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Economic and Nutritional Conditions at Settlement Schemes in Coast Province

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Summary

This report is concerned with land distribution and rural development and presents the final results of a survey in four settlement schemes in Kwale and Kilifi Districts. In each scheme one hundred households were visited and information collected regarding small farm characteristics, off-farm employment, socio-economic differentiation between households, food consumption and nutritional status of the population. Data from a companion survey among the general population were available for comparison purposes.

The report starts with a lengthy introduction to the region and the settlements. The study method is described in Section 2, with a summary of the data schedule in Appendix 1-2. The results are presented in the form of a series of 40 appendices. The main findings are discussed in Sections 3-6, illustrated with summary tables and figures. Sections 3 and 4 are concerned with the socio-economic conditions, Section 5 deals with food consumption and Section 6 with nutritional status.

The four schemes are Diani and Ukunda in Kwale and Roka and Mtwapa in Kilifi District, representative of the older, established schemes in Coast Province. The scheme households usually have more farmland than the general population but only half the households avail of the plot as initially issued. Some have sold off a part, others have purchased additional land. About 20% of the plots are owned by absentee owners; in Diani, a quarter of the plots lies fallow.

Food crop production, mostly maize and cassava, covers only 60% of the staple food requirements. The scheme households have a higher farm production in general than the coast population and in three of the four schemes, on average, the households manage to realize a farm income that, by itself, assures a minimum existence. In Diani this is not the case.

In all schemes, off-farm employment plays an important role and total household income consists for two thirds of employment income. In Diani this percentage is even higher. Taking all income into account, only a small percentage of households (10-15%) falls below the food poverty line; this is much higher among the general coast population (40%).

The variation in income and income composition is large. Apart from the poor households already mentioned, there are few households that restrict themselves to farming only (10%); others are mainly dependent on wages (25%); a sizeable group lives from a mixed economy (30%). There are quite a number of households with high incomes (20%) and these households also tend to be smaller in size.

Scheme households, on average, have a higher food energy consumption than the general population and they also have a greater variation in diet. The average energy intake per consumer unit is not far below the calculated requirements. Recommended protein was realized in most households. Maize provides two thirds of the energy intake and cassava, although widely cultivated, only 10%. Energy intake consists for only 30% of foods from the own farm; the remaining 70% to be purchased. Differences in energy intake exist between the schemes in the two districts, with Kwale households having a higher energy intake. This finds its cause in differences in food habits, household size and resource composition.

As regards nutritional status, there are significant differences between schemes and general population in respect of height-for-age of children, which find their cause in differences in mothers' height and in the standard of living. There is no traceable influence of individual schemes as such on the nutritional status of children. Instead, analysis reveals a complex pattern of relations between household size, household resources and nutritional status.

It is concluded that the results of the government settlement policy in the districts have been partly successful, partly not. From the point of view of regional agricultural development the results are far from optimal but from the point of view of the settler households the schemes are quite prosperous.

Chapter 1

Introduction

1.1 Nutrition in Rural Development

Since the influential policy statements by the World Bank (1981) and OAU (1981) strengthening the agricultural sector is generally regarded as one of the main development priorities of the countries of sub-Saharan Africa. Suggested policy measures include attractive and stable pricing, improvements in marketing arrangements, credit facilities and extension services, together with changes in farming practices. Essential changes in farming practices include the introduction of new crops and improved crop varieties, modern farming techniques and production methods, as well as alternative land tenure arrangements.

In general, the expectation is that such changes will not only lead to increased production but will also result in increased incomes and higher living standards. Greater crop production may result in increased food availability; or alternatively, production increases of commercial non-food commodities may generate higher incomes which can be used to secure nutritional needs. However, there is also substantial evidence that productivity increases are often realized at the expense of the nutritional situation of the farming population. Different studies point to various un-

derlying economic, social and cultural factors (Fleuret & Fleuret,1980; Kennedy & Pinstrup-Andersen,1983; Lunven,1982). As a consequence, it is increasingly recognized that it is necessary to introduce nutritional objectives in agricultural and rural development projects and programmes (FAO,1982; Pacey & Payne,1985).

The pressure on land resources in Kenya threatens the future balance between national food demand and national food production (Senga et al.,1981; World Bank,1983). The existing agro-ecological potential for rain-fed farming is quite limited and the country is, in fact, already short of good agricultural land (Ruigu,1987). High and medium potential lands with good to fair prospects for crop production and intensive livestock activities cover only 20% of the land area. The rapid population growth, however, necessitates substantial increases in food production in the near future, together with increases in the production of export crops. The role of agricultural policies, notably of government pricing, is of vital importance in this respect (Meilink, 1985;1987). Meanwhile, production increases will depend on the possibilities of increasing yields per hectare, and of bringing remaining, often marginal, areas under cultivation (GOK,1986).

Agricultural land is unevenly distributed over the country. The high and medium potential zones are found in the core region of the Central Highlands, the plateau adjoining Lake Victoria and the Ugandan border, and the very narrow strip near the Indian Ocean. These lands are bordered by semi-arid, low-potential belts. Here, the annual rainfall with its high variability and seasonal nature offers only limited opportunities for rain-fed agriculture (Braun,1982; Jaetzold & Schmidt,1982;1983). Since Independence, because of the great demand for land, the Kenya government has given out large tracts of land to smallholder tenants. This involves the division of former European-owned farms in the fertile highlands, but also large areas in Coast Province, with a much lower agricultural potential. Since almost the entire high and medium-potential zones are presently under cultivation (Epp & Kilmayer,1982), further extension of cultivation will necessarily take place in the less fertile areas which makes the settlement experience in Coast Province of particular interest. Coast Province was furthermore selected as research area because of a relatively high incidence of childhood malnutrition in the region and because knowledge about nutritional conditions in the province is scarce.*

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* The study reported here was only one of several which were carried out in Coast Province at the time. Other studies concern nutrition in dairy development (Leegwater et al.,1991) and seasonality in food supply and nutrition (Hoorweg et al.,1988; Foeken & Hoorweg,1988; Foeken et al.,1989; Niemeyer et al.,1991). Support studies are concerned with the aetiology of childhood malnutrition in the region (Peters & Niemeyer,1987), the topic of farm management and ecological adaptation (Oosten,1989) and the contribution of women's groups to development (Maas and Hekken,1991).

1.2 Kwale and Kilifi Districts*

Coast Province is the third area of population concentration in Kenya, numbering 1.3 million people in 1979, now estimated at more than 2 million. The climatic and economic conditions of the region are quite different from those of the highland areas. The topography consists of the coastal plain (the area of the present research), the coastal uplands and the Nyika plateau. Rainfall is bi-modal: the long rains start in April and the short rains in October or November. However, in the narrow coastal strip, the short rainy season is virtually absent (Foeken & Hoorweg,1988). Going inland, rainfall diminishes while the potential evapotranspiration increases. The climate is at its hottest and driest from January to April, when daily tempatures average more than 30° C. Most soils are chemically poor and the fertility of the land tends to be low (Boxem et al., 1987). The region knows different agro-ecological zones that alternate over relatively short distances (Jaetzold & Schmidt, 1983). The coastal plain consists mainly of the coconut-cassava (CL3) and cashewnut-cassava (CL4) zones. The first zone is relatively humid and has potential for a variety of food and cash crops, mainly depending on local variations in soil fertility. In the somewhat drier cashewnut-cassava zone possibilities for crop production are more restricted. Agriculture is dominated by food crops and perennial cash crops.** The seasonal character and the low reliability of rainfall, however, severely restrict the scope and productivity of agricultural activities. Maize production in the region is insufficient to feed the population and substantial "imports" are required from elsewhere in Kenya. In most parts, the short rains are very unreliable and many farmers do not plant at this time of the year (Kliest, 1985). The population is regularly confronted with drought conditions (MENR,1984a; 1984b).

The rural population is unevenly distributed. Due to historical factors and differences in agricultural potential on the one hand and the modern sector employment and government settlement policy on the other hand, the coastal plain and the coastal uplands are the most populated, although density is generally still below 200 persons/km^2. In the hinterland population density is much lower.

The economic development of the region has not kept pace with that of central and western Kenya. Although the coastal region was relatively prosperous in precolonial and early colonial times, the opening up of the highlands by European settlers meant an inevitable shift of development towards the interior (Cooper,1981). Afterwards and also in the post-independence period, economic development has

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* A more extensive description of the two districts is given in Foeken & Hoorweg, 1988:29-78.

** Inland, the livestock-millet zone and the ranching zones, which cover more more than two thirds of the agricultural land, offer only limited potential for rain-fed agriculture. Smallholders here usually combine livestock rearing with the production of annual subsistence crops.

stagnated due to a combination of political, economic and social factors. The economy is primarily dependent on agriculture. The industrial and services sector have shown only slow development (with the exception of the tourist sector), and the growth of employment opportunities outside the agricultural sector has been limited. Coast Province, in fact, scores comparatively low on accepted development indicators such as infant mortality (129 vs. 109 for all Kenya), childhood malnutrition (stunted: 39% vs. 28%; wasted: 5% vs. 3%), and enrollment of girls in primary education (58% vs 83%). The living conditions of the population in large parts of the province are harsh and estimates place the incidence of rural poverty at 40% of the households or more, which is higher than in Kenya as a whole (CBS,1983; CBS/UNICEF,1984; Foeken et al.,1989).

More than three quarters of the inhabitants of the two districts belong to the Mijikenda population group which, in turn, consists of nine sub-groups with a common linguistic and cultural heritage. The Giriama, the Duruma and the Digo are numerically the most important. The Rabai, Ribe, Kambe, Jibana, Chonyi and Kauma are smaller in number and live in the southern part of Kilifi District (CBS, 1981).

The Giriama live in Kilifi District and are mainly engaged in agriculture. The Duruma inhabit the hinterland of Kwale District and traditionally combine agriculture with cattle holding. The Digo who live in the coastal plain and coastal uplands of Kwale District, are agriculturists and are mainly of Islamic denomination.

The Mijikenda migrated from southern Somalia to the coastal region at the turn of the 17th century and occupied the upland ridges which extend from the Shimba Hills in the south to Kilifi Creek in the north. Here, they built *kayas*, fortified villages. The economy of the various Mijikenda groups was mainly based on agriculture. In addition, they were involved in the long and short distance trade between the coastal towns and the interior. In the 18th and 19th century, Mijikenda farmers supplied the urban centres with grain, and acted as middlemen between the ivory hunters of Ukambani and the Arab-Swahili merchants at the Coast. These trade activities increased considerably during the first half of the nineteenth century. As a result, young Mijikenda men were able to leave the kayas of their elders and many settled nearer to the coast. Mijikenda society expanded greatly in the nineteenth century and changed from its original concentrated settlement pattern to a more dispersed form of habitation (Spear, 1978).

However, the Mijikenda were prevented from occupying the rich coastal land. The political and military strength of the Arab and Swahili occupants of the coastal

plain hindered the Mijikenda in settling there. With the end of the overseas slave trade, landowners on the East African coast started to develop extensive plantations, based on slave labour. During the second half of the nineteenth century, the Arab-Swahili plantation agriculture became the mainstay of the coastal economy. The plantations produced export crops, mainly grain and coconuts as well as food for home consumption (Salim, 1973). Due to these developments, the Mijikenda ceased to be the main suppliers of food (grain) to the coastal towns and also lost their position as middlemen in the coastal trade.

After the abolition of slavery, the Arab and Swahili landowners were no longer able to find suitable labour to cultivate their lands. As a result, the plantation economy declined, large tracts of land remained idle and many Mijikenda from the drier hinterland joined ex-slaves living on non-productive plantations (Cooper,1981).

Access to land and land rights was arranged according to islamic law, whereby land became the property of the individual who first cleared and cultivated it. Property rights were recognized even if the land was temporarily abandoned and left to revert to bush. An important characteristic of land tenure was the distinction between ownership of the land, ownership of the trees and usufruct, the right to dispose of the crops. Individuals could obtain permission of the landowner to cultivate part of the land and to settle on it. However, he would be a 'squatter', at best a 'tenant-at-will', who could be evicted at short notice without being compensated for any land improvements or any permanent crops (Mbithi & Barnes, 1975).

After Abolition, the Arab and Swahili landowners from the coastal towns allowed Mijikenda squatters on their plantations to grow food and to maintain the valuable coconut trees. Again the Mijikenda became the main suppliers of food for the coastal towns. This situation changed again after the introduction of the Coast Lands Settlement Act in 1908, whereby freehold titles were issued to individuals and companies and abandoned land reverted to the Crown. Most of the Mijikenda landclaims in the coastal strip were disallowed. Instead large tracts of infertile and dry land were set aside in the hinterland to become 'Mijikenda reserves'. The colonial government, however, never completely controlled the influx of Mijikenda to the coastal lands and throughout the colonial period squatters were found on many former plantations (Cooper, 1981). After Independence, the migration of people from the hinterland to the coastal plain only increased. Many settled on unused parts of freehold farms and estates or on state owned land. It is these lands that were first selected as settlement areas by the government in the post-Independence period.

1.3 Settlement Schemes

Introduction

In many African countries settlement schemes have been established with the aim to settle displaced persons or to provide landless families and squatters with land. In addition, settlement schemes are often regarded as a means to increase agricultural production and to further rural development through optimal utilization of physical and human resources. Settlement schemes differ with respect to their size, plot arrangement, the degree of government intervention in the management of the scheme, the type of commodities produced by the settler farmers as well as the organization of the production. Four basic types are often distinguished: schemes with individual holdings; compulsory marketing schemes; schemes with scheduled production; and schemes in which production is collectively organized (Chambers,1969).

The majority of schemes started over the years in Kenya, fall in two of the mentioned categories, namely schemes with individual holdings and schemes with compulsory holdings, having the following characteristics.

= Schemes with individual holdings consist of small-sized farms which are organized on a planned basis. A special commission was established in 1965 at the Ministry of Agriculture to arrange for settlement of squatters in what later became Haraka schemes, established on abandoned or mismanaged freehold land. With government intervention limited to physical planning, scheme layout and the selection of the settlers, the development costs are usually relatively low. Farming decisions are taken by the settlers and any official control and assistance is limited in scope and time. The agro-support and social services provided to the settlers are generally similar to those supplied to the farming population in general. The aim generally is to incorporate the scheme quickly into the local administration and the government services of the different ministries concerned.

= Schemes with compulsory marketing know a greater degree of government intervention and higher capital investments. Obligatory cultivation of certain (cash) crops and mandatory marketing arrangements enable recovery of development costs and ensure a certain level of crop production. Like the individual holding scheme, the farm units are small-sized, but farmers are commonly restricted in their freedom to manage the holding. In this category there are a number of irrigation schemes which are de facto settlement schemes, but which resort under the Ministry of Agriculture and the National Irrigation Board. These schemes combine scheduled production with compulsory marketing.

Settlement Schemes in Kwale and Kilifi Districts

Agricultural settlement schemes at the coast date back to the beginning of the century. In 1911 and 1913, a small number of landless ex-slaves and destitutes were settled in six demarcated areas south and north of the Kilifi Creek (MOA, 1962). Due to the increasing problem of squatting on Crown Land in the area between Kilifi and Malindi, in 1937 the colonial government set aside 10,000 acres near Gedi to settle about 850 families. In the early 1950's the scheme was expanded. In 1952, a start was made with the settlement of farmers in the Shimba Hills, a scheme of about 40,000 acres in Kwale District. Various population groups from the coast and upcountry were settled in this scheme during the 1950s; the majority coming from overpopulated areas in Machakos and Kitui Districts. Both the Gedi and Shimba Hills schemes were merged with the regular, local administration in the 1960s. In the early years of independence, new settlement schemes were established in Kwale and Kilifi Districts in order to cope with the increasing squatter problem and to bring mismanaged or unused tracts of land into use.

At the time of study, there were 14 settlement schemes in Coast Province.* All of them schemes with individual holdings, as described above. A complete list of schemes with selected characteristics is included in Box 1 (p. 18). Upon completion, the schemes will cover a total of 100,000 ha and include some 12,750 settlers and their families. All schemes are located in Kilifi and Kwale with the exception of Lake Kenyatta Settlement Scheme in Lamu District. A number of sites for future settlement schemes had been identified.**

All schemes except Golini are situated in the coastal plains. Although often situated within striking distance from the coastline, the schemes nevertheless differ in agro-ecological potential, and cropping patterns. About half of them are situated in the CL3 zone (coconut-cassava), the others in CL4 (cashewnut-cassava). Soil fertility and the depth of the topsoil are further important variables, the latter being quite shallow for the schemes situated near the coastline. The number of plots varies from as few as 20 to as many as 3,500. Plot size also differs since there has been a tendency to allocate smaller plots through the years, reaching a recent low in Diani (2.0 ha) and Kijipwa (1.0 ha). In addition, the ethnic background of resident populations differs.

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* The information on the settlement schemes is drawn from various reports by the Department of Settlements (MLS, 1983a;1983b;1983c;1983d;1984) unless indicated otherwise.

** Notably the Hindi-Magogoni Scheme in Lamu District that will ultimately cover 6,000 ha with a projected number of 1,000 plots. Other areas identified for settlement schemes are Shimoni (1,000ha) and Mwahungo/Mukala (250ha), both in Kwale District.

Box 1
Settlement Schemes in Kwale and Kilifi District

	Name Scheme	*Starting Date*	*Size (ha)*	*No.of Plots*	*Plot size (ha)*	*Population*	*AE-Zone*	*Rainfall (mm)*	*Soils*	*Agriculture*	*Miscellaneous*
KILIFI	Kijipwa	1982	350	350	1.0	-	L4	1100-1200	shallow	food crops; tree crops	recent scheme; partly unoccupied
	Magarini	1978	60,000	4,000	12.0 6.0	Giriama mostly	L4	900-1000	deep	food crops; tree crops	scheme not yet completed
	Mtondia	1962	3,000	235	4.8	Giriama	L3/L4	900-1100	shallow/ deep	food crops; cashewnuts	
	Mtwapa	1969	3,986	607	4.8	Giriama; mixed	L3	1200	deep	foods crops; vegetables; cashewnuts	
	Ngerenyi	1968	5,236	950	4.8	Giriama	L3/L4	1000-1100	deep	food crops; cashewnuts	
	Tezo/Roka	1962	6,500	1,357	4.8	Giriama	L4	900-1000	shallow/ deep	food crops; coconuts; cashewnuts	
	Vipingo	1974	1,052	260	4.0	Giriama	L4	900-1000	deep	food crops cashewnuts bananas	
KWALE	Diani	1978	728	446	2.0	Digo; mixed	L3	1200-1300	shallow/ deep	food crops; cashewnuts; vegetables	
	Golini	1985	290	102	2.0	Digo	L3	1000-1100	deep	food crops; coconuts	re-allocation of land among squatters
	Mbuguni	1978	2,400	787	2.4	Digi Nduruma Kikuyu	L4	900-1000	deep	food crops; bananas	many plots fallow/deserted
	Sabharwal	1968	120	20	4.8	-	L3	1100-1200	shallow/ deep	-	minor scheme
	Tembo Springs	1968	202	26	4.8	-	L4	1000	shallow/ deep	-	minor scheme
	Ukunda	1968	607	123	4.8	Digo	L3	1200-1300	deep	food crops; coconuts; cashewnuts	

Schemes in Kilifi District include Mtwapa, Tezo-Roka, Mtondia, Ngerenyi and Vipingo. In 1972, the schemes came under the Department of Settlement and they cover a total area of 14,500 ha divided into some 3,400 plots of 4.0 to 4.8 ha each. Indigenous squatters already residing on the land and landless agricultural labourers were the groups provided with land. A smaller number of settlers came from elsewhere in Coast Province and from other parts of Kenya. The above schemes are Haraka schemes but they have all received technical support under the German Assisted Settlement Project (GASP). This assistance concerns the planning and implementation of three major settlement schemes and the provision of grants and loans. The funds were used for co-operative development, input supply, credit, technical assistance and has been continued in the Kwale Kilifi Integrated Development project (GOK, 1982).

In 1978, a start was made with the Magarini Settlement Scheme in the Marafa area, north-west of Malindi Town. This scheme receives Australian assistance and will eventually cover about 60,000 ha. Originally, it was planned to provide plots of 12 ha to some 4,000 farming families, mostly indigenous coastal people but also inhabitants from elsewhere in Kenya. By the end of 1983 about 1,100 plots had been allocated. In the course of 1984 it was decided to limit the plot size for future settlers to 6 ha. In 1982 the smaller Kijipwa Settlement Scheme was started south of Vipingo.

The five existing settlement schemes in Kwale District, i.e. Diani, Ukunda, Mbuguni, Sabharwal and Tembo Springs were also started under the Haraka programme. They cover a total of about 4,050 ha and can accommodate 1,400 farming families on plots ranging from 2.0 to 4.8 ha depending on the scheme. Ukunda, Tembo Springs and Sabharwal were established in 1968 by the commission for squatters; Diani and Mbuguni later in 1978. The small scheme at Golini, in the hills near Kwale Town, incorporates squatters already living in the area. In contrast to the schemes in Kilifi District, the Kwale schemes have not received donor support.

Little is known about the different conditions in the schemes in relation to the well-being of the resident populations. A general impression, though, is that Mtwapa is the most developed scheme, and that its inhabitants are relatively well-off. Reasons mentioned are that nearby Mombasa town provides a market for horticultural products and the purported buying-up of plots by comparatively wealthy new owners. On the other hand, the Mbuguni scheme in Kwale is relatively underdeveloped, many of the plots issued have been deserted. The other major schemes in Kwale - Diani and Ukunda - have generally done better than Mbuguni, although in

Diani there is a considerable number of undeveloped plots. In Kilifi District, the schemes Tezo-Roka, Mtondia, Ngerenyi and Vipingo occupy an intermediate position, but the impression is that the schemes with shallow soils are doing less well. Data regarding the nutrition and nutritional status of the populations at the schemes are not available.*

1.4 Research Sites

For purposes of this study four schemes were selected that offer a cross-section of the 14 existing schemes: Diani, Ukunda, Mtwapa and Roka (E), a part of the Tezo-Roka scheme (Map, inside back cover).** The first two schemes are situated in Kwale; the latter two in Kilifi District. The schemes were established under the Haraka Progamme in 1962, 1968, 1969 and 1978 respectively. They belong to the 'individual holding' schemes and were designed primarily for subsistence production. This means that the farm units are relatively small and farming decisions are taken by the individual settlers; official control is limited to standard social and legal procedures connected with land transactions. Capital and operating costs per settler are relatively low.

The four schemes are all situated in the coastal plain and fall in the agro-ecologocal zones CL3 and CL4 which allow for the cultivation of a range of annual and perennial crops. Agro-ecological conditions are rather similar with the exception of soil conditions. The soils in Mtwapa are deep to very deep but drainage varies and soils are partly alkaline. The soils in Ukunda are deep and well drained. The depth of the topsoil and drainage capacity in Diani and Roka (E) vary, the soils are partly deep and well drained and partly shallow and poorly drained.

The schemes also differ as concerns infrastructural development and the level of financial and technical support. Other differences concern the legal status of the tenants as well as the religious and cultural background of the inhabitants. A summary of characteristics of the four selected schemes is given in Table 1. The report describes the situation encountered at the time of research, in 1985-86. Changes in

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* Reports on the conditions at the remaining scheme, Lake Kenyatta in Lamu District are conflicting. Some years ago the nutritional and health status of the inhabitants was reportedly very poor, but recent reports from the area are more positive (AMREF, 1985).

** Tezo-Roka consists of the original core settlement Tezo (160 plots) and the later extension Roka (1,059 plots). The main part of the latter scheme is situated on the mostly shallow/rocky soils between the Malindi road and the ocean shore. It is this particular section of the scheme consisting of 843 plots that was included in the study and is referred to as Roka (E).

the circumstances which may have taken place since then are not discussed in the text.

Table 1 **Summary Characteristics of Selected Schemes**

	Diani	*Ukunda*	*Roka (E)*	*Mtwapa*
District	Kwale	Kwale	Kilifi	Kilifi
Starting date	1978	1968	1962	1969
Number of plots	446	123	843	607
Plot size (ha)	2.0	4.8	4.8	4.8
Soil condition	shallow/deep	deep	shallow/deep	deep
Annual rainfall (mm)	1200-1300	1200-1300	900-1000	1200
Population	Digo/mixed	Digo	Giriama	Giriama/mixed
Donor assistance	no	no	yes	yes

Diani

Diani scheme is situated in Kwale District at a distance of 25 km from Mombasa. It lies east of the main, tarmac road leading to Mombasa in the north and Lunga-Lunga and Tanzania in the south. There is ample public transport to Mombasa, Kwale town and Msambweni. The nearest market and shopping centre is Ukunda, next to the scheme, serving the Tiwi and Diani tourist beaches. It caters for agricultural supplies and consumption goods and offers opportunities for wage employment and self-employment.

The scheme was established in 1978 and covers 728 ha. The 446 plots consist of 2 ha each (5 acre), which is less than half the size of the plots in the other schemes (4.8 ha). The scheme has been established on formerly private land, taken over under the Mismanagement Act.

The settler population is of mixed composition. The majority of settlers are Digo but there are also occupants from elsewhere in Coast Province as well as a number of Kenyans who were repatriated from Tanzania in the late 1970s. A number of the original settlers have not developed their plots and have even abandoned them. Some of these plots have since been re-occupied by others, who technically are squatters since the land has not been allocated to them. Squatters have also settled on plots bordering Diani Beach, plots that were never inhabited by the owners who, given the expected expansion of the hotel zone, may have regarded the land more as a speculative investment.

In 1983, official demarcation and documentation of plots was started. In Diani scheme, the work met with considerable difficulties. Since many farmers did not

immediately start to cultivate the land, plot boundaries and access roads have grown back into bush, which necessitated the re-establishment of boundaries and marking of roads. In respect of land tenure, many settlers in Diani (and also in Ukunda) had not yet been issued with ownership documents at the time of study, hampering possibilities of obtaining credit.

Since parts of the scheme are not cultivated, monkeys and wild pigs pose a real problem which forces the settlers to make additional labour inputs and limits the potential area they can cultivate. More important perhaps is that the cultivation of tree crops is restricted due to the shallow soils in some parts of the scheme.

Ukunda

Ukunda scheme is situated opposite Diani Scheme on the west side of the road to Mombasa. What was said in respect of transport and market facilities in Diani therefore equally applies to Ukunda. Ukunda Settlement scheme was established in 1968. It covers an area of 607 ha and is divided into 123 plots each consisting of 4.8 ha (12 acres). Like Diani, it was established on former private plantations and taken over under the Mismanagement Act. It was only in 1983 that official demarcation and documentation of plots started.

The majority of the settlers are Digo and some of them originate from surrounding settlements like Tiwi, Diani, Bongwe and Mbuguni. Part of the present settlers are former squatters who were allocated plots when the scheme was officially established. A few Tanzanian labour migrants also live in Ukunda scheme as squatters on some of the plots.

The infrastructure of the scheme is poorly developed. There are a few shops, a primary school and a village polytechnic are situated on the outer border of the scheme. The construction of sand roads had only recently been completed. Like Diani, wildlife presents a problem.

The Department of Settlement in Kwale, unlike its counterpart in Kilifi District, has not received donor assistance. Lack of funds and personnel had severely restricted the department's development activities in Diani and Ukunda schemes.

Tezo-Roka

Tezo-Roka is situated between Kilifi and Malindi on both sides of the main road which connects the two towns. The scheme starts at some 10 km distance from Kilifi Town and stretches about 20-25 km to the north. Roka (E), the part of the scheme which has been included in the present study, is situated east of the main road along

the seashore. Tezo-Roka was established in 1962 on state owned land and occupies an area of 6,500 ha. Each of the 1357 plots counts 4.8 ha (12 acres).

Some of the settlers are former squatters, who were legalized by issue of temporary occupation licences. Since its formal establishment in 1962, migrants from other parts of Coast Province have gradually joined the original settlers. The majority of the inhabitants still are Mijikenda of whom the Giriama are the most numerous. Freehold titles have been issued to those farmers who have repaid the loan which enabled them to buy the land. Farmers may have retained claims to land in the areas from which they originate.

Inside the scheme, sand roads give access to the farms. There are a few shops, but no major local market has developed nearby or inside the scheme. Buses and matatus pass through regularly and Malindi and Kilifi town are the main buying and marketing centres for agricultural inputs and agricultural production as well as medical services.

The activities of the Department of Settlement in the scheme have largely focused on agricultural extension. With the support of GASP, the work of the department also included the provision and maintenance of water supply, the construction and maintenance of roads and the distribution of farm inputs in kind and cash (loans) to individual farmers (MLS,1982).

Mtwapa

Mtwapa Settlement Scheme is situated on Mtwapa Creek , 20 km north of Mombasa, west from the road to Kilifi, near the trading centre of Majengo. Buses and matatus frequently depart from here for Mombasa and Kilifi. The scheme was established in 1969 on former state and privately owned land. It covers a total of 3,986 ha and is divided into 607 plots of 4.8 ha (12 acres) each.

Mijikenda settlers, already living as squatters on the land, were the first to receive a plot. In addition, settlers from other parts of Coast Province and elsewhere in Kenya have come to live in the scheme. Initially, the land status of the former squatters was legalized by issuing letters of allotment. Since then, freehold titles have been issued to those farmers who have paid for the land.

There are few shops and no public transport is available inside the scheme. Most of the farms are accessible by sand roads. There are no permanent medical services available in the scheme, with the exception of Vipingo mobile clinic which visits three sites in the scheme, providing for child care and family planning consulta-

tions. The Department of Settlements provides for similar services as in Tezo-Roka scheme.

Chapter 2

Method

2.1. Research Objectives

Nutrition in rural development is one of the central topics of the Food and Nutrition Studies Programme.* The general objective is to contribute knowledge of the nutritional effects of different types of development projects among rural populations in Kenya. This particular study surveys the economic and nutritional conditions in different settlement schemes compared to the general population. The aim is furthermore to study the existing differences in nutritional conditions between the schemes. Since many factors contribute - separately or in combination - to well-being, insight is required into household resources, food consumption and nutritional status. Specifically, the following aspects will be taken into consideration:

= the characteristics of the small farms in different schemes in terms of land and labour use, cropping patterns, farm management practices and degree of commercialization;

= the differentiation in socio-economic terms among the households;

= the extent and nature of off-farm activities;

= the variations in food consumption;

= the variations in nutritional status of household members.

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* A previous study into this topic was concerned with irrigated rice cultivation in Nyanza Province (Niemeijer et al., 1985, 1988; Noy & Niemeijer, 1988).

2.2. Design

The schemes selected for study are Haraka schemes, all four situated in the coastal plains. They have already been described in section 1.4. with the exception that only that part of Tezo-Roka scheme was included, next to the coastline and east of the main road Kilifi-Malindi, referred to as Roka (E). The four schemes offer a cross-section of settlement schemes in the province, two situated in Kwale District, two in Kilifi District, but they show mutual differences as regards agro-ecological conditions and degree of agro-support.

In addition, we avail of the results of a companion study among the general population in the region during the same period. As part of that nutrition survey identical information was recorded. This survey covered 300 households in 6 locations in Kwale and Kilifi District, and as such presents a picture of the rural population living in the three main agro-ecological zones in the district (Foeken et al, 1989).*

The study design allows for comparison of the settlement population with the general (coast) population, comparison between districts and comparison between schemes within the same district (Table 2)

Table 2 **Study Design**

	Diani =	*Ukunda* =	*Roka(E)* =	*Mtwapa* =	*coast general population*
Settlement vs general population	+	+	+	+	-
Comparison between districts	+	+	-	-	
Comparison within district	+	-	+	-	

2.3. Data Schedule

The data schedule is identical to that used in the companion study. Information on the schedule follows below and in Appendix 1-2. A full record form can be found in an earlier report (Hoorweg et al., 1988). The information collected concerns household and demographic characteristics, agriculture and off-farm employment, food consumption and nutritional status. The schedule covers the following topics :

* The locations in Kwale are: Bongwe (CL3, next to Ukunda), Mwatate (CL4, 25 km. along the Mombasa-Nairobi road) and Kibandaongo (CL5, near Kinango). In Kilifi District: Chilulu (CL3, near Kaloleni), Kitsoeni (CL4, 10 km inland from Kilifi) and Bamba (CL5, 35 km inland from Kilifi). For further details see Hoorweg et al.,1988; Foeken et al.,1989.

Housing circumstances and living conditions
= house, kitchen, water source, distance water, sanitation
Demographic characteristics of household members
= sex, age, marital status, education, occupation
= period and type of employment; income estimate
= non-resident members; reason absence, frequency of visits, remittances
= adult women; pregnancy, antenatal visits
= child births and deaths over the past 36 months
Farm characteristics
= annual crops; acreage, type ownership, crops and crop mixture, farming practices, quantity harvests, quantity sales
= treecrops and perennials; number of plants, farming practices, quantity harvests, quantity sales
= livestock; type livestock, turnover, livestock products, farm management, milk sales
Food consumption
= household food preparation & consumption, dishes, ingredients, amounts, origin
= food preparation recipe
= dietary recall of young children
Nutritional status
= anthropometry; weight, height, mid-upper arm circumference
= health; examination for signs of malnutrition, breastfeeding history, recent illnesses

2.4 Sampling Procedure

Because of expected seasonal variations it was necessary to cover a complete agricultural cycle. The study was therefore designed as a rolling survey with visits to different households during differing rounds at different times of the year. The sampling unit was the household, defined as a group of people who reside together under a roof or under several roofs within a single compound, who are answerable to the same head and share a common source of food.*

For each scheme, a map was available identifying all tenant plots by number. Cluster sampling methods were used. Starting with a randomly selected plot number, and proceeding towards the higher numbered plots, 10 neighbouring households were identified. This procedure was repeated ten times, effectively selecting 100 households in each scheme. During the period August 1985 to September 1986, five survey rounds were conducted with visits to 2 clusters of 10 households in each scheme, i.e. 20 households during each round. Not all the plots were occupied in the

* Respondents without access to farmland were excluded. This nearly always concerned people such as teachers, agricultural workers, who had rented rooms/houses in the area, or guardsmen hired to protect the plot from squatter occupation.

sense that households were actually living there; these plots were passed over. The condition of unoccupied plots was recorded, whether fallow or whether, at least partly, cultivated. In the cases where plots were occupied by more than one household, all the households were included in the sample, and counted for that number. Table 3 gives an overview of the sampling procedure.

Table 3 **Sampling Procedure**

	Diani	*Ukunda*	*Roka(E)*	*Mtwapa*	*Total*
Total existing plots	446	123	843	607	2019
Number of plots visited	161	118	138	115	532
Plots not occupied	46%	18%	31%	25%	31%
Plots with 1 or more h.holds	54%	82%	69%	74%	69%
Total number h.holds sampled	100	100	100	99	399

See Appendix 3A

In Diani about half the plots were not occupied, a quarter of the plots lying fallow; another quarter not occupied but cultivated. This already points at the lesser development of the Diani scheme, something which will be confirmed by the findings later on. In the other schemes the number of fallow plots is small (although this does not mean that all land is under cultivation; many farmers cultivate only part of the plot). In about 20% of the cases plots are cultivated but without households actually resident (see also Box 3, p.46)

Household members were recorded as being either resident, part-time resident or non-resident. Full-time residents are persons taking one or more meals from the household kitchen on a daily basis. Part-time residents are persons who normally live in the compound but who are or have been absent for an uninterrupted period of two weeks or more during the last three months. Non-resident members are members of the household who are staying elsewhere for reasons of employment, education or other, but who return regularly, and keep economic ties with the household.

Information on the general coast population was collected during five survey rounds between June 1985 and November 1986, during which all 300 households were visited repeatedly. The socio-economic information used for comparison purposes in this report was collected in November 1985 and April 1986. The comparison data on food consumption and nutritional status consist of the repeated observations over five rounds (Hoorweg et al., 1988).

Enumerators were recruited from the respective locations. The 12 enumerators eventually selected were young men (and one young woman) between the ages of 18

and 25 years, who had completed at least four years of secondary education. The training of the enumerators took place during May 1985 and covered the necessary interviewing, recording and coding. Training and trial interviews were conducted at Mtwapa Farmers' Training Centre and Mtwapa Settlement Scheme as well as the home areas of the trainees. The final interview schedule was developed concurrently with the training of enumerators. A refresher training course was given before the start of round 2.

To make appointments for interviews, compounds were visited the day before the planned household-visit. All interviews were conducted in the local vernacular (in a few cases Swahili was used when the respondents belonged to a non-local ethnic group). Completed interview schedules were checked twice weekly by supervisors and senior staff. If necessary, compounds were revisited to complete missing data.

Table 4 **Household Members by Residency**

	settlement schemes		*coast general population*	
	N	%	N	%
Full-time residents	2947	90	2314	87
Part-time residents	121	4	107	4
Non-resident	217	7	229	9
Total	3285	100	2650	100

See Appendix 3B

2.5 Study Population

The majority of the settler population is of Mijikenda origin: Digo in the two Kwale schemes and Giriama in the Kilifi schemes. In addition, in Diani and Mtwapa settlers from other Mijikenda sub-tribes as well as from other parts of Kenya can be found. The population of the schemes shows the same demographic characteristics as the general population, including the district differences in household size. Various population characteristics are presented in Appendix 3-5, listed by settlement. The 399 households in the settlement schemes together numbered a total of 3,285 people. Only a small minority of the population were not full-time resident: there were 121 (4%) part-time residents and 217 (7%) persons were in fact resident elsewhere most of the time (Table 4).

Table 5 **Full-time Residents by Age Group**

	settlement schemes		*coast general population*	
	N	%	N	%
00-09	1012	34	871	38
10-19	720	24	565	24
20-29	429	15	306	13
30-39	275	9	241	10
40-59	373	13	237	10
60+	118	4	94	4
Unknown	20	1	-	-
Total	2947	100	2314	100

See Appendix 4A

The resident population comprised 2,947 people with 37% adults between the ages of 20-59 years. There were 118 elderly people. Of the younger people, 720 were in their teens, 477 between five and nine years, and 534 under-fives (Table 5). The age distribution of children under ten is detailed in appendix 4B.

A breakdown of residency by sex shows some differences between settlement schemes and general population (Appendix 5A). In the general population only 60% of the adult men are full-time residents, in the schemes this is about 80%. This is due to the location of the schemes, which offer access to nearby employment opportunities in Mombasa or the Diani Beach area. Men from areas that are less favourably situated have to migrate in order to find off-farm employment. Consequently, the number of part-time and non-residents is relatively high in Roka (E), which is situated at a larger distance from Mombasa.

The educational level of the adult population in the schemes is slightly better than among the general coast population. Among the adult women in the general population, 80% had not had any formal education at all; in the schemes this was 67%, which is about the national standard (CBS,1981:278). As regards the men, those from the Kilifi schemes are somewhat better educated than their Kwale counterparts (Appendix 5B).

Household composition characteristics are listed in Table 6. The household size in the schemes is slightly smaller than among the general population, both in terms of number of people and consumer units.* In the two Kilifi schemes average household size is larger than the Kwale schemes: 9.9 vs 6.6 people (Appendix 6). The reason for this is that extended households are much more common in Kilifi. Three quar-

* Because the survey is concerned with food consumption and nutritional status, household size was calculated as the number of consumer units incorporating the sex ratio and the age distribution of the members. See endnote 1 (e.n.1); p.183

ters of the Kilifi households are of the extended type; mostly because there are many polygamous marriages in Kilifi (Appendix 7A). Finally, it must be mentioned that almost 10% are female-headed households but these are mostly found in the Kwale schemes (Appendix 7B).

Table 6 **Household Characteristics**

		settlement schemes (N=399)	*coast general population* (N=297)
household size-	- no. household members	8.2	8.9
(average)	- no. consumer units [1]	5.5	5.8
household type	- nuclear	35	41
(%)	- other	65	59
		100	100

See Appendix 6 &7A

2.6 Analysis and Data Presentation

The presentation of the further results is as follows. All information is listed in the appendices, starting from Appendix 8, with a breakdown by settlement scheme. Selected information is highlighted in summary tables throughout the text. The presentation in Chapter 3 starts with the main economic activities, farming and off-farm employment, compared with the general population. Chapter 4 is concerned with the socio-economic differences between the schemes and within the schemes. Chapters 5 and 6 are concerned with food consumption and nutritional status. These two chapters, in turn, start off with a comparison between schemes and the general population; followed by an analysis of differences between and within schemes.

The calculation and analysis procedures are generally the same as in the companion study (Foeken et al., 1989; Niemeijer et al., 1991). In so far as not described in the text they are detailed in a separate section with specifications at the end of the report on p.183; referred to in the text as endnotes ([e.n.-]). Notably this concerns the way in which household resources and household income have been calculated, as well as the indicators of food consumption and nutritional status.

In both studies household income is used as an important point of reference. In the present study, however, data on food production were available for only one fifth of the sample, and the value of food crops is therefore not included in house-

hold income, in contrast to the companion study. The statistical testing relies on analysis of variance (anova). In the text reference is made to the final end results of the respective analyses. The exact figures resulting from the respective calculations are presented in Appendix 39 for household data and in Appendix 40-42 for data on persons.

Chapter 3

Socio-Economic Characteristics

3.1 Housing Conditions

Housing conditions are an important aspect of the quality of life. Appendix 8 & 9 contain relevant data. Households usually occupy a combination of living houses, one or more kitchen places, and sheds of various kinds. The head and the first wife live in the 'main house'. In many households there are additional houses for second (or third) wives, for adult children or kin of the head of the household and their dependents ('other houses'). Older boys build their own structures - 'boys' houses' - which they usually share. Where houses consist of several rooms, however, grown-up boys may be given a separate room. Girls of that age often sleep in the house of an older family member.

Compared with the general population, the average number of living houses in the four schemes is smaller, but since the houses tend to be larger with more rooms, the average number of rooms per household is not different. This is particularly so in Kwale, where households are smaller; many houses are of the Swahili type, larger in size but with fewer rooms; so that in the end the number of occupants per rooms differs little between the schemes in the two districts (Table 7).

Table 7 **Housing conditions**

		settlement schemes (N=399)	*coast general population* (N=297)
Number of persons per room	(average)	2.5	2.8
Improved houses	(%)	19	15
Improved water source in wet season	(%)	58	41
Latrine present	(%)	26	33

See Appendix 8A,8B,9A,9C

The housing quality shows little difference with that of the general rural population, even though - as we will see later - the income level in the schemes is much higher. Walls are made of mud or grass; floors are made of earth; roofs are made of *makuti* (coconut leaves); only in Mtwapa does a quarter of the houses have an iron roof, a sign of wealth.

Health conditions are very much dependent on sanitary provisions, notably clean drinking water and adequate waste disposal. Almost all households in the schemes obtain water from a well or tap. These taps are connected with pipelines from nearby small rivers. During the dry seasons these rivers may dry up. This is especially the case in the scheme with the lowest annual rainfall, Roka: during the wet season, three quarters of the households obtain water from a tap, but during the dry season only one third of the households can still do so. In the other schemes, seasonal differences are less. Overall, a quarter of the households have a latrine (Table 7), which is even less than among the general population. Latrines are most often present in Mtwapa: another indication of higher incomes, which allow the expense of pit construction.

3.2 Land and Labour

Rural households generally avail of two major means of production, land and labour. A short review of historical land development in the coastal strip has been given in Chapter 1. A review of labour developments does not fall in the scope of this report. Cooper (1987) has provided a comprehensive study of urban labour in Mombasa. Although the harbours and dockyards no longer dominate the labour market as much as used to be the case, Mombasa is still the major employment centre.

Table 8 **Land**

		settlement schemes (N=399)	*coast general population* (N=297)
Average farm size	(acres)	9.6	8.2
Plot size smaller than original issue	(%)	34	–
original issue	(%)	49	–
larger than original issue	(%)	17	–

See Appendix 10A

Initially, the plots issued in settlement schemes, such as Ukunda, Roka and Mtwapa were 12 acres in size; later, as in the case of Diani, this was reduced to five acres. Virtually all lots have been given out over time, but this does not mean that all plots are occupied or developed. In fact, 30% of the plots was not inhabited, with about 10% of the plots lying fallow, but this percentage differs considerably among the schemes (Appendix 3A). Almost half the households avail of plots of the original size, but there have been changes in many cases. Some farmers have managed to enlarge the holding, in twice as many cases the original plots are being shared or have been subdivided (Table 8). The average farm size in the schemes is larger, but not much larger, than among the coast general population. Compared with households in the same agro-ecological zones, however, the difference is much larger: 9.6 acres vs. 4.7 acres.

Labour is made productive on the farm and in off-farm employment. Usually households seek a combination of activities, but this depends very much on farm size, cultivation conditions and employment opportunities. All households deploy members at the farm, at least for food crop cultivation. It is off-farm employment that differs most between households.

There is only a minority of households that does not report any off-farm employment. In fact, more than 40% of the adult population are engaged in some form of employment. Employment ranges from regular jobs and casual labour to self-employment. It can vary from the weaving and selling of home-made mats to a well-paid regular job in town. Off-farm employment is primarily a male activity - 60% of the adult men; in the schemes, however, 28% of the women have some kind of work, which is much more than among the general population. About a fifth of the off-farm workers is non-resident and stays near the place of work (Appendix 5A,16,17).

Table 9 **Labour** (Average number of adults per household)

	settlement schemes (N=399)	*coast general population* (N=297)
Total household labour	3.9	4.3
Off-farm employment -	1.4	1.2
Farm cultivation	2.5	3.1
Acres / Adult farm labour	3.8	2.7

See Appendix 10B

The total household labour consists, in principle, of all adult men and women and teen-age children (partly) in so far a they are not schooling. e.n.2 The average figure, calculated in this way, arrives at 3.9 adults per household and this is slightly different from the general population. On average, there are 1.8 off-farm workers per household which is a higher figure than among the general population with 1.4. About half the workers are full-time occupied in their employment and about half are part-time occupied in this way. Assuming that the latter are occupied only half-time, this reduces the labour in off-farm employment to 1.4 and 1.2 adults respectively and this leaves about 2.5 adults available for farming in the schemes, which is less than among the general population (Table 9).

This means that, in the schemes, there is on average a ratio of 3.8 acres per adult farm labourer vs. 2.7 acres among the general population; also reflecting the larger farm size in the schemes .

3.3 Food Crop Cultivation

Although Kwale and Kilifi Districts have a weak bimodal climate - with a long rainy season during April-June and short rains in October-November - the coastal plains in fact have only one (long) rainy season, followed by some intermediate rains up to December (Foeken & Hoorweg,1988:42). In exceptional years there may be second rains, but in normal years there is only one growing season, although Mtwapa forms an exception.* As a consequence food production in the coastal plains is rather modest.

Because of the manner of sampling used, the rolling survey, complete data on food crop cultivation were available for one fifth of the sample i.e. 80 cases. Maize

* Because of its location close to the inland hills, it receives more rain during the short rainy season than the other schemes, thus making two growing seasons possible. Accordingly, as we will see later, agricultural performance in this area is better than in the other schemes.

and cassava are the main food crops cultivated in the coast area. In general, food production is low and in 1985/86 - not an exceptional year - it was estimated to cover less than 50% of the energy needs of the average household (Foeken et al., 1989). The situation is slightly better in the schemes, mainly because more cassava is grown, but not much better - as we will see below. The cultivation and production figures for annual crops are listed in Appendix 11-12 e.n.4. Nine out of ten farmers in the schemes cultivate cereals, somewhat more frequently than among the rural population in general. In terms of kilograms harvested there is little difference, however. Maize is the main cereal. Some rice is cultivated in Ukunda and Mtwapa; sorghum and millet are virtually not grown. For cassava the case is different. The percentage households with this crop is not higher in the schemes, but the number of plants is much greater, more than twice as high (Table 10).

Table 10 **Food Production**

	settlement schemes (N=80)		*coast general population* (N=297)	
food crop production	%*	Av**	%	Av
cereals	88	328	80	352
cassava	89	917	74	363
legumes	66	60	37	14
bananas	71	47	52	17
value of food crop production (Ksh)				
- per household	3,281		2,207	
- per consumer unit	685		486	

* Percentage of households cultivating crop type mentioned
** Average per household in kg (cereals, legumes) and number of plants (cassava, banana).
See Appendix 11-12A

Although more legumes and bananas are harvested in the schemes, the crops remain of secondary importance. The frequency with which the crops are grown is not so different, but the production per cultivator is much higher than among the general population, two and even fourfold respectively, which leads to the larger harvest figures. Indeed, a number of households were known to cultivate bananas for sales purposes. Overall, the value of food crop production per household is estimated at more than sh3000/year e.n.5 which is 1.5x higher than among the population in general.

Box 2. **Food Self-Sufficiency**

Calculating the degree of food self-sufficiency is another way of expressing food crop production, namely in relation to the nutritional needs of the household members [e.n.6]. On average, 60% of the energy requirements was covered (Table 11). Only 15% of the households succeed in covering all staple food requirements from own production. Many households, however, do not even succeed in covering half of their energy needs. Still, the situation in the schemes is better than among the general rural population where the degree of food self-sufficiency was even less. Nevertheless, in the schemes, 40% of the staple foods required had to be obtained from other sources, food purchases in particular.

Table 11 **Food Self-Sufficiency** (1985)

	settlement schemes (N=80)	*coast general population* (N=297)
average degree	61	46
% of households below 50% suff.	44	69
composition staple energy (%)		
- cereals	40	63
- cassava	41	24
- other	19	13
	100	100

See Appendix 12B

Apart from the fact that food self-sufficiency is higher in the schemes, it is also composed differently. About half of the 'own' food energy consists of cassava [e.n.7], more than a third of cereals. Among the general population the cereal contribution is much higher.

Food production shows considerable differences among the four schemes, being lowest in Diani (Appendix 12A). Farm-wise the food production is highest in Mtwapa, but when corrected for household size the food production per head in Ukunda and Mtwapa is of similar level. Cereal production in the two Kwale schemes is much lower than in the Kilifi schemes. This is somewhat compensated by cassava. In this respect, the two Kwale schemes show the same picture as reported for the neighbouring Bongwe location in the companion survey on seasonality: low cereal production combined with high cassava production.

3.4 Tree Crops

The main commercial crops are tree crops which play an important role in the coastal economy. In many parts of the coastal plains, coconut palms dominate,providing the tropical landscape characteristic of the Kenyan Coast. The nuts canbe harvested the whole year through and are used for home consumption or sold for copra production. The husks of the nuts may be used as fuel if firewood is scarce. The leaves are used as roofing material. Table 12 presents the main data regarding cash crop production in the schemes and among the general population. Apart from coconuts there are cashewnut, citrus and mango (improved varieties). About two thirds of the households cultivate at least one of these crop types. There are, on average, 100 coconut palms per household, excluding young trees not yet bearing fruit. The number of cashewnut trees is about two thirds of the number of coconut palms, while citrus and mango (combined) are far less in number.

Compared with the general population, the scheme households own many more trees. Not only do more households own trees; the average number of plants is also higher (Table 12). The number of coconut palms is three times higher and the number of cashewnut trees four times. This is as could be expected, because the schemes are situated in the two agro-ecological zones where trees thrive well. Even when compared with smallholders in the same agro-ecological zones, the settlement households still own considerably more trees. True as this may be, the estimated area planted with commercial trees is still only about 50%. This leaves almost half the land available for food crop cultivation, much more land than is actually cultivated in this way.[e.n.8] Consequently a sizeable part of the plots is not under any cultivation and this accords with visual impressions.

Table 12 **Cash Crop Production by Tree Type**

	settlement schemes (N=399)		*coast general population* (N=297)	
	%*	Av**	%	Av
coconuts	62	100	60	33
cashewnuts	68	65	54	16
mango/citrus	61	11	46	5

* percentage of households cultivating crop mentioned
** average number of producing trees per household
See appendix 13A

3.5 Livestock

Most of the livestock consists of local breed - the small East African Zebu type, mainly found in the hinterland under traditional rangeland husbandry (L5).* Apart from improved breeds on medium and large-scale farms there are few cattle in the L3 and L4 zones.** Goats and sheep are common and many households have some poultry. Goats and sheep are usually tethered or herded together with animals from other owners. Poultry range freely around the compound. The animals are generally kept to be slaughtered and also serve as a financial reserve to be sold when necessary.

Table 13 **Livestock**

	settlement schemes (N=399)		*coast general population* (N=297)	
	%*	Av**	%	Av
cows	15	1.1	18	4.3
goats/sheep	36	3.2	41	2.9
poultry	57	6.6	90	6.9

* percentage of households cultivating crop mentioned
** average number of producing trees per household
See Appendix 14

The relevant data concerning livestock are presented in Table 13: the percentage of households with certain types of animals and the average number of animals per household. On average, 15% of the households have one or more head of cattle, 36% have goats and/or sheep, while 57% keep some poultry. These figures are somewhat lower than among the general population, which is as expected, but the low percentage of households keeping poultry is conspicuous. In sum, the average number of livestock units (LU) is about one third of that among the general population (Appendix 14).

3.6 Off-farm Employment

From the companion study we also know that in this part of Kenya, off-farm employment is paramount in assuring a livelihood. According to CBS-estimates (1986:229), more than three quarters of all wage employment in the formal sector in the region is concentrated in the provincial capital. A further 14% of employment

* See Foeken et al., 1989; Leegwater et al., 1991.
** One of the main constraints for improved cattle breeds is the presence of tick-borne diseases and trypanosomiasis transmitted by tse-tse flies.

opportunities is found in Kilifi District, in Kwale another 9%. As a consequence, migration to Mombasa is often necessary to find work, be it that this is particularly so for the people in the hinterland (Foeken et al., 1989: 115). Although the settlement households generally have more land available, and could be expected to rely more on farming, this is not the case. The settlement population is equally if not more involved in off-farm employment: witness the greater percentage of adults employed and the higher percentage of households with income from employment (Table 14).

Table 14 **Income from employment**

	settlement schemes (N=399)	*coast general population* (N=297)
% of adult population engaged in employment	43	25
households with income from employment (%)	86	61

See Appendix 18A

These figures concern jobs in both the formal and the informal sector. The large majority of the off-farm workers is either regularly employed or self-employed: both categories account for about 35% of the workers. Compared with the general population, the percentage of regular employees is a bit lower and the percentage of self-employed people is higher. Self-employment, in practice, means a business at or near home. This explains the much higher percentage of people working in their own locations (72%; Appendix 17B). The fact that the four schemes are situated near tarmac roads is another factor contributing to these high percentages: workers from the settlement schemes are able to commute.

Non-regular employment includes temporary employment and urban day labour. Temporary employment concerns people who may have work for a few months but not permanently. Day labourers are employed on a daily basis; technically, they are hired anew each day and paid at the end of each working day. A special category is that of local casual labour, often with neighbours, which is irregular and part-time in nature.* It involves 23% of the adult population in the schemes; providing a not unimportant contribution to household income (Appendix 18).

* It must be pointed out that in the present study, so-called local casual labour was included in the employment figures, while this was not so in the companion survey to which reference is made. In that survey this type of employment played only a minor role, much less than among the present study population.

3.7 Income and Resource Base

The income from tree crops and livestock - what can be regarded as farm sales - was calculated in a similar manner as in the companion survey. [e.n.5] On average, the income from agricultural activities in the schemes is about three times that among the general population (see also Box 4). This substantial difference is mostly due to the income of tree crops, since the income from livestock in the schemes is low (Table 15).

On average, the income (in 1985) from off-farm employment in the schemes was more than Ksh.10,000 per household, which is 1.5x that among the general population. Clearly, the population in the schemes is more successful or more favoured in this respect than the general population (Table 15).

Together, farm income and employment income comprise an estimate of the cash income of the household. This will be considered the household income: it averages about sh14,500 in the schemes, against less than sh8,000 among the general population. Corrected for household size the picture remains essentially the same: incomes in the schemes are more than double those among the general population sh3,235 vs. sh1,425 per consumer unit (Appendix 19).

The scheme households are doing better in all respects, since the food crop production (section 3.3) was also estimated to be higher with sh3,281 vs. sh2,207/household in the general population. When the estimates for the value of food crop production are included in the calculations it is possible to estimate the total resource base and the incidence of relative poverty. This, however, can only be done by combining the group averages because food crops were recorded for 80 households only, as mentioned earlier (Table 16).

Table 15 **Household income** (sh/household)

	settlement schemes (N=399)	*coast general population* (N=297)
tree crops	3,921	466
livestock +	396	792
farm income	4,317	1,258
employment +	10,297	6,560
household income	14,589	7,818

See Appendix 15A,18A,19

Table 16 **Resource Base** (sh/household)

	settlement schemes (N=399)	*coast general population* (N=297)
household income	14,614	7,818
value of food crops +	3,281*	2,207
total resource estimate	17,895	10,025

* N=80
See Appendix 12A,19

In this way, we arrive at a total resource estimate to the value of sh18,000/ household in the schemes and 10,000sh/household among the general population. Despite this difference, the composition of resources is very much the same. The income from employment comprises about 60% of the resource base; although farm income is relatively more important among the settlement households than the value of food crops.

In the companion report it was estimated that 41% of the households live below the food poverty line of sh1,000/cu. The income figures were quite similar to earlier figures reported by CBS,1988 and Greer & Thorbecke,1986.[e.n.9] In the settlement schemes, where incomes are much higher, the number of households in such dire circumstances is smaller, and can be estimated at about 10-15%, depending on the manner of calculation: a considerably better result.

In the next chapters, the variations in economic characteristics between and within the schemes will be discussed, notably in respect of farming, employment and household income.

Chapter 4

Economic Variation Between and Within Schemes

4.1 Land & Labour

Land Tenure

The initial plot size issued in Ukunda, Roka and Mtwapa was 12 acres but in Diani was only 5 acres. Redistribution of land has occurred in all schemes and at least half the farms are no longer of the size of original issue. In Kilifi about a quarter of the households have acquired other plots in the same scheme, plots in other schemes or still have plots in the area of origin (Table 17). Conversely, another quarter of the households have sold part of the original plot, rent out to others or currently share their land with relatives. In Kwale, few households have managed to add land to their farm and some 40% of the households avail of smaller plots than originally issued. Here redistribution means fragmentation and in the case of Diani this is the more important because the plots issued were already smaller than in the other schemes.

Table 17 **Land**

			Diani (N=100)	*Ukunda* (100)	*Roka(E)* (100)	*Mtwapa* (99)
Average farm size		(acres)	4.1	8.8	14.7	10.7
Plot size	smaller than original issue	(%)	39	47	17	34
	original issue	(%)	50	44	58	43
	larger than original issue	(%)	11	9	25	22

See Appendix 10A

Box 3 **Land Tenure**

The survey focuses on households that are resident in the schemes. Absentee plot owners were not traced or visited and in this sense the information on land ownership in the main text is incomplete. It is possible to gain insight into different patterns of landownership for the schemes by combining the information on plots in Appendix 3 with that on farmsize in Appendix 10.

Table 18 **Plot Tenure (%)** *

	Diani (N=100)	*Ukunda* (100)	*Roka(E)* (100)	*Mtwapa* (99)
Absentee owners	44	18	22	13
Single resident h.hold owning standard issue	31	52	42	37
Single resident h.hold occupying double plot	2	0	17	24
Two resident households ....unequally sharing two plots	11	0	9	14
Single resident h.hold,..... .....owning additional land outside scheme	0	7	5	0
Single resident h.hold,..... .....sharing part of land with outsiders	2	0	0	0
Multiple resident households	9	24	5	11
Total	100	100	100	100

* Figures prevailing under the assumption that any land exchange occurs firstly between scheme tenants; secondly with outsiders

The largest single group are the resident tenants who own the plot on which they are resident, no more, no less (Table 18). At the same time it is clear that this standard situation which the scheme planners probably had in mind, prevails on less than half the plots. At least a quarter of the plots is owned by absentee tenants who are not resident in the schemes; this percentage is highest in Diani - more than 40%. Diani is also the only scheme with a large number of plots that are not under any kind of cultivation (25%). In addition, there are tenants who own two plots, notably in Roka and Mtwapa, where a fifth of the land is under this kind of ownership.

There are also tenants who have rented out or sold part of their plot to other tenants in the scheme. In an estimated 10% of the cases, tenants have entered into this kind of arrangement; half of them owning less than the original issue; the other half enlarging their farm in this way. Finally, about 10% of the plots are occupied by multiple households as one would expect with inheritance over time; this percentage is highest in Ukunda, with 25%.

These results allow several conclusions. Least developed as a scheme is Diani. Disregarding plot size, pressure on the land by households is largest in Ukunda, where land fragmentation is highest. The reverse trend, land accummulation, occurs in Roka and Mtwapa. Mtwapa, at the same time, has relatively many plots with multiple households, which means that a large differentiation in landownership exists in this scheme.

The survey being restricted to the people living in the schemes, absentee landowners and their families are not included in the study. Although we have no information on the number of such owners, it can be estimated that in total they own about 27% of the land, but this differs per scheme (see Box 3).

It must be pointed out, though, that absentee ownership does not always mean that owners live far away, in other districts, presumably making little attempt to develop the land. Firstly, there are owners who live nearby and who cultivate the plot in the same way as resident owners. The reasons for residing elsewhere can be many, ownership of a shop, a house nearer to public amenities etc. Secondly, some of the owners who indeed live far away, employ a guard or farm labourer on the plot, as a precaution against squatters or government repossession. In some cases these labourers are, in fact, farm managers for the absent owner. Absentee ownership is therefore not easy to define, and it is more useful to distinguish between uninhabited plots that are cultivated and deserted plots. The corresponding percentages vary from 30 to 25%; they are without doubt highest in Diani.

Farm and Household Labour

The available labour was calculated by expressing the household members in terms of adult labour equivalents.[e.n.2] Omitting non-residents, the resident household labour averages about 3.5 adults, but in the Kilifi schemes it is about a third larger than in the Kwale schemes, reflecting the larger households in Kilifi in general (Figure 1). About a third of the available household labour is engaged in off-farm employment.

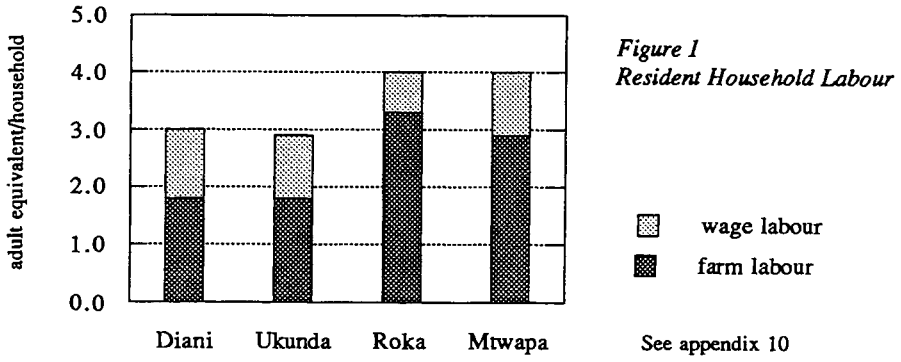

Figure 1
Resident Household Labour

See appendix 10

This leaves the households, on average, with about 2.5 labour equivalents for farm work and household chores. In the Kwale schemes there are 1.8 labour equivalents per household, lower than in the Kilifi schemes with 3.1 (Appendix 10B). When this figure is related to farm size, this results in a ratio of about 4.0 acres per available labour unit. In Diani the figure is quite different, only 2 acres per labour unit, reflecting the much smaller plots issued in this scheme.

4.2 Farming

Tree Crops

The schemes are located in the coastal strip in agro-ecological zones with potential for tree crops: the coconut-cassava zone and the cashewnut-cassava zone. The actual tree cover corresponds only partly with the ecological classification of the respective areas (Jaetzold & Schmidt, 1983). In three schemes (Ukunda-Roka-Mtwapa), 70% or more of the households have coconuts and/or cashewnuts (Table 19). Many households have also planted citrus and/or mango trees. The mutual differences between these three schemes concern the actual number of trees grown. In Roka coconut palms are more common than cashewnut trees; the number is 3x higher than in the two other schemes. In Mtwapa, on the other hand, cashewnuts are more common. In Ukunda the two types of trees are balanced. In these schemes the tree cover is estimated at 55-60%.[e.n.8]

Table 19 **Cash crop production by tree type**

	Diani (N=100)		*Ukunda* (100)		*Roka(E)* (100)		*Mtwapa* (99)	
	%*	Av**	%	Av	%	Av	%	Av
coconuts	23	6	78	77	85	284	63	32
cashewnuts	46	16	77	66	75	77	75	101
citrus / improved mango	31	2	78	15	61	9	75	19

* Percentage of households cultivating crop
** Average number of producing plants per household
See Appendix 13A

Box 4 **Farm Production**

Appendix 15 also gives estimates of agricultural returns in the schemes. The figures include the income from tree crops and food crops, calculated over total farm size. At first sight, the returns in the schemes appear much higher than in the districts in general, with sh753/acre vs. sh326/acre. The latter figure, however, is slightly deceptive because hinterland areas with very low agricultural potential are also included. When the latter areas are left out of the comparison group, the recalculated returns for the L3-L4 zones increase to sh690/acre (Foeken et al.,1989: Table 19) - and this is not very different from the returns in the settlement schemes. Apparently the settlement tenants do not use their plots more productively than farmers in general in these areas. However, because they own *more* land, their income from agriculture is nevertheless considerably higher and the returns for labour are also higher (Appendix 15C).

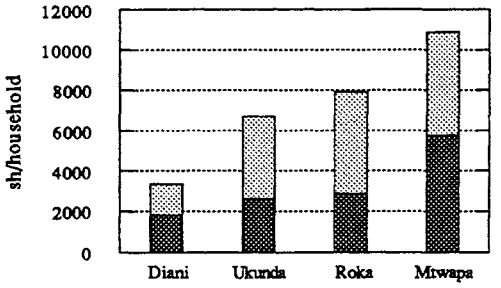

Figure 2
Agricultural Production

There are important differences in agricultural production between the schemes - it being highest in Mtwapa, followed by Roka and Ukunda in that order, and being much lower in Diani (Figure 2). This corresponds only partly with the agro-ecological differences, mentioned earlier, and this incongruity must be attributed to other existing differences between the schemes, notably as regards farm size and available household labour. Two other findings stand out: the high food crop production in Mtwapa and the low cash crop production in Diani. The first finds its explanation in the fact that in Mtwapa local conditions favour a second crop during the short rainy season. The low cash crop production in Diani is indicative of the poor soil quality but also of the lesser interest in farming of these tenants who are strongly oriented towards wage employment.

Diani has a less fertile environment, in many places the topsoil is thin and rocky and tenants less prepared to invest money and effort in tree cultivation. Only 20-40% of households have some trees and the average number of trees is less than a fifth of that in any of the other schemes. Pawpaw trees grow better under such conditions and are indeed more prevalent. Nevertheless the opportunities for tree crops are less than in the other schemes and the tree cover was estimated at only 25%.[e.n.8]

Livestock

Livestock is less important, as already mentioned - even so Diani also lags behind in this respect. Only two households own cows vs. 20% of the households in the other schemes (Appendix 14). Goats and sheep are more common in the Kilifi schemes than in the Kwale schemes, particularly in Roka. Chicken are present in more than 50% of the households, but the number of animals per household is again higher in the Kilifi schemes. Livestock ownership, as summarized in the number of livestock units per household, reflects these differences.

Farm Income

The income from farming in the two Kilifi schemes was calculated at more than sh5,000 per household, on average (Figure 3). Taking into account that food production was estimated at more than sh3,000, it means that in the Kilifi schemes households have an estimated income from farming of 8-10,000 sh. Taking household size into consideration this translates into about 1700sh/cu. This figure lies above the food poverty line (sh1000/cu) as well as the minimum existence level (sh1500/cu). This means that the households in Roka-Mtwapa are apparently able to cover their basic needs with the proceeds from farming. In that sense the Kilifi schemes can be said to have realized certain minimum objectives although there is, of course, still a considerable number of households for which this is not the case.

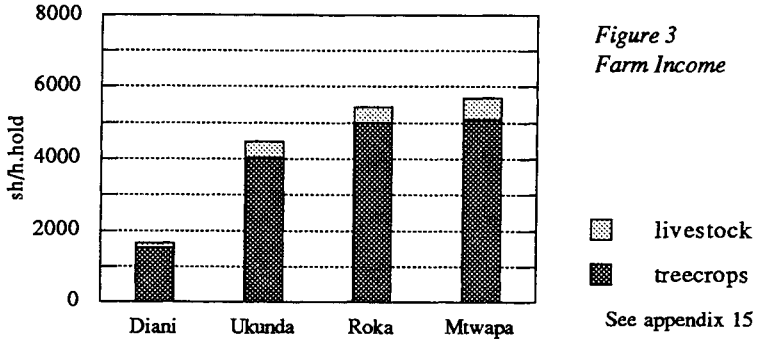

Figure 3
Farm Income

See appendix 15

The situation is different in Kwale District, notably in Diani. Farm incomes from tree crops and livestock were calculated at sh4,000 and sh1,500 respectively. Combined with an estimated value of food crops of sh2,600 and sh1,800 respectively, this means that household incomes average about sh6,500 and sh3,300 respectively. After correction for family size this leaves almost sh2,000/cu in Ukunda but less than sh1,000/cu in Diani.* This means that the households in Diani do *not* realize a minimum existence level from farming, unlike the average household in the other schemes (see Box 4).

4.3 Off-Farm Employment

In the Kwale schemes more than half the adults have some kind of employment, in the Kilifi schems this is less - about one third (Table 20). In Diani-Ukunda a third to half of the workers are self-employed. These are shopkeepers, artisans, small traders, and such. Although this type of employment offers a more or less regular source of income, most of these people have only modest businesses. In Ukunda, quite a large number of women reportedly have some employment - much more than in the other schemes. Nearly all these women are self-employed in some way (Appendix 17A).

The large majority of the workers in the two Kwale schemes work in their own administrative location and are full-time resident in their home compound (Appendix 17B). Although within easy reach of Mombasa, households in the two Kwale areas do not depend on this town as a source of work opportunities. Clearly the vicinity of Diani Beach with its tourist hotels and the spin-off employment this generates, contributes to this situation.

The workers in the Kilifi schemes have different characteristics. In Mtwapa most workers have a regular job, mostly in Mombasa (Figure 4). Because of the location, just north of this city, many workers commute. In Roka there is also a high percentage of workers with a regular job, but fewer work in Mombasa. Many live elsewhere, probably in the smaller urban centres like Malindi, Watamu and Kilifi town.

Thus, compared with the two Kilifi schemes, Diani and Ukunda are characterized by high percentages of off-farm workers who are self-employed and who reside permanently at home. So, although self-employment does not reward as much as regular employment, the full income from self-employment in the two Kwale schemes can go to the households. Roka and Mtwapa, on the other hand, are

* See Appendix 39A and 39B for results of statistical analysis (ANOVA)

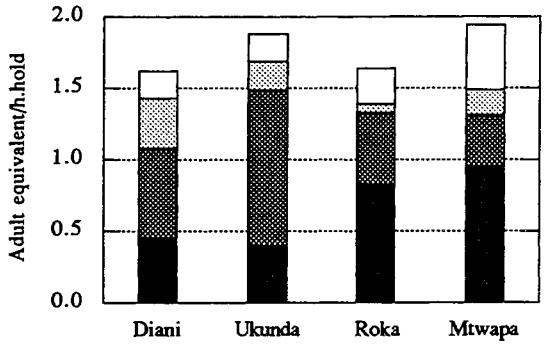

Figure 4
Off-farm Employment

See appendix 16

characterized by a relatively high percentage of workers with a regular job and who are non-resident. So, in the two Kilifi schemes, the employment wages as such are undoubtedly higher, but a smaller proportion of the payments will go to the households of the workers. This applies particularly in Roka (E).

The incomes from employment were calculated taking into account type employment and residency.* Only 10% of the households did not have any income from off-farm employment, with the exception of Roka where this was 30% (Table 20). The average wage income varies around sh9,000 per household, with the exception of Mtwapa where wage incomes are about 50% higher. This picture, however, is deceptive because it does not take household size and resulting household needs into consideration.

Table 20 **Income from employment**

	Diani (N=100)	*Ukunda* (100)	*Roka(E)* (100)	*Mtwapa* (99)
% of adult population employed	52	57	31	41
households with income from employment (%)	90	94	70	92
annual employment income / household (sh)	9,562	9,602	8,771	13,285

See Appendix 18A

4.4 Household Income

The average figures for household income are listed in Tables 21 & 22. The first table lists the figures per household, the second table the figures calculated per consumer unit. Household income in Mtwapa which had the highest farm sales and highest

* The wage income of a full-time resident was counted for 100% towards the household income; of a part-time resident for 75% and for a non-resident for 25%.

Table 21 **Household Resources** (sh/household)

	Diani (N=100)		*Ukunda* (100)		*Roka(E)* (100)		*Mtwapa* (99)	
	Av	%	Av	%	Av	%	Av	%
farm income	1661	15	4484	32	5446	39	5691	30
employment income ++	9562	85	9602	68	8771	61	13285	70
household income	11223	100	14086	100	14140	100	18953	100
food production *	1824		2649		2882		5768	

* Estimate based on N=80; see Box 1, p.xx.
See Appendix 12A,15A,18A,19.

wage income, consequently, leads with an average of almost sh19,000/ household; Diani on the other hand has the lowest incomes, only slightly more than sh11,000 (Table 21).

Employment income contributes about two thirds of the household income and farm income about one third. The two Kilifi schemes are quite similar in this regard, but in Diani the (relative) wage contribution to household incomes is much larger - about 80%.

The households in Kilifi and Kwale differ considerably in size and the household incomes in Roka-Mtwapa have to sustain much larger families. When household income is corrected for household size there are no longer any clear-cut differences between the districts* and a different pattern emerges (Table 22). The households in Mtwapa still realize the highest incomes (3680sh/cu) but the households in Ukunda follow next (3410sh/cu). The household incomes in Roka and Diani, however, remain below sh3,000/cu, which is 20% below the other schemes. A considerable difference arising because in Diani farm income are low, and in Roka because wage incomes are low. Since there is a greater variation in incomes in Roka this means that the number of low income households is largest in this scheme, with more than 15% below the treshhold level of sh500/cu.

4.5 Variation within Schemes

The differences between the schemes account for only a small part of the variation in household income. The differences between households within the same schemes are much larger, reflecting the differences in welfare that exist. The variation is

* See Appendix 39D for ANOVA results

Table 22 **Household Income per Consumer Unit** (sh/cu)

	Diani (N=100)	*Ukunda* (100)	*Roka(E)* (100)	*Mtwapa* (99)
Average (sh/cu)	2927	3406	2931	3680
Distribution (%)				
up to <sh499/cu	12	7	17	4
sh500-4999/cu	73	71	69	71
sh5000/cu and over	15	22	14	25
	100	100	100	100

See Appendix 19

considerable; 30% of the households have an income of less than sh1,500/cu; averaging sh750/cu; another 30% have incomes of more than sh3,500/cu, and average sh7,500/cu (Table 22). Various characteristics for different income classes are listed in Appendix 20. The better-off households owe their prosperity mainly to wage income (Figure 5), particularly because they have workers from higher job groups. In the lower income groups, wage incomes mainly come from local casual labour, i.e. working in the fields of neighbours. In the better-off households few people are engaged in this way. The low income households have to rely more on farming, but their actual farm incomes are low.

Both farm income and employment income increase with income class, suggesting that households with higher wage incomes also have higher farm incomes. This raises the question about the nature of this relation. Historically it was probably true that succesful farmers had a better a chance to acquire education and jobs, if not for themselves, at least for their children. At present, the relation is more likely to be the reverse, people with better education are able to land better jobs with higher incomes and seem to invest part of it in the purchases of land and trees.

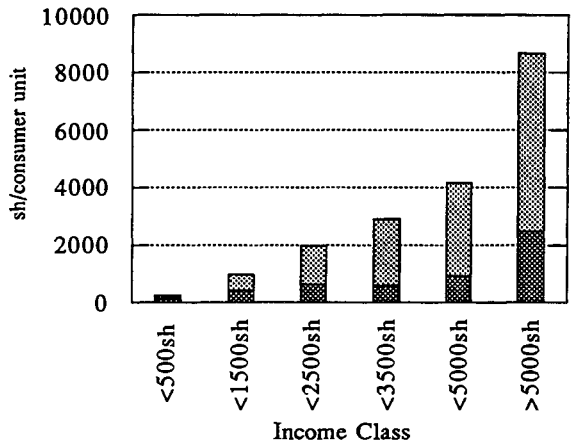

Figure 5
Income Composition by Income Class

See appendix 20

A further classification of households in terms of income and income composition gives additional insights. At the top end and bottom end there are the respective 'poor' and 'rich' groups already mentioned. The remaining 70% of the households fall in the income bracket of 500-5,000sh/consumer unit and for purposes of analysis they can be divided into farmers, wage earners and mixed household economies. The farmers consist of households with incomes of more than sh500/cu but with little or no wage income; the wage earners vice versa (Table 23 & Figure 6). e.n.10

Some characteristics of the 'poor' households have already been mentioned, it also needs to be mentioned that the farm incomes in these households are not low because of lack of land.* An average farm size of 8.0 acres is not much below the average of the group as a whole, but it is the agricultural performance of this group that is low on all counts. In that sense this group can perhaps be regarded as 'unemployed' in terms of farming as well as other employment, although there are indications that they cultivate more food crops from the food consumption data (Appendix 29).

As regards the three mid-income groups it is striking how few households make a living from farming - no more than 10% (Table 23). The total income of this group averages 1,300sh/cu, which is below the income of the wage earners and households depending on mixed economies (Figure 6). The wage earners, by definition, show the reverse picture with no income from farming but with a substantial income from employment, more than sh2,000/cu. The mixed household economies avail of farm resources as well as wage income. They have a similar farm income as the group of

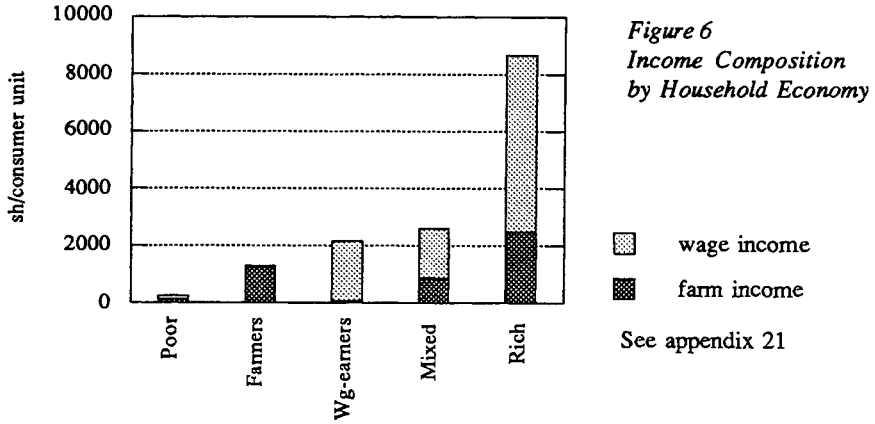

Figure 6
Income Composition
by Household Economy

* Of course, this only applies to the present settlement group; outside the schemes there are many people in dire circumstances and who have no land.

Table 23 **Type of Household Economy by Area** (sh/cu)

	Diani (N=100)	*Ukunda* (100)	*Roka(E)* (100)	*Mtwapa* (99)
Poor	12	7	17	4
Farmers	5	6	19	10
Wage Earners	45	26	19	23
Mixed	23	39	31	37
Rich	15	22	14	25
	100	100	100	100

farmers and a similar wage income as the wage earners, at least in terms of house hold income. Nevertheless, their income per consumer unit is not much higher than that of the wage earners, mainly because the mixed households are much larger in size (Appendix 21). Custom requires that well-to-do people are prepared to look after family relations who are doing less well, something often described as a considerable drain on resources. Something of the kind seems to occur here as well, households realize higher incomes but see their number of dependents grow.

The latter observation becomes particularly interesting in respect of the highest income group, because these households seem able to evade this situation. They have higher incomes not only because their incomes from employment are higher, but all the more because the household size in this group is much smaller, only half of that of the mixed households. It is as if these households have managed to free themselves from their traditional obligations, and are able to utilize their higher incomes for fewer individual members.

Whatever the truth of the latter speculations, all the results point at the poor prospects of agriculture, at least from the point of view of individual households seeking to assure a livelihood. Those who rely on their farms are generally poor and few succeed in securing a satisfactory income. Employment offers a better way to secure an existence, and many of these households also manage to reap a fair income from their farms. If households in settlement schemes, which are assured of land, are nevertheless so dependent on employment it means that land is apparently not a ready answer to rural poverty in this region.

Table 23 gives figures for the different household economies in the separate settlement schemes. The figures confirm what we already know from the earlier descriptions. Diani has a high percentage of households that rely first and foremost on wage income. Roka has the relatively largest percentage of farmers, in combina-

tion with an equally large group of poor households (36%). In Ukunda and Mtwapa households with mixed economies constitute the largest single group, almost 40%.

Chapter 5

Food Consumption

The food consumption data presented in this report were collected by means of the 24 hours recall method, namely a recall of all food prepared in the compound during the day prior to the interview. In households with more than one kitchen, data were collected for each kitchen. The women concerned were questioned about all the foods and drinks they had prepared or served in the course of the previous day. Starting with the first dish of the day, all subsequent dishes (including drinks and snacks) were covered. The women were further asked to demonstrate the cooking procedures and to indicate the quantities of the different ingredients used. In case of left-overs, the food that had not been eaten was estimated and subtracted. For each ingredient it was further noted whether it was grown on the own farm or whether it came from another source, in practice meaning that it was purchased.

The consumption data are presented in Appendices 22-29. Results are presented for the individual schemes and the aggregated schemes. For comparison purposes the findings of the companion survey among the general population are also presented (Niemeyer et al.,1991). The figures for this comparison group are based on the repeated observations (5x) on maximally 297 households. In the text summary in-

formation is presented in the form of short tables and figures. Section 5.1 starts with a discussion of the results for aggregated schemes compared with the general population; followed in the next section with a discussion of the differences between the districts and individual schemes. The relation between food consumption and household resources is discussed in section 5.3.

5.1 Settlement Population

Ingredients

Appendices 22-23 contain information on food ingredients; listing the percentage households that are consuming the respective ingredients; as well as the average amounts per day. The results are summarized in Table 24.

The diets in Coast Province consist, first and foremost, of maize meal, taken as *ugali* or *uji*. Virtually all settlement households consume at least one maize dish a day: more than 2250 grams/day, on average. Next follow cassava, green leaves and fish. In the households where these ingredients are consumed, about 2,750 grs, 570 and 550 grs is eaten respectively. Bread was eaten in 30% of the households. Tomatoes and coconuts, although eaten often, are eaten in smaller amounts, less than 500grs on any particular day; they function as flavourings mostly. The same is the case with fats, oils and sugar.

Table 24 **Consumption of Main Ingredients**

	1* *settlement schemes* (N=389)	1* *general population* (N=274)	2** *settlement schemes* (N=389)	2** *general population* (N=274)
maize flour	94%	97%	2381g.	2726g.
bread	34%	15%	631g.	538g.
cassava	29%	18%	2762g.	2214g.
leaves green	36%	49%	564g.	833g.
tomato	41%	21%	267g.	325g.
fish, fresh	26%	7%	566g.	484g.
fish, dry	23%	33%	132g.	119g.
milk, fresh	28%	21%	738g.	988g.
coconut	61%	45%	437g.	341g.
oils/fat	47%	16%	113g.	146g.
sugar	73%	48%	288g.	260g.

* Percentage households consuming ingredient listed. See Appendix 22

** Average amount consumed in households consuming ingredient listed (grams/day). See Appendix 23 (the appendix gives the average amounts calculated for the *total* population, while in table 24 the amounts have been calculated for the households actually consuming the ingredient concerned).

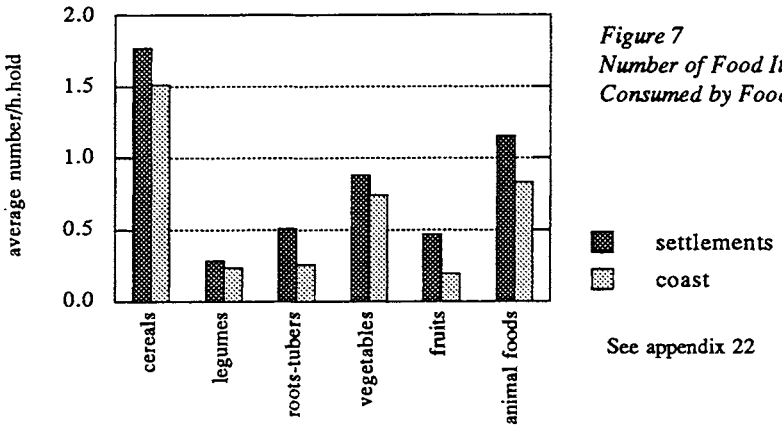

Figure 7
Number of Food Items Consumed by Food Group

See appendix 22

There are important differences with the general population, not in the sense that the main dish, maize meal, is eaten less often, but settlement households on average eat smaller amounts of maize. They also eat green leaves less frequently and, at the same time, in smaller amounts. The settlement households eat cassava and fresh fish more often and when eaten, in larger amounts. Coconuts, tomatoes, fats, oils and sugar are also eaten more frequently, but not really in larger amounts. Also noteworthy is that bread is eaten more often in the schemes. In broad terms, the settlement households have a more varied diet, in which maize and green leaves are less predominant than among the general population.

Moreover, the settlement households also have a greater variation in individual foodstuffs. On any given day they eat 1.8 different items from the group of cereals, 0.9 vegetable item; 0.5 fruit item and 1.1 animal food item. In the general population this is less, namely 1.5, 0.7, 0.2 and 0.8 respectively (Figure 7).

These differences reflect the influence of two factors: geographical location and income level. The settlement schemes are situated in the coastal zones while the comparison population is geographically more diverse, including locations from three different agro-ecological zones. This, for example, explains the differences in consumption of cassava, coconuts, fruits and fresh fish. The populations, however, also differ in income level and this probably leads to the higher consumption of items such as sugar, bread and fats.

Energy Intake

The figures presented so far concern household consumption in terms of raw weights of ingredients. Individual foodstuffs, however, differ considerably in water content and energy content, and for that reason it is not meaningful to sum the

weight figures of different ingredients, even ingredients in the same food group. Aggregation by food group is only meaningful when foods are converted into energy or nutrient equivalents. Apart from this, households differ considerably in size and this evidently influences the amounts eaten, without necessarily meaning that households are eating better or poorer. From here on, food consumption is therefore expressed in kcalories and grams protein per consumer unit e.n.1. Important differences between settlement schemes and general population remain.

The settlement population has an average intake of 2825kcal/cu, which is not much below the calculated requirement of 2960kcal/cu. The figure for the general population is lower, 2575kcal/cu, which is 250kcal below that of the settlement groups. This difference amounts to almost 10% of the estimated requirements (Table 25).

An average of 2825kcal means that more than 50% of the households have intakes of less than the requirements on any one day. This is correct as far as it goes but it does not mean that all these households indeed have insufficient food intakes on a regular basis. Households consume more or less from one day to another. In the absence of information on such within-household variations; one can only say that the above is an overestimate of the real prevalence of energy inadequacy. For purposes of group comparison, 1-day prevalence figures are nevertheless presented for the conventional cut-off points of 80%, 70% and 60% of estimated energy requirements (Appendix 24).* And although the figures are again difficult to interpret for the reasons mentioned; it is important to note that 25% of the households have an energy consumption below Energ(70) or 2100kcal. The latter compares with an estimate of 15% households with an income below the food poverty line - also based on a figure of 2100kcal (p.43). Among the general population there is a larger group with low energy intake (Table 25).

Table 25 **Food Consumption by Nutrients** (consumer unit /day)

	settlement schemes (N=389)	*coast general population* (N=274)
Energy (Kcalories)	2825	2578
Households with energy intake below 70% of requirements	27%	37%
Proteins (grams)	74	72
H.holds with protein intake below 100% of recommendations	25%	32%

See Appendix 24

* Further referred to as Energ (70) etc.

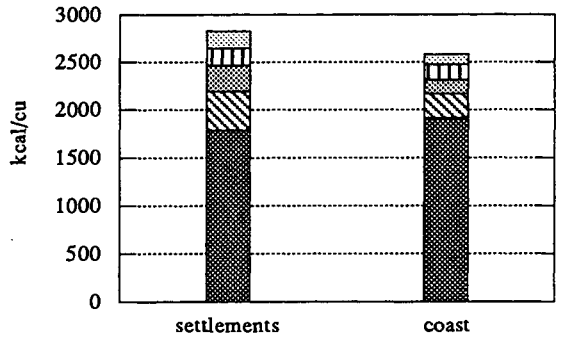

Figure 8
Composition Energy Intake

See appendix 25A

The protein intake is more than 70 grams in both populations, which is considerably above the recommended value of 50gr/cu/day. The recommended protein intake was realized in 70% of the households. In this respect there is little difference among the two populations.

Energy Composition & Origin

The energy figures reveal even more clearly the importance of maize meal in the daily diet. Two thirds of the energy intake comes from cereals (i.e. maize meal) and only 10% comes from the second group of staple foods, roots and tubers, mainly from cassava (Figure 8). The combined group of fats-oils-nuts contributes another 8%. Three remaining food groups contribute about 5% each: legumes; animal foods (in practice consisting of fish and milk); and miscellaneous items (mainly sugar).* Among the general population, even more of the energy comes from cereals (75%); accordingly the contribution from other food groups is less. This again indicates a greater variation in diet in the schemes, as has already been pointed out above.

The settlement population meets less than 30% of its energy needs with food from the own farm (referred to as homestead); among the general population this is about 40%. The difference occurs because of the larger consumption of home-grown cereals among the latter groups (Appendix 26B). This means that 70% of the energy needs in the settlement households comes from foods obtained in some other way, in practice they are purchased. The higher incomes apparently allow the settlement tenants to purchase more food and in turn this also appears to influence the composition of the energy. In the schemes 15% of the energy comes from fats, which is generally considered the minimum percentage that is still acceptable. Among the general population it is less, only 12% (Appendix 25B).

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* In the case of the three food groups that consist largely of one item, reference is made in the text alternatively to the food group itself or to the item concerned (cereals: maize meal; roots & tubers: cassava; miscellaneous: sugar).

What is most striking is the extent to which maize meal dominates the daily diet in both populations, and this is clearly a matter of preference, not availability. Cassava is widely cultivated, to the extent that it could potentially satisfy 25% of the energy needs (see Box 2; p.38); but it actually accounts for less than 10% of the energy intake. Apparently a lot of cassava is not home consumed; meaning that is is either sold or left in the ground.

While the diet in the settlements is more varied, the percentage of energy from protein is the same as in the general population. This is a familiar phenomenon: the larger consumption of protein rich animal foods is offset by larger amounts of foods that are poor in protein (roots, sugar, fats-oils)

5.2 Differences between Schemes

There are also important differences between the schemes. At closer examination these turn out to be differences between the districts rather than the schemes. The energy intake in the two Kwale schemes averages 3070kcal; in the two Kilifi schemes 2580kcal or about 15% less. In the case of protein the difference is about 4.5 grams; or 6%. This also means that in the Kilifi schemes there are more households on any one day below the level of Energ (70): 34% in Kilifi vs. 20% in the Kwale schemes (Table 26).

Table 26 **Nutrient Intake by Scheme** (consumer unit/day)

	Diani (N=99)	*Ukunda* (N=96)	*Roka(E)* (N=99)	*Mtwapa* (N=95)
Energy (Kcalories)	2929	3223	2494	2660
H.holds with energy intake <70% of requirements	24	16	37	30
Proteins (grams)	75	77	72	71
H.holds with protein intake <100% of recommendations	25	20	29	26

See Appendix 24

The higher figures for the Kwale population find their cause in the higher intakes of roots-tubers; fats-oils; animal foods and sugar which are only partly offset by a higher maize consumption in the Kilifi schemes (Table 27). Differences between the districts further occur in respect of the amounts of food from the own farm and food that is purchased. The Kilifi households* consume more cereals and legumes from

* Where reference is made to Kilifi or Kwale households this is always with the understanding that it concerns settlement households, not the population in general.

the own farm and this accords with the greater cultivation of cereals and legumes in the Kilifi settlements (Appendix 11A). The Kwale households compensate this by more home grown cassava and the purchase of cassava and maize.* The main differences in respect of purchased foods, however, occur in respect of animal foods; fats-oils and sugar. This reflects differences in food habits, but it has to be realized that these differences are compounded by the effects of household size which also differs between the districts.

Table 27 **Energy Intake by Origin and Food Group** (kcal/consumer unit/day)

	Homestead		*Purchases*		*Total*	
	Kwale (N=198)	*Kilifi* (N=191)	*Kwale* (N=198)	*Kilifi* (N=191)	*Kwale* (N=198)	*Kilifi* (N=191)
Cereals	167	515	1514	1371	1681	1886
Legumes	19	83	98	52	117	136
Roots-tubers	304	108	130	11	434	119
Vegetables	12	21	8	6	20	27
Fruits	26	21	7	2	34	21
Animal foods	12	20	221	100	234	120
Fats-oils-nuts	95	124	181	59	275	183
Miscellaneous	1	1	276	81	277	82
Total	636	893	2438	1681	3072	2574

See Appendix 26

The above results have been calculated per consumer unit, thus standardizing to some extent for household size. Nevertheless, results show that there still is a strong - negative - relation between energy intake and household size. Energy intake per consumer unit drops from 3000kcal in small households to slightly over 2000kcal in large households (Figure 9). This kind of effect has also been demonstrated elsewhere and means that in large households more food is prepared but not enough for the greater number of people.

In this case, there exists a difference in household size between the districts of 1.9 consumer unit and it can be calculated that this accounts for about 125kcal.** This accounts for a quarter of the differences in energy intake between the districts; the remainder left to be explained by differences in food habits and socio-economic factors.

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* In Kilifi very little or no cassava is bought. At first sight this appears to confirm the existing stereotype about the Digo and cassava as their main staple food. In reality, however, they eat far more maize; while the extensive cassava cultivation in the Kilifi schemes must also be mentioned in this respect.

** For statistical treatment, see the results of analysis of variance, Appendix 39E

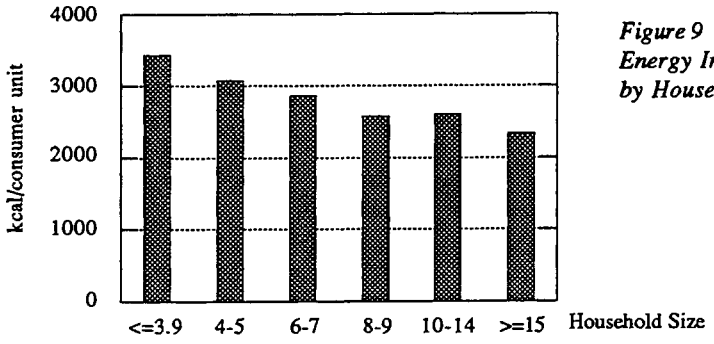

Figure 9
Energy Intake
by Household Size

5.3 Household Resources and Energy Intake

Household Income

Overall, there is little relation between income and energy intake, except for the two extreme income groups. The energy intake in the lowest income group, below sh500/cu, is considerably below average. In the top-income group with sh5000/cu or more, energy intake is above average but this is largely explained by a much smaller household size (Appendix 28). However, since the larger part of the diet consists of purchased foods and cashmoney comes mostly from wage employment; we may have a closer look at the relation between employment income and food purchases (Figure 10). With an increase in employment income there is a relative increase in food purchases; while the food from own farm decreases proportionally. Total energy intake, however, is unaffected.

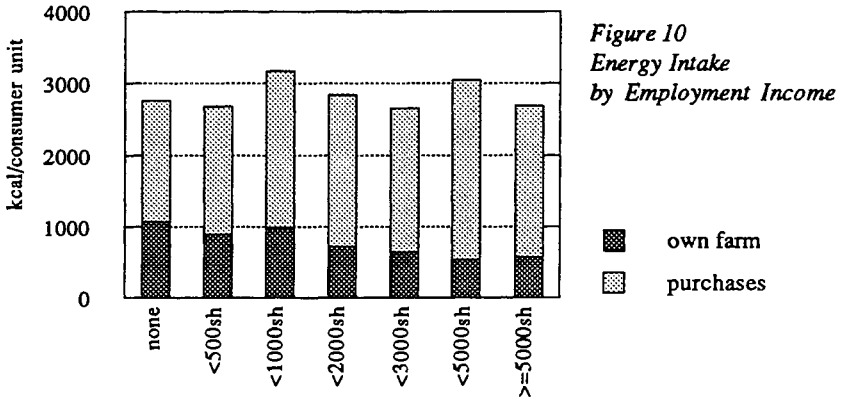

Figure 10
Energy Intake
by Employment Income

Wage income in rural households has different components, as described earlier on. Income from regular, non-regular and self-employment have no significant relation with energy intake (Table 28). It is indeed practice in rural households to use the income from regular employment to meet lump-sum expenses such as schoolfees, medical expenses and purchase of household goods. It is the income from local casual labour, received from day-to-day and traditionally used for daily household expenses, that appears important in respect of food purchases.

Table 28 **Analysis of Variance for Energy Intake with Different Income Components** (N=389; The figures in the table refer to the F values obtained in repeated ANOVA's, and after removal of the effect of district and household size)

	F-ratio	*df*
a) Regular wages	0.39	1
b) Income from self-employment	1.26	1
c) Non-regular wages	0.30	1
d) Wages from local casual labour	4.02*	1

* $p < .05$.
See Appendix 39F-I

Household Economy

Earlier on in this report a distinction was drawn between households according to household economy, notably for the households in the middle income bracket, distinguishing between farmers, wage earners and mixed economies. The main difference between the three groups is that the wage earners realize an energy intake of 2890kcal; while this is only 2730 among the farmers and 2760 among the mixed households (Figure 11). As far as the farmers are concerned this is in line with what we know about this group; they tend to have lower incomes and depend more on food from their own farm than the wage earners. The lower energy intake of the households with mixed economies comes as a surprise because they have higher incomes. The explanation for this lies in the larger household size in this group mentioned earlier (p.56), and which leads to lower intakes per consumer unit. The latter trend apparently persists irrespective of income level, and in this sense the lower energy intake among this group is a concrete example of the drain on resources occurring in such households. Among farmers and mixed households a similar proportion of energy comes from homegrown foods, which accords with the earlier finding that the farming activities of the two groups were quite similar. Among the wage earners, however, 80% of the food is purchased. But, apart from these differences the composition of the daily diet in terms of food groups and macro-nutrients is very similar,

somewhat surprising for households that have a very different resource composition [e.n.11].

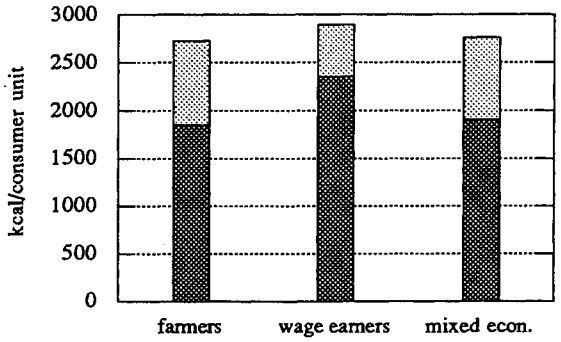

Figure 11
Energy Intake
by Household Economy

See appendix 29

5.4 Conclusion

Reassessing the differences in food consumption between the settlement population and the general population it is evident that the households in the Kwale schemes are responsible for improvements over the general population. The Kilifi schemes are not doing better than the coast population in general. Ironically then it is the schemes with the lesser agricultural production, with little food from home production, and more dependence on off-farm employment, that are doing better in this respect. The higher food consumption in these schemes can therefore hardly be credited as successes of the schemes, rather they confirm the overwhelming importance of wage employment. The total supply of energy from the typical staple foods remains fairly constant, but the wage incomes allow households to bring greater variation in their daily diet by purchase of non-staple items.

Chapter 6

Nutritional Status

According to the Third Rural Child Nutrition Survey, the two districts have the highest percentage of stunted children in Kenya (h-a below 90%). Kilifi ranking the lowest with 42% and Kwale, next lowest, with 39% (Box 5). In respect of wasted children (w-h below 80%), Kilifi ranked third and Kwale fifth, both with 5%. In other words, malnutrition of young children appears more common and more serious in the coastal areas than in Kenya as a whole. These worrying findings were essentially confirmed in the companion FNSP survey among the general population, where among children aged 6-59 months average h-a was again below the national average with 91.5, the percentage stunted high with 36% and the percentage wasted children more than 7% (Niemeyer et al.,1991). The situation in the schemes, however, is better than in the districts as as a whole, witness in particular the higher h-a averages. The percentage of stunted children in the schemes is less than among the general population, although still comparable to the national results. The same can be said in respect of severe malnutrition, i.e. children with weight-for-age of less than 60 percent.

Box 5
Summary of anthropometry from various sources

	year of survey	reference	no. of children	age group (months)	average H-A	%children <H-A(90)	average W-H	%children <W-H(80)	average W-A	%children <W-A(80)	%children <W-A(60)
Kenya: rural	1977	CBS 1980	1383	12-47	93.0		96.0	9.0	86.0	33.0	
Coastal Zones	1977	CBS 1980	81	12-47	95.3		95.2	9.0	88.7		
Kenya: rural	1982	CBS 1983	5323	3-59	94.2	24.0	100.7	3.0		23.0	0.7
Kwale/Kilifi: rural*	1982	CBS 1983	348	3-59	91.8	40.7	100.5	5.0			
Kwale/Kilifi: rural	1985/87	Niemeyer, 1991	388	6-59	91.7	35.9	93.2	6.5	79.9	51.6	4.2
Coast: Settl. Schemes	1985/87	this report	473	6-59	93.3	25.6	93.2	5.3	82.4	42.3	1.3

* recalculated from original figures

This chapter presents data on the nutritional status and health situation of adult women and children, aged 6months-11years. Height and weight were measured and expressed in terms of height-for-age; weight-for-height and weight-for-age (see Box 6, p.74). Health information consists of the reported illness over the past 14 days and visits to health facilities.

Information was collected for 392 women; their age distribution is listed in Appendix 30. The group is mainly restricted to women of child-bearing age because only the mothers of children under ten were included; the breakdown of children by year has been listed in Appendix 4B; with the exception that for the youngest children, below 6 months, no anthropometry was recorded. Otherwise anthropometry results are presented with a breakdown for the following age groups : 6-23 months (N=172); 23-59 months (N=301) and 60-119 months (N=467).

The figures for the general coast population are based on the (5x) repeated observations on maximally 332 women and 127, 263 and 386 children, respectively.

6.1 Adult Women

The findings for the adult women are listed in Appendix 30. The average height of the women is 155 cm, the average weight 50 kilos. Both figures are higher than among women from the coast general population. In addition, the average weight-for-height, with 92.8 per cent of the reference standard, is somewhat higher among the women in the schemes (Table 29).

Table 29 **Adult women; anthropometry** (Averages)

	settlement schemes (N=392)	*coast general population* (N=332)
height (cm)	154.8	153.6
weight (kg)	49.9	48.0
weight-for-height (%)	92.8	90.4

See Appendix 30

Table 30 contains a comparison of mothers in different schemes. On average, the women in the Kwale schemes are taller by about 2.5cm, and heavier by about 2.0kg, than the women in the Kilifi schemes. Differences in weight-for-height are

small. There is some difference in reported illness between Diani and the other schemes, something which will also be found among the children.

Table 30 **Adult women; results by scheme** (Averages)

	Diani (N=85)	*Ukunda* (78)	*Roka(E)* (121)	*Mtwapa* (108)
height (cm)	156.6	156.1	153.5	154.0
weight (kg)	50.2	52.1	48.9	49.2
weight-for-height (%)	91.7	95.5	92.2	92.4

See Appendix 30

Statistical analysis confirms that the differences in height between mothers in the two districts are significant, but that the differences between schemes in the same district are not.* Analysis of weight-for-height does not reveal any significant differences, which means that the heavier weights of the women in Kwale are the result of the larger stature of these women.**

6.2 Illness of Children

Mothers were asked about the number of days children had been ill during the previous two weeks. Results are presented in Appendix 31. In general, young children show higher illness rates than older children. Of the youngest age category (6-23 months), no less than 65% were reported to have been ill at some time during the preceding two weeks. In the elder age groups, the figures were lower, 48% and 39%. Once children are ill, the average number of days that they are reportedly ill averages around 7.0 days, and this figure does not decrease with age group. About half of the young children who were ill were taken to a doctor or a health center. Among the older children this is only one in three.

Overall, morbidity rates in the schemes hardly differ from the general population. In the schemes, 47% of the children had been ill during the two weeks prior to the interview, against 50% among the general population (Table 31). However, the average number of ill days is higher in the schemes: 7.1 vs. 6.0 days, respectively. On the other hand, the settlement children are more often treated by a doctor or at a health facility. Of ill children in the schemes, 40% received 'official' treatment. In

* See Appendix 40A.
** See Appendix 40B.

Table 31 **Reported illness of children**

	settlement schemes (N=930)	*coast general population* (N=754)
children reported ill, past 2 weeks (%)	47	48
number of days ill (average) *	7.0	5.8
children receiving treatment (%) *	42	31

* Figures refer to ill children only
See Appendix 31

the general population, this figure was only 30%. Undoubtedly, the easier access to health services plays a role in this as well as the higher income level. Morbidity rates are higher in the Kwale schemes than in the Kilifi schemes, at least as regards the reported incidence of illness and this will be reflected in the lower weight-for-height of these children (Figure 12).

6.3 Anthropometry of Children

The weight and height figures for the children are listed in Appendix 32. The indicators of weight-for-height, height-for-age and weight-for-age were calculated according to the standards described in Box 6 which also discusses the interpretation and meaning of these indicators. Detailed results are presented in Appendix 33-36 for the respective age groups of 6-23; 24-59 and 60-119 months.

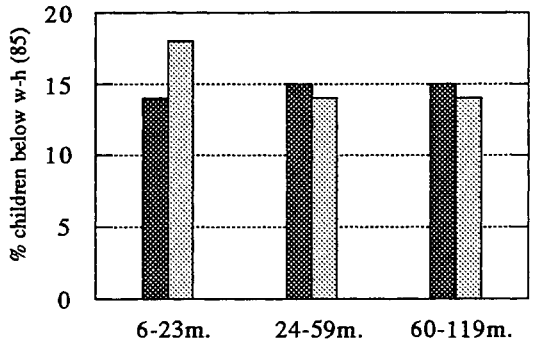

Figure 12
Weight-for-Height by Age Group

See appendix 33

Box 6 **Anthropometric Indicators**

It is general practice to standardize height and weight measurements for age by calculating height-for-age; weight-for-height and weight-for-age with the help of international growth standards. In this study the standard values of the WHO (1983) reference population were used.

Height-for-age expresses the height of a child as a percentage of the corresponding median height of children in the same age category in the reference population. Height-for-age values of 90 per cent or less are generally regarded as evidence of severe stunting, indicating that the child has failed to grow satisfactorily during lengthy periods in the past. Therefore, height-for-age is commonly regarded as an indicator of nutritional history reflecting social and economic conditions.

Weight-for-height expresses the weight of a child as a percentage of the median weight of children of similar height in the reference population. Weight-for-height values below 80/85 per cent can be regarded as evidence of wasting, indicating acute malnutrition. Different values of weight for height (80; 85; 90) have been used as critical cut-off point by different authors; In the present report we have used w-h(85) in the tables/figures accompanying the text; the appendices give detailed breakdowns. Weight-for-height is an indicator of present nutritional condition, easily influenced by ill health and showing the greatest variation among young children. Weight-for-height becomes more difficult to interpret when differences in h-a exist. Weight-for-height is therefore of particular interest at younger ages, height for age more indicative in elder age groups. The analysis and discussion in the text will therefore focus on these indicators in the respective age groups.

The weight of a child can also be expressed in terms of *weight-for-age*, often used as a 'shortcut measure' because it reflects both previous growth and present nutritional condition and is used for a broad classification of malnutrition. Children with less than 60 per cent of the standard weight for their age are generally regarded as severely malnourished, while those with a weight-for-age between 60 and 80 per cent as malnourished.

Finally, a *cross-classification* of height-for-age and weight-for-height is in usage, distinguishing between 'normal' children, stunted children, wasted children and malnourished cases.

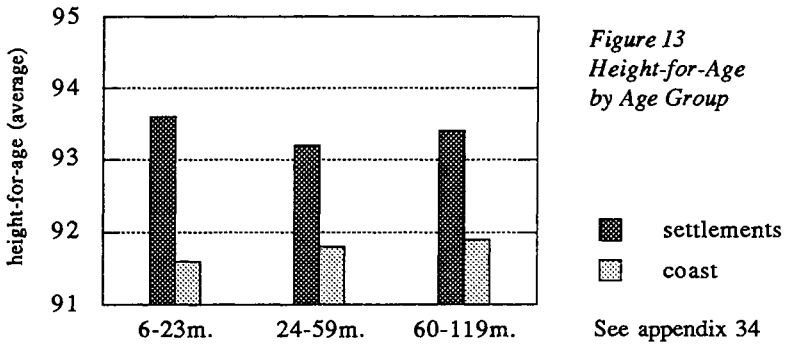

Figure 13
Height-for-Age
by Age Group

See appendix 34

Settlements vs. Coast General Population

Figure 12 presents the percentage of children falling below the critical value of w-h (85). Among the youngest age group there is a small difference with the general population, with better results for the children in the settlement schemes. There being no difference between the groups in reported illness this points at slightly better nutritional conditions in the schemes, although the difference is small and not statistically significant. The differences in the older age groups are even smaller and of no consequence.

Figure 13 shows the averages for height-for-age. Differences between the settlement and general population are consistent over age groups. It is somewhat unexpected, however, that the differences are equally strong among the youngest age group. Further analysis confirms that the height differences already exist at a very young age, before 12 months.* This raises the question as to how far the differences result from environmental conditions or were perhaps already present at the time of birth. The latter is not unlikely given the fact that the mothers are taller, as noted earlier.

Table 32 **Percentage of children, marginally and/or severely malnourished** (aged 6-119m.)

	settlement schemes (N=940)	*coast general population* (N=754)
Children below h-a (90) and/or below w-h (85)	36	45
Children below w-a (80)	48	56
Children below w-a (60)	1.5	4.6

See Appendix 35, 36

* Among children <12 months: in the settlement schemes h-a=95.8; in the general population h-a =93.4; roughly corresponding with 1.5cm.

Whatever may be the case, half the children in the general population fall below the combined h-a/w-h critical values; this is only 35% among the settlement children. The percentage of severely malnourished children, below w-a (60), varies from 3% to 6% among the general population and is not more than 2% in the settlements (Table 32). In conclusion it can be said that the settlement children are in better nutritional condition. Statistical analysis confirms that this is partly because of the larger stature of mothers, but even after statististical removal of the latter effect, there remain significant differences in h-a between the two populations of children. The higher standard of living and the higher food intakes are the causal factors that first come to mind.*

Differences between Districts

The analysis of district differences will focus on w-h among the youngest age group and on h-a among the elder children for the reasons explained in Box 6. (The detailed figures per scheme are listed in Appendices 33-34.) Table 33 gives a breakdown of the w-h results for the different age groups. In the youngest age group the figures for Kwale are slighly below those of Kilifi, although not significantly. The differences, in so far as they exist, are related to the higher incidence of illness in the Kwale schemes, mentioned on page 73.** The percentage of children below w-h (85) is virtually the same in the two districts.***

Table 34 details the height-for-age results for the three respective age groups. In the eldest age group the differences between the districts are significant confirming that we are dealing with permanent trend. However, the differences already appear

Table 33 **Weight-for-height results by age group and district**

	6-23 MONTHS		24-59 MONTHS		60-119 MONTHS	
	Kwale (N=78)	*Kilifi* (94)	*Kwale* (133)	*Kilifi* (168)	*Kwale* (192)	*Kilifi* (275)
Average	92.8	95.4	91.9	93.3	90.8	93.2
% children <w-h (85)	15	14	17	14	19	12

See Appendix 33

* See Appendix 40C.

** See Appendix 40D.

*** The differences in w-h are slightly larger in the older age groups, although still not significant, but difficult to interpret because partially related to the differences in physique between the children in the two districts, reported later on.

Table 34 **Height-for-age results by age group and district**

	6-23 MONTHS		24-59 MONTHS		60-119 MONTHS	
	Kwale (N=78)	*Kilifi* (94)	*Kwale* (133)	*Kilifi* (168)	*Kwale* (192)	*Kilifi* (275)
Average	94.7	92.8	93.6	92.9	94.2	92.9
% children <h-a (90)	13	29	25	30	20	25

See Appendix 34

to exist at a younger age; in fact they they are already present during the first year.* Again we have to deal with the question whether the height differences are perhaps induced during the first year of life or are perhaps already present at birth and related to the differences in stature of the mothers.

In fact, three quarters of the differences in h-a of elder children in the districts can be attributed to differences in mother's stature.** When this effect is statistically removed there are no longer significant differences between the children in the two districts. The fact that both mothers and children are taller in the Kwale schemes points to a more general explanation than that of the present settlement environment. Many mothers grew up before the schemes were started. Possibly the population in this part of the coast has been better off nutritionally since long.

6.4 Household Resources and Nutritional Status

Household Income and Household Size

In section 5.4 it was shown that energy intake is influenced by household size and household income. Further analysis among the elder children confirms that similar relations exist in respect of h-a. After removal of the effects of mother's height, district and schemes there remain significant effects of household size and household income.*** As in the case of energy intake in the previous section there is a negative relation between nutritional status and household size, and it is reasonable to assume that this is the effect of the lesser energy intake noted in larger households. The relation with household income is positive, as one would expect. A breakdown of anthropometry for different income classes is given in Appendix 37. However, the differences being small and district related they are hard to isolate.

* Among children <12 months: h-a in the Kwale schemes was 96.2; in the Kilifi schemes 94.0; also corresponding with 1.5cm.

** See Appendix 40E .

*** See Appendix 40F.

Table 35 **Analysis of Variance for Height-for-Age with Two Income Components** (Age group, 60-119 months. The figures in the table refer to the F values obtained in repeated ANOVA's, and after removal of the effect of mother's height and household size. df=1)

	Kwale schemes	*Kilifi schemes*
Farm Income	1.07	5.57*
Employment Income	12.75*	2.27

* $p < .05$.
See Appendix 41A-D

Household income has two main components: farm income and employment income, which are of different importance for the households in the two districts. In Kwale, 80% of the household income comes from employment; in Kilifi, this is 65%, and this reflects the different importance of agriculture in the respective schemes. It is therefore not surprising to find that in the Kwale schemes it is income from employment which is significantly related to the height status of older children (Table 35). In the Kilifi schemes, on the other hand, it is farm income which shows a significant relationship. This accords with the earlier finding that the households in the Kilifi schemes depend more on their own farm for their daily food and we will examine this again in the next section in respect of household economy.

Household Economy and Nutritional Status

Table 36 shows the results for the three different household economies in the middle income range: farmers, wage earners, mixed economies. Despite the differences in resource composition the results for the three groups are quite similar. It is surprising that the mixed households do not do better than the other groups which have, after all, lower incomes and - perhaps even more important - a much more restricted resource base. This unexpected result can primarily be attributed to the fact that the mixed households are larger in size, by half, and we already know that this has a negative influence on nutritional status.

Table 36 **Height-for-age results by Household Economy** (Age group, 60-119months)

	Farmers (N=40)	*Wage Earners* (144)	*Mixed* (210)
Average	93.6	93.5	93.0
Percent children <h-a (90)	30	24	24

See Appendix 38

Table 37
ANOVA for Height-for-Age with Income Components by Household Economy
(Age group, 60-119 months. The figures in the table refer to the F values obtained in repeated ANOVA's, and after removal of the effect of mother's height and household size. df=1)

	Farmers	*Wage Earners*	*Mixed*
Farm Income	10.91*	0.96	5.45*
Employment Income	0.87	4.38*	1.63

* $p < .05$
See Appendix 42A-F

The three groups having diffferent income compositions, the relations between the main income components and child growth are also different (Table 37). Among the farmers, child growth is related to farm income (reflecting own food production*); among the wage earners it is related to employment income; and this one would expect, if only for statistical reasons. In the mixed households, however, that avail of both farm income and employment income, child growth is related to farming. In that respect these households resemble the group of farmers more than the wage earners and apparently have chosen for the more traditional way of arranging their rural livelihood, something which was also reflected in the larger household size in this group.

This reasoning is confirmed by the results for the group of rich households. These households, as mentioned earlier, not only have higher incomes but also much smaller households. This is also the group that has significantly better results in respect of h-a among the elder children (Table 38). The fact that the youngest children in these households are not of different stature indicates that in this group the household environment has a long-term positive effect on child growth and development.

Table 38 **Height-for-age results for Mixed and Rich Households**

	6-23 MONTHS		24-59 MONTHS		60-119MONTHS	
	Mixed (N=84)	*Rich* (13)	*Mixed* (125)	*Rich* (18)	*Mixed* (210)	*Rich* (23)
Average	94.1	93.4	92.3	95.8	93.0	95.8
Percentage children <h-a (90)	18	15	34	11	24	9

See Appendix 38

* The correlation between farm income and food production was .45 among the households for which this could be calculated (N=80).

6.5 Conclusion

The results according to the initial study design are fairly straightforward; there are differences in nutritional status between the settlement schemes and general population that are the result of differences in standard of living. District-wise there are differences between the schemes, but these are correlated with a larger stature of mothers in Kwale and indicate differences of a more general nature, not related to the schemes as such.

The fact that there are no significant differences in nutritional status between the schemes in different districts, or within districts, is not surprising in view of the findings on household income and energy intake in the previous sections. The study design started from the agro-ecological characterstics of the schemes. However, as the study so far has shown, in general household incomes depend largely on employment, which compensates for less farm income. This, of course, is quite logical. If households cannot reap a satisfactory existence from the land they will look for other means of securing a livelihood. Moreover, rural households in Kenya have a universal strategy of reducing risks by spreading their income from different resources whenever they can, and this is no different in the coast area. It is therefore of interest that the children in households who are successful in this respect, the mixed households, do not fare better than children in other households of farmers and wage earners. However, the explanation for this can be found in the fact that these households tend to be much larger in size, by half as noted in Section 4.5 (p.56), and this apparently does not benefit the children.

Chapter 7

Conclusion

Land distribution is generally regarded as an important component of rural development, and the Kenya Government indeed made it one of her top priorities after Independence in 1964. In the coastal districts land distribution has, in fact, been one of the main development activities of the past 20 years. The prevailing schemes in the region are low cost, high density, Haraka settlements. At present, there are more than 15 schemes, which differ greatly as regards size and local conditions.

The settlement schemes in Kenya received considerable research attention in the period following Independence, but recent publications are few. The coastal schemes have received even less attention because researchers focused mainly on land distribution in the former white highlands. This is regrettable because Coast Province needs attention in general and because the coastal schemes are situated on less fertile lands than the highland settlements. In that sense, conditions are close to those in certain semi-arid areas elsewhere in the country that have recently shown an influx of settlers .

The coastal settlement schemes are also of interest because they can demonstrate the potential for agricultural development by smallholder farmers under the prevailing regional conditions. The farmers in most schemes operate under rather favorable conditions, at least by local standards. They have sizeable holdings that are situated on relatively fertile land, and at some time they were given the opportunity to start out on new land. On the other hand, they experience the same limitations on agriculture, notably agro-ecological and infrastructural restrictions, but also historical restrictions that determine local attitudes to farming. Since the farmers in the schemes have received only moderate development support under the prevailing settlement policy of the government, the schemes mark the potential and the limits of agricultural development under these conditions.

As elsewhere, the settlement schemes in Kenya, were started with several objectives in mind. Notably they were a means of settling the landless and improving their well-being, but also to increase agricultural production and stimulate rural development in general. To evaluate schemes of long standing against such criteria is not a matter of simply comparing the conditions before and after the introduction of the schemes. This is not possible, because of the long time periods involved and the general developments that have occurred. It is difficult if not impossible to find suitable communities that can be used as a comparison group to control for these developments. Consequently, studies also have to rely on analysis 'within', that is comparison of different settlements or different groups of tenants. This, however, makes it difficult to draw hard conclusions; it is in the nature of these studies that they provide new and illuminating information but raise further questions to answer.

The present survey covers four schemes in Kwale and Kilifi districts: Diani, Ukunda, Roka and Mtwapa which are mainly situated on former estates of Arab and Swahili landowners. The schemes differ in agricultural potential, plot size and other characteristics, notably the existing opportunities for off-farm employment. They can be regarded as representative for the older schemes in Kwale and Kilifi; the conditions in some of the newer schemes, notably Magarini and Lake Kenyatta, could be somewhat different because of their remote location and they are best compared with the Roka scheme. Data from companion surveys among the general population were available for comparison purposes

Land Tenure

The scheme households generally avail of farms that are larger in size than the general population, particularly in comparison with farms in comparable agro-ecological zones. About half the households are resident on the plot they own, no more land, no less. Many tenants have either sold a part of the plot or rented out a part. Some have even sold out completely. Others have managed to enlarge their land by leasing or buying.

It is striking that less than 60% of the plots are inhabited by one household. About 20% of the plots are cultivated to a greater or lesser extent but not inhabited, presumably because the owners also have land elsewhere, and about 10% of the plots are deserted (mostly in Diani). Finally, 10% of the plots are characterized by multiple occupancy because of subdivision. Whether this situation is good or bad is not easy to say, but it is not the situation which the original planners had in mind. Somewhere developments have taken a different turn resulting in a considerable differentiation in type and size of land ownership. On the other hand, such differentiation is only to be expected since sales and purchases of land in the schemes are permitted and since different households have different needs and may choose different economic strategies. It is clear that fragmentation, which initially was expected to be a major problem is a lesser issue than that of absentee owners, although the reader is reminded that the latter vary from up-country owners to people living quite nearby. In fact, in settlement areas elsewhere in the country even greater differentiation has occurred because of the sale of white-settler farms to individual buyers, groups of buyers and co-operatives, with the consequence that some large farms have been kept intact, others broken up in medium-size farms and others in smallholdings. In that sense the trends observed in the coast area are not different from those elsewhere in the country, and are the consequence of the prevailing settlement policies.

The schemes differ mutually. In Diani a quarter of the plots are deserted 7 years after the official start of the scheme, which can hardly be called a success. In Ukunda pressure on land is relatively high and here most land fragmentation has occurred. In Roka and Mtwapa there is a reverse trend, namely towards land accumulation in the hands of large owners.

The study reported here focuses on households that are resident in the schemes.

Agriculture

As concerns agricultural production a distinction must be made between food crops and cash crops. The food crop production covers only 60% of the staple food requirements of the households concerned, with maize and cassava being the main crops cultivated. This is disappointing since this is only 15 percentage points better than among the general population who avail of less land of lesser quality.

Cash crops mostly consist of tree crops, i.e. coconut palms, cashewnuts and to a lesser extent, citrus trees. Apparently the delays in issuing title deeds have not stopped the planting of new trees. Given the fact that many settlers were landless, squatters or originated from inland areas they must have realized an increased production as households. This does not necessarily imply that regional or national production has increased, although much of the land was reportedly in a neglected state at the time, following the decline of the plantation economy in the early part of this century.

Taking household size into account, the estimated farm production averages from 1600 to 2000 sh/cu in three of the four schemes. This is only slightly higher than the calculated minimum existence level of sh1500/cu, which means that a substantial minority of the households does not realize this. In Diani the figure is even lower and remains below sh1000/cu, always excepting other means of income, such as wage employment.

Still, the income from farming in the schemes is three times higher than among the general population, and this is mainly because the average farm size in the schemes is much larger.* The productivity per acre, however, is only slightly higher in the schemes than on other smallholdings in comparable agro-ecological areas. In fact, the area under tree crops in the schemes was estimated at 50-60% of the farmland which leaves room for considerable expansion of the cashcrop areal. The reasons why agricultural development has not been greater are the same ones that pertain to many settlers elsewhere, they were generally of unproven commercial farming ability, had little farm capital and have received little support from extension

* The Department of Settlement has struggled over the years with the issue of plot size. Initially the plot size was placed at 5ha, but later in Diani this was reduced to 2ha. In Magarini the initial plot size was 12ha large but in the second phase this was reduced to 6 ha. The basic objective of the allocation policy has been that people should be able to realize a satisfactory existence as farmers. But, as this report shows, this is not what the settler households do since they largely rely on wage employment. If this is accepted as an unalterable fact, which seems the wiser policy, than the need for the relatively large plots no longer exists. In fact, the Department of Settlement seems to have reached this conclusion also since the plots recently issued in Kijipwa were only 1ha large. Kijipwa is situated on rocky soils but quite near to a hotel and tourist area. The situation in more remote schemes could be different because of lesser employment opportunities, although the results for Roka do not support this suggestion.

services. Moreover, there are the general constraints on farmers in the region; agro-ecological limitations, uncertain marketing conditions and the lure of wage employment. Although one can look at this in various ways, the fact remains that households who rely on farming are generally poor and that from the point of view of individual households the prospects for agriculture are not attractive.

Household Income

The households in the Kwale schemes are, on average, smaller in size than the households in the Kilifi schemes, which accords with general differences between the districts. Wage employment plays a very important role in the economy of rural households in the coast; this is no different in the settlement schemes where 85% of the households have income from employment. Generally, it is the men who find employment, either near of far but in the present case employment opportunities are relatively nearby and many workers stay at home. This means that they incur less costs and are able to take a larger part of their income home.

Household income in the schemes consists for two thirds of employment and for one-third of farm income. But in this respect there exist differences between the schemes, employment contributing 60% in Roka and 85% in Diani. Two independent studies have estimated that 40% of the households in the coastal districts fall below the food poverty line, taking all income sources into account (Greere & Thorbecke,1986; Foeken et al., 1989). In the settlement schemes this percentage is about 10-15%, which is considerably better.

Nevertheless, the variation in incomes and income composition is great. Only 10% of the households realize a sufficient existence from farming and these 'farmer' households barely manage to stay abreast of the 10% 'poor' households who depend on subsistence crops and have little or no income. A number of households have sizeable farm incomes, but these households generally avail of income from employment as well. In this way, 30% of the households depend on a mixed economy. More than a quarter of the households do not have a farm income of any size and fully depend on wages. Finally, some 20% of the households have an income of more than sh5000/cu, partly because of higher wages but also because they are much smaller in size.

Nutrition

The average intake of 2835kcal/cu is only slightly below requirements. The recommended protein intake was realized in most households. On the whole, the scheme households have higher energy intakes than the population in general and they also have a greater variation in foodstuffs.

The daily diet consists mainly of maize which provides, on average, two thirds of the energy intake. Although cassava is widely cultivated, it accounts for no more than 10% of the energy intake. Energy intake consists for only 30% of foods produced on the own farm; the remaining 70% has to be purchased.

Differences were found to exist between the Kwale and the Kilifi schemes, the energy intake/consumer unit being considerably higher in the Kwale schemes. The differences in food consumption occur because of several factors: food habits, resource composition, and - important - differences in household size which make that people in large households have considerable lower energy intakes.

The higher intake in the Kwale schemes are, in fact, responsible for the earlier mentioned differences with the general population. Ironically, it is the schemes with relatively little food production and that are most dependent on wage employment that are doing better nutritionally, mainly because of greater food purchases.

According to the last nutrition survey of CBS in 1983, malnutrition is more common and more severe in the coastal districts. These results were essentially confirmed in the companion study (Niemeijer et al.,1991). The children in the schemes show better nutritional results than the children in the general population, notably as regards height growth. These differences are related to differences in height of the mothers and differences in the standard of living. There was no traceable influence of individual schemes on the nutritional status of the children.

Further analysis shows that there is a complex pattern of relations between household size, household income and nutritional status and that the nature of these relations differs in the two districts. Households with different types of economies, however, each appear to pose rather balanced adjustments to the given local circumstances, there being no great difference in energy intake or nutritional status in the respective middle-income groups of farmers, wage earners and mixed households.

Finale

Rural households in Kenya, if they can, prefer to diversify their resources. To counter the risks inherent in agriculture, one or more members may seek wage employment. In turn, crop cultivation safeguards against unemployment and eases food expenses. As a consequence households differ considerably as regards composition of resource base; the gamut varies from farmers, wage earners to mixed and rich households.

It is a cynical observer who does not appreciate the sight of many smallholdings where previously there were neglected tracts of land. The fact that there are rural communities where previously space reigned empty is a success in itself. If the well-being of the settlement population is regarded as the ultimate criterion, the settlements are a success. The incidence of poverty is much lower than among the general coast population; food consumption is higher and more varied; the nutritional status of young children and mothers is better. However, the improvement in nutritional status is only about 10% and there is still a large - too large - number of children in poor nutritional condition. The fears expressed about high density schemes in the past, that they would prove a mere dumping ground for people who would eventually be even worse off than before, have not materialised in this case.

Much of these positive findings, however, must be traced to the opportunities for wage employment in three of the four schemes, which have little to do with the schemes as such, while agricultural production could be improved. One scheme, Roka, knows fewer employment opportunities in the near vicinity but the farm production is not larger than in the other schemes, even less. This scheme probably comes nearest to the conditions at the new large schemes that are situated more remotely (although only additional research can give the final answer to this).

The general conclusion about the government settlement policy in these areas is therefore ambiguous. From the point of view of regional agricultural development the results are far from optimal but from the point of view of the settler households the schemes are quite a success. As so often the case, the objectives of government policy and interests of smallholder farmers do not converge.

APPENDICES

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Appendix 1

Data Schedule; socio-economic information

The questionnaire/record form is identical to that used in the companion FNSP-study on seasonaliy in the Coastal Lowlands. A full questionnaire/record form can be found in the pertaining report (Hoorweg et al., 1988). The information collected concerned household and demographic characteristics, agriculture and off-farm employment, food consumption and nutritional status. The items in the schedule cover the following topics :

Housing circumstances and living conditions
= house, kitchen, water source, distance water, sanitation
A small map was drawn of each compound, identifying the main house as well as other houses and shelters. For the main house the type, style, roof material, wall material, and floor material were recorded. The water source was recorded separately for drinking water and for the watering of livestock during the dry and wet season respectively.

Demographic characteristics of household members
= sex, age, marital status, education, occupation
= period and type of employment; income estimate
= non-resident members; reason absence, frequency of visits, remittances
= adult women; pregnancy, antenatal visits
= child births and deaths over the past 36 months

Farm characteristics
= annual crops; acreage, type ownership, crops and crop mixture,
farming practices, quantity harvests, quantity sales
= tree crops and perennials; number of plants, farming practices,
quantity harvests, quantity sales
= livestock; type livestock, turnover, livestock products,
farm management, milk sales

Production of annual crops, treecrops and perennials was assessed by means of interviews. The acreage planted or the number of plants were recorded together with the quantities harvested and crop sales during the period under review. Herd composition and livestock turnover were similarly recorded, notably the number of poultry, goats, sheep and cattle that were added or deleted from the existing herd; together with estimates of milk and egg production and milk sales. Further items concerned crop cultivation practices and livestock management.

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Appendix 2

Data Schedule; food consumption and nutritional status

Food consumption

= household food preparation & consumption, dishes, ingredients, amounts, origin

= food preparation recipe

= dietary recall of young children

Food consumption was assessed by two recall methods : (a) a recall of all food prepared in the compound during the day prior to the interview, and (b) a 24-hour recall of the quantities of food consumed by individual children, aged 6-35 months, also for the previous day. The recall of food preparation was collected for each kitchen of the household. The women concerned were questioned about all the foods and drinks they had prepared in the course of the previous day. Starting with the first dish of the day, all subsequent dishes (drinks and snacks) were covered. The women were further asked to demonstrate the cooking procedures, and to indicate the volumes of the different ingredients used, as well as the total volume of the dish as finally prepared. In case of left-overs from meals, the volume of food that had not been eaten was separately estimated and subtracted. For each ingredient it was further noted whether it was home produced or not.

Individual dietary recalls were collected for all young children, aged 6-35 months. The information was provided by the person who had supervised the feeding of the child, usually the mother. She was asked about the foods and drinks consumed by the child in the course of the previous day and night, including the number of times the child was breastfed. She was requested to demonstrate the portions consumed with the help of the cup or plate which had been used by the child. The volumes of the different dishes were estimated with procedures similar to those used for the food preparation.

Nutritional status

= anthropometry; weight, height, mid-upper arm circumference

= health; examination for signs of malnutrition, breastfeeding history, recent illnesses

Anthropometry included the measurements commonly used in nutrition studies : weight, height and mid-upper arm circumference. These measurements were collected for all children aged between 6 months and 11 years, as well as the mothers of these children.

The children under the age of two years were weighed using a SALTER 235 scale (max. 25 kg. with an accuracy of 100 grs.). The weighing of these children was done with a pair of 'trousers' with a harness for support. The weights of older children and adult women were measured with a TERAILLON digital scale (max. 135 kg. with an accuracy of 200 grs.).

The height of children under two years was measured with a portable length board with a fixed headrest and a moveable footrest. The children were measured in supine position. Older children and adult women were measured standing straight with their backs against a portable pole with a sliding headrest.

Mid-upper arm circumference of children and women was measured with an ordinary household measuring tape of reinforced cotton.

As regards health information, mothers were requested to report the number of days the child had been ill during the two-week period prior to the interview. The presence of major symptoms were registered notably including fever, coughing diarrhaea, vomiting, protruding belly, failure to thrive, worms, hair dyspigmentation, anaemia. The type and the result of treatment were also registered. Similarly recorded were the presence of clinical signs of malnutrition including oedema, hair dyspigmentation, flaky skin, moonface, protruding belly, marasmic appearance, lack of acticvitity. The incidence of diarrhoea and vomiting during the day before the interview were separately recorded.

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Appendix 3A
Sampling Procedure

		Diani	*Ukunda*	*Roka(E)*	*Mtwapa*	*Total*
Total existing plots		446	123	843[1]	607	2019
Number of plots sampled		161	118[2]	138	115	532
Plots fallow (%)		25%	2%	4%	4%	10%
Plots cultivated, not occupied		20%	16%	27%	21%	21%
Plots occupied by	1 h.hold	46%	58%	64%	63%	57%
	2 h.holds	7%	16%	4%	10%	9%
	3 h.holds	1%	5%	1%	-	2%
	4 h.holds	-	2%	-	1%	1%
	5 h.holds	-	1%	-	-	-
		100%	100%	100%	100%	100%
Total number h.holds sampled		100	100	100	99	399

1. The total number of plots in Tezo-Roka, as a whole, is 1357
2. In Ukunda the information on plot tenure was recorded for all plots in the scheme

Appendix 3B
Sample Composition:
Number of Household Members by Residency and Research Site

	Diani	*Ukunda*	*Roka(E)*	*Mtwapa*	*Total*	*Coast* *
Full-time residents	603	618	883	843	2947	2314
Part-time residents	26	18	55	22	121	107
Non-residents	18	29	101	69	217	229
Total	647	665	1039	934	3285	2650

* Source: Foeken et al.,1989: Appendix 1

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Appendix 4A
Sample Composition:
Number of Full-time Residents by Age Group and Research Site

Age (years)	*Diani*	*Ukunda*	*Roka(E)*	*Mtwapa*	*Total*	*Coast **
00-09	217	212	324	259	1012	871
10-19	128	154	209	229	720	565
20-29	111	84	112	122	429	306
30-39	66	58	78	73	275	241
40-59	67	94	108	104	373	237
60+	13	14	49	42	118	94
Unknown	1	2	3	14	20	-
Total	603	618	883	843	2947	2314

* Source: Foeken et al.,1989: Appendix 3B

Appendix 4B
Sample Composition:
Number of Children under Ten by Age Group and Research Site

Age (months)	*Diani*	*Ukunda*	*Roka(E)*	*Mtwapa*	*Total*	*Coast **
00-11	32	26	29	27	114	99
12-23	25	22	39	34	120	86
24-35	27	17	34	17	95	116
36-47	21	24	36	24	105	88
48-59	19	24	39	18	100	56
60-71	20	26	39	36	121	101
72-83	14	16	33	26	89	91
84-96	20	23	28	30	101	79
97-107	22	17	26	24	89	90
108-119	17	17	21	23	78	55
Exact age unknown	-	-	-	-	-	10
Total	217	212	324	259	1012	871

* Source: Foeken et al.,1989: Appendix 5

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Appendix 5A
Number of Adults by Residency, Sex and Research Site
(17+ years)

		Diani	*Ukunda*	*Roka(E)*	*Mtwapa*	*Total*	*Coast* *
Full-time residents	- men	156	144	179	190	669	394
	- women	138	152	224	212	726	615
Part-time residents	- men	5	7	15	8	35	60
	- women	5	3	17	4	29	19
Non-residents	- men	3	20	77	45	145	198
	- women	7	1	14	15	37	17
Total	- men	164	171	271	243	849	652
	- women	150	156	255	231	792	651
	total	314	327	526	474	1641	1303

* Source: Foeken et al.,1989: Appendix 4

Appendix 5B
Adults by Sex, Education and Research Site (%)
(17+ years)

	Diani	*Ukunda*	*Roka(E)*	*Mtwapa*	*Total*	*Coast* *
Men	(N=164)	(171)	(271)	(243)	(849)	(652)
- no formal education	35	42	26	18	29	35
- adult class only	8	3	5	8	6	3
- primary school, standard 1-4	13	10	12	14	12	16
- primary school, standard 5-8	38	33	34	34	35	32
- more than primary school	5	12	23	26	18	14
	100	100	100	100	100	100
Women	(N=150)	(156)	(255)	(231)	(792)	(651)
- no formal education	63	69	76	58	67	79
- adult class only	4	8	4	8	6	4
- primary school, standard 1-4	5	3	3	9	5	5
- primary school, standard 5-8	21	18	9	16	15	10
- more than primary school	7	3	9	10	7	3
	100	100	100	100	100	100

* Source: Foeken et al.,1989: Appendix 6

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Appendix 6
Household Size

	Diani (N=100)	*Ukunda* (100)	*Roka(E)* (100)	*Mtwapa* (99)	*Total* (399)	*Coast* * (297)
Members						
- average number per household	6.5	6.7	10.4	9.4	8.2	8.9
(standard deviation)	(3.8)	(3.7)	(6.9)	(5.3)	(5.4)	(6.2)
- distribution (%)						
1-3	24	21	10	15	18	12
4-5	21	22	17	11	18	15
6-7	21	19	14	14	17	23
8-9	16	20	9	14	15	19
10-14	16	11	28	28	21	18
15-19	1	7	14	14	9	9
20+	1	-	8	3	3	5
	100	100	100	100	100	100
Consumer units						
- average number per household	4.5	4.5	6.5	6.3	5.5	5.8
(standard deviation)	(2.6)	(2.4)	(4.3)	(3.5)	(3.4)	(3.9)
- distribution (%)						
0.0-1.9	13	14	11	11	12	9
2.0-3.9	37	33	20	15	26	25
4.0-5.9	26	33	21	25	26	29
6.0-7.9	14	11	19	19	16	16
8.0-9.9	7	5	11	13	9	11
10.0-11.9	2	4	8	9	6	5
12.0+	1	-	10	7	5	6
	100	100	100	100	100	100

* Source: Foeken et al.,1989: Appendix 2

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Appendix 7A
Household Extension (%)

	Diani (N=100)	*Ukunda* (100)	*Roka(E)* (100)	*Mtwapa* (99)	*Total* (399)	*Coast* * (297)
- nuclear households[1]	41	52	19	26	35	41
- other households[2]	59	48	81	74	65	59
	100	100	100	100	100	100

1. Includes households where adults are either head of the household, spouse to the head, or grown-up child of the head. The definition also includes female-headed households and households without young children, otherwise meeting the definition.
2. Includes households with adults otherwise related to the head, and households with head married to more than one wife.
* Source: Foeken et al.,1989: Appendix 9

Appendix 7B
Sex and Marital Status of Heads of Households (%)

	Diani (N=100)	*Ukunda* (100)	*Roka(E)* (100)	*Mtwapa* (99)	*Total* (399)	*Coast* * (297)
Sex						
- male	88	90	92	97	92	91
- female	12	10	8	3	8	9
	100	100	100	100	100	100
Marital status						
- married, monogamously	68	66	47	56	59	51
- married, polygamously	11	18	41	33	26	33
- divorced/separated	12	8	4	2	7	7
- widowed	4	6	5	2	4	8
- single	5	2	3	6	4	1
	100	100	100	100	100	100

* Source: Foeken et al.(1989): Appendix 8

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Appendix 8A
Structures, Rooms and Occupants

	Diani (N=100)	*Ukunda* (100)	*Roka(E)* (99)	*Mtwapa* (97)	*Total* (396)	*Coast* * (297)
Living houses (aver. no. per h.hold)						
- main house	1.0	1.0	1.0	1.0	1.0	1.0
- other houses[1]	0.2	0.2	1.0	0.5	0.5	0.8
- boys' houses	0.1	0.1	0.7	0.3	0.3	0.3
Rooms (aver. no. per household)	2.7	3.4	4.5	3.8	3.6	3.5
Occupants per room (average)	2.7	2.3	2.4	2.5	2.5	2.8

1. Houses of second (or third) wives, married or unmarried children of the head, or brothers/sisters of the head.
* Source: Foeken et al.,1989: Appendix 10

Appendix 8B
Houses: Construction Materials (%)[1]

		Diani (N=100)	*Ukunda* (100)	*Roka(E)* (99)	*Mtwapa* (97)	*Total* (396)	*Coast* * (297)
Roof	- grass	4	2	4	5	4	22
	- makuti[2]	91	92	88	72	86	66
	- mabati (iron)	5	6	8	23	10	12
		100	100	100	100	100	100
Walls	- grass/makuti	22	8	29	4	16	12
	- mud + coral	59	77	62	82	70	79
	- cemented	12	11	5	6	9	8
	- blocks/other	7	4	4	7	6	-
		100	100	100	100	100	100
Floor	- sand/mud	90	87	88	86	87	91
	- cemented	9	13	11	13	12	8
	- other	1	-	1	1	1	1
		100	100	100	100	100	100
Improved Houses[3] (%)		19	18	14	26	19	15

1.The materials used in the construction of the best quality house - nearly always the "main house" - were recorded.
2.Made of the leaves of the coconut palm.
3.Houses with iron roof and/or stone walls and/or cemented floor
* Source: Foeken et al.,1989: Appendix 11

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Appendix 9A
Source of Drinking Water by Season (%)

		Diani (N=99)	*Ukunda* (100)	*Roka(E)* (100)	*Mtwapa* (99)	*Total* (398)	*Coast* * (297)
Wet season	- river	-	-	-	-	-	8
	- well	65	29	23	20	34	30
	- pond/dam	-	15	1	15	8	21
	- improved/protected	35	56	76	65	58	41
		100	100	100	100	100	100
Dry season	- river	-	-	-	-	-	3
	- well	71	37	65	23	49	27
	- pond/dam	-	9	1	12	6	12
	- improved/protected	29	54	34	65	45	58
		100	100	100	100	100	100

* Source: Foeken et al.,1989: Appendix 12

Appendix 9B
Distance to Drinking Water by Season (%)

		Diani (N=99)	*Ukunda* (100)	*Roka(E)* (100)	*Mtwapa* (99)	*Total* (398)	*Coast* * (297)
Wet season	- 0-10 min.	39	41	73	61	53	46
	- 11-30 min.	52	54	23	34	41	49
	- 31-60 min.	9	5	4	5	6	4
	- 60+ min.	-	-	-	-	-	1
		100	100	100	100	100	100
Dry season	- 0-10 min.	37	37	36	54	41	26
	- 11-30 min.	53	52	44	37	46	42
	- 31-60 min.	10	8	18	8	11	9
	- 60+ min.	-	3	2	1	2	23
		100	100	100	100	100	100

* Source: Foeken et al.,1989: Appendix 13

Appendix 9C
Waste Disposal (%)

		Diani (N=99)	*Ukunda* (100)	*Roka(E)* (100)	*Mtwapa* (99)	*Total* (398)	*Coast* * (297)
Latrine	- present	13	30	12	49	26	33
	- not present	87	70	88	51	74	67
		100	100	100	100	100	100

* Source: Foeken et al.,1989: Appendix 10

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Appendix 10A
Farm Size

	Diani (N=100)	*Ukunda* (100)	*Roka(E)* (100)	*Mtwapa* (99)	*Total* (399)	*Coast* * (297)
Total acreage						
- average	4.1	8.8	14.7	10.7	9.6	8.2
(standard deviation)	(2.0)	(4.1)	(15.3)	(7.7)	(9.6)	(9.8)
- distribution (%)						
0.0 - 0.9 acres	9	7	4	12	8	3
1.0 - 1.9 acres	-	-	1	7	2	10
2.0 - 2.9 acres	27	-	3	7	9	14
3.0 - 4.4 acres	3	8	4	3	5	21
4.5 - 5.0 acres	**50**	3	-	-	13	8
5.1 - 11.4 acres	11	29	5	5	13	22
11.5 - 12.0 acres	-	**44**	**58**	**43**	36	1
12.1 - 19.9 acres	-	9	11	6	7	9
20.0 + acres	-	-	14	16	8	11
	100	100	100	100	100	100

* Source: Foeken et al.,1989: data generated for this report

Appendix 10B
Labour [1]
(adult equivalents/household)

		Diani (N=100)	*Ukunda* (100)	*Roka(E)* (100)	*Mtwapa* (99)	*Total* (399)	*Coast* * (297)
Total household labour	(a)	3.1	3.1	4.8	4.6	3.9	4.3
- non-residents, wage empl.	(b)	0.1	0.1	0.6	0.5	0.3	0.6
- non-residents, other	(b)	0.0	0.0	0.2	0.1	0.1	0.1
- - resident household labour	(c)	3.0	3.0	4.0	4.0	3.5	3.6
- wage empl., full-time	(d)	0.8	0.5	0.3	0.8	0.6	0.3
- wage empl., part-time	(e)	0.7	1.2	0.7	0.7	0.9	0.5
- - total wage employment	(f)	1.2	1.1	0.7	1.1	1.0	0.5
- - - farm labour	(g)	1.8	1.8	3.3	2.9	2.5	3.1

1. See endnote 2; p.184.
* Source: Foeken et al.,1989: data generated for this report

Appendix 10C
Farm and Farm Labour

	Diani (N=100)	*Ukunda* (100)	*Roka(E)* (100)	*Mtwapa* (99)	*Total* (399)	*Coast* * (297)
Farm size / Farm Labour rate[1] (acres) / (labour equivalents)	2.2	4.8	4.4	3.6	3.8	2.7

1. Area ratio; see endnote 3; p.184.
* Source: Appendix 10A & 10B above

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Appendix 11A
Food Crop Production per Household

	Diani (N=20)		*Ukunda* (20)		*Roka(E)* (20)		*Mtwapa* (20)		*Total* (80)		*Coast ** (297)	
	%[1]	Av[2]	%	Av	%	Av	%	Av	%	Av	%	Av
cereals	80	114	85	122	95	446	90	631	88	328	80	352
pulses/legumes	55	31	75	20	65	59	70	132	66	60	37	14
cassava	85	726	100	1253	80	334	90	1354	89	917	74	363
bananas	50	7	85	48	60	9	90	124	71	47	52	17

1. Percentage of households cultivating crop type mentioned.
2. Average production per household of crop type mentioned, 1985/86, in kg (cereals,legumes) and number of plants (cassava, bananas).

* Source: Foeken et al.,1989: Table 13, Appendix 16/17

Appendix 11B
Distribution of Households by Level of Cereals and Cassava Production (%)

			Total (N=80)	*Coast ** (297)				*Total* (N=80)	*Coast ** (297)
Cereals	0	kg	13	20	Cassava	0	plants	11	26
	0.1-99	kg	26	19		1-99	plants	8	4
	100-224	kg	14	14		100-249	plants	13	18
	225-349	kg	10	13		250-499	plants	13	20
	350-499	kg	13	13		500-749	plants	23	21
	500-999	kg	19	15		750+	plants	34	12
	1000+	kg	6	6				100	100
			100	100					

* Source: Foeken et al.,1989: Appendix 18

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Appendix 12A
Value of Food Crop Production

	Diani (N=20)	*Ukunda* (20)	*Roka(E)* (20)	*Mtwapa* (20)	*Total* (80)	*Coast* * (297)
Per household						
value of food crops	1824	2649	2882	5768	3281	2207
(standard deviation)	(1394)	(2057)	(1945)	(4239)	(2994)	(2449)
Per consumer unit						
value of food crops	475	851	610	803	685	486
(standard deviation)	(379)	(690)	(598)	(418)	(548)	(540)

* Source: Foeken et al.,1989: Table 18

Appendix 12B
Food Energy

		Diani (N=20)	*Ukunda* (20)	*Roka(E)* (20)	*Mtwapa* (20)	*Total* (80)	*Coast* * (297)
Food self-sufficiency (%)							
- average		42	78	54	70	61	46
- distribution (%)	0.0	5	0	5	0	3	8
	0.1-49.9	55	45	45	20	41	61
	50.0-99.9	35	30	45	55	41	22
	100.0+	5	25	5	25	15	10
		100	100	100	100	100	100
Composition of staple food energy (%)							
- cereals		36	13	66	46	40	63
- cassava		49	67	14	31	41	24
- bananas		8	16	9	15	12	11
- pulses		7	4	10	8	7	2
		100	100	100	100	100	100

* Source: Foeken et al.,1989: Appendix 19 (area-ratios).

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Appendix 13A
Cash Crop Production by Crop Type

	Diani (N=100)		*Ukunda* (100)		*Roka(E)* (100)		*Mtwapa* (99)		*Total* (399)		*Coast ** (297)	
	%[1]	Av[2]	%	Av	%	Av	%	Av	%	Av	%	Av
- coconuts	23	6	78	77	85	284	63	32	62	100	60	33
- cashewnuts	46	16	77	66	75	77	75	101	68	65	54	16
- citrus / improved mango varieties	31	2	78	15	61	9	75	19	61	11	46	5
- sweet soursop / guava / mango (local var)	24	1	48	5	35	1	26	1	33	2	30	1
- pawpaw / passion fruit	60	39	28	9	27	8	48	6	41	15	28	2
- pineapple	18	4	35	18	10	5	8	7	18	9	6	2
- sugar cane / pepper / bixa	13	3	7	1	6	0.3	9	16	9	5	7	1

1. Percentage of households cultivating crop.
2. Average number of producing plants per household.
* Source: Foeken et al.,1989: Appendix 16 & 20

Appendix 13B
Tree Crop Production per Household
(coconut/cashewnut/citrus/improved mango)

		Diani (N=100)	*Ukunda* (100)	*Roka(E)* (100)	*Mtwapa* (99)	*Total* (399)	*Coast ** (297)
average (number of producing plants)		25	158	370	152	176	54
distribution (%)	0 plants	46	20	13	21	25	39
	1 - 9 plants	22	1	2	5	8	13
	10 - 24 plants	11	5	7	6	7	9
	25 - 49 plants	6	6	4	12	7	14
	50 - 99 plants	8	20	7	13	12	12
	100 - 249 plants	6	22	22	22	18	7
	250 + plants	1	26	45	20	23	6
		100	100	100	100	100	100

* Source: Foeken et al.,1989: Appendix 21

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Appendix 14
Livestock

	Diani (N=100)		*Ukunda* (100)		*Roka(E)* (100)		*Mtwapa* (99)		*Total* (399)		*Coast* * (297)	
	%[1]	Av[2]	%	Av	%	Av	%	Av	%	Av	%	Av
cows	2	0.1	17	1.8	15	1.3	24	1.1	15	1.1	18	4.3
goats/sheep	22	1.8	27	2.5	52	5.7	43	3.0	36	3.2	41	2.9
poultry	55	4.2	53	3.9	59	9.2	61	9.4	57	6.6	90	6.9
livestock units (lu)[3]												
- average		0.3		2.1		2.1		1.5		1.5		4.7
- distribution (%)												
0 lu		78		69		44		41		58		55
0.0-0.9 lu		14		8		18		25		16		19
1.0-1.9 lu		4		3		11		8		7		8
2.0-4.9 lu		2		10		15		20		12		6
5.0-19.9 lu		2		6		10		3		5		6
20.0-49.9 lu		-		4		2		2		2		4
50.0+ lu		-		-		-		-		-		3
		100		100		100		100		100		100

1. Percentage of households with livestock mentioned.
2. Average number of animals per household.
3. Livestock expressed in livestock units (lu), i.e. the number of cattle plus one-seventh of the number of goats/sheep.
* Source: Foeken et al.,1989: Appendix 22

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Appendix 15A **Value of Agricultural Production - 1**
(sh/household)

	Diani (N=100)	*Ukunda* (100)	*Roka(E)* (100)	*Mtwapa* (99)	*Total* (399)	*Coast* * (297)
Average						
- cash crops	1541	4034	5017	5105	3921	466
- livestock +	120	450	429	586	396	792
farm income	1661	4484	5446	5691	4317	1258
(standard deviation)	(2980)	(5942)	(6919)	(7536)	(6281)	(2825)
Distribution (%)						
-499 sh	43	23	21	22	27	65
500-999 sh	15	4	3	4	7	10
1000-1499 sh	8	5	8	8	7	6
1500-2499 sh	13	12	11	11	12	5
2500-4999 sh	15	25	22	19	20	5
5000-9999 sh	5	21	20	17	16	5
10000+ sh	1	10	15	18	11	2
	100	100	100	100	100	100

* Source: Foeken et al.,1989: Table 18 and data generated for this report.

Appendix 15B **Value of Agricultural Production - 2**
(sh/consumer unit)

	Diani (N=100)	*Ukunda* (100)	*Roka(E)* (100)	*Mtwapa* (99)	*Total* (399)	*Coast* * (297)
Average	464	1235	946	1046	922	244
(standard deviation)	(773)	(1801)	(1175)	(1853)	(1492)	(- -)

* Source: Foeken et al.,1989: Table 18

Appendix 15C **Agricultural Returns** [1]

	Diani (N=100)	*Ukunda* (100)	*Roka(E)* (100)	*Mtwapa* (99)	*Total* (399)	*Coast* * (297)
per acre [2,3]	823	762	537	1018	753	326
per farm labour (adult eq.)	1936	3963	2524	3952	3039	1153

1. Area ratios; see endnote 3, p.184.
2. Calculated for food crop and tree crop production combined; livestock excluded.
3. Calculated for total farm size.
* Source: Foeken et al.,1989: Table 19

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Appendix 16
Off-Farm Employment; Adult Population

	Diani		*Ukunda*		*Roka(E)*		*Mtwapa*		*Total*		*Coast* *	
	N	%	N	%	N	%	N	%	N	%	N	%
Employment Rate												
- adults; engaged in off-farm employment	162	52	188	57	164	31	194	41	708	43	326	25
- adults; not engaged in off-farm employment	152	48	139	43	362	69	280	59	933	57	977	75
total	314	100	327	100	526	100	474	100	1641	100	1303	100
Type Employment												
- regularly employed	46	28	40	21	83	51	95	49	264	37	168	52
- self-employed	62	38	109	58	50	30	36	19	257	36	100	31
- non-regular employed	35	22	20	11	6	4	18	9	79	11	58	17
- casual employment - local	19	12	19	10	25	15	45	23	108	15	*	*
total	162	100	188	100	164	100	194	100	708	100	326	100

* Source: Foeken et al , 1989: Appendix 24, 25A (Figures for coast population do not include local casual labour).

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Appendix 17A
Off-Farm Workers: Type of Employment by Sex (%)

	Diani	*Ukunda*	*Roka(E)*	*Mtwapa*	*Total*	*Coast* *
Men	(N=125)	(112)	(121)	(153)	(511)	(344)
- regularly employed	32	34	60	52	45	46
- self-employed	31	38	21	15	25	20
- non-regular employed	23	16	3	12	14	15
- local casual labour	14	12	16	21	16	19
	100	100	100	100	100	100
Women	(N=43)	(81)	(50)	(50)	(224)	(61)
- regularly employed	16	4	20	34	17	15
- self-employed	53	86	52	26	59	51
- non-regular employed	26	2	4	-	7	10
- local casual labour	5	7	24	40	18	25
	100	100	100	100	100	100

* Source: Foeken et al.,1989: data generated for this report

Appendix 17B
Off-Farm Workers: Place of Work and Residency (%)

	Diani (N=168)	*Ukunda* (193)	*Roka(E)* (171)	*Mtwapa* (203)	*Total* (735)	*Coast* * (405)
Place of work						
- in own location[1]	91	91	53	50	72	41
- in own district	1	2	25	10	9	9
- in Mombasa	5	7	13	36	16	42
- elsewhere	2	-	6	3	3	7
	100	100	100	100	100	100
Place of residence						
- household	94	92	59	76	80	45
- elsewhere (part-time)	1	1	4	1	2	12
- elsewhere (non-resident)	5	7	37	23	18	43
	100	100	100	100	100	100

1. Administrative location.
* Source: Foeken et al.,1989: Data generated for this report

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Appendix 18A
Annual Income from Employment - 1

(sh/household)	*Diani* (N=100)	*Ukunda* (100)	*Roka(E)* (100)	*Mtwapa* (99)	*Total* (399)	*Coast* * (297)
- average (sh)	9562	9602	8771	13285	10297	6560
(standard deviation)	(8342)	(8564)	(10518)	(12543)	(10241)	(9975)
- distribution (%)						
0 sh	10	6	30	8	14	38
1-2499 sh	18	19	9	12	15	9
2500-4999 sh	7	13	15	15	13	18
5000-9999 sh	22	23	11	17	18	11
10000-14999 sh	24	17	9	12	16	9
15000-19999 sh	9	12	10	11	11	5
20000+ sh	10	10	16	24	15	9
	100	100	100	100	100	100

Appendix 18B
Annual Income from Employment - 2

(sh/consumer unit)	*Diani* (N=100)	*Ukunda* (100)	*Roka(E)* (100)	*Mtwapa* (99)	*Total* (399)	*Coast* * (297)
Annual income per household						
- average (sh)	2463	2171	2054	2671	2339	1180
(standard deviation)	(2404)	(1950)	(3632)	(2946)	(2804)	(1573)

Appendix 18C
Contribution to Employment Income by Residency (%)

	Diani (N=100)	*Ukunda* (100)	*Roka(E)* (100)	*Mtwapa* (99)	*Total* (399)	*Coast* * (297)
full-time residents	95	92	59	83	84	58
part-time & non-residents	5	8	41	17	16	42
	100	100	100	100	100	100

Appendix 18D
Contribution to Employment Income by Type of Employment (%)

	Diani (N=100)	*Ukunda* (100)	*Roka(E)* (100)	*Mtwapa* (99)	*Total* (399)	*Coast* * (297)
regular employment	34	28	55	53	42	54
self employment	40	58	25	19	36	33
non-regular employment	15	6	4	8	9	12
local casual labour	11	8	16	20	14	*
	100	100	100	100	100	100

* Source: Foeken et al., 1989: Appendix 28A, 28B, 28C and data generated for this report.

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Appendix 19
Household Income *

	Diani (N=100)	*Ukunda* (100)	*Roka(E)* (100)	*Mtwapa* (99)	*Total* (399)	*Coast*** (297)
Per household						
- average (sh)	11223	14086	14140	18953	14589	7819
(standard deviation)	(8769)	(10696)	(13194)	(16307)	(12808)	(10875)
- distribution (%)						
-1000 sh	10	3	7	2	6	34
1000-2499 sh	7	7	7	3	6	7
2500-4999 sh	12	11	14	15	13	17
5000-9999 sh	20	24	24	18	22	14
10000-14999 sh	26	19	9	14	17	11
15000-24999 sh	15	23	20	19	19	9
25000+ sh	10	13	19	28	18	8
	100	100	100	100	100	100
Per consumer unit						
- average (sh)	2927	3406	2931	3680	3235	1425
(standard deviation)	(2613)	(2638)	(3667)	(3507)	(3147)	(1695)
- distribution (%)						
-499 sh	12	7	17	4	10	42
500-1499 sh	20	12	24	30	22	22
1500-2499 sh	21	29	21	10	20	14
2500-3499 sh	20	17	18	19	19	11
3500-4999 sh	12	13	6	11	11	6
5000+ sh	15	22	14	25	19	5
	100	100	100	100	100	100

* Excluding value of food crops
** Source: Foeken et al., 1989: data generated for this report

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Appendix 20

Economic Characteristics by Income Class

		IC1 <500sh/cu N=40		*IC2* <1500sh/cu N=86		*IC3* <2500sh/cu N=81		*IC4* <3500sh/cu N=74		*IC5* <5000sh/cu N=42		*IC6* >=5000sh/cu N=76	
members / household	average	7.7		8.8		10.0		8.9		8.7		5.1	
consumer units / household	average	5.3		5.9		6.5		5.9		5.9		3.3	
acres	average	8.3		9.3		9.2		8.8		10.3		11.2	
Household Labour (adult equivalents)													
Labour in employment	average	0.5		0.9		1.6		1.7		2.0		1.7	
Labour in farm cultivation	average	2.9		2.9		2.8		2.5		2.3		1.5	
total	average	3.4		3.8		4.5		4.2		4.3		3.2	
Employment													
regular employment	N [%]	3	12%	28	24%	48	27%	61	39%	47	46%	79	52%
self employed	N [%]	8	32%	35	30%	63	36%	63	40%	37	36%	54	36%
non-regular	N [%]	5	20%	13	11%	30	17%	15	9%	9	9%	10	7%
local casual	N [%]	9	36%	39	34%	34	19%	19	12%	10	10%	8	5%
total	N [%]	25	100%	115	100%	175	100%	158	100%	103	100%	151	100%
Income composition (sh/cu)													
farm income	average	149		428		643		606		929		2493	
wage income +	average	93		544		1333		2302		3227		6166	
income, total	average	242		972		1977		2909		4156		8658	
education head: >= standard 5	N [%]	1	3%	3	3%	4	5%	7	9%	3	7%	20	27%
education head: < standard 5	N [%]	38	97%	83	97%	76	95%	67	91%	39	93%	55	73%
	N [%]	39	100%	86	100%	80	100%	74	100%	42	100%	75	100%
house quality: improved *	N [%]	3	8%	11	13%	17	21%	16	22%	10	24%	20	27%
house quality: not improved	N [%]	37	93%	75	87%	63	79%	57	78%	32	76%	55	73%
	N [%]	40	100%	86	100%	80	100%	73	100%	42	100%	75	100%
latrine, present	N [%]	6	15%	21	24%	20	25%	17	23%	11	26%	29	38%
latrine, not present	N [%]	34	85%	65	76%	60	75%	57	77%	31	74%	47	62%
	N [%]	40	100%	86	100%	80	100%	74	100%	42	100%	76	100%

* houses with iron roof and/or stone walls and/or cemented floor

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Appendix 21

Economic Characteristics by Household Economy *

		Poor N=40		*Farmers* N=40		*Wage Earners* N=113		*Mixed* N=130		*Rich* N=76	
household size	average	7.7		7.2		8.0		10.7		5.1	
consumer units / household	average	5.3		4.9		5.5		7.0		3.3	
acres	average	8.3		11.7		6.0		11.4		11.2	
Household Labour (adult equivalents)											
Labour in employment	average	0.5		0.3		1.7		1.7		1.7	
Labour in farm cultivation	average	2.9		2.9		2.2		3.1		1.5	
total	average	3.4		3.2		3.8		4.8		3.2	
Employment											
regular employment	N [%]	3	12%	2	13%	84	34%	98	34%	79	52%
self employed	N [%]	8	32%	5	33%	74	30%	119	41%	54	36%
non-regular	N [%]	5	20%	4	27%	38	15%	25	9%	10	7%
local casual	N [%]	9	36%	4	27%	50	20%	48	17%	8	5%
total	N [%]	25	100%	15	100%	246	100%	290	100%	151	100%
Income composition - 1											
farm income (sh/household)	Av [%]	1002		5695		529		6049		8009	
wage income (sh/household) +	Av [%]	490		292		10447		11715		18078	
income, total (sh/household)	Av [%]	1492		5987		10976		17764		26087	
Income composition - 2											
farm income (sh/consumer unit)	Av [%]	149		1250		80		875		2493	
wage income (sh/consumer unit) +	Av [%]	93		56		2079		1720		6166	
income, total (sh/consumer unit)	Av [%]	242		1306		2159		2595		8658	

* The household economy classification is described on page xx and was defined on the basis of income level and income composition as listed below.
The classification used in this report differs slightly from a similar classification used in the companion report on the seasonality study (Foeken et al, 1989)

poor households	income	< sh 500/cu	
farmers	income	sh500/cu - sh 5000/cu	farm income > sh250/cu, wage income < 250/cu
wage earners	income	sh500/cu - sh 5000/cu	farm income < sh250/cu, wage income > 250/cu
mixed	income	sh500/cu - sh 5000/cu	farm income > sh250/cu, wage income > 250/cu
rich	income	> sh5000/cu	

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Appendix 22

Food Consumption: Ingredients

(% hholds consuming ingredient listed)

	Diani	*Ukunda*	*Roka(E)*	*Mtwapa*	*Total*	*Coast* *	Ingredient Number
	N=100	N=96	N=100	N=96	N=392	N=274	(for legend, see p.141)
Cereals							
maize, fresh	6	3	-	1	3	6	1
maize, dry	7	1	3	3	4	5	2
maize, flour	93	88	97	97	94	97	3
rice	14	33	4	6	14	6	4
wheat flour	15	14	6	2	9	6	9
millet flour	2	-	-	-	0.5	0.4	11
bread	47	50	11	28	34	15	13
other	23	33	6	6	17	17	5-6-10-12-14-15-16-17-84**
Grain legumes							
beans	15	10	7	14	11	6	22
grams, green	2	4	3	-	2	2	23
peas, cow	7	9	22	13	13	15	21
peas, pigeon	3	1	2	2	2	1	20
other	-	1	-	1	0.5	0.1	24-25
Roots, tubers & starchy fruits							
banana, cooking	9	7	-	16	8	2	37
cassava	36	44	8	27	29	18	35
potato, Irish	14	17	3	9	11	5	39
other	5	8	-	1	4	1	36-38-40-41
Vegetables							
cabbage	6	4	-	5	4	3	64
leaves, green	27	17	49	52	36	49	60
pumpkin-squash	1	-	-	-	0.3	0.5	66-67
tomato	55	51	24	34	41	21	63
other	7	4	3	9	6	3	61-62-65-68
Fruits							
banana, sweet	6	2	2	5	4	3	70
citrus	17	20	6	20	16	5	74-75
guava-passion	-	11	-	-	3	0.4	78-79
mango	5	16	8	14	10	8	71
paw-paw	15	6	4	3	7	2	72
pineapple	-	2	1	1	1	0.1	73
sugar cane	2	-	-	1	0.8	0.4	77
other	6	13	1	-	5	2	42-43-76-80-81

* Source: Niemeyer et al.,1991: Appendix 5; data consisting of repeated observations (5x) on 274 households.

** The figures for the category 'other' indicate the households that have used one or more of these food items

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Appendix 22, continued									
Food Consumption: Ingredients									
(% hholds consuming ingredient listed)									
		Diani	*Ukunda*	*Roka(E)*	*Mtwapa*		*Total*	*Coast*	Ingredient Number
		N=100	N=96	N=100	N=96		N=396	N=274	(for legend, see p.141)
Animal foods									
	chicken-poultry	5	5	7	3		5	4	48
	eggs	9	3	3	2		4	1	49
	fish,fresh	35	45	13	9		26	7	54
	fish, dry	25	25	17	27		23	33	55
	fish, other	16	26	3	8		13	6	56-57
	milk, cow (fresh)	31	49	13	21		28	21	50
	milk, other	2	2	-	-		1	0.5	51-52-53
	meat, beef	15	15	3	9		10	11	45
	other	-	4	6	3		3	1	46-47-58
Oils, fats & nuts									
	oils-fats-margarine	77	60	20	31		47	16	93-94
	coconut	35	67	76	66		61	45	30
	cashewnut	5	6	2	-		3	0.4	31
	other	-	-	-	-		-	0.4	32
Miscellaneous									
	sodas & syrup	-	1	1	-		0.5	0.2	90-91
	sugar	93	100	40	61		73	48	85
	other	17	4	-	3		6	2	86-87-88-89-92-95
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Appendix 23

Food Consumption: Ingredients

(average amount consumed per household - grs)

	Diani	*Ukunda*	*Roka(E)*	*Mtwapa*	*Total*	*Coast* *	Ingredient Number
	N=100	N=96	N=100	N=96	N=392	N=274	(for legend, see p.141)
Cereals							
maize, fresh	33	19	-	1	13	99	1
maize, dry	30	2	11	34	19	49	2
maize, flour	1531	1286	3034	3060	2229	2643	3
rice	169	320	50	92	157	54	4
wheat flour	90	68	73	32	66	62	9
millet flour	4	-	-	-	1	2	11
bread	291	322	60	186	214	78	13
other	73	135	26	24	64	60	5-6-10-12-14-15-16-17-84
Grain legumes							
beans	78	75	38	83	68	35	22
grams, green	4	8	32	-	11	11	23
peas, cow	31	48	197	130	102	151	21
peas, pigeon	30	5	18	18	18	8	20
other	-	8	-	16	6	1	24-25
Roots, tubers & starchy fruits							
banana, cooking	44	48	-	169	64	16	37
cassava	750	1498	126	812	789	402	35
potato, Irish	54	69	15	50	47	26	39
other	33	29	-	5	17	16	36-38-40-41
Vegetables							
cabbage	39	36	-	50	31	21	64
leaves, green	133	75	278	330	204	404	60
pumpkin-squash	12	-	-	-	3	15	66-67
tomato	125	91	100	122	110	67	63
other	8	17	21	36	20	15	61-62-65-68
Fruits							
banana, sweet	12	8	3	41	16	14	70
citrus	12	8	6	15	10	11	74-75
guava-passion	-	54	-	-	13	-	78-79
mango	9	63	31	163	65	61	71
paw-paw	202	70	52	55	95	20	72
pineapple	-	29	28	10	16	1	73
sugar cane	9	-	-	21	7	1	77
other	8	18	0.2	-	6	2	42-43-76-80-81

* Source: Niemeyer et al.,1991: data generated for this report - consisting of repeated observations (5x) on 274 households.

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Appendix 23, continued									
Food Consumption: Ingredients									
(average amount consumed per household - grs)									
		Diani	*Ukunda*	*Roka(E)*	*Mtwapa*		*Total*	*Coast*	Ingredient Number
		N=100	N=96	N=100	N=96		N=392	N=274	(for legend, see p.141)
Animal foods									
	chicken-poultry	27	16	47	17		27	23	48
	eggs	6	2	6	5		5	1	49
	fish,fresh	319	144	58	53		144	34	54
	fish, dry	27	20	44	33		31	39	55
	fish, other	35	100	4	25		41	22	56-57
	milk, cow (fresh)	198	328	116	197		209	211	50
	milk, other	4	6	-	-		2	1	51-52-53
	meat, beef	65	83	26	58		58	80	45
	other	-	17	82	19		30	10	46-47-58
Oils, fats & nuts									
	oils-fats-margarine	84	69	25	27		51	23	93-94
	coconut	81	226	499	254		265	153	30
	cashewnut	13	17	15	-		11	1	31
	other	-	-	-	-		-	1	32
Miscellaneous									
	sodas & syrup	-	21	91	-		28	1	90-91
	sugar	286	329	106	127		212	124	85
	other	7	1	-	1		2	1	86-87-88-89-92-95
xx									

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Appendix 23; continued

Legend: Ingredient numbers

1	maize, fresh
2	maize, dry
3	maize flour
4	rice
5	rice flour
6	wheat
9	wheat flour
10	millet
11	millet flour
12	cerelac
13	bread
14	biscuits
15	toast
16	cake
17	weetabix
20	pigeon peas
21	cow peas
22	beans
23	green grams
24	ground nut
25	bambara nut
30	coconut
31	cashewnut
32	simsim
35	cassava
36	cassava flour
37	cooking banana
38	sweet potato
39	Irish potato
40	yam
41	arrowroot
45	beef
46	goat/sheep
47	dikdik & antilope
48	poultry
49	eggs
50	milk, cow (fresh & sour)
51	milk powder
52	milk, goat
53	lactogen (milk formula)
54	fish, fresh
55	fish, dried
56	fish, fried
57	fish, roasted
58	other types of meat
60	leaf vegetables
61	brinjal
62	ocra
63	tomato
64	cabbage
65	carrot
66	gourd, squash, marrow
67	pumpkin
68	sweet pepper (green/red)
70	sweet banana
71	mango
72	pawpaw
73	pineapple
74	citrus (whole)
75	citrus (juice)
76	cashew apple
77	sugar cane
78	passion fruit
79	guava
80	mbirimbi
81	tamarind
84	buiton
85	sugar, glucose
86	sweets
87	cocoa
88	milo
89	roiko mix
90	sodas
91	syrup (treetop)
92	pilipili
93	blueband/jam
94	fat, oil
95	yeast

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Appendix 24
Energy and Protein Intake

	Diani N=99	*Ukunda* N=96	*Roka(E)* N=99	*Mtwapa* N=95	*Total* N=389	*Coast* N=274
Energy (kcalories/cu)						
Average	2929	3223	2494	2660	2825	2578
Distribution (%)						
<60% of requirements**	19	13	25	18	19	26
60-69% of requirements	5	3	12	12	8	11
70-79% of requirements	12	11	13	15	13	12
80-99% of requirements	23	20	18	20	20	20
>=100% of requirements	40	53	31	36	40	31
	100	100	100	100	100	100
Proteins (grams/cu)						
Average	75	77	72	71	74	72
Distribution (%)						
<60% of recommendations***	7	2	9	4	6	11
60-79% of recommendations	6	8	9	9	8	9
80-99% of recommendations	12	9	11	13	11	12
>=100% of recommendations	75	80	71	74	75	68
	100	100	100	100	100	100

* Source: Niemeyer et al.,1991: Appendix 9; data consisting of repeated observations (5x) on 274 households.

** Energy requirements: 2960 kcal/cu/day

*** Protein recommendation: 50g/cu/day

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Appendix 25A
Contribution Food Groups to Energy Intake
(kcalories/cu)

	Diani [N=99]	*Ukunda* [96]	*Roka* [99]	*Mtwapa* [95]	*Total* [389]	*Coast** [274]
Cereals	1721	1641	1868	1904	1784	1910
Grain legumes	137	97	151	120	127	112
Roots, tubers, etc.	312	560	31	211	277	144
Vegetables	24	16	24	31	24	34
Fruits	29	39	9	34	28	16
Animal foods	190	280	120	120	178	138
Fats, oils & nuts	240	311	218	147	229	120
Miscellaneous	276	279	73	92	180	103
Total	2929	3223	2494	2660	2825	2578

Appendix 25B
Contribution Macro Nutrients to Energy Intake
(kcalories/cu)

	Diani [N=99]	*Ukunda* [96]	*Roka* [99]	*Mtwapa* [95]	*Total* [389]	*Coast** [274]
Carbohydrates	2191	2351	1822	2051	2102	1974
Fats	438	562	384	323	427	316
Proteins	300	310	288	286	296	287
	2929	3223	2494	2660	2825	2578

* Source: Niemeyer et al.,1991: Appendix 10 and data generated for this report - consisting of repeated observations (5x) on 274 households

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Appendix 26A
Energy Intake by Origin
(kcalories/cu)

	Diani (N=99)	*Ukunda (96)*	*Roka (99)*	*Mtwapa (95)*	*Total (389)*	*Coast* (274)*
Own farm	594	679	885	901	764	880
Purchases/Other	2335	2544	1609	1758	2061	1697
	2929	3223	2494	2660	2825	2577

Appendix 26B
Contribution of Food Groups to Energy by Origin
(kcalories/cu)

	Diani (N=99)		*Ukunda (96)*		*Roka (99)*		*Mtwapa (95)*		*Total (389)*		*Coast* (274)*	
	home	other	home	other	home	other	home	other	home	other	home	other
Cereals	246	1475	86	1554	528	1340	502	1402	341	1442	578	1332
Grain legumes	33	104	4	93	102	49	65	55	51	75	55	57
Roots, tubers, etc.	228	84	383	177	29	2	191	20	207	70	116	25
Vegetables	14	9	9	7	19	5	24	7	16	7	30	4
Fruits	22	7	31	8	7	2	34	1	23	4	14	2
Animal foods	11	179	13	267	26	94	13	107	16	162	25	113
Fats, oils & nuts	38	202	153	159	174	44	73	75	109	120	59	61
Miscellaneous	1	275	0	278	1	72	0	91	1	179	1	102
Total	594	2335	679	2544	885	1608	901	1758	764	2059	879	1699

* Source: Niemeyer et al.,1991: Appendix 10; data consisting of repeated observations (5x) on 274 households.

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Appendix 27A
Contribution of Food Groups to Protein Intake
(grams/cu)

	Diani [N=99]	*Ukunda* [96]	*Roka* [99]	*Mtwapa* [95]	*Total* [389]	*Coast** [274]
Cereals	40.5	37.1	44.4	45.3	41.8	45.4
Grain legumes	9.2	6.6	9.9	7.9	8.4	7.4
Roots, tubers, etc.	1.8	2.9	0.2	1.2	1.5	0.8
Vegetables	1.8	1.3	2.2	2.6	2.0	3.0
Fruits	0.4	0.4	0.1	0.3	0.3	0.2
Animal foods	19.8	25.7	12.1	12.5	17.5	13.8
Fats, oils & nuts	1.3	3.2	3.0	1.6	2.3	1.4
Miscellaneous	0.2	0.0	0.0	0.0	0.1	0.0
Total	75.1	77.5	71.9	71.5	74.0	71.9

Appendix 27B
Protein Intake by Origin
(grams/cu)

	Diani [N=99]	*Ukunda* [96]	*Roka* [99]	*Mtwapa* [95]	*Total* [389]	*Coast** [274]
Own farm	13.2	9.2	28.0	22.5	18.3	25.4
Purchases/Other	61.8	68.2	43.9	49.0	55.7	46.4
	75.1	77.5	71.9	71.5	74.0	71.9

* Source: Niemeyer et al.,1991: Appendix 11 and data generated for this report - consisting of repeated observations (5x) on 274 households

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Appendix 28
Food Consumption by Income Class *

28A. Intake of Nutrients (average/consumer unit)	*IC1 (N=38)*	*IC2 (85)*	*IC3 (79)*	*IC4 (72)*	*IC5 (42)*	*IC6 (73)*
Energy (kcalories/cu)	2639	2804	2907	2705	2830	2974
Protein (grams/cu)	64	74	76	70	69	84

28B. Contribution Food Groups to Energy Intake (kcal/cu)	*IC1 (N=38)*	*IC2 (85)*	*IC3 (79)*	*IC4 (72)*	*IC5 (42)*	*IC6 (73)*
Cereals	1651	1958	1875	1729	1642	1684
Grain legumes	108	168	100	108	142	127
Roots, tubers, etc.	397	209	280	277	354	246
Vegetables	23	26	23	19	20	28
Fruits	30	22	19	19	42	42
Animal foods	116	94	172	161	156	342
Fats, oils & nuts	157	185	268	219	243	279
Miscellaneous	156	141	170	173	232	226
Total	2639	2804	2907	2705	2830	2974

28C. Contribution Macro Nutrients to Energy Intake (kcal/cu)	*IC1 (N=38)*	*IC2 (85)*	*IC3 (79)*	*IC4 (72)*	*IC5 (42)*	*IC6 (73)*
Carbohydrates	2059	2165	2153	2018	2153	2052
Fats	325	342	451	406	400	587
Proteins	255	297	303	281	277	334
Total	2639	2804	2907	2705	2830	2974

28D. Energy Intake by Origin (kcal/cu)	*IC1 (N=38)*	*IC2 (85)*	*IC3 (79)*	*IC4 (72)*	*IC5 (42)*	*IC6 (73)*
Own farm	1147	865	675	698	629	685
Purchases/Other	1491	1938	2232	2006	2201	2289
Total	2639	2804	2907	2705	2830	2974

28E. Contribution of Food Groups to Energy by Origin (kcal/cu)	*IC1 (N=38)*		*IC2 (85)*		*IC3 (79)*		*IC4 (72)*		*IC5 (42)*		*IC6 (73)*	
	home	other	home	other	home	other	home	other	home	other	home	other
Cereals	594	1058	467	1491	309	1566	294	1435	165	1477	245	1439
Grain legumes	32	76	96	72	38	62	36	72	51	92	39	88
Roots, tubers, etc.	391	6	160	49	137	143	209	68	254	99	212	35
Vegetables	19	5	21	5	16	7	14	5	9	12	18	10
Fruits	25	5	17	4	17	2	15	5	41	0	34	8
Animal foods	11	105	9	85	20	152	22	139	19	137	15	326
Fats, oils & nuts	77	80	96	89	139	129	108	111	90	153	121	158
Miscellaneous	0	156	0	141	0	170	1	171	0	231	1	225
Total	1149	1491	866	1936	676	2231	699	2006	629	2201	685	2289

* For definition of income classes, see appendix 20

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Appendix 29
Food Consumption by Household Economy *

29A. Intake of Nutrients (average/consumer unit)	*Poor (N=38)*	*Farmers (39)*	*W.Earners(109)*	*Mixed (130)*	*Rich (73)*
Energy (kcalories/cu)	2639	2733	2893	2766	2974
Protein (grams/cu)	64	74	78	69	84

29B. Contribution Food Groups to Energy Intake (kcal/cu)	*Poor (N=38)*	*Farmers (39)*	*W.Earners(109)*	*Mixed (130)*	*Rich (73)*
Cereals	1651	1879	1932	1725	1684
Grain legumes	108	169	125	121	127
Roots, tubers, etc.	397	172	233	327	246
Vegetables	23	30	26	18	28
Fruits	30	15	21	28	42
Animal foods	116	111	170	130	342
Fats, oils & nuts	157	244	221	225	279
Miscellaneous	156	115	167	192	226
Total	2639	2733	2893	2766	2974

29C. Contribution Macro Nutrients to Energy Intake (kcal/cu)	*Poor (N=38)*	*Farmers (39)*	*W.Earners(109)*	*Mixed (130)*	*Rich (73)*
Carbohydrates	2059	2035	2169	2108	2052
Fats	325	404	414	384	587
Proteins	255	295	310	275	334
Total	2639	2733	2893	2766	2974

29D. Energy Intake by Origin (kcal/cu)	*Poor (N=38)*	*Farmers (39)*	*W.Earners(109)*	*Mixed (130)*	*Rich (73)*
Own farm	1147	874	536	855	685
Purchases/Other	1492	1859	2357	1912	2289
Total	2639	2733	2893	2766	2974

29E. Contribution of Food Groups to Energy by Origin (kcal/cu)	*Poor (N=38)*		*Farmers (39)*		*W.Earners (109)*		*Mixed (130)*		*Rich (73)*	
	home	other	home	other	home	other	home	other	home	other
Cereals	594	1058	479	1400	250	1682	356	1369	245	1439
Grain legumes	32	76	108	61	37	88	59	62	39	88
Roots, tubers, etc.	391	6	83	89	139	94	244	83	212	35
Vegetables	19	5	22	7	17	8	13	5	18	10
Fruits	25	5	7	8	18	4	26	2	34	8
Animal foods	11	105	14	97	8	162	25	105	15	326
Fats, oils & nuts	77	80	160	84	67	153	132	94	121	158
Miscellaneous	0	156	0	115	1	166	1	191	1	225
Total	1147	1491	874	1859	536	2357	855	1912	685	2289

* For definition of household economies, see appendix 21

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Appendix 30
Adult Women: Nutritional Status & Illness

Sample Composition	*Diani*	*Ukunda*	*Roka(E)*	*Mtwapa*	*Total*	*Coast**
17-29yr	49	41	55	51	196	164
30-39yr	23	22	40	31	116	110
40-59	7	11	21	24	63	40
unknown	6	4	5	2	17	18
total	85	78	121	108	392	332

Weight	*Diani*	*Ukunda*	*Roka(E)*	*Mtwapa*	*Total*	*Coast**
Average (kg)	50.2	52.1	48.9	49.2	49.9	48.0
Distribution (%)						
<=39.9kg	4	9	7	5	6	11
40.0-44.9kg	19	15	20	28	21	25
45.0-49.9kg	29	21	31	34	30	30
50.0-59.9kg	40	36	36	25	34	29
>=60.0kg	8	19	6	8	10	5
	100	100	100	100	100	100

Height	*Diani*	*Ukunda*	*Roka(E)*	*Mtwapa*	*Total*	*Coast**
Average (cm)	156.6	156.1	153.5	154.0	154.8	153.6
Distribution (%)						
<=144.9cm	1	4	3	5	3	7
145.0-149.9	9	8	20	17	14	20
150.0-154.9	25	31	40	39	34	34
155.0-159.9	42	31	24	28	30	23
>=160.0cm	22	27	13	12	18	16
	100	100	100	100	100	100

Weight-for-height	*Diani*	*Ukunda*	*Roka(E)*	*Mtwapa*	*Total*	*Coast**
Average (kg)	91.7	95.5	92.2	92.4	92.8	90.4
Distribution (%)						
<=79.9%	14	14	14	11	13	17
80.0-84.9	13	13	14	18	15	18
85.0-89.9	20	12	17	19	17	17
90.0-94.9	19	14	18	21	18	18
95.0-99.9	12	9	12	9	10	12
>=100.0%	22	38	26	21	26	17
	100	100	100	100	100	100

Reported Illness	*Diani*	*Ukunda*	*Roka(E)*	*Mtwapa*	*Total*	*Coast**
ill during past 2 weeks (%)	61	42	38	44	45	45
no. of days ill (average) **	7.9	7.0	6.6	7.4	7.3	6.9

* Source: Niemeyer et al.,1991: Appendix 23; data consisting of repeated observations (5x) on 332 women
**Figures refer to ill women only

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Appendix 31
Children: Illness

		Diani	*Ukunda*	*Roka(E)*	*Mtwapa*	*Total*	*Coast**
Children, 6-23months		N=43	N=34	N=52	N=41	N=170	N=129
ill during past 2 weeks	%	77	76	50	66	66	69
no. of days ill	av.**	8.4	7.1	6.4	6.0	7.0	6.4
seeking treatment	% **	48	58	50	56	53	44

		Diani	*Ukunda*	*Roka(E)*	*Mtwapa*	*Total*	*Coast**
Children, 24-59months		N=68	N=65	N=109	N=57	N=299	N=255
ill during past 2 weeks	%	54	57	34	60	48	53
no. of days ill	av.**	6.9	6.0	6.2	7.2	6.6	5.7
seeking treatment	% **	41	32	54	53	45	30

		Diani	*Ukunda*	*Roka(E)*	*Mtwapa*	*Total*	*Coast**
Children, 60-119m		N=94	N=97	N=139	N=131	N=461	N=370
ill during past 2 weeks	%	50	47	30	37	40	37
no. of days ill	av.**	8.3	6.2	7.9	7.3	7.4	5.5
seeking treatment	% **	28	35	31	35	32	24

* Source: Niemeyer et al.,1991: Appendix 34; data consisting of repeated observations (5x) on 129, 255 and 370 children respectively.

** Figures refer to ill children only

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Appendix 32
Weight and Height by 3-month age groups

Age (months)	*N*	*Weight (kg)* average	s.d	*Height (cm)* average	s.d
06-08-	25	7.2	0.9	66.7	3.2
09-11-	27	7.6	0.9	68.5	3.2
12-14-	35	8.7	1.2	72.2	4.3
15-17	38	8.6	1.3	73.9	3.6
18-20	24	9.1	1.4	76.5	3.8
21-23	23	10.1	1.1	80.4	3.1
24-26	31	9.9	1.4	80.7	4.5
27-29	26	10.5	1.3	82.0	4.5
30-32	23	11.3	1.1	85.7	4.5
33-35	18	11.7	1.3	85.7	4.5
36-38	33	11.8	1.4	87.7	4.9
39-41	25	12.6	1.7	91.4	6.1
42-44	23	12.6	1.6	91.7	4.3
45-47	21	13.4	1.7	96.0	5.9
48-50	35	13.9	1.8	97.2	5.3
51-53	21	14.0	1.8	98.0	6.2
54-56	28	14.3	1.3	99.4	5.1
57-59	17	14.4	1.4	101.2	4.0
60-65	55	15.1	1.8	102.8	5.5
66-71	65	15.5	2.2	104.9	6.8
72-77	44	17.0	2.0	109.6	5.0
78-83	46	17.3	2.2	110.8	6.8
84-89	45	19.8	3.2	117.4	6.9
90-95	56	19.2	2.6	116.5	6.4
96-101	47	20.3	2.8	119.6	5.8
102-107	37	21.7	3.0	122.7	6.1
108-113	31	22.8	3.2	126.1	6.2
114-119	41	22.9	2.8	125.4	6.3

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Appendix 33
Anthropometry Children: weight-for-height

Age Group, 6-23 months	*Diani*	*Ukunda*	*Roka(E)*	*Mtwapa*	*Total*	*Coast**
	N=44	N=34	N=53	N=41	N=172	N=126
Average	93.4	92.0	96.9	93.5	94.2	92.6
Distribution (%)						
-79	2	6	4	5	4	9
80-84	9	15	8	12	10	9
85-89	30	18	15	17	20	22
90-94	25	18	23	20	22	23
95-99	11	29	17	24	20	17
100+	23	15	34	22	24	21
	100	100	100	100	100	100

Age Group, 24-59 months	*Diani*	*Ukunda*	*Roka(E)*	*Mtwapa*	*Total*	*Coast**
	N=68	N=65	N=110	N=58	N=301	N=262
Average	90.5	93.3	94.5	91.1	92.7	93.4
Distribution (%)						
-79	10	5	4	7	6	5
80-84	12	6	9	10	9	9
85-89	19	23	15	22	19	19
90-94	38	29	27	29	31	25
95-99	15	20	24	21	20	20
100+	6	17	22	10	15	21
	100	100	100	100	100	100

Age Group, 60-119 months	*Diani*	*Ukunda*	*Roka(E)*	*Mtwapa*	*Total*	*Coast**
	N=95	N=97	N=143	N=132	N=467	N=384
Average	90.1	91.4	93.8	92.6	92.2	92.3
Distribution (%)						
-79	8	6	1	3	4	3
80-84	15	9	11	9	11	11
85-89	27	27	23	27	26	25
90-94	22	25	23	27	24	26
95-99	18	24	21	20	21	19
100+	9	9	20	15	14	15
	100	100	100	100	100	100

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* Source: Niemeyer et al.,1991: Appendix 30; data consisting of repeated observations on 126, 262 and 384 children respectively

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Appendix 34
Anthropometry Children: height-for-age

Age Group, 6-23 months	*Diani*	*Ukunda*	*Roka(E)*	*Mtwapa*	*Total*	*Coast**
	N=44	N=34	N=53	N=41	N=172	N=127
Average	94.8	94.5	92.2	93.5	93.6	91.6
Distribution (%)						
-84	0	0	6	0	2	7
85-89	9	18	34	15	20	28
90-94	39	44	28	54	40	43
95-99	43	35	21	29	31	18
100+	9	3	11	2	7	4
	100	100	100	100	100	100

Age Group, 24-59 months	*Diani*	*Ukunda*	*Roka(E)*	*Mtwapa*	*Total*	*Coast**
	N=68	N=65	N=110	N=58	N=301	N=263
Average	94.5	92.6	92.7	93.2	93.2	91.8
Distribution (%)						
-84	4	2	7	2	4	11
85-89	13	32	23	28	24	26
90-94	43	42	32	42	38	35
95-99	16	18	31	19	23	20
100+	24	6	7	10	11	8
	100	100	100	100	100	100

Age Group, 60-119 months	*Diani*	*Ukunda*	*Roka(E)*	*Mtwapa*	*Total*	*Coast**
	N=95	N=97	N=143	N=132	N=467	N=386
Average	94.6	93.7	93.7	92.1	93.4	91.9
Distribution (%)						
-84	4	3	6	8	6	11
85-89	13	20	14	23	18	24
90-94	39	43	38	39	40	38
95-99	31	22	31	24	27	20
100+	14	12	10	5	10	7
	100	100	100	100	100	100

* Source: Niemeyer et al.,1991: Appendix 31; data consisting of repeated observations on 127, 263 and 386 children respectively

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Appendix 35
Anthropometry Children: weight-for-age

Age Group, 6-23 months	*Diani*	*Ukunda*	*Roka(E)*	*Mtwapa*	*Total*	*Coast**
	N=44	N=34	N=53	N=41	N=172	N=126
Average	84.5	82.8	82.4	82.6	83.1	77.8
Distribution (%)						
-59	0	3	2	2	2	6
60-69	7	12	11	5	9	17
70-79	30	35	32	37	33	36
80-89	36	21	30	32	30	29
90-99	20	24	17	17	19	9
100+	7	6	8	7	7	3
	100	100	100	100	100	100

Age Group, 24-59 months	*Diani*	*Ukunda*	*Roka(E)*	*Mtwapa*	*Total*	*Coast**
	N=68	N=65	N=110	N=58	N=301	N=263
Average	81.9	81.7	83.0	80.6	82.0	80.9
Distribution (%)						
-59	0	3	1	0	1	3
60-69	10	9	10	14	11	12
70-79	32	26	28	34	30	32
80-89	40	45	31	38	37	31
90-99	16	15	25	14	19	16
100+	1	2	5	0	3	5
	100	100	100	100	100	100

Age Group, 60-119 months	*Diani*	*Ukunda*	*Roka(E)*	*Mtwapa*	*Total*	*Coast**
	N=95	N=97	N=143	N=132	N=467	N=386
Average	80.4	79.8	82.0	77.8	80.0	77.6
Distribution (%)						
-59	2	0	2	2	2	5
60-69	17	18	13	17	16	20
70-79	33	40	28	42	36	36
80-89	32	22	38	27	30	26
90-99	11	15	13	6	11	10
100+	6	5	6	5	5	4
	100	100	100	100	100	100

* Source: Niemeyer et al.,1991: Appendix 32; data consisting of repeated observations on 127, 263 and 386 children respectively

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Appendix 36

Nutritional Condition : h-a * w-h classification

(% children in respective conditions)

Age Group, 6-23months			*Diani* N=44	*Ukunda* N=34	*Roka(E)* N=53	*Mtwapa* N=41	*Total* N=172	*Coast** N=126
	h-a	w-h						
malnutrition	<90	<85	2	6	2	5	3	6
wasted	>90	<85	9	15	9	12	11	12
stunted	<90	>85	7	12	38	10	18	28
normal	>90	>85	82	68	51	73	67	54
			100	100	100	100	100	100

Age Group, 24-59 months			*Diani* N=68	*Ukunda* N=65	*Roka(E)* N=110	*Mtwapa* N=58	*Total* N=301	*Coast** N=262
	h-a	w-h						
malnutrition	<90	<85	1	6	5	3	4	8
wasted	>90	<85	21	5	8	14	11	7
stunted	<90	>85	16	28	25	26	24	29
normal	>90	>85	62	62	62	57	61	56
			100	100	100	100	100	100

Age Group, 60-119 months			*Diani* N=95	*Ukunda* N=97	*Roka(E)* N=143	*Mtwapa* N=132	*Total* N=467	*Coast** N=384
	h-a	w-h						
malnutrition	<90	<85	3	3	4	2	3	5
wasted	>90	<85	20	12	9	10	12	10
stunted	<90	>85	14	20	17	29	20	31
normal	>90	>85	63	65	71	59	65	55
			100	100	100	100	100	100

* Source: Niemeyer et al.,1991: Appendix 33; data consisting of repeated observations on 127, 263 and 386 children respectively

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Appendix 37
Anthropometry by Income Class

Women	*IC1* N=39	*IC2* N=101	*IC3* N=95	*IC4* N=80	*IC5* N=40	*IC6* N=37
weight (kg)	49.3	49.6	49.6	49.1	50.4	53.5
height (cm)	153.8	154.2	154.8	155.3	155.0	156.8
weight-for-height	92.9	92.8	92.3	91.0	93.6	97.3
% below w-h(85)	31	29	33	29	25	11

Children, 6-23 months	*IC1* N=14	*IC2* N=39	*IC3* N=45	*IC4* N=43	*IC5* N=18	*IC6* N=13
height-for-age (average)	88.4	94.1	94.0	94.4	94.1	93.4
% below h-a(90)	57	18	27	9	22	15
weight-for-height (av.)	100.8	93.7	92.7	92.9	97.9	93.9
% below w-h(85)	7	13	22	14	11	8
weight-for-age (av.)	78.0	83.5	82.7	82.9	86.9	83.5
% with w-a (60-80)	57	38	38	49	28	46
% below w-a(60)	0.0	2.6	2.2	0.0	5.6	0.0

Children, 24-59 months	*IC1* N=29	*IC2* N=79	*IC3* N=88	*IC4* N=64	*IC5* N=23	*IC6* N=18
height-for-age (average)	92.1	93.4	93.5	92.3	93.0	95.8
% below h-a(90)	41	27	19	36	39	11
weight-for-height (av.)	95.0	92.3	93.0	92.9	91.4	89.8
% below w-h(85)	7	15	16	14	17	28
weight-for-age (av.)	82.5	82.0	82.7	80.9	80.7	83.1
% with w-a (60-80)	41	42	35	47	39	39
% below w-a(60)	0.0	0.0	3.4	0.0	0.0	0.0

Children, 60-119 months	*IC1* N=50	*IC2* N=129	*IC3* N=124	*IC4* N=86	*IC5* N=55	*IC6* N=23
height-for-age (average)	94.0	92.5	93.9	92.5	94.5	95.8
% below h-a(90)	18	27	23	29	16	9
weight-for-height (av.)	92.6	92.3	92.1	91.2	93.1	93.0
% below w-h(85)	18	17	15	16	9	13
weight-for-age (av.)	81.4	78.5	80.7	77.7	82.2	85.5
% with w-a (60-80)	46	52	45	63	55	43
% below w-a(60)	2.0	3.1	2.4	0.0	0.0	0.0

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Appendix 38
Anthropometry by Household Economy

Women	*Poor* N=39	*Farmers* N=41	*Wage* N=115	*Mixed* N=160	*Rich* N=37
weight (kg)	49.3	48.4	49.7	49.8	53.5
height (cm)	153.8	153.8	155.8	154.3	156.8
weight-for-height	92.9	90.9	91.5	93.2	97.3
% below w-h(85)	31	32	31	28	11

Children, 6-23 months	*Poor* N=14	*Farmers* N=16	*Wage* N=45	*Mixed* N=84	*Rich* N=13
height-for-age (average)	88.4	94.9	94.1	94.1	93.4
% below h-a(90)	57	25	18	18	15
weight-for-height (av.)	100.8	95.0	91.6	94.5	93.9
% below w-h(85)	7	19	16	15	8
weight-for-age (av.)	78.0	86.3	82.0	83.7	83.5
% with w-a(60-80)	57	31	42	40	46
% below w-a(60)	0.0	6.3	0.0	2.4	0.0

Children, 24-59 months	*Poor* N=29	*Farmers* N=36	*Wage* N=93	*Mixed* N=125	*Rich* N=18
height-for-age (average)	92.1	93.8	93.9	92.3	95.8
% below h-a(90)	41	25	20	34	11
weight-for-height (av.)	95.0	93.3	91.7	93.1	89.8
% below w-h(85)	7	8	14	18	28
weight-for-age (av.)	82.5	83.5	82.2	81.1	83.1
% with w-a(60-80)	41	36	41	42	39
% below w-a(60)	0.0	0.0	0.0	2.4	0.0

Children, 60-119 months	*Poor* N=50	*Farmers* N=40	*Wage* N=144	*Mixed* N=210	*Rich* N=23
height-for-age (average)	94.0	93.6	93.5	93.0	95.8
% below h-a(90)	18	30	24	24	9
weight-for-height (av.)	92.6	95.2	89.8	93.1	93.0
% below w-h(85)	18	8	24	10	13
weight-for-age (av.)	81.4	83.3	78.1	79.8	85.5
% with w-a(60-80)	46	35	54	55	43
% below w-a(60)	2.0	7.5	2.1	0.5	0.0

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Appendix 39
ANOVA's for Household Data (N=389)

	SOURCE	SUM OF SQUARES	DF	MEAN SQUARE	F-RATIO	P
39A	*Dependent Variable: Farm Income (Sh/household)*					
	District	631	1	631	16.76	.00
	Schemes*	417	2	208	5.53	.00
	Error	14503	385	38		
39B	*Dependent Variable: Farm Income (Sh/cu)*					
	District	1.73	1	1.73	0.90	.34
	Schemes*	26.31	2	13.15	6.81	.00
	Error	743	385	1.93		
39C	*Dependent Variable: Employment Income (Sh/cu)*					
	District	0.31	1	0.31	0.04	.84
	Schemes*	12.16	2	6.08	0.81	.44
	Error	2885	385	7.49		
39D	*Dependent Variable: Household Income (Sh/cu)*					
	District	0.17	1	0.17	0.02	.89
	Schemes*	23.28	2	11.64	1.25	.29
	Error	3586	385	9.32		
39E	*Dependent Variable: Energy Intake (Kcal/cu)*					
	District	11422789	1	11422789	8.70	.00
	Schemes*	5784615	2	2892307	2.20	.11
	Consumer units	20893704	1	20893704	15.91	.00
	Error	504341000	384	1313387		
*39F***	*Dependent Variable: Energy Intake (Kcal/cu)*					
	District	10127397	1	10127397	7.70	.01
	Schemes*	5665389	2	2832695	2.15	.12
	Consumer units	21259229	1	21259229	16.16	.00
	Wages regular employment	514030	1	514030	0.39	.53
	Error	503827000	383	1315474		
*39G***	*Dependent Variable: Energy Intake (Kcal/cu)*					
	District	12492172	1	12492172	9.52	.00
	Schemes*	6010088	2	3005044	2.29	.10
	Consumer units	21748536	1	21748536	16.57	.00
	Income self-employment	1653991	1	1653991	1.26	.26
	Error	502687000	383	1312498		
*39H***	*Dependent Variable: Energy Intake (Kcal/cu)*					
	District	11697288	1	11697288	8.89	.00
	Schemes*	5690350	2	2845175	2.16	.12
	Consumer units	20729019	1	20729019	15.75	.00
	Wages non-reg. employment	393866	1	393866	0.30	.58
	Error	503947000	383	1315788		
*39I***	*Dependent Variable: Energy Intake (Kcal/cu)*					
	District	12657186	1	12657186	9.71	.00
	Schemes*	5056963	2	2528481	1.94	.15
	Consumer units	17765849	1	17765849	13.63	.00
	Income local casual labour	5243442	1	5243442	4.02	.05
	Error	499097000	383	1303126		

* Comparison of schemes within districts
[Schemes with low agricultural potential (Diani/Roka) vs high agricultural potential (Ukunda/Mtwapa)]
** The different income results are not fully independent because of theoretical interdependence of income components.

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Appendix 40
ANOVA's for Data on Persons - 1

	SOURCE	SUM OF SQUARES	DF	MEAN SQUARE	F-RATIO	P
40A	*Dependent Variable: Height*					
	Group: Adult Women (N=371)					
	District	691	1	691	22.49	.00
	Schemes*	20	2	10	0.33	.72
	Error	11278	367	31		
40B	*Dependent Variable: Weight-for-height*					
	Group: Adult Women (N=371)					
	District	98	1	98	0.64	.43
	Schemes*	373	2	187	1.21	.30
	Error	56486	367	154		
40C	*Dependent Variable: Height-for-age*					
	Group: Children, 6-119months (N=1746)					
	Study Populations	618	1	618	23.45	.00
	Height mother	2328	1	2328	88.26	.00
	Error	45975	1743	26		
40D	*Dependent Variable: Weight-for-height*					
	Group: Children, 6-23months (N=170)					
	District	102	1	102	1.15	.28
	Schemes*	337	2	169	1.91	.15
	Days ill	619	1	619	7.01	.01
	Error	14563	165	88		
40E	*Dependent Variable: Height-for-age*					
	Group: Children, 60-119months (N=385)					
	District	50	1	50	1.98	.16
	Schemes*	81	2	41	1.61	.20
	Height mother	529	1	529	20.96	.00
	Error	9589	380	25		
40F	*Dependent Variable: Height-for-age*					
	Group: Children, 60-119months (N=385)					
	District	1	1	1	0.04	.85
	Schemes*	158	2	79	3.24	.04
	Height mother	424	1	424	17.40	.00
	Consumption units	207	1	207	8.50	.00
	Household income	142	1	142	5.83	.02
	Error	9209	378	24		

* Comparison of schemes within districts
[Schemes with low agricultural potential (Diani/Roka) vs high agricultural potential (Ukunda/Mtwapa)]

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Appendix 41
ANOVA's for Data on Persons - 2

	SOURCE	SUM OF SQUARES	DF	MEAN SQUARE	F-RATIO	P
41A*	*Dependent Variable: Height-for-age*					
	Group: Children, 60-119months, Kwale schemes (N=160)					
	Height mother	333	1	333	14.02	.00
	Consumption units	63	1	63	2.65	.11
	Farm income	25	1	25	1.07	.30
	Error	3703	156	24		
41B*	*Dependent Variable: Height-for-age*					
	Group: Children, 60-119months, Kwale schemes (N=160)					
	Height mother	281	1	281	12.71	.00
	Consumption units	50	1	50	2.26	.13
	Employment Income	282	1	282	12.75	.00
	Error	3446	156	22		
41C*	*Dependent Variable: Height-for-age*					
	Group: Children, 60-119months, Kilifi schemes (N=225)					
	Height mother	154	1	154	6.11	.01
	Consumption units	122	1	122	4.83	.03
	Farm income	140	1	140	5.57	.02
	Error	5572	221	25		
41D*	*Dependent Variable: Height-for-age*					
	Group: Children, 60-119months, Kilifi schemes (N=225)					
	Height mother	240	1	240	9.39	.00
	Consumption units	148	1	148	5.78	.02
	Employment Income	58	1	58	2.27	.13
	Error	5654	221	26		

* The different income results are not fully independent because of theoretical interdependence of income components

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Appendix 42
ANOVA's for Data on Persons - 3

	SOURCE	SUM OF SQUARES	DF	MEAN SQUARE	F-RATIO	P
42A	*Dependent Variable: Height-for-age*					
	Group: Children, 60-119months, in Farmer h.holds (N=32)					
	District	18	1	18	0.43	.52
	Height mother	14	1	14	0.33	.57
	Consumption units	20	1	20	0.48	.49
	Farm income	460	1	460	10.91	.00
	Error	1138	27	42		
42B	*Dependent Variable: Height-for-age*					
	Group: Children, 60-119months, in Farmer h.holds (N=32)					
	District	27	1	27	0.48	.50
	Height mother	48	1	48	0.83	.37
	Consumption units	111	1	111	1.94	.18
	Employment Income	50	1	50	0.87	.36
	Error	1548	27	57		
42C	*Dependent Variable: Height-for-age*					
	Group: Children, 60-119months, in Wage Earner h.holds (N=121)					
	District	42	1	42	1.62	.21
	Height mother	272	1	272	10.61	.00
	Consumption units	173	1	173	6.74	.01
	Farm income	25	1	25	0.96	.33
	Error	2979	116	26		
42D	*Dependent Variable: Height-for-age*					
	Group: Children, 60-119months, in Wage Earner h.holds (N=121)					
	District	66	1	66	2.65	.11
	Height mother	177	1	177	7.11	.01
	Consumption units	141	1	141	5.64	.02
	Employment Income	109	1	109	4.38	.04
	Error	2894	116	25		
42E	*Dependent Variable: Height-for-age*					
	Group: Children, 60-119months, in H.holds with Mixed Economy (N=170)					
	District	185	1	185	10.13	.00
	Height mother	180	1	180	9.85	.00
	Consumption units	47	1	47	2.59	.11
	Farm income	100	1	100	5.45	.02
	Error	3016	165	18		
42F	*Dependent Variable: Height-for-age*					
	Group: Children, 60-119months, in H.holds with Mixed Economy (N=170)					
	District	118	1	118	6.30	.01
	Height mother	232	1	232	12.40	.00
	Consumption units	65	1	65	3.48	.06
	Employment Income	30	1	30	1.63	.20
	Error	3085	165	19		

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ENDNOTES & REFERENCES

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Endnotes on Calculations & Miscellaneous Information

1. *Consumer Units (with page 30, 62)*

For the analysis of survey findings at household level, it is often important to standardize household size. The most common way is a straight count of the number of household members, which means that each member receives an equal weight. For certain (e.g., demographic) purposes, this is quite appropriate. For other purposes, however, a weighted summation is often needed because the requirements of household members differ from each other. For example, the food consumption of a child is less than that of an adult, but this is also true for other needs: shelter, clothing, transport, etc.

An approximation of the relative needs is offered by a physiological weighting, namely according to the nutritional requirements of individual household members. This incorporates various biological characteristics: age, sex, physiological status and physical activity level and it offers a fair approximation of overall requirements, also because food consumption forms a large part of overall consumption.

Weighting in this way is known by the term "consumer units". One consumer unit (cu) is equal to a reference adult male. The reference adult male of 20-29 years of age is estimated to need 2960 kcal per day. All other individuals are expressed as a ratio of this unit (adult male equivalents) on the basis of their estimated nutritional requirements. For the calculation of these requirements, the most recent international recommendations were used (WHO,1985). Further assumptions that were made in order to fit the reference standards to the circumstances in Coast Province concerned body size, pregnancy and lactation, activity patterns and disease. The energy requirements of the various age and sex groups, expressed in terms of consumer units, are as follows:

age	*male*	*female*	*age*	*male*	*female*	*age*	*male*	*female*
0yr	0.3cu	0.3cu	8-10yr	0.7cu	0.7cu	30-39yr	1.0cu	0.8cu
1yr	0.4cu	0.4cu	11-16yr	0.8cu	0.7cu	40-59yr	0.9cu	0.7cu
2-4yr	0.5cu	0.5cu	17-19yr	0.9cu	0.7cu	60yr+	0.7cu	0.6cu
5-7yr	0.6cu	0.6cu	20-29yr	1.0cu	0.8cu			

Next to age and sex, the residency and frequency of visits of each member has been taken into account to determine the final number of consumer units per household

2. *Farm Labour (with page 36, 47 & 109)*
Total household labour (a) was counted, as follows:

persons,	17-60 years;		1.0 adult equivalent
persons,	17-60 years,	schooling;	0.5 adult equivalent
children,	11-16 years,	not schooling;	0.5 adult equivalent
elderly,	60years and over;		0.5 adult equivalent

Resident household labour (c) was calculated by subtracting all non-resident household members from the total household labour (a-b);
Regular and non-regular employment were counted as full-time occupations, presumably leaving no time for farming activities (d);
Self employment and local casual labour were counted as part-time occupations, presumably leaving 50% time for farming activities (e);
Total wage labour (f) was calculated by counting full-time workers as 1.0 and part-time workers as 0.5 (d+0.5e);
Farm labour (g) was calculated by subtracting labour in wage employment from the resident household labour (c-f);
The time period concerned was mid-1985 to mid-1986.

Since this calculation also includes people and time ordinarily devoted to domestic and social activities, the figures necessarily give overestimates of actual labour input in agriculture.

3. *Ratios (with page 109, 119)*
Certain tables in this report present ratios, such as the number of rooms / house, the child/adult ratio and various indicators per consumer unit. There are two possible ways of calculating these ratios.
A. By calculating the ratio for each household (e.g. rooms/house) and subsequently calculating the average of the ratio over all households.
B. By separately summing the two individual factors in the ratio over all households, subsequently dividing the totals on each other.
The two methods can give quite different results for the same data. The discrepancy between the two methods tends to be larger when the factor used as the divisor in the ratio has a large standard deviation.

In this report the first method has mostly been used since we are primarily concerned with characteristics of the average household. The second method was used, however, in the case of certain agro-ecological factors. The latter is indicated in the tables as area ratio.

4. *Food Crop Cultivation (with page 37)*
As mentioned in Section 2, this was a rolling survey consisting of five successive rounds, in which different households were visited at different times of the year, to neutralize seasonal fluctuations. Information on food crop harvests was collected for the past period of 2-3 months, not the full year. As a result estimates for annual food production 1985/86 were only possible for 80 households, 20 per scheme, visited during the second round, which covered the harvest from the long rains of 1985. The production figures of these households were adjusted for the short rains of 1985/86 with the help of information from the third round (concerning 80 other households). The subgroup visited during the 2nd round is quite representative of the total group: income and income composition are not different from that of the total group of 399 households, as shown by the figures below (sh/household):

	Sub-sample 2nd round (N=80)	Total sample (N=399)
tree income	3,986 (27%)	3,921 (27%)
livestock income	371 (2%)	396 (3%)
employment income	10,505 (71%)	10,297 (70%)
	14,862(100%)	14,614(100%)

5. *Agricultural Production (with page 37,42)*
The value of the food crop production was estimated by using sh4 for one kg of harvested cereals (consumer price), cassava and bananas for home consumption (converted into cereal equivalents according to caloric values), and sh8 for one kg of harvested beans.

The value of the cash crop production was determined by estimating the monetary income from the sales of the produce of trees with a commercial value (commercial bananas were also included).

The value of livestock rearing consists of two elements:
a) the income from the sale of poultry and milk (the latter was corrected for "caretaker", in the sense that it concerned only milk from cattle that was taken care of by one of the household members or by hired labour);
b) the increase of the value of cattle and goats/sheep through reproduction.

In the case of six variables a maximum value was determined to prevent serious distortions in the mean values:
cassava: 3000 plants (7 cases); cash crop income: sh32500/household (5 cases); livestock: sh10000/household (2 cases); employment income: sh45000/household (5 cases); income from casual labour: sh 7500/household (1 case); household income: sh16000/cu (3 cases).

6. *Food Self-Sufficiency (with page 38)*
The level of food self-sufficiency was calculated for households on the basis of the following foodstuffs: cereals, beans, cassava and bananas.

For each of these crops, the total yield of the harvests of the long rains of 1985 and the short rains of 1985/86 (in kg) was estimated and multiplied with a certain percentage in order to obtain the net yield, e.g. the edible portion (90%, 100%, 86% and 67% for cereals, beans, cassava and bananas, respectively).

These figures were multiplied with the respective caloric values per kilogram (3400 for cereals and beans, 600 for cassava and 1100 for bananas) and added. For each household, this figure was divided by the average number of consumer units, thus obtaining the annual staple food production (in kcal) per consumer unit.

Energy requirements per cu. were estimated to be 2960 kcal per day, and it was assumed that 75% of this amount is generally provided by staple foods, resulting in a staple food requirement of 810,300 kcal per consumer unit per year.

The degree of food self-sufficiency is calculated by expressing the annual food production/cu as a percentage of the staple energy requirements.

7. *Cassava (with page 38)*
As regards cassava, the food-selfsufficiency calculations are not based on the number of plants harvested but on the number of plants reportedly cultivated. It was assumed that cassava plants have a growth period of 15.3 months and that, on average, they produce a harvested weight of 1 kg. This

weight is much lower than the potential weight of an individual plant cultivated and harvested under optimal conditions. Usually, however, only a fraction of the cassava planted will be used for own consumption, thus reducing the average (harvested) weight per plant as counted in the field. It has already been mentioned that crop yields further suffer as a result of infections by the mosaic virus. Cassava is often used as a reserve food, and when food shortages do occur, the crop will often be harvested before being fully mature. Usually this is not the case and the remainder of the crop may be left in the fields or sold for factory processing. The latter is done at a later stage and at a much lower price than the cereal equivalent prices used in this report.

The findings therefore do not mean that 50% of the staple diet of the households consists of cassava. Nevertheless the cassava is there, and has to be counted as part of the household food production, even though people, in actual practice, often prefer to purchase maize meal.

8. Estimated Areas under Cultivation (with page 39,48)

The areas under crops were not measured in the field but estimated on the basis of the reported crop/plant figures for the respective schemes and certain assumptions about production and spacing, detailed below.

	Diani	*Ukunda*	*Roka(E)*	*Mtwapa*	*Total*
acres under food crops	1.7	3.1	3.1	3.9	2.9
acres under tree crops +	1.0	4.7	8.8	5.6	5.0
est.area cultivated	2.7	7.8	11.8	9.5	8.0

The area required for food crops was estimated on the basis of the results for the sub-group for which data on food cultivation were available (N=80; endnote 4). The degree of food self-sufficiency of each scheme (Appendix 12B) was converted into the required kilograms of maize which in turn was converted in an estimate of the area under cultivation assuming a maize production of 750kg/ha (Waayenberg,1987).

The area required for the reported tree crops was estimated on the basis of the results for all households (N=399). The average number of trees in each scheme (Appendix 13A) was multiplied by the average space occupied per tree/plant and added together (Purseglove,1974a,b: coconut -70m^2; cashewnut - 200m^2; citrus/ improved mango - 8m^2; pawpaw-passion fruit - 10m^2).

9.Food Poverty Line & Minimum Existence Level (with page 43)

The food poverty line was defined as the annual household income needed to purchase the amount of calories required to meet the minimum nutritional needs of household members and was calculated at sh990/cu (rounded at sh1000/cu). The calculation method used is derived from that of the Fifth World Food Survey (FAO, 1987) and is further detailed in Foeken et al., 1989.

The minimum existence level of sh1450/cu is based on the food poverty figure, but allowing 30% for non-food expenses.

The food poverty line is a quite different concept from that of food self-sufficiency explained in endnote 6, p.185. Food self-sufficiency refers to the food production of a household in terms of staple foods (which are assumed to account for 75% of the recommended daily intake needed for a normal healthy and active existence (2960 kcal)). The food poverty line refers to the

'purchasing power' of a household necessary to assure a minimum energy supply for daily survival with minimum activity (2115 kcal/day).

10. *Household Economy Classification (with page 55)*
The classification is similar in design to that developed in the companion survey (Foeken et al.,1989) with the difference that in this case food production value is not included. To allow for this the lower critical value of wage income and farm income have been adjusted from sh500 to sh250/cu. Because the incomes in the settlement schemes are higher, the upper critical value (rich households) could be adjusted from sh4000 to sh5000/cu.

11.*Food Consumption (with page 67)*
The household method of measuring food consumption does not cover food that is eaten elsewhere. This may consist of food that is eaten during visits to family or neighbors and meals or snacks eaten in schools, restaurants or at stalls. In the present case it was recorded which of the household members had taken any meals elsewhere, although no effort was made to inquire what and how much was eaten. Among the general population the number of people taking breakfast or lunch elsewhere averages less than 1.0 person: being about 0.3 per household but only 0.1 for the evening meal.

Average number of people per household having meals elsewhere

	settlements	coast general
morning	0.27	0.33
mid-day	0.65	0.31
evening	0.16	0.12

The figures for the settlements are quite similar with the exception that about double the number of people are taking lunch elsewhere. The larger number mainly consists of schoolchildren and persons with employment. Nearly all of them come home for the evening meal.

Average number of people having lunch elsewhere by type occupation

	settlements	coast general
no occupation	0.19	0.19
schooling	0.16	0.04
employment	0.30	0.09
total	0.65	0.31

This accords with the higher rate of employment in the settlement households, but it also means that the food consumption in these households may have been undercalculated. An estimate was subsequently made of the magnitude of this possible error, correcting for children having school-meals and employed persons taking lunch at work (assuming that in these cases 40% of the daily energy needs are met - 5 days a week). For the population in total the error is at most 1.6%. In some schemes or certain types of households it could be higher but not more than 2.4%. The results of further statistical analysis, notably the analysis of variance in table 28, remains unaffected.

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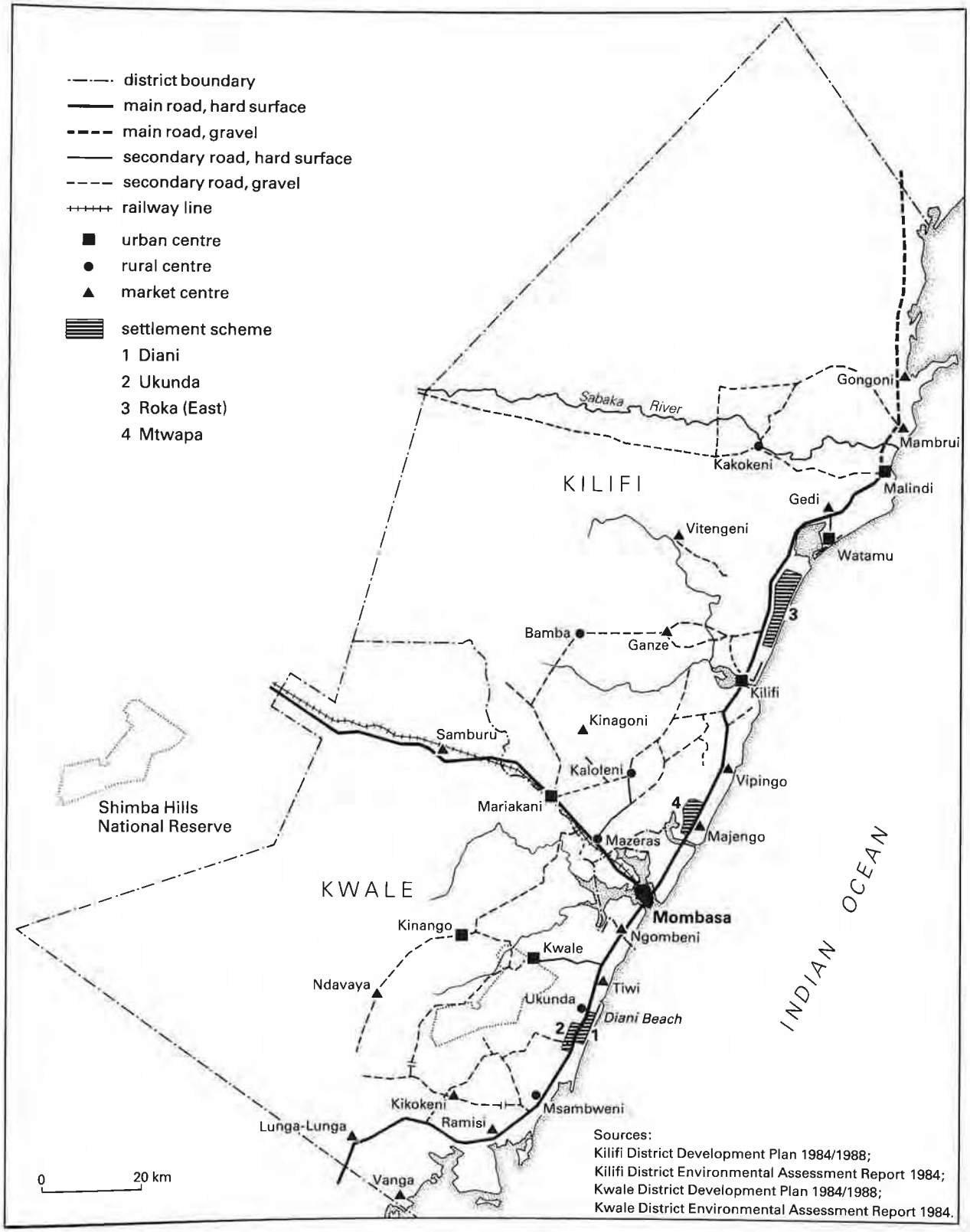
district boundary
main road, hard surface
main road, gravel
secondary road, hard surface
secondary road, gravel
railway line
urban centre
rural centre
market centre
settlement scheme
1 Diani
2 Ukunda
3 Roka (East)
4 Mtwapa
Sabaka River
Gongoni
Mambrui
Kakokeni
Malindi
KILIFI
Gedi
Vitengeni
Watamu
Bamba
Ganze
Kilifi
Kinagoni
Samburu
Kaloleni
Vipingo
Shimba Hills
National Reserve
Mariakani
Majengo
Mazeras
KWALE
Mombasa
Kinango
Ngombeni
Kwale
Ndavaya
Tiwi
Ukunda
Diani Beach
INDIAN OCEAN
Kikokeni
Msambweni
Ramisi
Lunga-Lunga
Vanga
0
20 km
Sources:
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