. campaigns to control the most frequent tropical diseases in Mauritania (malaria, urinary schistosomiasis, dracunculiasis) as well as tuberculosis and leprosy.

- iv. campaigns to control the environment: sanitation, hygiene, supply and improvement of water, legislation and organization of a health inspection program.
- v. enlarged vaccination program (PEV), oriented towards vaccination of children against 6 contagious diseases: diphtheria/whooping cough/tetanus (Triple DPT), measles, poliomyelitis and tuberculosis. The plan proposes to vaccinate, by the year 1985, 85% of the nation's children.

The specific objectives list the programs to be developed. These programs must be conceived in a coordinated manner so that polyvalent personnel can operate them. Each program must also have its specific qualitative and quantitative objectives.

The specific objectives presented in the Plan correspond to the country's needs; in general, they could apply to any tropical nation. This part of the Plan, however, should be considered as the basis for all the strategies and actions proposed as a consequence of applying the Plan. It has already been pointed out that there are certain weak aspects of the Plan, specifically the fact that the basic objectives have not been used as a basis for planning strategy.

Other problems arising from the same cause will be covered in the following analysis of the budget.

#### IV. Budget

In contrast to the Third Plan, the draft Fourth Plan of the health sector includes large sums devoted to the extension of medical coverage (infrastructure, personnel, medications), to the improvement of control and diagnosis of diseases (equipment, logistic means), to community medicine (vaccinations, campaigns against tropical and contagious diseases). This reflects the Ministry of Health's concern to resolve the nation's most urgent health problems. In the first edition of the Plan (September 1980), the projects entitled "Urinary Schistosomiasis" and "Sustaining the National Service to Combat Tuberculosis" are not mentioned. On the other hand, in the second edition (January 1981), personnel costs are given only indirectly (in the section entitled "Distribution of Health Budget 1978/1979/1980") where personnel salaries for these three years were cited as examples. In the September 1980 edition, the personnel budget was based on 1980 salaries (213 million UM); budget projections are based on a calculation of 5% annual growth to cover expenses of salaries of personnel in training during the Plan period 1981-1985. The budget's annual growth of 5% appears too low to cover the increased personnel proposed by the Plan; thus, the health personnel budget has been increased by 10% in the feasibility analysis. Taking this increase into account as well as allocations for special programs, the estimates made by the Ministry of Health in the second

edition of the Plan remain the same as those given in the following table.

Table 2. Budget of Fourth Health Plan

Proposed Budget Estimates (millions' UM) (1)

<u>Item</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>Total</u>	<u>%</u>
<u>Current Costs</u>							
1. Personnel	237	260	286	315	347	1,445	24.3
2. Operating Costs	124	129	130	131	134	648	10.9
3. Pharmaceutical Products	219	246	238	271	286	1,260	21.4
Sub-total	580	635	654	717	767	3,373	56.6
<u>Investment Costs</u>							
1. Construction	64	143	109	150	16	482	3.1
2. Renovation	53	67	93	65	37	315	5.6
3. Equipment	252	301	190	185	114	1,042	17.5
4. Vehicles (2)	42	35	21	14	18	129	2.2
Sub-total	411	564	413	414	185	1,987	33.4
<u>Special Projects</u>							
1. PEV	-	12	13	15	16	56	0.9
2. Prescribers/ Special Equipment	34	38	41	45	50	208	3.5
3. Schistosomiasis/ Malaria	28	14	14	16	21	93	1.6
4. Anti-Tuberculosis	56	56	55	34	34	235	4.0
Sub-total	118	120	123	110	121	592	10.0
<b>Total</b>	<b>1,109</b>	<b>1,315</b>	<b>1,210</b>	<b>1,241</b>	<b>1,073</b>	<b>5,952</b>	<b>100.0</b>

(1) Constant 1980 prices

(2) Cost of vehicles, spare parts and maintenance are included for 1981, 1982 and 1983, after which the budget will follow a three-year replacement cycle.

It is interesting to note the change of priorities within the Ministry of Health by comparing the allocations to these different items in each of the two editions of the Plan:

Table 3. Comparison of Budgetary Allocations between the Two Versions of Health Plan (September 1980 and January 1981)  
(in millions UM)

Budget Item	Plan IV Version 1 (Sept. 1980)	Plan IV Version 2 (Jan. 1981)	Percentage of Change
<u>Current Costs</u>			
1. Personnel	1,461	1,445	(- 1.1%)
2. Operating Costs	1,582	648	(- 59.0%)
3. Pharmaceutical Products	2,177	1,280	(- 41.0%)
Sub-total	5,220	3,373	(- 35.4%)
<u>Investment Costs</u>			
1. Construction	1,185	482	(- 50.3%)
2. Renovation	203	335	(+ 65.0%)
3. Equipment	551	1,042	(+ 89.1%)
4. Vehicles	131	128	(- 2.3%)
Sub-total	2,070	1,987	(- 4.0%)
<u>Special Projects</u>			
1. Vaccination Program (PEV)	56	56	( 0 )
2. Schistosomiasis/ Malaria campaign	63	93	(+ 47.6%)
3. Anti-tuberculosis campaign	-	235	new
4. <del>Produc.</del> Units/ Special Equipment	44	208	(+372.8%)
Sub-total	163	592	(+263.2%)
Total	7,453	5,952	- 20.1%

The second version is more realistic and better adapted to the precarious economic situation of the country. This comparison shows the following changes:

- (1) A decrease of more than one-third of recurring costs: expenses for operation and purchase of pharmaceutical products are greatly decreased. On the other hand (taking into account the 5% increase added to personnel salaries in the second version), the difference between the two personnel allocations is negligible.

- (2) Investment costs are only slightly modified for the general total, but equipment allocations have been increased by 89.1% and renovation costs by 65%. On the other hand, construction costs are greatly decreased (59.3%). The vehicle budget decreases by only 2.3%.
- (3) Sums devoted to special projects are multiplied by 2.63 in the second version, in order to take into account specific donations.
- (4) The second version represents a 20% decrease of the budget as compared to the first version.

When analyzing this budget as compared to the objectives cited in the Fourth Plan, it is noted that very limited funds are allocated to the most serious and widespread health problems of the nation. Most of the preventive medicine allocations are to be found in the Special Projects section, which represents only 10% of the total budget. The major portion of the health budget is reserved for curative medicine, urban centers, central administration, infrastructure for clinical units, operating costs and logistic means. It is not difficult to estimate that 20% of the budget is devoted to 80% of the population, an obvious contradiction to the objectives of the health plan described.

## C. EXTERNAL AND INTERNAL FACTORS AFFECTING THE MAURITANIAN HEALTH SYSTEM

### I. Introduction

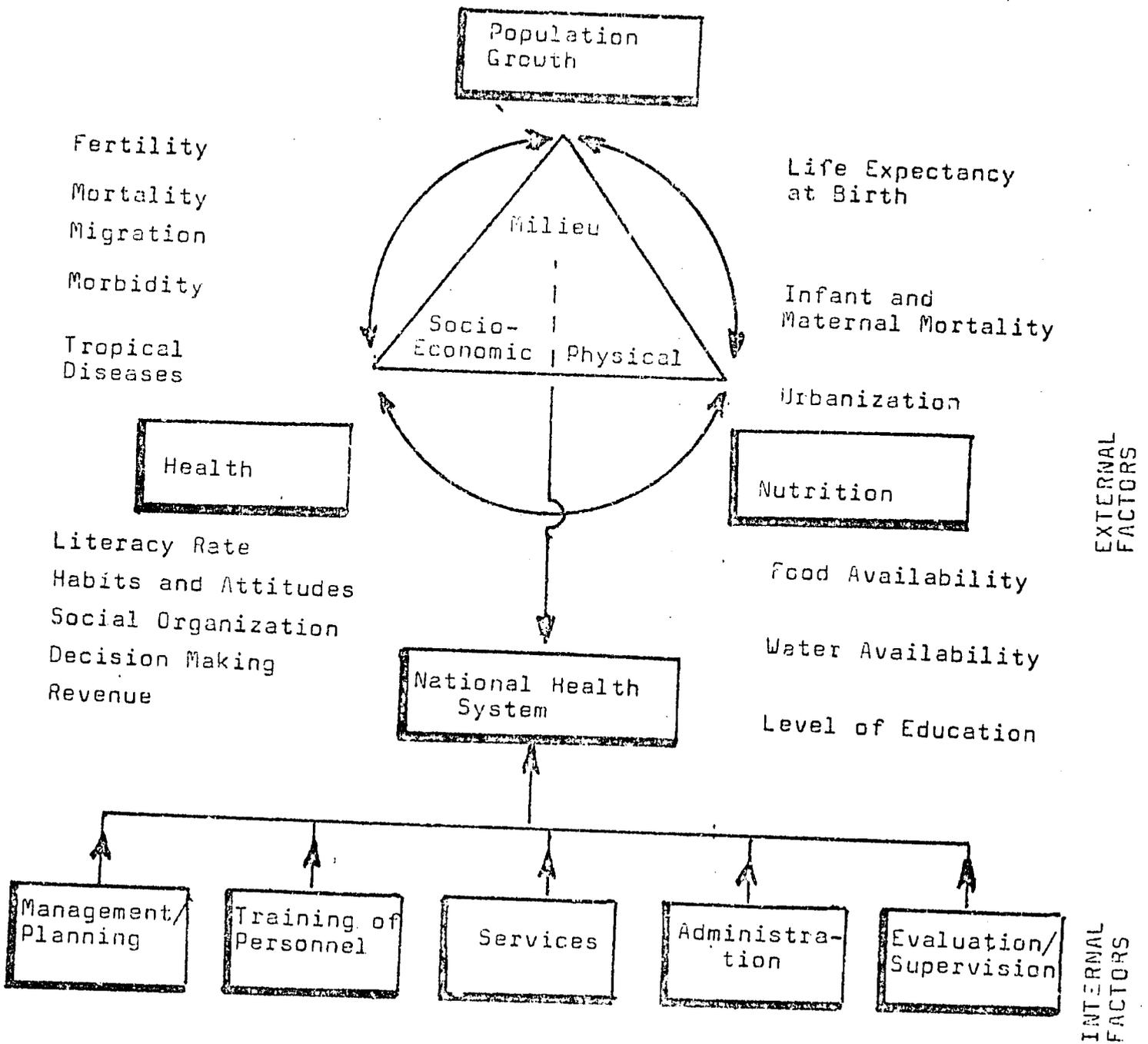
The quality of a national health system is determined by two fundamental aspects: its efficiency (minimum cost per unit of service provided) and its effectiveness (maximal decrease of incidence of death and disease). These aspects are influenced by factors both external and internal to the health system concerned (Figure 1).

External factors have complex interactions: state of health and nutrition/population growth/socio-economic characteristics/environment. Internal factors concern the specific capacities of the health system: management capacity, planning capacity, training of personnel, capacity to offer services, administer, supervise and evaluate.

In a developing nation like Mauritania, the study of these factors is very important, as resources are limited as compared to the needs; certain of these factors may become serious constraints to the operation of a health system.

In addition, it is necessary to have a better understanding of the relationship between external and internal factors of a health system. Decisions concerning human health may also have implications

Figure 1. Constraints Affecting National Health System in Mauritania.



for other sectors, which may be social, economic, environmental, nutritional or concern growth of population.

## II. External Factors

### 1. State of Health

The low quality of health statistics in Mauritania does not permit precise determination of morbidity or mortality rates by age and sex. Tropical, infectious and parasitic diseases, whether associated or not with malnutrition, are by far the majority of cases diagnosed in hospitals and health centers, as well as the cause of most deaths. While these diseases are preventable, their incidence has not decreased; each year, very large numbers of the population are infected by malaria, diarrhea, urinary schistosomiasis, measles and pulmonary tuberculosis. Estimates by the Ministry of Health indicate the following prevalence for 1980: (11)

Table 4. Prevalence of Five Diseases in Mauritania

Disease	Number of Cases Seen	Population Exposed to Risk	Prevalence
Diarrheas/Enteritis	80,000	468,150 (1)	171/1000
Measles	11,200	468,150	25/1000
Malaria	57,600	1,437,560 (2)	40/1000
Pulmonary Tuberculosis	7,400	1,437,560	5/1000
Urinary schistosomiasis	6,500	1,437,560	0.5/1000

(1) Children 0-9 years

(2) Total population of Mauritania

The main causes of infant mortality appear to be (by order of incidence): obstetrical complications, followed closely by prematurity, respiratory infections, gastroenteritis, infectious diseases and tetanus.

Mortality below the age of 5 years appears to be due to: respiratory infections, malaria, malnutrition, gastroenteritis, infectious diseases (the foremost being measles), tuberculosis, tetanus and accidents.

The diseases linked to pregnancy, delivery and the post-partum period include: infections, hemorrhage, eclampsia and premature deliveries.

It should be noted that a good many children from 6 months to 5 years old suffer from severe and at times multiple infections: malaria, diarrhea or pneumonia. In addition, diseases which are

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(11) Ministère de la Santé, Mauritania, 1980. Diagnostic des cas informés par les formations sanitaires.

usually not serious, such as measles, may become severe when associated with malnutrition. Malaria, which is widespread among the less than 3-year age group, is probably the primary cause of mortality along the Senegal River during the rainy season. While a high percentage of the adult population becomes infected with plasmodium before the age of 20, adults develop a limited immunity to malaria, so that attacks cause only sickness for one or two days, after which the patient may return to work. However, it can be estimated that 10% of work days per worker are lost each year due to this disease in Mauritania.

Diarrhea and vomiting are prevalent among children from 6 to 24 months, especially during the dry season. After this age, the incidence of diarrhea and vomiting decreases.

Contagious childhood diseases are relatively frequent, especially measles; when accompanied by malnutrition, measles are often fatal. Measles occur at any time of the year and spread rapidly. Anti-measles vaccinations have not yet been given to a sufficient number of Mauritanian children to decrease the incidence of this disease.

Morbidity and mortality among children from 2 to 3 years appears to increase during the "hungry period" and the rainy season. This situation may be partially attributed to the farming activities of the women during this period, preventing adequate care for newborns and young children. In addition, during this period, the children are more susceptible to the effects of heat and humidity. The negative effects of malnutrition on the psychomotor development of young children may also be considered as responsible for the high mortality rate, either directly or as a factor increasing the lethality of other diseases.

As for the mothers, their nutritional state deteriorates during the rainy season, which may have serious effects for pregnant and nursing women.

Intestinal parasites are quite common among both the young and adults. The problem of major endemic diseases will be treated in the discussion of environmental factors (C-5).

## 2. The State of Nutrition

Malnutrition is one of the most serious health problems in Mauritania. However, the health services are only beginning to consider nutrition as an important problem. Thanks to the dynamic approach of the MCH (Maternal Child Health) services and the integration of the Nutritional Recuperation and Education Centers in their operations, the situation is improving, especially in urban zones. The coverage of rural zones is still quite limited. In 1977, anthropometric surveys were conducted in the MCH centers, in collaboration with WHO. The results were as follows:

- 68% of the children had weights less than 80% of WHO norms
- 36% had weights less than 60% of the norms
- 57% of these children had an arm circumference which hardly attained the yellow band of the Bailey ruler.

Anemia is quite frequent among pregnant women. It is estimated that almost 40% of the families living in the suburbs of Nouakchott eat only once a day.

Among the causes of food and nutritional problems, the following may be mentioned:

- a) insufficient availability of food at the national level:  
The country must import annually between 150,000 and 170,000 tons of cereal. The low rainfall and water situation in the country, crop predators such as weaver birds and insects, and the primitive farming techniques employed are the main causes of low productivity. Structural problems of livestock raising and fisheries also play an important role in food deficiencies.
- b) insufficient local food production:  
This insufficiency is linked to the preceding situation but has complementary reasons: lack of road infrastructures, limited means of transport, insufficient storage systems. It is estimated that losses resulting from these problems may attain 30% of production.
- c) limited family production of food:  
Subsistence farming in Mauritania is generally not capable of satisfying qualitative and quantitative nutritional needs. Revenues are very low (almost non-existent for farmers and on the order of 4,000 UM/month (1978) for the lower-paid workers); nevertheless, a family of 5 persons, consuming only a little tea and sugar in the morning, a little rice and oil at noon, and a little melted butter in the evening will spend 3,660 UM/month for food. A family of 8 persons, consuming only tea and sugar in the morning, rice with oil as well as a little fish and tomato paste at noon, and nothing in the evening, will spend 3,800 UM/month for food. Dietary habits and tastes also play a role: many families, for example, dislike or are not used to fish, fresh vegetables or fruits.

An important problem which remains to be resolved is the availability of weaning foods based on local products.

- d) the size of households:  
Nutritional problems are increased by the lack of food and the number of persons within the family among whom it must be distributed. The average size of a household varies from 6 to 8 persons, according to region and locality. In addition, one

must count the constant guests and members of polygamous families. Distribution of the food ration thus includes the problem of the number of persons who must share the ration; this distribution is often unfavorable to the children and the women of the household (they are fed last).

e) diseases:

Diarrhea (32,000 cases reported by the MCH in 1977), measles (in epidemic form from January to September 1978), bronchitis (30,000 cases), malaria (50,000 cases) --- all contribute to aggravate the nutritional situation.

f) insufficient personnel for health and nutrition education:

This insufficiency is much more marked in the rural zones, villages and nomad encampments. Additional problems are: the manifest insufficiency of educational materials, of infrastructure, of general resources and of nutritional knowledge among the health personnel.

### 3. Population Growth

There has been almost continuous population growth in Mauritania since 1950 (except for the decade 1965-75). (12) The natural growth rate estimated by RAMS is 2.5% per year. (12) This growth rate is the result of a high birth rate (47 per thousand) and a decreasing mortality rate (22 per thousand). In the absence of large international migrations, if this rate continues at the same level, the population of the country will double over a period of 28 years. A stationary birth rate and a regressing mortality rate suggest that the population growth rate, instead of decreasing, will increase at an accelerated rhythm during a certain period. This growth rate will result in rapid decrease in the average age of the population and accelerated migration. Population growth will increase pressure on social services, such as health and education, as well as augment food consumption. Another effect will be increased dependence, as the percentage of the population under 15 years of age will increase. Increased migration of young people towards the towns will present the problems of unemployment and uncontrolled urbanization. The aging of the rural population as a consequence of youth migration will also present a problem. The migration of Mauritians towards neighboring countries has negative effects on the availability of agricultural labor to achieve food self-sufficiency.

These rapid changes in the size, distribution, composition and density of the population will have unfavorable effects on health in urban and rural zones. Urban health services are already insufficient and will not be able to respond to this avalanche. According to RAMS projections (12), it is estimated that the city of Nouakchott will increase by 2.3 times from 1980 to the year 2000 (or 173,000 to 574,000 inhabitants).

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(12) RAMS Population Projections, 1980.

The following table shows the population and its estimated growth over five-year periods.

Table 5. Growth Rate of the Population 1980-2000

Population	1980	1985	1990	1995	2000
Nouakchott	173,000	254,000	345,000	451,000	574,000
		(47%)*	(36%)	(31%)	(27%)
Urban population (without Nouakchott)	181,000	206,000	233,000	257,000	280,000
		(14%)	(13%)	(10%)	( 9%)
Rural population (sedentary)	680,000	813,000	944,000	1,084,000	1,235,000
		(20%)	(16%)	(15%)	(14%)
Rural population (nomad)	409,000	363,000	330,000	304,000	282,000
		(-10%)	(- 9%)	(- 8%)	(-7%)
Total	1,443,000	1,636,000	1,852,000	2,096,000	2,371,000
		(13%)	(13%)	(13%)	(13%)

\* Growth rate between five-year periods.

Decreased general and infant mortality, in the absence of decreased fertility, may result in further population growth. For this reason, the MCH programs must implement "family care" action in an attempt to space births to protect the health of mothers and children. Figure 2 shows population projections until the year 2000 (annual growth rate of 2.5%) for the total population and for urban and rural populations (both sedentary and nomad). The drought period of 1971-1974 is noted, as a subject for reflection.

##### 5. Socio-Economic Factors

Each ethnic group, each people, each nation has its social and economic constraints resulting from centuries or generations of multiple changes -- historic, economic, social, religious, physical -- through which the particular organization of the society has played a determining role by arresting, accepting or adapting to evolutionary processes. Certain constraints are anchored in socio-cultural atavisms which the planner may well overlook. Change is continual at different levels and is of different intensities, according to historical or economic events (or, as in the case of Mauritania, environmental events).

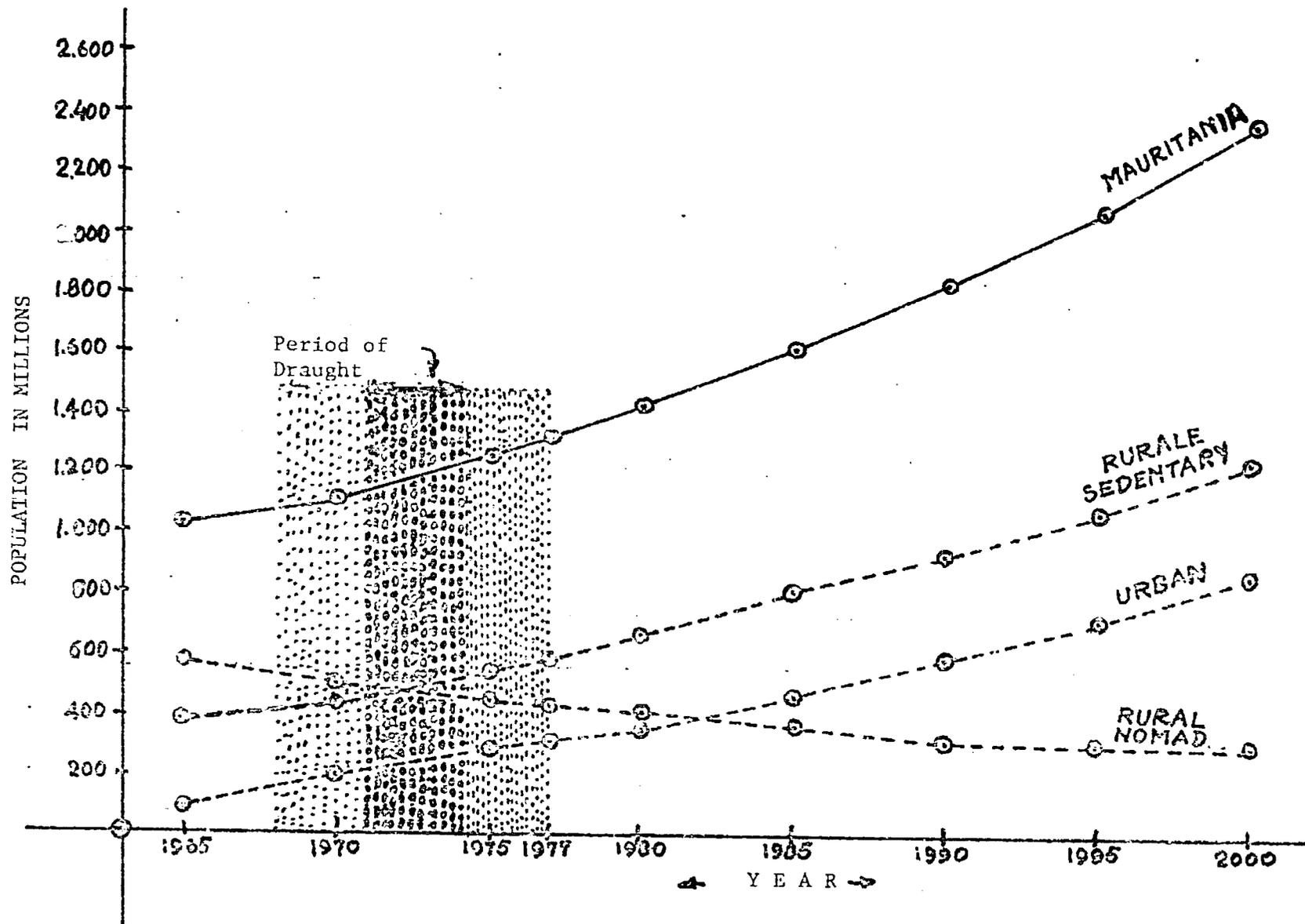


Fig. 2 = Mauritanian Population Projections to year 2000 divided in Rural Sedentary, Nomadic and Urban groups.

SOURCE: Susan Waltz: Projections de Population. Document RAMS (1980).

4. Before discussing the social aspects of health and nutrition in Mauritania, it is useful to reflect upon the general relationship between constraints and planning. "Constraints" is perhaps too intransigent a word, if one accepts the fact that slow change is a factor in all societies. Constraints reflect the particular characteristics of a society; thus, to comprehend a constraint, one must seek its source. Once the basis of social and economic constraints are understood, it should be possible to attenuate them by actions which are understood, absorbed and accepted by the society concerned. However, this often requires a long-term effort, through convincing measures of which the socio-cultural and economic impact are recognized as beneficial by the population. If the planner, the organizer, the administrator or the educator wishes to have his message understood, he must use the potential of the group in which he wishes to introduce changes; he must solicit the participation of the group itself in adapting to the changes. Certain obstacles will be easier than others to overcome; some may require a series of progressive actions to arrive at the change desired. This is the responsibility -- and the difficulty -- of the planner, who may, in his desire for social progress, or for economic or political reasons, omit necessary steps in solving fundamental social problems.

The social aspects of health and nutrition are often the most difficult to solve, given their interactions with all other sectors of the society. Health reflects the development of the nation and its interactions with the rest of the world; nutrition reflects the dietary habits of the people and the different production systems which characterize the nation. Below is a brief discussion of the relationship between social aspects and health/nutrition, according to the following main themes:

- (a) traditional habits and attitudes concerning health and nutrition
- (b) education - traditional and modern
- (c) migration - its impact on social organization for production.

(a) Traditional habits and attitudes concerning health/nutrition

The major problem in Mauritania is a lack of hygiene. This is a consequence of another serious problem, the lack of water. A vicious circle is thus created: there is a lack of concern for personal and community hygiene due to lack of water, but when water is made available hygiene is not improved, due to the habits and attitudes acquired and the lack of adequate sanitation and health infrastructure.

As compared to other African nations, particularly other Sahel nations, the different Mauritanian ethnic groups have relatively few superstitions which may impede improvement of health and nutrition. The basic problem is rather a lack of knowledge,

.. lack of means and a lack of integration with a milieu conducive to positive change. (13) However, certain superstitions do contribute to health problems: the tradition of abrupt weaning at the age of 2 years, the conditions and habits of delivering babies, the general lack of health care for infants and mothers, and the habit of force-feeding young girls, resulting from an esthetic concern which is very harmful to the health of young girls and women. These habits are encouraged by a traditional medicine which is often poorly understood or poorly applied, and by false religious interpretations, due to maraboutism which is often profoundly superstitious. (14)

Another major problem in health planning is the high fertility rate of the population (although Moorish families are usually smaller than black African families). In a country where all production sub-sectors, health infrastructure, education, and management are at a minimal level and are faced with constant pressure from increasing urban growth, high fertility can only be a drain on the economic and health progress of the country. For generations to come, this may hinder all coherent development as compared to the surrounding world. The high fertility rate is often defended on a religious basis, but this is ill-founded. One has only to read the Koran to realize that it recommends that each couple reasonably plan its family in accordance with its economic means and health. The importance of giving each human being an equal chance predominates in Islamic doctrine, whether concerning polygamy (15) or the integration of women and children in the family and the community. However, over the centuries, folkloric interpretations have distorted the religious lesson which were intended to benefit the community. There is a real potential for health re-education by using the Koran, without its maraboutism and superstitious accoutrements. A country as profoundly religious as Mauritania can only profit from such education.

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(13) Modern migration has an undeniable impact on the Mauritanian, regardless of his ethnic origin. However, it should be noted that most of the immigrants, whether they be in France, in Mauritanian towns or villages or in other African countries (Senegal, Mali, Ivory Coast), live in very difficult physical circumstances and often well below normal living conditions of the countries' inhabitants.

(14) RAMS, State of Health in Mauritania, 1981.

(15) The Koran discourages polygamy. It insists on the fact that a man must not only maintain his wives at the same economic level but also provide the same amount of affection; as this is quite difficult to accomplish, the Koran discourages men from polygamous marriage unless they know themselves to be capable of meeting these requirements.

Another problem is the practice of traditional medicine, based on long-standing social habits. The positive aspects of this traditional medicine have decreased due to the loss, over the generations, of specialized knowledge and the loss, due to the drought, of the plants required for medicinal potions. Thus, the traditional medicine of the past is often replaced, at present, by charlatanism and may be harmful. Integration of traditional medicine with the practice of modern preventive medicine is possible but will require mutual comprehension between the two types of medicine and objective adjustments to the requirements of the very limited health system.

From a nutritional point of view, it has been stated (16) that, compared to other African countries, the Mauritanian ethnic groups have well-balanced nutrition; the basic problem is essentially that they do not have enough to eat. The drought has had a devastating impact on the availability of basic foods: milk, dates, fish, meat, couscous (both wheat and millet). The pressure on family budgets has been very great to purchase the food stuffs families can not produce. (17) This generalized food deficit has especially harmed the women and children (this is due to familial organization; as in many other traditional societies, even those who do not practise subsistence farming, the position of women and children, especially young girls, is distinctly inferior to that of the men).

The climatic cycles in Mauritania and the dispersion of oases have led to the social and economic habit among the Moors of a date cure (quetna) and a date cure (practised by only one tribe along the coast which is nomadic). These cures are beneficial as they permit these people to obtain acceptable levels of Vitamin C and protein. However, a date cure also has harmful effects, especially for the teeth and the digestive system, due to the lack of oral hygiene and the quantity of sugar consumed. Improvement of consumption habits can only be brought about by education and information to the population, based on their tastes and specific nutritional needs.

The above discussion of habits and attitudes concerning health and nutrition is not exhaustive but gives examples that should be taken into account when developing health/nutrition programs. Changes in hygiene, in maternal and infant care, in fertility levels,

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(16) RAMS, Food and Nutritional Situation in Mauritania, 1981.

(17) It should be noted that money sent home by migrants has been of important aid to their families. See RAMS study on Migration, 1980.

in force-feeding (18), in traditional distribution of the family meal, in maraboutism and traditional medicine, can only be brought about by information and education which are understood and accepted by the different groups and followed up by health actions.

(b) Education and Health/Nutrition

The first form of organized teaching among all the ethnic groups was Koranic education; the marabout social class exists in all ethnic groups of Mauritania. After colonization, French-style education was introduced and spread, although there was great resistance, especially among the Moorish populations. Unfortunately, neither type of education has been used to introduce improved health or hygiene habits. After independence, this situation continued; at present, health and nutritional education has no priority in national education.

The illiteracy rate in Mauritania is high, 82.6% of the population. (19) However, even in the most remote regions, a greater relative number of men and women are able to write in Arabic, due to Koranic teaching. This indicates the existing potential, even in this country where it is so difficult to establish an educational infrastructure.

Within the Koranic educational system, especially among the nomads, young girls are traditionally integrated. However, in the national educational system, there has been great resistance to sending girls to school, as well as reluctance to employ educated women in government service. It is important to note that no country be it developed or otherwise, can achieve the balance necessary for coherent progress unless its women participate in the process.

In existing agricultural programs, it has been noted (20) that, although women participate in agricultural work, they are not included in the agricultural popularization or other educational actions. This is obviously a waste of large potential. On the other hand, the health and nutritional education dispensed by health

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(18) Since the drought, the practice of force-feeding has considerably decreased, not only due to economic conditions but also to new aesthetic considerations, gradually introduced by contact with urban areas.

(19) See RAMS study on Formal Education

(20) See RAMS, Social Organization of Agricultural Production, 1980.

services is directed only to the women, which is equally an error. Men should be included in health education as they have the same habits, attitudes and values as women. In order to change the family's habits, all members must be concerned, and especially those having decision-making roles.

The health and nutritional education dispensed by the schools and the health system (dispensaries, clinics, hospitals, etc.) is not sufficient. There is considerable potential in the possibility of using village cooperatives which are often the center of all the productive activities of the community. The interaction between production, family organization and health must be perceived as a whole. For example, irrigation projects along a river or oases may increase existing water-borne diseases or introduce new diseases affecting the entire community. The cooperatives, by information and education concerning the relationship of water to health, can lessen the negative impact.

(c) Migration and Health/Nutrition

Migration is a new phenomenon in Mauritania. It is characteristic of both nomad and sedentary ethnic groups. However, since the drought, nomadization, migration, rural exodus and urbanization have increased to unprecedented levels. (21)

Urbanization, in particular, is one of the most disconcerting problems (22); some towns of great potential have lost large populations (example: Rosso), whereas others, which have no productive interest but only administrative significance (example: Nouakchott), have increased in a disproportionate fashion.

The concentration of population, the breakdown of family structure, social polarization, forced dependence, and the total lack of health structures to receive this incessant flow of people have greatly added to the health and sanitation problems that already existed. One of the most worrying health problems, due to the socio-economic situation, is the propagation of venereal disease in urban

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(21) Migration, Op. Cit.

(22) In its World Development Report (1978) the World Bank noted that the urban growth rate in black Africa was 5% per year. In Mauritania, it was estimated that 1.2% of the population lived in Nouakchott in 1967 and 9.6% in 1977. In 1960, the population of Nouakchott was 5,000. Today, the city's population is unofficially estimated at over 200,000, with most of the migration having occurred after the drought. See RAMS Demographic Projections.

centers. This problem can only be solved by improving socio-economic conditions, both at the individual and community level.

Habits which may be acceptable in the desert or in a rural village are not adapted to urban life where contagious diseases, for example, are more easily spread. Nutritional imbalance, the total lack of sanitation, the very dense concentration of huts and tents, render the situation not only sanitarially deplorable but also socially explosive. The rural world can not sustain its growing population; reduced agriculture and livestock production can not retain the men on the farms. The villages along the Senegal River are beginning to be characterized by the absence of men from 15 to 45 years old. When these men are absent, the women are forced to assume responsibility not only for the management of the household but also for the work in the fields, well beyond their traditional habits. This situation has a negative impact on health; overwork leads to continual fatigue, affecting mental, physical and family equilibrium.

Traditional decision-making roles have also been profoundly affected by the prolonged absence of the head of the family or village, especially among the Moor and Toucouleur populations. On the other hand, among the Soninké, traditional organization is so enrooted in the dictatorial domination of the patriarchs that all questioning of decisions or of the system is inconceivable. These distinctions are important in developing any program where community participation is required. How will the participation be initiated? Who will decide? How to interest not only the group but each individual? An understanding of the community decision-making process, as it is perceived by the community, will help to establish the necessary link between the community and the project.

Migration has an undeniable role in the survival of the family left behind in the village. The money sent back by the migrants permits the purchase of food. On the other hand, investments in agriculture or livestock are minimal, as compared to investments in construction of houses and mosques. This has created greater dependence of the rural community on food assistance and organizations such as SONADER to initiate development projects, particularly irrigation. An investment made directly by the community member renders him responsible for its success. The lack of such direct investment has had harmful effects on the interest of community members towards irrigation and has limited their possibilities of choosing the type of irrigated crop to cultivate (a decision directly affecting health and nutrition). The predominance of rice, which is extremely expensive for cultivators, in no way helps the farmer to remain on his farm. The problem of labor migration continues in spite of new irrigation projects. In addition, rice crops have reduced traditional cultivation, such as millet and sorghum (already severely affected by the drought). While millet and

sorghum consumption have decreased, the habit of eating couscous has remained -- often women will pound the rice and cook it according to traditional methods, as if it were a traditional cereal. Nevertheless the cooking of rice, whether in urban or rural milieus, requires condiments and oil, which increase the pressure on the family budget, and thus, on the general health of the family.

The objective of this brief analysis of social factors is to show the important inter-relation of the different sectors: health, production, nutrition and socio-economy. Health and related actions must have an integrated approach and, if they are to succeed, a means to balance these different sectors must be sought.

## 5. Environmental Factors

In Arabic, "Sahel" means "shore or strand". The Sahel is the southern border or "shore" of the Sahara. Not only does rainfall volume decrease towards the north of the country, but also the variation and irregularity of this rainfall increase. The influence of environment on food production, nutrition and health are very important considerations. However, since the control of spatial improvement and agricultural production are not under the influence of the Ministry of Health, this will only briefly be treated. The Mauritanian Government has long envisaged food self-sufficiency for the year 2000. However, food deficits and cereal imports may continue to increase unless production in the traditional sector can be appreciably augmented. The accelerated growth of the Mauritanian population will be another constraining factor in attaining food self-sufficiency.

Other environmental aspects pertain more closely to public health and preventive medicine and, therefore, are more related to our study of the national health system; they will be discussed below:

### a) Contamination of the environment

Contamination of soil and water by human excrement- represents, together with malnutrition, the cause of most diseases affecting children. Any program to prevent children's diseases must include the protection of water sources, and the adequate distribution and use of water supplies. Massive health education is required to complement sanitation measures; personal hygiene and the application of minimal norms of sanitary control within the household are as important as control of the macro-environment.

Numerous diseases are transmitted by contamination from human excrement: typhoid, dysentery, cholera. Trachoma is another disease having a direct relationship to poor hygiene conditions and,

in particular, the lack of water for bodily hygiene and the existence of conditions leading to abundant dust.

Almost 75% of the Mauritanian population lives in extremely unclean conditions. More than half the population of the capital, Nouakchott, lives in tents or shacks, and has no access to the most essential urban services such as drinkable water or waste removal. The sanitation and health conditions of the poor people who live in the nation's towns of more than 5,000 inhabitants are not better - and, at times, are worse -- than the conditions of sedentary or nomad rural groups.

In the period following Mauritania's independence in 1960, a new phase in the population's distribution began, resulting from two distinct but related processes: sedentarization and urbanization. These two processes preceded the severe drought of 1968-72, and they will probably persist until the end of the 20th century.

The consequences of these two trends are seen in the dramatic changes in the population's social structure, as shown by the demographic surveys of 1965 and 1977. The nomad population of Mauritania was, at one time, the largest population group of the nation and it was responsible for making livestock raising the dominant economic activity of Mauritania; this group decreased from 65% to 35% of the total population during the 12-year period between the surveys. On the other hand, during this period the rural sedentary population increased from 25% to 42% and the urban population increased from 10% to 22%. The following table presents projections of population distribution until the year 2000. (23)

Table 6. % Distribution of Mauritanian Population (1965-2000)

<u>Mauritania</u> <u>Population</u>	1965	1977	1980	1985	1990	1995	2000
Urban	10%	22%	25%	28%	31%	34%	36%
Rural-sedentary	25%	42%	47%	50%	51%	52%	52%
Rural-nomad	65%	36%	28%	22%	18%	14%	12%
Total percentage	100%	100%	100%	100%	100%	100%	100%

(23) In 1965, a survey of a sample of 1/7th of the population conducted by CEDES (Société Française d'Etudes pour le Développement Economique et Sociale) estimated the population at 1,026,200 persons. The national population census of January 1, 1977, came up with a population of 1,338,830. The population projections presented in the table for 1980, 1985, 1995 and 2000 correspond to RAMS estimates.

A good part of the population formerly engaged in livestock raising has been sedentarized in the agricultural zones and urban centers. This increase of rural sedentary populations is due to two migratory movements: the first is the migration towards small villages due to agricultural activities. The second is the result of the drought, which decimated livestock and led to the progressive disappearance of the hierarchical division of labor among the nomads. Climatic catastrophes broke the internal equilibrium of the Moor society; demographic and economic concentration is shifting to the sedentary farmers, many of whom are former black slaves. (24) The sedentarization and massive rural exodus which has affected the Moor society since the 1970's is more than a simple change of place or modification of population distribution; these phenomena represent a complete upheaval of Moorish work and production structures, as well as of food and hygiene, of habitat and matrimonial exchanges. (25)

Urbanization, the other major trend associated with sedentarization, is essentially a manifestation of the rural exodus of sedentary, rural or nomadic populations towards the urban centers. A great deal of this urbanization is centered in Nouakchott which was created in 1960 and, 20 years later, has a population of more than 170,000 inhabitants.

The results of this accelerated urbanization can be seen in the extension of the town limits, the high density of poor neighborhoods (which have become veritable slums) and the spread of suburban quarters composed almost exclusively of tents and shacks built of perishable materials.

Sanitation, health and living conditions in the towns are becoming worse than those of rural zones. In spite of the appreciable number of health services available in towns, the incidence and degree of contagious disease transmission are very high. In Nouakchott, which is the town having the most health services, infant mortality is very close to the national average. Infant mortality in the towns of Nouakchott, Nouadhibou, Kiffa or Rosso is due mainly to measles, the rapid transmission of which is favored by high population density, in spite of a fairly widespread vaccination campaign. The problem of insufficient nutritional levels, resulting from low purchasing power and the low production capacity of poor communities, contributes to increase the number of individuals susceptible to measles. It is estimated that the average food ration of these populations includes only about 80% of the calories recommended by WHO diets for Africa.

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(24) RAMS, "The Moors", 1980 p. 81

(25) Op. Cit. p. 81

The water distribution system, managed by SONELEC (the public services company), furnishes water to 10 of the 17 urban centers, but it is estimated that less than 17% of the households in the towns served are linked to the system. SONELEC also supplies 93 public fountains in urban zones; the water is paid for by the local government and then resold to the inhabitants of the 10 towns. Thirty-three of these fountains are found in Nouakchott, where they supply about 20,000 households (110,000 persons), that is, more than 60% of the capital's population. (26) The archaic water distribution system and the often great distances between the fountains and the households have enhanced commercial exploitation of water by private distributors at prices of 8 to 10 times higher than the price at the fountain. The result is that consumption in these neighborhoods is on an average of barely 8 liters per person per day, whereas basic minimal nutritional and hygiene needs require 20 liters. In the capital, polluted water, only partially treated, is used to water vegetable gardens, which explains the high incidence of parasitic diseases and typhoid in Nouakchott.

The unhealthy conditions of the habitat (lack of space, ambient dust), propagate air-borne diseases, some of which are quite serious, such as tuberculosis.

b) Endemic tropical diseases in Mauritania

Certain diseases, the transmission of which is enhanced by water, are endemic in Mauritania, urinary schistosomiasis, malaria and dracunculiasis.

i) Urinary Schistosomiasis

In 1961, F.G. Marill conducted the first epidemiological survey of schistosomiasis (27). He demonstrated that the urinary form of this disease, due to Schistosoma haematobium, was dominant among the populations in the west and south of the country, especially in the Trarza, the south of Brakna and Gorgol, the west of Kiffa, at Akjoujt, Atar and in Hodh Occidental. In these regions, of 1,560 urine samples taken from children of 6 to 18 years, 26.5% were positive. In zones where covered wells were the only source of water, no infection was found. It is very difficult to arrive at a precise determination of the prevalence of urinary schistosomiasis in Mauritania.

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(26) National Savings and Loan League, Washington, D.C.:  
"Mauritania: Shelter Sector Assessment", 1979.

(27) F.G. Marill: "Première Enquête sur l'Epidémiologie de la bilharziose à Schistosoma Hematobium en Mauritanie" - Bull. Acad. National Méd., 145: 436-438 (1961).

Deschiens (28) estimated it at 31% and Gaud (29) showed that the prevalence at M'Bout (the town closest to the proposed reservoir at Fom Gilita) was 24% among girls of 7-10 years and 41% among boys of the same age. (30) An OMVS study (1977-79) to determine the effects of proposed improvements in the Senegal River Basin (31), indicated a prevalence of 40.9% at Zeneiga Maures, located to the south of Solibaby in the Guidimakha region. In 1980, a study was conducted by M. Sidatt et al., of the National Hygiene Center at Nouakchott, to determine the prevalence of parasitic diseases in the zones of the Gorgol and Brakna dams. (32) Urinary schistosomiasis prevalences of 43.4% at Ouedei Chrak, of 4.5% at Boussovelif and of 8.3% at Toueizk, were found. In general, schistosomiasis is found in the Chemama (Senegal River region). The source of infection is human contact with water containing the cercariae of the parasite after it has left its intermediate host, the snail, which for urinary schistosomiasis in Mauritania has been identified as Bulinus truncatus or Bulinus quernei.

ii) Malaria

Malaria has always been endemic in Mauritania. Plasmodium falciparum is the main species responsible for Mauritanian malaria. The major vector mosquito is Anopheles gambiae; Anophelese funestus is frequently found and is probably another vector; Anophelese tharsensis is also suspected. Mosquito larvae can be found in the stagnant water of receptacles, reservoirs, rock holes, rice fields, etc.

Malaria is probably the main factor of mortality of children and contributes importantly to decreasing production of adult

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- (28) R. Deschiens: "Le Problème Sanitaire des Bilharzioses dans le Territoire de l'Union Française". Bull. Soc. Pathol. Exot., 44: 631-667 (1951).
- (29) J. Gaud: "Les Bilharzioses en Afrique Occidentale et en Afrique Centrale". Bull. World Health Org. 13: 209-258 (1955).
- (30) W.R. Jobin et al.: "Schistosomiasis in the Gorgol Valley of Mauritania", Amer. J. Trop. Med. Hyg., 25: 587-594 (1976).
- (31) OMVS: Assessment of Environmental Effects of Proposed Developments in the Senegal River Basin, Final Report (1979).
- (32) M. Sidatt et al.: "Enquête Epidémiologique concernant les Barrages du Gorgol et du Brakna. Centre National d'Hygiène République Islamique de Mauritanie" 12 pp. (mimeo). (1980).

workers in infested zones. It is present in the most populated zones of Mauritania: the agricultural regions south of a line drawn from Tiguent to Néma, passing through Boutilimit, Magta-Lahjar, Tidjikja and Tamchekett. Malaria is endemic in the Senegal River Valley and reaches epidemic proportions during the rainy season; almost two-thirds of the Mauritania population -- more than a million persons -- live in malarial zones,

Significant splenomegaly is found in patients from hyper-epidemic zones. For example, an epidemiological survey conducted in the Assaba region by Dr. M. Sidatt et al. (33) showed high splenomegaly and hepatomegaly rates among children from 7 to 12 years old. The rate was higher for primary school children (58%) than for high school students at Kiffa (3.3%) who have probably acquired partial immunity.

Although this survey was conducted during the dry season, when the anopheles are least developed, the differences between splenomegaly rates of the children (4.6% at Kiffa, 13.2% at Kankossa, 33.3% at Selibaby) permit the affirmation that endemic malaria increases from the north to the south (from the desert zones towards the Senegal River).

### iii) Dracunculiasis

Dracunculiasis or infection by the Guinea Worm is due to the presence of the worm Dracunculus medinensis in human subcutaneous and connective tissue. Superficial lesions are produced, in which larvae are formed and from which they are discharged to the exterior. This disease is frequent in Mauritania; it also exists in other tropical African countries, in India and in the Arab Peninsula. Man contracts the disease by drinking water containing infected crustacea (Cyclops spp.), which are the intermediate hosts. Lesions are usually on the extremities and the larvae are released when the infected person comes into contact with water. Sidatt identified this disease in the Gorgol region at Ouedi Chrak and Touzekre. (32)

Consequently, the tropical diseases in which water plays a major role represent a public health problem in this country. The zones of ponds, lakes and dams already show signs of major infestation. The construction of new dams in the future will include additional risks, which must be taken into consideration, if control of these diseases is to be possible. Certain measures that could be taken are discussed below.

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(33) M. Sidatt et al.: "Enquête Epidémiologique dans la Région de l'Assaba", mimeo., 12 pp. 1979. C.N.H.

### III. Internal Factors

Internal factors are those within the health system itself. The following will analyze those factors which, in Mauritania, play the most important roles:

#### 1. Management/Planning

Health management is the responsibility of the Ministry of Labor, Health and Social Affaires\*. The structure of this Ministry (Figure 3) is too compartmentalized to facilitate the coordination of the different sections and the integration of preventive and curative medicine, or the creation of operational links with other ministries such as the Ministry of Rural Development or the Ministry of National Education. Restructuring efforts are indispensable to the efficiency of this Ministry. As was noted in the Phase I RAMS report on health (34), the existing structure of the Ministry is the result of the grafting over the years of new vertical services onto the basic structure. The creation of the national health services in Mauritania dates from independence in 1960, when a Ministry of Health and Population was created. There was no restructuring or reorganization of the national services inherited from the French; the same infrastructure was kept. (35) The past 20 years has not witnessed any basic change in the health services provided during the colonial period.

The health programs conducted by the Ministry of Health are curative, preventative and are also directed to health and nutritional education. They reach between 15 and 20% of the population and are conducted in about 75% of the towns at a high cost. (35) It is easy to image the complex work of the Health Director, who must be in contact with three departments, seven central services, 12 regional circumscriptions, the health district of Nouakchott, as well as being responsible for the international relations of his Ministry. The basis for the general structure of the Ministry was established by Decree 54 on May 19, 1979. In principal, there is an administrative decentralization (under the responsibility of the governor of each region) as well as technical decentralization (under the responsibility of the Head Doctors of each region); however, in reality the functioning of the system is much more complex. (figure 3)

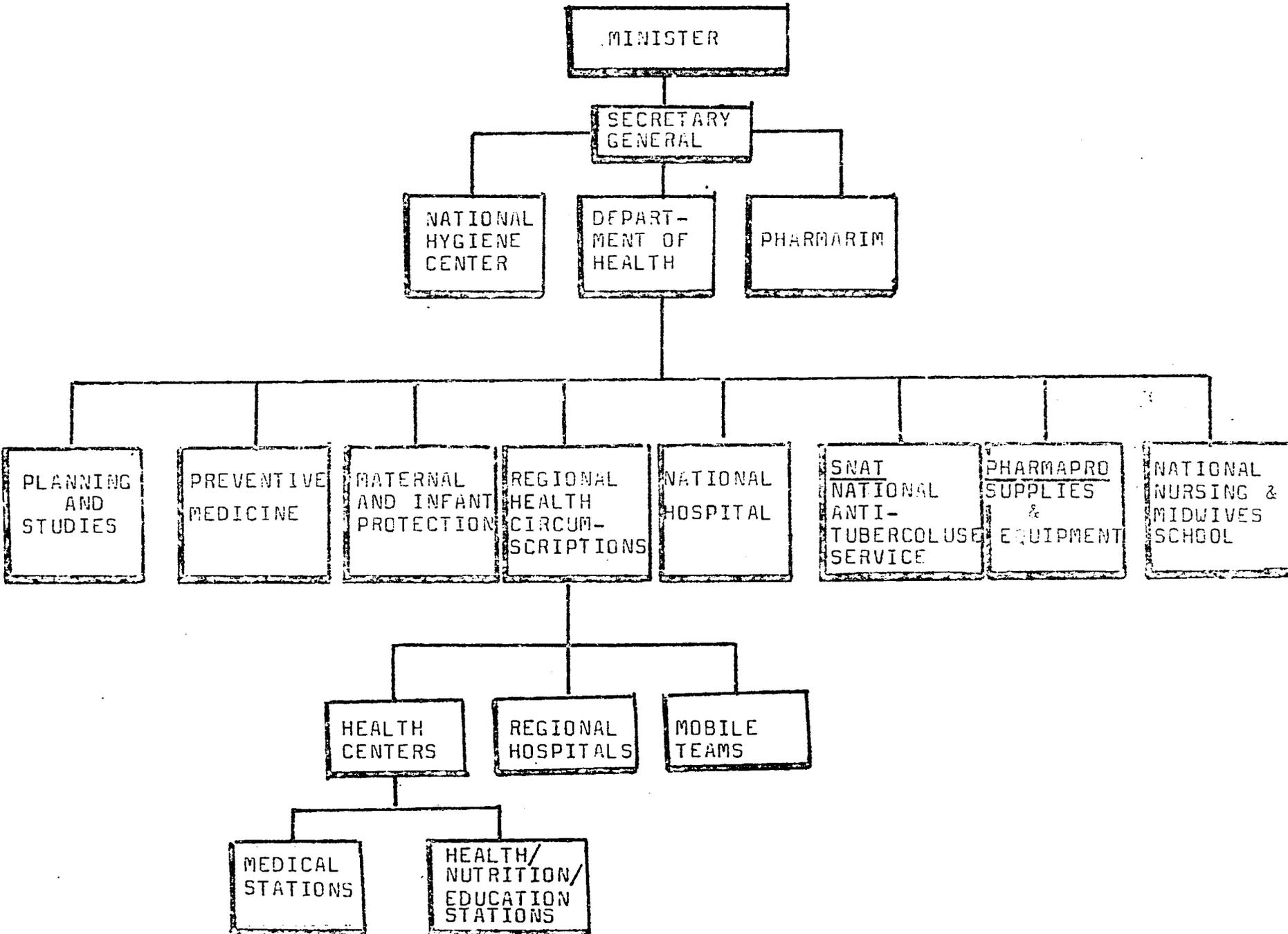
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\*The Labor department was recently transferred to another Ministry.

(34) RAMS, Survey of Health Sector in Mauritania, Rural Health Services, 1981.

(35) M.C. Anne: "Amélioration de l'Enseignement Infirmier de Santé Publique dans le Contexte de l'Action Sanitaire Communautaire". Mémoire de Fin d'Etudes, 1979, 219 pp.

Figure 3. Organization Chart of Ministry of Health (1980)



Health planning is the responsibility of cells or services of the Health Department, but they do not have the support of specialized personnel. This explains the absence of detailed programming, of a concrete plan of action, or of a long-term strategy. (34)

As a whole, the Ministry of Health requires more flexible management, more realistic planning, more polyvalent development of human resources, a more flexible logistics system and the creation of a planning office capable of undertaking specific studies in collaboration with the National Hygiene Center in order to periodically evaluate results and establish operational extension services.

## 2. Training of Personnel

The following table gives an idea of personnel deficiencies in the health sector for the year 1980:

Table 7. Health Personnel and Personnel Deficiencies in 1980

Profession	Proportion Recommended by WHO (Afr.)	No. Required WHO Recomm. (1980)*	Personnel Min. Health (1980)**	Personnel Deficiency No.	%
Physicians	1/10,000	144	55	89	61.8
Dentists	1/30,000	48	5	43	89.6
Government Nurses	1/ 5,000	286	216	70	24.5
Government Midwives	1/ 5,000	286	52	234	81.8
Pharmacists	1/50,000	29	10	19	65.5
Sanitation Engineers	1/250,000	6	1	5	83.3
Licensed Nurses	1/ 2,000	722	299	423	58.6
Dental Technicians	1/ 2,000	1,440	5	1,435	99.7
Traditional Midwives	1/ 3,000	480	105	375	78.1
		<u>3,441</u>	<u>740</u>	<u>2,693</u>	<u>78.3</u>

\* 1980 Population = 1,443,000 inhabitants

\*\* Personnel paid by the Ministry of Health according to the Personnel Office.

In the district of Mouakchott, and the 12 regions, the distribution of doctors and personnel requirements are as follows:

Table 8. Personnel and Personnel Deficiencies by Region  
(Physicians)

Region	Population (1980)	No. recomm. by WHO	No. Personnel Ministry of Health	Deficiency	
				No.	%
Nouakchott	173,000	17	40	23	+135
Hodh Chargui	166,000	16	1	15	93.8
Hodh Gharbi	130,000	13	1	12	92.3
Assaba	136,000	13	1	12	92.3
Gorgol	158,000	16	2	14	87.5
Brakna	159,000	16	1	15	93.8
Tearza	224,000	22	2	20	91.0
Adrar	56,000	6	2	4	66.7
Nouadhibou	30,000	3	2	1	33.3
Tagant	78,000	8	-	8	100.0
Guidimakha	90,000	9	1	8	88.9
Tiris Zemmour	26,000	3	1	2	66.6
Inchiri	17,000	2	1	1	50.0
<b>Total</b>	<b>1,443,000</b>	<b>144</b>	<b>55</b>	<b>89</b>	<b>61.8</b>

For the year 2000, the requirements for trained health personnel will be almost double those of 1980, if one takes into account the loss of trained personnel due to retirement, death, etc.

The first conclusion one makes upon the examination of these two tables is that the only place in Mauritania which provides health services is Nouakchott. In the rest of the nation, medical services are under the responsibility of government nurses, with the exception of foreign assistance personnel (about 100 professionals: physicians, pharmacists, midwives, engineers, technical and others). The cost and the difficulty of training Mauritanian medical and other specialized personnel outside the country are too great, given present possibilities. While it is possible to define personnel requirements on paper, it is very difficult to find capable and motivated students who will, after their training of from 7 to 10 years, return to work under the conditions offered in Mauritania.

As for health care in rural zones, the only possibility is to confide basic health care to community health agents (health delegates, traditional midwives, etc.). This personnel must be aided by the community in accordance with Ministry of Health planning. All policies for community participation in health, education and nutrition must be implemented by the government as soon as possible. However, the expenses will be very high in both time and money: training of regional educators, furnishing first aid kits, coordination of mobile units for preventive tasks, and at least

two months training of the health agents themselves. The experiments currently underway in the Trarza and Adrar regions will serve as a basis for other similar experiments in the rest of the nation.

The National Nursing and Midwives School (ENISF) at Nouakchott was created in 1966 with the assistance of WHO and UNICEF. A fundamental reorientation of its teaching will be required in order to include approaches to preventive medicine, basic health care, community organization, etc. In addition, this school must train health educators, retrain existing personnel and train polyvalent health personnel. At present, the orientation consists of "recycling" or "continuing education" of licensed nurses; this does not fulfil the requirements for training in basic health care. The organization of the various professions -- nurses, midwives, health auxiliaries, health agents, etc.-- must be rethought and adapted to the needs of community medicine.

Until the present, efforts to develop health personnel have concentrated on recruitment and training of personnel at all levels, given the population's health needs, especially in the area of curative medicine. They included the rapid training of intermediate level and basic personnel, such as licensed nurses and public health auxiliaries. This program was begun with a first phase to train public health auxiliaries (traditional midwives, auxiliary midwives and supervisory licenses nurses). The second phase of this project will train community health agents and village pharmacists.

In its first phase, the project was under the MCH services; in the second phase, it will be extended and called "Family Welfare Project" (financing by UNFPA).

The qualified personnel trained by the National Nursing and Midwives School includes midwives, state registered nurses and licensed nurses. A few midwives and government nurses were also trained in other countries of Africa (Libya, Morocco, Algeria).

The Ministry proposes to train 140 physicians by 1985; in theory, there are 97 students currently in training, and it is proposed to orient future high school graduates according to the projected needs for year 2000. So far, particular emphasis has been placed on the training of specialists to work in the hospitals; most of this training is provided by scholarships from international organizations or friendly nations.

### 3. Operation of Services

The absence of an action program in the Ministry of Health enormously limits its capacity to offer curative and preventive care capable of decreasing the mortality and morbidity rates.

The volume of urban actions and the large expenses for individual care represent too heavy a charge on the Ministry budget's meager resources. Recurring costs resulting from investment in curative infrastructure (regional hospitals, national hospitals) will compromise all budget increases that the Ministry may obtain in the future. Most of these investments were financed by gifts from friendly nations or international organizations, which did not take into account the country's limited ability to meet recurring operating costs or the limitations of the training of Mauritanian health personnel.

This situation has resulted in an almost total lack of health services in rural communities, where 80% of the nation's population resides. It is obvious that the state of health will not improve under these conditions. Preventive medicine and basic health care must be made priority measures. Larger operating budgets than currently available must be accorded to preventive medicine, the enlarged vaccination program (PEV), the fight against endemic diseases, health and hygiene education, as well as sanitation and nutrition.

As for basic health care, official Mauritanian documents recognize the need to increase these services, to train village community agents, to provide better supervision and follow-up of the activities of traditional midwives, community health agents and health delegates. These documents also discuss the importance of mobilizing population participation to sustain the agents and renew supplies of medication and first aid kits to villages. The government wishes to encourage these activities but, in the absence of a concrete plan of action, it has no way to do so effectively and practically. This results in a lack of basic health care in the rural areas. At present, the concept of community medicine, of medicine for the masses as a fundamental element of a unified and integrated national health services, is still only theoretical in Mauritania.

Existing facilities suffer from the high cost of medication and their sporadic distribution. There apparently does not exist any clear system for the purchase of staple drugs and their distribution to the different regions according to local pathology.

Coverage of the population is very poor: between 20 and 25%. In addition, assistance to personnel is insufficient, due mainly to the lack of maintenance of Ministry of Health's motor pool, which does not give priority to the improvement of these services. The excessive concentration of health resources in Nouakchott, as compared to the rest of the country is detrimental to the Ministry's capacity to offer health care to the majority of the population.

At present, there has not been any quality control of the services offered, but the obvious insufficiency of diagnostic tools (laboratories, X-Ray, etc.) in hospitals and health centers constitutes proof of the need to establish periodic controls on the quality of services offered in all health facilities.

#### 4. Administration

As has already been mentioned several times, the structure of the Ministry of Health is too compartmentalized, preventing coordination of services and the integration of preventive and curative medicine. There is also a lack of Mauritanian personnel specialized in administrative and technical tasks. These two aspects are correlated, as administrative action cannot provide positive support in the absence of a well-defined technical plan of action. Consequently, the Mauritanian administration of basic health services presents numerous problems and chronic deficiencies. A first step to solving these problems would be the reinforcement of the Ministry's Planning/Programming Unit and the training of additional administrative personnel for all the regions of the country.

#### 5. Evaluation and Personnel Training System

In spite of their importance, evaluation and follow-up of health programs are not part of the Ministry's routine work. One of the reasons for this problem is the lack of an organized system to collect statistical data. In the absence of an information system, the Ministry formulates annual summary tables of the number of consultations and number of patients, the most frequent diagnoses and the prevalence of transmittable diseases registered by the health units. The Maternal and Child Health programs (MCH), the Nutritional Education and Recuperation Centers (CREN) and the Enlarged Vaccination Program (PEV) collect more detailed data concerning their specific activities.

A national morbidity survey has not yet been conducted in Mauritania. As health coverage is estimated at only 20 to 25% of the population, information from health units can not be considered as representative of the true state of health of the population or of the incidence of major diseases in Mauritania.

Due to the lack of laboratories in the hospitals and health centers, most diagnoses are based only on symptoms, often hastily noted during brief clinical examination or the elaboration of very superficial clinical histories. Only two or three clinical laboratories in the country may be considered adequate, among which should be mentioned the National Hygiene Center at Nouakchott, which has accomplished a remarkable task in conducting epidemiological studies.

At present, there is no systematic personnel training system at either the national or regional levels. The personnel training services have no basis for measuring the quality of training or to evaluate the need to change curriculae. In addition, without a well-defined supervisory process, the Ministry of Health can not control the quality of care or measure the difficulties encountered by personnel in the field. This lack of supervision and assistance to personnel renders impossible the technical development of the Ministry's human resources which constitute, in the final analysis, one of its most precious capital.

#### IV. Interaction Between External and Internal Factors

The above discussion is intended to permit a better comprehension of the correlation between external and internal factors of the national health system: external factors (state of health, state of nutrition, population growth, socio-economic structure and environmental conditions); internal factors (management and planning capacity, capacity to train personnel, to operate health units, to administer, to provide evaluation and supervision). These two types of factors correspond to a series of rather serious constraints which, either directly or indirectly, affect the quality of the national health system.

Only the internal factors are under the control of the Ministry of Health; external factors depend on a number of variables, modulated by the behavior and attitudes of the society. Improved knowledge of these aspects is, therefore, indispensable in order to formulate a valid national health plan. The conclusion is evident: the work of the Ministry and its health units must be technically improved if they are to increase the level of the population's health. A well-conceived health program could serve as a catalyst for community development. Inversely, investments in health facilities or large-scale health programs can not be recommended so long as the Ministry of Health has no authority over the political, technical or financial aspects which directly affect it.

Health and education are two of the key elements of government social action. An ill or illiterate population can not aspire to development. The quality of life of the population can be measured by certain primary health indexes: life expectancy at birth, infant mortality, the growth and psychomotor development of the child.

## D. STRATEGIES TO IMPROVE THE PROGRAMMING AND OPERATIONS OF THE MAURITANIAN HEALTH SYSTEM

### I. Introduction

Health sector strategies must attempt to integrate the different social and economic factors discussed in this report in order to approach the different levels of society with appropriate methods for planning, implementation and follow-up of programs for the prevention and control of endemic and epidemic diseases. This approach will also facilitate the allocation of health budget resources; by establishing links between health/nutritional activities and other socio-economic factors, it will be possible to interest politicians, social pressure groups and government officials to make "appropriate" decisions throughout the country. The word "appropriate" is used here to underline the local or regional character of such decisions. Given the variety of social and economic conditions existing in Mauritania, and the variety of causes enhancing the transmission of disease among the different population groups (nomads, sedentary, rural or urban), it is not possible to adopt a single basic methodology to plan, apply or follow-up preventive medicine programs. For example, if a vaccination method could be found to prevent the most serious of Mauritania's contagious diseases, the conditions of its distribution and application would be different according to location, ethnic group or economic level of the group to be treated.

In selecting strategies in the Health/Nutrition sector, the following two questions must be answered:

- What are the appropriate activities to control the most prevalent diseases in a given area?
- What is the appropriate level of investment to achieve this control?

The answers to these questions can only be found after detailed study of the situation by experts who know the country and its inhabitants, and who are aided by public health and preventive health specialists. These answers will furnish a variety of "schemes" for each alternative, among which can be selected the best given available resources.

### II. Social and Economic Strategies

The major diseases which must be taken into account in health/nutrition planning for Mauritania are: diarrhea and enteritis; childhood infectious diseases; intestinal parasites; respiratory diseases (pneumonia, bronchial-pneumonia, pulmonary tuberculosis); tetanus; malnutrition; malaria; urinary schistosomiasis and

dracunculiasis. Secondary diseases include: dermatitis, insect and snake bites, venereal diseases, rheumatism, conjunctivitis, otitis and various other infections.

The health professionals working in the dispensaries or village health centers (who are in constant contact with the local population) will help determine the different ethnic groups' knowledge of the most frequent diseases and their attitudes and practices concerning these diseases. This field data should permit the Ministry of Health technicians to discuss with the official and unofficial community leaders concerning: the role the local population can play in preventing the spread of the diseases concerned; the most efficient and least expensive methods of controlling the diseases; the types of health workers and community members who should participate in the campaign; the type of hierarchical organization and coordination with rural development sectors, etc. These examples show the importance of this strategy of group work and the delegation of responsibilities which is the basis for the mobilization of social action. The variety of schemes resulting from these discussions will permit the choice of the most appropriate option.

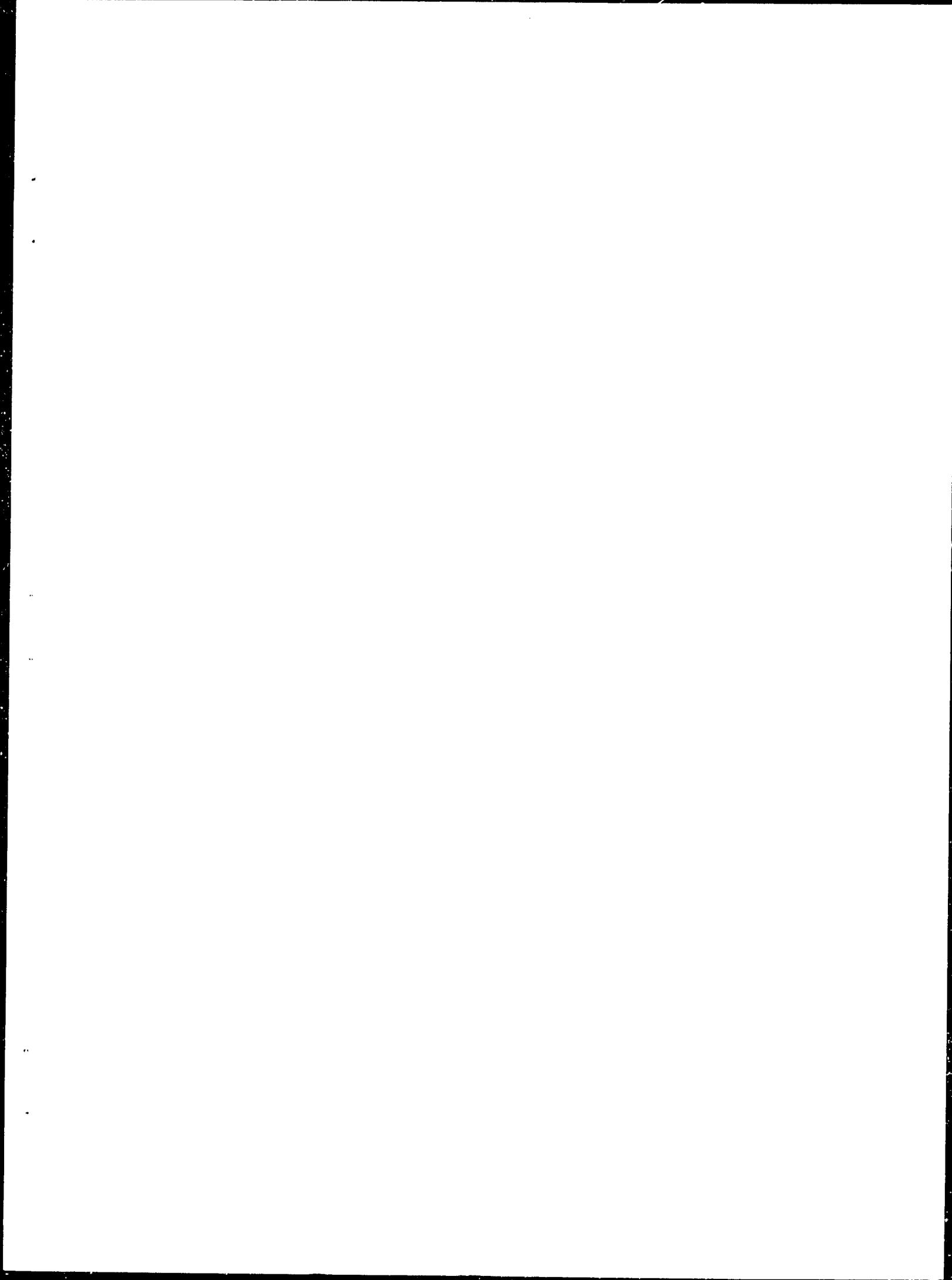
### III. Strategies for the Control of Disease

#### 1. Preventive Measures

Preventive measures for individual or community protection against disease may be accomplished by two means: individual immunity or control of the agents responsible for the disease.

The control of epidemics began with Jenner's discovery that the cowpox virus, when used to inoculate man, protected him against smallpox. Smallpox is the first infectious, contagious and epidemic disease to be virtually eradicated as the result of vaccination and epidemiological controls.

In Mauritania, the Enlarged Vaccination Program (PEV), in association with other complementary vaccination measures conducted by the MCH Centers, envisages a program to vaccinate over the next five years 85% of the nation's children against: tuberculosis, diphtheria, tetanus, poliomyelitis, measles and whooping cough. This will increase individual immunity among infants. Implementation of this plan will require excellent planning and coordination of logistic means, community mobilization, training of technical teams and improvement of the cold storage facilities. The following factors must also be taken into account: climatic problems, community attitudes, organization of systems to enlist, supervise and aid personnel, systems to determine the location and number of persons to be vaccinated during each cycle, etc. Only a computer can take this multitude of variables into account and indicate the best possibilities for implementation.



is often lacking in the country's health services; there are only 11 mobile teams to provide vaccination services; there are no vehicles to coordinate or supervise the different programs.

Effective organization and the mobilization of fairly extensive resources will be required if the execution of an acceptable health care program is to be successful.

The Fourth Plan includes the improvement of a large number of deteriorated facilities and the construction of health centers and maternities during the 1984-1985 period. However, total personnel and equipment deficiencies of the present health system are appreciable. How can all these requirements be fulfilled over such a short period of time? Only rigorous planning may provide the solution. The current cost of almost 900 ouguiyas per consultation/per year is extremely high and shows the inefficiency of the present system. At present, available data indicate that the improvement in the state of health has been practically nil.

The best strategy to improve curative programs is the use of rigorous planning of medical care based on existing resources.

### 3. Environmental Measures.

Control of the environment is the best manner in which to improve the state of health of a country. The role of water in health and nutrition has already been mentioned. In a Sahelian country such as Mauritania water is a critical factor in health and nutrition from both a quality and a quantity point of view.

When considering the quality of water, not only its physical properties must be studied but also its possible role as a vehicle for infectious agents. The number of dam and construction in Mauritania and those projected for the Senegal River (Diama and Manantali) have hydro-agricultural aspects of great economic importance. However, these dams may have unfavorable effects on the health of communities of the region. The list of water improvement projects is long: the small perimeters distributed throughout the Rosso, L'Agadez, Kiffi and Gannayé sectors; the filling of the large Aftout de Ghel and lac R'Kiz depressions envisaged in combination with the Senegal River dams; the large existing or proposed perimeters in the interior, in the Assaba and Brakna regions (Lefkharine, Bionaba, Bessoulif, Chagar Sud, Botungal, Lemaoudum, Sag-el-Mahr and Toedema). Control of these water systems is important for the nation's economy, but they will produce environmental changes which can enhance diseases whose cycles depend on water: schistosomiasis, malaria and dracunculiasis, in particular.

A large part of the Mauritanian population lives in these regions. This problem is, therefore, a major concern of the Ministry of Health, which has little control of the environment in rural zones and, given the fact that lack of sanitation and education contributes to the contamination of water by animals and men. The Department of Hydraulics, which is part of the Ministry of Rural Development, has the responsibility of developing and maintaining the water resources of the nation; however, its personnel and equipment resources are very limited.

As concerns the quantity of water, all human agglomerations should have available a sufficient quantity of water (a minimum of 20 liters per person per day). However, the water resources of Mauritania must be parsimoniously employed; any immoderate use of water may lead to exhaustion of the aquifers, with catastrophic consequences for the nation.

The Mauritanian Government must, therefore, establish a general policy for the improvement and use of the nation's water resources. The Ministry of Health must participate in forming this policy, particularly in the aspects which concern health: protection of water sources; health control of distribution networks in towns, the determination of water quality and quantity standards for human consumption; the evaluation of possible negative effects on health resulting from existing or projected water projects for human consumption, animals or irrigation; the water requirements of the different urban centers; and inspection and control by sampling of water sources.

-- Water was selected as one example of the strategic actions to be undertaken in controlling the environment. However, there is a large range of other actions to be studied which also play an important role in health preservation.

#### 4. Education Measures

The objective of education measures should be to make health education a national crusade with the participation of all major forces of the society. The use of massive education campaigns for health and nutrition -- through written and spoken communications media -- will be one of the elements. However, there are many other actions to be undertaken: development of health education materials adapted to conditions in the country; training of health education personnel throughout the country; organization of health and hygiene education programs integrated with other Ministry of Health programs, etc.

The objective of these actions will be to change attitudes unfavorable to good health. They will require fairly extensive follow-up and a precise plan of action. The interpenetration of strategies in this area will be considerable.

## 5. Complementary Actions

Complementary strategies may include the study of the possibilities of using traditional medicine in conjunction with the preventive and curative programs of the Ministry of Health. Traditional medicine represents an important resource; positive experiments have been conducted in this area by other countries, such as Madagascar, Upper Volta, China, Vietnam.

Technical and financial assistance from such international organizations as WHO, UNICEF, UNFPA, UNDP have been and will remain very important for the development of complementary actions envisaged by the Ministry of Health.

The recommendations made by health technicians having worked in or visited the interior of the country must be taken into account, for example, recommendations concerning control of urinary schistosomiasis, malaria and dracunculiasis within the framework of the dam projects. (36)

In the report mentioned above, recommendations for control of schistosomiasis are given, as well as for the installation of a surveillance team before beginning construction work (with regularly scheduled observation periods). This report also suggests the mechanical control of the level of reservoir waters to expose the snails and mosquito larvae to the sun, which would destroy them; the protection of wells by cement structures; the use of molluscides and larvicides, etc. It should be emphasized that the organization of basic health care is the least expensive and most effective method to combat malaria. (36)

Other studies were conducted by the research team of the National Hygiene Center at Nouakchott. This center is capable of providing technical assistance for epidemiological studies in Mauritania and of conducting scientific research.

## IV. Program Management Strategies

The choice of possible strategies for the management of disease control programs is the logical continuation of the socio-economic and epidemiological strategies.

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(36) E. Malek, D.R. Goff: "An Assessment of the impact of the Projected Dams on Water-Related Disease, with Special Reference to Schistosomiasis - Rural Land Reclamation Project 682-0203 Mauritania (1981).

These possibilities may include community level management as well as management at the Ministry of Health level. Over this wide range, there are a great variety of management techniques. An example would be the choice of financing to meet the costs of basic health care. After a study of a given community, Ministry of Health representatives could discuss the different budgetary sources with the community representatives and decide the type of community organization to be responsible for purchasing medicines, etc.

The different types of organization mentioned below are generally found in the operations of the various health campaigns that are being conducted:

### (1) Community Participation

Community participation is indispensable in all social programs, especially health programs. The community must be motivated from the very beginning of the program through discussions with community representatives. The community's priorities must be identified and discussed with respect to the positive and negative aspects of a health/nutrition project; this stage is essential before beginning any type of activity in a community. In Mauritania, the basic health care program will require a systematic approach in order to fully utilize the managerial and operating possibilities. An analysis of the Traza and Atar operations, as well as similar programs in Tanzania and Togo, may help in this selection.

### (2) Integration of Programs

The combined Maternal and Child Health/Nutrition/Vaccination and Health Education programs are a good example of the importance of unified activity. These programs can be considered the best in Mauritania for their high coverage rates and relatively low cost. A personnel retraining program would better prepare MCH personnel for polyvalent actions. Other programs could profit from this type of organization to improve their results.

### (3) Vertical and Horizontal Type Management Programs

A vertical type of program could be recommended to the Mauritanian government for macro-environmental control in combatting major endemic diseases. However, these programs are less used in modern preventive medicine, as community collaboration is now preferred to complement field actions. A good example of well-conducted vertical programs is the anti-malarial DDT campaign to kill vector mosquitoes and larvae.

Horizontal programs imply coordination and integration of program activities with community participation. In Mauritania, local services are almost always integrated; however, at the level

of the Ministry of Health in Nouakchott, the different services have developed virtually without inter-service coordination.

#### (4) Private and Mixed Programs

As health programs are among the priority social programs for the community and the State, they attract large numbers of persons and organizations willing to offer assistance. Religious and volunteer groups from bilateral sources generally offer this type of assistance. However, such activities often do not become part of coherent national health planning, and they may become a hindrance to the development of an integrated health plan.

Private or mixed health programs should always be examined with great care by the Ministry of Health before their implementation. If these projects do not correspond to a general planning conception, they should not be accepted.

#### (5) Communication/Motivation Programs

These programs represent the major means of spreading health education to the population, provided sufficient technical and financial resources are available for effective implementation. In spite of financial restrictions, these programs are the only means of achieving a positive change of community attitudes concerning health and nutrition.

In conclusion, there are a large variety of operational strategies which may be employed for program development.

### E. RANGE OF HEALTH POLICY OPTIONS FOR MAURITANIA

#### I. Introduction

After examining the technical, financial, social and political considerations presented in this report, the conclusion is that Mauritania needs a well-defined health policy accompanied by a detailed plan of action. This report constitutes a bare outline of such a plan. The Ministry must now formulate both short- and long-term planning, select the strategies best adapted to needs and resources, establish a detailed schedule of activities and tasks to be fulfilled by each level of health personnel and, finally, provide a means for systematic evaluation of the programs' results. A series of five "options" follow, setting forth possible strategies to be used in government decision-making in selecting a health policy directed towards the year 2000.

These options cover the range from a projection of the trends sketched out in the draft Fourth Health Plan (1981-1985) towards the year 2000 (Option C), to the operation of a Health/Nutrition

system in the context of multi-sectoral development (Option A), with intermediate options (B<sub>2</sub> and B<sub>1</sub>). As a complement to the foregoing the possibility of progressive application of the different options over successive 5-year periods (Combined Option or Option D) is described.

## II. Summary of Basic Aspects of Government Health Policy in Mauritania (\*)

- Health for all in the year 2000
- Priority to preventive medicine
- Health actions in rural zones
- Popularization of basic health care
- Improvement of management in all health units

## III. Options for Government Consideration

Taking the foregoing health policies into consideration, a series of 5 health options is presented. Each option will be examined under the following perspective: justification for the selection of the option, strategies to be followed and constraints to be considered.

The options will be presented in the following order: C, B<sub>2</sub>, B<sub>1</sub>, A and D (Combined Option). These options represent choices of increasing complexity, the last option analyzed being the progressive integration of the preceding options.

- IV. OPTION C. Continuation of existing trends: priority to facilities and budgetary calculations to reinforce the health network in urban centers. Beginnings of community medicine.

### I. Justification

The Ministry of Health has already prepared a draft Health Plan for the period 1981-1985, the budget of which is estimated at 6 billion UM, and in which individual services (i.e., services rendered to individuals as opposed to community services) have priority in budgetary allocations. The approach of providing individual services of the centripetal type (where the people seek care at the health centers) attain only modest coverage (less than 50%) in countries such as Mauritania, where there is a high rate of illiteracy and an insufficient road infrastructure. Thus, the impact of these services in reducing the morbidity rate is limited.

(\*) Ministry of Health Plan 1981-1985.

However, since the Government of Mauritania has decided to accept foreign assistance to extend the urban health infrastructure as the central element of the plan, the consideration of this approach is given a priority over all other options, at least for the 1981-1985 period.

## 2. Strategy

The negative impact of this option can be lessened in the long term if, simultaneously, preparatory activities for the implementation of the other options (B<sub>2</sub> in particular) are undertaken. The location and equipment of new health units must be carefully studied, as well as the feasibility of recruiting professional Mauritanian personnel and the ability to cover recurring costs over the years to come.

## 3. Constraints

- lack of availability of professional Mauritanian personnel for new health units;
- high recurring costs which will compromise the Ministry of Health's budgetary resources to extend health services to rural areas;
- the low efficiency (high cost and low coverage) and low effectiveness (modest decrease of morbidity, mortality and fertility rates) of individual health care;
- this approach will retard the implementation of a preventive medicine campaign of sufficient size to respond to the country's needs;
- increase the imbalance of health/nutrition care between urban and rural areas;
- if rural development is a government priority, this option will not enhance it;
- very high cost of individual care (curative medicine).

V. OPTION B2      Planning, programming and operation of Health/Nutrition services within the framework of combined actions to optimize the yields of existing units and create new polyvalent Health/Nutrition units in 570 villages (15-20% of the population) where no Health/Nutrition services exist.

## 1. Justification

- a. Before extending health facilities, the Ministry of Health must strengthen and increase the output of existing health service units.
- b. It is urgent to respond to the basic needs of the most disadvantaged segments of the population in Health/Nutrition.

as one of the fundamental steps in rural development. Village modules, composed of producers' cooperatives, Health/Nutrition bureaus and rural schools, must be developed in an integrated fashion (figure 4).

## 2. Strategy

- a. The reinforcement of existing health facilities implies the renovation of these units and their modernization (equipment, medication, vehicles), as well as the retraining of personnel in polyvalent activities (Health/Nutrition, Education). This reinforcement must also include, in Nouakchott, the Ministry of Health and its directors; hence, the necessity of reinforcing the different technical aspects of health planning: administration of services, bio-statistics, epidemiology, demography, nutrition and evaluation.
- b. The total system for the administration of basic health care in the villages must include the following elements:
  - Health/Nutrition care (promotional, preventive, curative and recuperational)
  - when the basic health care workers can not solve a medical problem, evacuation of the patient to other treatment levels
  - improvement or installation of water in the majority of villages (wells or borings, as required)
  - constitution of a food stock (preferably provided by the rural community itself) for families suffering from malnutrition due to a lack of food
  - Health/Nutrition education and evaluation of Health/Nutrition programs by regional supervisors.

## 3. Constraints

- the high costs required to obtain optimum output from existing Health/Nutrition services;
- limited capacity to train Health/Nutrition personnel; the needs are increasing and the numbers of professional Mauritanian personnel minimal;
- lack of coordination between health, education and agricultural development facilities;
- separation between "urban world" and "rural world";
- rather limited programs for control of major endemic diseases.

VI. OPTION B, Planning, programming and operation of Health/Nutrition services within the context of a polyvalent system (health/nutrition promotion, prevention, recuperation, rehabilitation), characterized by normative centralization and administrative decentralization.

### 1. Justification

The objective of this option is to respond to the need to rationalize the use of national health system resources, that is, to increase efficiency (high coverage at low cost) and effectiveness (favorable impact on morbidity, mortality and fertility).

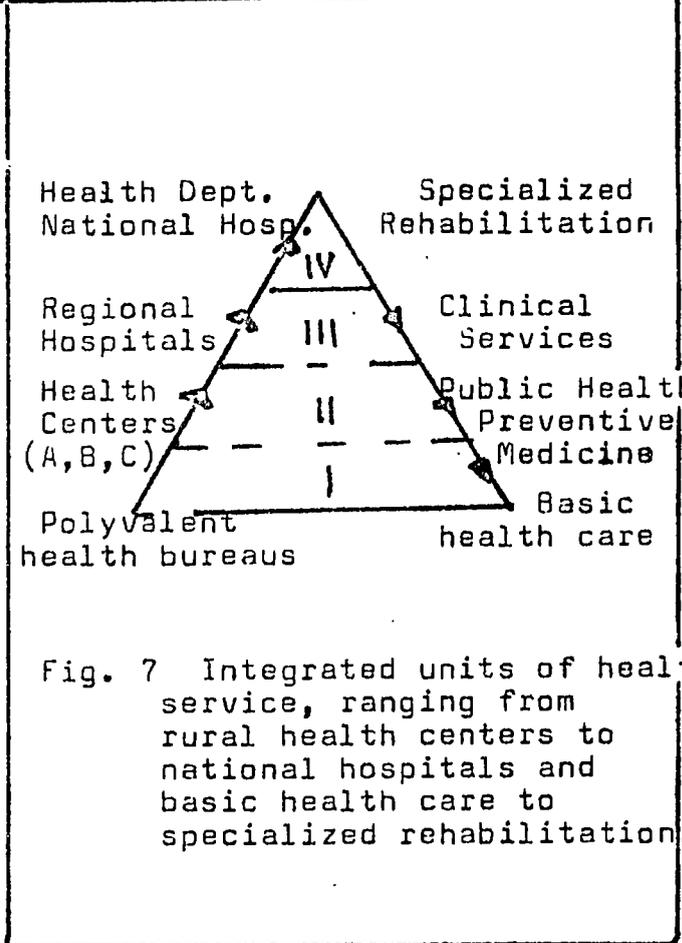
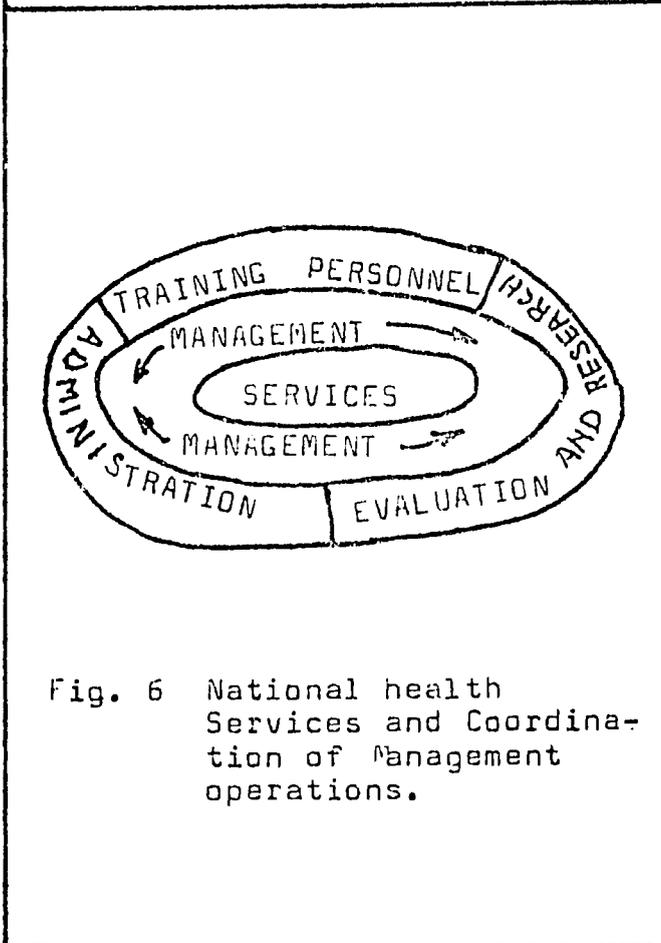
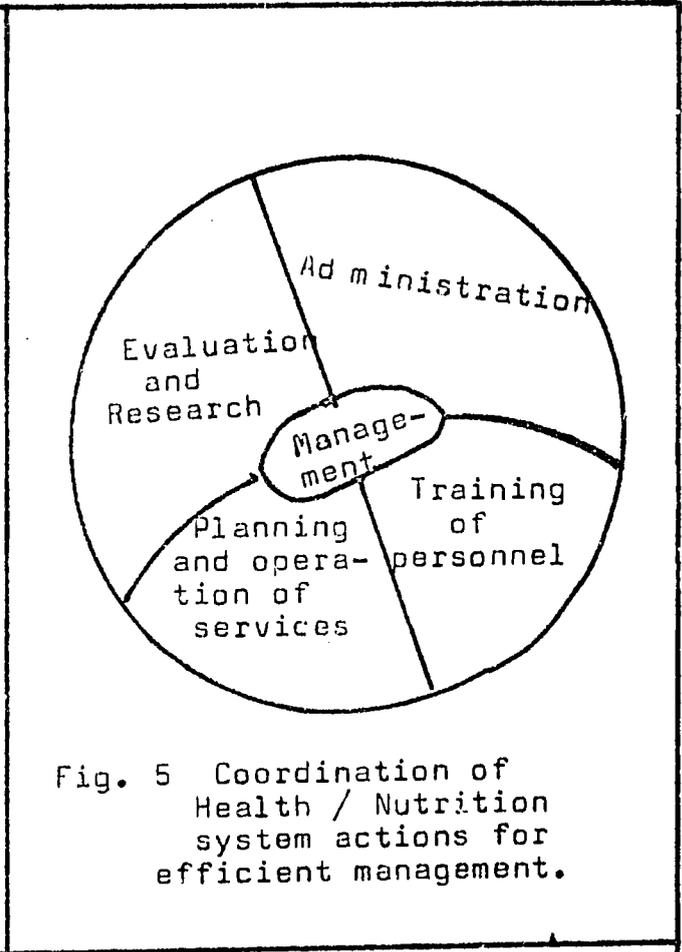
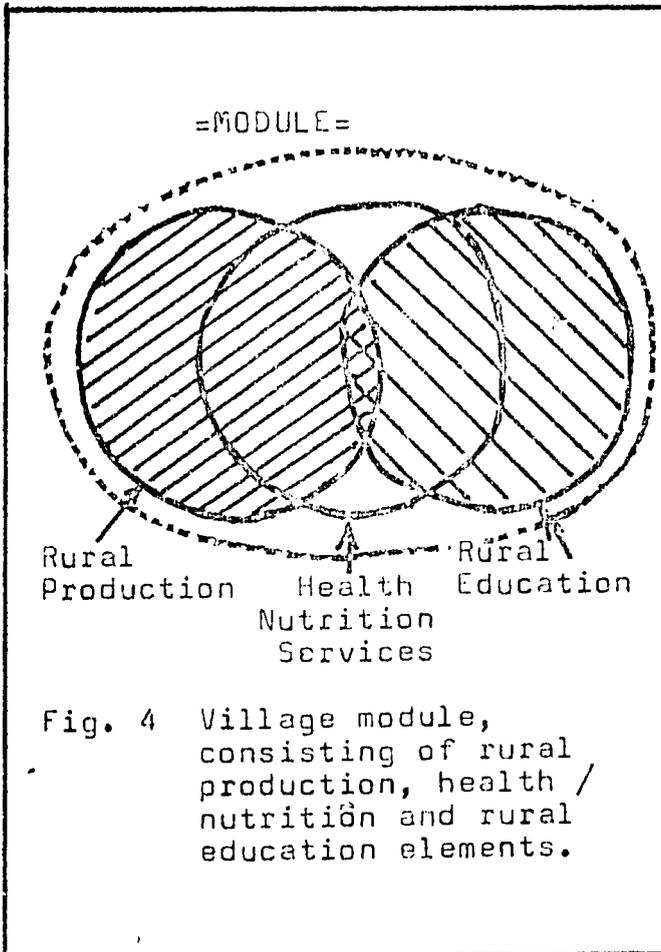
Planning, operation of services, training of personnel, administration, evaluation and research must be coordinated in order to obtain a good management of the system (see Figures 5 and 6).

### 2. Strategy

The integration of a health system of the pyramidal type operates in an ascending direction according to treatment needs and a descending direction according to the location of services and the decreasing complexity of care offered to the community (see Figure 7). The administration of basic health care must be composed of polyvalent units capable of locally solving a significant portion of the endemic health problems of the rural population. These units would be part of the village modules, receiving assistance from the mobile units (for preventive actions such as vaccinations, dental care, etc.) and regular supervision.

### 3. Constraints

- structure too compartmentalized at the national level (Ministry of Health at Nouakchott);
- isolation of towns and villages (difficult road accessibility during rainy season);
- nonexistant ambulance system;
- poorly developed telephone and radio communications;
- lack of secondary rural roads, etc.; insufficient physical and human resources;
- absence of efficient epidemiological surveillance system;
- statistical and health data of poor quality;
- interference with policy and decisions and technical operations of the Ministry of Health;
- part of health network is poorly located; almost total lack of health care and services in the rural areas where 80% of the population lives;
- inequitable distribution of resources between curative and preventive medicine; lack of medication, equipment, etc.



VII. OPTION A      Planning, programming and operation of Health/  
Nutrition services within the context of  
integrated inter-sectoral development.

1. Justification

This option is based on the acceptance of a direct correlation between the state of health and the state of nutrition. The frequency and length of diseases, as well as the biological use of nutrients (assimilation), are under the influence of a series of individual factors. Health care and food consumption are factors which must be taken into consideration at the community level within the context of multi-sectoral planning.

Diagram 1 (below) shows the complex relationships of this approach.

2. Strategy

Health/Nutrition programs must be considered as part of the promotion of economic development and the redistribution of revenue for the improvement of family welfare. These programs to improve the "quality of life" are of as great importance as investments in physical facilities, for example.

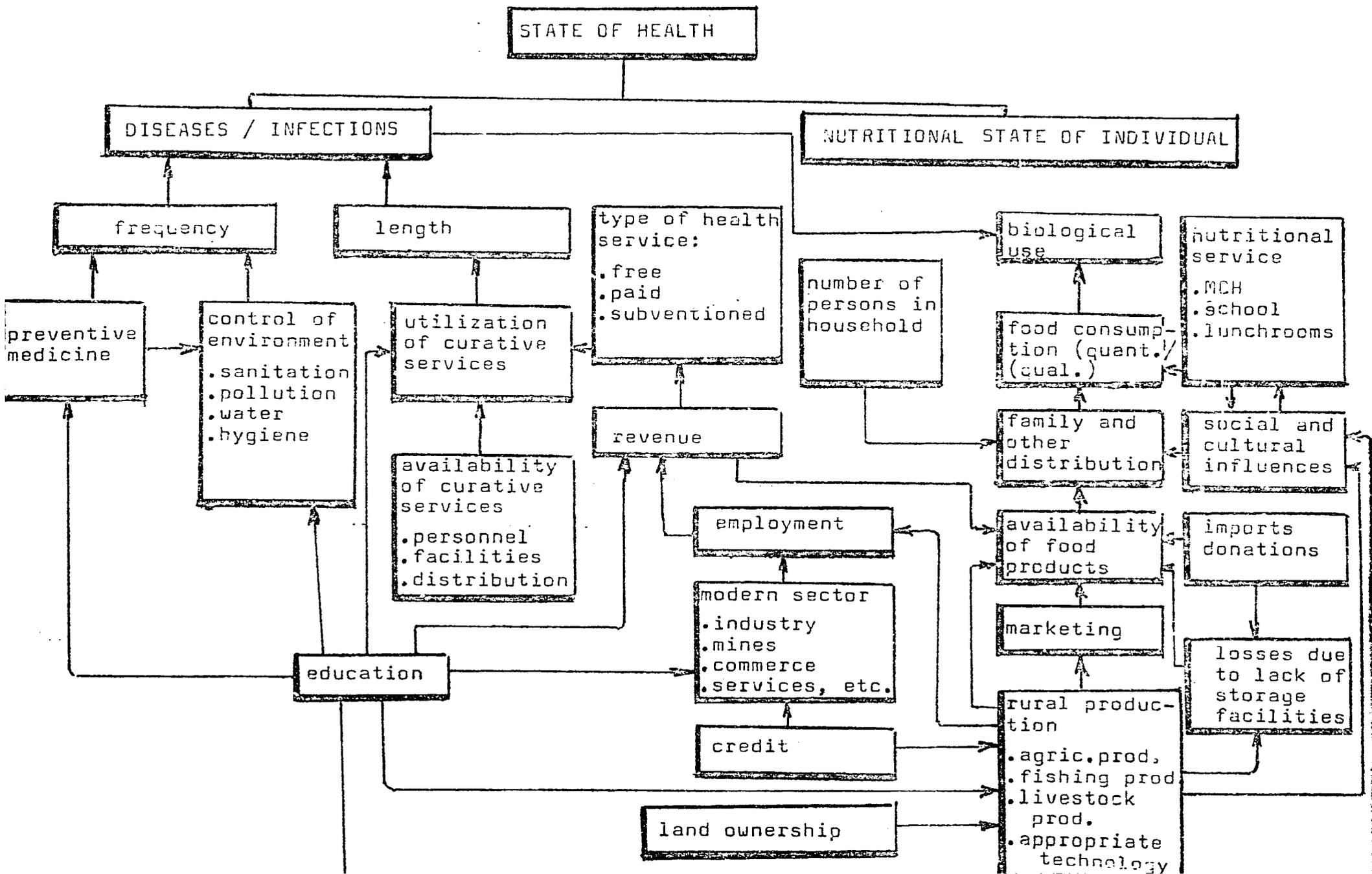
Inter-sectoral planning must be based on well-defined development priorities. Among these priorities, one of the first should be improvement of the "quality of life".

It would be necessary to collect data on the number of work days lost due to sickness and the average length of absence for health reasons (personal or family); these data could serve as the basis for calculating the negative effects of illness and determining the usefulness of health/nutrition programs from an economic standpoint.

3. Constraints

- uncoordinated distribution and utilization of national budget;
- absence of coherent development strategy;
- weak government capacities for planning, programming, operation, supervision and evaluation of Health/Nutrition programs;
- limited number of upper management and key personnel in the different sectors;
- lack of motivation (and low salary levels) of administrative personnel;
- decisions made without taking technical data or future implications into account.

Diagram 1. Interaction of Socio-Economic Development Factors in the State of Health



## VIII. COMBINED OPTION D

Progressive implementation of options C-B<sub>2</sub>-B<sub>1</sub>-A, as planning, programming and operation of Health/Nutrition services develop as a result of the nation's modernization.

### 1. Justification

As the sequence of Options C-B<sub>2</sub>-B<sub>1</sub>-A represents a series of objectives progressively more difficult to attain, it is necessary to employ increasingly sophisticated methodologies. However, this sophistication is not only a result of development in the health sector. General development must be considered as well as the possibility of moving from an option with simple objectives to a more ambitious option: this passage will be facilitated by the dynamic process of modernization (Figure 8).

### 2. Strategy

In order to implement this option, it is necessary to have sufficient lead-time for those activities whose objectives are uppermost (Diagram 2: see broken lines).

### 3. Constraints

See the specific constraints given in the descriptions of each preceding option and the constraints common to all options which are presented below.

## IX. Common Constraints of all Preceding Options

- global and per capita revenue insufficient to meet needs; high illiteracy rate;
- difficulties in changing traditional attitudes and habits concerning health/nutrition;
- difficulties in attaining food self-sufficiency;
- lack of equitable participation in village decisions (i.e., dominance of patriarchal and hierarchical power);
- absence of community awareness of the importance of hygiene and nutrition;
- government actions creating increased dependence of the population on a multiplicity of services (high price of medication, high maintenance costs of health facilities, food assistance, high ratio of foreign to Mauritanian professionals);
- high fertility rate, high population growth, accelerated urbanization;
- low life expectancy at birth (40 years). High mortality rate from 0 to 5 years and high maternal mortality rate;

Figure 8. Theoretical Coverage of Different Options.

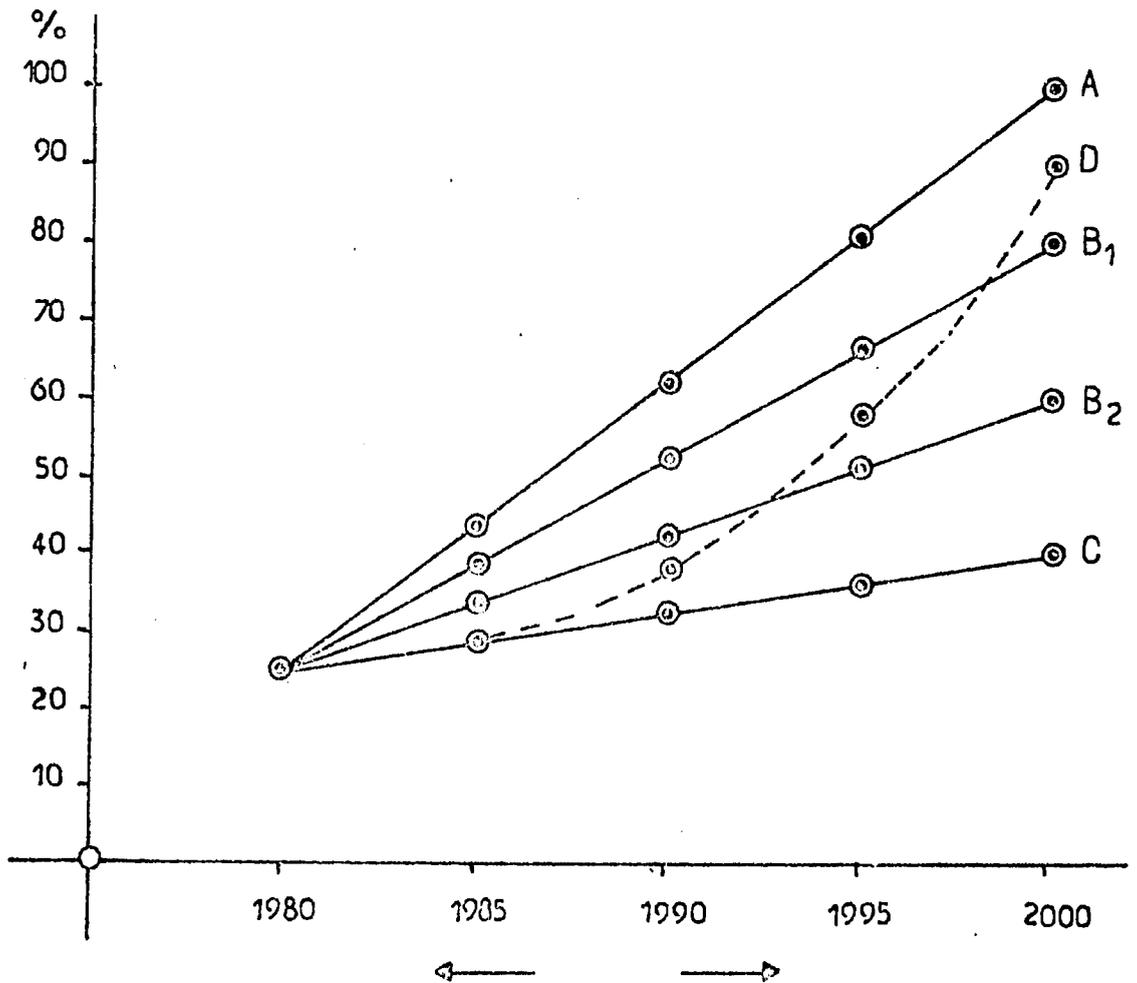
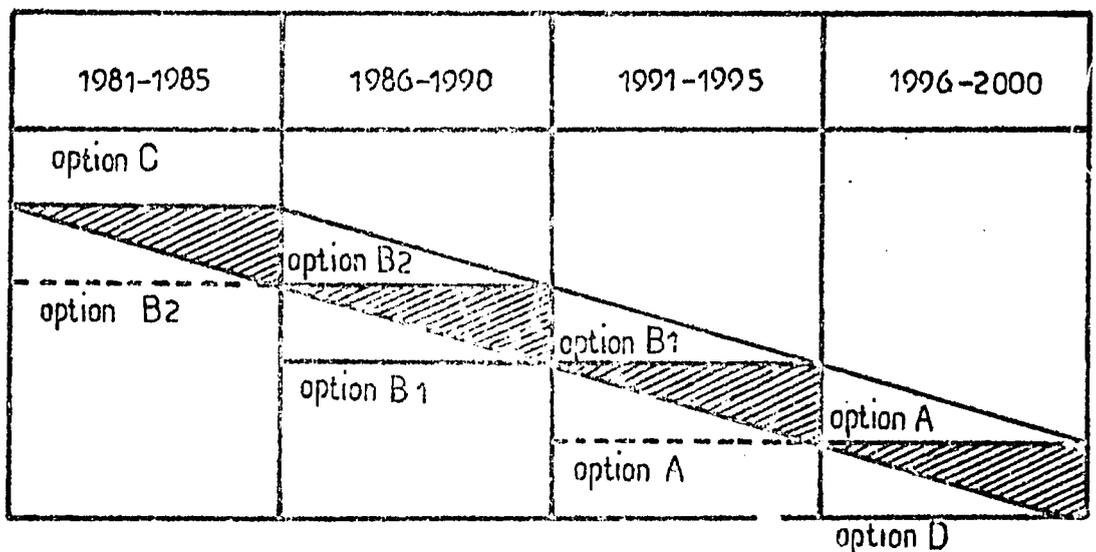


Diagram 2. Preparatory Activities Required to Implement Option D (Combined Options broken lines).



- unplanned migration;
- health personnel attracted to urban assignments;
- quantity and quality of water is beneath vital minimums (insufficient rainfall, insufficient running water);
- low priority given to preventive medicine by professionals and government services;
- socio-professional incomptability between modern and traditional medicine;
- concentration of social services in towns, where only 20% of the nation's population lives.

## F. FEASIBILITY OF THE OPTIONS PRESENTED

### I. Political Viability

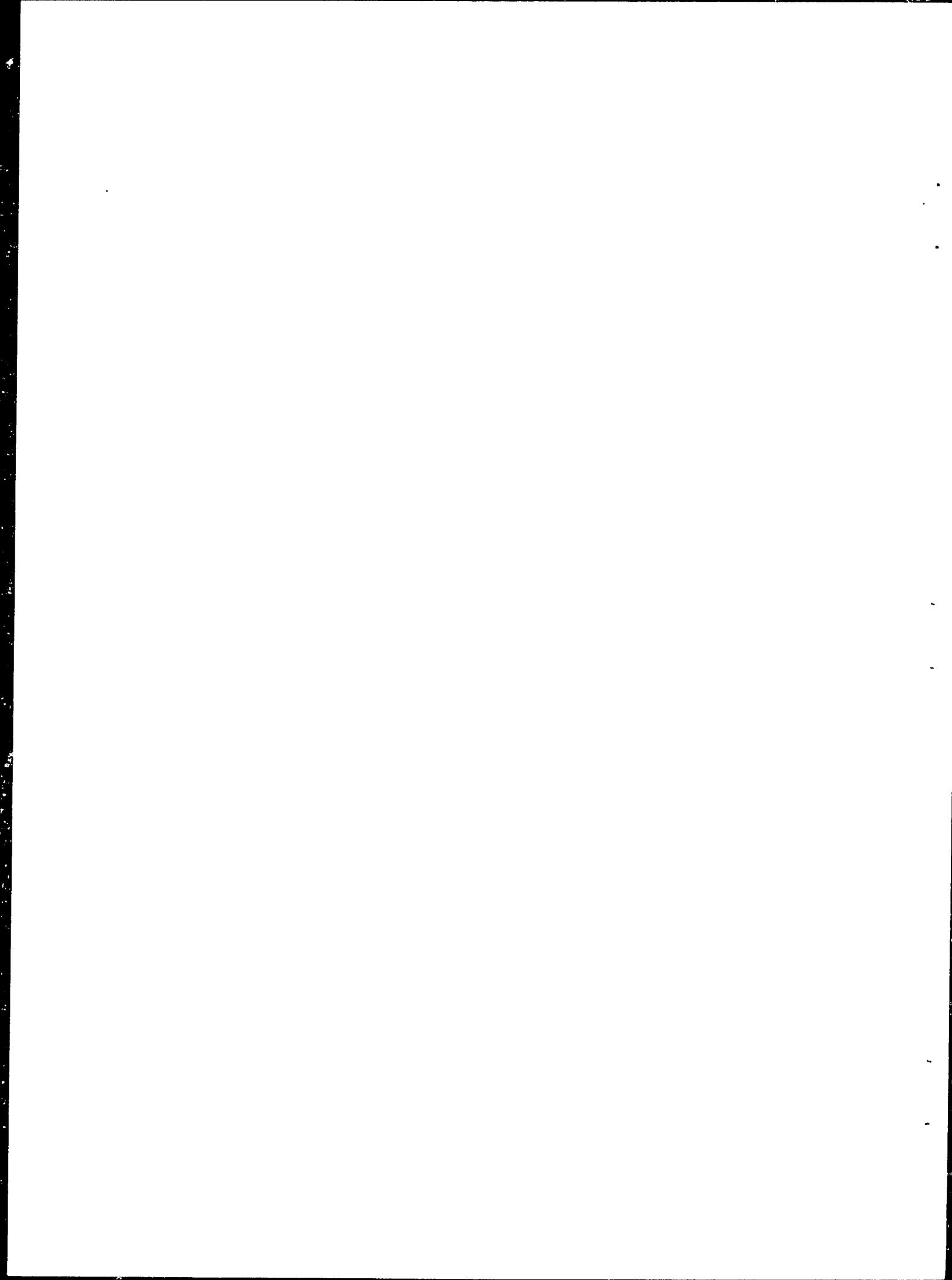
An objective analysis of the situation of the Mauritanian health system and its problems has already been presented in this report. The following reviews health policies as they relate to the options to improve the health situation. The objectives of these different options is to improve the health coverage of the population and to decrease the cost of health per person per year. Increased coverage will have a positive effect on the current high morbidity and mortality rates. Decreased costs per person treated (due to health promotion and curative and/or preventive measures) will permit better use of the funds allocated to the Ministry of Health.

Each of the options presented merits consideration by the decision-making units of the government, not only from the standpoint of improving the population's health but also with respect to the implications of improved health for other development sectors.

Once a given option has been selected, it may cause significant modification to and compromise in the administrative mechanisms of the State's social programs. Efficient and effective systems must begin to replace former unproductive systems if Mauritania is to progress in its social and economic development.

The Fourth Health Plan (1981-1985) demonstrates that the will to change is particularly firm in this sector. However, in order to achieve the objectives expressed in this plan, a much more detailed program of action must be developed; such a program must take into account both external and internal factors affecting the national health system.

The health options discussed in this report represent a series of applicable models to facilitate development of a precise program of action. The selection of a given option at the policy level will depend on the priority accorded by the government to health as compared to other sectors. Appropriate health legislation



The selection of "Option A" would indicate a multi-disciplinary approach to integrated development and the government's will to resolve, in a dramatic manner, the problem of food self-sufficiency. On a long-term basis, the only satisfactory strategy to reduce the problem of food insufficiency in the rural areas of underdeveloped countries is to improve the incomes of rural food producers: farmers, fishermen and livestock raisers. Option "A" is conceived to achieve this objective; health will improve as a result of a generalized up-grading of all sectors.

Finally, the selection of "Option D" would represent the government's decision to adopt ambitious long-term objectives (horizon 2000), using a methodology which nevertheless divides the operational aspects into five-year segments, each a preparatory stage for the next development step. This option would apply modern planning methods (logical sequence of tasks and schemes) while continuing to improve the operation of services. A simplified description might be to say that this option represents a progression from a fairly simple option (Option "C", for example) to an extremely complex option (Option "A"), passing through intermediate stages (Options "B2" and "B1"). In reality, this process would include a more complex and sophisticated feed-back mechanism which would permit continual adjustments of operations according to the results desired.

## II. Technical Feasibility

Technical feasibility will depend essentially on the degree of specialization in community medicine of the Ministry of Health staff and the quality of technical assistance furnished by WHO and other international organizations in preventive medicine, public health and tropical medicine.

1. OPTION C: The continuation of the approaches of the Third Health Plan (1976-1980) and the Fourth Health Plan (1981-1985) until the year 2000 could have unpredictable consequence for the nation. This continuation does not take into account the constraints which complicate the operations of the national system and decrease its impact. These constraints fall into three categories:
  - a. Constraints linked to internal factors of the health system, and which affect:
    - i. Management/planning: the absence of a diagnosis of the health situation of the country of a long-term strategy and of specific plans of action to meet specific objectives;
    - ii. Operation of services: the low priority given to basic health care and to preventive medicine; the neglect of possible positive uses of traditional medicine;

- iii. The training (of quality and quantity) of the health personnel required: Mauritanian professional and para-professional personnel do not, in general, receive polyvalent training; nor do they have sufficient motivation to work in rural areas;
  - iv. Administration of services: the very high costs per capita per year; recurring costs at levels higher than projected resources for the health sector; absence of any kind of logistical support;
  - v. Evaluation, follow-up and supervision of health facilities and personnel: lack of systematic data collection and of a health information system; the lack of a health evaluation system; the very limited supervision of programs; the lack of standards, procedures and precise techniques to be followed by personnel; only partial regional and local decentralization and even that lacks technical support.
- Constraints linked to factors external to the health system, caused by:
- i. population growth: an annual growth rate of 2,5%, in the face of very limited national resources; demographic variables characterized by high rates of fertility, mortality, migration (internal and international); a life expectancy at birth of 40 years.
  - ii. the precarious state of health: high prevalence of certain tropical diseases (malaria, schistosomiasis, Guinea worm, intestinal parasites); contagious diseases (measles, pulmonary tuberculosis, venereal diseases) and infectious diseases (diarrhea and enteritis, pneumonia, dermatitis, conjunctivitis, etc.).
  - iii. the state of nutrition: dietary deficiencies due to ignorance, traditional taboos, abrupt weaning. The existence of malnutrition due to insufficient food.
  - iv. the economic situation: heavy dependency on foreign aid; low growth of GDP; low percentage of the national budget allocated to health; low per capita income; unemployment, inflation, increasing prices of transport, medication and equipment.
  - v. the social situation: the large diversity of ethnic groups and local languages; attitudes and practices concerning health and nutrition which may be dangerous; lack of equitable participation in village decision-making (dominance of patriarchal and hierarchical power); lack of community participation in planning, operation, supervision and evaluation of health programs.
  - vi. the influence of the environment: low rainfall, difficult accessibility to water sources (insufficient quantity and quality for human consumption and for agriculture and live-stock); growing desertification; difficult road communications during rainy season.

- c. Constraints linked to the interaction of internal and external factors of the national health system. There should be a dynamic relationship between the health system and the milieu in which it operates; permanent contact should exist between decision-making units and operational units, i.e., between the government and the community. However, this contact is quite superficial at present.

The Fourth Health Plan, as well as the plans which preceded it, has not been the product of any global plan or any socio-economic development policy. A well-conceived health plan should, for example, reflect regional peculiarities and take into account hydro-agricultural developments affecting the environment. This would imply the allocation of sufficient resources (national budget, health services, qualified personnel, equipment, materials and foreign aid), and the development of a policy of integrated long-term planning, so that the Ministry of Health's policies become part of the thinking that goes on to the development plan. (37)

These technical considerations lead to the conclusion that the Fourth Health Plan is in reality a transitional plan. Its character will facilitate the laborious preparation of the foundation for the Fifth Plan (1986-1990). The preparatory steps for the Fifth Plan could begin immediately; hence it is important to consider the following Option B<sub>2</sub>.

2. OPTION B<sub>2</sub>: The selection of this option would permit implementation of basic health care services in the poorest communities of Mauritania. It would establish basic health services capable of responding to the fundamental needs of 20% of the nation's population, as sketched out in the Fourth Health Plan (5). Option B<sub>2</sub> presents the technical and feasibility aspects of this type of program. Optimization of the output of existing health units is another aspect of this option. Basic health care in accordance with the bases established by the World Health Organization (38):
- a. must be conceived in relation to the customs of the population to which they are directed and must respond to the real needs of the community.
  - b. must be an integral part of the national health protection system, with other levels being established to support the peripheral units, notably concerning supplies, supervision and evacuation

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(37) Inter-Etat de Lutte contre la Sécheresse dans le Sahel (CILSS): "Rapport de la Mission du CILSS Au près du Ministère du Travail, de la Santé et des Affaires Sociales". P. Leger et al. (1980).

(38) OMS/UNICEF: "Les Soins de Santé Primaire" Genève/New York, 1978, p. 78.

- of patients requiring more specialized treatment:
- c. must be totally integrated in the activities of other community development sectors such as agriculture, education, public works, construction of housing and communications.
  - d. must benefit from the participation of the local communities from the planning stages until actual operation of the health services in order to be adapted to the needs and priorities at the local level. Decisions relating to planned activities must be the result of a continuous dialogue between the population and government services.
  - e. must be supported above all by local resources: the cost of services offered must not surpass the strict limit of the economic resources of the community in question.
  - f. must constitute an integrated set of services: preventive and curative care, promotion of health and rehabilitation provided to individuals, families and the community.
  - g. must, inasfar as possible, be implemented at the most remote level of the health service by personnel trained in these duties.

These principles lead to the development of three themes: an integrated approach, concentration of actions in the villages themselves and priority to preventive medicine.

Integrated Approach: this means that health care will be not only preventive but also curative; a program for spacing of births must be offered to couples, as closely spaced pregnancies may compromise the health of the mother and the newborn. As health and nutrition are inter-related, a nutritional program must be an integral part of health care. Health education and supervision must complement the polyvalent activities of the health unit (village health bureau). This integrated approach can have important synergetic effects.

Concentration of Actions in the Village Itself: this will permit local participation and, consequently, facilitate identification of the community to the government through a common purpose. Capital and recurring costs must be earmarked especially to the villages and their inhabitants. Neighboring villages will become interested in adopting certain aspects of the program, and social process will be initiated.

Priority to Preventive Medicine: this is important from the point of view of the relatively low cost of service and the appreciable effects on the incidence of disease. Positive results may be seen in a relatively short time (5 years) and can be compared to the less spectacular results of the curative approach in urban areas.

The list of actions envisaged is as follows:

- a. basic health care
- b. preventive medicine measures
- c. improvement in the quality and quantity of water in the villages
- d. health/nutrition education
- e. training of at least 4 persons per village in Nutrition/Basic Health Care
- f. food supplements for cases of malnutrition in vulnerable groups (children less than 5 years old, nursing or pregnant women)
- g. strengthening (at the level of the Ministry of Health in Nouakchott and in the 12 administrative regions of the country) of management aspects: operation, supervision, distribution of medicines, planning and evaluation.

Most of the capital expenses proposed (4.3 billion UM; for the period 1981-2000) must come from foreign assistance sources. However, the Mauritanian Government as well as the communities concerned must participate to the extent their resources allow. The program must develop in a progressive manner: 5 villages per year during 3 years and progressively thereafter (10, 15, 30, 40 and 60 per year) until coverage of the 571 villages is attained around 1995.

Village water will be improved both in quality and quantity (wells or borings, as required). Water distribution points would be placed near the village center. Maintenance of the equipment would be assured by specially trained mechanics (1 for each 20 villages) who will need a vehicle. Insofar as possible, techniques which do not require continual maintenance will be used (photo-voltaic solar pumps, windmill pumps, etc.). Watering of vegetable gardens is another possibility to be explored; at times, sufficient water will be available from irrigation perimeters.

Systematic supervision must be provided in all cases by specially trained supervisors (1 for 10 villages); they will be part of a regional health personnel unit and will require a means of transport.

The specific objective of the project, which will satisfy basic health care needs, will be to decrease infant and maternal mortality, decrease infectious diseases, increase life expectancy at birth and provide accessible family planning services for those couples who need it. Malnutrition should be appreciably reduced by improved Health/Nutrition education and the possibility of aiding vulnerable groups with supplementary food assistance. Certain communities could create their own food stocks and be responsible

for its storage and distribution pursuant to guidance provided by health specialists.

Health specialists must be helped by the community. This will require the development of a methodology of community participation. The villagers must also be responsible for the periodic renewal of the first aid kit.

The village health center (polyvalent health post) must be built by the community itself, using local materials. The project will furnish certain materials as well as technical assistance for the operation of the center. The construction of wells and borings must also employ a maximum of local labor.

It is believed that this approach, combined with the strengthening of the existing health system, will result in an increase of 20% of health/nutrition coverage of the target population by year 2000 (an increase of from 40% to 60%).

Tables 10 through 15 present the cost estimates of the project to satisfy basic health needs for the population of the villages in question. These tables indicate that progressive satisfaction of basic human needs (BHN) in 570 villages represents a cost of 4.3 billion UM (in constant 1980 prices) during the 1981-2000 period. While these costs are high, they are not exorbitant and include: storage of food supplements, establishment of polyvalent health centers and improvement of village water supplies. However, in order to establish the project's feasibility, the following table gives the percentage of BHN costs as compared to the total costs of the health services in Option C:

Table 9. Comparison of Total Costs of Health Services of Option C and the Portion of Basic Health Care costs of Option B2  
(millions UM, in constant 1980 prices)

Year	Option	Recurring Costs	Capital Costs
1985	C	767	185
	BHN	25	29
	%	(3.3%)	(15.7%)
1990	C	1,026	800
	BHN	107	83
	%	(10.4%)	(10.4%)
1995	C	1,373	500
	BHN	302	137
	%	(22.0%)	(27.4%)
2000	C	1,837	50
	BHN	177	29
	%	(9.6%)	(58.0%)

This table shows that the proportion of basic health care costs (BHN), especially capital costs, is fairly high as compared to the cost of established health services. The implications of this are discussed below in the "Financial Feasibility" section.

From a technical point of view, it can be said that this part of Option B<sub>2</sub> (satisfaction of basic health care needs) is viable: with good planning, 2,500 polyvalent Health/Nutrition workers should be trained by the year 2000 (4 per village, of which 2 auxilliary). The key to successful training of such personnel lies in the preparation for training (for the district of Nouakchott and the 12 regions); the trainers will also be responsible for supervising the specialists in their own regions. This experiment is currently underway in the Trarza (where the first group of workers has begun to work) and must be followed by expansion throughout the country. As to community participation, there are already precedents in Mauritania, such as in Adrar, training of health specialists, and in other regions training of traditional midwives or community health agents. Another aspect to be explored is the integration of village modules composed of distribution/producer cooperatives, polyvalent health/nutrition centers (village health units) and rural schools.

The role of the Nursing and Midwives School in instructing and supervising the polyvalent health specialists must be clearly defined, as well as the possible collaboration of other training facilities. For example, supervisors could be trained either at the Nursing School or at the family section of ENECOFAS.

In the second part of this report (nutritional strategies), other aspects of health and nutrition activities are discussed complementing the proposed training program.

The optimization of the output of existing health units will be based on reinforcing the technical aspects and improving logistics; this point has already been discussed above.

Table 10. Option B2. Basic Human Needs in 570 Villages Where There Are No. Health/Nutrition Services: Cost of Creating Polyvalent Units over the 1981-2000 Period.  
(millions UM constant 1980 prices)

Basic Human Needs	Estimated Capital Costs	Estimated Recurring Costs
1. <u>Ministry of Health, Nkt</u>		
a. Improvement of management, supervision, distribution of medication	85.9	151.5 33.3
b. Improvement health planning	22.5	34.7
2. <u>Regional Health Centers</u> - Vaccination Campaigns	22.5	9.0
3. <u>Village Level (Village Health Bureaus)</u>		
a. Polyvalent Health Centers	384.8	479.7
b. Salaries 1,140 Health Specialists	-	319.5
c. Salaries 1,140 Aux. Health Workers	-	210.7
4. <u>Food Supplements</u>		1,096.1
5. <u>Training Personnel</u>		
a. Health/Nutritional Workers	16.1	-
b. Supervisors (Prof.level)	16.2	-
6. <u>Village Water</u>		
a. Wells	211.9	186.8
b. Boring	543.2	396.8
c. Maintenance	27.7	52.2
7. <u>Miscellaneous</u> General Expenses	-	18.7
Total	1,330.8	2,989.0

Table 11. OPTION B<sub>2</sub>. Basic Human Needs: 570 Villages  
 Budget Estimates over 5 year Periods  
 (millions UM in constant 1980 prices)

Basic Human Needs Sub-Projects	1982-1985	1985-1990	1990-1995	1995-2000	Total (1982-2000)	%
<b>A. Mobilization Costs</b> (materials, equipment, personnel training, supplements, etc.)						
a. Capital costs	21.9	127.4	211.6	40.5	400.8	(9.3)
b. Recurring costs	23.5	174.6	350.6	453.5	1,012.2	(23.4)
c. Food supplements	14.8	229.8	851.5	-	1,096.1	(25.4)
Sub-Total	60.2	531.8	1,413.1	504.0	2,509.1	58.1
<b>B. Supervisory Costs</b>						
a. Capital costs	5.4	32.2	53.7	10.3	102.1	(2.4)
b. Recurring costs	2.5	25.9	60.5	62.6	151.5	(3.5)
Sub-Total	7.9	58.1	114.2	72.9	253.6	5.9
<b>C. Village Water Costs</b>						
a. Capital costs	40.7	245.0	411.3	86.0	783.0	(18.1)
b. Recurring costs	4.5	67.2	233.7	349.2	654.6	(15.1)
Sub-Total	45.2	312.2	645.0	435.2	1,437.6	33.2
<b>D. Vaccination and Technical Assistance Costs</b>						
a. Capital costs	17.1	9.9	9.0	9.0	45.0	(1.0)
b. Recurring costs	28.5	22.4	15.3	10.8	77.0	(1.8)
Sub-Total	45.6	32.3	24.3	19.8	122.0	(2.8)
Grand-Total	153.9	934.4	2,196.6	1,032.4	4,322.3	100.0
%	3.7	21.6	50.8	23.9	100.0	

Table 12. OPTION B<sub>2</sub>. Satisfaction of Basic Human Needs (570 Villages)  
Estimate of Budget and Program to Create Health Centers  
 (construction and operating costs for polyvalent posts)  
 (in millions US constant 1980 prices)

Program to Create Polyvalent Centers	1982-1985 (30)	1986-1990 (100)	1991-1995 (300)	1996-2000 (61)	Total (571)
<u>Cost of Posts</u>					
<u>A. Capital</u>					
• Construction and equipment	20,250	121,500	202,500	40,500	384,750
• Training personnel	1,674	5,927	8,505	-	16,106
Sub-Total	21,924	127,427	211,005	40,500	400,856
<u>B. Recurring Costs</u>					
• Salaries of specialists	4,050	45,350	110,750	151,200	319,500
• Salaries of assistants	3,240	30,240	79,200	100,800	210,690
• Medication (first aid kit)	4,050	13,500	18,000	22,500	58,050
• Maintenance	12,150	85,500	135,000	135,000	421,650
Sub-Total	23,490	174,600	350,550	463,500	1,009,890
<u>C. Food Supplements</u>					
• Food	14,225	222,822	839,106	-	1,076,152
• Transport	450	5,625	10,125	-	16,200
• Charcoal	112	1,350	2,250	-	3,713
Sub-Total	14,787	229,797	851,481	-	1,096,065
<b>Total</b>	<b>60,201</b>	<b>531,824</b>	<b>1,410,786</b>	<b>504,000</b>	<b>2,506,811</b>

Table 13. OPTION B<sub>2</sub>. Satisfaction of Basic Human Needs (570 Villages)  
Estimate of Supervision and Control of Program (1982-2000)  
(in million UM constant 1980 prices)

Type of Cost: Supervision/ Control	1982-1985	1986-1990	1991-1995	1996-2000	Total
<b>A. Investments</b>					
<u>Vehicles:</u> Number	(3)	(18)	(30)	(6)	(57)
Cost	1,485	8,910	14,850	2,970	28,215
<u>Personnel:</u>					
Reinforcement of Tech.Group	3,038	18,225	30,375	6,075	57,713
Training supervisory personnel	0,850	5,103	8,505	1,701	16,159
Sub-Total	5,373	32,238	53,730	10,746	102,087
<b>B. Recurring Costs</b>					
Salaries Supervisors (57)	0,527	6,143	14,917	16,672	38,259
Operating/transportation costs	1,417	16,537	40,163	44,888	103,005
Replacement Vehicle pool	0,297	1,782	2,970	0,594	5,643
Maint./Repairs Village centers	0,243	1,458	2,430	0,486	4,617
Sub-Total	2,484	25,920	60,480	62,640	151,524
<b>Total</b>	<b>7,857</b>	<b>58,158</b>	<b>114,210</b>	<b>73,386</b>	<b>253,611</b>

Table 14. OPTION B<sub>2</sub>. Satisfaction of Basic Human Needs (570 Villages)  
Estimate of Costs of Improving Water Supplies  
in Villages (1982-2000)  
(million UM constant 1980 prices)

Type of Costs:	1982-1985	1986-1990	1991-1995	1996-2000	Total
<u>Improvement water in villages</u>					
<u>Capital Costs</u>					
Water improvement 570 villages	(30)	(180)	(300)	(60)	(570)
75% wells: 428 "	(25)	(135)	(225)	(45)	(428)
25% borings: 142 "	(7)	(45)	(75)	(15)	(142)
Costs: ( 495,000 UM) 428 wells	11,335	55,525	111,375	22,275	211,860
(3,825,000 UM) 142 borings	25,775	172,125	205,875	57,375	543,150
Mechanic./borings (1:20)	(1)	(2)	(4)	(0)	(7)
Cost room/house (2,025,000 house)	2,025	4,050	8,100	-	14,175
Vehicles for mechanics/borings	495	1,980	4,950	6,300	13,725
Sub-Total	40,680	244,980	411,300	85,950	782,910
<u>Recurring Costs</u>					
<u>Wells:</u> Spare parts, replacements,	630	18,990	61,470	105,750	186,840
10% general costs,	63	1,899	6,147	10,575	18,684
contingency					
<u>Borings:</u> Spare parts, replacements,	203	1,013	2,362	2,352	5,940
fuel, oil, etc.					
<u>Salaries:</u> Salaries 7 mechanics	472	2,362	5,513	5,513	13,860
<u>Transport:</u> Operating costs, spare	297	2,475	7,425	7,425	17,622
parts, replacements					
<u>Housing:</u> Maint. 7 houses (20%)	405	3,150	3,150	3,150	9,855
Contingency (10%)	203	1,575	1,575	1,575	4,928
Sub-Total	4,478	67,149	233,667	349,200	654,494
Total	45,158	312,129	644,967	435,150	437,404

Table 15. OPTION B<sub>2</sub>. Satisfaction of Basic Human Needs (570 Villages)  
Estimate of Costs of Technical Assistance and  
Vaccination (1982-2000)  
(million UM in constant 1980 prices)

Type of Cost: Technical Assistance/Vaccination	1982-1985	1986-1991	1991-1995	1996-2000	Total
<u>Ministry of Health, Nouakchott</u>					
<u>Capital Costs</u>					
Improvement of management/supervision, distribution of medication. Transport/Storage	9,00	4,50	4,50	4,50	22,50
Vaccination Campaign Transport, Mobile Units, equipment	8,10	5,40	4,50	4,50	22,50
Sub-Total	17,10	9,90	9,00	9,00	45,00
<u>Recurring Costs</u>					
Consultants Plan/Health/Admin. personnel	12,15	11,25	6,75	4,50	34,65
Consultants Management/Supervis./Logistics; spare parts, operating costs	13,05	9,00	6,75	4,50	33,30
Vaccines (free from UNICEF), Salaries, transport, campaign operation, etc.	3,24	2,16	1,80	1,80	9,00
Sub-Total	28,44	22,41	15,30	10,80	76,95
Total	45,54	32,31	24,30	19,80	121,95

### 3. OPTION B<sub>1</sub>

There are two fundamental aspects to Option B<sub>1</sub>: the efficient and effective integration of Ministry of Health operations (technically-oriented management and planning, operation of services, training of personnel, administration, evaluation and research). When these aspects are integrated, they should function like a gear mechanism. The second aspect concerns the basic health care services organized at the village level (as explained in Option B<sub>2</sub>) as a first point of contact of the health system with the community<sup>2</sup> (Level I, see figure 7). The health system will then become a whole, operating at four levels (I, II, III and IV) depending on the complexity of the health care provided. It is estimated that the efficiency of this type of system will increase the health/nutrition coverage by 20% (from 60% to 80% around year 2000). One of the important conditions of increasing the dynamism of the system is to decentralize its administration while retaining normative centralization. Another condition is to restructure the Ministry of Health into basic units corresponding to programmed activities: planning, administration, evaluation, training of personnel, operation of services, under which the integrated programs will be placed (MCH, basic health care, major endemic diseases, etc.). In this manner, a matrix is erected, arranged in a horizontal manner by activity and in a vertical manner by program. A structure of this type will facilitate the coordination of the different elements of the system which are, at present, dispersed.

A pyramidal arrangement of health care would have at its apex the Ministry's Directorate and the National Hospitals and as its base the basic health care services.

One of the priority programs should be to control major endemic diseases. New procedures are being used in tropical countries with WHO assistance. Mauritania must participate actively in these activities through its National Hygiene Center. One of the problems in treating malaria in Mauritania is the resistance of P. falciparum to anti-malarial drugs such as cloroquine. Studies are currently under way in the use of mefloquine and pyrimethamine, in diagnosis by immuno-fluorescence and in the development of vaccines.

To control urinary schistosomiasis, methods are being sought through more precise knowledge of the transmission mechanisms and the biology of the snail intermediate host, the search for more efficient and less toxic medication, the improvement of diagnostic techniques and understanding of immunity responses which will permit development of vaccines or lessening of the pathological process. The metabolism of metrifonate, which is active against the urinary schistosomiasis parasite most prevalent in Mauritania (S. haematobium) is being studied in Sweden, where "dichlorvos" has been isolated as the biologically active metabolite. At the London School of Tropical

Medicine, new medicines such as oxamniquine and praziquantel are being tested. A variety of studies on schistosomiasis are being conducted in several tropical countries in collaboration with the Regional Bureaus of WHO. The Ministry of Health must participate more actively in the solution to national health problems by collaborating with international health organizations. This will become possible after the proposed operational reorganization.

From a technical point of view, this option is viable if the idea of a basic reorganization of the Ministry of Health and its regional operational units is accepted. With the existing structure, ministerial actions are uncoordinated, slow and respond only to the most urgent problems. Management techniques must be the first to be improved, as they are the source of several problems discussed in this report. Modernization of the management system will cause simultaneous improvements in planning, programming and operation of services.

#### 4. OPTION A

Option A represent the integration of health/nutrition programs within the framework of multi-disciplinary development. The technical viability of this option is thus beyond the decision-making powers of the health sector. However, this option merits the consideration of the Government of Mauritania, as only this approach can provide an effective response to the problem of food self-sufficiency.

The existence of multiple relationships between the different development sectors is illustrated by Diagram 1 (page 57), adapted from a model by J. Grant. (39) This model illustrates the social dimensions and interactions of a series of variables affecting health and nutrition. The diagram permits the identification of the implications for planning: the direct and indirect effects of the actions in one sector on another and their feedback to the original sector, so that the net effect of a given action may sometimes be unpredictable. On the other hand, there is also a mutual reinforcement of the activities of different sectors, favoring synergic effects of simultaneous actions.

Much work can be saved by adopting such an option, because of the integrated approach between health and nutrition, the interactions between nutrition and infectious disease. and the relationship between

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(39) J. Grant: "Poverty and Health in Interaction of Health and Development", papers of the Conference on Interaction of Health and Development: A Focus on Social, Economic and Environmental Determinants. International Council for International Health (1977)

spacing pregnancies and the decrease of maternal and infant mortality.

The nutritional state has been identified as the determining factor of the length of an illness among children in a study conducted in Colombia. (40) Malnutrition can lead to illnesses such as rickets, pellagra, scurvy and goiter. During the first two years of life, malnutrition is one of the important causes of mental deficiencies; the malnutrition of the mother may also affect the physical and mental development of her child. (41)

In Mauritania, where food production and distribution are inadequate, the possibility of increased nutritional deficiency is always to be considered.

Table 16 and Figure 9 present data comparing the food requirements of the Mauritanian population and the production of cereals, meat and fish (1980-2000). It can be seen that the highest possible cereal production must be attained by year 2000, using the most advanced technology and an increase per production unit (5 tons/ha) in order to achieve food self-sufficiency by the end of the century. The accelerated growth of the Mauritanian population is one of the difficulties encountered in achieving food self-sufficiency (Figure 2, page 22). Figure 10 shows the levels of cereal requirements (calculated on the basis of a balanced diet for Mauritania) for 1980, 1985, 1990, 1995 and 2000. These requirements are calculated for the total population as well as for sedentary rural, nomad and urban populations. When compared with the data given in Figure 2, it is easier to see the close inter-relation in Mauritania between demographic and nutritional aspects.

Option A is the only option which could by year 2000 provide nearly total health/nutrition coverage to the Ministry of Health's target population. However, a prerequisite for applying this option would be the coordinated and integrated functioning of all development sectors. If the political will exists, this option will be feasible in Mauritania. This would mean that the government would engage in a sectoral development process with all the advantages such a strategy implies.

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(40) M. King et al.: "Medical Care in Developing Countries", London: Oxford Univ. Press (1972).

(41) V. Navarro: "A Systems Approach to Health Planning", Health Services Research (Summer 1969), 96-111.

Table 16. Correlation of Food Requirements of the Population and Production of Cereals, Meat and Fish (1980-2000)

	1980		1985		1990		1995		2000	
	tons	%	tons	%	tons	%	tons	%	tons	%
CEREALS	<u>Requirements</u>	225,440	255,400	287,900	324,670	366,400				
	<u>Production</u>	50,000	74,900	109,200	152,400	211,000				
		22.1	29.3	37.9	47.0	57.6				
			83,300	134,400	209,100	307,100				
			32.6	46.7	64.4	83.8				
			86,000	151,000	257,000	410,000				
			38.2	52.5	79.2	111.9				
MEAT	<u>Requirements</u>	24,630	28,370	32,460	37,010	42,180				
	<u>Production</u>	26,000	47,900	45,100	41,600	40,900				
		105.6	168.8	138.9	112.3	97.0				
			53,900	63,500	62,900	59,000				
			190.0	195.1	170.0	40.0				
FISH	<u>Requirements</u>	22,440	27,250	32,240	37,580	42,550				
	<u>Production</u>	20,000	27,500	50,500	72,500	90,600				
		89.3	100.9	156.7	192.9	212.9				
			100,000	150,000	175,000	200,000				
			367.0	465.3	465.7	490.0				

Remarks: a. Estimated 1980 production.

b. from 1985 on, three different production estimates for cereals:  
 1. with average technology; 2. with modern technology;  
 3. with techniques for increased production per hectare/  
 production unit. (See Development Option on Rural Production).

c. Cereal, meat fish requirements estimates are those calculated in Part Two of this report.

**Fig. 9** Islamic Republic of MAURITANIA.  
 Correlation between Food Requirements of the Population and  
 Production of Cereals, Meat and Fish (1980-2000).

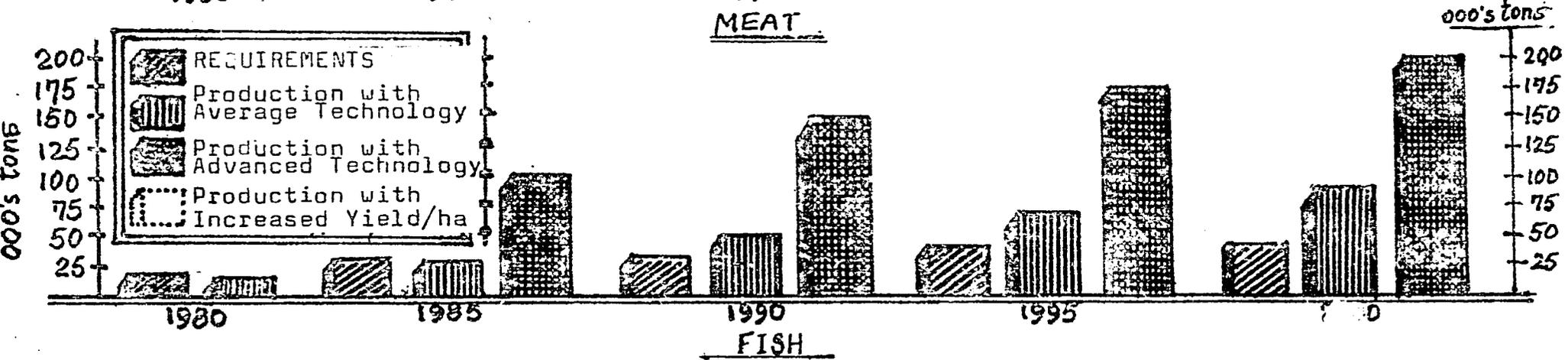
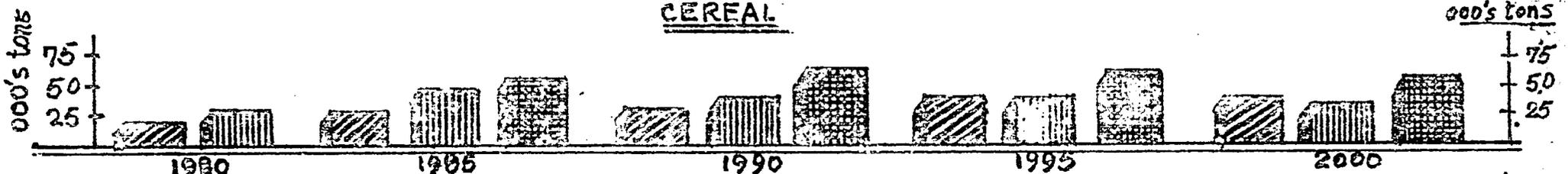
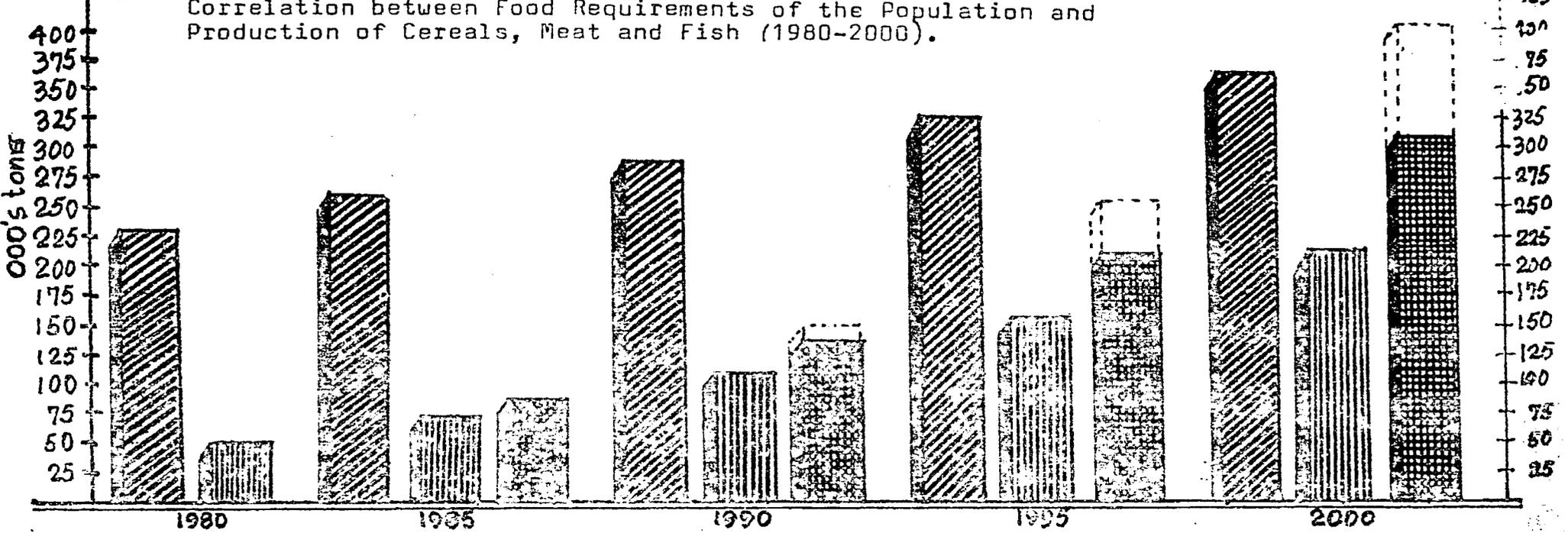
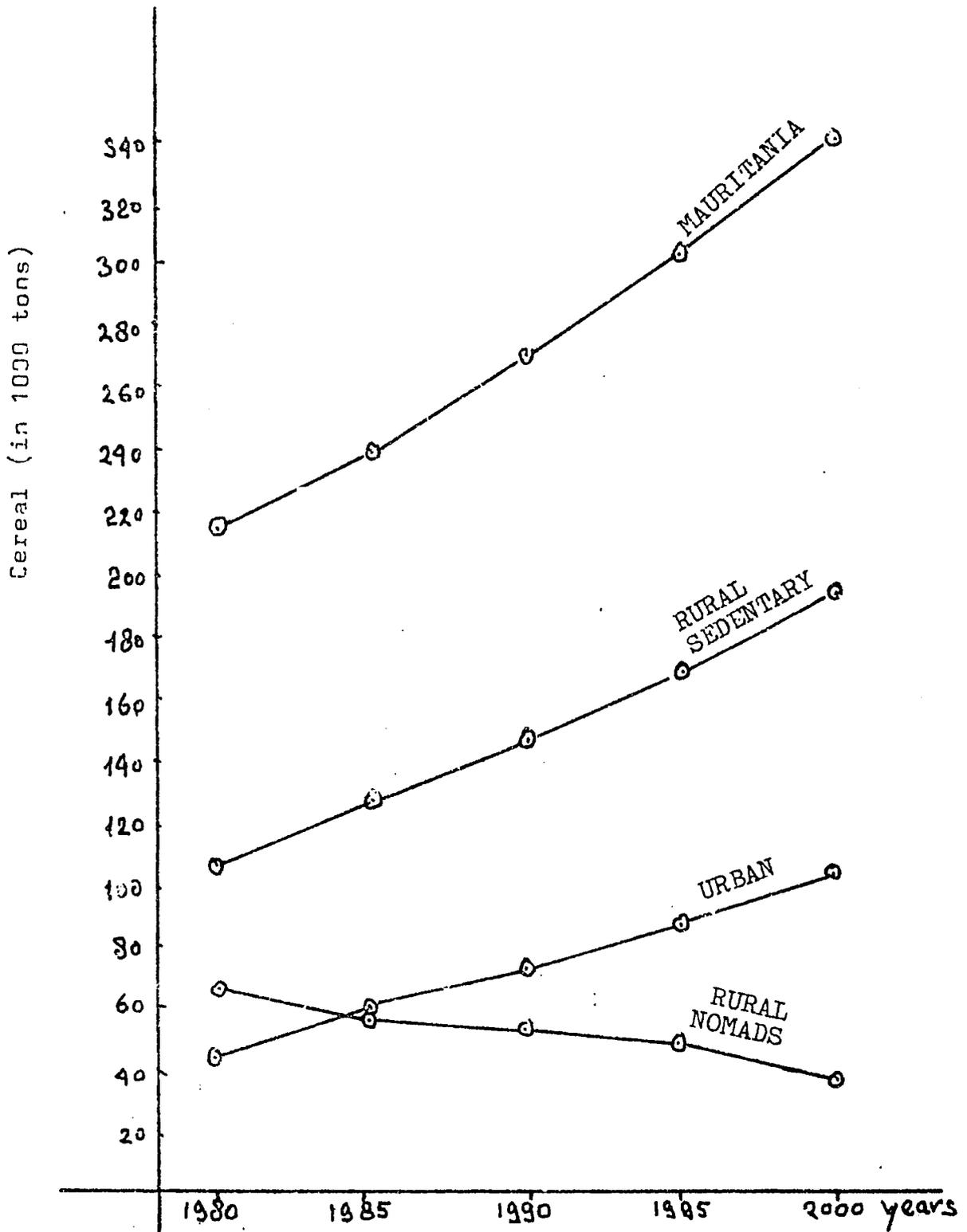


Figure 10. Cereal Requirements for a Balanced Diet:  
Urban, Sedentary Rural and Nomad Rural Population.



Source: Part II of this report.

## 5. OPTION D

Option D is the result of combining the other options: C (1981-1985); B<sub>2</sub> (1986-1990); B<sub>1</sub> (1991-1995) and A (1996-2000). It is, therefore, progressive over 5-year periods, parallel to the development cycle in Mauritania.

Experience in developing countries of Africa, Asia and Latin America has shown that overall planning can be rapidly achieved if there is a Ministry of Planning to integrate actions and decisions taken in the different sectors. The choice of strategies becomes relatively simple when priorities have been clearly identified. If, in the health sector, the strategy selected is to attain maximal coverage by year 2000, Option D will probably be chosen. The reason is simple: the state of health is the result of the physical, mental and social well-being of the population; it reflects progress achieved in the "quality of life". This process extends slowly throughout the country: strategies which take the time factor into account are, therefore, better adapted to such a process. The 5-year readjustments implicit in this option allow sufficient time so that planned activities may show concrete results; following evaluation, changes may then be made.

Option D is thus a viable option from the technical point of view. However, there are 2 prerequisites for its success: first, a detailed program of action must be developed, and, second, training of personnel must be rapidly initiated. These two activities must begin before implementation of a 5-year segment. Diagram 2 (page 59) clearly illustrates this point.

### III. Financial Feasibility

The Fourth Health Plan presents a health budget separated into recurring costs, capital costs and special projects (Table 2). Only recurring costs would be covered by the national budget.

WHO recommends that a nation's health budget be between 8 and 12% of the national budget. In Mauritania in 1967, the health budget was at a level of 7%; since then, its level has decreased because of the difficult financial situation of the country. At present, the budget of the Ministry of Health is not sufficient to cover the necessary expenses and the increased prices of medication, transportation and equipment.

Cost estimates of the different options are based on the following assumptions:

1. Budgetary estimates of the Fourth Health Plan (1981-1985) serve as a basis for the projections;

2. Recurring costs estimated for 1985 will increase at an annual rate of 6%;
3. Percentage of health budget recurring costs, as compared to government operating costs, will increase in a progressive manner: 8.5% in 1985; 10.0% in 1990; 11.5% in 1995; and 12.0% in the year 2000;
4. Capital costs and special programs will be financed by donations or concessionary loans (low percentage, several years grace period on interest and maturity at long term);
5. Capital costs will increase greatly from 1985 to 1990 and decrease rapidly from 1995 to 2000;
6. Rate of inflation will be 7% per annum during the 1985-2000 year period;
7. Expenses calculated for basic needs will be covered by foreign aid, the Mauritanian government, the community itself and the private sector;
8. Population growth rate will be 2.5% annually during the period 1981-2000 (with a probable increase of natural growth rate due to a decrease in 0-5 year age group mortality). However, this decrease will be counter-balanced by emigration of Mauritanian labor in search of work in neighboring countries as a result of unemployment and socio-political factors;
9. Cost of Option C during the period 1986-2000 will correspond to the projection of trends established for the period 1981-1985;
10. Cost of Options B<sub>2</sub>, B<sub>1</sub> and A will be at the same level. The best health coverage obtained will be more the result of applying a more efficient methodology than the increase of cost of a particular option;
11. Cost of Options B<sub>2</sub>, B<sub>1</sub> or A will be equal to the cost of Option C plus the cost of the program to satisfy basic health needs for 20% of the Mauritanian population; and
12. Strategy proposed by RAMS to increase GNP (taking into account the constraint of an 18% debt factor during the period 1981-2000 (42)) will be adopted by Mauritania.

Financial estimates were established on the basis of the foregoing assumptions, as well as on the rate of growth and level of spending in the health sector. These aspects will permit an analysis of the financial viability of the options proposed.

The cost of the program for "satisfaction of basic needs" will cause variations in the financial budget of options B<sub>2</sub>, B<sub>1</sub> and A as compared to Option C. Table 17 presents the annual recurring and investment costs (1985, 1990, 1995, 2000) of the

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(42) RAMS Macro Economic Simulation Model for Assessing Alternate Development Strategies, 1981.

Table 17. OPTION B<sub>2</sub>. Satisfaction of Basic Human Needs (570 Villages)  
 Cost Estimates (based on Table 10) Budget 1985-2000  
 (millions UM in constant 1980 prices)

Type o Cost	Recurring Costs				Capital Costs			
	1985	1990	1995	2000	1985	1990	1995	2000
<u>Mobilization Costs</u>								
<u>Construction and Equipment</u>								
Village health units, training health worker	7.8	34.9	69.8	92.7	7.3	25.5	42.2	8.1
<u>Operation of posts, medica- tion, food supplements (stock)</u>								
	5.0	46.0	170.3	-	-	-	-	-
<u>Supervision + Control Costs</u>								
<u>Vehicles, housing, training, salaries, fuel, maintenance for 57 supervisors</u>								
	0.8	8.6	12.1	12.5	1.8	6.4	10.8	2.2
<u>Improvement of Village Water</u>								
<u>Construction, operation + maintenance of 428 wells, 142 borings</u>								
	1.5	13.4	46.8	69.8	13.6	49.0	82.3	17.2
<u>Technical Assistance/Vaccination</u>								
<u>Improvement of management, supervision, distribution medication, planning, vaccination</u>								
	9.5	4.5	3.1	2.2	5.7	2.0	1.8	1.8
Total (constant 1980 prices)	24.6	107.4	302.1	177.2	28.4	82.9	137.1	29.3
Total (current prices*)	35.2	215.2	849.2	698.7	40.7	166.1	385.3	115.5

\*GNP inflators: 1985: 143.2; 1990: 200.4; 1995: 281.1; 2000: 394.3.  
 The percentage of recurring costs of basic care as compared to total recurring costs  
 (OPTION C) are: 1985: 3.3%; 1990: 10.4%; 1995: 22.0%; 2000: 9.6%

elements of the basic health care program. The costs increase progressively until 1995 and rapidly decrease thereafter. Thus, the activities of the program will begin relatively slowly in order to gain experience and evaluate preliminary results. The cost of food supplements (milk, cereals, oil) has been included in recurring costs during the first three 5-year periods, but excluded from the last. The assumption is that nutrition campaigns will have been sufficiently successful after this period. Table 17 presents overall costs to the partners of the program: the government, the community, the international aid agencies and the private sector. The percentage of their contributions will depend on the strategy selected.

Table 18 presents the cost estimates for Health/Nutrition services by option. As already mentioned, the lowest cost falls to Option C due to its exclusion of basic health care programs.

Table 19 shows annual cost estimates for health services per capita and per person treated, according to the percentage of coverage of each option. The highest cost per person treated is found in Option C; the lowest cost in Option A. Figure 11 presents these data in graphic form.

Tables 20 and 21 present the financial viability of the options. As a point of reference, the Option Paper on Macro Simulation Model for Assessing Alternative Development Strategies, which presents macro-projections up to the year 2000, has been used. (42)

Table 20 compares the recurring costs of the five options with government operating expenses. In Option C, the percentage of recurring costs correspond to the levels provided under the assumptions used, except for the year 2000 where they exceed the estimates by 1.4%. The other options correspond to estimates for 1985 and 1990, but exceed these estimates by 2.5% in 1995 and by 2.7% in 2000.

This would present a problem if the government were required to cover these costs; however, according to the strategy proposed, the costs for satisfying basic human needs would come from the community concerned, international assistance, the private sector and only partially from the government.

In general, the options follow the assumptions as to recurring costs.

Table 21 compares capital costs of the five options with government costs (public sector plus services). This demonstrates that with the exception of the year 1985 for Option C and the year 2000 for all the options, capital costs for health programs can not

be financed from the national budget. It would be necessary to call upon external financing to meet costs as recommended in assumption 4 above.

The macro model cited above permits the development of hypothetical growth schemes, as well as comparison between resources and needs, according to the constraints of the system in question. Assumptions could also be changed to modify resources, as these are in direct relationship with the assumptions. However, this exercise should be reserved to establish the compatibility of the different options. Within the health sector, the series of assumptions made are compatible with the macro model.

Consequently, from a financial point of view (on the basis of the assumptions presented above), all of the options are feasible.

Table 18. Cost Estimates of Health Services Based on Different Options:  
1985, 1990, 1995 and 2000.  
 (millions \$)

Year/ Option	Costs	Constant Prices (1980)			Current Prices *		
		Recurring Costs	Capital Costs	Total Costs	Recurring Costs	Capital Costs	Total Costs
<u>1985</u>							
Option C		767	185	952	1,098	265	1,363
Options B <sub>2</sub> , B <sub>1</sub> , A, D		792	213	1,005	1,153	308	1,439
<u>1990</u>							
Option C		1,026	800	1,826	2,056	1,603	2,659
Options B <sub>2</sub> , B, A, D		1,135	833	2,018	2,271	1,769	4,040
<u>1995</u>							
Option C		1,573	500	1,873	3,660	1,406	5,266
Options B <sub>2</sub> , B, A, D		1,675	637	2,312	4,709	1,791	6,500
<u>2000</u>							
Option C		1,837	50	1,887	7,243	197	7,440
Options B <sub>2</sub> , B, A, D		2,014	79	2,093	7,942	313	8,255

\* GNP inflation: 1985: 143.2; 1990: 200.4; 1995: 281.1; 2000: 394.3.

US

Table 19. Recurring Costs per Capita and per Person treated based on Option and Year: 1985, 1990, 1995, 2000 (in UM)

Year/ Options	Population/ Recurring Costs	Population	Recurring Costs Constant Prices (1980)		Recurring Costs Current Prices *	
	%	Population (000')	Cost per capita	Cost per pers.treated	Cost per capita	Cost per pers.treated
<u>1985</u>	100	1,636	UM	UM	UM	UM
Option C	28	458	469	1,674	671	2,397
Option B <sub>2</sub>	33	540	484	1,467	692	2,098
Option B <sub>1</sub>	38	622	484	1,273	692	1,822
Option A	43	704	484	1,125	692	1,610
Option D	30	491	484	1,613	692	2,308
<u>1990</u>	100	1,852	UM	UM	UM	UM
Option C	30	556	554	1,845	1,110	3,698
Option B <sub>2</sub>	40	741	612	1,529	1,226	3,064
Option B <sub>1</sub>	50	926	612	1,224	1,226	2,453
Option A	60	1,111	612	1,020	1,226	2,044
Option D	45	833	612	1,360	1,226	2,726
<u>1995</u>	100	2,096	UM	UM	UM	UM
Option C	35	734	655	1,871	1,842	5,259
Option B <sub>2</sub>	50	1,048	799	1,598	2,247	4,493
Option B <sub>1</sub>	65	1,362	799	1,230	2,247	3,457
Option A	80	1,677	799	999	2,247	2,808
Option D	72	1,509	799	1,110	2,247	3,121
<u>2000</u>	100	2,371	UM	UM	UM	UM
Option C	40	948	775	1,938	3,076	7,640
Option B	60	1,422	849	1,416	3,371	5,585
Option B <sub>2</sub>	80	1,897	849	1,062	3,371	4,187
Option A	100	2,371	849	849	3,371	3,350
Option D	90	2,134	849	944	3,371	3,722

\* GNP inflation: 1985: 143.2; 1990: 200.4; 1995: 281.1; 2000: 394.3

Figure 11. Cost per Person Treated - Options C, B<sub>2</sub>, B<sub>1</sub>, A and D (in constant 1980 prices and current prices).

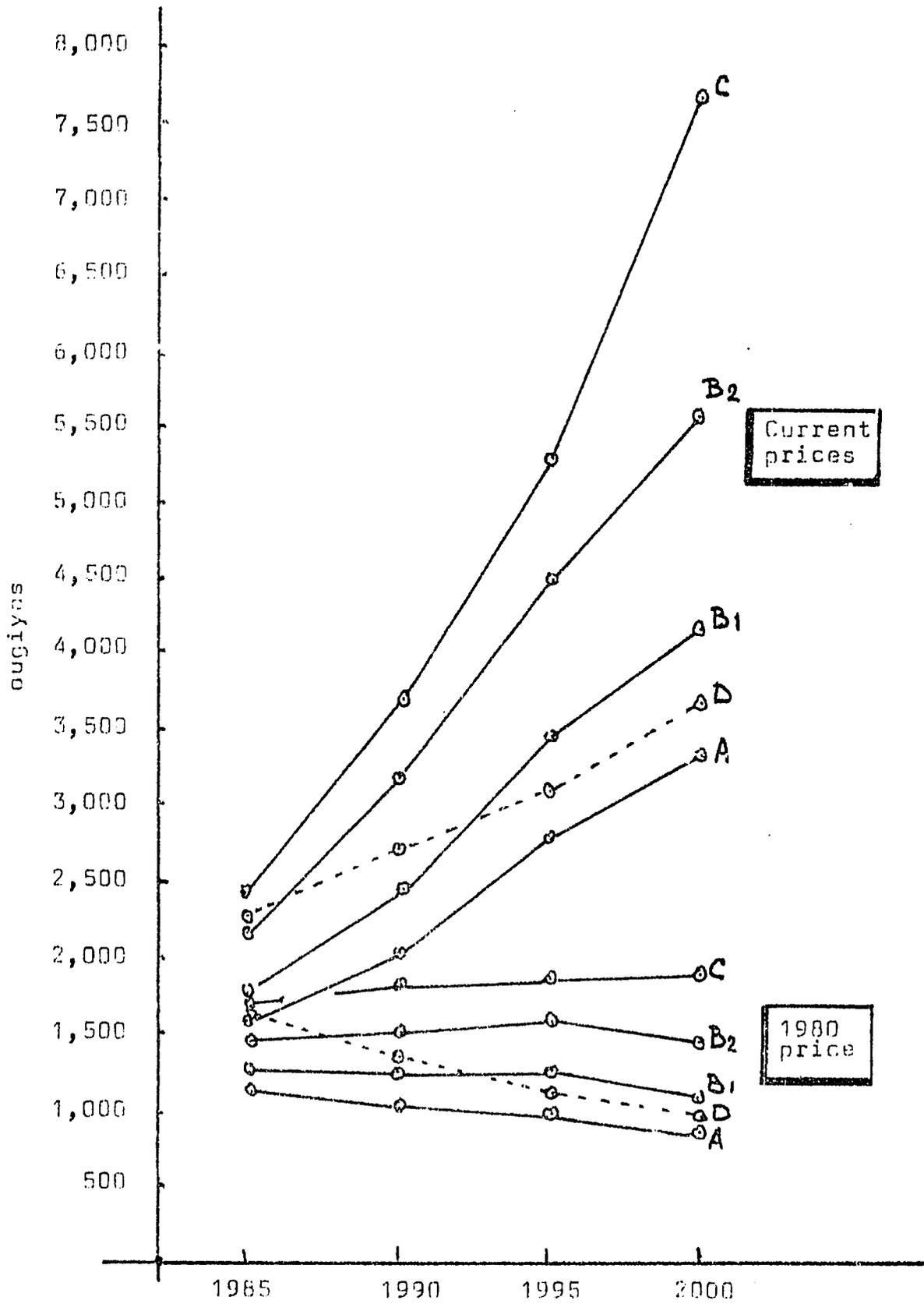


Table 20. Financial Viability of Options  
Government Operating Budget Compared to Recurring Costs of Options  
 (billions UM in current prices)

Allocation	1985		1990		1995		2000	
	10 <sup>9</sup> UM	%						
<u>Government</u> <u>Recurring Costs</u>	12.9	100.0	20.8	100.0	33.5	100.0	53.9	100.0
Option C	1.1	8.5	2.1	10.1	3.9	11.6	7.2	13.4
Options B <sub>2</sub> , B <sub>1</sub> , A, D	1.1	8.5	2.3	11.1	4.7	14.0	7.9	14.7

Source: Macro-Economic Model for Assessing Alternative Development Strategies,  
 Tables 36 and 53.

Table 21. Government Capital Costs (Public Sector plus Services)  
as Compared to Option Capital Costs  
 (billions UM in current prices)

Allocation	1985		1990		1995		2000	
	10 <sup>9</sup> UM	%						
<u>Government</u> <u>Capital Costs</u> (Public Sector plus Services)	3.2	100.0	7.3	100.0	8.1	100.0	6.1	100.0
Option C	0.3	9.4	1.6	21.9	1.4	17.3	0.2	3.3
Options B <sub>2</sub> , B <sub>1</sub> , B, A, D	3.1	96.9	1.8	24.7	1.8	22.2	0.3	4.9

Source: Ibid.

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7. 1980 Budget Distribution: 875 million UM, of which 39.4% corresponds to capital costs. 1981 Budget Distribution: 1.025 million UM, of which 43.4% corresponds to capital costs. All prices expressed in constant 1980 prices; the real increase is 17.1% in 1981.
8. Projection of the 1,338,830 at an annual rate of 2.4% (from January 1, 1977 to July 31, 1980), results in 1,454,808 persons instead of 1,521,334 (4.6% excess). Hodh Oriental would have 134,953 persons instead of 143,826 (6.6% excess) and Brakna, 164,464 persons instead of 172,200 (4.7% excess).
9. Census results: 0-14: 44.0%; 15-64: 52.2%; 64+: 38%. Fourth Plan Projections: 0-14: 45.2%; 15-64: 51.7%; 64+: 3.1%. Changes of this order are unlikely over 1 3/4 year period. Precise calculations would be possible only if there were correct registration of births, deaths and international migrations.
10. Alma Ata Declaration: International Conference on Basic Health Care, WHO, UNICEF, Alma Ata, URSS, September 1978.
11. Ministère de la Santé-Mauritanie, 1980. Diagnostic des cas informés par les formations sanitaires.
12. RAMS, Population Projections, 1980.
13. Modern migration has an undeniable impact on the Mauritanian, regardless of his ethnic origin. However, it should be noted that most of the immigrants, whether they be in France, in

Mauritanian towns or villages or in other African countries (Senegal, Mali, Ivory Coast), live in very difficult physical circumstances and often well below normal living conditions of the countries' inhabitants.

14. RAMS State of Health in Mauritania, 1981.
15. The Koran discourages polygamy. It insists on the fact that a man must not only maintain his wives at the same economic level but also provide the same amount of affection; as this is quite difficult to accomplish, the Koran discourages men from polygamous marriage unless they know themselves to be capable of meeting these requirements.
16. RAMS Food and Nutritional Situation in Mauritania, 1981.
17. It should be noted that money sent home by migrants has been of important aid to their families. See RAMS study on Migration, 1980.
18. Since the drought, the practice of force-feeding has considerably decreased, not only due to economic conditions but also to new aesthetic considerations, gradually introduced by contact with urban areas.
19. RAMS study on Formal Education
20. See RAMS Social Organization of Agricultural Production, 1980.
21. Migration, Op. Cit.
22. In its World Development Report (1978) The World Bank noted that the urban growth rate in black Africa was 5% per year. In Mauritania, it was estimated that 1.2% of the population lived in Nouakchott in 1967 and 9.6% in 1977. In 1960, the population of Nouakchott was 5,000. Today, the city's population is unofficially estimated at over 200,000, with most of the migration having occurred after the drought. See RAMS Demographic Projections, 1980.
23. In 1965, a survey of a sample of 1/7th of the population conducted by CEDES (Société Française d'Etudes pour le Développement Economique et Social) estimated the population at 1,028,200 persons. The national population census of January 1, 1977 came up with a population of 1,338,830. The population projections presented in the table for 1980, 1985, 1995 and 2000 correspond to RAMS estimates.
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**HEALTH/NUTRITION**

**PART II**

**FOOD REQUIREMENTS AND NUTRITION STRATEGY**

**ESTIMATES FOR YEAR 2000**

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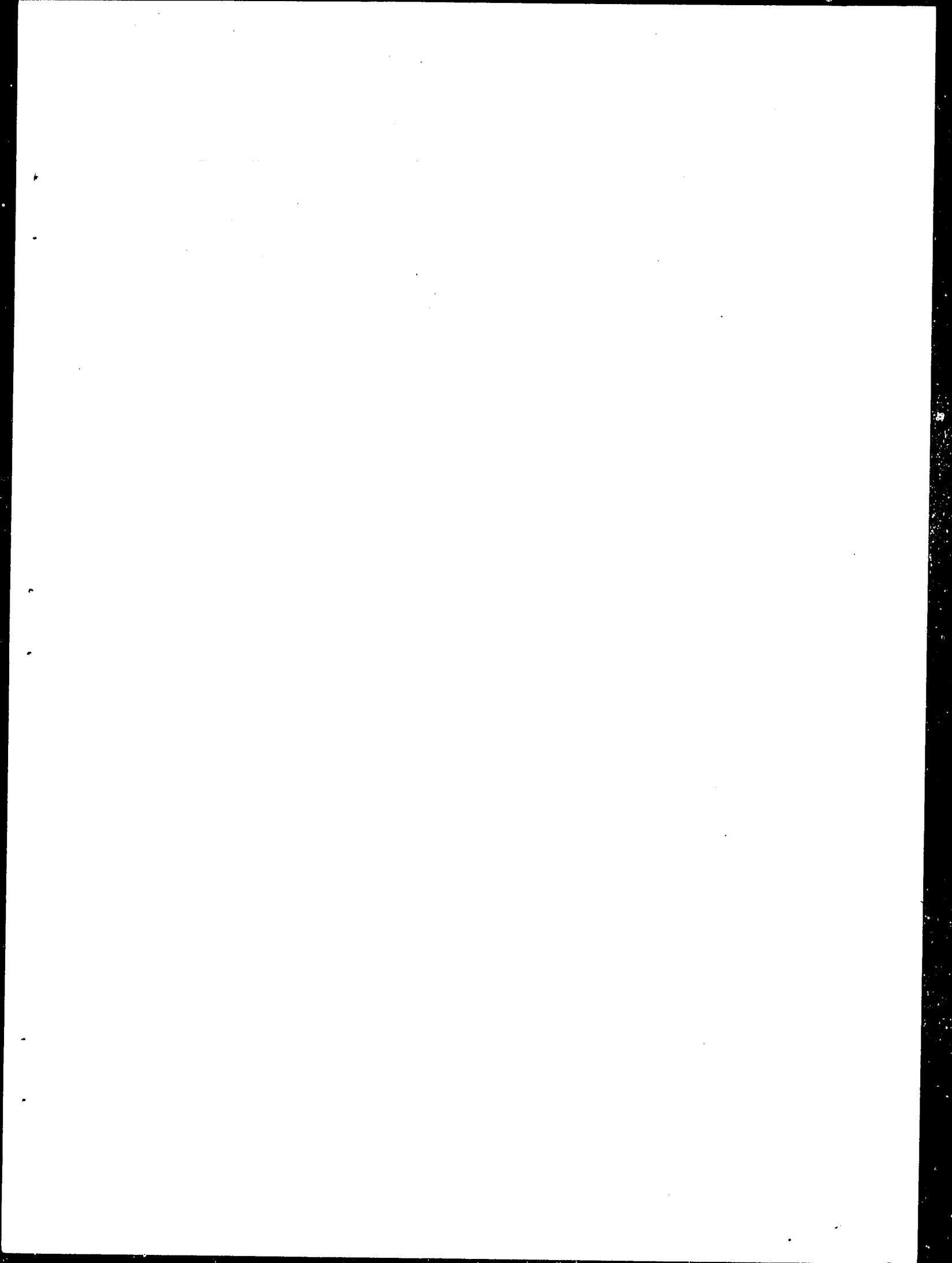
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A. Food Requirements

In order to calculate the volume of food required to cover future needs, the nutritional requirements of the population must be determined. Given irregularity of distribution, the volume of food required will be greater than that corresponding to exact coverage of food needs, unless perfectly equitable food distribution can be assured, which is practically impossible.

I. Calculation of Energy Needs

Energy needs were calculated according to the recommendations of the FAO and WHO.<sup>(1)</sup> They take into account the average weight per age, based on the results of epidemiological surveys conducted by the Mauritanian National Hygiene Center (1980-81). The relative weights of the different age groups were also taken into consideration as well as the level of activity of the different categories of workers. The distribution of the different age groups on the age pyramid is that determined by the results of the national population census in 1977. This distribution is on a national level; distribution probably differs among the nomadic, sedentary rural and urban groups.<sup>(2)</sup> Due to better health coverage in the towns, particularly Nouakchott, infant mortality is lower than in the rural milieu, and thus, the percentage of children is higher in towns.<sup>(3)</sup>

These different food rations were calculated for the sedentary rural, nomadic and urban groups (see Tables Annex 1 and 2). In calculating the sedentary rural rations, 25% of the women were considered to be highly active. Household work in this milieu often includes the pounding of cereals, drawing of water and carrying the heavy containers over long distances, searching for firewood - - all of which require high energy expenditure. In certain ethnic groups, the women also participate in agricultural work. Thus the rural woman has a regular and fairly heavy workload throughout the year.

The average net requirement per person and per day thus calculated (see Table Annex 1) is 2,172 K calories. A safety margin of 10% is added; the nutritional needs of sedentary rural populations are thus estimated at 2,400 K calories per person/day.

- 
- (1) FAO, Energy and Protein Requirements, FAO Meeting on Nutrition, Report No. 52, Rome 1973.
- (2) Distribution of Population by Age and Sex, Department of Statistics, RIM.
- (3) Estimated infant mortality in urban milieu : 170/1000.  
Estimated infant mortality in rural milieu : 200/1000.

In calculating the energy ration of nomads, 75% of the women and 40% of the men were considered to have a low level of activity, nomadic activities being quite different from sedentary rural activities. Much of the women's work, such as weaving mats or making leather cushions does not require great physical effort. Only part of the men participate in major migrations.

The average net requirement per person and per day thus calculated (see Table Annex 2) is 2,078 K calories with the 10% safety margin.

In calculating the energy ration of urban populations, 50% of both men and women were considered to have a low, or sedentary, level of activity.

Calculated average needs would be 2,072 K calories per person per year. Taking into account the over-estimation of needs resulting from the age pyramid utilized, the average needs are maintained at 2,100 K calories per day.

## II Balancing the Rations.

A "recommended ration" that takes into account energetic needs previously defined is proposed for sedentary rural, nomadic and urban populations. These rations include 53 to 70% of K calories from protein origin from which 26 to 30% are of animal protein origin and 20 to 24% of lipid origin.

The protein ration established takes into account the consumption of vegetable proteins, provided mainly by cereals and peanuts. These were balanced with animal proteins to provide the B<sub>2</sub> and B<sub>12</sub> factors essential for production of human proteins.

The protein ration may appear high. However, protein requirements are higher for anemic individuals, and the cases of anemia in Mauritania are numerous. In addition, recent work shows that if maintenance of good public health is sought, rather than simple nitrogen equilibrium,<sup>(4)</sup> the protein needs of young adults would be on the order of

---

(4) As was the purpose in establishing FAO/WHO protein requirements.

0.74 gm/kg body weight/day instead of 0.59 gm.(5) (6) In fact, Mauritians already consume a fairly high ration of meat.

These recommended rations of average annual rations were established for the purposes of planning, in order to evaluate food requirements. However, given the unequal distribution of energy expenditures throughout the year, the rations consumed will vary as a function of the season and the work performed, especially among the sedentary rural populations.

#### 1) Ration for Sedentary Rural Populations

Three different rations were selected for the sedentary rural populations, in order to take into consideration the differing dietary habits of the ethnic groups and ecological conditions of the different regions. They all contain 66% K calories of cereal origin.

The relative distribution of the different cereals (millet, rice and wheat) varies from one region to another - these regions were grouped into three models, corresponding to the three recommended rations (see following Tables 1, 2 and 3).

The quantities cited as "kg/year/person" concern food products as purchased : millet grain, hulled rice, whole fresh fish, etc. Millet and wheat are considered to be hulled.

The variety of products and quantities recommended are based on the author's observations and analysis of the RAMS food consumption survey.(7)

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- (5) N.S. Scrimshaw. An analysis of past and present recommended dietary allowances for protein in health and disease, The New England Journal of Medicine 294, Jan. 15-22, 1976, pp. 136-142 and 198-203.
- (6) N.S. Scrimshaw. Protein requirements of man; J. of Nutrition, May 1975, Vol. 5, No. 5, pp. 534-542.
- (7) J. Mondot-Bernard. Analysis of Food and Nutritional Situation in Mauritania, March 1981. Study Mission for Evaluation of Rural Sector and Human Resources in Mauritania.

## 2) Rations for Nomadic Populations

The ration for nomadic populations includes 70% K calories of cereal origin; this may appear surprising, as at present, the nomad's consumption of cereals per person per year is lower than that of the sedentary rural populations. However, given the very restricted variety of foods available to them, those nomads who satisfy their dietary needs have a very high proportion of cereal K calories in their rations - from 70 to 80%.

As shown in Table 4, although the recommended ration covers the energy requirements in proteins and fats, it is lacking in green vegetables and fruits (except dates). The Vitamin C ration may not be satisfied, except among those nomads who participate in the Guetna during the date harvest season. Nomads could procure fresh vegetables when passing by oases, if this dietary habit were acquired.

This ration recommends a substantial increase of cereal consumption among the nomads :150 kg/year/person instead of the 80 to 95 kg. which many presently consume. Will this be possible given the level of revenues and transport difficulties? However, this is the only way to balance the nomads' ration; it is not realistic to increase meat consumption sufficiently to attain a high caloric ration while maintaining low cereal rations. It should also be noted that this ration includes more fats than are usually consumed by the nomads.

## 3) Rations for Urban Populations

Urban rations include more bread than those of the sedentary rural; fish rations are higher and, in general, this ration reflects the present general situation by being more diversified (see Table 5). It includes only 63% of calories of cereal origin.

## III. Food Requirements in the Year 2000

Food requirements for the year 2000 were established for each region, and within each region for the three categories: sedentary rural, nomadic and urban. The population used for these calculations is based on RAMS projections.<sup>(8)</sup>

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(8) Demographic Projections, RAMS project.

Table 1

Recommended Ration

Sedentary Rural Regions: Hodh El Chargui, Hodh El Charbi and Assaba

Products	Per Person		Calories	Proteins g.	Lipids g.	Remarks
	Kg/year	g/day				
<u>Flour or Semolina</u>		400	1,480	31.5	9.5	
Millet 30%	47					
Rice 50%	73					
Wheat 20%	32					
	(152)					
Bread, noodles,						
wheat flour	1,3	20	72,8	2.0		
Root vegetables	4,75	13	11.8			
Unshelled peanuts	7,3	20	73.6	3,1	6.0	
Watermelon seeds	7,3	20	103.6	3,7	7,7	
Beans, peas	5,5	15	51	3,5	0.2	
Sugar	14	38	152			
Beef	3,6	10	15.8	1.2	1,2	
Camel	7,3	20	17	2.9	0,5	
Sheep	3,6	10	19,9	1,3	1,6	
Chicken	2	6	9,9	0,9	0,6	
Milk	45	125	98,7	4,7	6,0	
Fresh Fish	14,6	40	26,7	4,9	0,6	
Oil	5,5	15	135		15	
Butter	5,5	15	127		15	
Vegetables	18,2	50	20	0,6		
Fruits	9,1	25	12			

Calories	2,426	60.3	63.9
of which animal origin =		15.9	
or		26.4%	

Characteristics of this ration

Total calories	2,426
Calories of protein origin	10%
Calories of lipid origin	23.7%

Table 2

Recommended Ration

Sedentary Rural Regions: Gorgol, Brakna, Trarza, Guidimakha

Products	Per Person		Calories	Proteins	Lipids
	Kg/year	g/day			
<u>Flour or Semolina</u>		410	1,517	32.3	9.8
1) Region IV: Gorgol					
Millet 46%	74				
Rice 48%	71.8				
Wheat 6%	9.9				
	(155.7)				
2) Regions V: Brakna and X Guidimakha					
Millet 65%	105				
Rice 30%	44.9				
Wheat 5%	7.5				
	(157.4)				
3) Region VI: Trarza					
Millet 20%	33				
Rice 75%	112.2				
Wheat 5%	7.5				
	(152.7)				
Bread, noodles, wheat flour	7.3	20	72.8	2.0	
Root vegetables	4.75	13	11.8		
Unshelled peanuts	11	30	109	4.6	9.0
Beans	5.5	15	51	3.5	0.2
Sugar	14	38	152		
Beef	7.3	20	31.7	2.4	2.3
Sheep	7.3	20	39.7	2.5	3.2
Chicken	2	6	9.9	1.3	0
Milk	25.5	70	55.3	2.6	3.3
Fresh Fish	29.2	80	53.5	9.7	1.3
Oil	10.9	30	265		30
Vegetables	18.2	50	20	0.6	
Fruits	9.1	25	12		
			Calories 2,400.7	61.5	59
			of which animal origin	= 18.5	
			or	= 30%	

Characteristics of the ration

Total calories	2,400
Calories of protein origin	10.5%
Calories of lipid origin	22 %

Table 3

Recommended Rations

Rural Sedentary for Adrar, Dakhlet-Nouadhibou, Tagant, Tiris-Zemmour  
and Inchiri Regions

Food Items	per person		Calories	Protein g	Lipids g	Remarks
	kg/year	g/day				
Flour or Semolina		410	1,517	32.3	9.8	
Millet 25%	41					
Rice 45%	67.3					
Wheat 30%	49.3					
	(157.6)					
Bread, Noodles, Wheat flour	7.3	20	72.8	2.0		
Watermelon Seeds	7.3	20	73.6	3.1	6	
Pulses	5.5	15	51	3.5	0.2	1 Daklet Mutton 10 g. 19,9 ; 1,3 ; 1,6
Sugar	14	38	152			34,2 ; 5,7 ; 1
(1) Camel	21.9	60	51.2	8.6	1,6	(1) 40 g. camel
(1) Mutton	7.3	20	39.7	2.5	3,2	Daklet
Poultry	3.6	10	14.2	1.6	0,5	
Milk	45	125	98.7	4.7	6	
(1) Fish Dakhlet- Nouadhibou)	14.6	40	26.7	4.9	0,6	Fish: Daklet
Oil	5.4	15	135		15	
Butter	5.4	15	127.5		15	
Vegetables	18.2	50	20	0.6		
Dates	3.6	10	19.2			

Total Calories 2,372 58.9 57.9  
of which animal is 17.4  
thus 29.5%

Of Protein origin 10%  
Of Lipid origin 22%

Dakhlet-- K. calories 2,363  
Proteins 60.7  
Animal 18,2 thus 30%

Of Protein origin 10.3%  
Of Lipid origin 21 %

Table 4  
Recommended Ration  
Nomads

Products	Per Person		Calories	Proteins g.	Lipids g.
	Kg/year	g/day			
Flour or semolina		400	1.480	31.5	9.5
Millet 25%	40				
Rice 45%	65.7				
Wheat 30%	48				
	153.7				
Flour, noodles, wheat flour	7.3	20	72.8	2	
Beans, peas	1.8	5	17	1.2	
Sugar	14	38	152		
Dates	5.5	15	29		
Camel or Beef	3.6	10	8.6	1.5	0.2
Goat of sheep	10.9	30	95.6	3.8	4.8
Milk	84	230	181.7	8.7	11
Butter	5.4	15	135		15
Oil	1.8	5	45		5
Total Calories			2.180	48.7	45.5
of which animal origin =				14	
or				28.7%	
Calories of protein origin				9%	
Calories of lipid origin				18.9%	

Table 5  
Recommended Ration  
Urban Populations

Products	Per Person		Calories	Protein	Lipid
	kg/year	g/day			
<u>Flour or Semolina</u>		325	1,202	25.6	7.7
Rice 70%	83				
Millet 15%	19				
Wheat 15%	21				
	<u>123</u>				
Bread, noodles, wheat flour	18.2	50	122.5	3.5	0.5
Beans, peas	3.6	10	34	2.3	
Unshelled peanuts	7.3	20	103.6	3.7	7.7
Root vegetables	5.5	15	10	0.2	
Vegetables	18.2	50	20	0.6	
Fruits	9.1	25	12		
Sugar	14	38	152		
Fish	21.9	60	40.1	7.3	1
Beef	9.1	25	44.4	3.4	3.3
Sheep	7.3	20	39.7	2.5	3.2
Chicken	1.8	5	7	1	0-
Oil	9.1	25	225		25
Butter	1.8	5	45		5
Milk	18.2	50	39.5	1.8	2.3

Total Calories 2,096.88 51.9 56.7  
of which animal origin = 14.2  
or 27.3%

Calories of protein origin 10%  
Calories of lipid origin 24.3%

The food quantities given are those calculated for the recommended rations. It should be noted that the bread and sugar rations are maintained at present levels (or slightly lower for sugar) in order not to increase importation of these products.

Table 6 summarizes the food volumes required on a national level in order to satisfy the nutritional needs of the population. In the Annexes, Tables 3 through 7 present the quantities of each food product required per region. Annex Tables 8 through 20 present each region's food requirements.

The volume of cereals required, more than 366,000 tons, corresponds to almost double the volume presently available. Even if local production is increased to the maximum, it will not suffice to cover cereal needs. In any case, wheat and wheat flour must continue to be imported.

It is possible to decrease cereal requirements? The level of 154 kg/year/person has already been greatly surpassed by well-fed households observed during the surveys. At present, cereals are the least expensive food products on the market; their price may increase more quickly than other food products if the price to the producer is to be made sufficiently incentive. However, the price of wheat will still remain considerably higher than that of cereals.

In addition, cereals have the double advantage of supplying both calories and a fairly high quantity of proteins. Partial substitution for cereals may be assumed by legumes like the mung bean; however, it is presently consumed only in small quantities and production will probably remain fairly limited. Root vegetables could also replace part of the cereal ration, but this would require increasing other protein sources in the ration such as meat and fish, which are more expensive.

Therefore, great caution must be exercised in deciding to decrease the cereal portion of the ration; replacements by more expensive foods will favor the richer populations and may lead to a greater number of undernourished poor.

The energy of the recommended rations may be reduced by 10%; in this case, it will correspond to coverage of basic nutritional needs. However, this measure will require equitable food distribution, especially as concerns cereals. This 10% decrease, taking into account the different rations, corresponds to a cereal savings of 22.3 kg per person per year, or 52,800 tons.

If cereals are reduced, meat and vegetable consumption may be higher than recommended in the rations, and thus, food requirements will be met. However, nothing proves that those able to consume more meat and vegetables are not equally able to eat greater quantities of cereals than recommended.

About 313,450 tons of cereal will still be required for human consumption, to which must be added the grain required for planting and animal fodder, as well as losses.

This corresponds to an average cereal consumption per person of 132.1 kg. per year<sup>(9)</sup>. This is approximately the present consumption level in Mauritania, although unequal distribution causes it to vary from 190 to 100 kg per person per year. Observations have shown that those populations consuming the lowest cereal rations often also suffer from impoverishment of other elements in the ration (whether due to economic insufficiencies or supply difficulties). Thus these populations consume a ration which is often generally insufficient.

It is evident that, at the national level, it will be impossible to institute equitable distribution of foodstuffs. Therefore, part of the population will consume lower rations than those required for adequate nutrition of active workers.

Two schemes may be established for the calculation of projected food requirements :

Scheme 1 : 132.1 kg of cereal per person per year during the entire period; for all other foodstuffs, the quantities provided by the recommended rations described above.

Scheme 2 : 132.1 kg of cereal per person per year until 1985, following which 154.4 kg of cereal per person per year until the year 2000. For the other foodstuffs, the quantities provided by the recommended rations.

It is not possible to design a food strategy which will permit the State to assure a balanced nutritional ration to the population in

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(9)  $154.4 \text{ kg} - 22.3 \text{ kg} = 132.1 \text{ kg}$ .

Table 6

- 12 -

Food Requirements in the Year 2000

Products	Summary	
	Total tonnage	Kg/pers. year
Millet	102,506	43.2
Rice	176,865	74.6
Wheat	60,405	25.5
Total Cereals	366,400	154.4
Wheat flour (bread)	26,624	11.2
Beef	14,591	6.2
Camel	7,163	3.0
Sheep, goat	16,385	6.9
Poultry	4,037	1.7
Milk	83,502	35.2
Fish	40,550	18
Oil	18,208	7.7
Butter	6,627	2.8
Sugar	33,208	14
Unshelled peanuts	16,031	6.8
Watermelon seeds	4,752	2
Beans	3,544	1.5

it entirety. The food strategy proposed in the following chapter will attempt to :

1. describe those actions which, within the framework of agricultural development, will permit improved nutritional balance.
2. propose specific measures for the "target population" as defined in the basic health plan.<sup>(9a)</sup>

B. Food Production and Nutrition

I. Introduction

As indicated in the discussion of the food rations required to satisfy nutritional needs while respecting Mauritanian eating habits, it is important to maintain a high level of cereals in the ration to avoid their replacement by more expensive foodstuffs.

Cereal production does not appear sufficient, as shown by the calculations of rural production from 1980 to 2000.

While cereals remain the basis of the food ration, it should be emphasized again that these rations are often unbalanced by the unavailability of cereals, fresh vegetables and animal products furnishing indispensable proteins, especially for growing children.

The ration could be improved by familial production of these foodstuffs, at least among the farmers. Small scale animal husbandry (chickens, guinea fowl, sheep) and fish farming on a family basis could cover part of consumption needs. Land should be set aside for vegetable cultivation, so that one-crop cultivation (rice, in particular) does not cause further disequilibrium of the ration.

II. Nutritional Strategy and Rural Development

The food and nutrition problem must be approached as a whole. Insufficient rations are due not only to insufficient food supplies, but also to ignorance of nutritional requirements and the impossibility of the poorer populations to procure enough food. The following chapter, concerning satisfaction of essential health and nutrition needs, will present a specific approach to aid the poorer populations in satisfying their needs.

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(9a) Health/Nutrition Options, Dr. Ramiro Delgado, 1981.

An integrated approach to the food and nutrition problem necessarily links health and nutrition. These two factors depend on the availability of water. The basic health plan treats this problem. The integrated approach must also link agriculture and nutrition.

Increasing cereal production will require the replacement of traditional cultivation techniques by more elaborate methods using modern inputs (traditional farming + production factors such as improved seeds, fertilizers . . . , irrigated perimeter cultivation, more modern technology, use of tractors, etc.)

This passage from traditional techniques to more advanced technology cannot be done without training the farmers. Integrated development programs for villages or population groups will be required, instead of isolated agricultural, health or education sections. In addition, these programs must be designed with the participation of the populations concerned, taking the social context into account. This is essential if the population is to feel responsible for its own development, for otherwise, the programs risk failure. The final goal should be financial autonomy production units (see variables on Diagram A of Health/Nutrition Options report).

Integration can be done at two levels: (a) for adults, through a production unit monitor, who must have elementary nutritional training in order to explain to the farmers the reasons for varied production and the importance of balancing their rations. Both men and women, who often participate in agricultural production, will benefit from this instruction. When reforming the Nation Agricultural Training and Popularization School (ENFVA), it is essential to provide a nutrition course to each level, as this school will probably furnish the development agents concerned with these projects. (b) for children, nutritional education will be received through the rural schools (see report by Dr. Eric Raymaekers) at the level of modules 2 and 3, within the framework of practical activities corresponding to the vocation of the population concerned : agriculture, livestock raising, fishing, etc. Theoretical nutritional education will be part of science courses, which will be linked to observation themes inherent in the ecological context. .

Nutritional education, integrated in the development program as well as in the educational system, will thus develop as these two programs develop. We underline the fact that only active nutritional education is likely to give positive results. We repeat that it is not feasible to try to integrate it in the existing educational system. (10)

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(10) See conclusions of "Analysis of Food and Nutritional Situation in Mauritania", J. Mondot-Bernard, RAMS.

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C. Nutritional Strategy and Basic Health Care

1. Introduction

It is proposed that actions be centered on the rural populations of 570 villages which do not, at present, benefit from any health services. The objective is, above all, to reduce infant and young child mortality. Nutritional actions are very important, as very high mortality is found among children of weaning age (10 to 36 months). This mortality is also linked to close-set pregnancies, as newborns often have low birth weights due to the mother's exhaustion. It is difficult for the mother to provide sufficient care for a large number of small children. Improved nutrition of young children will reduce infant mortality and will thus have an indirect effect on the spacing of pregnancies. The death of a young child terminates nursing, and the mother may become more rapidly pregnant, as there is a statistical relationship between the length of nursing and the length of amenorrhea.<sup>(11)</sup> In addition, there may be a desire to replace the lost child.

II. Actions Proposed

1. Extension Service Personnel

It is proposed that two agents be responsible for the village health center. 1) A "nutritional agent" will be in charge of nutritional surveillance of the population as well as of educating the mothers. These conjugated actions should result in treatment of existing malnutrition cases, and on a medium and long term basis, in prevention of malnutrition. 2) The second agent will be a "basic health agent". These agents will be supervised by "health inspectors" (one inspector for ten health centers). However, it should be emphasized that it is not so much the agents themselves who are to be supervised, but rather the efficiency of the entire basic health program, in order to improve its functioning.

2. Nutritional Training of Health/Nutrition Supervisors

During their three years of training <sup>(12)</sup>, the health inspectors should receive a nutritional education essentially oriented towards practical application.

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(11) See J. Mondot-Bernard, O.E.C.D. Development Center, Paris 1977, Relationship between nutrition, fertility and mortality at young ages.

(12) See Basic Health/Nutrition report, Dr. Ramiro Delgado, 1981

These inspectors should be recruited from existing personnel: nurses, social workers (especially those trained in family and social education by the National School for Commercial, Familial and Social Teaching). They will then receive specialized training in courses designed to prepare them for their new roles as basic health inspectors.

On a medium and long term basis, the National Nursing and Midwives School, as well as the family section of the ENECOFAS, will probably provide the training of the basic health inspectors.

### 3. Training of Basic Health Care/Nutrition Agents

These future agents will be selected by the rural communities themselves from among the population. It is too early to precisely define their nutritional training program, but it will consist of theoretical and on-the-job training, directed by the first generation of health inspectors. The program will be divided into several themes: each theme will be studied and followed by periods of practical application in the communities concerned, with subsequent evaluation of results.

It should be emphasized that it is necessary to understand the village concerned and to study its living conditions (water supply, agricultural or other production systems, source of revenue of families) in order to define the context in which curative and preventive nutritional actions can be undertaken.

The population groups most vulnerable to malnutrition are pregnant and nursing women, as well as children aged from 0 to 6 years. Particular attention must be devoted to these groups; but their malnutrition must also be studied within the context of the budgetary unit to which they belong, in order to analyse the real cause of malnutrition.

### 4. Specific Actions

- a) Health and good nutrition are interdependent; thus, health and nutritional actions cannot be disassociated. However, the nutritional agent will be more particularly responsible for the growth and development of children, surveillance of their diets, as well as the composition and hygiene of food preparation for the entire family. Simple procedures must permit the mother to recognize the first signs of her child's malnutrition (such as a bracelet measuring the circumference of his arm). Inspection of hygiene in the home will be periodically performed by the health or nutrition agent.
- b) The family must be encouraged to produce, in as far as possible, other foods to complement the basic cereal ration, by gardening, small livestock raising, familial fish farming, etc. The responsibility for these activities might be given to the older children and adolescents.

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- c) One of the main points of this program will be to educate the mothers concerning weaning. They will be taught to prepare specific foods for the young child using local products (gruels of flour, millet, rice or wheat). For the very young children, mothers should be encouraged to use roasted flour (as predigestion is necessary for children from 5 to 6 months old, whose saliva does not contain enough amylase). Roasting of flour can be simply performed by continually stirring the dry flour on a metal sheet over the heat source.
- d) However, for those children presenting digestive intolerances when being weaned from maternal milk, special weaning products may be used. These products should be selected from the good, but inexpensive, specialized products available (higher prices are often due to expensive packaging), such as the "superamine" type manufactured in Algeria. In order to make the families completely responsible for their health and nutrition, each gift of food to the family should be accompanied by a corresponding requirement that the family offer some service to the community.
- e) A small food supply should be available at the beginning of the program to assist those families suffering from undernourishment due to lack of food. The ideal situation would be a food supply provided by the community itself, whether in kind or by a village fund created for this purpose. Only if this approach is not possible, and after analysis of the economic situation of the entire community, should it be decided to provide the basic health center with food supplies for alimentary supplements. These supplies will be used for those families having children, or nursing or pregnant women, suffering from malnutrition. The community itself could supervise the food supplement activities.
- f) When planning the health center building, which will be constructed with the aid of the population, a well-ventilated room should be provided for storage of foodstuffs. Conservation of this food supply should provide possibilities for the village people to study improved food storage methods.
- g) Recommendations concerning the medical aspects of treating serious malnutrition cases will be given in the health section of the report on basic health and nutrition.

III. Summary

After acceptance of this report by the government of the Islamic Republic of Mauritania and consultation with the rural zones concerned, a specific project, based on nutrition strategies within the framework of the basic health care program, can be elaborated. The first step of this strategy would be to train health inspectors. Following this, an experimental project could be conducted, based on a socio-economic study performed with the participation of a health inspector.

D) Recommendations for Food and Nutrition within the Framework of Existing Programs

1. Satisfaction of cereal needs

The chapter on food requirements underlines the volume of cereals necessary to satisfy the nutritional needs of Mauritania. Due to the current very low level of cereal production, a heavy cereal deficit exists. Even if cereal production were substantially increased, this deficit will remain considerable, due to increased demand caused by population growth.

At present, the basis of the food strategy must be to provide sufficient cereal for the country; several projects are underway or are being studied to stabilize cereal production in Mauritania. Particular attention must be devoted to the problem of cereal prices, to the relationship between the price to producers and the price to consumers. If the price to producers is not made more attractive, farmers will not be interested in producing and the production development projects linked to hydro-agricultural improvements will be destined to failure.

Another important aspect is the strategy to be employed in providing food aid to the poorer populations (actions of the Commissariat for Food Aid, the Red Crescent). These programs must serve to rehabilitate the marginal populations, particularly the newly-arrived migrants to urban centers. As with the strategy for the basic health and nutrition centers, the families concerned must feel responsible for their health and insertion in their communities. All food aid must correspond to a requirement of service from the family, until the family is able to leave the slums (either by returning to the rural zones within the framework of an improvement project, or by obtaining stable work in the town itself and benefiting from improved housing conditions).

The services required may concern improvement of sanitation conditions in the community : for example, participation in building a sewer network, street cleaning, planting and watering trees to protect the town ("green belt"), etc.

In addition, to improve these families' diets, plots of garden land should be made available, on the condition they be cultivated by the family itself and serve principally for its own consumption.

II. School Lunchrooms

At present, it is important to maintain the school lunchroom programs; however, it would be preferable to reinforce nutritional supervision and to allow the children to participate actively in their operation. On a medium and long term basis, the lunchrooms in the rural schools will benefit from the production of school gardens and may be operated under the financial responsibility of the village community.

III. Urban Nutritional Recuperation and Education Centers (CREN)

In food distribution, the same recommendations as apply to the rural basic health and nutrition centers should be employed by the CRENs. In addition, emphasis should be placed on the necessity for home visits by the centers' agents to families whose children receive care for severe malnutrition, in order to be sure the mother has correctly understood the dietary advice given by the Recuperation Center.

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Table Annex 2

Calculation of Energy Needs

Nomadic

Women average weight 53 kg.  
Men average weight 56 kg.

Urban

50% men and women low activity

Men

20-59

40% low activity

Women

75% low activity

20-70

Kcalo.100 persons

Kcalo.100 persons

Children

2,886.4  
12,393.4  
19,219.2  
19,527.9

Children

2,886,4  
12,393,4  
19,219,2  
19,527,9

Adolescents

7,529  
6,900  
9,144.8  
7,649.4  
13,249.6

Adolescents

7,529  
6,900  
9,144,8  
7,649,4  
12,249,6

Women

2,120 x 3.35	2,120 x 0.9 x 10.08	26,355.8
2,014 x 1.13	2,014 x 0.9 x 3.37	8,384.3
1,908 x 0.78	1,908 x 0.9 x 2.34	5,506.5
1,696 x 0.59	1,696 x 0.9 x 1.76	3,687.1
1,484 x 0.29	1,484 x 0.9 x 0.88	1,605.6
	Pregnant women	1,140.0
	Nursing women	1,590.0

Women

2,120 x 6.72	2,120 x 0.9 x 6.72	27,068.1
2,014 x 2.25	2,014 x 0.9 x 2.25	8,609.8
1,908 x 1.56	1,908 x 0.9 x 1.56	5,655.3
1,696 x 1.17	1,696 x 0.9 x 1.18	3,785.4
1,484 x 0.58	1,484 x 0.9 x 0.57	1,622.0
	Pregnant women	1,140.0
	Nursing women	1,590.0

Men

2,576 x 7.21	2,576 x 0.9 x 4.8	29,701.2
2,447.2 x 2.53	2,2447.2 x 0.9 x 1.69	9,913.5
2,318.4 x 1.78	2,318.4 x 0.9 x 1.18	6,588.8
2,060.8 x 1.48	2,318.4 x 0.9 x 1.18	3,049.9
1,803.2 x 1.10		1,983.5

Men

2,668 x 6	2,668 x 0.9 x 6	30,415.2
2,534.6 x 2.11	2,534.6x0.9 x 2.11	9,907.8
2,401.2 x 1.48	2,401.2x0.9 x 1.48	5,714.8
2,134.4 x 0.74	2,134.4x0.9 x 0.74	1,421.5
1,847.5 x 0.55	1,867.5x0.9 x 0.55	1,951.6

Total

207,879.2

Needs per person 2,078 Kcalories

207,284.4

Needs per person 2,072 Kcalories

Table Annex 3

Summary of Cereal Requirements for the Year 2000 by Region  
and Type of Cereal (Quantities in tons)

Region	Millet	Rice	Wheat	Wheat flour
Nouakchott	10,906	47,642	12,054	10,446.8
H. Chargui	9,794	16,913.6	8,290	1,991.6
H. El Gharbi	8,403	13,919.2	6,374	1,546.9
Assaba	9,484	15,836.5	7,425	1,740.1
Gorgol	13,670	15,922.0	3,005.1	1,976.5
Brakna	18,051	10,111.1	2,302.5	1,714.2
Trarza	8,908	25,465.1	5,893.5	2,447.0
Adrar	1,779	4,223.8	2,092.2	668.8
Dakhlet-Noudhibou	3,596	8,400	4,233.5	1,366.8
Tagant	3,942	7,009.6	4,719.6	853.6
Guidimakha	11,794	6,561.3	1,690.5	1,058.9
Tiris Zemmour	1,508	3,460.8	1,778.1	550.2
Inchiri	471	1,297.5	5,547.3	235.1
<b>Total</b>	<b>102,506</b>	<b>176,865</b>	<b>60,405</b>	<b>26,624.5</b>
kg/pers. 154,4	43,2	74,6	25,5	11,2

Total Cereals 366,401 tons

Table Annex 4

Summary of Meat and Milk Requirements for the Year 2000  
by Region and Type of Meat

Tons

Region	Beef	Camel	Sheep + Goats	Chicken	Milk*
Nouakchott	5,223.4	0	4,190.2	1,033.2	10,446.8
H. Charghi	985.4	1,022	1,435	326.8	12,485.2
H. El Gharbi	764.6	1,102.3	929.2	327.2	9,233.8
Assaba	859.9	1,248.3	1,092	365.4	10,811.7
Gorgol	1,604.5	-	1,627.3	432.8	5,972.7
Brakna	1,451.5	-	1,495.9	369.2	5,601.4
Trarza	1,756	-	2,269.9	371.4	11,335.1
Adrar	227.5	554.4	444.9	93	2,207.0
Dakhlet-Nouadhibou	445.9	949	591.7	218.2	3,816.8
Tagant	91	1,648.8	816.6	162	5,102
Guidimakha	917	-	999.4	229.8	4,058.7
Tiris Zemmour	172.9	594.9	346.7	188.2	1,644.8
Inchiri	91	43.5	145.7	20	731
<b>Total</b>	<b>14,590.6</b>	<b>7,163.2</b>	<b>16,384.5</b>	<b>4,037.2</b>	<b>83,501</b>

kg/person/year      6,2      3,0      6,9      1,7      35,2

Total Meat      42.176, or 17.8 kg/person/year

(\*) Fresh milk (liters)

Table Annex 5

Summary of Fish Requirements for the Year 2000  
by Region

Region	Fish (Tons)
Nouakchott	12,570.6
Hodh Charghi	2,613.4
Hodh El Gharby	2,511.2
Assaba	2,781.8
Gorgol	4,823.2
Brakna	5,285.2
Trarza	5,234.1
Adrar	547.5
Nouadhibou	2,022.1
Tagant	219
Guidimakha	3,306.9
Tiris Zemmour	416.1
Inchiri	219
Total	42,549.6
kg/yr/person :	17.9

Table Annex 6

Summary of Fat and Sugar Requirements for the Year  
2000 by Region

(tons)

Region	Oil	Butter	Sugar
Nouakchott	5,223.4	1,033.2	8,036
Hodh Charghi	1,129	1,184	3,276
Hodh El Gharby	1,004.7	996.1	2,474
Assaba	1,121.8	1,152.9	3,066
Gorgol	1,191.3	129.6	3,033
Brakna	1,016.7	108	2,786
Trarza	1,139.4	514.8	3,794
Adrar	371.5	217.8	798
Nouadhibou	796.9	439.2	1,596
Tagant	515.8	514.8	1,428
Guidimakha	1,269.8	95.4	1,820
Tiris-Zemmour	330.5	185.4	658
Inchiri	107.2	55.8	238
<b>Total</b>	<b>18,208</b>	<b>6,627</b>	<b>33,208</b>
<b>kg/year/person</b>	<b>7.8</b>	<b>2.8</b>	<b>14</b>

Total fats : 10.4 kg/pers/year.

Table Annex 7

Summary Requirements of Root Vegetables, Peanuts  
Watermelon Seeds and Beans for the Year 2000, by Region

(tons)

Region	Roots	Unshelled Peanuts	Watermelon Seeds	Beans
Nouakchott	3,157	4,190.2	0	2,066.4
Hodh Charghi	808	1,211.8	1,022.0	(986)
Hodh El Gharby	794.2	1,204.5	1,102.3	( 927.7)
Assaba	883.7	1,343.2	1,248.3	(1,050.3)
Gorgol	1,001	2,121.8	0	(1,080.7)
Brakna	906.2	1,968.2	0	(1,004.5)
Trarza	934.7	1,930.9	0	(1,109.1)
Adrar	137.5	182.5	175.2	236.4
Dakhlet-Nouadhibou	269.5	357.7	474.5	551.9
Tagant	55	73	525.6	468
Guidimakha	559.2	1,235.3	0	( 642.3)
Tiris-Zemmour	104.5	138.7	197.1	218.7
Inchiri	55.0	73	7.3	52.3
<b>Total</b>	<b>9,666</b>	<b>16,031</b>	<b>4,752</b>	<b>10,394.3</b>
kg/person/year	4.1	6.7	2.0	4.4

Table Annex 8

Food Requirements by Food Product for the Year  
2000 Nouakchott

Products	Kg/year	Population (000)	Total (tons)
Millet	19	574	10,906
Rice	83		47,642
Wheat	21		12,054
Bread flour	18.2		10,446.8
Cowpeas	3.6		2,066.4
Unshelled peanuts	7.3		4,190.2
Roots	5.5		3,157
Vegetables	18.2		10,446.8
Fruits	9.1		5,223.4
Sugar	14		8,036
Fish	21.9		12,570.6
Beef	9.1		5,223.4
Sheep	7.3		4,190.2
Chicken	1.8		1,033.2
Oil	9.1		5,223.4
Butter	1.8		1,033.2
Milk	18.2		10,446.8

Table Annex 9

Food Requirements by Food Product for the Year 2000 ( tons)

Hodh Charghi

Products	Rural Sedentary			Nomadic			Urban			Regional Total a + b + c
	Kg/yr.	Pop. (000) (a)	Tons	Kg/yr.	Pop. (000) (b)	Tons	Kg/yr.	Pop. (000) (c)	Tons	
Millet	47	140	6,580	40	68	2,720	19	26	494	9,794,0
Rice	73		10,220	66,7		4,535.6	83		2,158	16,913,6
Wheat	32	4,480	4,480	48		3,264	21		546	8,290,0
Bread flour	7,3		1,022	7.3		496.4	18,2		473.2	1,991,6
Root	4.75		665	0		0	5,5		143	808,0
Unshelled peanut	7.3		1,022	0		0	7,3		189,8	1,211,8
Watermelon seeds	7.3		1,022	0		0	0		0	1,022,0
Cowpeas	5.5		770	1.8		123.4	3.6		93.6	986.0
Sugar	14		1,960	14		952	14		364	2,276,0
Beef	3.6		504	3.6		244.8	9,1		236.6	985,4
Camel	7.3		1,022	0		0	0		0	1,022
Sheep	3.6		504	10.9		741.2	7,3		189.8	1,435.0
Chicken	2		280	0		0	1,8		46,8	326.8
Milk	45		6,300	84		5,712	18,2		473,2	12,485.2
Fresh Fish	14,6		2,044	0		0	21,9		569,4	3,021.2
Vegetables	18,2		2,548	0		0	18,2		473,2	3,021.2
Fruits	9.1		1,274	0		0	9,1		236,6	1,510.6
Oil	5.5		770	1.8		122.4	9,1		236,6	1,129.0
Butter	5.5		770	5.4		367.2	1,8		46,8	1,184,0
Dates				5.5		374				374

Table Annex 10

Food Requirements by Food Product for the Year 2000 (Tons)  
Hodh El Gharbi

Products	Rural Sedentary			Nomadic			Urban			Regional Total a + b + c
	Kg/yr	Pop. (000)	Tons ( a)	Kg/yr.	Pop (000) (b)	Tons	Kg/yr.	Pop. (000)	Tons (c)	
Millet	47	151	7.097	40	26	1.040	19	14	266	8.403
Rice	73		11.023	66,7		1.734,2	83		1.162	13.919,2
Wheat	32		4.832	48		1.248	21		294	6.374
Bread flour	7,3		1.102,3	7,3		189,8	18,2		254,8	1.546,9
Roots	4,75		717,2	0		0	5,5		77	794,25
Unshelled peanut	7,3		1.102,3	0		0	7,3		102,2	1.214,5
Watermelon seeds	7,3		1.102,3	0		0	0		0	1.102,3
Cowpeas	5,5		830,5	1,8		46,8	3,6		50,4	927,7
Sugar	14		2.114,0	14		364	14		196	2.674
Beef	3,6		543,6	3,6		93,6	9,1		127,4	764,6
Camel	7,3		1.102,3	0		0	0		0	1.102,3
Sheep	3,6		543,6	10,9		283,4	7,3		102,2	929,2
Chicken	2		302	0		0	1,8		25,2	327,2
Milk	45		6.795	84		2.184	12,2		254,8	9.233,8
Fresh Fish	14,6		2.204,6	0		0	21,9		306,6	2.511,2
Vegetables	18,2		2.748,2	0		0	18,2		254,8	3.003,0
Fruits	9,1		1.374,1	0		0	9,1		127,4	1.501,5
Oil	5,5		830,5	1,8		46,8			127,4	1.004,7
Butter	5,5		830,5	5,4		140,4	1,8		25,2	996,1
Dates				5,5		143				143

Table Annex 11

Food Requirements by Food Product for the Year 2000 Tons

Assaba

Products	Rural Sedentary			Nomadic			Urban			Regional Total a + b + c
	Kg/yr.	Pop. 000	Tons	Kg/yr	Pop 000	Tons b	Kg/yr.	Pop. 000	Tons c	
Millet	47	171	8.037	40	35	1.400	19	13	247	9.684
Rice	73		12.483	66,7		2.334,5	83		1.079	15.836,5
Wheat	32		5.472	48		1.680	21		273	7.425
Bread flour	7,3		1.248,3	7,3		255,5	18,2		236,6	1.740,4
Roots	4,75		812,2	0		0	5,5		71,5	883,75
Unshelled peanut	7,3		1.248,3	0		0	7,3		94,9	1.343,2
Watermelon seeds	7,3		1.248,3	0		0	0		0	1.248,3
Cowpeas	5,5		940,5	1,8		63	3,6		46,8	1.050,3
Sugar	14		2.394	14		490	14		182	3.066
Beef	3,6		615,6	3,6		126	9,1		118,3	859,9
Camel	7,3		1.248,3	0		0	0		0	1.248,3
Sheep	3,6		615,6	10,9		315,5	7,3		94,9	1.092
Chicken	2		342	0		0	1,8		23,4	365,4
Milk	45		7.695	84		2.940	18,2		236,6	10.871,6
Fresh Fish	14,6		2.496,6	0		0	21,9		284,7	2.781,3
Vegetables	18,2		3.112,2	0		0	18,2		236,6	3.348,8
Fruit	9,1		1.556,1	0		0	9,1		118,3	1.674,4
Oil	5,5		940,5	1.8		63	9,1		118,3	1.121,8
Butter	5,5		940,5	5,4		18,9	1,8		23,4	1.152,9
Dates				5,5		192,5				

Table Annex 12  
Food Requirements by Food Product for the Year 2000 (Tons)

Gorgeol

Rural Sedentary

Nomadic

Urban

Products	Kg/yr.	Pop 000	Tons a	Kg/yr.	Pop. 000	Tons b	Kg/yr.	Pop. 000	Tons c	Regional Total a + b + c
Millet	74	169	12,506	40	12.0	480	19	36,0	684	13,670
Rice	71.8		12,134.2	66.7		800.4	83		2,988	15,922.6
Wheat	9.9		1,673.1	48		576.0	21		756	3,005.1
Bread flour	7.3		1,233.7	7.3		87.6	18.2		655.2	1,976.5
Roots	4.75		802.75	0		0	5.5		198	1,000.75
Unshelled peanuts	11		1,859	0		0	7.3		262.8	2,121.8
Cowpeas	5.5		929.5	1.8		21.6	3.6		129.6	1,080.7
Sugar	14		2,266.0	14		168	14		504	3,038
Beef	7.3		1,233.7	3.6		43.2	9.1		327.6	1,604.5
Sheep	7.3		1,233.7	10.9		130.8	7.3		262.8	1,627.3
Chicken	2		368	0		0	1.8		64.8	432.8
Milk	25.5		4,309.5	84		1,008	18.2		655.2	5,972.7
Fresh fish	29.2		4,034.8	0		0	21.9		788.4	4,823.2
Vegetables	18.2		3,075.8	0		0	18.2		655.2	3,731.0
Fruits	9.1		1,537.9	0		0	9.1		327.6	1,865.5
Oil	10.9		1,842.1	1.8		21.6	9.1		327.6	2,191.3
Butter				5.4		64.8	1.8		64.8	129.6
Dates				5.5		66				66

Table Annex 13

Food Requirements by Food Product for the Year 2000 (Tons)

Brakna

Products	Rural Sedentary			Nomadic			Urban			Regional Total a + b + c
	Kg/yr.	Pop. 000	Tons	Kg/yr.	Pop. 000	Tons	Kg/yr.	Pop. 000	Tons c	
Millet	105	163	17,115	40	12	480	19	24	456	18.051
Rice	44.9		7,318.7	66.7		800.4	83		1,992	10,111.1
Wheat	7.5		1,222.5	48		576	21		504	2,302.5
Bread flour	7.3		1,189.9	7.3		87.5	18.2		436.8	1,714.2
Roots	4.75		774.2	0		0	5.5		132	906.25
Unshelled peanuts	11		1,793.0	0		0	7.3		175.2	1,968.2
Cowpeas	5.5		896.5	1.8		21.6	3.6		86.4	1,004.5
Sugar	14		2,282.0	14.0		168	14		336	2,786
Beef	7.3		1,189.9	3.6		43	9.1		218.4	1,451.5
Sheep	7.3		1,189.9	10.9		130.8	7.3		175.2	1,495.9
Chicken	2		326.0	0		0	1.8		43.2	369.2
Milk	25.5		4,156.5	84		1,008	18.2		436.8	5,601.3
Fresh fish	29.2		4,759.6	0		0	21.9		525.6	5,285.2
Vegetables	18.2		2,966.6	0		0	18.2		436.8	3,403.4
Fruits	9.1		1,483.3	0		0	9.1		218.4	1,701.7
Oil	10.9		1,776.7	1.8		21.6	9.1		218.4	2,016.7
Butter				5.4		64.8	1.8		43.2	108
Dates				5.5		66				66

Table Annex 14

Food Requirements by Food Product for the Year 2000 (Tons)

Trarza

Products	Rural Sedentary			Nomadic			Urban			Regional Total a + b + c
	Kg/yr.	Pop. 000	Tons a	Kg/yr.	Pop. 000	Tons b	Kg/yr.	Pop. 000	Tons c	
Millet	33	147	4,851	40	81	3,240	19	43	817	8,908
Rice	112.2		16,493.4	66.7		5,402.7	83		3,569	25,465.1
Wheat	7.5		1,102.5	48		3,888	21		903	5,893.5
Bread flour	7.3		1,073.1	7.3		591.3	18.2		782.6	2,447
Roots	4.75		698.2	0		0	5.5		236.5	934.7
Unshelled peanuts	11		1,617	0		0	7.3		313.9	930.9
Cowpeas	5.5		808.5	1.8		145.8	3.6		134.8	109.1
Sugar	14		2,058	14		1,134	14		602	3,794
Beef	7.3		1,073.1	3.6		291.6	9.1		391.3	1,756
Sheep	7.3		1,073.1	10.9		882.9	7.3		313.9	2,269.9
Chicken	2		294	0		0	1.8		77.4	371.4
Milk	25.5		3,748.5	84		6,804	18.2		782.6	11,335.1
Fresh fish	29.2		4,292.4	0		0	21.9		941.7	5,234.1
Vegetables	18.2		2,675.4	0		0	18.2		782.6	3,458.0
Fruits	9.1		1,337.7	0		0	9.1		391.3	1,729.0
Oil	10.9		1,602.3	1.8		145.8	9.1		391.3	2,139.4
Butter				5.4		437.4	1.8		77.4	514.8
Dates				5.5		445.5				445.5

Table Annex 15  
Food Requirements by Food Product for the Year 2000 (Tons)  
Adrar

Products	Rural Sedentary			Nomadic			Urban			Regional Total a + b + c
	Kg/yr.	Pop. 000	Tons a	Kg/yr.	Pop. 000	Tons b	Kg/yr.	Pop. 000	Tons c	
Millet	41	24	984	40	8	320	19	25	475	1,779
Rice	67.3		1,615.2	66.7		533.6	83		2,075	4,223.8
Wheat	49.3		1,183.2	48		384	21		525	2,092.2
Bread flour	7.3		175.2	7.3		58.4	18.2		455	688.6
Roots	0		0	0		0	5.5		137.5	137.5
Peanuts	0		0	0		0	7.3		182.5	182.5
Watermelon	7.3		175.2	0		0	0		0	175.2
Cowpeas <sup>seeds</sup>	5.5		132	1.8		14.4	3.6		90	236.4
Sugar	14		336	14		112	14		350	798
Beef	0		0	0		0	9.1		227.5	227.5
Camel	21.9		525.6	3.6		28.8	0		0	554.4
Sheep	7.3		175.2	10.9		87.2	7.3		182.5	444.9
Chicken	2		48	0		0	1.8		45	93
Milk	45		1,080	84		672	18.2		455	2,207
Fresh fish	0		0	0		0	21.9		547.5	547.5
Vegetables	18.2		436.8	0		0	18.2		455	891.8
Fruits	0		0	0		0	9.1		227.5	227.5
Oil	5.4		29.6	1.8		14.4	9.1		227.5	371.5
Butter	5.4		129.6	5.4		43.2	1.8		45	217.8
Dates	3.6		86.4	5.5		44	0		0	130.4

Table Annex 16

Food Requirements by Food Product for the Year 2000 (Tons)

Nouadhibou

Products	Rural Sedentary			Nomadic			Urban			Regional Total a + b + c
	Kg/yr.	Pop. 000	Tons a	Kg/yr	Pop. 000	Tons b	Kg/yr.	Pop. 000	Tons c	
Millet	41	65	2665	40	0		19	49	981	3,646.0
Rice	67,3		4374	66,7			83		4,067	8,441
Wheat	49,3		3204.5	48			21		1,029	4,233.5
Bread flour	7,3		474.5	7,3			18.2		891.8	1,366.3
Roots	0		0	0			5.5		269.5	269.5
Unshelled peanut	0		0	0			7.3		357.7	357.7
Wat. seeds	7,3		474.5	0			0		0	474.5
Beans	5,5		375.5	1.8			3.6		176.4	551.9
Sugar	14		910	14			14		686	1,596.0
Beef	0		0	3.6		0	9.1		445.9	445.9
Camel	14,6		949	0		0	0		0	949
Sheep	3.6		234	10.9			7.3		357.7	591.7
Chicken	2		130	0		0	1.8		88.2	218.2
Milk	45		2,925	84			18.2		891.8	3,816.8
Fresh fish	14.6		949	0			21.9		1,073.1	2,022.1
Vegetables	18.2		1,183	0			18.2		891.8	2,074.8
Fruits	0		0	0			9.1		445.9	445.9
Oil	5.4		351	1.8			9.1		445.9	796.9
Butter	5.4		351	5.4			1.8		88.2	439.2
Dates	3.6		234	5.5						234

Table Annex 17

Food Requirements by Food Product for the Year 2000 Tons  
Tagant

Products	Rural Sedentary			Nomadic			Urban			Regional Total a + b + c
	Kg/yr.	Pop. 000	Tons a	Kg/yr	Pop. 000	Tons	Kg/yr.	Pop. 000	Tons c	
Millet	41	72	2,952	40	20	800	19	10	190	3,942
Rice	67.3		4,845.6	66.7		1,334	83		830	7,009.6
Wheat	49.3		3,549.6	48		960	21		210	4,719.6
Bread flour	7.3		525.6	7.3		146	18.2		182	853.6
Roots	0		0	0		0	5.5		55	55
Peanuts	0		0	0		0	7.3		73	73
Watermelon seeds	7.3		525.6	0		0	0		0	525.6
Cowpeas	5.5		396	1.8		36	3.6		36	468
Sugar	14		1,008	14		280	14		140	1,428
Beef	0		0			0	9.1		91	91
Camel	21.9		1,576.8	3.6		72	0		0	1,648.8
Sheep	7.3		525.6	10.9		218	7.3		73	816.6
Chicken	2		144	0		0	1.8		18	162.0
Milk	45		3,240	84		1,680	18.2		182	5,102
Fresh Fish	0		0	0		0	21.9		219	219
Vegetables	18.2		1,310.4	0		0	18.2		182	1,492.4
Fruits	0		0	0		0	9.1		91	91
Oil	5.4		388.8	1.8		36	9.1		91	515.8
Butter	5.4		388.8	5.4		108	1.8		18	514.8
Dates	3.6		259.2	5.5		110	0		0	369.2

Table Annex 18

Food Requirements by Food Products for the Year 2000 (Tons)

Guidimakha

Products	Rural Sedentary			Nomadic			Urban			Regional Total a + b + c
	Kg/yr.	Pop. 000	Tons a	Kg/yr.	Pop. 000	Tons b	Kg/yr.	Pop. 000	Tons c	
Millet	105.0	105	11,025	40	14	560	19	11	209	11,794
Rice	44.9		4,714.5	66.7		9,338	83		913	6,561.3
Wheat	7.5		787.5	48		672	21		231	1,690.5
Bread flour	7.3		766.5	7.3		102.2	18.2		200.2	1,068.9
Roots	4.75		498.75	0		0	5.5		60.5	559.25
Unshelled peanuts	11		1,155	0		0	7.3		80.3	1,235.3
Cowpeas	5.5		577.5	1.8		25.2	3.6		39.6	542.3
Sugar	14		1,470	14		196	14		154	1,820
Beef	7.3		766.5	3.6		50.4	9.1		100.1	917
Sheep	7.3		766.5	10.9		152.6	7.3		80.3	99.4
Chicken	2		210.0	0		0	1.8		19.8	229.8
Milk	25.5		2,677.5	84		1,176	18.2		200.2	4,053.7
Fresh fish	29.2		3,066.0	0		0	21.9		240.9	3,369
Vegetables	18.2		1,911.0	0		0	18.2		200.2	2,111.2
Fruits	9.1		955.5	0		0	9.1		100.1	1,055.6
Oil	10.9		1,144.5	1.8		25.2	9.1		100.1	1,269.8
Butter				5.4		75.6	1.8		19.8	95.4
Dates				5.5		77				77

Table Annex 19

Food Requirements by Food Products for the Year 2000 (Tons)

Tiris-Zemmour

Products	Rural Sedentary			Nomadic			Urban			Regional Total a + b + c
	Kg/yr.	Pop. 000	Tons a	Kg/yr.	Pop. 000	Tons b	Kg/yr.	Pop. 000	Tons c	
Millet	41	27	1,107	40	1	40	19	19	361	1,508
Rice	67.3		1,817.1	66.7		66.7	83		1,577	3,460.8
Wheat	49.3		1,331.1	48		48	21		399	1,778.1
Bread flour	7.3		197.1	7.3		7.3	18.2		345.8	550.2
Roots	0		0	0		0	5.5		104.5	104.5
Unshelled peanuts	0		0	0		0	7.3		138.7	138.7
Watermelon seeds	7.3		197.1	0		0	0		0	197.1
Cowpeas	5.5		148.5	1.8		1.8	3.6		68.4	218.7
Sugar	14		378	14		14	14		266	658
Beef	0		0	0		0	9.1		172.9	172.9
Camel	21.9		591.3	3.6		3.6	0		0	594.9
Sheep	7.3		197.1	10.9		10.9	7.3		138.7	346.7
Chicken	2		54	0		0	1.8		34.2	88.2
Milk	45		1,215	84		84	18.2		345.8	1,644.8
Fresh fish	0		0	0		0	21.9		416.1	416.1
Vegetables	18.2		491.4	0		0	18.2		345.8	837.2
Fruits	0		0	0		0	9.1		172.9	172.9
Oil	5.4		145.8	1.8		1.8	9.1		172.9	320.5
Butter	5.4		145.8	5.4		5.4	1.8		34.2	185.4
Dates	3.6		97.2	5.5		5.5	0		0	102.7

Table Annex 20

Food Requirements by Food Products for the Year 2000 (Tons)

Inchiri

Products	Rural Sedentary			Nomadic			Urban			Regional Total a + b + c
	Kg/ yr.	Pop. 000	Tons a	Kg/yr.	Pop. 000	Tons b	Kg/yr.	Pop. 000	Tons c	
Millet	41	1	41	40	36	240	19	10	190	471
Rice	67.3		67.3	66.7		400.2	83		830	1,297.5
Wheat	49.3		49.3	48		288	21		210	547.3
Bread flour	7.3		7.3	7.3		43.8	18.2		182	233.1
Unshelled peanuts	0		0	0		0	5.5		55	55
Watermelon seeds	7.3		7.3	0		0	7.3		73	73
Cowpeas	5.5		5.5	1.8		10.8	3.6		36	52.3
Sugar	14		14	14		84	14		140	238
Beef	0		0	0		0	9.1		91	91
Camel	21.9		21.9	3.6		21.6	0		0	43.5
Sheep	7.3		7.3	10.9		65.4	7.3		73	145.7
Chicken	2		2	0		0	1.8		18	20
Milk	45		45	84		504	18.2		182	731
Fresh Fish	0		0	0		0	21.9		219	219
Vegetables	18.2		18.2	0		0	18.2		182	200.2
Fruits	0		0	0		0	9.1		91	200.2
Oil	5.4		5.4	1.8		10.8	9.1		91	107.2
Butter	5.4		5.4	5.4		32.4	1.8		18	55.8
Dates	3.6		3.6	5.5		33	0		0	36.6

Table Annes 21  
Food Requirements for the Year 1980

	Urbain Nouakchott		
	Kg/an	Population (000')	Total (tonnes) Nouakchott
Millet	19	173	3.287
Rice	83		14.359
Wheat	21		3.633
Bread flour	18,2		3.148,6
Beans	3,6		622,8
Unshelled peanuts	7,3		1.262,9
Roots	5,5		951,5
Vegetables	18,2		3.148,6
Fruits	9,1		1.574,3
Sugar	14		2.422
Fresh fish	21,9		3.788,7
Beef	9,1		1.574,3
Sheep	7,3		1.262,9
Chicken	1,8		311,4
Oil	9,1		1.574,3
Butter	1,8		311,4
Milk	18,2		3.148,6

Table Annex 22

Food Requirements for the Year 1980

Hodh Charqui - Hodh El Charbi - Assaba

	Ruraux Sédentaires			Nomades			Urbains			Total des 3 régions en T.
	Kg/an	Pop. (000 <sup>e</sup> )	Tonnes	Kg/an	Pop. (000 <sup>e</sup> )	Tonnes	Kg/an	Pop. (000 <sup>e</sup> )	Tonnes	
Millet	47	216	10.152	40	181	7.240	19	35	665	18.057
Rice	73		15.768	66,7		12.072,7	83		2.905	30.745
Wheat	32		6.912	48		8.688	21		735	16.235
Bread flour	7,3		1.576,8	7,3		1.321,3	18,2		637	3.535
Roots	4,75		1.026	0		-	5,5		192,5	1.218
Unshelled peanuts	7,3		1.576,8	0		-	7,3		255,5	1.832
Watermelon seeds	7,3		1.576,8	0		-	0		0	1.576
Cowpeas	5,5		1.188	1,8		325,8	3,6		126	1.639
Sugar	4		3.024	14		2.534	14		490	6.048
Beef	3,6		777,6	3,6		651,6	9,1		318,5	1.747
Camel	7,3		1.576,8	0		-	0		0	1.576
Sheep	3,6		777,6	10,9		1.972,9	7,3		255,5	3.006
Chicken	2		432	0		-	1,8		63	495
Milk	45		9.720	84		15.204	18,2		637	25.561
Fresh fish	14,6		3.153	0		-	21,9		766,5	3.919
Vegetables	18,2		3.931,2	0		-	9,1		637	4.568
Fruits	9,1		1.965,6	0		-	9,1		318,5	2.284
Oil	5,5		1.188	1,8		325,8	9,1		318,5	1.832
Butter	5,5		1.188	5,4		977,4	1,8		63	2.228
Dates	0		0	5,5		995,5	0		0	995

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Table Annex 23

Food Requirements for the Year 1980  
Gorgol

	Rural Sedentary			Nomadic			Urban			Regional Total
	Kg/yr	Pop. (000')	Tons	Kg/yr	Pop. (000')	Tons	Kg/yr	Pop. (000')	Tons	
Millet	74	119	8,806	40	16	640	19	23	437	9,883
Rice	71.8		8,544.6	66.7		1,067.2	83		1,909	11,520.8
Wheat	9.9		1,178.1	48		768	21		483	2,429.1
Bread flour	7.3		868.7	7.3		116.8	18.2		418.6	1,404.1
Tubercule	4.75		565.25	0		0	5.5		126.5	691.7
Unshelled peanut	11		1,309	0		0	7.3		167.9	1,476.9
Cowpeas	5.5		654.5	1.8		28.8	3.6		82.8	766.3
Sugar	14		1,666	14		224	14		322	2,212
Beef	7.3		868.7	3.6		57.6	9.1		209.3	1,135.6
Sheep	7.3		868.7	10.9		174.4	7.3		167.9	1,211
Chicken	2		238	0		0	1.8		41.4	279.4
Milk	25.5		3,034.5	84		1,344	18.2		418.6	4,797.1
Fresh fish	29.2		3,474.8	0		0	21.9		503.7	3,978.5
Vegetables	18.2		2,165.8	0		0	18.2		418.6	2,584.4
Fruits	9.1		1,082.9	0		0	9.1		209.3	1,292.2
Oil	10.9		1,297.1	1.8		28.8	9.1		209.3	1,535.2
Butter	0		0	5.4		86.4	1.8		41.4	127.8
Dates	0		0	5.5		88	0		0	88

Table Annex 24

Food Requirements for the Year 1980  
Guldimaka - Brakna

	Rural Sedentary		Nomadic		Urban		Regional Total			
	Kg/yr	Pop. (000')	Tons	Kg/yr	Pop. (000')	Tons				
Millet	105	179	18,795	40	48	1,920	19	22	418	21,133
Rice	44.9		3,037.1	66.7		3,201.6	83		1,826	13,064.5
Wheat	7.5		1,342.5	48		2,304	21		462	4,108.5
Bread flour	7.3		1,306.7	7.3		350.4	18.2		400.4	2,057.5
Tubercule	4.75		850.25	0		0	5.5		121	971.25
Unshelled peanut	11		1,965	0		0	7.3		160.6	2,125.6
Cowpeas	5.5		984.5	1.6		86.4	3.6		79.2	1,150
Sugar	14		2,308	14		672	14		308	3,488
Beef	7.3		1,306.7	3.6		172.8	9.1		200.2	1,679.7
Sheep	7.3		1,306.7	10.9		523.2	7.3		160.6	1,990.5
Chicken	2		358	0		0	1.3		39.6	397.6
Milk	25.5		4,564.5	84		4,032	18.2		400.4	8,000.9
Fresh fish	29.2		5,226.8	0		0	21.9		481.6	5,708.4
Vegetables	18.2		3,257.3	0		0	18.2		400.4	3,657.7
Fruits	9.1		1,628.9	0		0	9.1		200.2	1,829.1
Oil	10.9		1,951.1	1.8		86.4	9.1		200.2	2,237.7
Butter	0		0	5.4		259.2	1.8		39.6	298.8
Dates	0		0	3.5		264	0		0	264

Table Annex 25  
Food Requirements in the Year 1980  
Traza

	Rural - Sedentary			Nomadic			Urban			Regional Total
	Kg/yr	Pop. (000')	Tons	Kg/yr	Pop. (000')	Tons	Kg/yr	Pop. (000')	Tons	
Millet	33	95	3,135	40	102	4,080	19	27	513	7,728
Rice	112.2		10,659	66.7		6,803.4	83		2,241	19,703.4
Wheat	7.5		712.5	48		4,896	21		567	6,175.5
Bread flour	7.3		693.5	7.3		744.6	18.2		491.4	1,929.5
Tubercule	4.75		451.25	0		0	5.5		148.5	599.7
Unshelled peanut	11		1,045	0		0	7.3		197.1	1,242.1
Cowpeas	5.5		522.5	1.8		183.6	3.6		97.2	803.3
Sugar	14		1,330	14		1,428	14		378	3,136
Beef	7.3		693.5	3.6		367.2	9.1		245.7	1,306.4
Sheep	7.3		693.5	10.9		1,111.8	7.3		197.1	2,002.4
Chicken	2		190	0		0	1.8		48.6	238.6
Milk	25.5		2,422.5	84		8,568	18.2		491.4	11,481.9
Fresh fish	29.2		2,774	0		0	21.9		591.3	3,365.3
Vegetables	18.2		1,729	0		0	18.2		491.4	2,220.4
Fruits	9.1		864.5	0		0	9.1		245.7	1,110.2
Oil	10.9		1,035.5	1.8		183.6	9.1		245.7	1,464.8
Butter	0		0	5.4		550.8	1.8		48.6	599.4
Dates	0		0	5.5		561	0		0	561

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Table Annex 26

Food Requirements in the Year 1980  
Dakhlet-Nouadhibou

	Rural Sedentary			Nomadic			Urban			Regions Totals
	Kg/yr	Pop. (000')	Tons	Kg/yr	Pop. (000')	Tons	Kg/yr	Pop. (000')	Tons	
Millet	41	4	164	40	0	0	19	26	494	658
Rice	67.3		269.2	66.7			83		2,153	2,427.2
Wheat	49.3		197.2	48			21		546	743.2
Bread flour	7.3		29.2	7.3			18.2		473.2	502.6
Roots	0		0	0			5.5		143	143
Unshelled peanuts	0		0	0			7.3		189.8	189.8
Watermelon seeds	7.3		29.2	0			0		0	29.2
Cowpeas	5.5		22	1.8			3.6		93.6	115.6
Sugar	14		56	14			14		364	420
Beef	0		0	3.6			9.1		236.6	236.6
Camel	14.6		58.4	0			0		0	58.4
Sheep	3.6		14.4	10.9			7.3		189.8	204.2
Chicken	2		8	0			1.8		46.8	54.8
Milk	45		180	84			18.2		473.2	653.2
Fresh fish	14.6		58.4	0			21.9		569.4	627.8
Vegetables	18.2		72.8	0			18.2		473.2	546
Fruits	0		0	0			9.1		236.6	236.6
Oil	5.4		21.6	1.8			9.1		236.6	258.2
Butter	5.4		21.6	5.4			1.8		46.8	68.4
Dates	3.6		14.4	5.5			0		0	14.4

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Table Annex 27

Food Requirements in the Year 1980  
Tagant - Adrar - Inchiri - Tiris-Zemmour

	Rural Sedentary			Nomadic			Urban			Regional Total
	Kg/yr	Pop. (000')	Tons	Kg/yr	Pop. (000')	Tons	Kg/yr	Pop. (000')	Tons	
Millet	41	67	2,747	40	62	2,480	19	48	912	6,139
Rice	67.3		4,509.1	66.7		4,135.4	33		3,984	12,628.5
Wheat	49.3		3,303.1	48		2,976	21		1,008	7,287.1
Bread flour	7.3		489.1	7.3		452.6	18.2		873.6	1,815.3
Roots	0		0	0		0	5.5		264	264
Unshelled peanuts	0		0	0		0	7.3		350.4	350.4
Watermelon seeds	7.3		489.1	0		0	0		0	489.1
Cowpeas	5.5		368.5	1.8		111.6	3.6		172.8	652.9
Sugar	14		938	14		868	14		672	2,478
Beef	0		0	0		0	9.1		436.8	436.8
Camel	21.9		1,467.3	3.6		223.2	0		0	1,690.5
Sheep	7.3		489.1	10.9		675.8	7.3		350.4	1,515.3
Chicken	2		134	0		0	1.8		86.4	220.4
Milk	45		3,015	84		5,208	18.2		873.6	9,096.6
Fresh fish	0		0	0		0	21.9		1,051.2	1,051.2
Vegetables	18.2		1,219.4	0		0	18.2		873.6	2,093
Fruits	0		0	0		0	9.1		436.8	436.8
Oil	5.4		361.8	1.8		111.6	9.1		436.8	910.2
Butter	5.4		361.8	5.4		334.8	1.8		86.4	783
Dates	3.6		241.2	5.5		341	0		0	582.2

Table Annex 28

Food Requirements in the Year 1985

Urban  
Nouakchott

	Kg/year	Population (000')	Nouakchott Total (Tons)
Millet	19	254	4,826
Rice	83		21,082
Wheat	21		5,334
Bread flour	18.2		4,622.8
Beans	3.6		914.4
Unshelled peanuts	7.3		1,854.2
Roots	5.5		1,397
Vegetables	18.2		4,622.8
Fruits	9.1		2,311.4
Sugar	14		3,556
Fresh fish	21.9		5,562.6
Beef	9.1		2,311.4
Sheep	7.3		1,854.2
Chicken	1.8		457.2
Oil	9.1		2,311.4
Butter	1.8		457.2
Milk	18.2		4,622.8

Table Annex 29  
Food Requirements for the Year 1985  
Hodh Charghi - Hodh Charbi - Assaba

	Rural Sedentary		Nomadic		Urban		Regional Total			
	Kg/yr (000 <sup>t</sup> )	Pop. (000 <sup>t</sup> )	Tons	Kg/yr (000 <sup>t</sup> )	Pop. (000 <sup>t</sup> )	Tons				
Millet	47	272	12,784	40	165	6,600	19	39	741	20,125
Rice	73		19,856	66.7		11,005.5	83		3,237	34,098.5
Wheat	32		8,704	48		7,920	21		819	17,443
Bread flour	7.3		1,985.6	7.3		1,204.5	18.2		709.8	3,899.9
Roots	4.75		1,292	0		0	5.5		214.5	1,506.5
Unshelled peanuts	7.3		1,985.6	0		0	7.3		284.7	2,270.3
Watermelon seeds	7.3		1,985.6	0		0	0		0	1,985.6
Cowpeas	5.5		1,496	1.8		297	3.6		140.4	1,933.4
Sugar	14		3,808	14		2,310	14		546	6,664
Beef	3.6		979.2	3.6		594	9.1		354.9	1,928.1
Camel	7.3		1,985.6	0		0	0		0	1,985.6
Sheep	3.6		979.2	10.9		1,798.5	7.3		284.7	3,062.4
Chicken	2		544	0		0	1.8		70.2	614.2
Milk	45		12,240	84		13,860	18.2		709.8	26,809.8
Fresh fish	14.6		3,971.2	0		0	21.9		854.1	4,825.3
Vegetables	18.2		4,950.4	0		0	18.2		709.8	5,660.2
Fruits	9.1		2,475.2	0		0	9.1		354.9	2,830.1
Oil	5.5		1,496	1.8		297	9.1		354.9	2,147.9
Butter	5.5		1,496	5.4		891	1.8		70.2	2,457.2
Dates	0		0	5.5		907.5	0		0	907.5

Table Annex 30

Food Requirements for the Year 1985  
Gorgol

	Rural Sedentary			Nomadic			Urban			Regional Total
	Kg/yr	Pop. (000')	Tons	Kg/yr	Pop. (000')	Tons	Kg/yr	Pop. (000')	Tons	
Millet	74	131	9,694	40	15	600	19	27	513	10,807
Rice	71.8		9,405.8	66.7		1,000.5	83		2,241	12,647.3
Wheat	9.9		1,296.9	48		720	21		567	2,583.9
Bread flour	7.3		956.3	7.3		109.5	18.2		491.4	1,557.2
Tubercule	4.75		622.25	0		0	5.5		148.5	770.75
Unshelled peanut	11		1,441	0		0	7.3		197.1	1,638.1
Cowpeas	5.5		720.5	1.8		27	3.6		97.2	844.7
Sugar	14		1,834	14		210	14		378	2,422
Beef	7.3		956.3	3.6		54	9.1		245.7	1,256
Sheep	7.3		956.3	10.9		163.5	7.3		197.1	1,316.9
Chicken	2		262	0		0	1.8		48.6	310.6
Milk	25.5		3,340.5	84		1,260	18.2		491.4	5,091.9
Fresh fish	29.2		3,825.2	0		0	21.9		591.3	4,416.5
Vegetables	18.2		2,384.2	0		0	18.2		491.4	2,875.6
Fruits	9.1		1,192.1	0		0	9.1		245.7	1,437.8
Oil	10.9		1,427.9	1.8		27	9.1		245.7	1,700.6
Butter	0		0	5.4		81	1.8		48.6	129.6
Dates	0		0	5.5		82.5	0		0	82.5

Table Annex 31

Food Requirements in the Year 1985  
Guidimakha - Brakna

	Rural Sedentary			Nomadic			Urban			Regional Total
	Kg/yr.	Pop. (000')	Tons	Kg/yr.	Pop. (000')	Tons	Kg/yr.	Pop. (000')	Tons	
Millet	105	208	21.840	40	36	1.440	19	25	475	23.755
Rice	44.5		9.256	66.7		2.401.2	83		2.075	13.732.2
Wheat	7.5		1.560	48		1,728	21		525	3.813
Bread flour	7.3		1.518.4	7.3		262.8	18.2		455	2.236.2
Tubercule	4.75		988	0		0	5.5		137.5	1.125.5
Unshelled peanut	11		2.288	0		0	7.3		182.5	2.470.5
Cowpeas	5.5		1.144	1.8		64.8	3.6		90	1.298.8
Sugar	14		2.912	14		504	14		350	3.766
Beef	7.3		1.518.4	3.6		129.6	9.1		227.5	1.875.5
Sheep	7.3		1.518.4	10.9		392.4	7.3		182.5	2.093.3
Chicken	2		416	0		0	1.8		45	461
Milk	25.5		5.304	84		3.024	18.2		455	8.783
Fresh fish	29.2		6.073.6	0		0	21.9		547.5	6.621
Vegetables	18.2		3.785.6	0		0	18.2		455	4.240.6
Fruits	9.1		1.892.8	0		0	9.1		227.5	2.120.3
Oil	10.9		2.267.2	1.8		64.8	9.1		227.5	2.559.5
Butter	0		0	5.4		194.4	1.8		45	239.4
Dates	0		0	5.5		198	0		0	198

Table Annex 32

Food Requirements for the Year 1985  
Trarza

	Rural Sedentary			Nomadic			Urban			Regional Total
	Kg/yr	Pop. (000')	Tons	Kg/yr	Pop. (000')	Tons	Kg/yr	Pop. (000')	Tons	
Millet	33	108	3.564	40	96	3.840	29	31	589	7.993
Rice	112.2		12.117.6	66.7		6.403.2	83		2.573	21.093.8
Wheat	7.5		810	48		4.608	21		651	6.069
Bread flour	7.3		788.4	7.3		700.8	18.2		564.2	2.053.4
Tubercule	4.75		513	0		0	5.5		170.5	683.5
Unshelled peanut	11		1.188	0		0	7.3		226.3	1.414.3
Cowpeas	5.5		594	1.8		172.8	3.6		111.6	878.4
Sugar	14		1.512	14		1.344	14		434	3.290
Beef	7.3		788.4	3.6		345.6	9.1		282.1	1.416.1
Sheep	7.3		788.4	10.9		1.046.4	7.3		226.3	2.061.1
Chicken	2		216	0		0	1.8		55.8	271.8
Milk	25.5		2.754	84		8.064	18.2		564.2	11.382.2
Fresh fish	29.2		3.153.6	0		0	21.9		678.9	3.832.5
Vegetables	18.2		1.965.6	0		0	18.2		564.2	2.529.8
Fruits	9.1		982.8	0		0	9.1		282.1	1.264.9
Oil	10.9		1.177.2	1.8		172.8	9.1		282.1	1.632.1
Butter	0		0	5.4		518.4	1.8		55.8	574.2
Dates	0		0	5.5		528	0		0	528

Table Annex 33

Food Requirements for the Year 1985  
Dakhlet - Nouadhibou

	Rural Sedentary			Nomadic			Urban			Regional Total
	Kg/yr.	Pop. (000')	Tons	Kg/yr.	Pop. (000')	Tons	Kg/ yr	Pop. (000')	Tons	
Millet	41	10	410	40	0	0	19	32	608	1.018
Rice	67.3		673	66.7			83		2.656	3.329
Wheat	49.3		493	48			21		672	1.165
Bread flour	7.3		73	7.3			18.2		582.4	655.4
Roots	0		0	0			5.5		176	176
Unshelled peanuts	0		0	0			7.3		233.6	233.6
Watermelon seeds	7.3		73	0			0		0	73
Cowpeas	5.5		55	1.8			3.6		115.2	170.2
Sugar	14		140	14			14		448	588
Beef	0		0	3.6			9.1		291.2	291.2
Camel	14.6		146	0			0		0	146
Sheep	3.6		36	10.9			7.3		233.6	269.6
Chicken	2		20	0			1.8		57.6	77.6
Milk	45		450	84			18.2		582.4	1.032.4
Fresh fish	14.6		146	0			21.9		700.8	846.8
Vegetables	18.2		182	0			18.2		582.4	764.4
Fruits	0		0	0			9.1		291.2	291.2
Oil	5.4		54	1.8			9.1		291.2	345.2
Butter	5.4		54	5.4			1.8		57.6	111.6
Dates	3.6		36	5.5			0		0	36

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Table Annex 34

## Food Requirements for the Year 1985

Tagant - Adrar - Inehiri - Tiris-Zemmour

	Rural Sedentary			Nomadic			Urban			Regional Total
	Kg/yr	Pop. (000')	Tons	Kg/yr	Pop. (000')	Tons	Kg/yr	Pop. (000')	Tons	
Millet	41	84	3,444	49	51	2,040	19	52	980	6,474
Rice	67.3		5,653.2	65.7		3,401.1	83		4,316	13,370.3
Wheat	49.3		4,141.2	40		2,448	21		1,092	7,681.2
Bread flour	7.3		613.2	7.3		372.3	18.2		946.4	1,931.9
Roots	0		0	0		0	5.5		286	286
Unshelled peanuts	0		0	0		0	7.3		379.6	379.6
Watermelon seeds	7.3		613.2	0		0	0		0	613.2
Cowpeas	5.5		462	1.8		91.8	3.6		187.2	741
Sugar	14		1,176	14		714	14		728	2,618
Beef	0		0	0		0	9.1		473.2	473.2
Camel	21.9		1,839.6	3.6		183.6	0		0	2,023.2
Sheep	7.3		613.2	10.9		555.9	7.3		379.6	1,548.7
Chicken	2		165	0		0	1.8		93.6	258.6
Milk	45		3,780	84		4,284	18.2		946.4	9,010.4
Fresh fish	0		0	0		0	21.9		1,130.8	1,130.8
Vegetables	18.2		1,528.8	0		0	18.2		946.4	2,475.2
Fruits	0		0	0		0	9.1		473.2	473.2
Oil	5.4		453.6	1.8		91.8	9.1		473.2	1,018.6
Butter	5.4		453.6	5.4		275.4	1.8		93.6	822.6
Dates	3.6		3,024.4	5.5		250.5	0		0	3,274.9

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Table Annex 35

Food Requirements for the Year 1990

Urban  
Nouakchott

	Kg/yr.	Population (000')	Total (tons Nouakchott)
Millet	19	345	6.555
Rice	83		28.635
Wheat	21		7.245
Bread flour	18,2		6.279
Beans	3.6		1.242
Unshelled peanuts	7,3		2.518.5
Roots	5.5		1.897.5
Vegetables	18.2		6.279
Fruits	9.1		3.139.5
Sugar	14		4.830
Fresh fish	21.9		7.555.5
Beef	9.1		3.139.5
Sheep	7.3		2.518.5
Chicken	1.8		621
Oil	9.1		3.139.5
Butter	1.8		621
Milk	18.2		6.279

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Table Annex 36

Food Requirements for the Year 1990  
Hodh Charghi - Hodh El Gharbi - Assaba

	Rural Sedentary			Nomadic			Urban			Regional Total
	Kg/yr	Pop. (000')	Tons	Kg/yr	Pop. (000')	Tons	Kg/yr	Pop. (000')	Tons	
Millet	47	329	15,463	40	151	6,040	19	45	855	22,358
Rice	73		24,017	66.7		10,071.7	83		3,735	37,825.7
Wheat	32		10,528	48		7,248	21		945	18,721
Bread flour	7.3		2,401.7	7.3		1,102.3	18.2		819	4,323
Roots	4.75		1,562.75	0		0	5.5		247.5	1,810.2
Unshelled peanuts	7.3		2,401.7	0		0	7.3		328.5	2,730.2
Watermelon seeds	7.3		2,401.7	0		0	0		0	2,401.7
Cowpeas	5.5		1,809.5	1.8		271.8	3.6		162	2,243.3
Sugar	14		4,606	14		2,114	14		630	7,350
Beef	3.6		1,184.4	3.6		543.6	9.1		409.5	2,137.5
Camel	7.3		2,401.7	0		0	0		0	2,401.7
Sheep	3.6		1,184.4	10.9		1,645.9	7.3		328.5	3,158.8
Chicken	2		658	0		0	1.8		81	739
Milk	45		14,805	84		12,684	18.2		819	28,303
Fresh fish	14.6		4,803.4	0		0	21.9		985.5	5,788.9
Vegetables	18.2		5,987.8	0		0	18.2		819	6,806.8
Fruits	9.1		2,993.9	0		0	9.1		409.5	3,403.4
Oil	5.5		1,809.5	1.8		271.8	9.1		409.5	2,490.8
Butter	5.5		1,809.5	5.4		815.4	1.8		81	2,705.9
Dates	0		0	5.5		830.5	0		0	830.5

Table Annex 37  
Food Requirements for the Year 1990  
Gorgol

	Rural Sedentary		Nomadic			Urban		Region Total		
	Kg/yr	Pop. (000)	Tons	Kg/yr	Pop. (000)	Tons	Kg/yr		Pop. (000)	Tons
Millet	74	140	10,656	40	14	560	19	30	570	11,786
Rice	71.8		10,339.2	66.7		933.8	83		2,490	13,763
Wheat	9.9		1,425.6	48		672	21		530	2,727.6
Bread flour	7.3		1,051.2	7.3		102.2	18.2		546	1,699.4
Tubers/roots	4.75		684	0		0	5.5		165	849
Unshelled peanut	11		1,584	0		0				
Cowpeas	5.5		792	1.8		25.2	3.6		108	1,805
Sugar	14		2,016	14		196	14		420	2,632
Beef	7.3		1,051.2	3.6		50.4	9.1		273	1,374.6
Sheep	7.3		1,051.2	10.9		152.6	7.3		219	1,422.8
Chicken	2		288	0		0	1.8		54	342
Milk	25.5		3,672	84		1,176	18.2		546	5,394
Fresh fish	29.2		4,204.8	0		0	21.9		657	4,861.8
Vegetables	18.2		2,620.8	0		0	18.2		546	3,166.8
Fruits	9.1		1,310.4	0		0	9.1		273	1,583.4
Oil	10.9		1,569.6	1.8		25.2	9.1		273	1,867.8
Butter	0		0	5.4		75.6	1.8		54	129.6
Dates	0		0	5.5		77	0		0	77

Table Annex 38

Food Requirements for the Year 1990  
Guidimakha - Brakna

	Rural Sedentary		Nomadic			Urban		Regional Total		
	Kg/yr	Pop. (000')	Tons	Kg/yr	Pop. (000')	Tons	Kg/yr		Pop. (000')	Tons
Millet	105	230	24,150	40	30	1,200	19	29	551	25,901
Rice	44.5		10,235	66.7		2,001	83		2,407	14,643
Wheat	7.5		1,725	48		1,440	21		609	3,774
Bread flour	7.3		1,679	7.3		219	18.2		527.8	2,425.8
Tubercule	4.75		1,092.5	0		0	5.5		159.5	1,252
Unshelled peanut	11		2,530	0		0	7.3		211.7	2,741.7
Cowpeas	5.5		1,265	1.8		54	3.6		104.4	1,423.4
Sugar	14		3,220	14		420	14		406	4,046
Beef	7.3		1,679	3.6		108	9.1		263.9	2,050.9
Sheep	7.3		1,679	10.9		327	7.3		211.7	2,217.7
Chicken	2		460	0		0	1.8		52.2	512.2
Milk	25.5		5,865	84		2,520	18.2		527.8	8,912.8
Fresh fish	29.2		6,716	0		0	21.9		635.1	7,351.1
Vegetables	18.2		4,186	0		0	18.2		527.8	4,713.8
Fruits	9.1		2,093	0		0	9.1		263.9	2,356.9
Oil	10.9		2,507	1.8		54	9.1		263.9	2,824.9
Butter	0		0	5.4		162	1.8		52.2	214.2
Dates	0		0	5.5		165	0		0	165

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Table Annex 39  
Food Requirements in the Year 1  
Trarza

	Rural Sedentary			Nomadic			Urban			Regional Total
	Kg/yr	Pop. (000')	Ton	Kg/yr	Pop. (000')	Ton	Kg/yr	Pop. (000')	Ton	
Millet	33	122	4,026	40	91	3,640	19	35	665	8,331
Rice	112.2		13,688.6	65.7		6,069.7	83		2,905	22,663.1
Wheat	7.5		915	48		4,368	21		735	6,010
Bread flour	7.3		890.6	7.3		664.3	18.2		637	2,191.9
Tubercule	75		579.5	0		0	5.5		192.5	772
Unshelled peanut	11		1,342	0		0	7.3		255.5	1,597.5
Cowpeas	5.5		671	1.8		163.8	3.6		126	960.8
Sugar	14		1,708	14		1,274	14		490	3,472
Beef	7.3		890.6	3.6		327.6	9.1		318.5	1,536.7
Sheep	7.3		890.6	10.9		991.9	7.3		255.5	2,136
Chicken	2		244	0		0	1.8		63	307
Milk	25.5		3,111	84		7,644	18.2		637	11,392
Fresh fish	29.2		3,562.4	0		0	21.9		766.5	4,328.9
Vegetables	18.2		2,220.4	0		0	18.2		637	2,857.4
Fruits	9.1		1,110.2	0		0	9.1		318.5	1,428.7
Oil	10.9		1,329.3	1.8		163.8	9.1		318.5	1,812.1
Butter	0		0	5.4		491.4	1.8		63	554.4
Dates	0		0	5.5		500.5	0		0	500.5

Table Annex 40  
Food Requirements for the Year 1990  
Dakhlet - Nouadhibou

	Rural Sedentary			Nomadic			Urban			Regional Total
	Kg/yr	Pop. (000')	Tons	Kg/yr	Pop. (000')	Tons	Kg/yr	Pop. (000')	Tons	
Millet	41	20	820	40	0	0	19	38	722	1,542
Rice	67.3		1,346	66.7			83		3,154	4,500
Wheat	49.3		986	48			21		798	1,784
Bread flour	7.3		146	7.3			18.2		691.6	837.6
Roots	0		0	0			5.5		209	209
Unshelled peanuts	0		0	0			7.3		277.4	277.4
Watermelon seeds	7.3		146	0			0		0	146
Cowpeas	5.5		110	1.8			3.6		136.8	246.8
Sugar	14		280	14			14		532	812
Beef	0		0	3.6			9.1		345.8	345.8
Camel	14.6		292	0			0		0	292
Sheep	3.6		72	10.9			7.3		277.4	349.7
Chicken	2		40	0			1.8		68.4	108.4
Milk	45		900	84			18.2		691.6	1,591.6
Fresh fish	14.6		292	0			21.9		832.2	1,124.2
Vegetables	18.2		364	0			18.2		691.6	1,055.6
Fruits	0		0	0			9.1		345.8	345.8
Oil	5.4		108	1.8			9.1		345.8	453.8
Butter	5.4		108	5.4			1.8		68.4	176.4
Dates	3.6		72	5.3			0		0	72

Table Annex 41

Food Requirements for the Year 1990

Tagant - Adrar - Inchiri - Tiris-Zemmour

	Rural Sedentary			Nomadic			Urban			Regional
	Kg/yr.	Pop. (000')	Tons	Kg/yr.	Pop. (000')	Tons	Kg/yr.	Pop. (000')	Tons	Total
Millet	41	99	4,059	40	44	1,760	19	56	1,064	6,883
Rice	67.3		6,662.7	66.7		2,934.8	83		4,648	14,245.5
Wheat	49.3		4,880.8	48		2,112	21		1,176	8,168.7
Bread flour	7.3		722.7	7.3		321.2	18.2		1,019.2	2,063.1
Roots	0		0	0		0	5.5		308	308
Unshelled peanuts	0		0	0		0	7.3		408.8	408.8
Watermelon seeds	7.3		722.7	0		0	0		0	722.7
Cowpeas	5.5		544.5	1.8		79.2	3.6		201.6	825.3
Sugar	14		1,386	14		616	14		784	2,786
Beef	0		0	0		0	9.1		509.6	509.6
Camel	21.9		2,168.1	3.6		158.4	0		0	2,326.5
Sheep	7.3		722.7	10.9		479.6	7.3		408.8	1,611.1
Chicken	2		198	0		0	1.8		100.8	298.8
Milk	45		4,455	84		3,696	18.2		1,019.2	9,170.2
Fresh fish	0		0	0		0	21.9		1,226.4	1,226.4
Vegetables	18.2		1,801.8	0		0	18.2		1,019.2	2,821
Fruits	0		0	0		0	9.1		509.6	509.6
Oil	5.4		534.6	1.8		79.2	9.1		509.6	1,123.4
Butter	5.4		534.6	5.4		237.6	1.8		100.8	873
Dates	3.6		356.4	5.5		242	0		0	598.4

Table Annex 42

Food Requirements for the Year 1995

Urban  
Nouakchott

	Kg/yr.	Population (000 <sup>1</sup> )	Nouakchott total (Tons)
Millet	19	451	8,569
Rice	83		37,433
Wheat	21		9,471
Bread flour	18.2		8,208.2
Beans	3.6		1,623.6
Unshelled peanuts	7.3		3,292.3
Roots	5.5		2,480.5
Vegetables	18.2		8,208.2
Fruits	9.1		4,104.1
Sugar	14		6,314
Fresh fish	21.9		9,876.9
Beef	9.1		4,104.1
Sheep	7.3		3,292.3
Chicken	1.8		811.8
Oil	9.1		4,104.1
Butter	1.8		811.8
Milk	18.2		8,208.2

Table Annex 43

Food Requirements for the Year 1995

Hodh Chargui - Hodh El Gharbi - Assaba

	Rural Sedentary			Nomadic			Urban			Regional
	Kg/yr	Pop. (000)	Tons	Kg/yr	Pop. (000')	Tons	Kg/yr	Pop. (000')	Tons	Total
Millet	47	392	18,424	40	140	5,600	19	49	931	24,955
Rice	73		28,616	66.7		9,338	83		4,067	42,021
Wheat	32		12,544	48		6,720	21		1,029	20,293
Bread flour	7.3		2,861.6	7.3		1,022	18.2		891.8	4,775.
Roots	4,75		1,862	0		0	5.5		269.5	2,131.
	7.3		2,861.6	0		0	7.3		357.7	3,219.
Watermelon	7,3		2,861.6	0		0	0		0	2,861.
Beans	5.5		2,156	1.8		252	3,6		176.4	2,584.
Sugar	14		5,488	14		1,960	14		686	8,134
Beef	3.6		1,411.2	3 6		504	9.1		445.9	2,361.
Camel	7,3		2,861.6	0		0	0		0	2,861.
Sheep	3.6		1,411.2	10 9		1,526	7.3		357.7	3,294.
Chicken	2		784	0		0	1.8		88.2	872.
Milk	45		17,640	84		11,760	18.2		891.2	30,291.
Fish fresh	14,6		5,723.2	0		0	21.9		1,073.1	6,796.
Vegetables	18.2		7,134.4	0		0	18.2		891.8	8,026.
Fruits	9,1		3,567.2	0		0	9.1		445.9	4,013.
Oil	5.5		2,156	1.8		252	9.1		445.9	2,853.
Butter	5,5		2,156	5.4		756	1.8		88,2	3,000.
Dates	0		0	5,5		770	0		0	770

Table Annex 44  
Food Requirements for the Year 1995  
Gorgol

	Rural Sedentary			Nomadic			Urban			Regional Total
	Kg/yr	Pop. (000')	Tons	Kg/yr	Pop. (000')	Tons	Kg/yr	Pop. (000')	Tons	
Millet	74	157	11.618	40	13	520	19	33	627	12.765
Rice	71.8		11.272	66.7		867.1	83		2.739	14.878.7
Wheat	9.9		1.554.3	48		624	21		693	2.871.3
Bread flour	7.3		1.146.1	7.3		94.9	18.2		600.6	1.841.6
Tubercule	4.75		745.75	0		0	5.5		181.5	927.25
Unshelled peanut	11		1.727	0		0	7.3		240.9	1.967.9
Cowpeas	5.5		863.5	1.8		23.4	3.6		118.8	1.005.7
Sugar	14		2.198	14		182	14		462	2.842
Beef	7.3		1.146.1	3.6		46.8	9.1		300.3	1.493
Sheep	7.3		1.146.1	10.9		141.7	7.3		240.9	1.528.7
Chicken	2		314	0		0	1.8		59.4	373.4
Milk	25.5		4.003.5	84		1.092	18.2		600.6	5.696.1
Fresh fish	29.2		4.584.4	0		0	21.9		722.7	5.307.1
Vegetables	18.2		2.857.4	0		0	18.2		600.6	3.458
Fruits	9.1		1.428.7	0		0	9.1		300.3	1.729
Oil	10.9		1.711.3	1.8		23.4	9.1		300.3	2.035
Butter	0		0	5.4		70.2	1.8		59.4	129.6
Dates	0		0	5.5		71.5	0		0	71.5

Table Annex 45  
Food Requirements for the Year 1995  
Guidimakha - Brakna

	Rural Sedentary		Nomadic		Urban		Regional Total			
	Kg/yr	Pop. (000')	Tons	Kg/yr	Pop. (000')	Tons		Kg/yr	Pop. (000')	Tons
Millet	105	249	26.145	40	28	1.120	19	32	608	27.873
Rice	44.5		11.080.5	66.7		1.867.6	83		2.656	15.604.1
Wheat	7.5		1.867.5	48		1.344	21		672	3.883.5
Bread flour	7.3		1.817.7	7.3		204.4	18.2		582.4	2.604.5
Tubercule	4.75		1.182.75	0		0	5.5		176	1.358.75
Unshelled peanut	11		2.739	0		0	7.3		233.6	2.972.6
Cowpeas	5.5		1.369.5	1.8		50.4	3.6		115.2	1.535.1
Sugar	14		3.486	14		392	14		448	4.326
Beef	7.3		1.817.7	3.6		100.8	9.1		291.2	2.209.7
Sheep	7.3		1.817.7	10.9		305.2	7.3		233.6	2.356.5
Chicken	2		498	0		0	1.8		57.6	555.6
Milk	25.5		6.349.5	84		2.352	18.2		582.4	9.283.9
Fresh fish	29.2		7.270.8	0		0	21.9		700.8	7.971.6
Vegetables	18.2		4.531.8	0		0	18.2		582.4	5.114.2
Fruits	9.1		2.265.9	0		0	9.1		291.2	2.557.1
Oil	10.9		2.714.1	1.8		50.4	9.1		291.2	3.055.7
Butter	0		0	5.4		151.2	1.8		57.6	208.8
Dates	0		0	5.5		154	0		0	154

Table Annex 46  
Food Requirements for the Year 1995  
Trarza

	Rural Sedentary			Nomadic			Urban			Reg: Total
	Kg/yr	Pop. (000')	Tons	Kg/yr	Pop. (000')	Tons	Kg/yr	Pop. (000')	Tons	
Millet	33	135	4.455	40	85	3.400	19	39	741	8.596
Rice	112.2		15.147	66.7		5.669.5	83		3.237	24.053.5
Wheat	7.5		1.012.5	48		4.080	21		819	5.911.5
Bread flour	7.3		985.5	7.3		620.5	18.2		709.8	2.315.8
Tubercule	4.75		641.25	0		0	5.5		214.5	855.75
Unshelled peanut	11		1.485	0		0	7.3		284.7	1.769.7
Cowpeas	5.5		742.5	1.8		153	3.6		140.4	1.035.9
Sugar	14		1.890	14		1.190	14		546	3.626
Beef	7.3		985.5	3.6		306	9.1		354.9	1.646.4
Sheep	7.3		985.5	10.9		926.5	7.3		284.7	2.196.7
Chicken	2		270	0		0	1.8		70.2	340.2
Milk	25.5		3.442.5	84		7.140	18.2		709.8	11.292.3
Fresh fish	29.2		3.942	0		0	21.9		854.1	4.796.1
Vegetables	18.2		2.457	0		0	18.2		709.8	3.166.8
Fruits	9.1		1.228.5	0		0	9.1		354.9	1.583.4
Oil	10.9		1.471.5	1.8		153	9.1		354.9	1.979.4
Butter	0		0	5.4		459	1.8		70.2	529.2
Dates	0		0	5.5		467.5	0		0	467.5

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Table Annex 47  
Food Requirements for the Year 1995  
Dakhlet - Nouadhibou

	Rural Sedentary			Nomadic			Urban			Regional
	Kg/yr	Pop. (000')	Tons	Kg/yr	Pop. (000')	Tons	Kg/yr	Pop. (000')	Tons	Total
Millet	141	38	1.558	40	0	0	19	44	836	2.394
Rice	67.3		2.557.6	66.7			83		3.652	6.209.4
Wheat	49.3		1.873.4	48			21		924	2.797.4
Bread flour	7.3		277.4	7.3			18.2		800.8	1.078.2
Roots	0		0	0			5.5		242	242
Unshelled peanuts	0		0	0			7.3		321.2	321.2
Watermelon seeds	7.3		277.4	0			0		0	277.4
Cowpeas	5.5		209	1.8			3.6		158.4	367.4
Sugar	14		532	14			14		616	1.148
Beef	0		0	3.6			9.1		400.4	400.4
Camel	14.6		554.8	0			0		0	554.8
Sheep	3.6		136.8	10.9			7.3		321.2	458
Chicken	2		76	0			1.8		79.2	155.2
Milk	45		1.710	84			18.2		800.8	2.510.8
Fresh fish	14.6		554.8	0			21.9		963.6	1.518.4
Vegetables	18.2		691.6	0			18.2		800.8	1.492.4
Fruits	0		0	0			9.1		400.4	400.4
Oil	5.4		205.2	5.4			9.1		400.4	605.6
Butter	5.4		205.2	5.4			1.8		79.2	284.4
Dates	3.6		136.8	5.5			0		0	136.8

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Table Annex 48

Food Requirements for the Year 1995  
 Tagant - Adrar - Inchiri - Tiris-Zemmour

	Rural Sedentary			Nomadic			Urban			Regional Total
	Kg/yr	Pop. (000')	Tons	Kg/yr	Pop. (000')	Tons	Kg /yr	Pop. (000')	Tons	
Millet	41	113	4.633	40	38	1.520	19	60	1.140	7.293
Rice	67.3		7.604.9	66.7		2.534.6	83		4.980	15.119.5
Wheat	49.3		5.570.9	48		1.824	21		1.260	8.654.9
Bread flour	7.3		824.9	7.3		277.4	18.2		1.092	2.194.3
Roots	0		0	0		0	5.5		330	330
Unshelled peanuts	0		0	0		0	7.3		438	438
Watermelon seeds	7.3		824.9	0		0	0		0	824.9
Cowpeas	5.5		621.5	1.8		68.4	3.6		216	905.9
Sugar	14		1.582	14		532	14		840	2.954
Beef	0		0	0		0	9.1		546	546
Camel	21.9		2.474.7	3.6		136.8	0		0	2.611.5
Sheep	7.3		824.9	10.9		414.2	7.3		438	1.677.1
Chicken	2		226	0		0	1.8		108	334
Milk	45		5.085	84		3.192	18.2		1.092	9.369
Fresh fish	0		0	0		0	21.9		1.314	1.314
Vegetables	18.2		2.056.6	0		0	18.2		1.092	3.148.6
Fruits	0		0	0		0	9.1		546	546
Oil	5.4		610.2	1.8		68.4	9.1		546	1.224.6
Butter	5.4		610.2	5.4		205.2	1.8		108	923.4
Dates	3.6		406.8	5.5		209	0		0	615.6

Table Annex 49  
Food Requirements for the Year 2000  
Nouakchott

	Kg/yr.	Population (000')	Total (Tons)
Millet	19	574	10.906
Rice	83		47.642
Wheat	21		12.054
Bread flour	18.2		10.446.8
Beans	3.6		2.066.4
Unshelled peanuts	7.3		4.190.2
Roots	5.5		3.157
Vegetables	18.2		10.446.8
Fruits	9.1		5.223.4
Sugar	14		8.036
Fresh fish	21.9		12.570.6
Beef	9.1		5.223.4
Sheep	7.3		4.190.2
Chicken	1.8		1.033.2
Oil	9.1		5.223.4
Butter	1.8		1.033.2
Milk	18.2		10.446.8

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Table Annex 50  
Food Requirements for the Year 2000

Hodh El Gharbi - Hodh El Charghi - Assaba

	Rural Sedentary			Nomadic			Urban			Regional Total
	Kg/yr.	Pop. (000')	Tons	Kg/yr.	Pop. (000')	Tons	Kg/yr.	Pop. (000')	Tons	
Millet	47	462	21.714	40	129	5.160	19	53	1.007	27.881
Rice	73		33.726	66.7		8.604.3	83		4.399	46.729
Wheat	32		14.784	48		6.192	21		1.113	22.089
Bread flour	7.3		3.372.6	7.3		941.7	18.2		964.6	5.278
Beans	4.75		2.194.5	0		0	5.5		291.5	2.486
Unshelled peanut	7.3		3.372.6	0		0	7.3		386.9	3.759
Watermelon seeds	7.3		3.372.6	0		0	0		0	3.372
Beans	0		0	0		0	0		0	0
Cowpeas	5.5		2.541	1.8		232.2	3.6		190.8	2.964
Sugar	14		6.468	14		1.806	14		742	9.016
Beef	3.6		1.663.2	3.6		464.4	9.1		482.3	2.609
Camel	7.3		3.372.6	0		0	0		0	3.372
Sheep	3.6		1.663.2	10.9		1.406.1	7.3		386.9	3.456
Chicken	2		924	0		0	1.8		95.4	1.019
Milk	45		20.790	84		10.836	18.2		964.6	32.590
Fresh fish	14.6		6.745.2	0		0	21.9		1.160.7	7.905
Vegetables	18.2		8.408.4	0		0	18.2		964.6	9.373
Fruits	9.1		4.204.2	0		0	9.1		482.3	4.686
Oil	5.5		2.541	1.8		232.2	9.1		482.3	3.255
Butter	5.5		2.541	5.4		696.6	1.8		95.4	3.333
Dates	0		0	5.5		709.5	0		0	709.5

Table Annex 51  
Food Requirements for the Year 2000  
Gorgol

	Rural Sedentary			Nomadic			Urban			Regional Total
	Kg/yr	Pop. (000')	Tons	Kg/yr	Pop. (000')	Tons	Kg/yr	Pop. (000')	Tons	
Millet	74	169	12,506	40	12.0	480	19	36,0	684	13,670
Rice	71.8		12,134.2	66.7		800.4	83		2,988	15,922.6
Wheat	9.9		1,673.1	48		576.0	21		756	3,005.1
Bread flour	7.3		1,233.7	7.3		87.6	18.2		655.2	1,976.5
Tubercule	4.75		802.75	0		0	5.5		198	1,000.75
Unshelled peanut	11		1,859	0		0	7.3		262.8	2,121.8
Cowpeas	5.5		929.5	1.8		21.6	3.6		129.6	1,080.7
Sugar	14		2,366.0	14		168	14		504	3,038
Beef	7.3		1,233.7	3.6		43.2	9.1		327.6	1,604.5
Sheep	7.3		1,233.7	10.9		130.8	7.3		262.8	1,627.3
Chicken	2		368	0		0	1.8		64.8	432.8
Milk	25.5		4,309.5	84		1,008	18.2		655.2	5,972.7
Fresh fish	29.2		4,034.8	0		0	21.9		788.4	4,523.2
Vegetables	18.2		3,075.8	0		0	18.2		655.2	3,731.0
Fruits	9.1		1,537.9	0		0	9.1		327.6	1,865.5
Oil	10.9		1,842.1	1.8		21.6	9.1		327.6	2,191.3
Butter				5.4		64.8	1.8		64.8	129.6
Dates				5.5		66				66

Table Annex 52

Food Requirements for the Year 2000  
Brakna - Guidimakha

	Rural Sedentary			Nomadic			Urban			Regional
	Kg/yr	Pop. (000')	Tons	Kg/yr	Pop. (000')	Tons	Kg/yr	Pop. (000')	Tons	Total
Millet	105	265	28.140	40	26	1.040	19	35	665	29.845
Rice	44.9		12.033,2	66,7		1.734,2	83		2.905	16.672,4
Wheat	7.5		2.010	48		1.248	21		735	3.993
Bread flour	7.3		1.956,4	7.3		189,8	18.2		637	2.783,2
Roots	4.75		1.273	0		0	5.5		192,5	1.465,5
Unshelled peanuts	11		2.948	0		0	7.3		255,5	3.203,5
Watermelon seeds	0		0	0		0	0		0	0
Cowpeas	5.5		1.474	1,8		46,8	3,6		126	1.646,8
Sugar	14		3.752	14		364	14		490	4.606
Beef	7,3		1.956,4	3,6		93,6	9,1		318,5	2.368,5
Camel	0		0	0		0	0		0	0
Sheep	7,3		1.956,4	10,9		283,4	7,3		255,5	2.495,3
Chicken	2		536	0		0	1,8		63	599
Milk	25,5		6.834	84		2.184	18,2		637	9.655
Fresh fish	29,2		7.825,6	0		0	21,9		766,5	8.592,1
Vegetables	18,2		4.877,6	0		0	18,2		637	5.514,6
Fruits	9,1		2.438,5	0		0	9,1		318,5	2.757,3
Oil	10,9		2.921,2	1,8		46,8	9,1		318,5	3.286,5
Butter	0		0	5,4		140,4	1,8		63	203,4
Dates	0		0	5,5		143	0		0	143

Table Annex 53  
Food Requirements for the Year 2000  
Trarza

	Rural Sedentary			Nomadic			Urban			Regional Total
	Kg/yr	Pop. (000')	Tons	Kg/yr	Pop. (000')	Tons	Kg/yr	Pop. (000')	Tons	
Millet	33	147	4.851	40	81	3.240	19	43	817	8.908
Rice	112.2		16.493.4	66.7		5.402.7	83		3.569	25.465.1
Wheat	7.5		1.102.5	48		3.888	21		903	5.893.5
Bread flour	7.3		1.073.1	7.3		591.3	18.2		782.6	2.447
Tubercule	4.75		698.25	0		0	5.5		236.5	934.75
Unshelled peanut	11		1.617	0		0	7.3		313.9	1.930.9
Cowpeas	5.5		808.5	1.8		145.8	3.6		154.8	1.109.1
Sugar	14		2.058	14		1.134	14		602	3.794
Beef	7.3		1.073.1	3.6		291.6	9.1		391.3	1.756
Sheep	7.3		1.073.1	10.9		882.9	7.3		313.9	2.269.9
Chicken	2		294	0		0	1.8		77.4	371.4
Milk	25.5		3.748.5	84		6.804	18.2		782.6	11.335.1
Fresh fish	29.2		4.292.4	0		0	21.9		941.7	5.234.1
Vegetables	18.2		2.675.4	0		0	18.2		782.6	3.458.0
Fruits	9.1		1.337.7	0		0	9.1		391.3	1.729.0
Oil	10.9		1.602.3	1.8		145.8	9.1		391.3	2.139.4
Butter				5.4		437.4	1.8		77.4	514.8
Dates				5.5		445.5				445.5

Table Annex 54  
Food Requirements for the Year 2000  
Nouadhibou

	Rural Sedentary			Nomadic			Urban			Regional Total
	Kg/yr	Pop. (000')	Tons	Kg/yr	Pop. (000')	Tons	Kg/yr	Pop. (000')	Tons	
Millet	41	65	2,665	40	0	-	19	49	931	3,596.0
Rice	67.3		4,374.5	66.7			83		4,067	8,441.5
Wheat	49.3		3,204.5	48			21		1,029	4,233.5
Bread flour	7.3		474.5	7.3			18.2		891.8	1,366.3
Roots	0		0	0			5.5		269.5	269.5
Unshelled peanuts	0		0	0			7.3		357.7	357.7
Watermelon seeds	7.3		474.5	0			0		0	474.5
Cowpeas	5.5		375.5	1.8			3.6		176.4	551.9
Sugar	14		910	14			14		686	1,596.0
Beef	0		0	3.6		0	9.1		445.9	445.9
Camel	14.6		949	0		0	0		0	949
Sheep	3.6		234	10.9			7.3		357.7	591.7
Chicken	2		130	0		0	1.8		88.2	218.2
Milk	45		2,925	84			18.2		891.8	3,816.8
Fresh fish	14.6		949	0			21.9		1,073.1	2,022.1
Vegetables	18.2		1,183	0			18.2		891.8	2,074.8
Fruits	0		0	0			9.1		445.9	445.9
Oil	5.4		351	1.8			9.1		445.9	796.9
Butter	5.4		351	5.4			1.8		88.2	439.2
Dates	3.6		234	5.5						234

Table Annex 55

Food Requirements for the Year 2000  
Adrar - Tagant - Tichiri - Tiris-Zemmour

	Rural Sedentary			Nomadic			Urban			Regional Total
	Kg/yr	Pop. (000 <sup>1</sup> )	Tons	Kg/yr	Pop. (000 <sup>1</sup> )	Tons	Kg/yr	Pop. (000 <sup>1</sup> )	Tons	
Millet	41	124	5,084	40	35	1,400	19	64	1,216	7,700
Rice	67.3		8,345.2	66.7		2,334.5	83		5,312	15,491.7
Wheat	49.2		6,113.2	48		1,680	21		1,344	9,137.2
Bread flour	7.3		905.2	7.3		255.5	18.2		1,164.8	2,325.3
Roots	0		0	0		0	5.5		352	352
Unshelled peanut	0		0	0		0	7.3		467.2	467.2
Watermelon seeds	7.3		905.2	0		0	0		0	905.2
Beans	0		0	0		0	0		0	0
Cowpeas	5.5		582	1.8		63	3.6		230.4	975.4
Sugar	14		1,736	14		490	14		896	3,122
Beef	0		0	0		0	9.1		582.4	582.4
Goat	21.9		2,715.6	3.6		126	0		0	2,841.6
Sheep	7.3		905.2	10.9		381.5	7.3		467.2	1,753.9
Chicken	2		248	0		0	1.8		115.2	363.2
Milk	45		5,580	84		2,940	18.2		1,164.8	9,684.8
Fresh fish	0		0	0		0	21.9		1,401.6	1,401.6
Vegetables	18.2		2,256.8	0		0	18.2		1,164.8	3,421.6
Fruits	0		0	0		0	9.1		582.4	582.4
Oil	5.4		669.6	1.8		63	9.1		582.4	1,315
Butter	5.4		669.6	5.4		189	1.8		115.2	973.8
Dates	3.6		445.44	5.5		192.5	0		0	637.94

Table Annex 56  
Food Requirements for the Year 1980  
Mauritania

	Rural Sedentary (Tons)	Nomadic (Tons)	Urban (Tons)	Total Mauritani (Tons)
Millet	43.799	16.360	6.726	66.885
Rice	47.787	27.280.3	29.382	104.449.
Wheat	13.645.4	19.632	7.434	40.711.
Bread flour	4.964	2.985.7	6.442.8	14.392.
Roots	2.892.75	0	1.947	4.839.
Unshelled peanuts	5.899.8	0	2.584.2	8.484
Watermelon seeds	2.095.1	0	0	2.095.
Beans	3.349.5	624.6	385.2	4.359.
Cowpeas	390.5	111.6	889.2	1.391.
Sugar	9.520	5.726	4.956	20.202
Beef	3.646.5	1.249.2	3.221.4	8.117.1
Camel	3.102.5	223.2	0	3.325.7
Sheep	4.150	4.458.1	2.584.2	11.192.3
Chicken	1.360	0	637.2	1.997.2
Milk	22.936.5	34.356	6.442.8	63.735.3
Fresh fish	14.687	0	7.752.6	22.439.6
Vegetables	12.376	0	6.442.8	18.818.8
Fruits	5.541.9	0	3.221.4	8.763.3
Oil	5.855.1	736.2	3.221.4	9.812.7
Butter	1.571.4	2.208.6	637.2	4.417.2
Dates	255.6	2.249.5	0	2.505.1

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Table Annex 57

Food Requirements for the Year 1985  
Mauritania

	Rural Sedentary (Tons)	Nomadic (Tons)	Urban (Tons)	Total Mauritania (Tons)
Millet	51.736	14.520	8.740	74.996
Rice	56.961.1	24.211.5	38.180	119.353.1
Wheat	17.005.1	17.424	9.660	44.089.1
Bread flour	5.934.9	2.649.9	8.372	16.956.8
Roots	3.415.25	0	2.530	5.945.25
Unshelled peanuts	6.902.6	0	3.358	10.260.6
Watermelon seeds	2.671.8	0	0	2.671.8
Cowpeas	3.954.5	561.6	439.2	4.955.3
Beans	517	91.8	1.216.8	1.825.6
Sugar	11.382	5.082	6.440	22.904
Beef	4.242.3	1.123.2	4.186	9.551.5
Camel	3.971.2	183.6	0	4.154.8
Sheep	4.891.5	3.956.7	3.358	12.206.2
Chicken	1.626	0	828	2.454
Milk	27.868.5	30.492	8.372	66.732.5
Fresh fish	17.169.6	0	10.074	27.243.6
Vegetables	14.796.6	0	8.372	23.168.6
Fruits	6.542.9	0	4.186	10.728.9
Oil	6.875.9	653.4	4.186	11.715.3
Butter	2.003.6	1.960.2	828	4.791.8
Dates	338.4	1.996.5	0	2.334.9

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Table Annex 58

## Food Requirements for the Year 1990

## Mauritania

	Rural Sedentary (Tons)	Nomadic (Tons)	Urban (Tons)	Total Mauritania (Tons)
Millet	59,174	13,200	10,982	83,356
Rice	66,233.3	22,911	47,974	136,273.3
Wheat	20,460.3	15,840	12,138	48,438.3
Bread flour	6,891.2	2,409	10,519.6	19,819.8
Roots	3,918.75	0	3,179	7,097.75
Unshelled peanuts	7,857.7	0	4,219.4	12,077.1
Watermelon seeds	3,270.4	0	0	3,270.4
Beans	4,537.5	514.8	500.4	5,552.7
Cowpeas	654.5	79.2	1,580.4	2,314.1
Soyab	13,216	4,620	3,092	25,928
Beef	4,805.2	1,029.6	5,259.8	11,094.6
Camel	4,961.8	158.4	0	5,020.2
Sheep	5,599.9	3,597	4,219.4	13,416.3
Chicken	1,838	0	10,404.4	12,242.4
Milk	32,808	27,720	10,519.6	71,047.6
Fresh fish	19,572.6	0	12,658.2	32,230.8
Vegetables	17,180.8	0	10,519.6	27,700.4
Fruits	7,507.5	0	5,259.8	12,767.3
Oil	7,858.5	594	5,259.8	13,712.3
Butter	2,452.1	1,782	1,040.4	5,274.5
Dates	478.4	1,815	0	2,293.4

Table Annex 59

Food Requirements for the Year 1995  
Mauritania

	Rural Sedentary (Tons)	Nomadic (Tons)	Urban (Tons)	Total Mauritania (Tons)
Millet	66.833	12.160	13.452	92.445
Rice	76.278.8	20.276.8	58.764	155.319.2
Wheat	24.422.6	14.592	14.868	53.882.6
Bread flour	7.913.2	2.219.2	12.885.6	23.018
Roots	4.431.75	0	3.894	8.325.75
Unshelled peanuts	8.812.6	0	5.168.4	13.981
Watermelon seeds	3.963.9	0	0	3.963.9
Beans	5.131.5	478.8	550.8	6.161.1
Cowpeas	830.5	68.4	1.998	2.896.9
Sugar	15.176	4.256	9.912	29.344
Beef	5.360.5	957.6	6.442.8	12.760.9
Camel	5.891.1	136.8	0	6.027.9
Sheep	6.322.2	3.313.6	5.168.4	14.804.2
Chicken	2.168	0	1.274.4	3.442.4
Milk	38.230.5	25.536	12.885.6	76.652.1
Fresh fish	22.075.2	0	15.505.2	37.580.4
Vegetables	19.728.8	0	12.885.6	32.614.4
Fruits	8.490.3	0	6.442.8	14.933.1
Oil	8.868.3	547.2	6.442.8	15.858.3
Butter	2.971.4	1.641.6	1.274.4	5.887.4
Dates	543.6	1.672	0	2.215.6

Table Annex 60  
Food Requirements for the Year 2000  
Mauritania

	Rural Sedentary (Tons)	Nomadic (Tons)	Urban (Tons)	Total Mauritania (Tons)
Millet	74.960	11.320	16.226	102.506
Rice	87.106.5	18.876.1	70.882	176.864.6
Wheat	28.887.3	13.584	17.934	60.405.3
Bread flour	9.015.5	2.065.9	15.542.8	26.624.2
Roots	4.968.5	0	4.697	9.665.5
Unshelled peanuts	9.796.6	0	6.234.2	16.030.8
Watermelon seeds	4.752.3	0	0	4.752.3
Beans	5.753	446.4	601.2	6.800.6
Cowpeas	1.057.5	63	2.473.2	3.593.7
Sugar	17.290	3.962	11.956	33.208
Beef	5.926.4	892.8	7.771.4	14.590.6
Camel	7.037.2	126	0	7.163.2
Sheep	7.065.6	3.084.7	6.234.2	16.384.5
Chicken	2.500	0	1.537.2	4.037.2
Milk	44.187.0	23.772	15.542.8	83.501.8
Fresh fish	23.847	0	18.702.6	42.549.6
Vegetables	22.477	0	15.542.8	38.019.8
Fruits	9.518.6	0	7.771.4	17.290
Oil	9.927.2	509.4	7.771.4	18.208.0
Butter	3.561.6	1.528.2	1.537.2	6.627.0
Dates	680.4	1.556.5	0	2.236.9