



GULF AREA OFFICE

THE STATE OF FOOD AND NUTRITION IN BAHRAIN

ABDULRAHMAN O. MUSAIGER



Gulf Area Office

THE STATE OF FOOD AND NUTRITION IN BAHRAIN

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First Edition, 1993
UNICEF, Gulf Area Office
Riyadh, Saudi Arabia

First Edition, 1993

Bahrain Public Library No. L.D. 1403/93

Printed in Awal Press, Bahrain

Cover design by Mr. Mahmood Al-Yamani

Musaiger, Abdulrahman Obaid

The State of Food and Nutrition in Bahrain

1. Food 2. Nutrition

3. Bahrain

I. Title II. Musaiger, A.O.

Requests for additional copies of this publication should be sent to:

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P.O. Box 18009
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Preface

This report attempts to highlight the food and nutrition in Bahrain. Information in this report was based on the country paper prepared for the International Conference of Nutrition (ICN), Rome, 1992, which I had the privilege to write and become the country focal point for that conference.

The report is not intended to be an exhaustive review, but it provides essential information on problems related to food and nutrition in Bahrain. Such information can be used as a baseline for researchers and planners who are interested in improving nutritional status of the Bahraini community.

I am grateful to the Ministry of Health, Bahrain for giving me the opportunity to prepare the first draft of this report as a country paper for ICN. I would like to express my appreciation to Dr. J.W.T. Dickerson, former professor of Nutrition, University of Surrey, U.K., for his valuable comments on the manuscript. Thanks are also due to Mr. Sabah Allawi, UNICEF Representative and Mr. Shamsul A. Farooq from UNICEF Gulf Area Office, Riyadh, for their support and encouragement.

August, 1993

A.O. Musaiger

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Demographic and socio-economic background

Geography

Bahrain consists of 33 islands with a total of about 661 square Kilometers. The country lies halfway down the Arabian Gulf and about 24 Km away from S. Arabia, which is linked to Bahrain through a causeway. The main island of Bahrain is Manama, the capital, where about half of the population lives in.

Population

The Population of Bahrain was found to be 508037 in 1991 and largely consists of Arab Muslims. There has been a large increase in the population since the first census in 1941 when it was 89970. The population doubled in the rest 25 years upto 1965 and then took only 15 years to 1981 to double again (Table 1). This latter increase was mainly due to the influx of expatriates who came to Bahrain to work. Based on the latest census (1991) about 64% of the population are Bahraini, the rest are expatriates mainly from Indian subcontinent, Iran and the Far East.

Table (1)
Population by nationality in census year.

Year	Bahraini		Non-Bahraini		Total	
	No	%	No	%	No	%
1941	74040	82.3	15930	17.7	89970	100.0
1950	91179	83.2	18471	16.8	109650	100.0
1959	118734	83.0	24401	17.0	143135	100.0
1965	143814	78.9	38389	21.1	182203	100.0
1971	178193	82.5	37885	17.5	216078	100.0
1981	238420	68.0	112378	32.0	350798	100.0
1985	282119	66.4	142534	33.6	424657	100.0
1991	323305	63.6	184732	36.4	508037	100.0

The Economy

Bahrain was one of the richest areas in the northern Gulf prior to the discovery of oil. Its pearls were the best in the region and pearling employed nearly half the male working population. It was also an important agricultural and trading centre. The discovery of oil was discovered in 1932 and this led to Bahrain becoming the first state on the Arab side of the Gulf to exploit its oil. However, Bahrain's oil reserves are very limited and the country has had to develop a more diversified economic base. As a result Bahrain's economy was not seriously affected by the regional recession until late 1984. Although oil contributes only about one sixth of GDP, oil sales provide over 50 percent of government revenues and public expenditure and is thus a powerful force in the economy. Conditions in the international oil markets have a major impact on levels of government spending (EIU, 1990).

Manufacturing and banking are both important sectors of the economy and Offshore Banking Units have been able to operate in Bahrain since 1975. The fact that it developed earlier than many of its neighbours enabled Bahrain to provide many facilities and services that its neighbours had not yet acquired. It now acts as major banking, telecommunications and air transport centre. This role is threatened somewhat by the fact that other Gulf states are increasingly establishing such services for themselves but nonetheless Bahrain has become the site for some sizeable pan-Arab industrial projects (EIU, 1990).

One project which has had a profound impact on the economic and political life of Bahrain is the causeway to Saudi Arabia, which was opened in December 1986. There is still some disagreement within the Bahraini community as to the effects of the causeway and how far it will benefit the country. Saudi goods are, for example, more heavily subsidised than Bahraini goods, so Bahraini merchants have lost out as locals flock to Saudi Arabia to buy cheaper food and consumer goods. However, local industries are benefiting from export opportunities in Saudi Arabia and the other GCC states and the advantages of cheaper transport for imported raw materials. The influx of Saudi visitors, especially at weekends, has given a fillip to restaurant and hotel trade and has encouraged increased investment in the tourism sector. (EIU, 1990).

National Accounts

Although Bahrain has been affected by the world oil price slump, its real impact only began to take effect in 1984 and 1985. Oil accounted

for only 16.3% of GDP in 1986 and the banking sector was nearly as significant, contributing 14.1%. Current government investment in heavy industry and measures to encourage the development of light industry in the private sector also mean that manufacturing will contribute a much greater proportion of GDP in the future (EIU, 1990).

Employment

According to the 1985 estimates Bahrain's economically active population totalled 162,508. Of whom 57% were expatriates, mostly from India, Pakistan and South East Asia. Economically active non-Bahraini males numbered 85,727 in 1985. By 1988 the local labour force was 80,000 which is expected to double by the end of the century.

Of the total number employed in 1985 women accounted for about 12%; however, they make up a larger share (18%) of the Bahraini work force. Official figures for 1981 (the last year for which figures are available) show that the largest number of workers were then employed in the service and construction sectors.

There are comparatively few non-Bahraini Arabs in the work force because Bahrain has enforced very stringent entry requirements for Arab Nationals. The numbers of other workers entering the country increased significantly until 1983, reflecting the need for construction workers. Bahraini nationals tend to work in specific sectors: only 25% of those employed in the private sector and only 20% of those in construction are Bahraini, whereas over 50% of employees in the community, social and personal services sectors are Bahraini nationals. The proportion of expatriates in the population as a whole was thought to have peaked at 73.6% in early 1985, but has fallen since then. The government is keen to ensure that senior posts in all sectors of the economy are filled by nationals (EIU, 1990).

The increasing participation of young Bahraini women, combined with high levels of immigration, has been a contributory factor in reducing the median age of the labour force. This fell from 34 years in 1971 to 29 years in 1981. Nationals have limited trade union rights and are represented by the General Committee for Bahrain Workers, which operates in eight companies. Bahraini unemployment is currently estimated at around 3% and is highest among the young. With 50% of the national population under 24 years there is some anxiety about job prospects, and the government is placing greater emphasis on training schemes (EIU, 1990).

The state of public health

Since 1970 socio-economic conditions have continued to improve. Infant mortality has fallen dramatically mainly due to the promotion of health services. Primary and secondary health care services have expanded intensively and now cover all geographical areas in Bahrain. Additionally health services are provided free of charge to all the people living the country.

Infant mortality decreased from an estimated 77 to 45 per 1000 live births during 1971-1981 (CSO, 1983) to an estimated 20 per 1000 live births in 1990 (Public Health Directorate, 1991). Life expectancy was estimated to increase by 7.1 years for males and 7.5 years for females between 1965 and 1981, to reach 63.9 and 67.8 years respectively during 1976-1981 (CSO, 1983). Some of the essential vital statistics for Bahrain are presented in Table (2).

Table (2)
Vital statistics rates and the sex ratio for 1990.

Indicator	Rate and ratio
Crude birth rate	27.0/1000 population
Crude death rate	3.1/1000 population
Neonatal mortality rate	17.3/1000 live births
Post neonatal mortality rate	2.4/1000 live births
Infant mortality rate	20.2/1000 live births
Still birth rate	11.3/1000 births
Maternal mortality rate	0.15/1000 live births
Sex ratio at birth	1.06

Main Communicable Diseases

Salmonellosis

There was a decrease of 24% of salmonellosis cases when compared with that reported in 1990 (Table 3). Of all salmonellosis cases, 51% occurred in young children (less than 5 years), and this age group reported the highest incidence rate of 14.6/10000 population. It is well documented that meat, poultry and eggs are the common foods involved with this

infection. Unhygienic preparation of these foods at home may be responsible in part for the high prevalence of salmonellosis at this age group. It is worth mentioning that there is no precise infective dose of this bacteria, although some strains are more virulent than others. It was found that some people can get sick from a few as 10 bacteria in their food. Infants have incompletely immune systems, and therefore become more susceptible for salmonellosis and other microbial infection.

Shigellosis

Cases of shigellosis increased by 31% during 1990-1991, children aged less than 5 years had the highest incidence rate accounting to 45% of total cases in 1991. Children at age 5 to 14 years came next in order with a percentage of 32% of total cases. The most sources of shigellosis are infected human and water. Most mixed foods and milk are commonly foods involved with this infection.

Viral Hepatitis (A)

The total reported cases of viral hepatitis in 1991 were 272, and this figures represents a decrease of 28% from 1990 figure. Hepatitis A is the most reported cases (62% of total cases). Of these cases, 62% were in children 5-14 years of age. In many cases it is difficult to ascertain the food implicated since the disease has a long incubation period, varying from 10 to 50 days, and thus by the time an outbreak is detected the food is no longer available for examination. Probably all contamination initially by food handlers or polluted water.

Typhoid and Paratyphoid

About 86 and 12 cases of typhoid and paratyphoid were reported in 1991, respectively. The reported cases of typhoid increased by 39% compared to 1990, however, 83% of the cases were imported. The countries of importation were mainly India (67.7%) and Pakistan (21.1%). Of the total reported cases the majority (81%) were at age group 5 to 34 years, with almost equal percentage among the following age groups, 5-14 years (24.4%), 15-24 years (29.1%), and 25-34 years (28%). It is important to mention that typhoid fever is no long considered a public health problem in the country and the increase in the incidence in 1991 is mainly due to the increase in reporting cases in this year. All the 12 cases of paratyphoid fever were imported from India (10 cases) and Pakistan (2 cases).

Table (3)
Reported incidence of communicable diseases-Bahrain, 1986-1990.

Diseases	1986	1987	1988	1989	1990	change of 1990 fig. from that of 1989	% change
Typhoid fever	51	68	74	63	62	-1	-2
Paratyphoid Fever	12	239	30	25	16	-9	-36
Other Salmonella Infections	239	231	159	174	284	+110	+63
Shigellosis	163	180	222	161	121	-40	-25
Amoebiasis	44	49	66	55	33	-22	-40
Viral Hepatitis	355	167	190	324	380	+56	+17
Food Poison (inf. & Intox)	104	122	23	25	135	+110	+440
Poliomyelitis*	0	0	0	0	0	0	0
Streptococcal Sore Throat	22	253	149	213	399	+186	+87
Diphtheria**	0	0	0	0	0	0	0
Whooping cough	1	10	2	0	0	0	0
Meningococcal Infection	3	27	4	4	4	0	0
Other Meningitis	31	50	36	27	14	-13	-48
Pulmonary TB	94	90	114	96	91	-5	-5
Non-Pulmonary TB	62	30	28	26	26	0	0
Chickenpox	1305	6487	3194	7586	2243	-5343	-70
Mumps	4526	2448	343	223	192	-31	-14
Influenza	7540	4245	6450	5467	5147	-320	-6
Measles	97	22	5	181	59	-122	-67
Rubella	68	183	155	56	27	-29	-52
Syphilis	33	11	50	19	37	+18	+95
Gonococcal Infection	565	639	540	364	330	-34	-9
Leprosy	11	7	11	13	9	-4	-31
Neonatal Tetanus***	0	0	0	0	0	0	0
Non-neonatal Tetanus	0	1	1	0	2	+2	0
Malaria (P.vivax)****	243	161	139	176	181	+5	+3
Malaria (P.falciparum)****	11	7	31	22	28	+6	+27

No cases of Cholera, Brucellosis, Anthrax, Plague, Relapsing Fever and Typhus Fever were reported in the years 1986-1990.

* No cases of Polio reported since 1982.

** No cases of Diphtheria reported since 1982.

*** No cases of Neonatal Tetanus reported since 1985.

**** All imported cases - no indigenous transmission since 1979.

Intestinal Parasitic Infection

Intestinal parasitic infections such as ascariasis, hookworm infection and trichuriasis are among the most common infections in the developing countries. Studies indicate that parasitic infections adversely affect the health status of the population through malsorption, diarrhoea, growth stunting in young children, and impaired work capacity (WHO, 1986).

Information on intestinal parasitic infection in Bahrain is scarce. Mobayed et al (1981) found that 36% of children aged 0-11 years were infected with intestinal parasites. A recent study (Musaiger and Gregory, 1989) on prevalence of intestinal parasites among school children 6 to 20 years indicated that males (15.4%) were more infected than females (12.5%). Infection of parasites among male children less than 16 years was twofold of that among children 16 years and above. For female children, the infection increased with age, as 9.7% of females aged 6-10 years were infected with parasites, compared to 12.4% and 19.6% of 11-15 years and 16 years and above age groups; respectively.

The study did not detect any hookworm infection among both sexes, and only one infection of *E.histolytica* was found in a male child. The frequency of other parasites by sex and age of children is given in Table (4). In general, the infection with *G. lamblia* (4.7%), *T. trichiura* (3.8%) and *H. nana* (3.4%) were the most common. The prevalence of *G. lamblia* among both sexes was similar. However, when age groups were considered, males (7.1%) at age group 6-10 years had higher prevalence of *G. lamblia* than females (1.6%). At age group 11-15 years, females showed slightly higher prevalence of this infection than males (5.3% and 3.3 % respectively); whereas the difference between females and males increased markedly at age group 16 years and above (2.5% for males and 11.8% for females).

The prevalence of *T. trichiura* was greater among males than females in all age groups. In both sexes this prevalence decreased with age. Infection with *H. nana* showed different patterns, as the prevalence was higher among males age less than 16 years than females of the same age group. At age 16 years and thereafter females (5.9%) displayed higher prevalence of *H. nana* than males (1.3%).

Table (4)
Frequency of parasitic infections among school children in Bahrain

Parasites	Age group (years)											
	6-10			11-15			16+					
	Male	Female	Total	Male	Female	Total	Male	Female	Total			
No. examined	(183)	(124)	(307)	(211)	(113)	(324)	(80)	(51)	(131)	(474)	(288)	(762)
<i>A. lumbricoides</i>	0.6	1.6	1.0	2.8	2.7	2.8	1.3	2.0	1.5	1.7	2.1	1.8
<i>G. lamblia</i>	7.1	1.6	4.9	3.3	5.3	4.0	2.5	11.8	6.1	4.6	4.9	4.7
<i>T. trichura</i>	6.0	4.8	5.5	3.8	1.8	3.4	2.5	-	2.3	4.4	2.8	3.8
<i>H. nana</i>	2.7	0.8	2.0	6.6	1.8	4.9	1.3	5.9	3.1	4.2	2.1	3.4
<i>E. vermicularis</i>	0.6	0.8	0.7	0.5	-	0.3	-	-	-	0.4	0.3	0.4

Hereditary anaemia

The hereditary anaemia are a group of non-nutritional anaemias which are mainly sickle cell disease, thalassaemia, and glucose-6-phosphate dehydrogenase deficiency (G6PD). In Bahrain, hereditary anaemias are becoming a major health problem. The existence of these anaemias in the country was first reported by Mobayed et al (1980) who showed that the prevalence of sickle cell diseases among 0-5 years old children was 16.9%, and among 6-11 years old children was 21.0%. Blair and Gregory (1985) found that 12% of school girls aged 7 to 18 years had thalassaemia a minor, mild form of hereditary anaemia. In a comprehensive study on 10327 hospitalized births, Mohammed et al (1987) reported that 11.2% of neonates had sickle cell trait (heterozygones), 2.1% had sickle cell anaemia (homozygones), 24.3% had thalassaemia and 20.9% had G6PD. These figures are alarming and they are making a high demand in health resources. The magnitude of the health problem assert by the hereditary anaemias arises from the fact that they are both common and chronic (WHO, 1983).

The admissions of hereditary anaemias patients in the Salmaniya Medical Centre (the main hospital) has increased dramatically during 1980-1989. The admitted cases were 259 in 1980, rised to 644 in 1989, an increase of 150%. This increase can be attributed to several factors: increase in the awareness of physicians to diagnose these anaemias, improving the diagnosis and biochemical assessment used to detect these diseases, and increase in the population which in turn lead to an increase in the number of patients being admitted.

Causes of death

The major causes of death in Bahrain are cardiovascular diseases, cancer and conditions originating in the perinatal period. Deaths due to circulatory system has increased from 28.9% in 1974 to 32.0% in 1990, while those due to neoplasms have risen from 7.8% to 12.3%, during the same period. Deaths due to infectious and parasitic diseases have decreased dramatically to represent only 1% of the total death (Table 5).

It is worth mentioning that the notification of deaths in Bahrain is underreported since the law requiring a death certificate has no fine or other penalty attached. Hospital and Public Security are the main sources of mortality data. The registration of deaths occurring in homes is still less complete, mainly due to ignorance about the importance of death notification. Another important factor that affects the reliability of death registration is the poor knowledge of physicians about how to classify diseases and to fill out accurately the form of the cause of death.

Table (5)
Ten leading reported causes of death (percent of reported deaths).

Causes of death	1974	1979	1982	1985	1990
Diseases of Circulatory System	28.9	24.5	32.7	33.7	32.0
Diseases of Respiratory System	12.0	6.1	6.1	6.4	7.1
Diseases of Digestive System	7.6	1.8	2.4	2.5	3.2
Neoplasms	7.8	9.5	8.8	11.6	12.3
Accidents, Poisoning & Violence	11.4	13.2	11.5	10.3	7.7
Causes of Perinatal Mortality	6.5	14.0	14.8	15.2	13.4
Diseases of Genitourinary Tract	1.0	3.9	2.8	3.0	3.6
Congenital Abnormalities	2.0	3.7	1.7	3.1	4.1
Infective & Parasitic	5.6	5.9	2.2	2.1	1.0
Others	17.2	17.4	17.3	12.1	17.6

Food and agricultural production

Agricultural production has declined steeply in Bahrain, during the past 30 years. Advent of the oil industry caused many workers to shift from agriculture, as well as from fishing and pearl diving for better paid jobs in the oil industry. The unfavourable climate, salinity of the soil, and shortage of ground water have also played a vital role in the decline of agricultural production (Musaiger, 1982a). The amount of arable land is decreasing slowly due to the expansion of housing at the expense of cultivatable land. The area of cultivatable land decreased by 4.5% during the period 1974–1980 (Musaiger, 1986). The number of date-bearing palms fell by 22% for the same period, while the number of abandoned date palms was estimated at 450,000. For these reasons the country has become increasingly dependent on food imports which now represent about 90% of the total foods consumed (Musaiger, 1986).

Irrigation

Bahrain enjoys high summer temperatures and high relative humidity. Rainfall is minimal and irregular, averaging around 75mm a year. Farmers have to rely on irrigation and on aquifers originating in Saudi Arabia. Hydroponic and greenhouse cultivations are being developed.

Bahraini soils are generally calcareous or silty sands and sandy loams. They tend to have low organic matter content and low water holding capacity. The subsoil is often near the surface and is non-permeable which can lead to waterlogging. The ground water is highly saline ranging from 5,000 to 11,000 ppm of total dissolved solids (TDS). Even the aquifer water is saline, in the range of 1,500–7000 ppm TDS. The quality of aquifer and ground water is deteriorating due to over-use and increased penetration of sea water (Falcon Publishing, 1990).

Currently 70% of Bahrain's annual water consumption of 160 million cu m is used for agriculture. Around 70 million cu m of this comes from the Saudi aquifer. Much of the rest comes from highly saline water which is used to irrigate traditional Bahraini crops such as fodder (alfalfa) and dates and vegetables (Falcon Publishing, 1990).

Improving the quantity and quality of water for agriculture and other uses is an important government priority. The government spent \$385 million on desalination projects over the course of its 1982-87 Six Year Plan. The desalination plant is aimed at providing water for household use and thereby reducing demands from the aquifer. Water usage in agriculture is being reduced by the introduction of more economical irrigation methods such as drip irrigation, sprinkler irrigation etc, as compared to the traditional flood irrigation system. In order to promote the introduction of the new methods, the government provides a 40% subsidy to the farmers. The availability of desalinated water has improved the quality of effluent water, making it feasible to introduce treatments and make the treated water available for agricultural usage. The government has spent about eight million Bahaini dinars on the treatment, distribution and production network making possible the reclamation of about 500 ha land into productive agriculture. From the end of 1987, about 45,000 cu m per day of treated sewage effluent (TSE) have become available and there are plans to double this within a few years (Falcon Publishing, 1990).

Agricultural production

Bahrain's main crops are dates, fruits, vegetables and alfalfa. Dates are the country's oldest and most traditional food crop. However, the area under dates has been rapidly declining. Even in the past decade there has been a sharp fall in the number of date palms whose average yield is estimated at between 40 and 50 kilograms per palm.

Tomatoes are Bahrain's most widely cultivated vegetable, but yields are still low. A wide range of vegetables is grown, including cucumbers, lettuce, okra, peppers, cabbage, cauliflower, canteloups, marrows, radishes and onions (Table 6).

The local production of vegetables covers about 30% of the total vegetable consumption, compared with 65% for fish, 75% for milk, and 80% for eggs. The contribution of agriculture to gross domestic production does not exceed 1%. The estimated arable land and land under permanent crops for 1984 was 2000 ha (Musaiger, 1987).

The Ministry of Commerce and Agriculture is currently developing new techniques of vegetable production and experimenting with hot houses and hydroponics, particularly at its Budaiya station, extending the growing season throughout the year, thereby boosting yields.

Table (6)
Production of different vegetable crops in Bahrain
by Area, weight and value (85/86-87/88).

Crops	Value* (in 000 BD)		Production* (n tons)		Area (in donums)				
	87/88	86/87	85/86	87/88	86/87	85/86	87/88	86/87	85/86
Tomatoes	815	864	997	4382	4720	4413	232119	265200	252754
Cabbage	180	161	140	816	778	650	39892	38036	31784
Cauliflower	54	54	52	262	221	225	22412	18940	19404
Lettuce	118	118	150	586	594	573	29332	29719	28662
Carrots	61	46	48	241	200	233	15458	13397	15643
Onions(green)	54	64	73	695	776	810	12820	25860	26969
Eggplants	59	42	47	359	239	269	22316	14867	16685
Beet root	7	8	8	66	63	56	4144	4639	4115
Turnips	12	14	16	129	121	105	6362	6442	5582
Potatoes	8	12	10	75	85	74	4591	5186	4575
Snake Cu'mber	200	225	230	633	612	621	42307	40906	64104
Watermelons	-	-	-	-	-	-	16900	14361	16001
Canteloups	15	15	14	67	59	55	95743	91434	83824
Okra	82	94	54	188	179	108	100490	95595	57712
Marrow	126	130	139	741	746	778	37746	38534	40208
Pumpkin	14	15	26	88	84	152	4506	4323	7853
Other kinds	203	281	140	1082	929	780	148217	127276	104113
Total	2008	2143	2144	10410	10406	9902	835355	834715	779988

* Estimated

The most widespread crop is alfalfa, which requires a large quantity of water and whose area has accordingly declined. The Ministry is introducing new varieties of animal feed including sorghum, oats, ryegrass, Sudan grass and Napier grass. To raise livestock output it offers a 40% subsidy on mainly imported animal feed.

The traditional area of activity, date palm plantations has been receiving increasing attention by the authorities. There are today, a large number of dead and abandoned trees. The productive palms number 500,000 which produce about 10,000 tons of dates. It is said that about 50 per cent of the crop is lost completely.

Food industry

Food industries are confined to milling, baking, carbonated and non-carbonated soft drink, dairying and the processing of some snacks.

The government has started a factory in the Mina Salman area to process dates. The plant, which has been set up in collaboration with the U.N. Food and Agriculture Organisation, processes today only about 100 tons of dates per year. It has a large potential to increase its output. The scientific processing and marketing of dates are designed to help the farmer to get a fair price.

The Ministry of Commerce and Agriculture has also been trying to develop new varieties of palms which can stand the rigorous environmental conditions. New Zealand government horticulture scientists have been helping Bahrain to develop new date palms through tissue culture. New Zealand has supplied the requisite laboratory equipment and researchers to conduct studies. These studies are expected to yield worthwhile results.

The development of the Bahraini poultry industry has been particularly successful. The government run General Poultry Company has 70,000 hens laying up to 20 million eggs a year, satisfying some 40% of the local demand, while 35 mainly privately owned units provide a further 7.5 million eggs and 1.25 million table birds. Progress in increasing the numbers and yield of cattle, sheep and goats has been more limited however. The government is attempting to boost dairy output, mainly through import of Australian Friesian and British Jersey herds. In February 1985 a new Bahrain National Dairy Company, in which the government has a 20% interest, was established. Bahraini cattle produce only an estimated 10% of milk consumed on the island (Falcon Publishing, '90).

Food imports

Food importation has increased steeply due to the lack of a developed agricultural base and very rapid growth in demand for food commodities.

Imports of livestock increased from 27000 animals in 1975 to 260000 animals in 1983. Meat and meat preparation rose from 13103 tons in 1980 to 17116 tons in 1986. Poultry importation showed the same trend, as it increased from 4343 tons to 11564 tons during the period 1978-1986, an increase of 166% (CSO, 1976, 1987).

The state of fish and fisheries

Shifting from traditional occupations to more highly paid jobs in the oil industry and other businesses, rapid urbanization and population growth, all contributed to the decline of fisheries in Bahrain. Oil revenue has a limited effect on the development of agriculture in general and food production in particular. This is because the ratio of investment in agriculture to the total planned investment was very low. It was reported that the contribution of agriculture to the gross domestic production in Bahrain does not exceed 1%.

Since the end of the 1970s serious efforts have been focused on the developments of the fishery sector, resulting in a noticeable improvement in this sector. Actually, the Bahrain islands are rich in fishery resources with many potentially productive sites on the inhabited coast. However, the efforts to develop fisheries are facing many difficulties. This section briefly highlights the present situation of fish and fisheries in Bahrain, outlines the constraints and gives some possible measures to develop the fishery sector.

Fish landing

In the five-year period from 1979 to 1984, the total fish landing increased by 80%, from 3801 tons to 5599 tons. The two sectors contributing to fish landing are the artisanal and the industrial sectors, which contributed 76% and 24%, respectively. As seen in Table 7, the contribution of the industrial sector did not show a significant increase during this period. The total catch from this sector was 1305 tons in 1979 and slowly rose to 1357 tons in 1984. However, the artisanal sector, operated by traditional fishing methods proved to be the principal supplier of fish in Bahrain, and thus more attention should be paid for its development.

Rabbit fish, shrimps, perches, groupers and trevallies represent the main landing in Bahrain (Table 8). Crustaceous fishery depends largely on shrimps which constitute 80% of the total crustaceous catch. Rabbit fish, the most popular fish in Bahrain, was the main fin fish caught. The contribution of rabbit fish to the total landing of fin fish increased from 11.9% in 1979 to 29.6% in 1988. Groupers came second in order, although its contribution to the total landing decreased from 13.4% to

11.5% during the years 1979 and 1984, respectively. In general, the fin fish catch increased by 55.5%, and the crustaceous by 23%, while molluscans rose by 464.3% during the period 1979–1984.

Landing facilities

There are about 51 fishing sites distributed around the islands of Bahrain. Unfortunately many of these sites have no landing facilities. It was found that the majority of these sites lack facilities for providing ice, fresh water, fuel and a mooring pier. Beach landing and marketing facilities were available in 86.3% of the total fishing sites. The facilities available for artisanal fishery were found to be poor when compared with those available for industrial fishery (Musaiger 1988).

Labour force

The number of fishermen has increased from 4101 to 4554 during the period 1978–1983, an increase by 11%. Most of this increase has occurred in the Bahraini fishermen, where their number rose by 13% during this period. Similarly, the number of non-Bahraini fishermen increased by 13%. It is important to note that there was decline by 16% among the full-time Bahraini fishermen, and more part-time as well as occasional fishermen have become involved in the fisheries. This implies that some full-time fishermen have shifted to better paid jobs in other sectors, indicating an unhealthy situation, as these fishermen are the most skilled workers (Fisheries Statistical Services, 1985).

Handling and processing

Fishermen in Bahrain operate two kinds of vessels, wooden, and steel boats, and using various methods of fishing such as traps, trawls, and handling. The fish catch is presented in insulated boxes in which an adequate amount of ice is mixed with the fish to attain rapid cooling. Cole and his coworkers (1977) noted that in Bahrain fish during handling were bulked too deep with at least 8 feet, a practice which damages the fish, especially those in the middle and at the bottom of the pile. Hence, the shelf-life and quality of the fish will be affected. The same investigators recommended the use of pound boards to separate the catch into layers of not more than two feet. Storing the catch with ice in plastic boxes to facilitate fish handling, especially from the vessels to the store, was also recommended.

Unsuitable handling and processing of fish in Bahrain has been reported by other investigators (Cole et al 1977). Much ice is lost through melting as a result of being transported in open vehicles. Fish transported in open vehicles suffer spoilage and reduction of shelf-life, due to exposure to direct sunlight (MATCH, 1982). Fish and other marine products are displayed with or without ice in palm-leaf baskets or mats on the ground or on concrete displays, depending upon market facilities. In some markets in big cities, fish marketing facilities are available, including proper display shops, cold storage and running water. Cleaning, filleting and/or eviscerating of fish are also provided to the consumers. In many other markets, particularly in the rural areas, handling and processing facilities are lacking, and fish are displayed without ice on mats placed on the ground. Most fish are sold as fresh products, with some being dried or salted. Shrimps are commonly dried, especially at peak seasons. However, as a result of changes in dietary habits, salted fish have become less popular dietary items in recent years. When compared to other processed fish, canned fish are highly consumed, and the most popular of these are tuna, mackerel, and sardines. All canned fish are imported, since there is no fish canning industry in Bahrain. Frozen fish and shrimps are available in supermarkets, and are widely consumed by non-Bahrainis.

Marketing and distribution

There are various methods of fish marketing in Bahrain. In big towns having a central fish market, storage and fresh water facilities are available, and the possibility of fish spoilage is relatively low. In some villages which are lacking most facilities, the marketing is done in an open area and the fish are not protected from heat, particularly from direct sunlight. Under these conditions a rise in fish temperature is possible, and this influences the subsequent shelf-life. Many purchasers, therefore, prefer to buy the fish early in the morning or in the afternoon, soon after the fishermen land their catch.

In other villages, especially those far from the seashore, small vehicles drive round the houses to sell the fish, which are mixed with ice and covered by wet cloths. In this case fish are exposed to contamination and spoilage, since these vehicles have no proper storage facilities.

Local consumers prefer small and medium size fish such as rabbit fish and trevallies. Large size fish like groupers are usually bought by hotels and restaurants.

Table (7)

Quantities of fish landed (estimated) imports and average person consumption in Bahrain - metric ton (1981-1988).

Year	Average person daily consumption of fish(g)	Quantity consumed	Imports		Industrial Artisanal Total	
			Quantity consumed	Fishing sector		
1981	55.6	73006	17863	57468	21483	35985
1982	54.9	75035	19316	55938	18443	37495
1983	55.8	79582	31539	48117	15092	33025
1984	58.0	86199	30211	55988	13571	42417
1985	69.0	106911	29285	77626	15775	61851
1986	65.9	106226	29316	80567	19268	61299
1987	63.6	106219	35676	78415	21119	57296
1988	53.4	92334	30792	67361	17649	49712

Table (8)

Total estimated quantity & value of fish landing by fish groups in Bahrain, quality in Metric Tons, value in 000 BD., (1984-1988).

Fish type	1984		1985		1986		1987		1988	
	Qua.	Value								
Fish group	45634	39573	58506	46484	60935	49924	57524	44225	53396	46086
Trevallies	5219	4768	5325	4628	4325	3910	3202	2386	3938	3547
L. Jackets	101	18	49	9	89	8	71	7	63	12
S. Biddies	944	1112	881	966	1010	853	847	762	234	244
Perches	6563	3439	8236	4414	8736	4932	9297	4834	9528	5191
Snappers	875	319	625	237	621	269	851	378	365	165
Mulletts	235	181	1118	586	1263	1327	108	89	1777	1401
Groupers	6423	5976	9329	6648	11658	9796	9937	8734	8630	7460
Rabbit	11048	15564	17020	20648	13226	17233	15656	18217	12691	18555
Mackerels	2210	3134	1409	1994	2899	3557	2935	2748	1895	2712
Grunts	1040	797	1693	1510	1808	1311	2172	1598	2647	2939
Sea Breams	1365	818	2105	1237	3552	2032	1446	863	1334	1070
Barracudas	464	337	707	436	624	384	1113	533	1240	661
Goat	414	158	356	128	332	115	276	67	218	100
Gar	343	206	917	466	1776	1271	327	197	381	253
Parrot	1525	233	1818	209	1472	220	1634	291	1628	353
Sergeant	220	218	194	176	166	135	150	127	131	109
Others	6645	2295	6731	2192	7378	2490	7502	2394	6693	1314
Crustaceans	9860	11944	18699	14607	19269	15602	20607	22062	13262	15969
Shrimps	8082	11411	13247	12293	17330	14926	18432	21301	11176	15386
Crabs	1619	383	5180	2033	1541	363	1854	500	1908	325
S. Lobsters	159	150	272	281	398	313	321	261	210	258
Mollusca	494	342	421	246	363	219	284	261	674	476
Sepia, Calamars	494	342	421	246	363	219	284	261	674	476
Total	55988	51859	77626	61337	80567	65745	78415	66548	67361	62531

Prices of fish depend mainly on the seasons of fish species. For example the peak season for Spanish mackerel landing is during the winter months, November till February. Shrimps and rabbit fish landing peak is during summer, while groupers are continuously landed all through the year.

Fish imports and exports

Fish importation experienced a marked growth during the period of 1979-1989, during which it increased from 927 tons in 1979 to 9233 tons in 1985. The major growth occurred in the importation of fresh, chilled and frozen fish, which experienced a rise of 44.6% during the period 1979-1984. Canned fish importation showed the next most marked increase, with a rise of 108.7% during the same period (CSO, 1990). In 1984, the contribution of imported fish to the total fish consumption in Bahrain was 35%, which indicates that Bahrain still lacks self-sufficiency in fish production. A well-designed programme, therefore, is needed to encourage the two sectors of Bahrain's fishery, especially the artisanal sector which contributes nearly 50% of the total catch.

Bahrain has not exported any fish or fish products since 1983. Prior to that year there were some fish exportation and the amount fluctuated from year to year. It was reported that in 1976 Bahrain exported 1366 tons of fish, most of it frozen shrimps (MATCH, 1982). The Fisheries Statistical Services (1985) reported that the amount of fish exported in 1979 was 15.3 tons representing 1.2% of local fish landed in the same year. The amount, then, increased sharply to 179.2 tons in 1980, and to 218.9 tons in 1981, representing 8.0% and 10.2% of total fish landed, respectively. The exports in 1982 dropped dramatically to only 21.2 tons which represented 1.1% of the total fish landing. It is important to mention that most of fish exported were those which were not accepted in local markets except by certain expatriates (Feidi, 1986).

Constraints to fishery development

Several factors influence the development of the Bahrain fishery, these could be summarized as follows:

1. Lack of fishing and harbour facilities, particularly ice plant, cold storage, fuel and marketing facilities.

2. Insufficiency of investment capital to the fishing industry, with most available investment capital directed to poultry, milk and other food industries.
3. Insufficient research directed to the development of the Bahrain fishery.
4. Inadequate fishery regulation and legislation, such as fishing methods, handling, processing and marketing regulations . Although Bahrain is applying FAO/WHO Codes Alimentarius Standards, the need for local standards is emphasized.
5. Shift of fishermen from the fishery industry to better paid jobs in other industries. This leads to a gradual reduction of the labour force, particularly, the full-time fishermen.
6. Dredging and land reclamation activities which are carried out along the Bahraini coasts, affect the inshore biosystem with many corals being killed. It was reported that the total area dredged in 1982 was about 13,500,000 m² , while that reclaimed was 9,000,000 m² (Al-Alawi, 1982).
7. Lack of modern techniques and methods in fishing, since this activity is still dependent on artisanal sectors which used traditional methods for catching fish.
8. Shortage of qualified manpower in various aspects of fishery science. Saleh (1986) explained that the shortness of qualified persons in the fishery industry may be due to socio-economic factors, as fishing became less attractive to the new generation, and hence fewer people were involved in this sector.
9. Regional and government restrictions, as FAO (1978) reported that grounds fished by Bahraini fisheries are also fished by other fleets from neighbouring countries, so their catches were influenced by the activities of these fleets. Also, some areas are prohibited for fishing because of the availability of industrial and defence institutions (Saleh, 1986).
10. Pollution of the sea either by oil spill which occurs occasionally from time to time, or by industrial wastage and untreated sewage which affect the marine life.
11. Increase in prices of fishing gears and other fishing equipment.

Nutritional problems

Few nutritional surveys have been carried out during the past decade. Most of these surveys have methodological problems and lacked some important information such as dietary intake and clinical examination.

Undernutrition

Amine (1980) found that the prevalence of stunting among pre-school children (using Harvard Standard) was 14.3%, while that of wasting was 67.6%. For school children aged 6-18 years 0.7% had weights less than 60% of the Harvard Standard, and 6.9% had heights less than 90% of this standard.

Mobayed et al (1980) reported similar findings. They showed that undernutrition was more prevalent among preschool children, as 76% of preschool males and 71.2% of females in rural areas had low weight for age (using Harvard Standard), compared to 52.6% and 70.4%, respectively in urban areas. In children aged 6-11 years, 72% of males and 58% of females had low weight for age in rural areas, while the percentages were 65.5% for males and 70.5% for females in urban areas. The prevalence of low weight for age was lower among urban children; 17.9% of males and 23.2% of females in rural areas, as compared to 13% of males and 5.1% of females in urban areas.

Blair and Gregory (1985) showed an improvement in nutritional status among Bahraini school girls when compared to those reported earlier. Their results indicated that only 5% of school girls were less than 90% of NCHS Standard, while 87% of the girls were shorter than this standard.

A recent study on growth patterns of school children in Bahrain found that at all ages median heights and weights of Bahraini boys and girls fluctuated between the 25th and 5th percentiles of the NCHS Standard. Median triceps skinfold of Bahraini boys and girls fell between the 50th and 25th percentiles of the standard. Based on mid arm measurement the study indicated a high subcutaneous fat store, suggesting a lack of muscle development (Musaiger et al, 1989).

Low birth weight

Birth weight can be considered as sensitive indicator for assessing the health and maturity of newborn children. There is enough evidence to suggest that birth weight distribution and the proportion of children with low birth weight are promising indicators of socioeconomic development (Petros-Barvazian & Behar 1978). A study on 6793 infants (3495 males and 3298 females) born in 1980 showed that the mean birth weight of all infants was 3170g. The mean birth weight for males was 3223g, while that for females was 3140g. The sex ratio was 1.1 to 1.0 (Musaiger, 1985).

The distribution of infants by birth weight and socio-demographic factors is shown in Table 9. There was a higher incidence of low birth weight among females (7.9%) compared to males (6.9%). The difference between sex and birth weight was statistically significant ($P < 0.001$) (Musaiger, 1985). Sex, geographical location, mother's age and interval between births contributed significantly to birth weight in Bahrain; whereas mother's nationality and the number of past deliveries were not significant contributory factors.

El-Shafei and Mostafa (1988) demonstrated that the mean birth weight of Bahraini infants is lower than that of developed countries and some well-to-do developing countries, but is higher than many other developing nations.

The birth weights of 830 full term live births born between June 1982 and May 1984 were analysed to determine some of the factors predicting the mean birth weight and the incidence of Intra Uterine Growth Retardation (IUGR), often referred to as "small-for-gestational age" in Bahrain. The mean birth weight of full term babies was 3237 kgs ($SD = 0.480$). Mother's age, spacing between births, gestation, the sex of the baby and its nationality were the significant predictors of the mean birth weight in a multiple regression model. The incidence of low birth weight (< 2.5 kgs) among full term babies was 5.4%. This risk was higher for girls compared to boys with a marginal significance and significantly higher among non-Bahraini babies relative to Bahrainis. Mother's age was a strong predictor of the incidence of low birth weight of term babies. It had a clear curvilinear relationship to IUGR with the highest risk at ages < 20 years and > 40 years and the lowest risk at age 30-34 years. This relation was independent of previous parity. The effects of spacing pattern and gestation over 37 weeks were not significant. Parity beyond

Table (9)
Some factors associated with low birth weight (<2.5 kg) in Bahrain (N=6793)

Factors	% of Low Birth Weight
<u>Sex of infant</u>	
Male	6.9
Female	7.9
<u>Geographical location</u>	
Urban	6.5
Rural	8.5
<u>Nationality of Mother</u>	
Bahraini	7.2
Non-Bahraini	8.2
<u>Age of mother (years)</u>	
15 - 19	11.0
20 - 39	7.0
40 +	6.8
<u>Interval between deliveries</u>	
9 - 12 months	8.0
13 - 24	6.1
>24	5.9
<u>Number of past deliveries</u>	
1 - 3	6.1
4 - 6	6.4
7 +	7.2

three babies and pregnancy after age 35 years seem to provide important areas for prevention of IUGR but further research into mothers behavioral and health factors is needed (Musaiger and El-Samani, 1991).

Iron-deficiency anaemia

Anaemia appears to be a public health problem in Bahrain. Amine (1980) reported that 34% of preschool children were anaemic

(Hb < 11g/ 100ml), while the percentage was 32% among children aged 6 to 18 years (Hb < 12g/ 100ml). The prevalence among females (42.8%) was almost double that of males (21.0%). Mobayed et al (1980) showed that the prevalence of anaemia among preschool children was 39.5 % in rural areas and 19.7% in urban areas. The percentages were 40% and 23%, respectively for the children aged 6-11 years.

The situation with regard to iron deficiency anaemia seems to have improved as the prevalence has declined. Blair and Gregory (1985) showed that 24% of school girls aged 6 -18 years in Bahrain were anaemic, decreased by 18.8% during the period 1980-1985.

The causes of anaemia are complex including dietary factors, parasites and other infections. Studies in Bahrain (Mobayed et al 1980; Musaiger and Gregory 1988) showed that parasitic infection are prevalent among Bahraini children. However, the prevalence of intestinal parasitic infections decreased during the period 1980-1987, mainly due to the general improvement in health services and sanitation conditions.

Vitamin deficiency

Vitamin deficiencies do not seem to be a serious problem in Bahrain. There are no studies on the prevalence of certain vitamin deficiencies, but based on the hospitalized data, some cases of rickets were reported. Rickets is unlike most nutritional disorders in that it is more determined by socio-cultural factors than by economic ones. Wrapping of the infant may contribute to the prevalence of vitamin D deficiency. Mohamed (1985) found that 79% of Bahraini mothers wrapped their infants. The duration of wrapping varied from less than 1 week to more than 6 months. Dietary vitamin D is another important factor. Musaiger and Aldallal (1985) showed that with the exception of fish dishes, all other dishes commonly consumed in Bahrain contained a very small amount of Vitamin D.

Diet-related noncommunicable diseases

Cardiovascular diseases

Cardiovascular diseases are the most common cause of death in Bahrain. This category includes coronary heart disease (CHD), cerebrovascular disease (stroke), hypertension and peripheral vascular diseases. In Bahrain, the death rate due to diseases of the circulatory system for

age group 50 years and above has increased from 77/10000 in 1976 to 120/10000 in 1986. (Public Health Directorate, 1987).

Deaths due to diseases of the circulatory system occur early at 20-34 years age group, and increased sharply thereafter. Whereas deaths due to hypertension occur at 45-54 years age group and continue to increase thereafter. In general, males are more susceptible to cardiovascular diseases than females (Table 10).

Cardiovascular diseases have multifactorial aetiology. The clearly identified risk factors are high blood cholesterol, hypertension, cigarette smoking, diabetes, arteriosclerosis, advanced age, male sex and obesity. A case control study (Al-Awadi and Al-Khateeb, 1988) in Bahrain showed that the prevalence of diabetes, hypertension, drinking alcohol, smoking and overweight was higher among patients with coronary heart diseases than in the control (Table 11).

Table (10)
Age specific death rates per 100000 for circulatory system diseases, diabetes, hypertension and cancer, 1987 (Bahrain).

Age (yr)	Circulatory System Diseases		Diabetes		Hypertension		Cancer	
	Male	Female	Male	Female	Male	Female	Male	Female
1 - 4	14.4	4.9	-	-	-	-	4.8	-
5 - 14	-	11.8	-	-	-	-	2.3	4.7
15 - 24	4.0	2.6	-	-	-	-	4.0	2.6
25 - 34	29.7	21.8	-	-	-	-	4.7	3.6
35 - 44	84.4	25.0	-	-	-	6.3	6.5	18.8
45 - 54	325.4	177.0	35.5	8.8	17.8	53.1	65.1	79.6
55 - 64	682.4	500.0	94.1	116.7	58.8	83.3	270.6	166.7
65 - 74	1787.9	1344.8	242.4	344.8	272.7	206.9	636.4	310.3
75 +	4937.5	4066.7	562.5	466.7	562.5	466.7	1062.5	466.7
Total	123.4	97.0	12.7	14.5	10.7	14.5	33.2	24.4

Table (11)
Risk factors associated with coronary heart diseases in Bahrain 1987.

Risk factor	Case (N=109) %	Control (N=109) %	P-value
Diabetes	28.4	15.6	<0.05
Hypertension	86.2	9.2	<0.001
Drinking alcohol	11.0	5.5	<0.05
Smoking	86.2	31.2	<0.001
Over-weight	77.9	14.7	<0.001
Normal Cholesterol	91.3	94.5	N.S

The high intake of saturated fatty acids, dietary cholesterol and sodium may play an important role in increasing the risk of heart diseases in Bahrain. Transition from traditional diet to a western diet is likely to result in a significant increase in the intake of animal foods, and hence saturated fatty acids and dietary cholesterol.

Obesity

Obesity has become one of the major public health problems in Bahrain, especially among adult females. Amine (1980) reported that 39% of the adult females in Bahrain were obese (>120%, wt/ht). A recent study showed that 64% of mothers aged 18 years and above were obese (based on BMI equal or above 25) (Musaiger and Al-Sayyad, 1990).

Factors associated with obesity in Bahrain have not been well investigated. Some possible factors are lack of physical exercise, a high intake of energy-rich foods, sedentary life style, multiple pregnancies, and socio-cultural factors. Zaghoul et al (1985) found that the energy, fat, protein and carbohydrates intake of obese girls in Bahrain was significantly higher than that of non-obese. Additionally 65% of obese girls were categorized as less active compared to 29% of non-obese (Table 12). Amine (1980) demonstrated that the total number of children of obese mothers is likely to be higher than that of non-obese mothers. Of the mothers, 40.2% had seven children and more, compared to 27.7% among non-obese mothers.

Table (12)
Nutrient intake and activity level of obese and non-obese adolescent Bahraini girls 1984.

	Obese (N=40)	Non-obese (N=34)
<u>Nutrients intake (mean)</u>		
Total energy, kcal	2529	2057
Protein, g	78.0	63.0
Fat, g	79.0	61.0
Carbohydrates, g	37.6	31.4
<u>Activity level</u>		
	%	%
Less active	65.0	29.0
Moderately active	25.0	53.0
Active	4.0	18.0

A recent study by Musaiger and Al-Ansari (1991) showed that the educational level, employment, family history of obesity, and exercise contributed significantly to obesity among adult females in Bahrain, whereas nationality, ownership of a car, availability of housemaid, age and marital status were not significant contributory factors. Food faddism was more prevalent among these females, suggesting that these groups lack sound nutrition knowledge.

Childhood obesity tends to persist into adulthood in some individuals, and to be associated with a variety of physical, social and psychological problems. In Bahrain, Zaghoul (1985) showed that 12% of preschool children aged from 1 month to 5 years were overweight (>110% of Harvard standard). The highest percentage (30%) occurred in the first six months of life which means that obesity started early in some children. A study among Bahraini school girls aged 7 to 18 years reported that 19% of these girls were obese, based on the sum of four-skinfold and arm muscle circumference. In general, Bahraini girls had small muscle mass and low physical work capacity (Blair and Gregory, 1985).

Skinfold and arm circumference measurements done on 1593 Bahraini school children aged 6 to 18 years indicated a high subcutaneous fat store, suggesting a lack of muscle development. Fat patterning is of concern from a clinical perspective. Trunk and upper body fat distribution have been shown to be a risk factor for heart diseases and diabetes.

Diabetes Mellitus

Diabetes is another important public health problem in Bahrain. Morbidity due to diabetes has increased remarkably in the past 10 years, and has become one of challengeable health problems especially in the urban societies. Deaths due to diabetes are underreported, as physicians rarely consider diabetes as the main cause of death. In 1987 it was estimated that 4% of the total deaths in Bahrain were due to diabetes mellitus. From Table 8 we can see that deaths due to diabetes occurred at age 45 and over. At age group 45-54 years old, the death rate of diabetes was four times higher among males than females. At 55 years and more the death rate was higher among females than males (Musaiger, 1990).

The main type of diabetes in Bahrain, is non-insuline dependent diabetes (type II). Obesity may play an important role in the occurrence of this type of diabetes. It is evident that obese subjects develop diabetes

mellitus more often than those of normal weight or the lean subjects. The apparent increasing incidence of diabetes is also associated with higher average life expectancy, changes in the standard of living, and an increased survival rate of young diabetics to the reproductive age (Musaiger, 1992a).

The recent statistics of the Ministry of Health in 1990 showed that, of 21076 patients seen at the Salmaniya Medical Centre, 1.3% had diabetes. About 53% of the hospitalized patients with diabetes were male. There was a relatively high percentage of juvenile diabetic patients; 21.7% of the hospitalized diabetic patients were under the age of 15 years. The proportion of females was higher among the age group 15-44 years and those above 64 years of age.

A community-based study on nutritional status of 481 Bahraini mothers aged 18 to 48 years demonstrated that 8.5% of these mothers had diabetes (95% CI, 5.6-10.4%). The true prevalence of diabetes in Bahrain is probably higher than this estimate (8.5%) as many cases of diabetes are not recognized (Musaiger and Al-Sayyad, 1991).

A more recent study on dietary habits of elderly Bahrainis aged 65 years and older demonstrated a higher prevalence of diabetes (13.4%) among this age group. The prevalence of diabetes was higher among elderly women compared to men (15% and 10.2%, respectively) (Musaiger, 1992b).

Diabetes occurs more commonly among overweight people, the elderly and women. The reasons for the differences between sexes are still unclear. Multiple pregnancies contribute to the development of diabetes among women. Also as women live longer than men, they are more likely to develop diabetes. Bahraini women, in general, have a high risk of developing diabetes, possibly due to multiple pregnancies, obesity, inactivity and food habits.

Cancer

Cancer is the third cause of death in Bahrain, behind diseases of circulatory system and perinatal mortality. The percentage of deaths due to cancer increased from 2.5% in 1976 to 12% in 1985, and the incidence was higher among males than females. Between the age of 35 to 54 years old the cancer death rate was higher among females than males. However, from 55 years old and upward the death rate was almost double among males than females (Table 8).

World-wide epidemiological studies showed a correlation between dietary fat intake and the incidence of cancer of the breast, colon, prostate and endometrium. Low dietary fiber intake was found to be linked with breast and colon cancer. Death statistics in Bahrain showed that the main types of cancer were: Lung (33.3%), gastrointestinal (22.0%), liver (7.3%) and breast (5.7%).

The high intake of animal fat, low intake of dietary fiber and high incidence of obesity may be responsible in part for the increasing incidence of some types of cancer in Bahrain. It was reported that the daily per capita intake of animal fat in Bahrain increased by 77.5% during the period 1970-1980 (Musaiger, 1990).

The majority of Bahraini dishes are low in fiber content. Polished rice and bread made of low extraction rate wheat flour constitutes the staple diet in the country. The intake of fruits and high fiber vegetables are low. More investigations are therefore needed to find out the association of dietary habits with some types of cancer in Bahrain.

Dental caries

Dental caries is considered as a nutritional disorder because dietary carbohydrates play an important role in its occurrence, and because some nutrients help in preventing its occurrence. The incidence of dental caries in all Arabian Gulf countries has been found to be very high. In Bahrain there are few reports concerned with dental and oral health. In 1980, Mobayed et al (1980) found that 46.8% of children aged 6 to 11 years had teeth decay. Barmes (1980) showed that the DMFT (Decayed, missing or filled teeth) index among 12 years old Bahraini children was 1.0. A recent survey by Westwater (1986) on school children aged 6, 12 and 15 years old has shown that the DMFT index was 2.8, 1.3 and 1.9 for these age groups respectively. The prevalence of caries and fluorosis among school children in Bahrain is alarming (Table 13). In general the DMFT among 12 year old Bahraini children is below the WHO goal for 2000 (WHO is recommending 3 or less DMFT). However, it is essential not to let the current level rise.

The frequency of consumption of sweets is of prime importance in the occurrence of dental caries. The intake of soft drinks, chocolates, and sweets, cakes and other high sugar foods between meals especially by school children has been associated with rising caries rates. The high

consumption of bottled water which contains a low concentration of fluoride is another contributing factor to the occurrence of dental caries in the country. Prevention programmes should focus on the improvement of dietary habits and oral hygiene of school children.

Table (13)
Percentage of caries and fluorosis among
school children in Bahrain, 1986.

Age group	Sex	No. Examined	Caries %	Fluorosis %	DMFT
6 yr (deciduous teeth)	Male	165	75.2	-	3.2
	Female	183	61.7	-	2.5
	Total	348	68.1	-	2.8
12 yr	Male	168	40.5	34.5	1.1
	Female	174	51.1	33.3	1.6
	Total	342	45.9	33.9	1.3
15 yr	Male	175	53.7	52.0	1.7
	Female	153	54.9	36.6	2.1
	Total	328	54.3	44.8	1.9

Food consumption patterns

Food consumption patterns in early 1960s and 1970s

In Bahrain detailed statistics of food imported and consumed have been published since 1971. Prior to this year there were few publications on Bahraini food consumption patterns. In the early 1960s the Bahraini inhabitants were entirely dependent on rice and fish as main foods eaten at lunch and supper, and sometimes at breakfast. The dates which were produced for many years were the main sweets consumed either with lunch or in between meals along with Arabic coffee. Laban (butter-milk) was widely drunk with lunch and formed the main dairy product consumed at that time. Fresh vegetables and fruits were also consumed widely as agriculture represented one of the major economic activities of the people.

In the early 1970s, Musaiger (1977a) reported a little change in the food habits of Bahraini inhabitants which may have been due to the slight improvements in the economy resulting from the yield of the oil industry. The most common breakfast was milk and bread or tea with milk and bread. Only 2.3% of the sample consumed eggs at breakfast. Dried dates, Arabic coffee, laban and bread were the most foods eaten between breakfast and lunch. Fish and rice comprised the most common lunch (97.7%) and none of the sample studied consumed meat or chicken at lunch. This may be due to the fact that fishing was the main occupation of the inhabitants at that time. FAO (1968) reported that the Bahraini inhabitants have been for centuries depending on the sea to earn their living. Fishing and trading had always been the way of life of the people.

The only difference in food consumption observed was the intake of meat and canned vegetables at dinner. Fish and rice were consumed by 81.4% of farmers at dinner, followed by meat and canned vegetables (8.9%), meat and rice (4.7%), milk and bread (4.7%) and tea with milk and bread (22.2%). The frequencies of the weekly intake of high protein foods were 4 for fish, 2 for both meat and eggs, 1 for both chicken and cheese. Although these figures apply to the rural population in Bahrain, there was no great difference between food habits of rural and urban inhabitants (Musaiger, 1977b).

Change in the consumption of food groups

Trends in food consumption are of much interest to government, as they will affect the food subsidy policy. They project that the annual per capita consumption of all types of foods will be increased by 50% by the year 2000. The increase will be greatest for poultry and fish (72.2% and 73%, respectively) (Ministry of Commerce and Agriculture, 1982).

Rice, which is the dietary staple in Bahrain, shows a decrease in consumption. During the period 1970-1984 the level of daily per capita consumption has decreased by 12.4%. The consumption of vegetable oils registered an increase by 1081%, for the same period. Red meat, poultry and fish consumption have increased by 76%, 282% and 469% respectively. In general there is an increase in consumption of all food items except wheat and rice. However, some food items showed a slight increase in consumption such as fruit (3.5%) and sugar(4.5%), as illustrated in Table 14.

Table (14)
Annual per capita consumption of various food products in Bahrain, 1970-84.

Food	1970-1972 (kg)	1982-1984 (kg)	% Change
Cereal (Total)	148.8	161.9	+8.8
Wheat	68.2	63.1	-7.5
Rice	72.7	63.7	-12.4
Potatoes	18.4	25.7	+39.7
Pulses	4.8	7.1	+47.9
Vegetables	42.7	108.5	+154.1
Fruit	111.2	115.1	+3.5
Sugar	26.4	31.0	+4.5
Vegetable oils	1.6	18.9	+1081.3
Red meat	22.6	39.8	+76.1
Chicken	7.7	29.4	+281.8
Fish	3.2	18.2	+468.8
Eggs	7.1	13.2	+85.9
Milk	43.3	186.9	+331.6

Adapted from Arab Organization for Agricultural Development (1987).

Nutrient availability from food

During the 1970s there was a steady increase in the average energy and protein consumption at the household level. This increase tended to be more impressive during the second half of the seventies than the first half. This may have been due to the sharp rise in the per capita income in the wake of oil boom at the end of 1973.

The daily per capita consumption of energy has increased from 2080 kcal to 2829 kcal during the period 1970-1980. It is highly evident that people were starting to consume more of the high protein foods such as meat, poultry, eggs, cheese and fish which contribute to the animal protein in the Bahraini diet. The daily per capita intake of animal protein has almost doubled during the period 1970-1980. On the contrary a negative trend in per capita food intake has been noticed as the consumption of fat and oil has increased sharply. It was 20 grams in 1970, and increased to 56 grams in 1980. The animal fat represented 53.4% of the total fat and oil intake in 1980 (Arab Federation for Food Industries, 1985).

Factors responsible for the change in food consumption

Many factors are known to have an influence on food consumption patterns in Bahrain. Probably the most important is the high per capita income which resulted from the oil boom. As income rose during the seventies, food expenditure decreased from 46% to 36% of the total household expenditure (Ministry of Finance, 1975; and CSO, 1985).

When their income rise, Bahraini consumers tend to eat more expensive, processed and convenience foods. This is clearly demonstrated by the latest Household Budget Survey (CSO, 1985), where canned and processed foods as well as frozen vegetables and poultry represent a good proportion of the total food consumed when compared to the early seventies.

Price also has an important influence on dietary pattern. It is evident that fluctuations in prices have been responsible for some changes in food consumption. The dietary intake of certain foods goes up when real prices of such foods go down and vice versa. For example the higher price of fish in Bahrain forced consumers, especially those of low income, to consume other foods such as poultry and meat which have remained stable in price because of government subsidies for the past ten years.

Educational level has a vital influence in changing eating habits of the people. In Bahrain the illiteracy rate decreased from 53% in 1971 to about 31% in 1981. Education is positively associated with the food habits of Bahraini housewives. The better educated housewives consumed more fruits and high protein foods with their lunch and during pregnancy and lactation (Musaiger et al, 1986).

Household size and structure have some effect on food consumption patterns. The formerly typical extended family has shifted to a nuclear family in Bahrain, but the average family size is still high (6.7 members). The recent household Budget Survey (CSO,1985) showed that expenditure on food increases as household size increases. The expenditure on food was 30.9% of total expenditure for a household with 2-3 members, compared to 41.7% for a household with more than twelve members.

Another important factor that can affect food consumption patterns is the influence of mass media, particularly the food advertisements shown on television. Musaiger (1980) found that TV advertisements has a marked effect on the dietary habits of Bahraini housewives. About 42% of the housewives believed and another 47% moderately believed in the claims of food advertisements. Of these housewives, 48.5% purchased the food seen in television advertisements.

The immigrants who came to Bahrain, during the oil boom to get better paid work have introduced many foods and dishes which have become popular with the Bahraini inhabitants. The best example is the widely adopted intake of spicy foods as result of the influence of Indian and Pakistani immigrants.

The government food subsidy policy also contributes to changes in food consumption. The amount spent on food subsidies has increased from 16.2 million US dollars in 1975 to 27 million US dollars in 1983. The current food subsidy policy may encourage the people to increase their intake of subsidized energy-rich foods such as fat and oil, rice and sugars. This trend in dietary intake may adversely affect the health status of the population (Musaiger, 1986).

Food and nutrition education

A. Education of the public

Nutrition education programmes for the public are carried out by several institutes and using various approaches. A brief description of these approaches is as follows:

1. **Nutrition education in health centers:** This programme is carried out in all health centers in Bahrain, and aims to provide the attendants with some information on nutrition related to health. A video programme is shown to women and men, as well as teenagers, followed by some discussion with the audience.
2. **Booklets and posters:** Several booklets and posters are produced and distributed in health centers, clubs and women's associations. However, it is worth mentioning that many of these printed materials are poorly designed and have little effect.
3. **Radio programme:** Nutrition messages are broadcasted through Bahrain radio with the cooperation of the family programme. The messages are mostly concentrated on nutrition for mothers, young children and school children.
4. **TV spot:** Some nutrition messages are given through Bahrain television, and these take about three to five minutes for each message. Most of these messages are given by medical and nutrition professionals. There is no well designed message using creative techniques to attract and convince the public.
5. **Lectures:** Several lectures on food habits and sound preparation of foods are given to women and men in public clubs, women's associations and sports clubs. Slide projectors are usually used during the lectures.
6. **Mobile nutrition education programme:** Mobile nutrition education is provided in a bus which is furnished with all the necessary facilities such as video tape, flipchart, slide projector, posters and booklets, as well as kitchen facilities. The aim of the programme is to reach the women in their villages because it is difficult for them to go to

cities. The programme consists of lectures, showing video tapes and slides, and demonstrations on how to prepare sound weaning foods.

Main topics of nutrition education programme

Nutrition education programmes in Bahrain cover topics related to the nutrition of pregnant and lactating mothers and children, and sometimes address the management of some common nutritional disorders such as obesity, diabetes and heart diseases.

Continuous evaluation of nutrition education programmes is not carried out, and this is one of the main limitations of these programmes. Some pilot studies on evaluation of mobile nutrition education programmes and the effectiveness of booklets and TV spots were carried out by the Nutrition Unit at the Ministry of Health, and showed that there are several deficiencies in these programmes which affect their effectiveness in changing the knowledge, attitudes and behaviour of the public.

Difficulties in teaching nutrition in Bahrain

As stated earlier, Bahrain is one of the newly industrializing countries which is experiencing very rapid modernization. As a result, the country is facing many difficulties in teaching nutrition. These difficulties will be discussed:

(1) *The role of advertising in changing food habits*

Nutrition education faces a big challenge from advertising, particularly with the rapid growth of mass media. Television and video occupies most of the leisure time of the public. This is due to a lack of other recreational facilities and the relatively high rate of illiteracy. About 99% of households in Manama City (the capital of Bahrain) have one television set or more (Musaiger, 1983b). This availability of television in almost all Bahraini households should facilitate the process of informal nutrition education. Unfortunately, as found by Al-Umran (unpublished report) the health and nutrition programmes run from Bahrain television are uninteresting and relatively ineffective. There is a lack of overall planning of programmes.

Nevertheless, while these nutrition education failed to capture the attention of the audience, the advertising of food products is succeeding

to do so. Nutritionists always declare that food habits are difficult to change, but advertising induces a lot of change in food habits. Bahraini mothers believed (42%) or moderately believed (47%) food advertisement claims (Musaiger, 1983b). About 48.5% of the mothers purchased the food seen in the television advertisements, and another 39% sometimes purchased them (Musaiger, 1982).

Advertising is to a great extent responsible for the growing consumption of sugar-products with their consumption effect on the increased incidence of dental caries as well as obesity and its related problems (VanSchaik, 1976). The children are more vulnerable to advertisements of sugar foods such as chocolates and sweets. They always request these foods, and this may influence their food habits, as well as the family's budget. In Bahrain, Musaiger (1980) reported that the children favoured watching chocolates and sweets advertisements more than that of any other food. Of the children surveyed, 59% always requested food advertised on television, and a further 30% sometimes requested it. About 95% of the mothers respond to their children's request, and almost 90% stated that their children's request affected the family expenditure.

(2) *The conflict between advertising and nutrition education*

Television food advertisements frequently contain little or no information on nutrition. Moreover, most of the foods advertised are of a poor nutritional value (Council on Children, Media and Merchandising, 1977). Advertising claims are highly accepted as a fact by the consumers, and this sharply affects the nutrition education message. For example if the advertisement claims that certain food product will make your child grow strong and healthy, how can we nutrition educators convince the public that this claim is not true?, especially when we lack the technique to compete with the advertising agencies.

It was quite unexpected that a high percentage (55.7%) of Bahraini mothers said that television food advertisements helped to increase their nutrition knowledge. The advertisements were, in fact, the main source of knowledge about food products (Musaiger, 1980). The findings presented in Table 15 shows how advertising interferes with the nutrition knowledge of the Bahraini mothers. Almost 74% of the mothers agreed that advertisements on television keep them informed about good and healthy foods, where as 63% of the mothers agreed that the food they see advertised on television are good and useful.

Table (15)
Proportion of Bahraini mothers who agreed on statements
toward television food advertisements.

Statements	Percentage agreed
- Advertisements on TV keep me inform of the good and healthy foods	74.4
- Foods advertised on TV help children choose their food in a better way.	62.8
- Foods advertised on TV are good and useful.	62.8
- Baby foods advertised on TV encourage mother to use them and abandon breast-feeding.	57.5
- Modern housewives are those who depend on food advertisements for purchasing food.	46.8
- Food advertisements make purchase unuseful food.	10.9

Table (16)
Proportion of secondary school students who defined
correctly nutrition terms.

Nutrition terms	Sex				Total (N=345)	
	Male (N=156)		Female (N=189)			
	No	%	No	%	No	%
Protein foods	35	22.4	72	38.1	107	31.0
Starchy foods	14	9.0	69	36.5	83	24.1
Vitamins	35	22.4	65	34.4	100	29.0
Balanced diet	27	17.3	47	24.9	74	21.5

The situation becomes more complicated when we know that the majority of the young generation have no information on the nutrition words used in food advertising and labelling. Table 16 shows that in a sample secondary school students few knew what was meant by protein, starchy foods, vitamins and a balanced diet. Clearly, food advertising can be misleading if consumers misinterpret information because of a lack of knowledge about the meaning of nutrition words or concepts (Vermeersch and Swenerton, 1979).

It is interesting that girls seemed rather more knowledgeable on nutrition terms than boys (Table 16). The differences may be due to the teaching of home economics subjects to the girls. The findings suggest that it might be helpful if it was also taught to boys.

It seems that neither school nor nutrition education through the mass media can protect the public from the misleading food advertising claims, especially in the absence of advertising regulations.

(3) *Illiteracy and ignorance*

The percentage of illiteracy among Bahraini inhabitants is still high (31%) as compared to inhabitants from other industrialized countries. The percentage is higher among females (41%) than males (21%) and amongst older than younger people. Booklets and leaflets are widely used as a tool for nutrition and health education and the Ministry of Health in Bahrain spends thousands of dollars printing these publications. Yet we know that these printed materials are hardly ever read. In a pilot study by Musaiger (1985b) the visitors to the health centers in Bahrain were asked whether or not they read the health and nutrition educational booklets published by the Ministry of Health. About one third of the visitors read the booklets. Almost 19% of the visitors said that they could not read or write (illiterate), and again, the percentage was higher among females (29%) than males (8%).

We don't know how many of those who read the booklets benefited from them. It is well known that giving people the facts about nutrition does not ensure that their food habits will change (Srinivasan, 1983).

Ignorance about sound nutrition is the most important factor causing improper nutritional status in Bahrain. There is no scarcity of food either in quality or variety. Both these aspects are similar to those found in industrialized countries. It is the lack of a wise selection of foods, as well as food faddism.

It is true that a large group in the community accepts false beliefs about food, despite that fact that they have completed secondary or university education (FAO, 1971). In agreement with this, it was found that all the educated people attending health centers in Bahrain were practicing many unsound food habits and believed in numerous food fads.

The health practitioners are themselves deficient in nutritional knowledge (Marriott, 1976). Jelliffe and Jelliffe (1971) added that many nutritionists, food planners and health personnel, who are expected to be more knowledgeable about infant feeding, in fact often have little modern information and are ill-prepared to give advice. In Bahrain,

Musaiger (1983a) found that 69% of the mothers thought that they were told to use bottle-feeding by health practitioners.

(4) *The wrong selection of the target group*

Mothers are always selected as the target group for communication messages in Bahrain, or in other developing countries (Gussow and Contents, 1984). Several factors influence the selection of a particular group as the target one. Amongst these factors, the socio-cultural and religious are the most important ones, particularly in Muslim countries. The selection of the target group by many nutrition educators has been based on what is written in textbooks, without taking into consideration the socio-cultural customs which affect the nutritional status of a particular community. This often disregards the fact that these books were prepared for use in communities with a different culture such as African and Latin American Communities, and not for Arab Communities with their different culture. For example, in Bahrain education of the mothers could not help much in improving the nutritional status of the family, because the father has a great influence on decision making and food purchasing. Even when the mother is well educated, the father is the only person who decides whether the mother should attend a nutrition education class or not; this is particularly true in low and middle social families.

Groups which have responsibility for making policy decisions which eventually influence nutritional status, such as government officials and health planners should also be selected as a target group (CFNI, 1978). In fact, without convincing these people about the need for nutrition education programmes, it is difficult to get good support to run the programmes. Summing up, the policy makers and the father should be given more attention as they are the main target groups to improve the nutritional status of the population in Bahrain.

(5) *The influence of foreign housemaids on the food habits*

It is not only advertisements which influence the food habits of children, but also the housemaid. Bahraini families have become more and more dependent on the services of housemaids, who are very often poorly qualified and indifferent. The existing high income and the gradual employment of the women, particularly in the nuclear family, has called for the services of housemaids from abroad. Most of these

housemaids are poorly educated (60%), and only about 40% of them can understand a little Arabic. They have come from totally different cultures such as Srilanka, India, Pakistan and the Phillipines. They assume responsibility for all levels of home management, in addition to feeding the infants and young children. Therefore, it is widely accepted that these housemaids have a big influence on the food habits of the children in Bahrain (Researches and Studies Department, 1983). Who should be taught proper nutrition? Is it the mother, or the father, or the housemaid or maybe all of them. The task of nutrition education has become more complicated especially when the majority of housemaids do not understand Arabic. If all these persons are to be reached the medium of nutrition education should be in another language in addition to Arabic.

(6) *Exposure to various TV channels*

The Geographical location of the State of Bahrain, allows its people to see as much as 6 to 10 TV broadcasting channels from neighbouring countries. In this case there is no guarantee that the nutrition message will reach the audience. A study by Musaiger (1985c) showed that only 45% of the youths preferred to see the Bahrain Television Station, whilst the rest preferred to see other channels. This clearly create a problem for nutrition educators who aim to ensure that the nutrition message has been received by all target groups. Coordination and cooperation between the Arab Gulf Countries in regard to nutrition messages would seem to be essential if contradiction in the information provided is to be avoided.

(7) *Inadequate planning and lack of experienced staff*

Planning is one of the most important prerequisites for establishing a programme. In Bahrain, Al-Umran (unpublished report) found that most of the health and nutrition education programmes lacked good planning. There was a lack of coordination between media and nonmedia channels in the presentation of a topic and there was no plan or rational choice and organization of health topics in their presentation.

The lack of technical staff, especially those responsible for production and script writing has markedly affected the nutrition education programmes. Insufficient training of nutrition educators in the use of audio-visual technique has also contributed to a deficiencies in the nutrition education programme.

B. Nutrition education in school and university

In general, nutrition is given a low priority in schools, and colleges, including the medical colleges in Bahrain. There is no programme in nutrition solely for schools at any level. However, some nutrition information is included in school programmes in science, home economics, public health, and agriculture. In the College of Health Sciences, nutrition education is given to the students, but this is mostly of a somewhat basic nature. There is no information on local nutrition problems and measures to prevent and control such problems.

In the College of Medicine and Medical Sciences at the Arabian Gulf University the situation is worse for nutrition as it is mostly neglected as an important part of the management of diseases. It is well documented all over the world that medical schools pay little specific attention to nutrition, and this is why many physicians lack adequate knowledge of the subject.

There are a number of ways in which formal education can contribute to increased nutritional awareness in the community. Nutrition education can be integrated quite easily in many learning activities in schools, especially primary schools. Introduction of such education at intermediate and secondary schools faces various difficulties.

Children at the age of 6 to 10 years are more ready to accept new ideas and to adapt their food habits than older children (11-18 years). In primary school nutrition education can be fitted easily into courses mathematics, science, islamic, Arabic and conversation subjects.

In intermediate and secondary schools, nutrition education can be included in selected subjects like science and home economics. The latter may be the best subject but unfortunately, it is only taught to girls, and that is why many girls know more nutritional science than boys. One important deficiency in home economics teaching is that the curriculum focuses on cooking and recipes rather than on giving some essential nutrition information such as nutrition problems of the community and factors associated with these problems.

At the College of Health Sciences, nutritional subjects should be extended to include more information on the dietary management of

diseases, the role of nutrition in patient care, current nutritional problems in the country, social, health and economic factors affecting nutritional status, and the nutritive values of foods and dishes commonly consumed in Bahrain and other Gulf countries. This information can be obtained from various studies and books published in the region. Unfortunately, the nutrition curriculum in the health and medical colleges is based on foreign textbooks which are prepared for their own countries but not for Arab or Gulf countries. The nutritional problems, food habits and customs, as well as the socio-economic situation are all different in the Arabian Gulf Countries from those in many non-Arab countries. Teachers and lecturers in schools and Universities should adapt the nutrition information obtained from such textbooks to be relevant to the situation in Bahrain.

In the College of Medicine and Medical Sciences, for example, one of the problems which was given to the 4th year students was iron-deficiency anaemia, one of the common diseases in the region. But all the educational materials provided to the students were quoted from foreign textbooks, which contain no information on the social, health and economic factors associated with anaemia in the Gulf. The food consumption tables and meals provided were those of the United States, although we have three books containing the composition of foods commonly consumed in Bahrain, the Middle and Near East. The food tables of the United States provided the weight of food in pounds (lb) a unit no more used in the Arabian Gulf (we use Kilogram).

The students in the medical colleges must be able to prevent, diagnose and treat nutritional diseases commonly prevalent in the community. Therefore, examples and information given to them in the education curriculum should be relevant to community. The students at health colleges, especially the nurses, should be able to give appropriate dietary advice to patients to help to control their diseases.

Difficulties in introducing nutrition education in school and medical curriculum

There are several difficulties encountered in the introduction of nutrition in formal education:

1. Lack of qualified personnel in nutrition.
2. Lack or absence of nutrition training of teachers in schools.

3. Lack of useful textbooks related to health and nutrition in Arabian Gulf region.
4. Lack of interest of policy makers in colleges and schools in nutrition.

A pre-service and in-service training programme for teachers and lecturers in schools and colleges is essential. Health subjects and related fields in school and college curricula should be reviewed to include more information in nutrition. Results of nutritional studies and surveys which were carried out in Bahrain should be utilized in designing such nutrition curricula.

Infant feeding practices

Breast-feeding patterns

Mobayed et al (1980) studied the health status and infant feeding practices among 461 pre-school children (0-5years). The study was based on interviewing the mothers at their homes and included both urban and rural areas. The investigators found that 9.3% of pre-school children were breastfed in urban and rural areas respectively, whereas 80% and 70% of those children received mixed feeding respectively. Abrupt weaning was more evident in rural (85%) than urban areas (77%). Abrupt weaning was started by 28% of mothers before the infant was 4 months old.

Amine (1980) showed that only 16 % of infants were breastfed, 8% were artificially fed, while the majority (76%) received mixed feeding. Breast-feeding was more common in male infants from rural areas (28%) than in male infants from urban areas (10%). The same trend was also noted among female infants. Of the infants, who were breast-fed, 16% were weaned when they were less than 3 months old, and another 19% before they reached the age of six months. However, 49% were breast-fed for more than one year. Lack of milk secretion (27%), infants' refusal (15%) and a new pregnancy (15%) were the main factors for early stopping of breast-feeding in urban areas. In rural areas, a new pregnancy accounted for a third (33%) of stoppage of breast-feeding, and infants' refusal for another (16%).

Infant feeding habits were carefully studied by Musaiger (1983a) in a sample of 310 mothers from urban and rural areas. The mothers were interviewed in their homes and asked about their infant feeding practices. The findings showed a trend toward longer breast-feeding. The mean duration of breast-feeding was 15.5 ± 13.9 months among urban infants compared to 19.3 ± 12.8 months among rural infants. About 45% of urban mothers and 71% of rural mothers breastfed their infants for more than 18 months. Supplementary foods were introduced very early, with 13.5% of mothers, introducing supplementary foods before their infants reached their third months. However, the majority (62%) introduced supplementary foods between 3 to 6 months.

Socio-economic factors determining breast-feeding

Data on socio-economic factors associated with breast-feeding were obtained from 1482 pre-natal files available in 12 health centers in Bahrain. Information on breast-feeding was collected from these files and correlated with mother's age, nationality, employment and geographical region (Musaiger, 1985a). It was found that as the age of the mothers increased, so the practice of breast-feeding decreased. The percentage of breast-feeding was 80% amongst mothers aged 15-20 years, decreased to 73% and 72% amongst mothers aged 21-30 years and over 30 years respectively. Bahraini mothers were more likely to breast-feed their infants than non-Bahraini mothers. This is because most of the non-Bahraini mothers were employed. Mothers from rural areas were more interested to breast-feed their infants than those from urban areas. Employment has a negative influence on breast-feeding, as employed mothers were less likely to breast-feed the infants than unemployed (housewives). However, there was no statistically significant association between mothers employment and infant feeding practices.

Although most of mothers in this study breast-fed their infants, information on duration of breast-feeding and age at introduction of bottle-feeding and other foods was not available in the perinatal files in the health centers. These limitations affect the real picture of infant-feeding practices. As demonstrated by previous studies, mixed feeding is the dominant method of infant feeding in Bahrain.

Musaiger (1983b) studied the association between socio-economic status and age at introduction of bottle feeding. His study included 315 mothers from Manama city, the capital of Bahrain. Socio-economic status was based on the educational level of husband, the educational level of the mother, monthly family income and family size. The study showed that bottle-feeding was introduced at less than one month of age by high and middle social classes compared to the low class (16.7%, 13.2% and 1% respectively). Fresh cow's milk, whole powdered milk and evaporated milk were mainly used by the low social class.

Weaning habits

Commercial baby foods (canned weaning foods, infant formula and whole powdered milk) were the main foods used for weaning, 74%

Table (17)
Supplementary foods given to infants and reasons for giving such foods according to urban and rural areas of Bahrain.

Supplementary foods and reasons for giving such foods	Urban areas		Rural areas		Total	
	No	%	No	%	No	%
Supplementary foods						
No supplement	11	4.3	6	11.5	17	5.5
Commercial baby foods*	200	77.5	30	57.7	230	74.2
Boiled eggs	21	8.1	4	7.7	25	8.1
Rice	26	10.1	12	23.1	38	12.2
Reasons for giving such foods						
No supplement	11	4.3	6	11.5	17	5.5
Habits	30	11.6	7	13.5	37	11.9
Nutritious foods	94	36.4	14	26.9	108	34.8
To promote growth of the infant	54	21.0	7	13.5	61	19.7
To acquaint the infant with staple foods	45	17.4	6	11.5	51	16.5
Others**	24	9.3	12	23.1	36	11.6
Total	258	100.0	52	100.0	310	100.0

* Commercial baby foods include: special baby foods, formula and powdered milks.

** Others include: to supplement breast-feeding, the infant likes it and doctor's advice.

Source: MUSAIGER (1983).

(Musaiger, 1983a). Urban mothers were more likely to use these foods (77.5%) than rural mothers (58%). Rice was more commonly used by rural than urban mothers. The highest percentage of mothers (35%) believed that these foods are nutritious (Table 17).

The educational level of mothers has a negative effect on weaning practices. Commercial baby foods were used by the majority of middle (89%) and highly (91%) educated mothers compared to 67% of the low education groups. Boiled eggs and rice were mainly used in weaning by low educated mothers (Musaiger et al, 1986).

Weaning habits in Bahrain were studied by the Department of Planning and Social Research (1985). The study included 250 mothers from 9 geographical regions. It was found that 25% of mothers weaned their children before they reached the fourth month of age. Abrupt weaning was more practiced by rural mothers (69%) than urban mothers (56%). About 38% of mothers used traditional methods to stop breast-feeding abruptly. The most common method was putting a bitter

substance or iodine on the breast. Some mothers covered their nipples with plaster to prevent the child breast-feeding. Bottlefeeding was practiced by 32% of mothers as a direct replacement for breast milk. A new pregnancy was the main reason for stopping of breast-feeding (25%). This reason was more given by rural mothers (30%) than urban mothers (19%). Drying-up of breastmilk came next as a reason for stopping breast-feeding (24%). Normal daily diet (16.9%), farleys rusks (14.3%), boiled rice (8.2%) and canned baby foods (8.6%) were the main weaning foods used by the mothers investigated (Table 18).

Table (18)

Supplementary foods given to infants by urban and rural areas in Bahrain (N=250).

Supplementary foods	Urban %	Rural %	Total %
Normal daily diet	15.7	17.7	16.9
Farley's rusks	12.7	15.4	14.3
Commercial baby foods	10.1	7.5	8.6
Boiled rice	7.8	8.4	8.2
Infant formula	10.1	5.7	7.5
Fruit juice	6.0	7.7	7.0
Boiled vegetables	8.5	5.7	6.8
Fruits	8.8	5.4	6.8
Meat, fish, poultry	4.9	6.6	5.9
Potatoes	3.3	4.3	3.9
Boiled eggs	4.2	3.2	3.6
Oats	2.0	4.3	3.3
Cow's milk	2.6	1.5	2.0
Others	3.3	6.6	5.2
Total	100.0	100.0	100.0

Source: Department of Planning and Social Research (1985).

Marketing and distribution of infant formula

Musaiger and Lankarani (1986) studied labelling information, composition and cost of baby foods available in the market of Bahrain. During the collection of samples (April, 1984) there were 203 types of baby foods available in the market. Of these, 17 were infant formulas and 37 were cereal based products. The study showed that there was a lack of information declared on the labels of the baby foods. Information such as production date, Arabic instructions, age of child and storage instructions were found to be deficient.

The vitamin and mineral composition of the infant formulas were within the range recommended by the WHO/FAO Codex Alimentarius. However, the results showed a wide variation in the nutrient composition of these formulas.

The price of 100 grams of protein and 100 kilocalories was higher in canned baby cereals compared to that of fresh foods available in the market such as meat, chicken, wheat flour and rice.

Although advertising of infant formula has been banned from TV, radio and press, other techniques of promotion are still carried on. The distribution of free infant formula in hospitals and health centers, posters, leaflets and the influence of private clinics are all examples of the commercial promotion of infant formulas. Health workers also play an important role. In a previous study by Musaiger (1983b) it was found that 69% of Bahraini mothers said that they were told to use bottle-feeding by health workers. The investigators called for an application of a Code of Marketing of Human Milk Substitutes in order to organize marketing of infant formulas in the country.

Food quality and safety

One of the main problems facing developing countries is the need to ensure an adequate supply of safe and nutritious foods. Contamination and adulteration of foods are a health hazard. Contamination of the environment, extensive use of pesticides and the use of carcinogenic food additives are all examples of practices that make foods unsafe for human consumption.

It is readily accepted that the risk of intake of food contaminated with toxic matters is great in the country. This is because the current food control system is mainly dependent on physical examination of foods with limited microbiological and chemical examinations. Bahrain imports 90% of its foods from numerous countries all over the world. Therefore, it is not surprising when some of these countries dump unfit or low quality foods in Bahrain. It was reported that 12% of foods inspected by the Ministry of Health were found unfit for human consumption (Public Health Directorate, 1988).

Food poisoning outbreaks

Although outbreaks of foodborne disease in Bahrain are seldom reported, instances of such diseases are increasing. For example, notified cases of food poisoning have increased from 6 cases in 1983 to 122 cases in 1987, an increase of 1950% (Public Health Directorate 1988). Moreover, it is well known that food poisoning cases are underreported, and the notified figures are far below the actual occurrence.

Reasons for the increase in food poisoning cases in Bahrain (Musaiger, 1989):

There are several reasons for the increased occurrence of food poisoning cases in Bahrain:

- (1) *Change in food consumption patterns:* fifteen years ago most Bahraini families ate their meals at home. Nowadays the practice of eating out is becoming more popular. Thus, people have a higher chance to become sick due to eating contaminated foods prepared at restaurants with low hygiene standards.

- (2) A rapid growth of shops or canteens which are providing take-away meals that need to be reheated at home and/or kept warm for a long period before eating. This practice provides the ideal conditions for microbial growth.
- (3) *The increase in the employment of women:* In Bahrain, more and more women are participating in the labour force. Therefore, the time allocated for food preparation is diminished. Many employed mothers are preparing and cooking food for lunch at night and keeping it in the freezer for the next day. Lunch then is reheated at noon. If the reheating is inadequate, this may result in food poisoning.
- (4) *Increased dependence on housemaids:* The demand for the services of foreign housemaids by Bahraini families has risen dramatically. Even unemployed mothers depend on the services of housemaids to help in home management and cooking the meals. These housemaids are poorly educated (Musaiger 1986), have little or no information on hygienic preparation of foods and probably play an important role in the occurrence of food poisoning at home.
- (5) *Food handlers:* The majority of food handlers in Bahrain are foreigners who came from the Indian-subcontinent, and some have not been trained in good practices of food hygiene (Nabali et al, 1986). Moreover, they cannot speak either Arabic or English, but only their local languages with different dialects. This makes it difficult for the health inspectors to communicate and educate the food handlers.
- (6) *The increase in camping outside the home:* In Bahrain, there is an increased tendency to camp outside, especially during the spring and summer vacations. In such conditions the family either cooks the food at home and reheats it later, or prepares the food at the camp. In the first practice the cooked food is usually kept warm for a long time thus providing an increased chance for microbial growth. In the second practice, the family has poor facilities at the camp for preparing food hygienically.
- (7) *Ignorance:* although there are refrigerators and freezers in the majority of households in Bahrain, improper use of these facilities is common. Based on our experience in food and nutrition education programmes, most mothers in Bahrain lack sound information on proper refrigeration of food, thawing frozen food and personal hygiene.

Contamination with aflatoxin

Bahrain is facing the problem of contamination of foods with aflatoxin. This is particularly because the country is characterized by warm and highly humid weather during most of the year. Additionally, it is highly dependent on imported foods which come from various countries all over the world.

In Bahrain, there are no specific regulations regarding the level and detection of aflatoxin in foods. This may create a health hazard to the public due to the consumption of contaminated foods. Nuts especially peanuts, almonds, cashew and pistachio nuts are commonly consumed as snacks and used in the preparation of some local sweets and dishes.

Examination for aflatoxins in 80 samples of nuts, cereals and legumes available in Bahrain showed that only two samples of shelled peanuts and one sample of unroasted pistachio nuts were contaminated with aflatoxin B₁. The levels in peanuts (2.5-3.5 ppb) were below the U.S.FDA guideline, while that in pistachio nuts (100 ppb) was much higher than the recommended guideline. Further studies are needed to detect the occurrence and levels of aflatoxin in food products in Bahrain as well as the application of a proper food control system (Musaiger et al, 1991).

Chemical quality of drinking water

A safe water supply is a basic health need. Many diseases are transmitted through water. Some chemical constituents are known to be hazardous to health if present in water in high concentration. Drinking water, therefore, should not contain harmful pathogenic organisms and should contain a minimum of certain chemicals.

There are various sources of drinking water in Bahrain. Tap water is obtained from both ground water and desalinated water. These two waters are blended and then chlorinated for purposes of disinfection. Other sources of drinking water are the desalination plants (treated water) and bottled mineral water.

Water is never pure and free from chemical substances. It contains several kinds of impurities. The main problem related to chemical constituents in water is the ability of some constituents to cause adverse health

effects after prolonged consumption, especially cumulative poisons and carcinogens. Some chemical compounds, although not of direct health concern, could affect palatability and appearance of water.

The chemical quality of five types of water used for drinking purposes in Bahrain has been studied. There are three main sources of drinking water: tap, privately treated, and bottled waters. The findings revealed that tap water had the highest level of all chemicals studied (except silica) compared to other waters. The sodium concentration in tap water ranged from 100 to 546 mg/l, with an average of 309 mg/l. This average exceeds the drinking water standard of 200 mg/l recommended by WHO, making this water unsuitable for hypertensive people. The average level of fluoride ranged from 0.28 mg/l in carbonated mineral water to 0.85 mg/l in tap water. The high usage of bottled mineral water for drinking purposes may deprive the public, especially the children, of one of the protective elements (fluoride) for dental caries. This disease is highly prevalent in Bahrain. A programme to control chemical quality of drinking water in the country has been strongly recommended (Musaiger and Khunji, 1990).

Food labelling

One of the vital activities of food safety and control is the issuing of comprehensive food legislations. Prior to 1985 food control activities were based on several provisions of the Public Health Law which were directly or indirectly related to food control. In the beginning of 1985 the Imported Food Law was issued, as well as the Food Labelling Regulations. The food law and labelling regulations were put into practice in 1986.

Musaiger (1989) studied the impact of food labelling regulations on information declared on food products in Bahrain. The study was carried out in two stages – before implementation of food labelling regulations and after implementation. The first stage was carried out in 1983, that is two years before implementation of the regulations. Labelling information on prepackaged foods with various brands displayed in supermarkets and groceries were reviewed and analysed. The following information was noted: production date, expiry date, storage instruction and Arabic description. A total of 1896 brands of prepacked foods were studied during the first stage.

The second stage was carried out at the end of 1987, almost two years after implementation of food labelling regulations. The same

technique was used as in the first stage and the same information was collected. A total of 2539 brands of prepacked foods were studied during this stage.

Production date was declared on 95% of the food labels in 1987, an increase of 57% from 1983. The increase was the highest for fruits and vegetables (+65.5%) and lowest for cereal and cereal products (+43.5%). In many countries the production date is not mandatory and the expiry date is sufficient. In Bahrain, the food labelling regulations have required that both production and expiry dates should be declared on the label. There is an advantage in having information on the production date in this country. Many groceries have no good storage facilities and in addition the high humidity and high temperature of the Bahraini climate may affect the shelf life of the products. For these reasons the production date is important in order to let the consumers and merchants know the durability of the products for consumption. This is particularly true when the date of minimum durability (best before) is put according to the climate condition of the country of origin, which in many cases is not similar to that in the country of import. Another important factor is that production date labelling will encourage merchants to systematically move their stocks to avoid the products from running out-of-date. This will reduce losses due to destruction of expired food.

From Table 19 we can see that there was a great improvement in the declaration of expiry date between 1983 and 1987. Declarations after two years of adopting the food labelling regulations has exceeded 92% in all food groups, except for cereal and cereal products where the percentage was 88%. The highest increase in the percentage was in meat products (an increase by 59.5%), while the lowest was in milk and milk products (24%). Actually the percentage of declaration of expiry date in this food group was the highest in 1983, therefore the increase in declaration was limited, even though the percentage of declaration had reached 95.5% in 1987.

It is generally recognized that conditions of storage affect the keeping quality of food products. The Bahrain food labelling regulations have not required the declaration of storage conditions. For this reason the storage condition labelling had only slightly improved (4%). In contrast with other information there was a decline in the percentage of declaration of food storage in milk and milk products (-4%) and meat products (-6%). The most remarkable increase was seen in baby foods (+32%).

Bahrain food labelling regulations have required that information on the label should be in Arabic in addition to another acceptable language. This is an important issue since Arabic is the main language of the people, and the great majority of them can not read English or any other language. The findings of this study demonstrated that the increase in Arabic description labelling was not as high as in production and expiry dates. Meat products showed the highest increase in Arabic description labelling (+45 %), followed by fruits and vegetables (+37%). Baby foods showed the lowest increase (+22%). It is highly recommended, therefore, that emphasis should be put on the enforcement of Arabic labelling in order to provide the consumers with clear and understandable information about food products.

Table (19)
Percent distribution of prepacked foods according to information declared on food labels in 1983 and 1987.

Food group	Production date		Expiry date		Storage instruction		Arabic description					
	1983	%Change	1983	%Change	1983	%Change	1983	%Change				
Milk & milk products	44.1	92.7	+48.6	71.4	95.5	+24.1	57.1	53.1	-4.0	55.3	87.2	+31.9
Meat, poultry & fish	32.8	96.0	+63.2	33.2	92.7	+59.5	42.0	35.9	-6.1	30.0	75.0	+45.0
Fruits & vegetables	34.5	100.0	+65.5	38.4	95.9	+57.5	22.8	28.3	-5.5	42.7	79.8	+37.1
Beverages	49.2	94.7	+45.5	51.3	92.4	+41.1	6.0	21.2	+15.2	50.4	83.3	+32.9
Cereal & cereal products	47.1	90.6	+42.5	52.9	88.3	+35.4	10.7	26.9	+16.2	48.4	78.9	+30.5
Baby foods	36.2	99.5	+63.3	56.7	100.0	+43.3	26.8	59.2	+32.4	44.9	66.8	+21.9
Others	31.5	97.2	+65.7	36.1	95.9	+59.8	11.1	14.7	-3.6	30.3	68.6	+38.3
Total	37.7	95.0	+57.3	43.5	93.3	+49.8	20.5	24.5	+4.0	36.5	75.8	+39.3

Programmes related to food and nutrition

There is no specific food and nutrition policy in Bahrain. The country carries out projects and programmes of various types in the fields of agriculture, health, social and education that are directly and indirectly related to the problems of food and nutrition. These programmes are often developed in isolation from other activities. The programmes linked with nutrition can be briefly described.

Health sector

There is no specific programme for nutrition in the health sector. Nutrition activities are mostly linked with other health activities that are provided in health centres and hospitals. These activities can be summarized as follows:

Growth monitoring for preschool children

Weight, height and head circumference measurements are taken regularly for all preschool children attending MCH clinics in the health centres. These anthropometric measures are taken frequently during the first year, because the mothers bring their children for immunization. In general, the child is medically examined (including growth monitoring) at 2nd, 4th, 6th, 9th, 18th, 24th, 36th and 60th months of his life. These times parallel the immunization appointments.

Promotion of breast-feeding

Several activities have been undertaken to promote breast-feeding patterns in the community. These activities are: (1) prohibition of advertisements on television and radio and in newspapers concerning infant formula; (2) the entitlement of female workers to maternity leave with full pay for 45 days; (3) the allocation of one hour each day for nursing mothers for the first six months of infant life, in order to breast-feed their infants at home; (4) establishing some regulations of the provision of free infant formulas in health centers; (5) increasing the promotion of a breast-feeding campaign through various mass media (Musaiger, 1985).

Supplementary feeding for pregnant mothers

General medical checkup, weight and haemoglobin determination are routinely carried out for all pregnant mothers visiting perinatal clinics in health centers. Vitamin and iron tablets are usually given to pregnant mothers during the second and third trimesters. Advice on a balanced diet and sound dietary practices are also provided to mothers.

Nutrition education

Nutrition and health education through various mass media is a continuing process. Posters, booklets and radio broadcasting are widely used as a tool for nutrition education. Televised nutrition education is very limited because of lack of specialized people in the mass media. Lectures to women, students and others are often given. In general, there is no special policy in nutrition and health education. The main topics covered by nutrition education are sound food habits, management of breast-feeding and diarrhoeal diseases, sound weaning practices, nutrition during pregnancy and lactation, and dietary management of diabetes, obesity and hypertension.

Food and nutrition regulations

The health sector has the major responsibility for establishing food and nutrition regulations. These regulations can be classified into three criteria: regulations related to food hygiene and sanitation in food premises; regulations related to labelling and shelf-life of food; regulations related to standards for toxic chemicals in foods such as pesticide residues, mycotoxins, additives, and heavy metals.

More progress has been done in food hygiene and sanitation as well as in food labelling, but less progress has been done in the regulation of toxic matters in foods. This is mainly due to lack of equipment and specialized personnel.

Food inspections

The inspection of imported foods at the entry points (land, sea and air) is also the responsibility of the health sector. All foodstuffs entering the country are physically inspected, and where necessary some foods are taken for bacteriological tests. Chemical examination is mostly done on oils and bottled water.

Food premises that produce, handle or sell food stuffs are inspected regularly by food inspectors to ensure that foods are prepared under good hygienic conditions and are fit for human consumption. Monitoring of radiation levels in consignments of foodstuffs arriving from affected countries started towards the end of 1986.

The quality of public drinking water is monitored by bacteriological and chemical examination of samples from all public water sources.

Oral hygiene programme

A comprehensive oral hygiene programme was launched in the early months of 1987. The programme includes the following activities: Training dental hygienists, teeth examination and treatment in health centres, dental screening of school children, preventive programmes for primary school children, fluoridation of piped water, and oral health education in schools and colleges (Dental Health Department, 1988).

Nutrition research

Several studies and researches have been carried out during the past decade. These researches covered three main areas, composition of foods commonly consumed in the country, nutritional surveys and nutrition regulations. Unfortunately the results of these researches have been rarely utilized in health programmes. However, most of these surveys are cross-sectional and limited in their objectives and scope.

Nutrition training

Training in nutrition for teachers and health staff was started in 1988. The objective of such training are to improve knowledge and skills related to nutrition of health and social workers. Three training courses were carried out during 1988-1989 for female secondary school teachers, home economic teachers and community workers (health and social workers). An attempt is being made to carry out these training courses regularly.

Training in nutrition research has been carried out annually since 1982 for students of College of Health Sciences. Most of the training activities have focused on the methodology of community nutrition surveys.

Agricultural and industrial sector

Improving food production

The contribution of agriculture to the gross domestic product does not exceed 1%. Efforts to improve food production are facing several constraints such as low quality of cultivated land, decline in arable land due to urbanization, shortage of water resources and lack of qualified manpower (Musaiger, 1987).

Intensive agricultural practices aimed at increasing the yield per hectare by improving the quality of the soil, management, proper fertilization, insect and disease control, improved seed varieties and mechanized farming operations coupled with modern irrigation system have been incorporated in the long term plans to increase food production in the country. It is planned that Bahrain will be self-sufficient in eggs and chickens by 1990-1991, when the country should be able to meet 75% of its vegetables and half of its dairy requirements. However, these were not achieved. Cereals, meat, fruits and oil and fat will have to be imported in large amounts (Bahrain Falcon Publishing, 1989).

Bahrain has a relatively good resource for fish production. However there are some difficulties in utilising such resources. A five year plan (1980-1985) for the development of the fishing sectors was launched. But there has been only a slight improvement in fish production. More persistent efforts are needed to reach self-sufficiency in fish consumption (Musaiger, 1987).

Food subsidy policy

The government established a food subsidy policy in 1974. The objective of this policy is to keep the price of staple foods within the purchasing power of the majority of population. The main foods subsidized are rice, wheat, sugar, ghee, barley, mutton, beef and chicken. The government expenditure on food subsidies increased from 15 million to 25 million US Dollars during the period 1975- 1983 (Musaiger, 1989)

Food pricing control

The pricing control policy for food products in Bahrain depends on limiting the profit margin of food traders. The pricing regulations do not allow the food traders to get more than 10% profit in food products.

The prices of vegetables and fruits are controlled by different regulations. The government allows the traders to get a profit of not more than 100 fils (0.3 US Dollars) for each kilogram of vegetables or fruits.

Encouraging and supporting food manufacturing

The government has issued a law to encourage and protect local industries (including the food industry). Custom and cost of raw materials are reduced for local food manufactures. The main food industries in Bahrain are dairy products, soft drinks, snacks, dates and pickles.

Social sector

The Ministry of Labour and Social Affairs has a family education programme. This activity is aimed to increase the awareness of women in family planning, health and nutrition matters. Nutrition takes the bulk of such programme. Information on diarrhoeal management, breast-feeding, proper weaning habits and sound food preparation are given to the women especially in the rural areas.

Education sector

School curriculum

Nutrition is included in the school curriculum at all levels in the programmes of science, home economics, public health and agriculture. There is no sole programme for nutrition in the schools. The college of Health Sciences is providing a nutrition programme for nurses and public health inspectors, but this is mostly of a basic nature. There is no information on local nutrition problems and measures to prevent and to solve such problems in school or university curricula.

Adult literacy programme

A programme on family awareness for mothers attending adult literacy programmes has been recently established. The objective of this programme is to improve knowledge and skills of the mothers in home management, health, first aid and nutrition.

Towards a food and nutrition policy in Bahrain

The success of a food and nutrition policy depends on integrated planning and effective implementation. Therefore it is important to ensure adequate coordination of programmes of activities, and a clear-cut division of responsibilities amongst the various sectors.

The food and nutrition policy should identify the programmes which are expected to be carried out by each sector in a certain period of time in order to reach the targets. Once the responsibilities of each sector have been identified, a coordination mechanism will be necessary through which the different sectors could interact with each other in order to avoid duplication and start to develop a comprehensive food and nutrition strategy (Bagchi, 1989).

Formulation of a national food and nutrition board is therefore very essential to coordinate the responsibility of each sector through intersectorial collaboration. The Board should consist of representatives from all sectors involved in food and nutrition activities. It is recommended that the Board should be attached to a Ministry of Planning to overcome many operational activities. However, such a Ministry is not available in Bahrain. In this case a Food and Nutrition Board is best attached to the Council of Ministers in order to operate punctually. The Board should be chaired by a powerful policy maker and report directly to the Council of Ministers, in order to strengthen the decisions and plans taken by such a Board.

Measures to be taken into consideration in implementation of a Food and Nutrition Policy in Bahrain

A food and nutrition policy should include three main measures:(FAO/WHO, 1976).

1. Measures that affect food availability such as food production, prices, marketing, processing and storage, food exports and imports and food safety.
2. Measures that affect the demand on foods such as per capita income,

food subsidies, consumer preferences, nutrition education, supplementary feeding programmes and population policy.

3. Measures that affect the utilization of foods such as parasitic and infectious diseases, hygiene, pregnancy and lactation, physical activities and food intolerance.

In the case of Bahrain, in addition to the above programmes which are carried out by several sectors, there are many measures which should be considered in any food and nutrition policy:

Per capita food intake

The per capita food intake in Bahrain is based on food availability either through food balance sheet or household expenditure survey. These data do not represent actual per capita food consumption, and therefore cannot provide feedback information for planning purposes. It is essential to establish nutrition surveillance to ensure a continuous flow of information on food intake as well as other nutrition indicators.

Food subsidy policy

The current food subsidy policy may encourage an increase in the intake of energy-rich foods such as rice, fat and sugar. The trend in dietary intake adversely affects the health status of the population by increasing the risk of obesity and heart diseases. It is recommended that the government should use this policy to promote the consumption of high nutritive value foods such as vegetables, fruits and fish.

Food manufacturing

One way to make the proposed change in diet in Bahrain, is to alter manufacturing practices to allow the production of foods with a higher nutritive value. The local food factories should be encouraged to produce food free from artificial additives and preservatives, as well as with a good nutritive value. Many nutritious traditional foods can be produced commercially if equipment and government support are available.

Food fortification

Fortification is one of the methods used for improving the nutritional value of foods commonly consumed. Such a programme is projected in many developed countries but is not practiced in Bahrain.

It is recommended to fortify the common foods like wheat flour and milk with minerals and vitamins. This will help in part to prevent some nutritional disorders. However, recently the Bahrain Flour Mills has started fortifying the wheat flour with some minerals and vitamins.

Food safety and regulations

To attain adequate and effective food quality control in the country the following measures should be taken into consideration:

1. Revising the current Food Law. Unfortunately the Food Law is far from being comprehensive. The law is a modified copy of of Food Law in some developing countries which in many cases is not related to Bahraini circumstances. In view of the rapid technical development in food processing and handling, more attention should be given to up-dating the current Food Law.
2. Active and effective food inspection services. Food inspection in Bahrain is more concentrated on hygienic and sanitation aspects, without taking into consideration the chemical contamination of foods. Such consideration is restricted because of limited analytical services. Inspection should focus on storage and preservation of foods, cooking methods, cleaning materials and method , sterilization and disinfection, kitchen designe and equipment and control of infestation.
3. Improve quality and quality of analytical services. This can be done by training the staff and carrying out more chemical tests such as determining pesticide residues, mycotoxins, food additives and hormones in foods.
4. Preparation of food standards which are related to local circumstances in Bahrain. Standards relating to levels of mycotoxins, additives, pesticide residues and heavy metals in foods are urgently needed. Equipment used in the preparation and processing of foods should be standardized to avoid production of unsafe foods.
5. Proper training for both food inspectors and chemists. This can be done in two ways; inservice training to update knowledge and improve skills of these staff, and overseas training for senior staff to gain skills in specific techniques or advanced methods used in the inspection and analysis of foods.

6. Revising the current food inspection organization in order to cover more aspects of food control and to increase the efficiency of activities.
7. Involvement of other governmental and private bodies which are working in food production and services in preparation of food standards, such as the Directorate of Fisheries, the Directorate of Agriculture, the Nutrition Unit (at Ministry of Health), the Bahrain Society of Engineers, food factories, and others.

Development of fisheries

Although there is an increase in fish production, the rise in the Bahrain population and the high demand for fish, especially fresh fish, make it difficult to rely on local fish. As a result fish importation is increasing annually. Additionally, there are many barriers to developing the marine fisheries in the country. Therefore in order to develop fishery resources in Bahrain, the following measures should be taken into consideration:

1. Providing basic facilities for landing, handling, processing and marketing of fish in Bahrain.
2. Introducing modern techniques and improvement of traditional methods in fishing.
3. Stimulating local fishermen to be more involved in fisheries by providing them easy access to credit and gear technology.
4. Establishing local regulations and legislation for fisheries in Bahrain. This could be done through assistance from other related International organizations.
5. Controlling dredging and reclamation activities through regulating them, and carrying out geological and bioecological surveys in areas which are planned to be dredged or reclaimed.
6. The training of manpower in different aspects of fishery science.
7. Encouraging research and studies in fisheries, and providing adequate facilities, to carry out these studies. Laboratory equipment should be given first priority in order to attain this recommendation.
8. Financial subsidizing of fishing gear and other equipment used for fishing, to encourage the fishermen to enroll in fisheries.

It is important to note that some of these measures were considered in the five-year plan for the development of the fishing sector in Bahrain (Ministry of Commerce and Agriculture, 1980), however serious efforts should be taken to apply these measures.

Recently, the government of Bahrain, the United Nations Development Programme (UNDP), and the Food and Agriculture Organization of the United Nations have signed an agreement to establish a regional fish marketing service for the Arab World "INFOSAMAK". The main objectives of this project are to provide information and technical assistance to the fishery industry, to assist in opening up new markets for fish and fish products, to assist exporters of fish products, to generate new investment information in the Arab fishing industry and to establish a basis for cooperation among the Arab countries in fisheries matters (INFOSAMAK, 1985). It is hoped that this project will help in developing fishery resources in Bahrain and other Arab countries.

Nutrition education

The current health and nutrition education is less effective. This is mainly due to lack of people specialising in mass communication and concentration on the use of booklets and posters in education which have a low influence on changing beliefs and attitudes. Nutrition should be introduced in school curricula, medical colleges and other health institutes. Local nutritional problems must be considered in such curricula. Emphasis should be paid to efficient use of mass media, especially the television which is widely spread in the country. The use of advertising techniques in nutrition education seem to have a more profound influence than the classic techniques (giving advice, and interviewing health professionals).

Educational materials should be developed locally as much as possible and must show the way to prevent or manage nutritional problems commonly relevant in the community such as iron deficiency anaemia, heart diseases, diabetes and obesity. Attention should be given to involve the community in nutrition education, especially the religious leaders who have a respectable position.

Control of food advertisement claims

Food advertisements particularly those viewed on television have a negative influence on food habits of the public, such as a high

consumption of junk foods. Additionally many advertisements provide misleading or false claims which deceive the people. This is especially true in Bahrain where the television occupies most of the leisure time of mothers and children. Musaiger (1983) found that advertising plays an important role in shaping the food attitudes and practices of Bahraini housewives. Therefore it is essential to control food and health advertisement claims in the mass media and particularly by television, on the radio, and in newspapers. This can be achieved through establishing a committee from related Institutes to evaluate the advertisement claims before releasing them to the public.

Control of parasitic and infectious diseases

Diarrhoea and intestinal parasitic infection are still prevalent in the country. The main parasitic infections among school children in Bahrain are *Giardia lamblia*, *Trichuris trichiura* and *Hymenolepis nana*. The prevalence of intestinal infections decreased by 22% among boys and 27% among girls aged 6-11 years during the period 1980-1986 (Musaiger and Gregory, 1990). This is because of the improvement in health services and hygienic conditions. However, some rural areas and slums in the cities are still characterized by low sanitation. Additionally food handlers play an important role in spreading parasitic infections and food poisoning (Musaiger, 1989). Early detection of parasites in preschool and school children is an essential measure to control parasitic infections. Increasing the awareness of the public regarding personal hygiene and other sanitation practices should be undertaken in any health education programme. Regular screening of food handlers, proper inspection of food premises and proper disposal of wastes are all among the measures to control diarrhoeal and parasitic infection in the country.

Iron-deficiency anaemia

A specific programme to eradicate iron deficiency anaemia is an essential element in any food and nutrition policy. The following measures should be considered in such programme: proper weaning foods with emphasis on food rich in iron and vitamin C, proper antenatal care for pregnant and lactating mothers, health education to encourage consumption of iron-rich foods and reduce foods inhibit iron absorption such as tea and coffee, control intestinal parasitic infection, iron supplementation to pregnant mothers, school feeding programmes and food fortification with iron and other important minerals.

Maternal malnutrition

The mother and child health (MCH) services in health centres should be expanded to include more activities related to the promotion of the nutrition of mothers and their children. Activities such as including teenage girls in MCH services, encouraging spacing between pregnancies, discouragement of unsound food beliefs and attitudes during pregnancy and lactation, and assessment of nutritional deficiencies are all examples for activities to promote nutrition of mother.

Control of diseases of affluence

In order to control nutritional disorders associated with affluence in Bahrain, the following measures are suggested:

1. Develop a nutrition intervention programme to be applied by the Ministry of Health, with emphasis on malnutrition of affluence.
2. Expanding the activities of nutrition in both primary and secondary health cares.
3. Nutrition education programmes should focus on the prevention of heart diseases, obesity, diabetes, dental caries and cancer.
4. Training health staff on nutritional management of these clinical disorders. Community health nurses should have the priority in such training.
5. Improve the curriculum of health and medical schools by introducing more information on prevention and management of nutritional disorders associated with affluence.
6. Integrate nutrition activities with the oral hygiene programme in primary schools.
7. Establishing a dietary guideline for the community in order to advice them on sound dietary habits. For example, the dietary guideline should include advice on decreasing the intake of animal fat, increasing the intake of fish, reducing the consumption of refined sugar etc.
8. Encouraging physical exercise, by supporting physical fitness programmes for males and females in schools and clubs.
9. Carrying out epidemiological studies on factors associated with such clinical disorders.

Food and nutrition research

There is an urgent need to deal with two types of research; maintenance of the safety and quality of food supplied, and the role of nutrition in diseases commonly prevalent in the community. Determination of carcinogenic matters in foods such as pesticide residues, artificial hormones in meat, mycotoxins in feeds and foods, and heavy metals in water and food is of the utmost important.

Research should also focus on non-communicable diseases. Research on the link between dietary habits and aetiology of cancer, coronary heart diseases, hypertension, obesity and diabetes are first priority. Social and environmental factors associated with incidence of these diseases should be investigated.

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Appendices

Medium Projection of The Population By Age,
Sex and Nationality — 2000

Appendix (1)

Age Group	All-Bahrain			Non-Bahraini			Bahraini		
	Total	Female	Male	Total	Female	Male	Total	Female	Male
0 - 4	81,591	40,104	41,487	12,136	5,713	6,423	6,9455	34,391	35,064
5 - 9	79,135	38,928	40,207	12,535	5,939	6,596	66,600	32,989	33,611
10 - 14	72,610	35,651	36,959	13,679	6,466	7,213	58,931	29,185	29,746
15 - 19	60,220	29,531	30,689	12,691	5,998	6,693	47,529	23,533	23,996
20 - 24	43,965	21,529	22,436	8,283	3,845	4,438	35,682	17,684	17,998
25 - 29	41,651	19,987	21,664	7,940	3,215	4,725	33,711	16,772	16,939
30 - 34	41,342	19,224	22,118	8,741	2,914	5,827	32,601	16,310	16,291
35 - 39	44,008	19,061	24,947	14,336	3,914	10,422	29,672	15,147	14,525
40 - 44	51,895	18,183	33,712	28,080	6,060	22,020	23,815	12,123	11,692
45 - 49	49,161	14,116	35,045	32,365	6,056	26,309	16,796	8,060	8,736
50 - 54	31,442	8,848	22,594	20,905	3,803	17,102	10,537	5,045	5,492
55 - 59	20,167	6,630	13,537	11,919	2,132	9,787	8,248	4,498	3,750
60 - 64	15,133	5,478	9,655	7,376	1,272	6,104	7,757	4,206	3,551
65 - 69	9,831	3,980	5,851	3,493	692	2,801	6,338	3,288	3,050
70 - 74	6,424	2,786	3,638	1,622	337	1,285	4,802	2,449	2,353
75 .	4,969	2,357	2,612	679	226	453	4,290	2,131	2,159
TOTAL	653,544	286,393	367,151	196,780	58,582	138,198	456,764	227,811	228,953

Year/Nationality		Rates Per (000) Population							
		Infant Mortality Rate ^a (Per (000) Live Birth)			Natural Increase Rate	Crude Death Rate ^b			Crude ^b Birth Rate
						Total	Females	Males	
1978	Bah.	18.3	17.0	19.5	32.1	3.6	3.2	4.0	35.7
	Non-Bah.	22.4	21.9	22.8	15.9	2.4	1.6	2.7	18.3
1979	Bah.	26.9	27.7	26.2	30.9	3.7	3.2	4.2	34.6
	Non-Bah.	21.7	24.0	19.3	17.2	2.2	1.8	2.3	19.4
1980	Bah.	25.3	23.1	27.5	30.9	3.8	3.4	4.3	34.7
	Non-Bah.	23.9	23.5	24.2	17.7	1.8	1.7	1.8	19.5
1981	Bah.	22.0	21.3	22.7	28.9	3.5	2.7	4.1	32.3
	Non-Bah.	19.5	17.6	21.3	18.7	1.9	1.6	2.0	20.6
1982	Bah.	21.7	21.8	21.6	29.1	3.4	2.8	4.2	32.5
	Non-Bah.	16.0	14.8	17.1	21.0	1.9	2.1	1.9	23.0
1983	Bah.	17.0	14.4	19.4	28.6	3.2	2.6	3.8	31.8
	Non-Bah.	17.0	18.9	15.3	22.2	1.8	2.0	1.7	24.0
1984	Bah.	23.7	21.6	25.8	26.9	3.8	3.2	4.4	30.7
	Non-Bah.	18.9	18.9	19.0	21.4	2.0	1.5	2.2	23.4
1985	Bah.	20.8	20.4	21.1	29.0	3.4	2.7	4.1	32.4
	Non-Bah.	16.1	14.8	17.3	20.5	1.8	1.2	2.0	22.3
1986	Bah.	18.6	20.3	17.1	29.5	4.1	3.7	4.5	33.6
	Non-Bah.	14.0	7.9	20.1	19.1	1.4	1.0	1.6	20.5
1987	Bah.	21.3	20.1	22.4	27.6	4.5	4.0	4.9	32.1
	Non-Bah.	17.5	18.5	16.5	17.8	1.4	1.3	1.5	19.2
1988	Bah.	23.8	25.4	22.2	26.2	4.1	3.7	4.5	30.3
	Non-Bah.	22.7	22.3	23.1	17.6	1.5	1.4	1.5	19.1
1989	Bah.	19.8	18.8	20.8	27.1	4.0	3.5	4.5	31.2
	Non-Bah.	18.7	24.1	13.7	19.8	1.5	1.7	1.4	21.3

^a Registered Events

^b Reported Events

**Beds in Government Hospitals By Speciality
(1985 - 1989)**

Item	Year				
	1989	1988	1987	1986	1985
Salmaniya Medical Center	607	587	577	577	577
Medical	110	110	109	109	109
Surgical	126	126	126	126	126
Obstetrics & Gynaecology ⁽¹⁾	38	38	38	38	38
Paediatrics	80	80	75	75	75
Ear, Nose, Throat	38	38	38	38	38
Respiratory	28	28	28	28	28
Intensive Care Unit	6	5	5	5	5
Ophthalmology	44	44	44	44	44
Infectious Diseases	23	23	19	19	19
Orthopedics	58	58	58	58	58
Burns	17	17	17	17	17
Emergency Ward	16	-	-	-	-
Cardiology Care Unit	7	4	4	4	4
Day Case Unit	16	16	16	16	16
Salmaniya Maternity	147	148	148	148	148
Maternity Unit	107	108	108	108	108
Special Baby Care Unit	40	40	40	40	40
Other Maternity Hospitals	117	117	126	126	126
Long Stay Unit	20	20	-	-	-
Psychiatric Hospital	180	180	180	180	202
Geriatric Hospital	56	56	56	56	56
Military Hospital	193	196	196	191	163
Medical	44	44	44	44	44
Surgical	65	62	62	58	38
Obstetrics & Gynaecology	31	31	31	31	31
Paediatrics	20	20	20	20	20
Ear, Nose, Throat	14	9	9	9	9
Respiratory	-	-	-	-	-
Intensive Care Unit	4	4	4	8	-
Coronary Care Unit	4	5	5	-	-
Others	11	21	21	21	21
Total	1,320	1,304	1,283	1,278	1,272

⁽¹⁾ Including Maternity Hospitals.

Health Expenditure Compared to Public
Expenditure - in 000, BD - (1975 - 1989)

Year	Growth in %	% To Public Expenditure	Annual Public Expenditure	Health Expenditures		
				Total	Non-Current	Current
1975		7.6	121,800,	9,300	2,600	6,700
1976	46.2	6.7	203,200	13,600	5,000	8,600
1977	61.0	8.4	259,400	21,900	9,400	12,500
1978	-11.0	6.8	285,300	19,500	4,500	15,000
1979	- 4.6	7.2	257,700	18,600	1,300	17,300
1980	31.6	7.7	317,200	24,474	2,690	21,784
1981	17.5	7.5	381,600	28,762	3,111	25,651
1982	13.5	6.9	470,500	32,632	3,690	28,942
1983	6.1	6.5	531,000	34,592	2,292	32,300
1984	0.4	6.6	529,300	34,726	1,723	33,003
1985	- 1.2	6.9	497,500	34,295	2,320	31,975
1986	- 7.3	6.7	476,500	31,774	902	30,872
1987	1.3	7.1	454,800	32,179	610	31,569
1988	5.9	7.1	482,200	34,062	531	33,531
1989	6.1	7.3	496,000	36,138	1,141	34,997

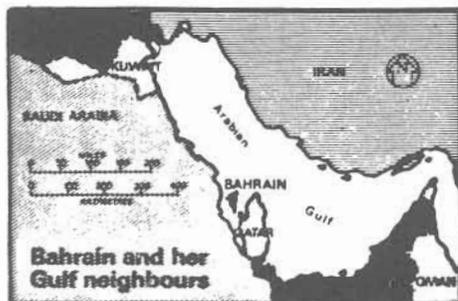
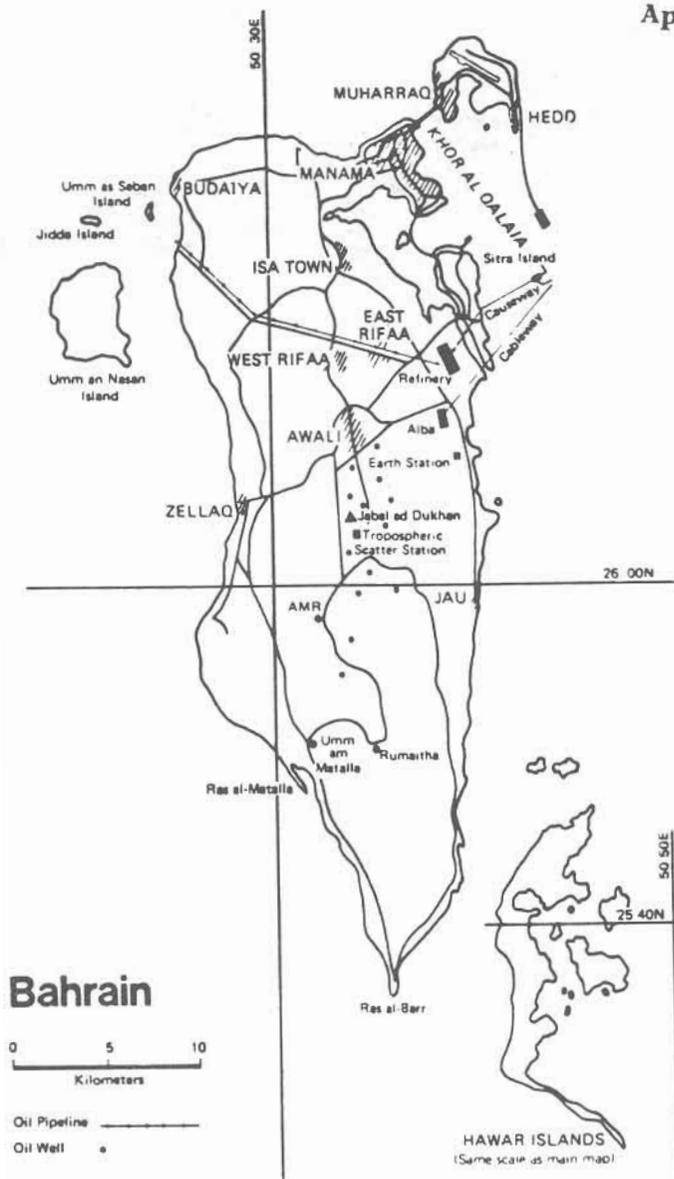
Fresh Milk Quantity Value, Local -
Produced (Estimated), Imported and
Average person consumption -
Quantity in 000 liter, value in 000 BD. -
(1982-1989)

Year	Average person Daily Consum- ption from Fresh Milk (Liter)	Import		Local production	
		Value	Quantity	Value	Quantity
1982	0.054	1,229	1,312	2,432	6,080
1983	0.051	122	309	2,800	7,000
1984	0.061	155	660	2,969	8,485
1985	0.067	180	829	3,339	9,540
1986	0.071	141	828	3,195	10,650
1987	0.077	180	761	3,650	12,168
1988	0.104	459	1,256	4,595	16,708
1989	0.126	1,177	2,855	5,404	19,650

Poultry Quantity & Value of Local produced (Estimated)
and Imported and Average person consumption
Quantity in 000 kg, value in 000 BD -
(1982 - 1989)

Year	Average person Daily Consum- ption from Fresh Poultry (Grm)	Import		Local production	
		Value	Quantity	Value	Quantity
1982	...	3,748	7,183
1983	62	3,396	7,437	869	1,449
1984	68	3,938	8,247	1,114	1,856
1985	85	4,585	10,313	1,746	2,910
1986	88	5,443	11,567	1,586	2,644
1987	79	4,732	9,992	1,950	3,250
1988	78	4,501	9,998	2,067	3,445
1989	89	6,216	12,486	2,051	3,419

(...) not available



About the book: Nutrition situation analysis is the first step for any nutrition intervention programme. This book highlights the situation of food and nutrition in Bahrain. It covers many important topics such as health situation, agricultural production, nutritional problems, food consumption patterns, nutrition education, infant feeding practices, food safety, and the current programmes related to nutrition. The book also discusses some essential elements for a nutrition policy for the country.

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