

FOOD CONSUMPTION AND NUTRITION

Wijnand Klaver & Robert Mwadime

ABSTRACT

The coastal region is a net importer of food. Under these conditions, household food security can still be realized thanks to non-farm income. Yet, for a sizeable portion of the population food security is not assured. Furthermore, the current food pattern, which relies heavily on maize and cassava, is lacking in dietary quality and variety. This results in nutritional problems among the population which are partly hidden, but which surface most clearly among vulnerable groups such as women and children. While these problems are the corollary of poverty and ill health, they can be partly prevented by appropriate caring behaviour. This is both an individual and a community responsibility. While the nutritional problems are very serious, there are also signs of hope and of 'resilience'. In the 1990s the level of chronic malnutrition in the Coast had for the first time started to go down.

INTRODUCTION

Food consumption and nutrition are at the far end of the 'food path', which starts from food production and food gathering. An important consideration from the consumer's perspective is the security of 'access' that users (individuals or households) have to the food they need. This is called 'food security'; it is based on their access to productive resources to produce their own food as well as on their purchasing power (to buy food) and social networks (to claim or receive food).

As much as food security is a necessary condition for good nutrition, it is not sufficient in itself: food has to be prepared, distributed between household members, consumed and digested, and the energy and nutrients that are released have to be absorbed and utilized by the body. This is where appropriate caring behaviour and health conditions come in. Only when all these steps are secured, can we speak of 'nutrition security' (Mwadime 1996).

Food consumption and nutrition in the Kenya Coast is the result of the interplay of biological processes which are rather universal in nature, and anthropological or socio-

economic factors which tend to be culturally specific. This review will look at food consumption and nutrition in terms of the level of fulfilment of some of the 'basic needs' and the socio-economic determinants.

Apart from being an outcome of development, good nutrition is also an input into development, as it contributes to the quality of the human resources. Mortality and morbidity data are one way to express this. Direct information on the level of productivity and performance in relation to health and nutrition are not readily available, but their importance is very plausible and known from practical experience.

FOOD HABITS IN THE COASTAL REGION

*Rural food habits*¹

In most rural households, three meals per day are served. Breakfast is prepared early in the morning before the children leave for school. The second meal is prepared between twelve and two o'clock while dinner is taken in the evening, usually at about seven o'clock. Some households may skip lunch or breakfast or sometimes both when no food is available or because of work patterns. Dinner is the most important meal of the day in which generally all resident household members partake.

Breakfast in many households consists of some leftovers from the previous evening. These leftovers, heated up or eaten cold, are usually accompanied by some tea with sugar (and/or milk). Other households may prepare special foods for breakfast such as *chapatis* (unleavened bread), or eat *uji* (thin cereal porridge, usually from maize flour). Lunch and dinner generally consist either of *ugali* (stiff porridge made of maize and/or cassava flour) taken with a relish or of a dish prepared with boiled roots, mostly cassava. This latter type of dish is more commonly taken at lunch time when the cassava is carried home from the field for that purpose. Side dishes consist mainly of different types of cooked green vegetables but can also be prepared from legumes, unripe mangoes, fish, meat or chicken or simply consist of sour milk. If nothing else is available, some households may take *ugali* with just a little salted water.

In the coastal strip as such, the food culture is more varied: dishes generally contain more ingredients — like fish (fresh, dried, or fried) and coconut — due to the influence of the Swahili tradition on the local kitchen. This is particularly true for the Digo in Kwale District. Compared with the other coastal communities, they use more spices, and consume, beside the basic dishes mentioned above, a larger variety of snacks (such as *chapatis*, various types of fritters and snacks cooked in coconut extract) and special dishes such as *pilau* (spiced rice) and sweetened vermicelli. Among the Digo, food-peddling is more common than among the other ethnic groups. Especially during the

1 This section is largely based on the so-called Coast Seasonality study of 1985/6 carried out in the context of the Food and Nutrition Studies Programme (FNSP). It was a study among 300 rural households with young children in the three dominant agro-ecological zones (CL3, CL4 and CL5) in Kwale and Kilifi Districts. See Foeken & Hoorweg 1988; Foeken *et al.* 1989; Niemeijer & Klaver 1990; Niemeijer, Foeken & Klaver 1991. The overall end publication is that of Hoorweg, Foeken & Klaver (1995).

month of Ramadan, when people fast during day-time hours and eat during the evening and night, many peddlers and stalls open up during the evening hours. However, eating out is mainly a habit of the men and not women. This may be related to the Islamic *Pudah* regulation, that limits women's movement in public places and participation in public activities.

There are traditional food taboos and food avoidances, notably affecting women. Traditional healers often recommend avoidance of specific foods during pregnancy. For instance, the pregnant woman may be advised to eat well, but not to eat foods like eggs, as the child born may not have hair (Mwadime 1995) or might develop a large spleen (Sehmi 1993). Traditionally among the Giriama people, when a girl approaches marriage age, she is forbidden from eating poultry until she has born a child (Sehmi 1993).

Young child feeding

The first national Rural Child Nutrition Survey² held in March 1977 (Kenya 1977; 1979) provides an impression of infant and child diets based on estimates of food consumption frequencies. In the Coast, cereals and milk (from cow and goat) were consumed most frequently, 30-40 times per month, only slightly less than elsewhere in rural Kenya. The consumption of meat, fish and eggs was uniformly low in the country (6 times per month; Coast: 8 times). The underfives' diet in the Coast was monotonous in other respects as well: it shared with the ecological zones west of the Rift Valley a pattern of low frequency of other foods, like potatoes/cassava, bananas and beans (4-8 times a month), and it even did not have the west's high vegetable consumption frequency (Coast: 11 times per month; western Kenya: around 30).

In households with young children, special weaning foods may be prepared in addition to the main household dishes. Sometimes this is just a portion of *ugali* which is diluted with a little milk or reconstituted milk powder. However, *uji* is the most important weaning food (Niemeijer, Foeken and Klaver 1991). In many cases no special weaning foods are made, so that to a large extent adult food reflects what is fed to the child (Mwadime *et al.* 1995). According to information from the second national Child Nutrition Survey (Kenya 1980), the main ingredient of children's weaning porridges in the rural areas of the Coast was maize (95% of cases) while in the urban areas it was a bit more varied (81% maize, 5% millet or maize mixed with millet and 14% other or not stated). The pattern of additional ingredients showed a clear rural-urban differential: in the rural areas, the weaning porridges in more than half of the cases had neither sugar nor milk added, while the weaning porridges in more than half of the urban cases had both sugar and milk, which implies a better energy density of the dish. Information from CNS-3 (Kenya 1983) confirms that only one-third of rural pre-school children received milk in their porridge; in one out of four cases this was powdered milk instead of fresh cow's, goat's or other milk.

A non-food habit that does have nutritional consequences is the practice among the

2 The national rural child nutrition surveys are denoted in the text by the abbreviation CNS followed by their number.

Taita of keeping the child indoors away from sunlight which is the main factor in the provision of vitamin D: a short exposure now and then of part of the skin to the sun is all that would be needed.

Breast-feeding and baby food

The first and unique food for infants is mother's milk, starting from the valuable 'first milk' (colostrum), which is particularly rich in immune substances. Exclusive breast-feeding is recommended for the first six months, whereafter so-called weaning foods are gradually introduced. Earlier weaning carries the risk of contamination and infection, while later weaning carries the risk of starving the child (Kenya 1977; 1979; 1983).

The three national rural child nutrition surveys between 1978 and 1988 all revealed a slightly longer duration of breast-feeding at the Coast compared with the national figures (Kenya 1980; 1983; 1991). For instance, CNS-4 (Kenya 1991) reported 17-18 months of breast-feeding (depending on the district) compared with a national average of 16 months. Several cultural and religious practices promote this higher prevalence of breast-feeding in the Coast. The practice of mothers carrying their baby on the back has several advantages: it allows them to breast-feed on demand (frequent sucking stimulates breast-milk production), while the close contact between mother and infant is also important for emotional development. The traditional cultural practice among the Taita of enclosing the mother and her newborn for 21 days promotes mother-infant bonding. A traditional Islamic practice is to breast-feed the child for at least 24 months.

Various reasons lead mothers to stop breast-feeding. Most of them are related to such factors as sickness, a next pregnancy or the mother having to go back to school or work (Mwadime 1995). These factors can be a combination of practical and cultural considerations. For instance, mothers may deny the breast when they are sick, for fear that the child will get the sickness. In the case of culturally disapproved behaviour (such as adultery by the mother), there can also be fear that the child will be possessed by an evil spirit and consequently develop malnutrition (*chirwa* in Digo or marasmus in medical terms) (Mwadime 1995).

The use of commercial baby food is uncommon among the coastal population. According to CNS-2 (Kenya 1980), the proportion of babies who had ever been given any commercial baby food (milk or cereal based) was lowest of all provinces in rural Coast (16%) while in urban coastal areas it was as high as in Nairobi, i.e. around 75%. CNS-3 (Kenya 1983) gives a similar percentage of children who ever used formula in the rural Coast (hardly 20%), with the lowest figures reported for Kilifi/Tana River/Lamu (16%) and the highest for Taita Taveta District (almost 30%). These low percentages are in a way reassuring because when processed foods are improperly prepared and fed, they carry important health risks for the baby (notably diarrhoea). On the other hand, the low percentages may partly reflect the low income level among the rural coastal population.

According to CNS-3 (Kenya 1983), the mean age of introduction of the first weaning food was three months in rural Coast Province, although in Kwale District it was almost six months, which corresponds to current international recommendations. Porridge was

the main type of first supplement in the rural Coast (around 80% of the cases); milk feeds were the first supplement in only around 10% of the cases. The results of a study on weaning practices of 0-23 months old children in Kilifi (Thiuri, Gemert & Kinoti 1984) indicate that feeding at least two meals per day improved growth performance during the early weaning period.

FOOD AVAILABILITY AND FOOD ADEQUACY

Data are lacking to complete a 'food balance sheet' for the Kenya Coast because at sub-national level the necessary statistics are lacking. Yet, it is possible to convert at least certain food production statistics in a nutritionally meaningful way: not money value in this case, but in terms of dietary energy (kilocalories) (Table 1). Although Table 1 is not complete (it does not include food from animal origin neither food hunted or gathered in the wild), it covers the bulk of food availability. In 1992, total food crop production represented around 675 billion kcal, which is equivalent to 193,000 T grain equivalents. This represents 44% of the estimated food needs of the coastal population.³ Hence, the Coast is clearly a food deficit region. This is not a new phenomenon: it can be traced to colonial times, when priority was given to agricultural development in the White Highlands; since then, investment in the Coast has been lagging behind. The tourist industry particularly relies for its food supply on the highlands (Mwakubo, Sambili & Maritim 1996). Whether full food self-sufficiency of a region is necessary or desirable is outside the scope of this review; what is relevant here is that people in the Coast, in order to meet their food requirements, rely heavily on food that has to be imported from other regions and has to be purchased. It has been found that groups that have enough income can achieve food adequacy (Mwadime 1996).

An indication of the dietary quality of the foods is the part of the energy contributed by protein. It can be calculated from Table 1 that plant protein contributes 8.2% to the vegetal food energy produced in the region, assuming that 1 gram of protein provides 4 kcal. Allowing for a protein quality score of 70-80%, this represents around 6 net protein-energy percent. This figure does not yet include foods from animal origin, which are typically rich in protein. A modest consumption of foods of animal origin (including fish and shark, which are widely consumed in the coastal strip) will bring this ratio closer to the empirically desirable level of 11-12%, while increasing the protein quality. The dietary quality in terms of micronutrients (vitamins and minerals) depends to a large extent on the availability of vegetables, fruits and foods of animal origin. As there are no

3 To estimate the region's food needs, one uses estimates of its population size and of individual nutritional requirements. If demographic trends of the past decade continued, the population had reached 2 million in early 1992. With an estimated average per capita energy requirement of 2,100 kcal per day, a population of 2 million people (in 1992) required 1,200 T of grain equivalents per day (at around 3,500 kcal per kg of grain), or 440,000 T of grain equivalents per year. At 6.5 energy percent (a value that allows for biological variation, but not yet for 'social' variation in food intake), the amount of protein required by the population of the region is of the order of 25,000 T of reference (high quality) protein per year, that is roughly 35,000 T dietary protein per year. Thus, protein needs were covered to the same degree as energy needs.

reliable statistics on these foods, it is more convenient to assess their adequacy from intake data (see next section).

Table 1 Energy equivalent of annual food crop production, 1992

	Kcal/kg edible portion	Protein as % of energy	Waste (%)	Kcal/kg as prod- uced	T/year prod- uced	Kcal/yr (bill- ions)	% vegetal energy	Protein (T/yr)	% vegetal protein
cereals	3500	9.1	15	2975	75091	224	33	5100	37
legumes	3350	26.3	0	3350	10978	37	6	2400	17
cassava	1550	1.8	15	1320	120079	158	24	710	5
sw. potato	1150	5.2	15	980	1456	1	0	19	0
vegetables	300	36.0	20	240	32543	8	1	700	5
fruits	650	4.3	30	450	179662	82	12	900	7
coconut	2800	7.1	35	1800	52983	96	14	1700	12
cashew	5900	13.6	0	5900	10363	61	9	2100	15
simsim	5900	13.6	0	5950	1323	8	1	260	2
Total		8.2				675	100	13900	100

Sources: Platt 1962; T/year (1992) from the corresponding review of Agriculture by Waaijenberg in this Portal (Appendix 2).

Nutritional requirements for energy (and for some of the micronutrients, notably the B-vitamins) depend on the level of physical activity, which in turn is influenced by labour activity. Infections are also expected to increase requirements, but to a lesser extent. The period between March and July-August is generally regarded as the period in which labour requirements in agriculture are high (Jaetzold & Schmidt 1983; Waaijenberg 1987; van Oosten 1989; see also Hoorweg, Foeken & Klaver 1995). In particular, the period between, roughly, mid-April to the end of June can be considered as the annual labour peak in this part of Kenya and, by the combined effect of more time spent in fieldwork and the more energy-intensive physical activities, result in a peak in the daily energy expenditure of most adults.

The Coast has known hunger periods since historical times (Herlehy 1983) either due to drought or to insect pests (such as locusts), sometimes compounded by warfare. During the last droughts of 1992 and 1996/7, over 40% of Kilifi District was affected, as well as parts of Taita Taveta, Kwale and Tana River. Already in colonial times, food relief was organized in cases of severe famine: rice imported from India in 1898, imported wheat in 1944 and maize during the drought of 1948-52 (Herlehy 1983). Nowadays food relief consists mainly of maize and beans, in line with the local food pattern.

ENERGY AND NUTRIENT INTAKE

Data on actual food consumption are not routinely collected on a population basis, but are limited to restricted samples in the context of research studies. The earlier mentioned Coast Seasonality study⁴ provides detailed information on the food intake of 300 rural households with young children in Kwale and Kilifi Districts. The results give an idea about the level of nutritional adequacy and seasonal variation in food intake, as well as

⁴ See footnote 1.

about a number of determinants of food intake. A study in three rural sub-locations in Kwale (Mwadime 1996) gives information on food intake in 1994 (mid-October to mid-December).

Diet composition and nutritional quality

The diet of the coastal population is fairly monotonous. The Coast Seasonality study found that 84% of energy intake (73% of requirements) came from staple foods (cereals, cassava and bananas) and beans combined. In general, the meals consist predominantly of cereals. Most of the cereals is purchased, confirming that this is a food-deficit region. The intake from roots, tubers and starchy staples (mainly cassava), vegetables (mainly green leaves), fruits (mainly mangoes), and oil seeds and nuts (coconuts) mostly came from home production. Legumes and animal products were largely purchased. Finally, fats and various miscellaneous items (mainly sodas, syrups, sugar) were nearly always bought. In terms of macronutrients, 77% of the energy was derived from carbohydrates, 11% from proteins and only 12% from fats. The contribution of fats (12%) is within the 5-35% range that is considered to be not incompatible with health. Nevertheless, it is a fairly low percentage, indicative of a one-sided, monotonous diet that is quite bulky with a low energy density (Hoorweg *et al.* 1995).

The average intake of proteins ranged from a minimum level of 69 grams/day per consumer unit⁵ in July-August to 75 grams/day in May-June. From the international figures for individual 'safe protein intakes', a requirement value can be assessed at 50 grams/day per consumer unit of protein from the current diet (which would correspond to about 40 grams of optimal quality reference protein). This aggregate value does not take care of distributional variation within the household, so that it should be increased by a certain margin before it could qualify as a 'safe household intake'. The current average protein intake is apparently high enough to provide such a margin. Yet, there is no reason for complacency: although the results for protein intake are more favourable than the results for energy intake (see below), once energy is lacking in the diet, proteins will be more readily used for energy purposes than for the body building purposes to which the requirements refer. This may explain why in the Kenya Coast vulnerable groups like young children remain at risk of what is commonly referred to as 'protein-energy malnutrition' (PEM).

As for various nutrients, the average intake of thiamin and iron corresponded to the recommended levels, vitamin C intake was ample (provided cooking losses are not excessive). However, vitamin A, vitamin B2 and niacin intakes were only half the recommended values. This reflects a diet poor in vegetables/fruits and foods from animal origin. A study done end of 1994 in Msambweni in Kwale likewise found a protein intake that was well above recommended values, while the energy intake was only 80% of estimated requirements. The level of vitamin C appeared adequate, but the intake of

5 A consumer unit is equivalent to a male adult in terms of energy requirements. For the precise method of calculation and the way other age/sex groups are expressed as consumer units, see Hoorweg *et al.* 1995: 119.

vitamin A was inadequate, around 80% of the recommended value (Mwadime *et al.* 1996b).

Energy intake and its seasonal variation

Daily energy intake throughout the 15-month period of the Coast Seasonality study in 1985/6 averaged slightly less than 2600 kcal per consumer unit (Hoorweg *et al.* 1995). This intake is comparable to the energy intake reported for groups of peasant smallholders elsewhere in Kenya. With estimated energy requirements per adult equivalent at almost 3,000 kcal/day, the actual energy intake was on average 87% of that figure, i.e. varying from 6 to 17% below the reference value⁶. Due to a skewed distribution, this mean value of 87% of requirements gives too favourable an impression: half of the households had an energy intake below 80% of requirements, while in about one-quarter of the households a one-day energy intake below 60% of requirements⁷ was reported. These findings point to a widespread prevalence of chronic energy deficiency.

During most of the year total energy intake was around a base level of 2500 kcal/cu and there was no pronounced dip at any time of the year. On the contrary, a peak in energy intake was found in the months of May-June with 2780 kcal/cu and a second, lower peak occurred in November-December, that is during the period of the long rains and the short rains, respectively. The peaks in household intake occurred in the pre-harvest months (May-June; November-December) and not in the post-harvest periods when food from own production is more plentiful. This finding was explained by the interplay of (-) the structure of the local food base (low own food production complemented by high food purchasing and by cassava as a buffer food in some areas) and (-) seasonal variation in food requirements (Hoorweg *et al.* 1995). As for the latter, activity patterns were not assessed directly in this study, so no estimates have been attempted of season-specific energy requirement figures. Yet, there is indirect evidence of increased energy stress in the pre-harvest period. Body weight fluctuations of mothers (see below) indicate that the energy balance was slightly negative in November-December 1985 and more so in May-June 1986 (minus 1 kg on average). These effects are moderate though and much less than one would have expected under the 'classical scenario' for nutrition and seasonality in the international literature, which consists of a pre-harvest phase of strong 'tightening of the belt' followed by a post-harvest phase of 'feasting' (Chambers 1981).

The fact that the peaks in *total* household intake in the Coast were the exact reverse of the classical seasonality scenario was largely made possible by the high reliance on food purchases. The ratio of purchased over subsistence energy was always more than one, showing that at all times the largest part of energy intake came from purchases, not from home-produced foods. On average throughout the year, purchased foods contributed 63%

6 As the reference value is based on assumptions regarding body size and activity pattern, the true deficit in food intake may differ to some extent.

7 The level of 60% of requirements corresponds roughly with an activity level that allows only mere survival (1.2 x basal metabolic rate).

of the energy intake. This agrees with the low degree of food self-sufficiency earlier calculated from the production findings. Maritim (1982) reported that expenses on maize in Coast Province in 1976-77 were higher than in all other provinces and this was confirmed in 1982 (Kenya 1988). The high food purchases in the Coastal region in turn depend on the combination of adequate incomes available at the right time and affordable prices on the markets and in the *dukas* (small dry good stores). Not surprisingly, then, it was found that income did affect energy intake positively.

Rural households in the Coast depend to a large extent on income generation which offers a coping mechanism to deal with seasonal energy stress. The monetary income allows them, firstly, to preserve a large part of their food stocks throughout the year (instead of selling shortly after the harvest) and, secondly, to purchase more food during the cultivation season when home stocks are running low. This agrees with observations by others that coping mechanisms in rural Africa consist increasingly of monetarization (de Garine & Harrison 1988). In the Coast Seasonality study, this coping mechanism was active in all agro-ecological zones and income classes. A secondary coping mechanism (but quantitatively less important) among part of the households was the increased consumption of cassava in the period of low cereal stocks.

NUTRITIONAL STATUS

A measure further down the "food path", and taken from individuals, is nutritional status. The classical method relies on anthropometric measurements (such as body weight and height). They reflect the condition of the body of individuals as a cumulative result of the balance between intake and requirements of energy, protein and (micro)nutrients. Anthropometric information per se is non-specific and inadequate for identifying the cause of thinness or growth failure (Golden 1995). Its usefulness lies in its close correlation with nutritional outcome and its socioeconomic determinants. Such information is usually (and the Coast is no exception) not available systematically for all age groups, but only for the vulnerable groups: young children and mothers. Yet, because of their very vulnerability, this information is quite indicative of the general situation.

Representative information on child nutrition is available from the five national nutrition surveys (since 1977), and from the FNSP Coast Seasonality study⁸. While the former give cross-sectional results of attained growth, the latter study in addition reports growth velocities throughout the seasons.⁹ In the last decade or so, there is a renewed interest in specific micronutrient deficiencies. Recent knowledge in international nutrition has shown that the roles of the micronutrients in growth, development and immunity are more fundamental than was formerly believed and that even mild deficiency has adverse consequences. The results of the recent National Micronutrients Survey are also discussed

8 See footnote 1.

9 Growth data are also routinely collected by the Ministry of Health (CHANIS: Child Health And Nutrition Information System) and the Ministry of Education. These can be very valuable for surveillance purposes, but caution is needed for their interpretation due to possible sampling biases and shifting group composition. Such data are not incorporated in this review.

below.

Malnutrition is not new for the Mijikenda. Local concepts of malnutrition refer to the severe forms which are most visible, but which in actuality only constitute the 'tip of the iceberg'. The local concept of *kirwa* (*chirwa* among the Digo), also known as *kanyanzo*, corresponds to the medical term 'marasmus' (emaciation). The local term *mwazulu* corresponds more or less to the medical term 'kwashiorkor' (characterized by the presence of oedema). Sometimes there is confusion in the terms; health personnel tend to use *kirwa* for any form of severe malnutrition (marasmus and kwashiorkor). With the local term goes a local understanding about what causes it. *Kirwa* is seen not as a disease, but as a condition of the child, that is caused by the adultery of one of the parents, or sometimes by the 'evil eye'. Since the cause is in the spiritual domain, it needs cleansing by a traditional healer. *Mwazulu*, however, is a disease that can occur both among children and adults. If a child has *mwazulu*, it was born with it. It is a disease in the parents, notably if the parents are greedy and/or do not like sharing with other people, especially relatives. Under the influence of nutrition education, the term *kashiako* has been introduced besides *mwazulu*, and also the notion that malnutrition is caused by poor feeding (Mwadime 1995).

Child anthropometry

National (rural) surveys of child nutrition have been carried out by the Kenyan Central Bureau of Statistics in 1977, 1978/9, 1982, 1987 and 1994 (Kenya 1977; 1979; 1980; 1983; 1991; 1996), a longer time series than in any other African country (ACC/ SCN 1993). Seasonality varies greatly across the country and to some extent from year to year, so that stunting (retarded height growth: a measure of attained linear growth over a longer time period) is generally considered to be a better indicator than underweight to make comparisons over time. Trend analysis is somewhat hampered by the change in the early 1980s to another mode of expression of the results (i.c. from percentages of the median to standard deviation scores); the 1978/9 results have been recalculated in a later report (Kenya 1991).

The situation in Coast Province has consistently been among the worst in Kenya, with 10-17% more stunting than for Kenya as a whole. In a regional comparison, it was concluded that the factors which probably contribute to these very high malnutrition figures include poor land productivity in addition to a high rate of sickness (Test *et al.* 1984). This crude classification of causes deserves further specification and expansion (cf. Mwadime 1995). Poor agricultural productivity is not only because of poor soil quality, but also because vast tracts of land are tied-up in cashewnuts or coconut plantations. Additional household income thus becomes a main determinant of food security in such a situation. Non-farm employment among women in a community with good access to such opportunities (i.c. Msambweni in Kwale District) was found to have a positive effect on the nutritional status of their children under five years of age, through increased food purchases (Mwadime *et al.* 1996a). Unfortunately, many people have inadequate sources of earning outside agriculture and have to depend on meagre remittances from kin mem-

bers working elsewhere.

Even if the climate may favour the incidence of infectious diseases, part of the morbidity load can be prevented. For example, the high incidence of diarrhoea is attributed to poor sanitation conditions in the community, as few households own a toilet, and to poor water quality. Other care-related causes are low dietary quality and variety, lack of time for child care, social/family problems, traditional health-seeking behaviour and lack of community support for women. Peters & Niemeijer (1987) have pointed at the relation between poor maternal caring behaviour and malnutrition. It has further been observed (Mwadime 1995) that many of the severely malnourished children come from homes where there are strong social problems and from 'broken homes'. Because of strong cultural and spiritual beliefs, most parents with a severely malnourished child go to a traditional healer (*mganga*) first and seek modern medical care only when the condition worsens. Men and community leaders tend to relegate nutrition to the 'women's domain' so much so that the woman is the one blamed for a child's poor nutritional condition.

The low level of education makes preventive action and behavioural change in the areas of health and nutrition more difficult. In this respect, average education of household members may be more strongly related to good quality child care and house living conditions than maternal education only, as was illustrated by the recent village study in coastal Kwale (Mwadime *et al.* 1996c).

During the mid-1980s the Coast did not show the improvement of underfives' nutritional status that was found for Kenya as a whole; much of that improvement occurred in the more central areas of the country (ACC/SCN 1993). However, the last survey in 1994 showed a sizeable decrease in the Coastal stunting rate by more than ten percentage points. These results conform to those of a Demographic and Health Survey carried out in 1993 (NCPD/Kenya/MI 1994). Curiously, the pattern for the Coast as it looks now mimics the overall pattern of stunting for Kenya, albeit at a higher level and roughly five years later. The most recent level of stunting in the Coast was still above Kenyan average; future surveys will have to tell whether the rate will continue to drop.

As stated above, stunting is generally held to be a better indicator than underweight to make comparisons over time, because it is less influenced by seasonality than body weight. The results of the FNSP Coast Seasonality study (1985/6) provide in-depth information confirming the general level of stunting in the 1980s, but they also warn us that cross-sectional figures produced by periodic surveys are not immune to seasonal influences and to year-to-year variations.

As for the drop in stunting rates experienced by the Coast in the early 1990s, its order of magnitude is much greater than the year-to-year variations suggested by the FNSP study. Thus, it most likely reflects a true improvement. Interestingly, in a rapid survey in 1995 in communities within a 20 km radius of the Family Life Training Centres (FLTCs) of Kwale and Kilifi, people in the focus group discussions ventured that the cases of severe malnutrition seen in the villages were fewer than a decade ago. This may reflect a general improvement rather than the effect of the FLTCs themselves, considering their limited geographical outreach, limited population coverage and the proven low effective-

ness of these services in preventing recurrence of malnutrition in the same child or in other siblings (Peters & Niemeijer 1987; Mwadime 1995).

Table 2 compiles the overall anthropometrical results of the national surveys as from 1978/9 and of the FNSP study of 1985/6 (in terms of standard deviation scores). For a compilation in terms of the classical percentage system, the reader is referred to earlier publications (Niemeijer *et al.* 1991; Hoorweg *et al.* 1995).

The surveys reveal that the reversal of trends in nutritional status in Kenya as a whole, observed from the mid-1980s (not shown), is also apparent in the stunting rates in the Coast, but only in the 1990s. As expected, the wasting rates show stronger fluctuations between the years than the stunting rates do. In this respect, the years of the FNSP study (July 1985 to October 1986) were a less favourable time, just like the period of February-August 1993 when the DHS survey was held. The various surveys do not point to significant sex differentials.¹⁰

The Coast Seasonality study found no differences in average growth rates between children 2-11 years from different income classes, despite differences in household energy intake. The pattern of growth was also quite similar: in all income classes the largest height growth occurred during the dry season, between December and February while during the rest of the year height growth remained substantially lower. During the long rains, in the period of March-May, average weight growth accelerated and in the two higher income groups (Ksh 2,000 or more per consumer unit per year) this continued during the June-September period. The relationship between income and seasonal *variation* was more pronounced. In the relatively prosperous households, the group of children grew quite evenly throughout the year (seasonal variation in average weight growth less than half that of the others). On the other hand, in the group of very poor households, both weight growth and height growth were uneven indeed; such children are usually considered to be more at risk of malnutrition. It has to be admitted though, that overall attained growth (height-for-age) among the poorest children was comparable to the other income groups, thanks to a particularly high peak in height growth velocity during the dry season.

As yet, there is insufficient understanding of the mechanisms of growth. It is speculated that irregularity in growth can to some degree be a natural phenomenon of adaptation to fluctuations in external factors such as seasonal illness, food intake or possibly sunlight. The question of when the variation becomes harmful and what are the risks involved is not resolved. There is more consensus on the negative effects of a substandard *level* (as against *variation*) of attained growth (Hoorweg *et al.* 1995).

¹⁰ The sex differential that the first national nutrition survey of 1977 did suggest at first (CNS-1; ref. Kenya 1979), disappeared when sex-specific anthropometric references were applied.

Table 2 Summary of anthropometrical results of child nutrition surveys

Year of survey	Survey (a)	Area	Period of survey	Age group (mths)	No. of children	Aver. H-A (z)	% stunted (<-2sd)	Aver. W-H (z)	% wasted (<-2sd)	Aver. W-A (z)	% under-weight (<-2sd)	Reference
1978/9	CNS-2	Coast/rural ^b	Nov-Jan	6-59	252	-1.59	46.3	-0.18	9.4			Kenya 1980
1978/9	CNS-2	Coast/urban	Nov-Jan	6-59	222	-1.17	28.8	-0.25	9.4			Kenya 1980
1982	CNS-3	Coast/rural ^c	Jul-Sep	3-59	419	-1.88	49.6	-0.18	7.0			Kenya 1983
1982	CNS-3	Kwale/Kilifi/rural	Jul-Sep	3-59	348	-2.05	53.7	-0.11	7.1			Kenya 1983
1985/6	FNSP	Kwale/Kilifi/rural	1985-86	6-59	390	-2.12	54.1	-0.80	9.3	-1.91	47.2 ^d	
1987/8	CNS-4	Coast/rural ^c	Nov-Jan	6-59	782	[-2.08] ^e	[50.0]	[-0.09]	[5.1]			Kenya 1991
1987/8	CNS-4	Kwale/Kilifi/rural	Nov-Jan	6-59	576	[-2.18]	[53.3]	[-0.10]	[5.3]			Kenya 1991
1987/8	CNS-4	Kwale/rural	Nov-Jan	6-59	205	-2.50	56.1	+0.11	6.7			Kenya 1991
1987/8	CNS-4	Kilifi/rural	Nov-Jan	6-59	371	-2.00	51.7	-0.21	4.5			Kenya 1991
1987/8	CNS-4	Taita Taveta/rural	Nov-Jan	6-59	206	-1.80	41.2	-0.09	4.6			Kenya 1991
1993	DHS	Coast/rural	Feb-Aug	0-59	n.a.		41.3		10.6		31.7	NCPD 1994
1994	NMS	Kwale	Feb-Jul	6-72	258		50.5		3.7		30.4	Unicef/Kenya n.d.
1994	NMS	Mombasa	Feb-Jul	6-72	189		43.4		5.6		28.5	Unicef/Kenya n.d.
1994	CNS-5	Coast/rural ^c	Jun-Aug	6-59	484		38.5		7.0		26.9	Kenya 1996

Notes: a. CNS = Child Nutrition Survey; FNSP = Food and Nutrition Studies Programme; DHS = Demographic and Health Survey; NMS = National Micronutrients Survey

b. Excluding Lamu District

c. Kwale, Kilifi/Tana River/Lamu and Taita Taveta Districts.

d. The presented figures are averages of five survey rounds, calculated from the original data of the Coast Seasonality study.

e. [] denote authors' aggregation of figures from the CNS-4 report.

The ideas on what exactly causes growth retardation are still evolving. Although early studies since the 1930s identified deficiencies in certain nutrients as causes for growth retardation, in the 1960s attention settled on protein and in the 1970s it turned to energy and energy density (hence the term 'protein-energy malnutrition' or PEM). Recently, there is renewed interest in the role of the various nutrients. Golden (1995) proposed that a number of nutrients play a universal role in cell metabolism and whose deficiency does not lead to specific clinical signs (as is the case with iron, iodine and the vitamins), but that the only clinical sign is growth failure. The immune system is also affected. These 'growth nutrients' comprise potassium, sodium, magnesium, zinc, phosphorus and protein (both total protein and the individual essential amino acids). A deficiency of any of these nutrients gives rise to loss of appetite, which then leads to growth failure. One can only speculate to what extent the seasonal pattern of growth observed in the Coast is related to such hidden 'growth nutrient' deficiencies. In any case, the intake of all nutrients, and in particular vitamin A and vitamin C showed a dip at the end of the dry season, which corresponds to the time of the year when the strong conversion took place from the previous height spurt (with some wasting) to a spurt in body mass (with some stunting). For practical purposes, this theory again stresses the importance of dietary quality versus quantity. In a nutritional-economics study among coastal villagers in Msambweni (Kwale District), there was evidence that, at household level, variety in energy sources consumed was positively associated with higher household energy intake (Mwadime *et al.* 1996b). This finding highlights the crucial role of appetite, which acts as a 'pull factor' at both individual and household level.

Nutritional status of adult women

The Coast Seasonality study provided data on weight and height of the resident mothers of the children studied; these were women mostly between 20 and 40 years of age. Their average weight was 48.0 kg and their average height 153.6 cm. These figures indicated women of relatively small posture who are also somewhat lean. The two measurements combined, the so-called body mass index (BMI)¹¹ averaged 20.3 kg/m². This average is close to normal. Yet, as regards the distribution, throughout the year 25% of the women had values indicative of chronic energy deficiency (BMI < 18.5 kg/m²). The condition of the women was mostly stable, but in the long rains' peak labour period (May-June) there was an average weight loss of slightly more than one kg and a corresponding dip in BMI (towards 19.9 kg/m² on average). The percentage of undernourished women increased to 32%. Since these women were not reported to be more often ill at this time of the year the weight loss cannot be attributed to health factors. This time of the year is the period of planting and weeding during the long rains and as such a period of high labour requirements and high energy needs. It is likely that their energy balance became negative, notwithstanding the higher household food consumption mentioned above. Although the weight loss is small, the percentage of women with chronic energy deficiency increased with 7-12%. About a third of the women (32% in all) were apparently on the edge of

¹¹ Weight divided by height squared.

chronic energy deficiency, although this is more an indication of poor conditions throughout the year than of a seasonal emergency.

Surprisingly, although average BMI was similar across income groups, the seasonal fluctuation was minimal among the poorest. They also showed hardly any drop in nutritional status in May-June. The same holds for fluctuations in energy intake (see above). This suggests that they perhaps, unlike the women from the other income groups, avoided (or were forced to avoid) the seasonal energy peak. This probably means that they limited their labour expenditure, which in turn may well result in a low food production. And this again might be a reason why they belonged to the lowest income group. Could this be an example of the vicious circle ('energy trap') again pointed at recently by Latham (1993)?

Micronutrient deficiencies

One of the micronutrients involved in the three major deficiencies of public health importance is vitamin A (the other ones being iron and iodine). One of the first investigators to report on vitamin A deficiency (xerophthalmia) in Kenya was Philip, who found evidence of this disorder among the Digo at the Coast during the period 1928-1933 (Jansen, Horelli & Quinn 1987). The prevalence was relatively low, which he attributed to the consumption at that time of yellow variety maize (which contains provitamin A in the form of carotenoids). Studies on vitamin A elsewhere in Kenya since then provided a mixed picture: clinical signs (eye signs and night blindness) could not always be observed, even in cases of diets very low in vitamin A (low in food from animal origin, low in green vegetables and coloured fruits, and gradual replacement of yellow maize by white maize). A case in point is a survey by Blankhart (1970) in Kwale around 1970: in four villages he did not observe any Bitot spots, one of the signs of vitamin A deficiency. Until the 1980s, vitamin A deficiency was not considered a problem of public health importance in Kenya (Jansen *et al.* 1987: 305).

In the light of new scientific knowledge on the importance of vitamin A in reducing morbidity and mortality and stimulating child growth, a nation-wide assessment was recently done. Scrutiny of the records of a few government hospitals had already suggested that vitamin A deficiency was a problem of public health importance in the Coast: the percentage of clinical xerophthalmia cases in Kilifi and Malindi was of the order of 2% (the highest in the series), and in Mombasa 0.5% (Pertet 1992). The National Micronutrients Survey of 1994 in 14 selected districts, assessed not only clinical signs, but also the level of serum retinol in children 6-72 months and women 15-49 years (Unicef/Kenya n.d.). Clinical signs of vitamin A deficiency were highly prevalent in Mombasa (2.2% of the children had Bitot spots — the highest rate after Kitui District). In Kwale the prevalence was 0.7%. Both Mombasa and Kwale were areas with a severe vitamin A problem (more than 40% had moderately or severely reduced retinol levels). Possible causes are inadequate intake of vitamin A rich foods and lipids (necessary for the absorption of carotenoids), parasitic infections (malaria — very prevalent in the Coast) and infestation with intestinal helminths, such as hookworm and ascaris.

Iron deficiency is another major nutritional problem. In Kenya, the Coastal region is

the most severely affected by anaemia. A great majority, i.e. 70-90% of the anaemias at sea level, are of the iron deficiency type, mainly attributed to excessive iron loss due to parasitic infections and a low content of iron absorption in the diet, notably vitamin C (Jansen *et al.* 1987). Anaemia levels in Kwale District are estimated at 80% among pregnant women and 72% among children below 5 years of age (Mwadime 1995).

In Kenya the occurrence of goitre (a sign of iodine deficiency) is confined mainly to Rift Valley, Central and Nyanza Provinces. As sea foods (fish, crustaceans, etc.) are rich in iodine, one expects less of this problem on the Coast. However, this is not the case: for instance, Kilifi District is categorized as having a moderate iodine deficiency level, with a goitre rate between 10 and 30% (Mwadime 1996). Iodine deficiency may be aggravated by the intake of goitrogens (e.g. brassica, cassava, *E. coli*).

CONCLUSION

In terms of food production, the Coastal region is less than 50% self-sufficient. Thus, a large proportion of the food consumed in the region has to be 'imported' from other districts. The proportion of food purchased by households is concomitantly high.

Households seek a balance between their resource base and their consumption needs. In terms of nutrition, this means that the level of food consumption is determined by the demand for food on the one hand and the supply of food on the other. The former is a function of the physical needs and fluctuates along with the amount of labour to be done. Labour fluctuations during the agricultural cycle are an important cause and since agricultural labour is mainly done by women (especially food production), women are usually expected to show the largest fluctuations regarding food requirements. The supply of food is determined by two factors: the household's own food production and the amount of food that can be bought. The latter is a function of the monetary income that can be realized.

Studies in Kwale and Kilifi Districts showed that the rural population has developed fairly successful strategies to cope with diminishing food stocks at the end of the agricultural year (despite the fact that household income levels are generally low), so that household energy intake is comparable to that of groups of peasant smallholders elsewhere in Kenya. The coping mechanisms are (-) a high level of food purchasing while spreading consumption of the home-produced food as much as possible over the year and (-) consumption of cassava during the rainy season when the cereal stocks are depleted. Nevertheless, the nutritional status of children is below that of other districts.

The high dependence on food purchases also means that any serious distortion in food supply or food prices can seriously upset the balance because they cannot easily be compensated by subsistence cultivation or extra employment. At the time of the Coast Seasonality study (1985/6), maize pricing and maize movements were officially regulated by the Kenyan government. Food prices were kept low for many years and maize movements were the responsibility of the National Cereals and Produce Board and its appointed wholesalers. The recent liberalization policy is generally expected to result in

better food distribution by private wholesalers but also higher maize prices. Consumer maize prices did indeed rise strongly since 1992 and it is important to find out what has actually happened in this area under these conditions. Malnutrition rates in the Coast showed a slight decrease in the 1990s, about half a decade later than in the rest of Kenya, where the trend had started to be reversed again in the 1990s. Moreover, it has to be remembered that food (security) is not the only factor in nutrition security; care and health factors play a role as well.

Apart from general policy measures, targeted interventions are necessary. Income class is a more important factor for targeting purposes than agro-ecological zone. The low-income households show little seasonal variation but also show a low energy intake during cultivation time which raises concerns about the ability of this group to put sufficient effort into food cultivation — a possible ‘energy trap’. The children in those households tend to have a very uneven (‘ratchet’) growth pattern; all the more reason for growth monitoring activities as part of nutritional surveillance. Another option for targeting is selecting particularly vulnerable or affected communities and starting there a participatory process to develop appropriate community-based food and nutrition security activities.

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REVIEW DETAILS

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