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Food and Nutrition Studies Programme

# Farming Systems and Food Security in Kwale District, Kenya

Cora van Oosten

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1989

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# Acknowledgements

This study could only be accomplished with the help of a large number of people, to whom I am very grateful. First of all I would like to mention the African Studies Centre and its staff members, for offering me the facilities to carry out this research. In particular, I wish to thank Ted Kliest, who was my supervisor initially. Piet Leegwater has taken over this supervision, with at least the same amount of knowledge and enthousiasm. His ideas have contributed a lot to the final document. Dick Foeken and Jan Hoorweg gave valuable assistance with the transformation of the preceding M.A. Thesis into the present report. Further, I would like to mention Willem Veerman, who helped me patiently with the computer work (which is not my forte), and David Stelpstra, who spent a lot of time copying and reproducing photographs and texts. I am also grateful to Prof. Dr. J. Hinderink, Faculty of Spatial Sciences, University of Utrecht, who has kept a watchful eye over the scientific value of the study.

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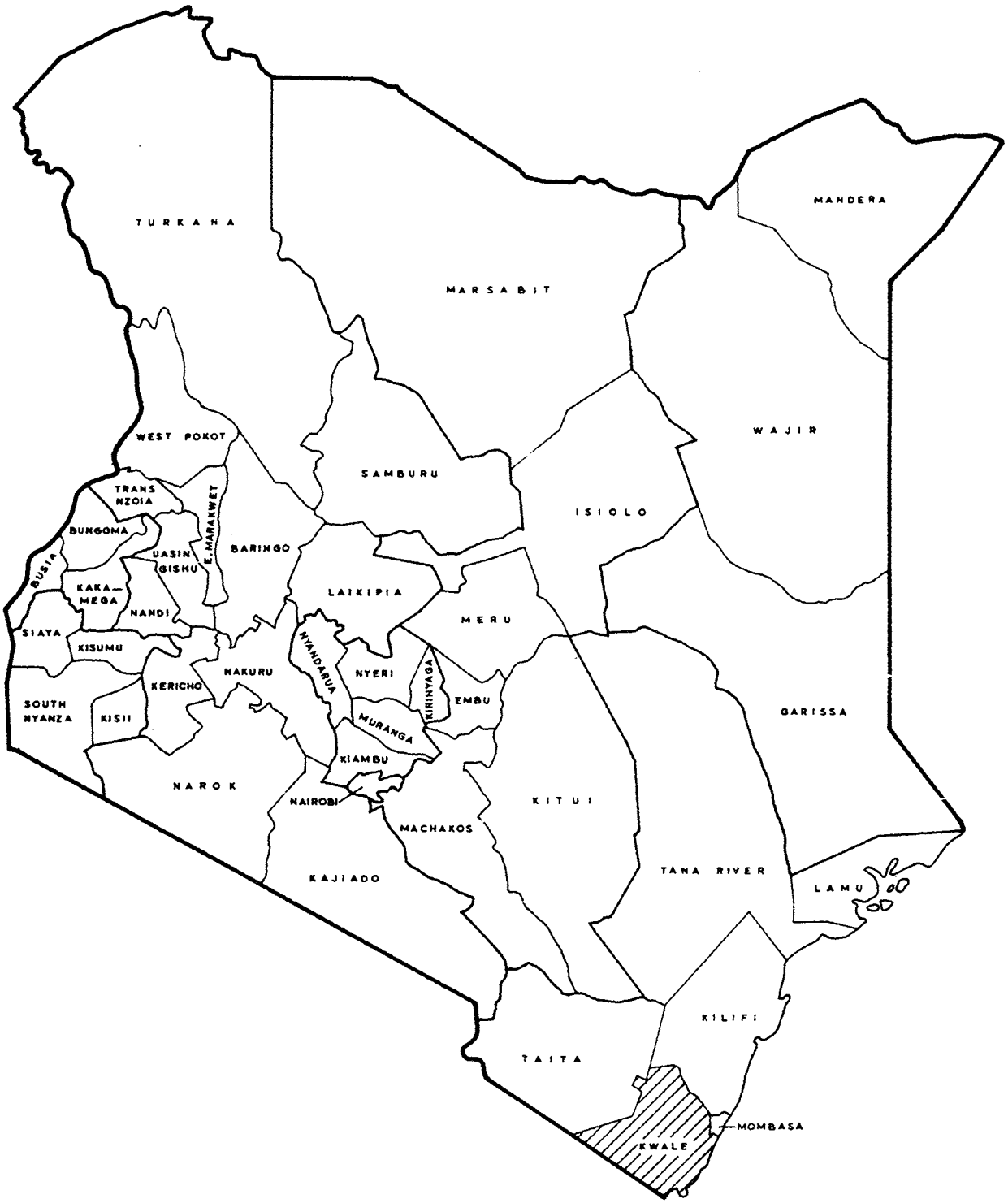
Finally, I would like to dedicate this paper to the children of Nzovuni Primary School, who became dear to me.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MACHAKOS
KAJIADO
TANA RIVER
LAMU
KILIFI
TAITA
KWALE
MOMBASA

# Summary

In order to provide some in-depth information to the Food and Nutrition Studies Programme in Coast Province (a joint programme of the African Studies Centre in Leiden, the Netherlands, and the Ministry of Planning and National Development in Nairobi), the present study has concentrated on farming systems in Kwale District. More specifically, the study pays attention to agricultural production, the importance of off-farm employment for the rural population, as well as the relationships between these two activities. Furthermore, these results will briefly be related to the topics of agricultural development and the government's agricultural policy towards the areas concerned.

The study itself has been carried out in two villages, located in different agro-ecological zones. Kibandaongo is located in the low-potential Livestock-millet Zone (CL5), and has poor infrastructural connections with Mombasa. The area is inhabited by the partly animistic, partly Islamic Duruma, who have a rather traditional form of social organization. Bongwe is located in the relatively high-potential Coconut-cassava Zone (CL3), and has very good connections with both Mombasa and Diani Beach. This area is inhabited by the Islamic Digo, and has a more modern social organization, which has been highly influenced by the coastal Arabs and Swahili.

The study shows that the areas differ considerably regarding agricultural performance and the role of additional incomes. These differences, however, are not primarily caused by differences in agro-ecological potential, but rather by differences in the socio-economic sphere. Possibilities for off-farm employment in Bongwe are much greater than in Kibandaongo. Because off-farm activities provide a more reliable income and a higher social status than farming alone, the male population of Bongwe prefers to be involved in off-farm employment. For the female population of Bongwe, off-farm employment can provide a certain independence, something which also applies to the younger male population. This combination of reasons leads to a neglect of agricultural activities, especially food crop production.

In Kibandaongo, where access to off-farm employment is limited, the population remains dependent on a relatively low and unreliable agricultural production, and is subject to frequent food shortages.

These conditions are likely to have consequences for both agricultural development and the agricultural policies of the government. Farm households which are dependent on agricultural production, and which would therefore directly benefit from agricultural improvements, do not have access to the capital required for such improvements. On the other hand, those households which do have access to certain amounts of capital have minimized their agricultural production and are not interested in agricultural improvements.

If the government wants to maintain its objectives of increasing agricultural production and productivity, it will have to take a considerable number of measures in order to make agricultural production more attractive to the population. It might be more realistic to readjust the policy at district level, by putting more emphasis on the development of off-farm employment, in keeping with the interest of the population. Moreover, this would ease the increasing pressure on the ecological resource base, which already shows considerable forms of degradation.

# Introduction

In many ways the food and nutritional situation in Kenya gives reason for concern. Less than 20 per cent of the surface area consists of land suitable for crop production. The country has one of the highest rates of population growth in the world, while some trends in food production have given reason for concern in past years (Kliest, 1985). By African standards, the total number of people that have to be supported per hectare of agricultural land is high. In some parts of the country the pressure on land has become a serious constraint, making further increases in agricultural production dependent on the possibilities of increasing yields per hectare of crop land (Mwangi, 1981). Development of new land is only possible in arid and semi-arid environments, where serious food problems often have to be faced.

In addition to the task of securing food self-sufficiency on the national level, the government also has to ensure the food supply to the different regions of the country. Kenya has a great variety of ecological conditions; the differences in farming conditions are many and they are accompanied by profound cultural differences between the various ethnic groups. The problems inherent in assuring the food supply to the different regions of the country are greatly complicated by this variation in conditions and practices and by the differences between seasonal cycles in different parts of the country.

The Food and Nutrition Studies Programme (FNSP) has recently carried out several studies in Coast Province. The main study, on seasonality, consisted of a large-scale survey on agricultural production, food consumption and nutritional status of smallholder families. In this context, detailed knowledge was required about the relation between agricultural production and the role of additional rural incomes.

The present study provides such detailed material. It covers two villages in Kwale District, which are situated in different agro-ecological zones and which are marked by different socio-economic characteristics. The main objective of the study is to provide insight into how rural households organize their agricultural production activities under varying agro-ecological circumstances, as well as to provide insight into the role

and importance of additional rural incomes, given the geographical differentiation of the various kinds of activities.

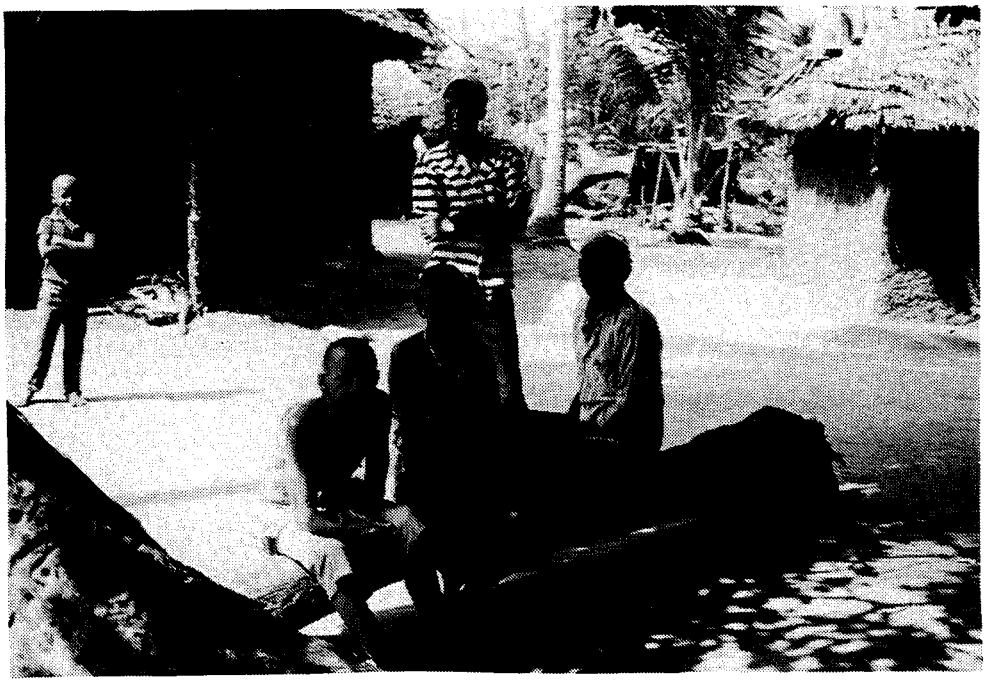
This has been done by means of an in-depth study carried out in two locations selected from the main FNSP-study. These two locations are situated in different agro-ecological zones: Kibandaongo in CL5 (Livestock-millet Zone) and Bongwe in CL3 (Coconut-cassava Zone). In both locations 15 households were selected at random, forming a total core population of 30 households.

The period of data collection lasted from February to September 1986, a period which included the complete agricultural cycle of the long rainy season. During this period the researcher alternately stayed in the two research locations. In both villages the researcher became more or less "adopted" by local families, which opened the way to observing and experiencing the village life, and obtaining a lot of "inside" information.

The main frame of data collection has been a general questionnaire conducted among the selected households (see Appendix III). This questionnaire was divided into five sub-inquiries, according to the main agricultural activities. Additional information was gathered through a large number of irregular and informal visits to the households. Open discussions, interviews and role plays with the local population, local leaders, elders, school teachers etc., provided much insight into local living conditions. Finally, regular contacts - through formal and informal interviews - with government officers, extension workers and staff members of the district research stations provided information about general policies, problems and progress in the district.

The formal inquiries and part of the informal interviews were conducted with the help of a field assistant and interpreter, who was familiar with the Mijikenda customs and the local languages.

1. One of the surveyed households in Kibandaongo



2. One of the surveyed households in Bongwe

# Chapter 1

# Theoretical framework and research objectives

In response to the pressing situation as outlined in the introduction, the government of Kenya has re-emphasized the high priority for agricultural development and improved food security (Republic of Kenya, 1986). Challenging goals and targets for the agricultural sector have been set for the year 2000: sufficient food production for an estimated population of 35 million; yearly increases in family incomes of 5%; increases in agricultural productivity and export crop production and growth of off-farm employment in the rural areas. To achieve these goals, the government intends to stimulate the expansion of more productive farming practices and a diversification of crops that produce higher incomes and generate more employment. These policies are notably aimed at redressing the economic balance between the rural and urban sectors of the economy.

Summarizing these policies, it can be said that high priority is given to an increase of agricultural production and productivity, which has to be achieved through an intensification of production methods and land-use. This agricultural intensification should stimulate a growth of rural off-farm employment, especially those types of employment which are closely linked with agricultural production. The way to achieve such a development, however, is related to the agro-ecological potential of each specific region.

The interactions between these three key elements - agro-ecological potential, farm production and off-farm employment - have been a frequent topic of scientific discussion in which the findings of the several proponents have been far from uniform.

### *Agro-ecological potential*

It is generally agreed that the agro-ecological potential of a certain area largely determines the range of crops which can be grown, and - apart from the techniques which are used - their yielding potential. As a result, different agro-ecological potentials imply different types and levels of agricultural production, which might lead to differences in regional development.

Most authors subscribe to this view of the relation between regional differences and differences in agro-ecological potential (Collier, 1980; Freeman & Norcliffe, 1985; Herlaar, 1987; Sonnema, 1987). Some authors, however, also stress that agro-ecological potential is not the only determining factor which causes regional differences. Sharpley (1986, p. 18) for example states that *"rural incomes are related not only to agro-climatic zones but are also influenced by the geographic pattern of government spending, incentives for industrial location, and the extent to which the rural labour force has access to the better paying jobs in the non-agricultural sector"*. Lavrijsen (1984), too, connects these off-farm activities with agro-ecological potential. Besides the fact that areas with a high agro-ecological potential offer possibilities for commercial farming, investments in agriculture, and higher production levels, he notes that in high potential areas also the opportunities for off-farm employment are higher.

### *Agricultural production and productivity*

Agricultural production and productivity have long since been a recurrent subject of development-oriented research. Especially during the fifties and sixties, methods to raise outputs per unit of land area were developed, both in order to raise the production of export crops and to increase the level of national food self-sufficiency. Usually, these methods concentrated on one single commodity crop. They were developed in research stations, after which the results were transmitted to a relatively small group of "progressive farmers". In the longer term, the new technologies were supposed to find their way to the mass of small-scale farmers, according to the rules of the so-called "trickling-down mechanism".

During the end of the sixties and the early seventies, however, the results of this "Green Revolution" appeared to be disappointing. Although a number of countries had succeeded in raising their total (food) production, the level of existence of the rural masses had failed to improve. The majority of production increases had taken place on the larger farms which had access to the new technologies, while the rural masses often faced deteriorating circumstances. The main reason for this failure turned out to be that conditions in the research stations differed considerably from the circumstances under which farmers had to carry out their production activities (Norman, 1980). It became clear that new approaches had to be developed, in order to deal with agricultural production in relation to its specific environment.

Thus, several authors tried to classify the agricultural sector into different "farming systems", either based on land utilization and soil management (see for example Ruthenberg, 1974), or on production structures and farm organisation (see for example Collinson, 1972). These "farming systems" usually covered large regions in which production conditions were assumed to be more or less uniform. The central theme of these classifications was that each farming system has its own potential and requirements for an increase of production.

Still, there continued to be a wide gap between, on the one hand, the level on which research was carried out and policies were formulated, and, on the other, the farmers who are the actual agricultural producers. It has only recently been admitted that research priorities and methods to increase production and productivity should be adapted to the specific conditions and constraints of the environment directly surrounding individual farmers. Investigations made clear that these conditions and constraints consist not only of agro-ecological and biological factors, but also of social, economic and cultural factors. If all these factors have to be included, research must necessarily be of a more holistic character. Besides, a flexible methodology is needed in which region-specific and household-specific characteristics occupy a central place (Gilbert et al., 1980; Fresco, 1986). This means that the farm households should be taken as the research units.

Since then, a multitude of research approaches have been developed, all characterised by the systematic way in which they address the farm household. This is commonly referred to as Farming Systems Approach (Fresco, 1988). Farm improvement remains

the central target, but it is placed within a context of objectives, possibilities and constraints of the individual households (Gilbert et al., 1980; Norman, 1980). In this way, agricultural research aims to develop improvements and techniques to improve the functioning of the entire farming system, in terms of its own objectives (Schipper, 1988). It must be clear that the Farming Systems Approach is primarily a research approach and not a development strategy, although its results may have implications for development planning (Fresco, 1988).

As in all relatively new approaches, there is still confusion about the actual methodologies and terminologies. A great deal of this confusion seems to be caused by the interdisciplinary character of the Farming Systems Approach. Where researchers of different disciplines have to work in one team, it tends to be difficult to create one common frame of reference (Box, 1983). Still, an integration of technical and biological disciplines with the more social and economic disciplines is urgently required in order to analyse farming systems in all its complexity (van Dusseldorp, 1982; Richards, 1983).

An example of this is provided by the way in which the off-farm sector is approached. Rightly, in the majority of studies within the Farming Systems Approach, agricultural activities are stressed as being the major activities of farm households, while little attention is paid to off-farm activities. Examples of more socio-economically oriented studies, however, show that off-farm activities often play an important role in the rural economy. If the Farming Systems Approach is too strongly agriculturally biased, there is the risk of underestimating the role and influence of off-farm activities on agricultural production and productivity.

Figure 1.1 presents a graphic representation of a general farming system model as it might be applicable to the situation in Kwale District. For many farmers, food security forms the main objective of their activities. For others, a higher level of living is aimed at, resulting in saving practices. These objectives can partly be accomplished by means of the resources the farm has to offer - subdivided into food production, tree crop production and livestock production - and off-farm activities.

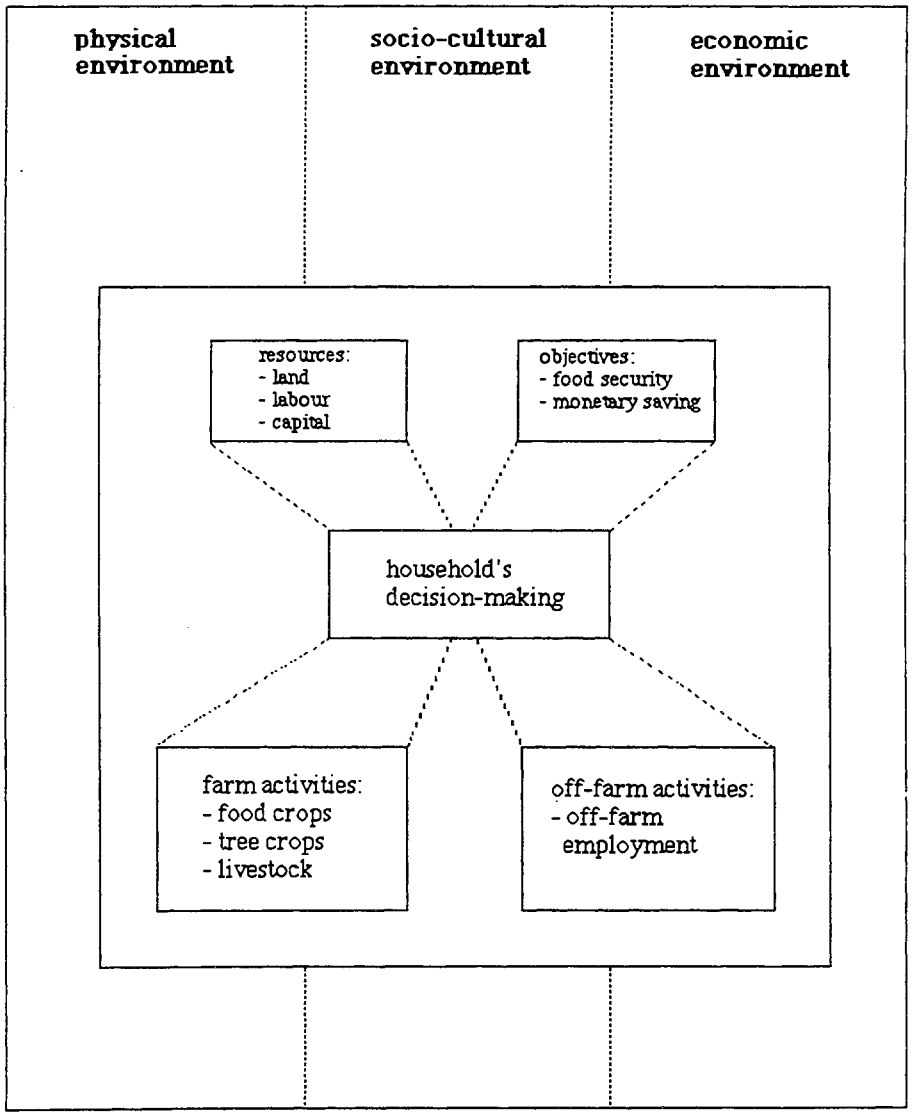



**Figure 1.1: Graphic representation of a farming system**

### *Off-farm employment*

In general, off-farm employment comprises all kinds of income-generating activities, which take place outside the farm household but which are not necessarily non-agricultural. Casual labour in the agricultural sphere, for example, can be regarded as off-farm employment because it takes place outside the farm household.

In the past, the rural off-farm sector was regarded as no more than a pool of resources and labour, used by the urban-industrial sector when needed (Freeman & Norcliffe, 1985). More recently, however, many authors have admitted that the off-farm sector should play a crucial role within the rural economy itself, both on regional and on household level. Haugerud (1981) even states that off-farm income is the most important determinant in socio-economic differences between rural households.

Therefore, the farm sector and the off-farm sector should no longer be seen as self-contained sectors but rather as closely related to each other. On regional level, most authors agree about the nature of the interactions between the two sectors (extraction of rural labour surplusses, marketing of agricultural products, provision of monetary income to the households, provision of capital to be invested in the agricultural sector; see Mellor, 1968; Liedholm, 1981; Freeman and Norcliffe, 1985).

Regarding the relations between the farm sector and the off-farm sector on household level, however, conclusions diverge considerably. In general, three different findings can be recognized, each of which will be discussed briefly. Freeman and Norcliffe (1985, p.127) claim that the off-farm sector provides a supplementary income to the household, with which the household can fulfill its monetary (consumptive) needs. Regarding their study area in Central Province, they note that *"non-farm activity is viewed as a simple means of supplementing income from the farm or providing needed cash for goods not obtainable from the farm itself"*. Lavrijsen (1984, p. 49), in referring to one of his three cases in Western Province, adds, however, that this mainly concerns those households which only have access to small off-farm incomes: *"Due to the smallness of the peasant family budgets, off-farm earnings are usually set apart for satisfying pressing personal needs, and are not used for short or long-term investment in the farm"*.

Quite a number of researchers note that the off-farm sector can provide the capital which is required by the farm sector to finance agricultural improvements. For example, Smith (1978, p. 36) states that *"a non-farm source of income, especially if it is (...) regular (...) allows the family to retain more of its own (farm) output for consumption, to purchase more farm inputs, and to hire an increased amount of farm labour (...) which should lead to an increase in farm output and income"*. Collier (1980, p. 22), referring to cases in Nyanza, Central and Western Provinces, states that higher incomes correlate with higher levels of innovation: *"Non-farm income is likely to be the most important element in the ability of smallholders to break the financial constraints, which inhibit both innovation as well as purchases of farm inputs"*. Livingstone (1986, p. 159) states that *"such remittances may constitute an important means for improving the farm and developing farm income"*. Herlaar (study of Meru, 1987) and Sonnema (study of Nyeri, 1987) completely agree with this statement, while Lavrijsen (study of Western Province, 1984, p. 105) only agrees for one of his three cases, where farming is highly commercialized and short-term arable inputs and hiring of labour has become attractive.

Finally, some authors came to the conclusion that the off-farm sector does not stimulate the farm sector at all. On the contrary, they argue, the off-farm sector provides an alternative base of existence, which, depending on the height and regularity of the earnings, partly or completely replaces the farm sector. This statement is not so widely accepted as the former two. Sharpley (1986) notices the non-farm sector's potential supply of agricultural capital, but she also suggests that farmers tend to invest this potential capital in the non-farm sector, where the rates of return are higher than in the farm sector. Lavrijsen (1984, p. 105) found this to be the case in one of his three study areas, where *"off-farm income is diverted away from the farm, for reasons of security and because of total lack of prospects, or because the non-market oriented agro-economic system does not readily lend itself to monetary investments"*.

### *Research objectives*

The present study aims to provide a detailed study of the interrelations between the three elements outlined above (agro-ecological potential, agricultural production and

productivity, and off-farm employment) in the two selected areas in Kwale District. Four broad research objectives can be discerned:

1. a description of the farm and non-farm activities of the households in Kibandaongo and Bongwe (what are the general characteristics of the two locations, both in agro-ecological and socio-economic terms; how is the agricultural production organized; what is the role of off-farm employment in making a living; what is the actual relation between agricultural production and off-farm employment?);
2. a comparison between the two areas regarding agricultural production and the standard of living (to what extent can these differences be ascribed to variations in agro-ecological potential, and to what extent to the importance of off-farm employment?);
3. a comparison between households within the areas regarding socio-economic characteristics; (to what extent can these differences be related to different farming systems; what are the implications of these differences for food security and household prosperity?);
4. the implications of all these differences for agricultural development in the district and the government's policy.

The first objective will be addressed in chapters 2, 3 and 4, which offer a description of the agro-ecological and socio-economic characteristics of Kwale District as a whole and of Kibandaongo and Bongwe in particular. In chapter 5, the second and third objectives will be discussed. Finally, in the concluding chapter 6, policy implications will briefly be dealt with.

# Chapter 2

# Kwale District

As mentioned before, the environment in which the farm households are located cannot - or only to a very limited extent - be modified by the farm households. Still, the environment largely determines the possibilities and limitations of both farm and off-farm activities. In order to gain a full understanding of the circumstances under which the several activities of the households are carried out, insight into the specific environment is essential. In this chapter, three types of environment are distinguished: the physical, the socio-cultural, and the economic environment. As environmental unit, the whole of Kwale District has been chosen (although there are, of course, also influences from Nairobi, i.e. on a national scale). Mombasa has to be included regarding the economic environment only.

## 2.1. Physical environment

The physical environment covers all natural elements: topography, soils, climate and agro-ecological potential. First, some attention will be paid to the general physical characteristics of Kwale District, before some more detailed descriptions will be given of the research locations Kibandaongo and Bongwe.

### *Topography, soils and climate*

The total surface of Kwale District is 825,700 ha of which 731,300 ha can be regarded as suitable for agricultural production. The remaining land includes the Shimba Hills National Reserve (21,740 ha), human settlements, roads, lakes, swamps and unsuitable steep slopes (Jaetzold & Schmidt, 1983). In the district, three main topographical units can be distinguished: the coastal plain which is generally below the 30 m contour line; the coastal uplands which rise steeply behind the coastal plain to an altitude of some 462 m (Dzombo Hill); and the Nyika plateau, an erosional

plain which extends from the western margin of the coastal uplands to the boundary with Taita-Taveta District.

The soils of Kwale District vary with topography and geology. They are strongly weathered, due to climatic conditions in the past - especially the very humid and hot periods during the Pleistocene era - but also due to the present climatic conditions. The most strongly weathered soils (pure Ferrasols) are found in the eastern part of the district, where annual rainfall is highest. Further inland, the diminishing rainfall causes a gradual transition via Acrisols, Luvisols and Planosols to the less weathered Cambisols and Lithosols. Because most soils are characterized by a low structure stability, they are sensitive to erosion and sealing. Because of the sandy topsoils and the low organic matter contents the fertility of the soils is generally low to very low (Kenya Soil Survey, 1978). The spatial distribution of the fertility of the soils is shown in figure 2.1.

The climate of Kwale District is influenced by the semi-annual passage of the inter-tropical convergence zone and the two monsoons (the north-eastern monsoon from January to March, and the south-eastern monsoon from June to October) resulting in a bimodal rainfall pattern (National Environment and Human Settlements Secretariat, 1984). This means that the annual rainfall is concentrated in two periods: from April to June (the long rainy season), and from September to October (the short rainy season). Further inland, the mean annual precipitation and the length of the rainy seasons diminish quickly (figure 2.2). Moreover, the unreliability of the rainfall and the potential evapotranspiration increase from the coast towards the interior. This is mainly caused by the breaking effect of the Shimba Hills, in front of which the humid air masses from the Indian Ocean lose most of their water content. The relative importance of the long rainy season is greater along the coast, while the relative importance of the short rainy season is greater in the hinterland (Braun, 1985).

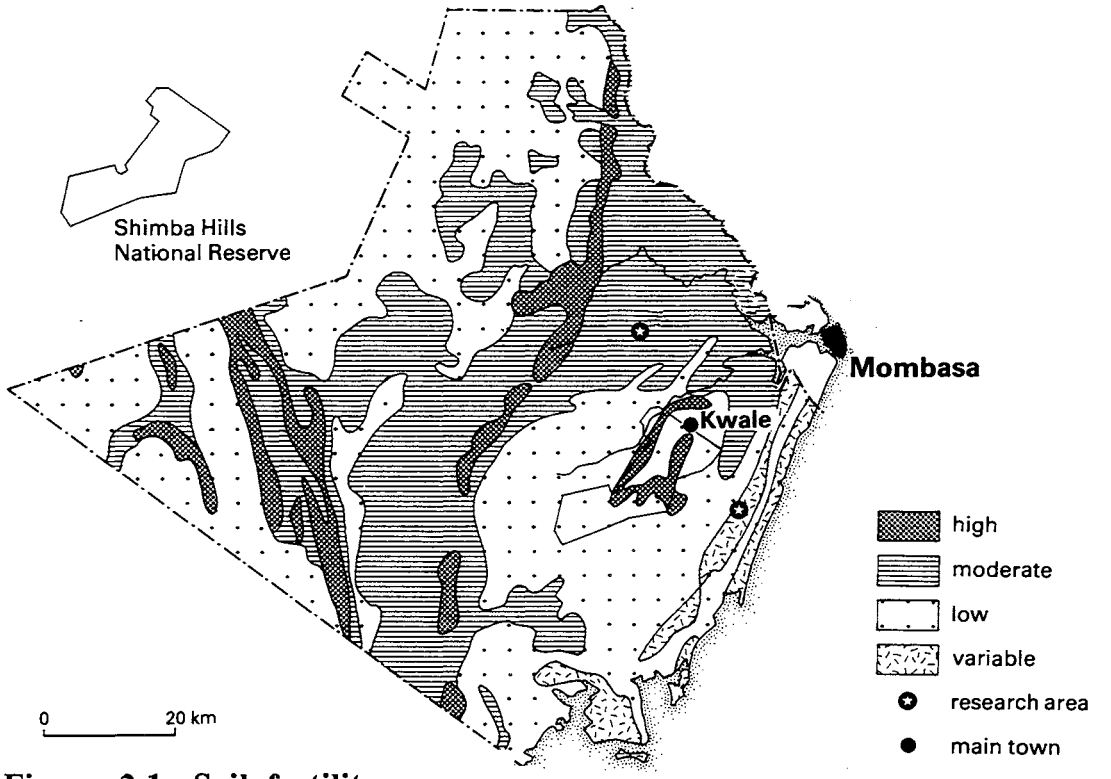



**Figure 2.1: Soil fertility**

Source: Jaetzold & Schmidt 1983

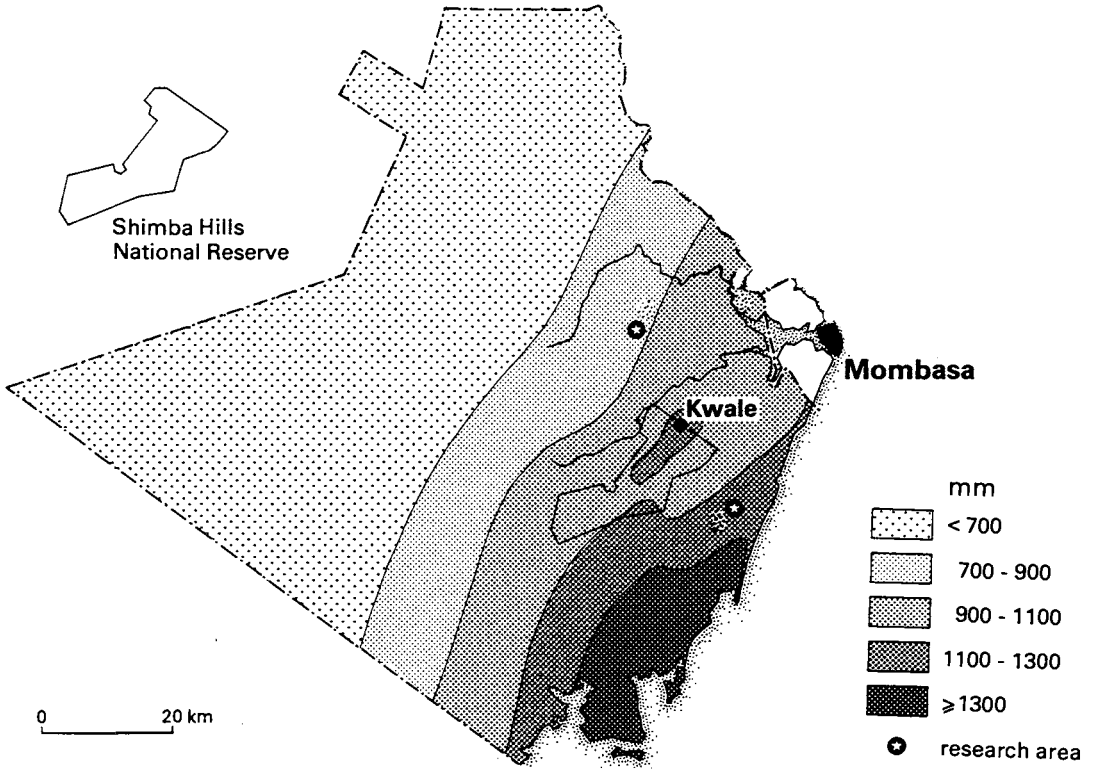



**Figure 2.2: Mean annual rainfall**

Source: Jaetzold & Schmidt 1983

### *Agro-ecological zones*

Kenya has been divided into several agro-ecological zones (A.E.Z.'s), as classified by the F.A.O. (1978). This classification is based on two climatic factors: mean annual temperatures and mean annual precipitation. The various combinations of these factors result in a specific ecological potential for crop production and livestock rearing in each zone. For Kwale District, Jaetzold & Schmidt (1983) identified five major A.E.Z.'s, ranging from medium to extremely low agro-ecological potentials (see figure 2.3).

*1. Sugarcane Zone (CL2)*

This is the wettest zone in the district with an average rainfall of over 1,400 mm per year. In terms of precipitation, this zone would be classified as high-potential, but due to low fertility, poor drainage and salinity of the soils, it can be more aptly described as medium-potential. The natural vegetation consists mainly of lowland rain forest. A rather large variety of crops can be grown throughout the year.

*2. Coconut-Cassava Zone (CL3)*

This zone has an annual precipitation of about 1,000 mm which results in a medium potential for agricultural activities. Most soils found in this zone have a low to very low fertility, except for the soils on the lower slopes of the Shimba Hills and some small parts of the southern section. Some areas, especially in the northern part and around the Shimba Hills, have problems with moderate sheet erosion, and sometimes severe gully erosion. The natural vegetation consists of lowland moist savanna. In the southern part, lowland rain forest is found, and around the Shimba Hills the vegetation is classified as woodland and lowland dry forest. The cropping season of the long rains covers a period of 155 to 174 days. The short rains offer limited possibilities for cultivation other than drought-tolerant crops.

*3. Cashewnut-Cassava Zone (CL4)*

The larger part of this zone is taken up by the Shimba Hills National Reserve. The annual rainfall averages about 900 mm. Most of the soils in this zone are of poor to very poor quality. More fertile soils occur in the northern hilly part of the zone, but these are more vulnerable to erosion. The natural vegetation is dominated by lowland wood and dry forest types, with some lowland moist savanna in the south. Due to the low reliability of the rains and the short cropping season, drought-evading and

drought-resistant crop varieties should be cultivated. In general, the short rains are inadequate for the cultivation of annual crops.

*4. Livestock-Millet Zone (CL5)*

This zone has an average annual precipitation of 700 to 900 mm. The soils of the northern part of this zone have a moderate to high fertility, but are very vulnerable to sheet and gully erosion (especially in the area around Kinango). The northern part of this zone is covered by Acacia thorn bush, while the southern part consists of lowland dry forest. The rains are very unreliable and the cropping season is short, less than 104 days. Therefore, the zone consists mainly of ranch land. Crop production should be restricted to drought-resistant crops only.

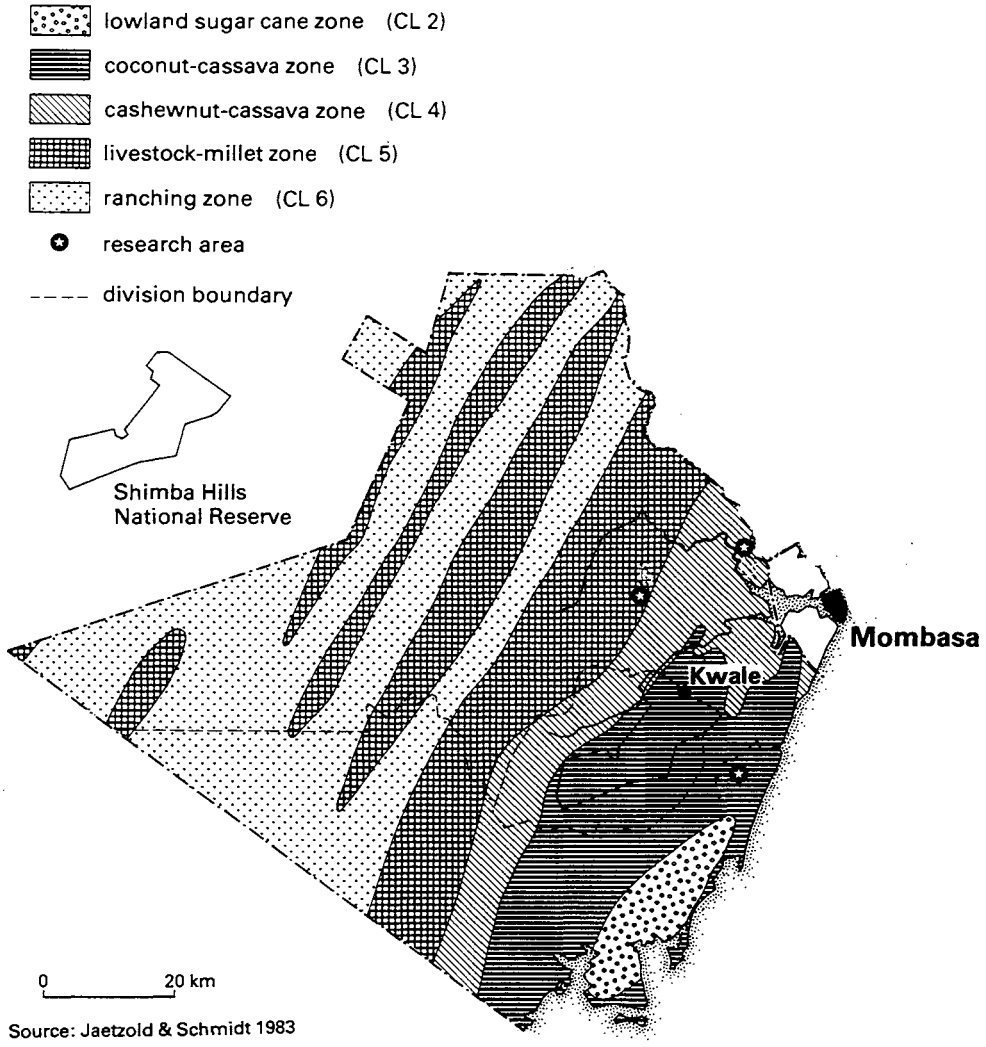



**Figure 2.3: Main agro-ecological zones**

*5. Ranching Zone (CL6)*

Due to an annual rainfall with an average of less than 700 mm and the extremely unreliable rainfall pattern, this zone has virtually no potential for arable agriculture. The natural vegetation is restricted to Acacia thorn bush. The agricultural activities are restricted to extensive livestock rearing.

Table 2.1 gives an indication of total hectarage and percentage of agricultural land of the various A.E.Z.'s. It is clearly shown that only 15% of the agricultural land can be considered as having a moderate potential; 12% has a low, and 72% a very low or no potential for the cultivation of crops.

**Table 2.1: Size and potential of agro-ecological zones in Kwale District.**

| A.E.Z. | description | potential | ha | % of total |
|---|---|---|---|---|
| CL2 | Lowland Sugarcane Zone | moderate | 23,500 | 3.2 |
| CL3 | Coconut-cassava Zone | moderate | 95,300 | 13.0 |
| CL4 | Cashewnut-cassava Zone | low | 89,700 | 12.3 |
| CL5 | Livestock-millet Zone | very low | 234,200 | 32.0 |
| CL6 | Ranching Zone | very low/none | 288,600 | 39.5 |
| Total Kwale District | | | 731,300 | 100.0 |

source: Jaetzold & Schmidt, 1983.

This main zonation offers only a rough indication of the possibilities for the cultivation of crops. Therefore, Jaetzold & Schmidt (1983) constructed a sub-zonation based on the yearly distribution of precipitation and the length of the growing periods for crops. A complete description of all the sub-zones in the district is beyond the scope of this study, so only the two sub-zones in which the research areas are located will be dealt with.

### *Kibandaongo (CL5)*

Kibandaongo is located within the administrative boundaries of Kinango Location. This location is situated on the western side of the Shimba Hills, on the so-called Nyika plateau, which forms the main part of the coastal uplands. The area of Kibandaongo itself stretches between the last two ridges of the Shimba Hills, with the Kibandaongo river - a small and seasonal stream - flowing in between.

The natural vegetation of the area can be classified as Acacia thorn bushland. This is a semi-arid vegetation type, dominated by species of Acacia and Euphorbia, although on the border of the area also species of Manilkara and Diospyros can be found (National Environment and Human Settlements Secretariat, 1984). The area is further populated and visited by several types of wildlife. Animals like wild pigs and gazelles commonly appear, but also elephants and lions, coming from the Shimba Hills National Park, can be noticed incidentally.

The soils in the area of Kibandaongo are developed on fine sandstones and siltstones (Mariakani sandstone and Upper Maji-ya-Chumvi beds), both of which were formed during the Triassic era. Due to the occurrence of these siltstones, the water of the Kibandaongo river is saline. Both in chemical and in physical regard the soils are poor (Kenya Soil Survey, 1978).

Because of the strong variation in relief, the poor and shallow soils of Kibandaongo are very vulnerable to erosion. Moreover, large areas have been cleared from vegetation as a result of the system of shifting cultivation, the continuous collection of firewood and considerable overgrazing in the past. The rainfall is usually concentrated in heavy showers, which causes considerable run-off on the cleared slopes. This run-off has formed a complex pattern of gullies and tracks on the slopes, leading to the valley bottom where the Kibandaongo river runs. Much of the top-soil from the slopes has been transported to the river banks, leaving slopes of bare rocks, with only poor or even no vegetation. Down in the valley bottom the sediment has accumulated, forming deep, unstructured, sandy soils. Parts of the valley are frequently flooded by the Kibandaongo river which turns into a wild stream just after heavy showers. These floods can cause serious damage to the river banks and surrounding fields.

Kibandaongo is located in a sub-zone of the Livestock-millet zone (CL5), which is characterized by short to very short cropping seasons. The growing period of the long rains counts 75 to 84 days, the growing period of the short rains 40 to 53 days. Between these two periods some very slight intermediate rains may occur.

Annual rainfall and its distribution over the months is very irregular. Therefore, apart from livestock rearing, the suitability of the area for agriculture is restricted to drought resistant crops like sorghum, millet and pulses. More vulnerable crops like maize have a high risk of failure. The cultivation of tree crops like coconut palms, cashewnut trees, citrus and mango is restricted to the more humid hill tops and valley bottoms, even though the conditions are not optimal for good and regular harvests. The potential for livestock and forage production is restricted to 2 to 3 hectares per livestock unit of 300 kg (Jaetzold & Schmidt, 1983).

### *Bongwe (CL3)*

Bongwe is situated on the eastern side of the Shimba Hills, on the Coastal Plain which stretches from the Shimba Hills up to the Indian Ocean. The natural vegetation of this area can be classified as lowland moist savanna, with a domination of Afzelia, Albizia and Panicum species. However, little of this natural vegetation has been left, because almost the entire area is under cultivation now. Main surviving tree species are Vitex mombassae, Fernandoa magnifica, and Ziziphus mauritiana, while the most common herbs and grasses are Panicum maximum, Pennisetum polystachyon, and Sporobolus pyramidalis (National Environment and Human Settlements Secretariat, 1984). Because of the high population density, wildlife is mainly restricted to the presence of wild pigs, baboons and other monkeys, while turtles and leguans can be found in some swampy depressions dispersed over the area.

The soils consist mainly of corals, loams and alluvial deposits which are developed on the so-called Magarini Sands. These Magarini Sands are sedimental sands and gravels of a deltaic and continental origin, formed in the Pliocene era. Generally, these soils are chemically and physically poor (Kenya Soil Survey, 1978).

Bongwe is located in a sub-zone of the Coconut-cassava Zone (CL3), which is characterized by a medium to long cropping season with 155-174 days, while the short rainy season is too limited to permit substantial crop cultivation. Between these two periods intermediate rains may occur.

Although the distribution of the rainfall is rather irregular, the area offers considerable possibilities for the cultivation of a wide range of food crops (including rice in the swampy depressions), as well as tree crops like coconut palms, cashewnut trees, mango, citrus, pawpaw, etc. The potential for livestock and forage production is about 0.6 hectare per livestock unit of 300 kg (Jaetzold & Schmidt, 1983).

## 2.2. Socio-cultural environment

Concerning the socio-cultural environment, some basic demographic data of Kwale District will first be presented. Then, the socio-cultural characteristics of the major population group - the Mijikenda - will be put in a historical perspective. Finally, some socio-cultural differences between two subgroups of the Mijikenda - the Duruma and the Digo, living in Kibandaongo and Bongwe respectively - will be described.

### *Demography*

In 1979, the population of Kwale District counted 288,363 persons, spread over 52,261 households. Given Kwale's total surface of 8,257 square km, this means an average population density of 35 persons per square km (CBS, 1981). Over 95% of the population of Kwale District lives in rural areas. The available agricultural land is estimated at 713,300 ha, resulting in an average land holding of 2.47 ha per person or 13.65 ha per household (Jaetzold & Schmidt, 1983). However, the population is mainly concentrated in the eastern coastal areas (CL2 and CL3) where the agro-ecological potentials are higher than in the more marginal western areas (figure 2.4). There is a constant population movement from the drier hinterland to these coastal regions. In the other direction however, a (smaller) movement of people exists. These

people leave the densely populated coastal areas and move in the direction of the Shimba Hills, in search of land.

Although population pressure has not taken alarming forms yet, the population of Kwale District is growing rapidly. The estimated annual growth rate is 3.9% (MENR, 1984). This growth rate contains two elements: the natural growth, and a considerable in-migration from up-country. The broad base of Kwale's population pyramid (over 40% of the population is under 15 years) predicts that the natural growth of the population indicates a high growth rate which will remain high in the coming decades. According to a moderate growth scenario (which excludes in-migration) the population is expected to double in 21 years (MENR, 1984).
The in-migration primarily concerns people from the densely populated western part of the country (mainly Kamba, Kikuyu and Luo). Many of these people are attracted by the coastal settlement schemes, or by employment opportunities in the tourist sector and governmental sector in the administrative centres of the district. In general, these migrants have higher education levels than the original population, giving them better chances on the labour market (MENR, 1984).

### *History of the Mijikenda*

The main ethnic group in Kwale District are the Mijikenda, comprising about 82% of Kwale's total population. The term "Mijikenda" literally means "nine houses" or "nine tribes", referring to the nine groups of people who settled at the Kenyan coast at the turn of the sixteenth century. Two of these groups settled down in what is now Kwale District: the Duruma and the Digo, on the west and east sides of the Shimba Hills, respectively. Their settlements, called "kayas", were built on hilltops, where social life was regulated by the elders of the clan, who controlled the resources, divided the land, and paid the bride price for the younger generation (Prins, 1952; Spear, 1978).

The areas immediately around the kayas were cultivated in a communal way, by making use of a fallow system, which prevented the soils from exhaustion. The main crops were sorghum, millet and eleusine, supplemented with several sorts of beans, yams and eggplant. Livestock was mainly limited to goats, sheep and chickens, because cattle were often subject to raids by other tribes. The kaya society was self-

supporting, and the only external relations were based on small exchanges between the nine kayas themselves and some neighbouring tribes (ibid.).

The living conditions were highly subject to climatic fluctuations, and food shortages occurred frequently. In order to cope with these problems, the Mijikenda tried several times to supplement their subsistence agriculture with other activities, by seeking contacts with the outer world. Three main periods can be distinguished, periods that can be regarded as coinciding with fluctuations in economic development.

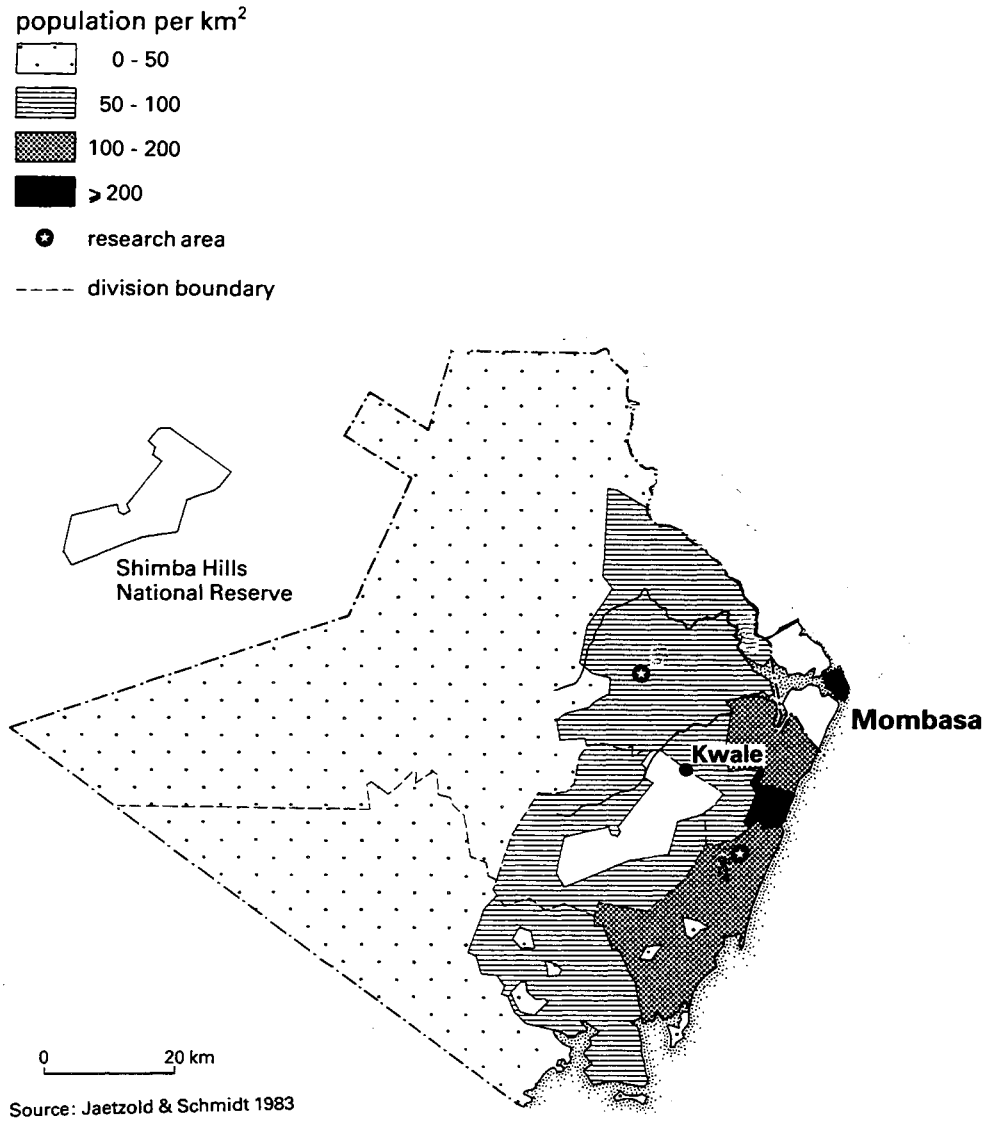



**Figure 2.4: Population density**

*First period: trade (±1700-1900)*

The first period of expansion was largely induced by contacts with the Arabs and Swahili who dominated the coastal towns. They were involved in the large commodity trade patterns between Africa, Arabia and India, but their trade routes into the interior of Kenya were limited because of the hostility of the inland African tribes. The Mijikenda, however, found themselves in an intermediate position and gradually began to act as middlemen between the Arabs and Swahili on the one side, and the African tribes from up-country on the other side. The main trading commodities were hides, horns and ivory, in exchange for beads and wire. Beside this middlemen-trade, a trade of food commodities developed between the coastal towns and the Mijikenda. In years of agricultural prosperity, the Mijikenda sold their surplusses to the coastal towns, while in years of shortage they could obtain food from these towns, where it was imported from surplus areas. Both types of trade led to a certain prosperity and wealth among the Mijikenda, especially the younger generation which became more and more involved in these trading activities. The kaya populations grew, the younger generation became economically independent from the elder generation, and during the mid-nineteenth century several young individuals left the kayas and settled wherever there was vacant land at places which were also favourable for their trading activities (Prins, 1952; Champion, 1967; Spear, 1978).

For the people living in the hinterland, the Duruma, contacts with the Swahili were limited to irregular markets and incidental middlemen-trade, and they largely kept their own traditions, law and religion. The Digo who lived near the coastal Swahili region, benefited more from these trade relations than the other Mijikenda sub-tribes. Their contacts were more intense, leading to a gradual conversion from the indigenous religion to the Islam, and an earlier disruption of the social organization related with the kaya structure (Spear, 1978; Salim, 1973).

During the second half of the nineteenth century however, when the overseas trade of slaves became prohibited, the Arabs started to grow food crops for export at plantations, by exploiting slaves, while the Swahili started to organize their own caravans to go up-country. The result was that the Mijikenda lost their position as food supplier and middlemen. The completion of the Mombasa-Kisumu railroad in 1901 reinforced this process (Spear, 1978), and so the Mijikenda were back to where they began: agriculture.

*Second period: livestock and copra (±1900-1960)*

At the turn of the twentieth century, two alternative income-generating activities emerged, one based on livestock, the other on palm trees. The drier western areas, with their low agro-ecological potential, offered considerable possibilities for animal husbandry. The Pax Brittannica had relieved the area from the frequent raids by nomadic tribes. For the Duruma, this opened the way to develop large herds. In central places like Kinango, Mazeras and Mariakani, livestock markets appeared, and soon cattle became the standard for wealth and investment (Prins, 1952; Champion, 1967).

In the meantime, in the eastern areas with higher agro-ecological potential, the coconut palm increased in popularity. The coconut palm was already known for the production of palm wine, a specialization of the Digo. But gradually the coconut palm became more important for copra, which had become a well-paid export product during the first decades of the twentieth century. In this way, coconut palms became a standard for wealth and investment, just as livestock did in the western areas. Different from livestock, however, copra production and trade was of a more dynamic and commercial character, and offered considerably higher profits (Parkin, 1972).

But in Mijikenda logic quantity has always been more important than quality. So the Mijikenda exerted themselves to increase the number of livestock and palms, but made no attempt to improve the quality. In the western areas, this led to overgrazing and erosion. Beside this, several epidemics of rinderpest (of which the last one took place in 1963/1964) made an end to the large scale livestock practices of the Duruma. The eastern palm belt gradually became fully occupied with coconut palms, forcing the people to plant their palms in less suitable areas, which consequently led to lower yields. Due to inheritances, the number of palms per person decreased, resulting in a decline in income per head. Moreover, because of the lowering world market prices for vegetable oil, the ever-fluctuating prices for copra showed an average decline during the early sixties.

*Third period: modern employment (±1960-1980)*

During the last decade opportunities for off-farm employment have been growing considerably. Beside employment in Mombasa, there were the smaller rural towns

which emerged as administrative centres after independence. The fast growing tourist sector along the coast also offered many opportunities. This meant again a chance to become involved in off-farm activities, especially for those living close to the new centres of employment. Nowadays however, the employment opportunities for the Mijikenda people are becoming scarce, due to the concurrence of a stagnating growth and in-migration.

### *Some differences between the Duruma and Digo sub-tribes*

Although the cultures of the Mijikenda sub-tribes seem to be rather uniform, several differences can be noticed between the Duruma and the Digo. These differences are related to the different degrees of impact of external relations on the development of their societies. As mentioned before, the Duruma sustained their traditional religion with its own customs and laws, leading to a rather gerontocratic and egalitarian society, almost entirely dependent on self-subsistence farming and extensive livestock rearing. The Digo, in contrast, went over to the Islamic religion through their intensive relations with the Swahili. This gradually broke down the gerontocratic and egalitarian principles, and led to a more individualistic society in which individual development became accepted and desired. By copying the Arab/Swahili way of life, the Digo became less interested in agriculture, and preferred to concentrate on trade. Agricultural work became associated with slave labour, because the Arabs and Swahili had slaves to work on their plantations. Especially the Digo women became sensitive to this association.

This brings in view the differences in the socio-economic position of the women. The position of both Duruma and Digo women seems to be related to the systems of inheritance and marriage. In the Duruma tradition, the inheritance system is patrilineal. The bride price payments are relatively high: fourteen cows (representing KSh. 10,000/- to KSh. 14,000/-), or a partial equivalent in money. This bride price transfers the woman's right in her matriclan to the husband. This makes the Duruma women very dependent of their husbands, and because of the high bride price, divorce by repayment hardly exists. A Duruma wife has no other choice than to follow the orders of her husband, which includes cultivating all the food crops required by the household.

The Digo, in contrast, are the only Mijikenda sub-tribe with a matrilineal system of inheritance. The bride price is paid in money, and is relatively low, ranging from KSh. 1,000/- to KSh. 10,000/-. This price does not include rights in the matrilineal kin group or any right over the children. This gives a Digo woman a relatively independent position. In case of divorce she still has the rights in her matriclan. She can repay her low bride price either by earning this money herself, or by monetary assistance from her new lover. As a result, a Digo woman is rather self-confident. For instance, as soon as she has the feeling being forced by her husband to work more on the land than she intends, she can demand divorce and move to her parental homestead.

> The socio-cultural differences between the Duruma and the Digo can best be illustrated by the perceptions they both have towards each other. The Duruma regard the Digo as rich and lazy people, who are for their food production dependent on the labour which is provided by the Duruma. The Digo women in particular have a reputation of independency, which - according to the men - makes it difficult to keep them as wives. The opinion of the Digo towards the Duruma is rather the contrary. Duruma are regarded by the Digo as very hard working and tough, but poor people. The Digo blame this poorness on the choice of the Duruma to settle themselves in the low potential hinterland, and their conservatism to maintain their own traditions, rather than to take profits from the coastal trade relations. As a result the Duruma are, in times of food shortage, dependent on Digo assistance, according to the Digo.*

## 2.3. Economic environment

The economic environment of Kwale District is highly influenced by the early trade activities of the Arabs and Swahili, as described in the previous section. These activities had their impact on the spatial distribution of infrastructure and artefacts, leading to regional differences in economic development. First, some characteristics will be given of Kwale District as a whole, before attention will be paid to the specific economic environments of Kibandaongo and Bongwe.

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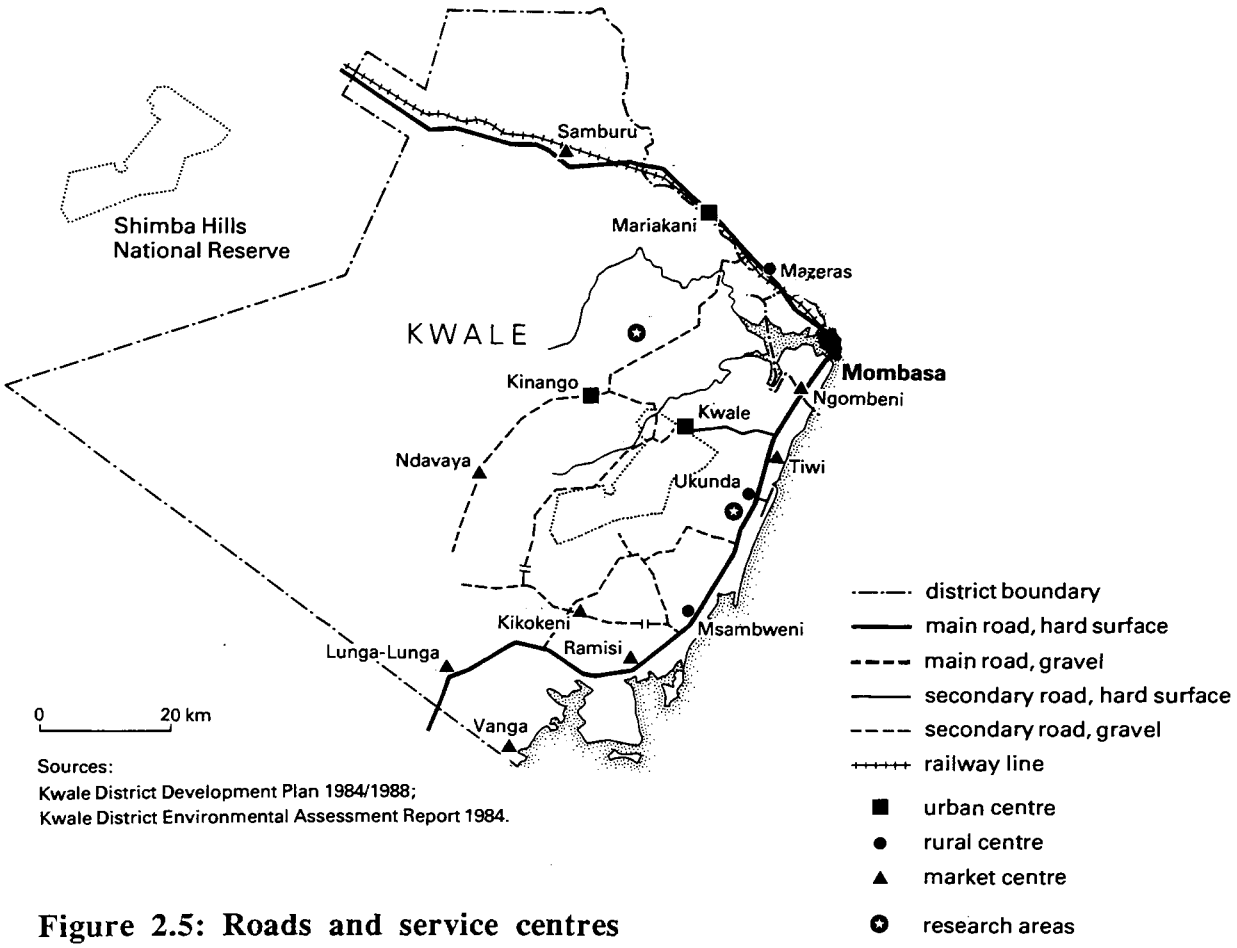
* Sections written in small script refer to particular cases, which have been observed in the field and are meant as illustrations of the general discourse.

*Kwale District*

The coastal strip of Kwale District has since long been attractive for settlement. The early Arab/Swahili population settled along the coast where they could develop their oceanic trade. This led to an early development of the infrastructure. The inland Mijikenda population benefited from these economic advantages by concentrating their settlement on the border of the coastal strip, and by having intensive contacts with the Arab and Swahili population. This spatial concentration still exists. Almost all features, like road networks, population centres, water resources, post offices, health centres, points of energy supply and industrial plants, are concentrated in the coastal areas (see figure 2.5). This has considerable consequences in terms of social welfare,




Sources:
Kwale District Development Plan 1984/1988;
Kwale District Environmental Assessment Report 1984.

**Figure 2.5: Roads and service centres**

market facilities and possibilities for off-farm employment. Consequently, it has created inequalities within the district, and has led to several streams of labour migration. First, there is the flow of agricultural casual labourers from the hinterland who, in years of drought, move to the wetter areas to work on the fields in exchange for food or money. Second, there is the more recent flow of temporal labour migration to Mombasa (and to a lesser extent to Kwale and the tourist sector of Diani Beach).

### *Kibandaongo*

Kibandaongo, being located in the hinterland of Kwale District, is an area with a poorly developed infrastructure. The only road which connects Kibandaongo with the Mazeras-≈Kinango main road is in bad condition and becomes impossible to pass during the rainy season.

Locally, employment opportunities are restricted to casual labour in the agricultural sector, and some traditional occupations like medicine-man, palm wine tapper or mason. A few richer inhabitants own small shops. Maize meal, salt, sugar, tea and soap are the main commodities which are sold in these shops. The nearest market centre, Kinango, is of little importance as a market for agricultural products or place for employment. For trade and off-farm employment, the population is more dependent on Mombasa which has a strong regional dominance. However, the trade of agricultural products to Mombasa is limited, due to the long distance and poor connections. Entrance to the labour market of Mombasa is further hindered by few social contacts and the generally low level of education.

### *Bongwe*

Bongwe is located in the coastal strip, and has relatively well developed road connections. The market centre of Ukunda is at walking distance. From Ukunda regular busses and private vehicles drive to Mombasa and Diani Beach, which offer good opportunities for both the marketing of agricultural products and for off-farm employment. As a result, a large proportion of Bongwe's population has realized a growth in income and adapted a more modern way of life. This has led to the

development of a local demand for modern consumption goods as well as for vegetables, fish and home-prepared snacks and dishes.

# Chapter 3

# Kibandaongo

As described in chapter 1, a general farming system on the household level contains several elements, like the household's resource base, the household's objectives, the decision making process of the household, and the actual farm and off-farm activities. In this chapter, each of these elements will be described, starting with the resources land, labour and captial, followed by the farm activities and the off-farm activities, and completed with the household's objectives.

## 3.1. Land, labour and capital

The basis of all activities which take place at the farm household, are the resources which are at the disposal of the household: land, labour and capital. Some of these resources are given facts, like the physical characteristics of the land, or the rules concerning land ownership or labour division, which are culturally determined. Others can be modified and manipulated by the household itself, like the length of fallow periods, the amount of labour destined for farm activities, and the way in which capital is invested.

### *Land*

The land in Kibandaongo has not yet been adjudicated. This means that, in general, access* to land is still taking place under traditional Mijikenda rules. According to these rules, land is not held individually, but controlled by the entire family clan. Every male head of a household has the right to use a piece of this clan land, while a

* In this report, the term "access" means that a person or a household has the disposal of a resource or a commodity. It is not necessarily the same as "ownership".

woman only has access to land through her husband. When the head of household passes away, his right to land use is transferred to his sons.

Most of the fields are located around the homestead. A few farmers have land outside Kibandaongo, in the direction of the Shimba Hills, where rainfall is higher and tree crops are more productive. Access to such fields is usually obtained through inheritance or other family relations.

Table 3.1 gives an indication of the areas of the cultivated land per household and per household member. Five of the fifteen households cultivate an average of only 0.75 ha. This is half the size of the six households cultivating 1.49 ha, and a quarter of the size of the four households which cultivate 3.13 ha. The cultivated area per household member of the group with only 0.75 ha is little more than half of the area per household member of the other two groups, which hardly differ from each other.

**Table 3.1: Kibandaongo: area under cereals.**

| area under cereals (ha) | number of households | mean size (ha) | mean number of household members | area per household member |
|---|---|---|---|---|
| 0-1 | 5 | 0.75 | 5.4 | 0.14 |
| 1-2 | 6 | 1.49 | 6.3 | 0.24 |
| > 2 | 4 | 3.13 | 11.5 | 0.27 |
| total | 15 | 1.68 | 7.4 | 0.23 |

About 70% of the land under cultivation had been cleared for cultivation many years ago. The other 30% has been taken in use within the last five years. The average period that the land has been under cultivation is 5.4 years.

About 30% of the land destined for cultivation was under fallow. The fallow period varies from three to over ten years. The length of the fallow period seems to be more related with the productivity of the fields under cultivation, than with the degree in which the fertility of the fallow field has recovered. This is because the clearance of the old fallow fields requires much labour, so that people try to keep fields in production as long as possible. As fallow land is often used as pasture, the

regeneration of soil fertility is hampered. It is unlikely that the original fertility of the soils is regained during the practised fallow periods.

The range lands of Kibandaongo have been incorporated into the Kinango Group Ranch. Officially, this means that livestock owners herd their livestock in the grazing area which is allocated to them individually, but benefit - at least on paper - collectively from ranch facilities like water sources, dips, and veterinary assistance (MENR, 1984). Indeed, the ranch area is now protected against herds from other areas which are no longer allowed to graze there. The facilities, however, are still lacking.

### *Labour*

The size of the cultivated area depends on the availability of labour which is provided by the number of resident household members. The average number of family members is 7.4 persons, although this number varies considerably per household. In every household there are persons who are either too young or too old to carry out farm labour, while other persons might be employed elsewhere. As a result, an average of only 2.9 persons can be considered as full-time agricultural labourers. Given a mean cultivated area of 1.68 ha, on average 0.56 ha is cultivated per full-time agricultural labourer. Only those households which have access to a considerable income can afford to hire additional labour. Within the sample this applied to only one household.

The bulk of farm labour is done by women. Usually, a distinction is made between the main fields, which are cultivated by the wife (wives) of one husband co-operatively, and the individual fields of the wives, given to them by their husband. The harvest of these individual fields belong to the wife. She can use it to provide her children with some extra food, or prepare it for her own visitors. The women usually work on these individual fields only during the early mornings and during resting days. As a result, the sizes of the fields are small, not more than 0.1 ha.

The Duruma women, especially those who are still the only wife, like to work in groups with other women. They work together on each other's main fields. The

hostess usually provides a lunch. Beside this daily farm work, often lasting more than eight hours, women have the responsibility for the domestic work, including the pounding and grinding of maize, cooking, fetching water, collecting fire wood, cleaning and taking care of the children.

The men's tasks are more limited. Usually, they are responsible for the management of the farm. They decide on the size of the main fields which are to be cultivated. Their actual farm work is restricted to the clearance of the fields. When they are not employed off-farm, they can go hunting, while they spend lots of time on social contacts and discussing local issues.

Children, especially the girls, are involved in the domestic and agricultural work, which often prevails above attending school. They cook and clean, herd goats and sheep (the herding of cattle is a professional job), help with planting and weeding, and chase away birds when the harvest is ripening.

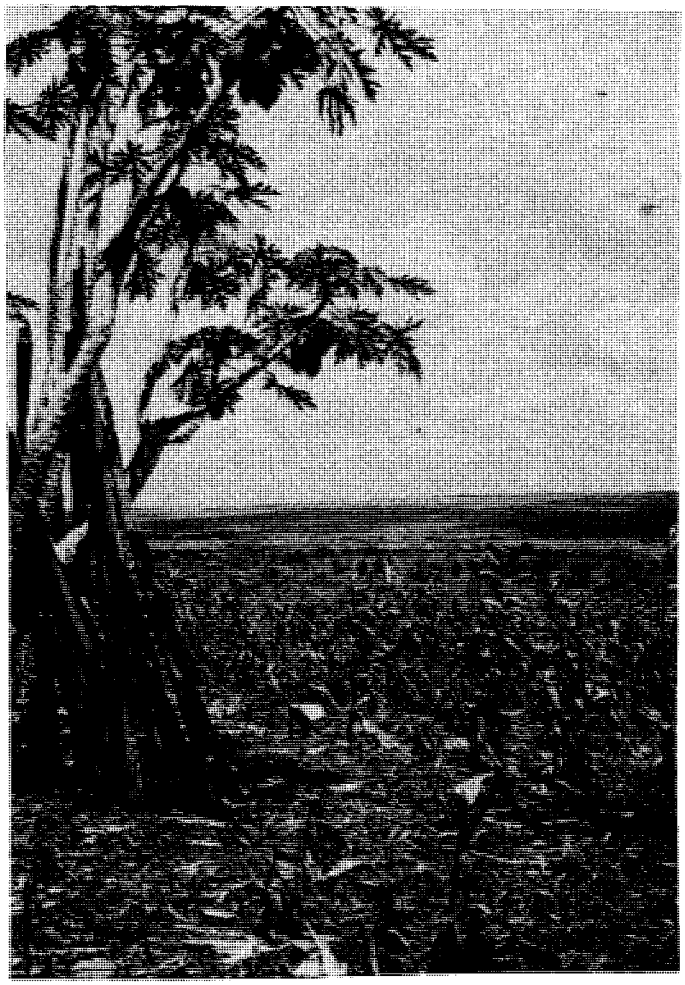
Women and men are both frequently attending ceremonies and rituals. Many of these activities, like marriages and spiritual happenings, take place during the non-agricultural season, when labour can be missed (during the agricultural season the spirits are assumed to be sleeping). Other ceremonies, however, like funerals, occur at any time. Due to their long duration (they can easily take a whole week) they can reduce the availability of labour at essential moments during the growing cycle of the main crops, leading to reductions in yield.

### *Capital*

In general, capital is invested in livestock. Livestock still plays an important role as bride price, but also functions as part of the long term food strategies (in times of food shortage livestock can be sold). Modern inputs like fertilizers, pesticides, seeds of improved varieties, cattle feed and land preparation by tractor or oxen are not used. The locally produced handhow and the cutlass are the common tools. They are only bought anew when the old one is worn out.

## 3.2. The farm sector

As shown in the previous chapter, the farm sector in Kibandaongo is mainly determined by the resources land and labour, and forms the major basis of existence for the farm households. The farm sector can be divided into three sub-sectors: food crops, tree crops and livestock. Other ways of exploitation of the environment, like hunting and firewood collection, are closely related to the farm sector, and will therefore be described briefly.



3. Farming in Kibandaongo. Food crops - especially maize - predominate. Trees, like this pawpaw, are relatively few in number. Due to lack of rainfall during the long rainy season in 1986, the maize was retarded.

### 3.2.1. Food crops

The cultivation of food crops is the major agricultural activity in Kibandaongo, and is entirely done for home consumption. There are no surplusses to be sold.

The indigenous *cereals* were sorghum and millet, both of which are drought-resistant and therefore well suited for the unreliable and low amounts of rainfall. Since the end of the last century, however, sorghum and millet have almost entirely been replaced by maize. Compared to sorghum and millet, maize has a higher production potential, is less vulnerable to diseases and pests (especially bird attacks), and is more easily prepared for consumption. On the other hand, maize is quite vulnerable to both water shortages and water surplusses, while it requires a well drained soil with a good supply of minerals. Due to the usually low and unreliable rainfall, together with the low fertility of the soil, yields vary from low to almost nil over the years. Yields are on average 100-1,000 kg/ha, which is very low compared to other regions in Kenya.

Weeds are serious competitors regarding nutrients, light and space, especially in the early life stages of the cereals. If not properly removed, they can cause considerable yield reductions. A special problem is formed by Striga spp. (witchweed), a parasite which attaches to the root system of the cereal. Most common pests affecting yields are the stalk borer and the army worm, while major diseases are white leaf blight and rust.

Indigenous *root crops* are the several types of yam, which are not very popular any more. More common nowadays is cassava, a crop which was hardly grown before the mid-nineteenth century. Cassava is relatively drought resistent, has a good yield potential on poor soils, and is resistent to pests and weeds. Moreover, it requires little labour and does not show a peak in labour demand. The crop can remain in the field throughout the season, so that it can function as a reserve crop. However, compared with cereals, the protein content is very low. The cassava in Kwale District is infected with the mosaic virus, which causes considerable yield reductions. Average yields of cassava count about 1-5 kg of tubers per plant. Another root crop is the sweet potato, which is grown by only a few farmers.

*Pulses* are commonly grown, although always in small quantities. Most common pulses are beans, cow peas, pigeon peas and green grams, but also groundnuts and bambara groundnuts are grown incidentally. Most of these pulses, especially the latter two, are rather drought resistant. Due to the ability to fix nitrogen in the soil, pulses can be useful if intercropped with cereals. Most pulses are vulnerable to insect damage, which often lead to a failure of making pods.

*Miscellaneous crops* are primarily vegetables, such as tomatoes, brinjals (African type), pumpkins, ocra, amaranth, chillies, and simsim. All these crops are grown only incidentally, and in very small quantities.

### *Cultivation practices*

The agricultural cycle in the area of Kibandaongo shows two cropping seasons in one year, a main cropping season during the long rainy season from March until August, and a second cropping season during the short rainy season from September until November. This means that all cultivation practices like land preparation, planting, weeding and harvesting have to be carried out twice a year.

*Land preparation* in Kibandaongo is done by hand. If the field which is going to be prepared has not been cultivated for long, it has to be cleared of bushes, shrubs and trees. These are slashed down with a cutlass, collected in heaps, and burned. Then the land is tilled with a handhow, making the soil loose, and working the smaller vegetation rests into the soil, providing some green manure. This tillage is irregular and superficial. It produces a rough seed bed, which causes an early appearance of weeds and an uneven germination, and reduces the rooting space of the crops. It also means that season after season the same weathered topsoil is used, while nutrients in deeper layers remain almost untouched. On the other hand, a rough seed bed encourages water infiltration, while a superficial tillage on slopes decreases soil erosion.

Usually, the tillage is started after the first showers. This is primarily done because after the dry season the soil is extremely hard and dusty, and thus difficult to cultivate. Unfortunately, not all the fields can be prepared at the same time so some of the fields

are prepared weeks after the first showers. This late preparation implies late planting, which usually reduces yields.

> Before the actual rainy season starts, the head of household "feels" that soon the rains will come. He will then go to the field to clear the land. After this clearance, the fertility of the land has to be symbolized by the sexual intercourse between the head and his (first) wife. Only after this intercourse can the women start the preparation of the field.

The short rainy season leaves little time to be spent on land preparation, so the same fields of the long rainy season are used again. This means that the soil has no time to recover, while pests and diseases remain present. This, in combination with the poor rainfall, leads to generally poor yields during the short rainy season.

Usually, people reserve part of their harvest as seed for the next season. If the harvest has been small, however, people are not able to reserve seed, so that they are forced to borrow it from relatives. The harvest prior to the period of the research was rather small: eleven of the fifteen households had to borrow part of or all their required seed. Because most of the households had to face shortages of seed, many households had to borrow from relatives not living in Kibandaongo.

*Planting* of maize is done by making a hole with the handhow, of about 6 cm depth, and dropping four seeds in it. The general advice of the extension service is to put only one seed per hole, otherwise the seedlings would suffer from mutual competition. However, people continue with the planting of four seeds, because the percentage of non-germination is rather high. Besides, people prefer to harvest more small cobs than fewer large cobs. Hence, no thinning is practiced.

People do not plant in lines, but the holes are made in a scattered pattern with a mutual distance of about 60-100 cm, leading to a density of 10,000-15,000 holes per hectare, or 30,000-45,000 plants per hectare (at a germination rate of 75 %). It could be suggested that planting in lines would have several cultivational advantages, permitting higher crop densities, and higher yields per hectare. However, it would also lead to an acceleration of mineral use. Without additional fertilizer this would imply an acceleration of exhaustion of the soil.

The cassava planting material comes from the mature cassava plants which are still on the field, or is borrowed from neighbours. These cuttings of varying length (20-60 cm) are planted under varying angles (30-60 degrees) with varying mutual distances (1-5 m).
A problem with the use of these cuttings is that they are not free from the cassava-mosaic virus, which is usually present in the mature plants, and causes considerable yield reductions.

Seeds of pulses usually have to be bought in the shop. People hardly preserve pulse seeds, partly because preserved seeds are vulnerable to damage by beetles, partly because often the crop does not make any pods. Also regarding the miscellaneous crops, seeds usually have to be bought. Their planting is dependent on the availability of money and time at the right moment. Since the importance attached to these secondary crops is generally low, planting will not take place before the weeding of the maize is finished and the early harvest of cobs has started.

*Weeding* is done by holding the weed with one hand, and cutting it off with the handhow, or, if possible, pulling it out with the roots completely. The weeding is started immediately after the planting is finished. Because of the large areas which have been planted, the weeds at the starting point are already fully grown at the moment the weeding is started. So, in the early life stages of the crop - in which the crop is most vulnerable - it has to compete with the weeds. Because the weeds already have a considerable height and a widespread root system when weeding is started, it is a labour-intensive job, and usually only one weeding round can be made. This makes that, especially in years with abundant rainfall, weeds are an important cause of yield reduction.

*Harvesting* starts during the last week of July, even though the maize is still green and not yet dry, and thus not suitable for storage. But because of a continuing food shortage, people start to roast this early maize in order to reduce the amount of purchased food. This green maize is often the maize from the women's private plots, while the maize from the main fields remains in the field to dry completely before being harvested.

The harvesting of the dry maize is done by hand, mainly during the month of August, depending on the time of planting. The crop residues are left in the field. The cobs, within their covering leaves, are collected in baskets and brought to the store.

> When the harvest is finished, the people who belong to a certain family clan will gather at the field of one of the family members, in order to help with the harvest. During the following night, this first harvest is celebrated by a party with music, dance and offering at the harvested field. Next day the people will move to the field of another family member, where the procedure is repeated. It must be noticed however, that this custom is nowadays less common as it used to be.

Most of the pulses planted in June and July will be harvested in September and October. Cassava can be harvested from nine months after planting onwards.

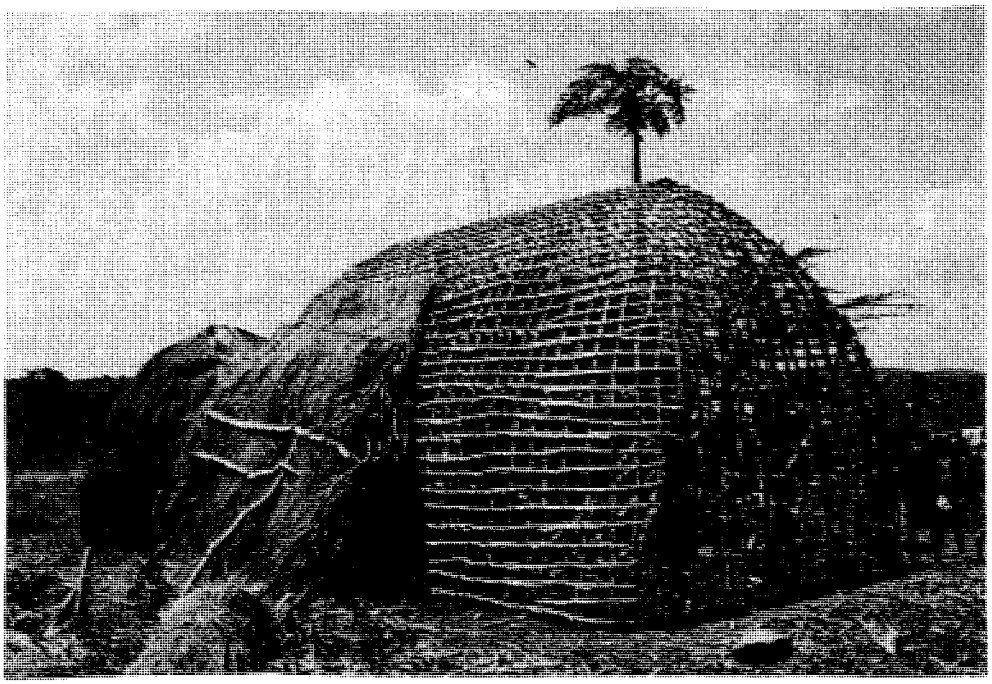
*Additional land preparation and planting* of maize is practiced as much as possible. Therefore, people will plant and weed as quickly as they can, and every new series of showers will stimulate them to start planting new plots. In this way, thirteen of the fifteen surveyed households planted twice, while six households even planted three times, all during the same long rainy season.

### *Storage and processing*

While the maize is drying in the field, the old stores are repaired and new stores are built. These stores are usually made on a platform in the main house, where the maize cobs (with the covering leaves still around it) are kept, while the kitchen fire is made underneath. The smoke from the kitchen fire rises through the stored maize for further drying, and keeps the maize free from insects.

When food has to be prepared, the number of required cobs are taken from the platform, the seeds are removed from the cobs, and pounded to remove the hard endocarp. The pounded seeds are ground between stones into a fine maize meal, from which the daily food - a thick porridge called "ugali" - can be cooked.

Seeds of pulses and other seeds are usually preserved in calabashes. Most of the pulses, however, are consumed soon after harvest, as the quantities are small, and storage losses due to insects are very high.



4. The construction of a traditional Duruma house
On the right, the platform for storage is constructed.

5. Grinding maize meal

### *Food production of the long rainy season of 1986*

Because of the limited agro-ecological conditions, combined with the presently used cultivation practices, yields in Kibandaongo are generally low. But the yields of the long rainy season of 1986 were even less than in "normal" years. For the fifteen sampled households, the average yield of maize counted 485 kg, which means, given the average size of cultivated land, a productivity of 289 kg/ha. The households, however, showed a wide variation around this average, yields per household ranged from 20 to 1,200 kg and yields per hectare from 28 to 700 kg. For most farmers, these yields represented only 40-60% of the yields in "normal" years.

The major reason for this reduction is to be found in the climatic conditions in 1986, as well as in 1985, having a delayed effect on the yields of 1986. Both the long rains and the short rains of 1985 were below average. None of the households had enough harvest to last until the 1986 harvest. In three households, it had lasted until April; in eight households only until January/February. The remaining four did not even make it until December. After the consumption of the seeds which were kept as planting material, many people tried to find casual work, and a considerable number went to the coastal area to work for the Digo. Therefore, the land preparation of the fields in Kibandaongo had been delayed considerably. Due to this delay, the crops were still small when the heavy showers - which were extremely heavy in 1986 - appeared, causing a lot of damage. After this, an unexpected period of drought set in. Also the last, unexpected showers in August, which caused some quick additional planting, were followed by a dry spell, so that all together the yields were extremely low. There was only one farmer who expected his harvest to last him more than six months. Seven expected their harvest to last them two to four months, and two even less than two months.

> The population of Kibandaongo has its own explanations for the bad performance of the rains. One explanation is the fact that nowadays many Duruma take their traditions less serious then they used to do. The ancestors must have been offended by this, and punished the population by holding back the rains. Another explanation is related to the fact that a part of the holy kaya forest has been cut recently, while a third explanation refers to a murder which has been committed recently. Both incidents had led to the anger and punishment of the ancestors. In response to this anger, the witch doctors and clan elders went to the kaya on the night of the full moon, in order to offer goats, clothes and castor oil to satisfy the ancestors. A few days after this ceremony clouds appeared and it started to rain. Unfortunately, it rained so heavily, that a lot of crops got damaged by floods.

Of course, a lot might still depend on the harvest of the short rainy season, but during the last interviews in September 1986 the signs for the coming short rains were not very hopeful. Many people were already planning to sell some of their animals, to look around for work, or to send a family member to Mombasa in order to find employment. And again, casual labour on the Digo fields was considered as one of the possibilities.

> Duruma history is usually remembered by the occurrence of food shortages. The earliest food shortage which could be remembered, occurred somewhere between 1920-1930. This period of shortage is remembered as "the famine of wild leaves and roots". This is because people could only survive by the consumption of wild leaves and roots. Around 1940 a famine took place, which became known as "the famine of dried cassava". Many people went to the coastal areas to obtain cassava from the Digo, which they dried and consumed. Between 1950 and 1960 a serious famine occurred, which is remembered as "the famine of wheat", referring to the wheat which was distributed by the colonial government. During the last years of the sixties a famine occurred, known as "the famine of queues", referring to the long queues of people waiting for the distribution points, where small amounts of maize meal were distributed. The "famine of the yellow maize" refers to the famine from 1979 to 1981, during which American maize was distributed, which had a yellow colour, and - according to the people - a very bad taste. The last famine of 1984 has been called "the famine of water-sales", during which there was no water at all in the area, and tradesmen came from Mombasa to sell tins of water at high prices.

### *The short rainy season of 1986*

In Kibandaongo, the short rains form an essential part of the agricultural cycle. Especially in years when the yields of the long rains are disappointing, people try to cultivate as much as possible during the short rains, in order to compensate the long rainy season's losses. The short rains, however, are extremely unreliable, in amount of rainfall as well as in distribution pattern. Therefore, yields are usually low. The smaller the amount of rainfall, the closer timing of planting is required. People usually start with the preparation of the short rains' fields immediately after the long rains' harvest, so that the planting can be started immediately when the first showers set in. Most people prepare the same fields as they did during the long rains, which will save them the heavy work of clearing. This means, however, that the fertility of these fields is rather low, and that the growing of the same main crop accumulates pests and parasites, like the stalk borer and Striga.

Although the short rainy season of 1986 has not been included in the research period, so that no exact figures are available, it could already be registered that all the surveyed households were planning to plant maize during the next short rainy season. Compared with the long rainy season, there are relatively more people who will plant cowpeas (twelve households) and cassava (six households), mainly because maize prospects of the short rains are rather low.

### *Soil management*

In order to maintain soil fertility during the cropping period, fertilizer, manure or mulch should be added to the soil. However, no household applied fertilizer to the fields. The application of manure was done by eight households. Because these households neither had large numbers of animals, nor disposed of efficient methods to collect and transport manure, only small quantities were used on the plots directly surrounding the homesteads.

> Not all the farmers see the application of manure or fertilizer as a necessity for soil conservation. According to Mijikenda traditions, there are other methods to guarantee soil fertility and to protect the fields against theft, witchcraft, evil eye, diseases and pests. Such methods are, for example, the burying of certain medicines (plants and roots) in the soil, or the placing of a magic stick in one of the corners of the field. Such a custom, executed by a local medicine man, is believed to be more effective than the application of manure or fertilizer.

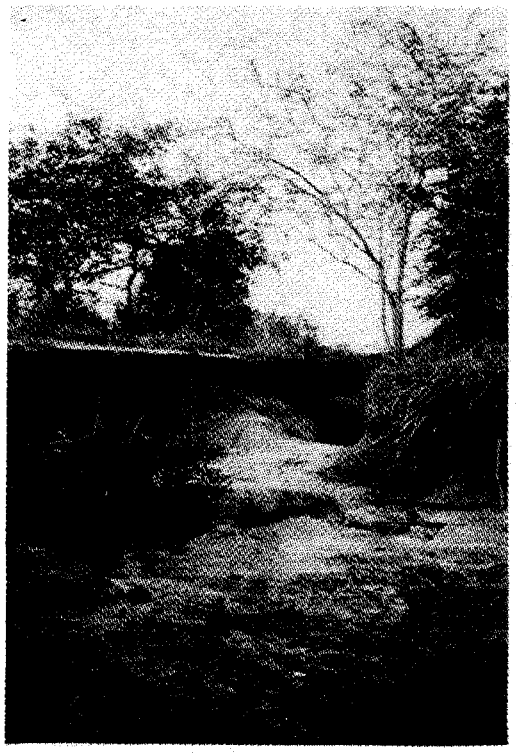
6.Traditional form of soil management in Kibandaongo: medicine, buried in a Coca Cola bottle, to protect soil fertility.

Although crop rotation and interplanting can have positive effects on soil fertility and soil structure (caused by different growth habits, growth lengths, nutrient requirements, etc.), these methods are hardly practised in Kibandaongo. Most fields (75%) planted with food crops contained maize only. In 20% of the fields maize was interplanted with cassava, and in the remaining 5% the maize was interplanted with pulses. It has to be noted that a maize-cassava combination has negative rather than positive effects on maize growth (cassava is marked by a large rooting space and high nutrient withdrawals). Concerning the maize-pulse combination, the amount of interplanted pulses is too low to have a positive effect on the maize plants, and is done when the maize is already maturing.

Erosion, as already mentioned before, is a serious problem in Kibandaongo. The cultivation of slopes, the clearance of the fields just before the start of the rains, and the uncontrolled way of livestock grazing, cause the problem to be more serious each year. All the households had noticed one or more gullies in their fields. Nine of them even noticed that the width of the gullies increased last year with 0.5 to 2 meters! Asked for the causes of this increase, people usually replied that, because the rain has been given as a blessing from God, the erosion has to be accepted as a side effect of this blessing. Four farmers took some measures to protect their fields against erosion, however, but without much effect. One farmer planted a few trees along the river side, two farmers planted bananas and napier grass in the gullies, and one farmer threw some shrubs and bushes in the gully. Many of the young trees and bananas were swept away, while the remaining plants indeed reduced depth erosion, but increased side erosion, because the amount of run-off water has not been reduced.

### 3.2.2. Tree crops and cash crops

There are not many tree crops in Kibandaongo, which may be attributed to three factors. First, both climate and soils are not well suited for the growing of tree crops. Annual rainfall is too low, while the soils are usually too shallow and poor. Second, people do not regard fruits as an essential part of the human diet, and therefore do not waste their energy in the propagation of tree crops under such unsuited natural circumstances. And third, there are very poor marketing facilities, which make it unattractive to grow tree crops for commercial purposes. Locally, there is hardly any



7/8/9.Soil erosion in Kibandaongo: gully erosion (top) and surface erosion (bottom).

demand for fruits. The roads and transport facilities are poor. The nearest market is at Kinango, but also there the demand is limited. The distance to Mombasa is far, and the transport costs are high, while the relatively poor quality would lead to low prices.

A remark should be made concerning copra and cashewnuts. There is a certain degree of marketing by buyers coming from the processing factories in Mombasa and Kilifi, who travel around the area to buy the products locally. But because of the low potential for tree crops, the production of copra and cashewnuts is very low. Therefore, buyers come irregularly, so the marketing has little meaning to the population. An exception are the few farmers who live in Kibandaongo, but who have access to fields located on the other side of the Shimba Hills. Here, the potentials for tree crop production are much higher, and marketing is better organized. Relatives who live there take care of the trees, and the profits made by marketing are shared.

The tree crops that do occur in Kibandaongo can be divided into four categories, which have different values to the households. The first category is formed by coconut palms and cashewnut trees, which have, except for their value for home consumption, a commercial value. It has already been mentioned that especially those households with access to fields in the more humid areas are able to derive a reasonable income out of the sales of fruits. The second category contains mango (improved variety) and citrus, which can be sold locally, and, when yields are reasonable, brought to Mombasa. The third category consists of bananas (both cooking and sweet bananas) which are almost entirely used for home consumption. The last category contains local varieties of mango, pawpaw, guava and custard apple, which are hardly of any value; they are often not even harvested.

Table 3.2 presents the distribution of the different categories of tree crops among the households Table 3.3 shows what households do with their productive trees. It is clear that only coconuts and cashewnuts have some commercial value.

Besides coconuts and cashewnuts, tobacco is the only cash crop of some importance. It is grown in small quantities, and marketed locally. Only in years with abundant harvest, do people bring it to Mombasa to sell on the market, but due to the relatively low quality (it is usually infected with the tobacco-mosaic virus), profits are not high. The crop is usually planted halfway the rainy season. The cultivation is labour-

**Table 3.2: Kibandaongo: distribution of tree crops.**

| type of tree crop | total number of producing trees | number of households with access to tree crops | average number of trees per household* |
|---|---|---|---|
| 1) coconut palm/ cashewnut tree | 399 | 7 | 57 |
| 2) mango/ citrus | 5 | 3 | 1.7 |
| 3) bananas (sweet and cooking) | 157 | 6 | 26.2 |
| 4) mango (local)/ guava/ custard apple/ pawpaw | 87 | 11 | 7.9 |
| Total | 648 | 13 | 49.8 |

* average number per household with access to trees.

**Table 3.3: Kibandaongo: destination of tree crops.**

| Tree crop | home consumption only | sometimes sold | regularly sold |
|---|---|---|---|
| 1) coconut palm/ cashewnut tree | 88 | 208 | 103* |
| 2) mango/ citrus | 5 | 0 | 0 |
| 3) bananas (sweet and cooking) | 157 | 0 | 0 |
| 4) mango (local)/ guava/ custard apple/ pawpaw | 84 | 3 | 0 |
| Total | 334 | 211 | 103 |

* Almost 70% of these trees are located in areas outside Kibandaongo, usually on the other side of the Shimba Hills.

demanding, and is therefore done in periods when the maize requires little labour input. No use of a seed bed is made. A large number of the small seeds is put in holes, about one meter apart, but because the rate of germination is low, only a few plants will reach maturity.

The late planting means that the tobacco is hindered by water shortage, and might suffer from too fierce sunshine. So the seedlings and young plants are watered daily, and protected from the sun by leaf coverages. Although the keeping of the inflorescences has a negative influence on the leaf quality, they are kept for seed production. The leaves can be harvested regularly from

September to December. Removed tobacco leaves are dried in the sun, and put together into a bundle, or are crumbled to a fine powder and preserved in dried calabashes. Usually, the tobacco is chewed or sniffed, but the younger generation also rolls and smokes it in small pieces of newspaper. Remarkably, it is always the head of household who is concerned with the growing of tobacco. In the female-headed household the sale of tobacco is often the only source of monetary income.

10. Tobacco, a local cash crop

### 3.2.3. Livestock

In Duruma history, livestock has always been important, especially since the turn of the nineteenth century. Livestock has always been an essential commodity of trade, and regarded as a standard of wealth. Bride prices are usually paid in cattle. Indirectly, livestock also plays an important role in the food security cycle. When food becomes scarce, people sell some of their livestock in exchange for money or food.

Cattle kept in Kibandaongo area belong to the small East African zebu type. This type of cattle is relatively well adapted to the local circumstances. However, cattle in Kibandaongo are not in optimal condition. During the dry seasons, the animals have to face harsh circumstances, and long distances have to be walked in order to obtain enough water and food. The salty water of the Kibandaongo river can be consumed by the animals, but in years when the river has dried up, the animals have to walk to the nearest waterpump, which is 10 to 20 km away from the homesteads.

An ever returning problem has been rinderpest, which regularly reduced herd sizes. The last fierce epidemic of rinderpest was during the dry season of 1963-1964, which left hardly any animal alive. After this event, the livestock sector was affected so seriously that until now it has never recovered completely. Other troublesome diseases are east-coast fever, foot-and-mouth disease, and trypanosomiasis which is transmitted by the tse-tse fly. Most of the cattle suffer from lack of minerals, leading to geophagia (earth eating). Remarkably, geophagia is regarded by the people as a sign that the cattle have been affected by witchcraft (a jealous neighbour buried some sorcery attributes in the soil, in order to harm the animals). No supplementary feeding is practised to decrease these mineral deficiencies.

Cows are milked, but not primarily kept for milk production. Milk is usually taken by the herdsmen, who sometimes sell it locally. Milk is consumed freshly in tea, or sourly as a relish accompanying the maize porridge. Sometimes ghee is processed, and sold locally. At night the cows are kept separately from the calves and milked in the morning. Milk production per cow is low. Except for the low milk potential of the local breed, this is caused by the extensive way of keeping, which results in a milk production for human consumption of about one litre per day per cow, and lactation periods of about 150 days. Beef is only consumed at special occasions. After

slaughtering the hides are washed, drained, fleshed and dried, and locally used for carpets, beds, drums, etc.

The indigenous breed of goats in the Kibandaongo area is the small East African goat. The sheep are of a local type. They are both herded by children. When water is available, they drink at the Kibandaongo river. Otherwise they have to go to a waterpump which is far away. At night, they are usually kept inside of the house, to protect them against wild animals. Common diseases, both for goats and sheep, are pneumonia, diarrhoea, foot-and-mouth disease, tick-born diseases and other parasites. Goats and sheep are rarely milked. At special occasions, such as births, funerals, and rituals, some animals are slaughtered.

> Goats often have to be given to, and offered by a local doctor, in case of disease or spirit possession. A piece of the goat skin is usually put around the arm of a new born child, a sick or a spirit-possessed person, in order to bring luck, to heal, or to satisfy and calm the spirit.

The chickens* in the Kibandaongo area are of a small local breed. They move freely around the homestead, where they can find their own food in the form of grass, seeds, insects, and kitchen wastes. During the dry season, however, when not much food and water is available, the chickens become weak and many die. There are several diseases which regularly reduce the numbers of chickens , like New Castle disease, fowl typhoid, coccidiosis, eye infection, and parasites, like ticks, worms, etc. The meat of chickens is consumed at special occasions, and offered to important visitors. The eggs are hardly consumed. People prefer eggs to be hatched to increase the number of chickens . In fact, eggs are regarded as snake-food, and therefore not suited for human consumption.

Table 3.4 shows the numbers of cattle, goats, sheep and chicken in the surveyed households. Chickens and goats are quite common, while sheep and especially cattle are only present in one-third of the households. It can also be seen that livestock is a common object of sale. When taken into account that the majority of sales took place during the dry season and the first part of the rainy season, one may conclude that in periods of food shortage, livestock plays an essential role in the households' food security.

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* For reasons of simplicity, poultry is included in livestock in this paper.

**Table 3.4: Kibandaongo: distribution and sales of livestock.**

| Type of animal | number of households with access to animals | average number of animals per household* | number of animals sold |
|---|---|---|---|
| cattle | 4 | 7 | 7 |
| sheep | 5 | 6 | 0 |
| goats | 11 | 13 | 20 |
| chicken | 15 | 12 | 65 |

* average number per household with access to livestock

The keeping of livestock is quite risky in the Kibandaongo area, which can be illustrated by the high death rate during 1986. In that year, twenty-six cows and sixteen goats died. Most deaths occur in December and January, almost at the end of the dry season, when food and water were scarce, and the animals were vulnerable to diseases. Most of these deaths were young, just-born animals. People do not practise breeding-planning (the timing of birth in the more favourable rainy season) so that animals born during the dry season have to face harsh conditions immediately after birth.

Also from government side, there are only limited measures to improve the cattle. For instance, cattle dips ar not available in the area, The closest veterinarian assistent is settled in Kinango. Now and then, he visits Kibandaongo to vaccinate cattle against foot-and-mouth disease and rinderpest. However, farmers are very sceptic about these vaccinations; according to the people they cause more harm than protection. The main explanation for the bad quality and the non-presence of improvement measures lies in the value of livestock for the population: quantity is more important than quality. Therefore, quality and productivity of the livestock remains low, while the grazing of the relatively large herds leads to degradation of the natural environment (overgrazing, soil erosion).

### 3.2.4. Other forms of exploitation of the environment

Apart from agricultural production, the local population uses the environment for other purposes, like the daily collection of firewood, hunting, fishing, and gathering. Firewood is the single source of energy supply in Kibandaongo. This energy is needed primarily for cooking, but also for heating, lighting, as well as for the drying of grains. The firewood is usually collected in the bushes and shrubs around the homesteads and surrounding fields, where it seems to be available abundantly, especially in the dry season.

Hunting is a common activity. Small wildlife, like rabbits, gazelles, dikdiks, and several types of birds, is common in the area, especially during the dry season when the animals come from the drier hinterland. They are hunted with bows and arrows, the latter often poisoned. Sometimes fishing is done in the Kibandaongo river during the rainy season, although not many fishes are available there. Several insects like locusts and ants are consumed, usually as a kind of snack.

Many types of wild vegetables and fruits are gathered and consumed as relish, which makes them an important source of vegetal nutrients. Other types of plants, roots, fruits, and barks, are prepared by the local medicine men as remedies against all kinds of diseases and evils. Finally, some people specialized themselves as collectors of wild honey, a product which can be sold locally, and, if collected in sufficient quantities, on the market in Mombasa.

## 3.3. Off-farm employment

It has already been mentioned that the off-farm sector forms an essential element in the means of subsistence of the households in Kibandaongo. Due to the marginal circumstances under which agricultural activities are carried out, agricultural production is generally low, leading to regular food shortages. In order to cope with these situations, people try to get involved in all kinds of off-farm activities, providing an income with which the required amount of food can be purchased.

Off-farm employment can be either in the agricultural sphere, or in the non-agricultural sphere ("non-farm employment"). The latter can be divided into self-employment in Kibandaongo, informal employment in Mombasa, and formal employment in Mombasa. The height and regularity of income varies with the different types of employment (Table 3.5).

**Table 3.5: Kibandaongo: off-farm employment.**

| type of employment | number of persons involved | monthly income (KSh.) | regularity of income |
|---|---|---|---|
| rural casual labour | 13 | 0-100 | very irregular |
| self-employment (Kibandaongo) | 5 | 100-500 | irregular |
| informal employment (Mombasa) | 5 | 100-500 | irregular |
| formal employment (Mombasa) | 4 | 500-1000 | regular |

The first type of off-farm employment concerns hired agricultural labour. It consists mainly of land preparation and weeding, and is exclusively carried out by women during the labour-intensive periods. In these periods, stocks have often run out, while the new harvest is not yet ready. When other sources of income are not available, women are forced to work on the fields of others, in order to obtain money to purchase the household's food requirements.

But earnings from this form of labour are low, sometimes salary is not even paid in money, but in food. A consequence of the working on fields of others, is that less time is available for the necessary work on the household's own fields. This means a delay of the own land preparation up to 70%, and a reduction of the size of the household's own cultivated area up to 50%. This delay and reduced sizes lead to lower yields, which imply that stocks will run out earlier, forcing the women to repeat this procedure next year.

When casual labour can be done on the fields of neighbours, the negative effects for the household's own production can be reduced because the women can still work on

their own fields part of the day. However, when there is no rain, they have to move to the fields in the coastal areas, which means temporary migration.

The second type of off-farm employment is the non-agricultural off-farm employment. In Kibandaongo itself, possibilities to find non-farm employment are restricted to some local professions like house builder, shop keeper, or medicine man. All these types of self-employment are rather irregular and low-paying, because earnings are dependent on the local demand, which is low, especially in the seasons when money is highly needed. In total, there are four households which depend on this type of employment, carried out either by the male heads of household, or by their sons.

More promising seem to be the employment opportunities in Mombasa. Due to the generally low levels of education, however, these employment opportunities are largely restricted to informal activities (five persons of the survey) or low-paying factory work (three persons of the survey). Still, these types of employment offer relatively large incomes, especially the factory work which has a certain regularity. There is only one person who is employed by the government. This is a younger household head, who had some years of secondary education, and who is employed as a primary school teacher in Mombasa.

## 3.4. Food security and saving

Up to now, the various farm and off-farm activities carried out by the household members have been described in general terms only. In this section, the extent will be evaluated to which the various farm and off-farm activities correspond with the household's objectives, and whether or not they result in the satisfaction of the objectives.

In chapter 1, food security and monetary saving have been mentioned as being the two objectives of the households. It will be clear that these two objectives are closely related to each other (monetary saving will only take place when the food security is guaranteed). Therefore, food security can be seen as a primary, and monetary saving as a secondary objective.

Regarding food security, it must be noted that the majority of the households in Kibandaongo do not succeed in achieving this objective, and face food scarcity regularly. In terms of frequency of food scarcity (measured in number of days per month, averaged over the different seasons), the households can be classified into four groups, ranging from households which never or hardly ever face food scarcity, to households which have to face more than ten days of food scarcity per month (Table 3.6).

**Table 3.6: Kibandaongo: frequency of food scarcity and monetary saving.**

| number of households | frequency of food scarcity (av. nr of days per month) | monetary saving |
|---|---|---|
| 4 | 0-1 | yes |
| 5 | 2-5 | no |
| 4 | 6-10 | no |
| 2 | > 10 | no |

The low degree to which the primary objective of food security is achieved, implies that also the secondary objective of monetary saving will be achieved to only a very limited extent. Indeed, only the four households which never or hardly ever face food scarcity, succeed in saving little amounts of money. This money is usually kept somewhere in the house, and is used when food has to be bought. When the amount of money is larger than required for food purchases, it is transferred to livestock as a long-term investment.

# Chapter 4

# Bongwe

## 4.1. Land, labour and capital

In Bongwe the same resources as in Kibandaongo - land, labour and capital - form the basis of both farm and off-farm activities. The nature of these resources, however, differs from those in Kibandaongo, due to differences in the physical, socio-cultural and economic environments.

### *Land*

Almost all the land suitable for agricultural production is actually under cultivation. The available amount of agricultural land is limited, and a growing demand for land can be noticed. In addition to natural population growth, there are immigrants from up-country, who try to obtain land. As a result, land pressure and land shortage are increasing. Land has become a major pledge in order to get a loan, and one may expect that land will soon become an object of trade and speculation.

The traditional Mijikenda rules concerning land ownership have been highly influenced by the Islamic Swahili law. According to this law, land is owned by the community as a whole, as long as the land is uncleared or planted with annuals only. As soon as tree crops have been planted, the land belongs officially to the (male) person who planted the trees. In 1969, however, these rules changed, as the government started a land adjudication programme in Kwale District. Individual farmers could obtain official title deeds for the fields they had been cultivating so far, without making a distinction between the cultivation of annuals or tree crops. Soon after that, all the fields in the Bongwe area were registered as private ownership. Conflicts concerning land ownership, usually originating from confusion about conflicting old rules and new rules, resulted in the development of several types of land ownership, corresponding with different types of land-use:

- communal family ownership, i.e. land surrounding homesteads (built on family land) planted with cassava, and fields planted with trees only (i.e. fields with trees which have been divided among family members after the death of an elder, while the land itself remains communal family ownership);
- individual ownership obtained by inheritance, i.e. main fields planted with a combination of annual crops and tree crops;
- individual ownership obtained by purchase, i.e. land located outside Bongwe, in recently adjudicated areas; this land is often not cultivated but purchased for speculation purposes;
- borrowed land, i.e. rice fields which are owned by a few individuals who lend it out freely;
- squatted land, to which the user has no official rights and is allowed to plant annuals only.

All the fields under cultivation were occupied more than 10 years ago. Moreover, almost all suitable agricultural land has been occupied and there is hardly any uncleared land left in the area. As a result, the frequency as well as the lengths of fallow periods have been decreasing

The average period of cultivation, i.e. since the last fallow period, is 7.6 years. The fields directly around the homesteads are often under continuous cultivation. The main fields which are located further away are often planted with tree crops, not with annual crops. This is partly due to the long distance to the homestead which makes the people unwilling to cultivate them. Another reason is that these fields are often common family ownership. The trees have been divided among different heirs, but the right to cultivate the land beneath the trees is unclear.

Table 4.1 shows the average area cultivated with cereals, per household and per household member. The majority of the households cultivate areas between 0.1 and 0.3 ha. These households usually have a large number of family members, but this does not entail a large labour force as many members are small children, or older members who are involved in off-farm employment. So, despite large family sizes, cultivated areas per household member are still small.

**Table 4.1: Bongwe: area under cereals.**

| area under cereals (ha) | number of households | mean size (ha) | mean number of household members | area per household member |
|---|---|---|---|---|
| 0.0 - 0.1 | 2 | 0.06 | 2.5 | 0.02 |
| 0.11 - 0.2 | 5 | 0.17 | 5.2 | 0.03 |
| 0.21 - 0.3 | 6 | 0.24 | 7.5 | 0.03 |
| > 0.3 | 2 | 0.37 | 3.0 | 0.12 |
| total | 15 | 0.21 | 5.5 | 0.04 |

### *Labour*

Labour which is directed to agricultural activities seems to be more related to the number of household members willing to devote their time to agricultural activities, than to the total number of household members. The average number of family members is 5.5 persons, but the number of persons who can be regarded as full-time agricultural labourer is only one. Given the average of 0.21 ha under cereals, this means that every full-time agricultural labourer cultivates 0.21 ha. The majority of the male population prefers to be employed off-farm , they leave the farm work completely to their wives. But neither are these wives willing to work on the land all day. They prefer to gain some private income, and are only motivated to grow some cassava (interplanted with maize or not interplanted) or a small plot of rice. Children usually go to school, and do not spend much time on the fields. When a household really wants to have a reasonable agricultural production and has a sufficient monetary income, labourers are hired, usually Duruma labourers from the other side of the Shimba Hills.

Other tasks of the women are in the domestic sphere: pounding (milling is usually done at the maize mill in Ukunda), cooking, cleaning, taking care of the children, fetching water, collecting firewood, etc. The men, although they do not spend much time on the field, take care of the tree crops. In the evening, the men come together in the centre of the village to go to the mosque and to discuss local issues.

Both sexes spend a considerable amount of time attending ceremonies and rituals, which are a mixture of the traditional Mijikenda and the Islamic ceremonies and rituals added later.

### *Capital*

In general, capital is invested in housing and trees, and to a lesser extent in livestock. Trees function as an object of renting and leasing. Livestock no longer plays a role as bride price, which is entirely paid in money nowadays. Modern inputs like fertilizers, pesticides, or seeds of improved varieties are not used. Only one household hired a tractor to plough the main field. The common tools are the handhow and the cutlass, but also the more modern long-steel handhow is used by some farmers. People who have access to capital prefer to invest this in non-farm activities like trade or tourist related activities rather than in agriculture.

## 4.2. The farm sector

Although the farm sector in Bongwe does not necessarily provide the major basis of existence to all the farm households, all farm households are to a certain extent involved in agricultural activities. As in the case of Kibandaongo, the description of the farm sector will be divided into the three sub-sectors of food crops, tree crops and livestock. Also the other ways of exploiting the environment will be described briefly.

### 4.2.1. Food crops

The staple food in Bongwe is maize, immediately followed by cassava. To a lesser extent rice is grown as a food crop. The production of food crops is entirely for home consumption, and yields are usually not high enough to form surplusses which could be sold.

11. Farming in Bongwe. Trees dominate the landscape (like the bananas and coconut palms on this picture), alternated with food crops.

The indigenous *cereals* of sorghum and millet are no longer grown in Bongwe. Even maize, although being the staple food, is not grown by every household. Although climatic circumstances are quite favourable, people often prefer to purchase their required maize meal in the shop, rather than grow the maize themselves. Pests, diseases and weeds affecting the maize are similar to those described in the Kibandaongo section.

An important cereal is rice. Introduced by the Arabs, rice gained a certain status and popularity among the Digo, who like to consume it during special occasions like funerals and ceremonies. The local variety is not very vulnerable to pests and diseases, but requires proper weeding.

Of the *root crops*, cassava is the most widespread. The Digo have always been known for their high consumption of cassava, which is in some cases even higher than that of maize. In agro-ecological terms, the area is well suited for cassava, while the low labour requirements accord well with the Digo attitude towards field work. It is usually grown directly around the homesteads, where it can be uprooted and

consumed directly. As in Kibandaongo, all the cassava is infected with the mosaic virus. Other root crops are hardly cultivated. Only sweet potatoes are grown by a few farmers, but in small quantities.

*Pulses* like beans, cowpeas, pigeon peas and green grams are commonly grown although in small quantities. Affected by insect damage, they often fail to make pods. *Miscellaneous crops* like pumpkins, tomatoes, brinjals, ocra, amaranth, water melon and chillies, and simsim are only grown incidentally, and also in small quantities.

### *Cultivation practices*

The long rainy season from March until August offers fairly good perspectives for crop cultivation, but the short rainy season from September until November is often too weak and unreliable to guarantee a reasonable harvest. Only cassava and pulses are planted during this short rainy season. This means that the largest part of the cultivation practices are carried out during the long rainy season.

*Land preparation* is mainly done with the local handhow, although within the surveyed households, two farmers used the more modern long steel handhow (only used by the men) and one farmer hired a tractor-plough. Because there are hardly any fields left which have not been cultivated before, no first clearances have been made recently. But due to the humid climate weeds are growing rapidly, so in several cases the land has to be cleared with the cutlass, after which the material is collected in heaps and burned. Although most of the people realize that it would be better to finish preparation, and plant before the first showers set in, there are several personal reasons (illness, no time or no desire) which delay the preparation until after the first showers.

At the beginning of the preparation period, a large number of fields are still covered with cassava planted during the short rains of the previous year. Thus, these fields do not have to be cleared completely, but only weeded, while the maize is planted in between the cassava. An exception has to be made for the rice fields, which are prepared from January onwards, i.e. before the long rains set in. The main reason for this is that after the first showers the clay soils of these rice fields become very muddy

and difficult to cultivate. Further, people are eager to occupy the borrowed rice plots early, in order to make sure that they will have access to the plot they want.

*Planting* of maize is done after the land preparation is completed. The maize variety in Bongwe is a local variety. It has shorter stalks and heavier and more compact cobs than the Kibandaongo variety, and contains white seeds with incidentally also red seeds. Usually three seeds are put into one hole of about 4 cm depth, with a mutual distance of about 60 cm, leading to a density of about 28,000 holes and 60,000 plants per ha. People do not plant in lines, so the plants grow in a scattered pattern in the field.

The rice grown in Bongwe is also local variety. Seeds are usually preserved from the previous harvest. As said, long before the rains set in, the rice is sown in the dry ground, and the seeds will remain dormant until the first showers appear. Six to twelve seeds are dropped in holes about 2-6 cm deep and about 30 cm apart This leads to a density of about 110,000 holes per ha. When the seeds have germinated, the rice is thinned until 2-8 plants remain per hole.

The cassava, pulses and simsim are planted either when the maize plants are maturing (June - July), or while the maize is harvested (August). The cassava cuttings are obtained from mature plants which are still in the field. They are of varying lengths (20-60 cm) and planted under varying angles (30-60 degrees) at varying distances apart (40-100 cm). The new cassava is interplanted with the maize or mature cassava, or on a separate field. Another common method of planting cassava is putting a new cutting in the soil on the spot where a mature one has just been uprooted, without regard to the season.

Seeds of pulses are usually bought from the local shopkeepers who buy them in Mombasa. They are planted between the maize or cassava, or on separate plots. Generally, people plant one seed per hole, with varying mutual distances. Other crops - if planted at all - are not planted at special times, but whenever the seeds and the time are available.

*Weeding* is a hard work, because due to the relatively high rainfall, the weeds grow fast. Especially the rice and maize fields require intensive weeding. However, it is often not done properly, leading to considerable yield reduction.

> The Islamic Digo attach high importance to Ramadan, the holy month in which it is forbidden to eat or drink from sunrise to sunset. For the Digo, this provides a good excuse not to work very hard on the field. In 1986, Ramadan took place during the weeding period. Therefore, not much time was spent on the weeding, which had its reducing effect on the yields.

*Harvesting* of the maize is usually done during the end of July (green maize) and August (dry maize). Mostly, people do not want to let the maize dry completely in the field, because during that time monkeys and wild pigs are eager to enter the fields and eat it. However, shortening the drying period might increase storage losses because of rotting and fungi. Therefore, during the drying period, often a family member will stay in the field day and night to chase the animals away. The harvesting of rice is done in August. The paddy is collected, spread on a woven mat and dried in the sun. The cassava is planted several times a year, and can thus be harvested throughout the year.

*Additional preparation and planting* is hardly practiced, except in some cases where the first planting got damaged in an early stage, due to low germination rates, chickens, rats or monkeys.

### *Storage and processing*

In Bongwe, the quantity of maize harvested per household is often too small to store it properly. Usually the cobs are bound together with their outer leaves, and hung two by two on a stick above the kitchen fire to dry. The women pound the grains themselves, but the milling is mostly done at the maize mill in Ukunda.

The rice is preserved in baskets, after drying in the sun. Before consumption the husks are removed by means of slashing with sticks. Usually the cassava is uprooted just before consumption. Due to the high water content the tubers are unsuited for storage, unless they are dried in the sun and milled into flour. This flour can be used to cook a thin porridge, called "uji" (which can also be made from maize meal). The

young leaves of pulses are often used as relish. The seeds of the pulses, when not immediately consumed, are dried in the sun and preserved in calabashes, bottles or baskets. Simsim and other seeds are stored in the same way.

### *Food production of the long rainy season of 1986*

The rainfall during both the long rains and the short rains of 1985 were regarded by seven households as enough and by eight households as too little for a reasonable harvest. The total amounts of the long rains of 1986 were higher in Bongwe than in Kibandaongo, but the distribution showed the same irregular pattern, with an extreme peak and two dry spells. This peak destroyed a large proportion of the planted maize (especially where it had been planted on badly drained soils), while the dry spells had a serious effect on the rice. Two households did not experience much damage, because they had planted their maize in time and had no rice. Two households had a lot of water damage on their fields, six households had to cope with drought and five with both.

The average yields of maize and rice together counted about 70 kg, which would mean, given the average size of cultivated fields of 0.21 ha, a productivity of about 350 kg/ha (ranging from 10 to 200 kg per household and from 45 to 715 kg per hectare). These yields are rather low, and, according to the majority of households, represent no more than 50-70% of the yields in more average years. Most farmers however, do not consider these low yields as very dramatic, because usually the Digo do not have the intention of growing enough maize to last throughout the year. They depend to a varying extent on their off-farm income, with which they buy the required food in the shop.

### *Short rainy season of 1986*

Due to the more unimodal rainfall pattern in the coastal areas, the short rainy season in Bongwe is extremely unreliable. Combined with the fact that most Digo are not enthousiastic about preparing the field again in September, the short rainy season is not regarded as important for agricultural production. Still, ten of the fifteen surveyed

households were planning to prepare a field for the short rainy season of 1986. Three of them wanted to plant maize, the remaining seven only cassava, cowpeas, green grams and simsim. The other five households expected to be able to buy all their required food.

Of the ten households planning to plant a second crop, the majority wanted to prepare the same fields as they did for the long rainy season. Because there was still cassava in these fields, preparation should not require much labour. There were also several households that wanted to prepare the rice field of the long rainy season for the cultivation of pulses, because the clay soils of these fields have a larger water-conserving capacity.

### *Soil management*

None of the households used any fertilizers. Very few households have access to livestock, making the role of manure almost negligible. Only the crop residues and weeds are left in the field. House wastes are usually thrown in the plot around the homestead, which might be a compensation for the continuous cultivation of these plots.

> Many people still underestimate the value of manure or fertilizer application. Although the traditional Mijikenda custom of the burying of medicine or placing of magic sticks is not often practiced any more among the Digo, this custom is replaced by comparable Muslim ceremonies. Recitals from the Koran or the burying of written Koran texts should protect the field from theft, witchcraft or the evil eye, and must guarantee the maintenance of soil fertility.

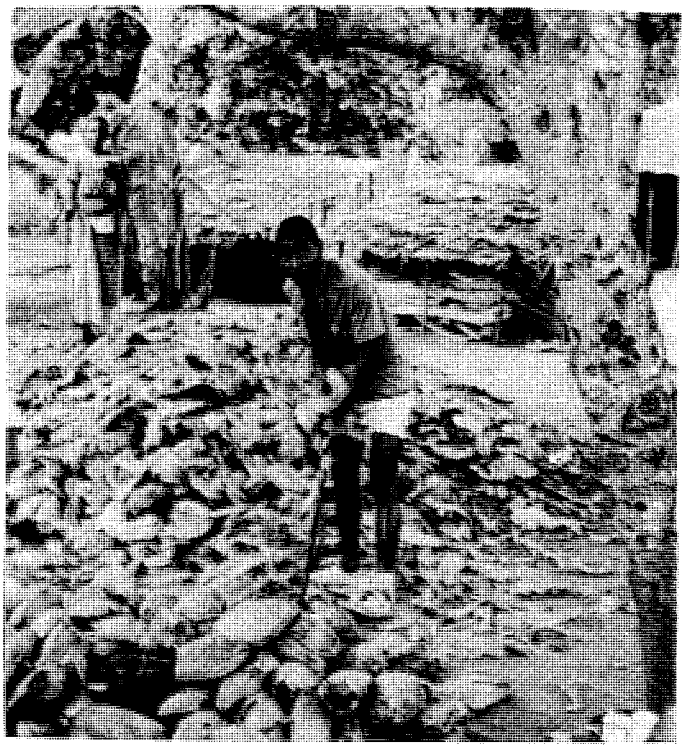
There is hardly any crop rotation. Most of the fields are reserved for a certain crop. Cassava is usually grown around the homesteads, where they can be uprooted and prepared immediately. Maize, when grown, is usually planted in main fields outside the village, where there is still open space between the trees, and where there are no chickens to eat the seeds and young plants. Only in the rice fields pulses are sometimes planted during the short rainy season, increasing the amount of nitrogen in the soil, which will have a positive effect on the rice yields of next year.

Interplanting is common. Only 6% of the cultivated area is planted with maize only, and 13% with cassava only. Almost half the cultivated area is interplanted with a

combination of maize and cassava, and 2% with a combination of maize and pulses. Rice, planted on 32% of the cultivated area, is never interplanted with another crop.

### 4.2.2. Tree crops and cash crops

In Bongwe, the cultivation of tree crops is very common, and the rate of tree coverage is high. The soils and the climate are relatively well suited for the cultivation of tree crops. Nevertheless, the population does not regard fruits as an essential part of the diet (except for the coconut), but the trees grow easily without much labour requirements, and the fruits can be sold whenever money is needed. Yet, the tree crops are not regarded as a serious and regular source of income. Only cashewnuts, fresh coconuts and copra are sold regularly, but after that the needs for home consumption are satisfied. Kapok and bixa used to be grown for commercial purposes years ago. But due to the increased popularity of synthetic substitutes, kapok and bixa both lost their value as export crops, and are nowadays not grown any more. The few kapok trees which were left are now often used as firewood.



12. Processing copra. Coconut palms form the most important cash crop in Bongwe.

Fruits are sold locally or on the markets of Ukunda and Mombasa. Recently, there are also buyers from the beach hotels who go around and buy from individual farmers. Still, the general interest in the cultivation of tree crops for commercial purposes is rather limited, and young trees are only planted to a limited extent. Another function of tree crops - especially coconut palms - is that they can be used for leasing and renting. In this way trees can be regarded as a pledge, a method for investment and security, and to some extent a sign of wealth.

> The coconut palm is called the "tree of life", and enjoys a certain respect. The coconut palm provides the population with food, roofing material, pleasure (palm wine) and cash. Moreover, it can function as an object of sale, renting, and leasing. Hence the coconut palm can be regarded as a sign of wealth and prestige. It is a shame to cut a coconut palm, even when it is dead.

In Bongwe, the tree crops can be classified in the same categories as was done in the Kibandaongo section: coconut palms and cashewnut trees, of which the harvest can be sold to processing factories in Mombasa and Kilifi; mango (improved variety) and citrus, the harvest of which can be sold at the markets of Ukunda and Mombasa, as well as in the hotel zone of Diani Beach; bananas (both cooking and sweet bananas) which are almost entirely used for home consumption and local sales; and, finally, local varieties of mango, pawpaw, guava and custard apple, which are hardly of commercial value, and are locally consumed by children. Table 4.2 shows the total producing numbers of the several categories of trees, while table 4.3 gives insight into the destination of the yields. In contrast with Kibandaongo, where only coconuts and cashewnuts had some commercial value, the marketing possibilities of tree crops in Bongwe are much better: most of the fruits are sold, either incidentally or regularly.

### 4.2.3. Livestock

Long ago, also the Digo used to keep livestock, although never to the same extent as the Duruma. The warm and humid climate combined with the high infestation of the environment with the tse-tse fly made it difficult to keep cattle in the coastal areas. There are some Digo who own large numbers of cattle, but they are herded by Duruma behind the Shimba hills. However, none of them is included in the sample. Table 4.4. presents the numbers of different types of livestock per household and in total, as well as the numbers of sales in 1986.

**Table 4.2: Bongwe: distribution of tree crops.**

| Tree crop | number of productive trees | number of households with access to tree crops | average number of trees per household* |
|---|---|---|---|
| 1) coconut palm/ cashewnut tree | 837 | 11 | 76 |
| 2) mango/ citrus | 206 | 9 | 22.9 |
| 3) bananas (sweet and cooking) | 236 | 12 | 19.7 |
| 4) mango (local)/ guava/ custard apple/ pawpaw | 117 | 12 | 9.8 |
| Total | 1396 | 14 | 99.7 |

* average number per household with access to trees.

**Table 4.3: Bongwe: destination of tree crops.**

| Tree crop | home consumption only | sometimes sold | regularly sold |
|---|---|---|---|
| 1) coconut palm/ cashewnut tree | 3 | 116 | 718 |
| 2) mango/ citrus | 41 | 109 | 56 |
| 3) bananas (sweet and cooking) | 135 | 51 | 50 |
| 4) mango (local)/ guava/ custard apple/ pawpaw | 55 | 36 | 26 |
| Total | 234 | 312 | 850 |

**Table 4.4: Bongwe: distribution and sales of livestock.**

| Type of animals | number of households with access to animals | average number of animals per household* | number of animals sold |
|---|---|---|---|
| cattle | 0 | 0 | 0 |
| sheep | 0 | 0 | 0 |
| goats | 5 | 3 | 5 |
| chickens | 12 | 9 | 7 |

* average number per household with access to livestock

The households which kept livestock (only chickens and goats) did so primarily for investment purposes, and secondly as a source of food. In some households, livestock is especially kept for ceremonies at which the animals are slaughtered and offered or eaten.

The animals in Bongwe are in a relatively good condition, because enough food is available throughout the year. Diseases are similar to those which have been described in the Kibandaongo section. During 1986, five goats died, but not in a particular time or due to a particular reason.

During the day, the chickens move freely around the homestead, where they can consume the house wastes. Goats are tethered on the edges of fields and roads. During the night, goats usually stay in a small house built next to the main house, while the chickens stay either in the kitchen or in the main house. Chickens which are sold are usually sold in cases of small sudden needs for money. The goats are sold when larger sums of money are required, or offered to local medicine men in exchange for treatments.

### 4.2.4. Other forms of exploitation of the environment

All the households in Bongwe rely on firewood as the main source of energy. However, firewood is getting scarce, so people use house wastes like coconut shells, and palm leaves, or cut kapok trees and (old) cashewnut trees to provide firewood. Wild vegetables and fruits are gathered only to a limited extent, as many wild plants

have disappeared, and people prefer to consume more sophisticated types of relish. Only the local medicine men and women still collect herbs, roots, fruits and barks to prepare their medicines.

## 4.3. Off-farm employment

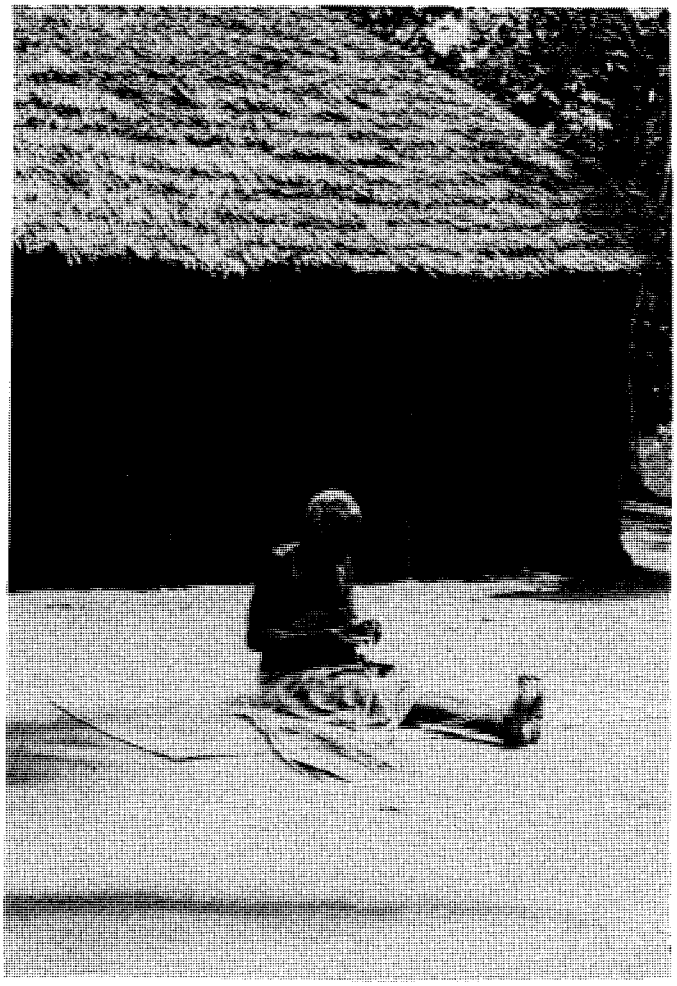
Off-farm employment plays an essential role in Bongwe. The majority of the households is involved in one or more types of employment and thus has access to a monetary income. This creates a certain local demand for consumptive needs and handicraft, leading to opportunities for local self-employment. Off-farm employment in the agricultural sphere was not found in Bongwe. All types of off-farm employment were non-farm. They can be divided into handicraft, self-employment in Bongwe, informal employment in Diani Beach, formal employment in Diani Beach, and government services. In table 4.5, the various types of off-farm employment are presented, with the number of persons involved in it, as well as an estimation of the height and relative reliability of the incomes.

A common form of off-farm activities is provided by the several types of small handicrafts, like the weaving of mats and makuti (roof coverings), or the preparation and sale of small foodstuffs. These activities are usually carried out by women, either wives or female heads of household, who wish or need an income of their own. The more official types of employment are almost entirely restricted to men, although one of the female heads of household is both self-employed as a diviner and involved in informal trade.

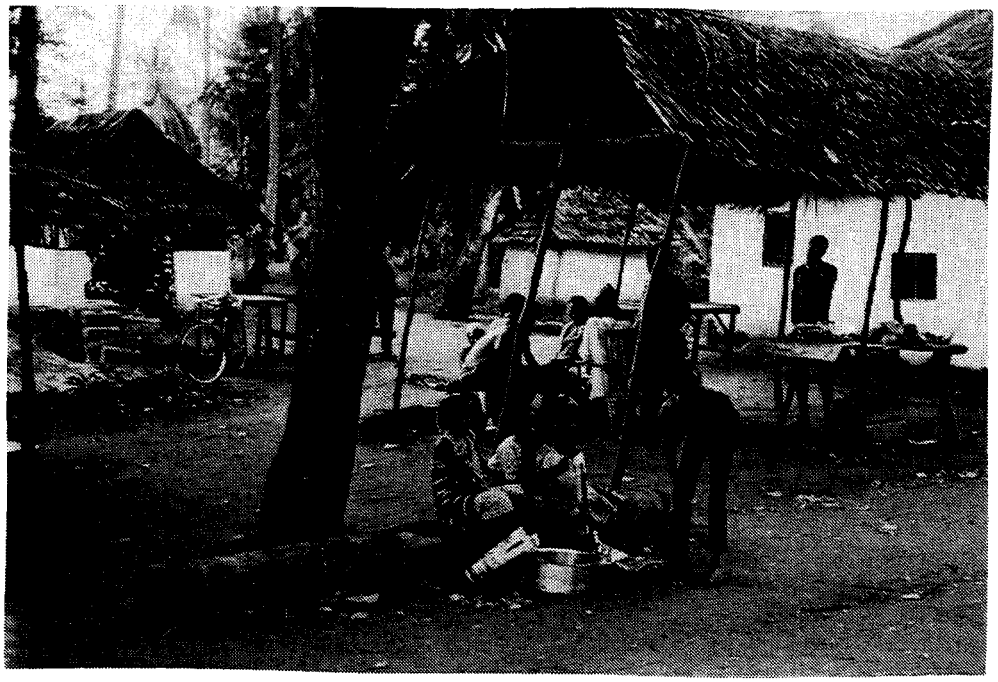
> Fatuma divorced her husband long ago. She went with her children to her parental homestead, where she started several activities in order to gain money and repay her bride price. Nowadays, she is a highly respected woman in Bongwe, who trades in paraffin, tobacco and fish, runs a local restaurant, and is frequently consulted as a diviner. Only when she has some spare time, she cultivates a small plot of rice and cowpeas.

**Table 4.5: Bongwe: off-farm employment.**

| type of employment | number of persons involved | av. monthly income (KSh.) | regularity of income |
|---|---|---|---|
| handicraft | 8 | 0-100 | very irregular |
| self-employment (Bongwe) | 4 | 100-500 | irregular |
| informal employment (Diani Beach) | 3 | 100-500 | irregular |
| formal employment (Diani Beach) | 4 | 500-1000 | regular |
| government employment | 1 | 1000-1500 | regular |



13. Handicraft: production of mats



14/15. Off-farm employment in Bongwe: local trade in the centre of Bongwe (top) and the tourist sector of Diani Beach (bottom).

Common types of local self-employment are shopkeeping, fishery and trade, of which the latter is closely connected with the trade relations between Ukunda, Mombasa and Diani Beach. A more lucrative type of employment is found in the tourist sector of Diani Beach. Relatively high profits are made out of various informal and formal activities to serve the foreign tourists. Although also some elder men are involved in these activities, it is primarily the younger (male) generation with some education who succeed in obtaining these jobs. The only person in the surveyed households who is employed by the government is the Councillor of the division, who has settled in Bongwe.

## 4.4. Food security and saving

As in Kibandaongo, the household's main objectives in Bongwe are food security and monetary saving. Table 4.6 shows to what extent the several farm and off-farm activities result in the satisfaction of these objectives.

**Table 4.6: Bongwe: frequency of food scarcity and monetary saving.**

| number of households | frequency of food scarcity (av. nr. of days per month) | type of saving |
|---|---|---|
| 2 | 1-5 | no saving |
| 6 | 0 | individually |
| 5 | 0 | saving group |
| 2 | 0 | bank account |

Two households do not succeed in achieving its primary objective, food security, and have to face food scarcity sometimes. Nor do they succeed in saving money regularly. The majority of households, however, do succeed in achieving food security, and have a chance to succeed in achieving the secondary objective - monetary saving - as well.

Three types of monetary saving can be distinguished which are primarily dependent on the amount of money that can be saved. Firstly, saving on an individual basis: small amounts of money are kept somewhere in the house. Secondly, saving through membership of a local saving group: each month a certain amount of money (which is usually more than the amounts of money saved individually) is donated to a common fund, and paid out to one member by turns. The third and most sophisticated method of saving is the use of a bank account at one of the commercial banks in Mombasa.

# Chapter 5

# Farming systems and household objectives

In this chapter, the results of the previous chapters will be combined. First, the two research areas will be compared concerning the main socio-economic characteristics discussed so far. In the next section, households will be compared, leading to a distinction of three different farming systems. Finally, these farming systems will be related to the two main household objectives: food security and saving.

## 5.1. A comparison of the two research areas

In table 5.1, the main socio-economic characteristics of Kibandaongo and Bongwe are compared. The agro-ecological potential in Bongwe is considerably higher than in Kibandaongo. As a result, the perspectives for agricultural production in Bongwe are also higher than in Kibandaongo. Yields per ha could therefore be expected to be higher in Bongwe. This is indeed the case. However, the average production per household in Bongwe is only a fraction of that in Kibandaongo, which shows that a higher agro-ecological potential does not necessarily lead to higher agricultural production. Agro-ecological potential may be a limiting factor, but the household's inputs determine the quantity of harvested food crops (provided there is a minimum level of rainfall, of course).

Concerning tree crops, it is clear that the area around Bongwe offers far better opportunities. Livestock, on the other hand, is much more important in Kibandaongo, but this can partly be explained by a lack of grazing lands in and around Bongwe. Perhaps the most striking difference is found regarding the importance of the off-farm sector. Although the percentage of household members engaged in off-farm employment is almost the same in both locations, the type of off-farm employment is totally different. Almost all the off-farm employment found in Kibandaongo belongs to low-qualified, irregular and low-paying categories. Opportunities for employment

**Table 5.1: Main socio-economic characteristics of the two research areas**

| | Kibandaongo | Bongwe |
|---|---|---|
| agro-ecological potential | low | high |
| number of households (N) | 15 | 15 |
| average household size | 7.4 | 5.5 |
| food crop production (long rainy season 1986) | | |
| - cultivated area (food crops per ha) | 25.2 | 3.1 |
| - maize and rice yield (kg/ha) | 289 | 341 |
| - production per household (kg) | 485 | 71 |
| trees: total number of | | |
| - coconut palms and cashewnut trees | 399 | 837 |
| - other trees | 249 | 559 |
| livestock: total number of | | |
| - cattle | 28 | - |
| - other livestock | 353 | 123 |
| off-farm employment | | |
| - opportunities in neighbourhood | few | many |
| - % of household members engaged in off-farm employment | 24 | 24 |
| - type of employment | -irregular | -regular |
| | -low status | -higher status |
| | (50% rural casual labour) | (0% rural casual abour) |
| - % of households with off-farm income > KSh. 1,000/- per month | 0 | 47 |

in the neighbourhood are largely restricted to rural casual labour. As a result, one of the households is able to raise an income from off-farm employment exceeding KSh. 1,000/-. In Bongwe, in contrast, the bulk of off-farm employment belongs to higher classified categories with higher and much more regular salaries. There are quite many opportunities for non-farm employment in the near vicinity, and almost half of the households (47%) are able to raise incomes exceeding KSh. 1,000/-.

In sum, the households in Bongwe are in a position to make a choice between agricultural production and off-farm employment as a major base of existence. The choice between agricultural production and off-farm employment usually works out in favour of the latter. In Kibandaongo, the choice between agricultural production and off-farm employment does not exist for the majority of the households. Hence, despite the low agro-ecological potential of the area, the population there is largely dependent on agricultural production. So, although the agro-ecological potential is much higher than in Kibandaongo, the relatively high standards of living in Bongwe must primarily be explained by the socio-economic characteristics of better access to off-farm employment (reinforced by more flexible social structures).

## 5.2. Farming systems compared

The figures and qualifications presented in table 5.1 hide important differences between the households within each of the two research areas; differences that become immediatly clear if one moves around in the areas. A few examples may illustrate this. Food crop production per household in Kibandaongo ranges from 20 to 1,200 kg. Only four households in the same area own cattle. Despite a total of about 1,400 trees in Bongwe, there are also households without access to trees, while others own more than 400. And finally, although off-farm employment can be considered the dominant economic activity for the households in Bongwe, there are two households without access to this type of activity.

In table 5.2, therefore, for each household the relative importance of the four elements that compose the resource base is presented. For simplicity's sake, all scores are either above (+) or below (-) the average for all households per area. Only in the case of off-

farm emloyment, a dividing point of KSh. 500/- per month has been used. The different combinations of these four elements, then, can be grouped into four categories of farming systems.

The first type of farming system represents those households which depend primarily on the cultivation of food crops (maize, rice, cassava) for their livelihood. They have hardly access to tree crops or livestock. Cultivated areas per labour unit are rather large, but taken into account that these households are all relatively small, the total cultivated areas are small. Income derived from rural casual labour or handicraft usually provides the single and very modest source of monetary income. This income is entirely spent on food requirements in times of shortage.

**Table 5.2: Relative importance of the elements of the resource basis per household.**

| Resources | relative importance of the resources | | |
|---|---|---|---|
| Kibandaongo | | | |
| food crops | - + - | + - | - + |
| tree crops | - - + | + + | + + |
| livestock | - - - | - + | - + |
| off-farm income | - - - | - - | + + |
| nr. of households | 6 2 1 | 1 1 | 1 3 |
| Bongwe | | | |
| food crops | - | + | - + - + |
| tree crops | - | + | - + + + |
| livestock | - | - | - - + + |
| off-farm income | - | - | + + + + |
| nr. of households | 2 | 2 | 2 4 3 2 |
| **FARMING SYSTEM** | **I** | **II** | **III** |

source: Appendix I and II

The second type of farming system represents those households which have a relatively large agricultural production, derived from their access to livestock and/or tree crops, and relatively large areas cultivated with food crops. These large areas can be realized because of a large number of family members, which provide a large labour force. As in the case of the first type of farming system, the income from off-farm employment is very modest, but it is high enough to purchase additional food when the home-produced food is finished.

The third type of farming system represents those households which have access to a regular source of off-farm income. In general, these households also have a more than average access to tree crops and livestock, while food crop production is relatively unimportant. For their food requirements, they are for a large part dependent on their off-farm income. This income is provided through formal employment, which is relatively high-rewarding and guarantees a stable source of income.

Although all the three types of farming systems are represented in both locations, table 5.2 shows that in Kibandaongo the majority of households belong to the first type, while in Bongwe the majority of households belongs to the third type of farming system. This means that, in general, the households in Bongwe are better off than in Kibandaongo. The difference in wealth between the locations could be explained by environmental factors, the differences between the households within the locations are rather caused by the capability to make use of the possibilities the different environments offer.

## 5.3. Farming systems, food security and saving

The next question is the extent to which the different types of farming systems are related to the two major household objectives of food security and saving. Table 5.3 presents these relationships. Regarding the first and third types of farming systems, a rather clear picture emerges. Households with farming system I suffer from periodic food shortages and (thus) any saving is out of the question. All money is spent on necessities, including food. For households with farming system III, the opposite is the case: food shortages never occur and saving is common.

**Table 5.3: Farming systems, food scarcity and saving.**

| | number of households | average number of days with food scarcity | type of saving |
|---|---|---|---|
| Kibandaongo | | | |
| farming system I | 8 | ca. 7 | - |
| farming system II | 3 | ca. 5 | - |
| farming system III | 4 | 0 | individually |
| Bongwe | | | |
| farming system I | 2 | ca. 3 | - |
| farming system II | 2 | 0 | individually |
| farming system III | 11 | 0 | saving group/ bank account |

As so often, the remaining middle category is the most heterogenous and the most difficult to define. Some households experience food shortages, other households succeed in saving. It is this farming system II which shows the most clearly that, although all three farming systems occur in both research areas, the results of the farming systems - in terms of food security and saving - are also determined by environmental factors. In general, a household with a certain farming system in Bongwe is better off than a household with the same farming system in Kibandaongo.

# Chapter 6

# CONCLUSIONS

In chapter 1, three different types of relationships between the farm and the off-farm sector on household level were distinguished. Firstly, off-farm employment serves rural households with a supplemental income, which can be used for the households' consumptive needs. Secondly, off-farm employment provides households with the capital that is required for agricultural improvements, and will therefore directly lead to agricultural development. And thirdly, off-farm employment is competitive to the agricultural sector, and may even replace agricultural activities.

The results of the present study confirm the third statement. For the case of Kwale District, it appears that increasing importance of off-farm employment correlates with decreasing performance of agricultural production. This implies that both the profits which are derived from off-farm employment and the labour provided by the household are diverted from the agricultural sector. Food crop production is then replaced by the purchase of food, which, in its turn, creates a local demand for all kinds of consumer goods and increasing opportunities for local self-employment.

The causes of this trend are rather complex. Most authors relate it to agro-ecological potential. For example, Collier (1980, p. 47) assumes - in contrast to his own findings in Nyanza, Central and Western Provinces, by the way - that in the coastal areas *"the role of the off-farm income in financing rural development is likely to remain unimportant, while probably this income has in part been productively invested in trade and handicraft"*, seeking the cause of this in the poor agro-ecological conditions of the region.

The results of the Kwale study show, however, that within the generally low-potential coastal area, the relatively higher-potential areas show a poorer agricultural performance than the relatively lower-potential areas. This brings into view the conclusions of Sharpley (1986) and Lavrijsen (1984), who state that although agro-ecological potential is an important factor, it is not the only factor. Sharpley mentions

that also the geographical pattern of the non-agricultural sector must be regarded as a possible cause. Lavrijsen points out that this non-agricultural sector too is related to the agro-ecological potential. Indeed, in the case of Kwale District the non-agricultural sector has historically been concentrated in the higher-potential areas.

Lavrijsen (1984, p. 105) explains the fact that the presence of an off-farm sector implies a (potential) shift from capital and labour from the farm to the off-farm sector, by the non-market oriented character of the existing farming system. Sharpley (1986) agrees with this, stressing the unequal balance of the rates of return between the farm and the off-farm sector. Concerning Kwale District, these explanations can be subscribed. They should, however, be completed with an explanation of a more socio-cultural nature, which has not been mentioned by other authors so far. Besides the fact that in the research areas agricultural activities are not very attractive in ecological and economical terms, people seem to have a rather negative perception of agricultural activities. Especially the Islamic Digo regard agricultural activities as inferior to off-farm activities. Men prefer to derive a higher social status from the involvement in off-farm activities, while women and youngsters try to gain a financially and socially independent position by deriving an income of their own from handicraft, trade and services. These socio-cultural causes are related to religion, inheritance system and gender-related inequalities and are therefore more difficult to influence by policy makers than the economic causes; they are not only related to income, but also to the mentality and motivation of the population.

We saw that the households dependent most on agricultural production, - i.e, the households which would benefit most from agricultural improvements - are also the poorest households of the sample. These households do not have access to any capital which could be invested in agricultural improvements. But even if they would have the means for such improvements, they would most probably prefer to broaden their resource base by improving their access to off-farm employment. On the other hand, those households which do have access to a certain amount of capital, are not very dependent on agricultural production. As a result, they do not see the necessity for, and are not interested in agricultural improvements. They are more interested in improving their activities in the off-farm sector, in order to improve their monetary income and social status.

What policy implications does this have? The government's policy objectives regarding the rural areas are directed towards an increase of the agricultural production of food crops - in order to feed the rapidly growing population - and of cash crops - in order to provide foreign currency. The interest of the individual farmer in Kwale, however, is to broaden his/her resource base, in order to cope with unfavourable climatic conditions, and to become less dependent on food crop production only.

If policy makers continue to concentrate on agricultural improvements, a considerable change in the mentality and motivation of the population will be required. This could only be achieved if agriculture would offer the population a more reliable base of existence. And, apart from improved technology, this would require an increase in the economic attractiveness of farming.

Possible improvements in Kwale's agricultural sector would be the development of dairy production and an increase in the production of fruits and vegetables. Market facilities for such activities, as well as extension and training programmes, could be better organized. Such improvements, however, would be restricted to those areas with higher agro-ecological potentials and good accessibility to the market centres, as well as to those already more fortunate farmers who have access to livestock and/or tree crops (women would be excluded a priori).

An alternative, which, in contrast to the former suggestions, is not directly related to agricultural activities, would be the development of off-farm employment.* The present possibilities for off-farm employment in Kwale are strongly regionally concentrated (Mombasa, Diani Beach) and show a stagnation, offering little perspectives for further development. A sustained development should be based on more structural sources of employment, and indeed equally distributed over the district.** In contrast with possibilities for agricultural development, which have been studied frequently, possibilities for the development of off-farm employment have hardly been researched. Such a development, however, would be in the interest of the farmers, and would be able to count on the entire support of the population.

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* According to the government's long-term policy, employment in the informal sector should be stimulated as much as possible. But this can only be done if sufficient growth in the agricultural sector can be realized (Republc of Kenya, 1986).

** Here lies an important basis for more and useful research.

# Appendix I: Kibandaongo: basic data

| household number | ha.under maize | number of household members | maize yield (kg) | yield per hectare | yield per household member | access to tree crops* | access to live-stock** | estimated off-farm income (KSh/mth) |
|---|---|---|---|---|---|---|---|---|
| 1 | 1.09 | 6 | 400 | 367 | 67 | - | 1 | 0-500 |
| 2 | 1.99 | 7 | 1080 | 543 | 154 | 1 | 1 | 0-500 |
| 3 | 1.55 | 11 | 1080 | 697 | 98 | 1,2,3,4 | 1 | 0-500 |
| 4 | 0.70 | 3 | 240 | 343 | 80 | 1,3,4 | 1,6 | 0-500 |
| 5 | 1.12 | 3 | 280 | 250 | 93 | - | 1,4 | 0-500 |
| 6 | 0.93 | 6 | 320 | 344 | 53 | 1 | 1,4 | 0-500 |
| 7 | 1.22 | 6 | 160 | 131 | 27 | 1,2,3,4 | 1,4 | 500-1000 |
| 8 | 0.76 | 4 | 200 | 263 | 50 | 1 | 1,4 | 0-500 |
| 9 | 1.98 | 5 | 340 | 172 | 68 | 2 | 1,4 | 0-500 |
| 10 | 0.71 | 7 | 20 | 28 | 3 | 1 | 1,4 | 0-500 |
| 11 | 4.21 | 13 | 720 | 171 | 55 | 1,4 | 1,4,6 | 500-1000 |
| 12 | 0.65 | 7 | 80 | 123 | 11 | 1 | 1,4 | 0-500 |
| 13 | 3.06 | 19 | 440 | 144 | 23 | 2,4 | 1,4,6 | 500-1000 |
| 14 | 2.67 | 7 | 1200 | 449 | 171 | 1,2,4 | 1,4,6 | 500-1000 |
| 15 | 2.58 | 7 | 720 | 279 | 103 | 1,2,4 | 1,4 | 0-500 |
| Total | 25.22 | 111 | 7280 | 289 | 66 | 60 | 83 | |
| Average | 1.68 | 7.4 | 485 | | | 4 | 5.5 | 0-500 |

* 1 = access to mango (local), guava, custard apple and pawpaw
2 = access to bananas (sweet and cooking)
3 = access to mango and citrus
4 = access to coconut palms and cashewnut trees
The height of the figures correspondends more or less with the importance of the several tree species. It was thus possible to calculate an average value.

** 1 = access to chickens
4 = access to goats and/or sheep
6 = access to cattle
As with the tree crops, the figures are weighed according to the value of each animal type. Determining the rate of access has thus become simply a matter of adding and dividing. It was mentioned before that for simplicity's sake, chickens have been considered as a livestock category.

# Appendix II: Bongwe: basic data

| household number | ha. under cereals | number of household members | maize yield (kg) | rice yield (kg) | yield per hectare (cereals) | yield per household member | access to tree crops* | access to live-stock** | estimated off-farm income KSh/mth |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.22 | 6 | 10 | - | 45 | 2 | 1,2,3,4 | 1 | 500-1000 |
| 2 | 0.27 | 8 | - | 60 | 222 | 8 | 1,2,3,4 | 1 | 1000-1500 |
| 3 | 0.24 | 8 | 140 | - | 583 | 18 | 1,2,3,4 | 1 | 1500-2000 |
| 4 | 0.21 | 3 | - | 40 | 190 | 13 | 1,2,3,4 | 1,4 | 500-1000 |
| 5 | 0.14 | 3 | - | 10 | 71 | 3 | 1,2 | 1 | 0-500 |
| 6 | 0.22 | 10 | 40 | 10 | 227 | 5 | 2,4 | 1,4 | 100-1500 |
| 7 | 0.20 | 10 | - | 40 | 200 | 4 | 1,2,3,4 | 1,4 | 1000-1500 |
| 8 | 0.15 | 5 | - | 60 | 400 | 12 | 2,4 | 1,4 | 1000-1500 |
| 9 | 0.03 | 3 | - | - | - | - | - | 1 | 500-1000 |
| 10 | 0.28 | 10 | 160 | 40 | 714 | 20 | 1,2,3,4 | 1 | 500-1000 |
| 11 | 0.34 | 2 | 80 | 80 | 471 | 80 | 1,2,3,4 | - | 0-500 |
| 12 | 0.16 | 4 | 60 | 40 | 625 | 25 | 1 | - | 0-500 |
| 13 | 0.09 | 2 | - | 40 | 444 | 20 | 1,2,3,4 | 1,4 | 1000-1500 |
| 14 | 0.39 | 4 | 80 | 40 | 308 | 30 | 1,2,3,4 | 1 | 0-500 |
| 15 | 0.20 | 4 | 40 | - | 200 | 10 | 1 | 1 | 1000-1500 |
| Total | 3.14 | 82 | 610 | 460 | 341 | 13 | 107 | 33 | |
| Average | 0.20 | 5.47 | 40.7 | 30.7 | | | 7 | 2 | 500-1000 |

* 1 = access to mango (local), guava, custard apple and pawpaw
2 = access to bananas (sweet and cooking)
3 = access to mango and citrus
4 = access to coconut palms and cashewnut trees
The height of the figures correspondends more or less with the importance of the several tree species. It was thus possible to calculate an average value.

** 1 = access to chickens
4 = access to goats and/or sheep
6 = access to cattle
As with the tree crops, the figures are weighed according to the value of each animal type. Determining the rate of access has thus become simply a matter of adding and dividing.It was mentioned before that for simplicity's sake, chickens have been considered as a livestock category.

# Appendix III: General questionnaire

*The following list is more a checklist than a questionnaire. While reading the following questions, it should be borne in mind that conducting an interview is much more than asking a list of questions. Usually, an interview takes place in a relaxed atmosphere, in which both the questions and the answers can be extracted from a whole series of conversations. Therefore, some questions have to be repeated several times, while other questions can be set aside.*
*The sequence of questions is considerably altered. In the following list the questions have been ordered by subject. In the field the questions were ordered in five sub-questionnaires, which dealt with activities going on at that particular time.*

A. Questions concerning the fields
1. How many fields do you have?
2. Where are the fields located?
3. What is the status of the fields (home plot, women's plot, main plot)?
4. What is the slope of the field?
5. What is the estimated acreage?
6. How long has it been since the first clearance?
7. When was the last fallow period?
8. How many years was that fallow period?
9. When will the next fallow period be?
10. Has it ever been grazing land?
11. Which crops have been grown here before?
12. Which crops will be grown here the coming rainy season?
13. Estimated number of maize plants (if maize is grown).
14. Estimated number of cassava plants (if cassava is grown).
15. Remarks.
16. Which person is allowed to make decisions concerning this field?

B. Questions concerning land ownership
17. Who is the owner of the land?
18. How has the land been obtained?
19. Do you have certain feelings for this land?
20. How do you protect your land (against witchcraft)?
21. Would it be possible to increase your land?
22. Are your children interested in continuing to cultivate this land?
23. Do household members who have been out-migrated still have rights on this land?
24. Do you expect these people ever to return in order to claim these rights?

C. Questions concerning the fertility of the land
25. What do you think of the fertility of your land?
26. What is your most fertile field?
27. What do you undertake to maintain the fertility?
28. Have you noticed any changes in fertility?
29. Did you ever notice soil erosion in your fields?
30. Do you undertake anything to protect your fields against soil erosion?

D. Questions concerning farming methods
31. Which tools do you use on your fields?
32. Are you using the same methods as your parents did?
33. Are you going to use the same methods also (asked of the children)?
34. What kind of agricultural inputs can you think of?
35. Did you ever buy any of these agricultural inputs?

E. Questions concerning crop management

36. When did you start land preparation this year?
37. When will you start planting?
38. Which crops are you going to plant?
39. In what order are you going to plant them (and why)?
40. Do you already have your planting material?
41. Where did you get this planting material?
42. Which type of variety is this planting material (local or improved)?
43. Are you preparing the same acreage as last year?
44. Are you going to grow the same crops as last year?
45. Which crops have been planted?
46. Crop density.
47. Number of seeds per planting hole.
48. Date of planting.
49. How are the crops doing?
50. How many weeding rounds are you planning?
51. What will happen with the crop residues?
52. Will there be grazing on the fields after the harvest?
53. How much planting material will you preserve for next season?
54. How many times did you plant?
55. Which period provides the bulk of produce?
56. What do you know about sorghum or millet?
57. Did you ever grow sorghum or millet?
58. Would you ever like to grow it?

F. Questions concerning livestock

59. How many cattle do you have?
60. How many goats do you have?
61. How many sheep do you have?
62. How many chickens do you have?
63. Where do these animals graze?
64. Where do these animals drink?
65. Who tend them?
66. Where are they during the night?
67. What do you do with the manure?
68. Do they get extra food?
69. What kind of food do they get, and in which months?
70. Did you recently buy new animals?
71. If so, where and why?
72. Did you recently sell animals?
73. If so, where and why?
74. Have animals been born recently?
75. Have animals died recently+
76. When and why?
77. Which diseases do you have to cope with now and then?
78. Did you ever visit a veterinary surgeon?
79. Did you ever go to a dip?
80. What is your main reason to keep livestock?
81. What is more important to your income: livestock or crop production?

G. Questions concerning tree crops

82. Which types, and how many of each type of tree do you have?
83. Which person is the actual owner of them?
84. Which person takes care of the trees?
85. Which person is allowed to harvest fruits?
86. Did the trees produce last year?
87. How much did you produce and what did you do with it?
88. What was the amount for sale, to whom did you sell, and for what price?
89. What did you use the money for?
90. Did you recently plant new trees?

91. If yes, why? If not, why not?
92. Would you like to increase your amount of cash crops?

H. Questions concerning labour
93. Which persons work on the fields during preparation time?
94. Which persons work on the fields during weeding time?
95. Which persons work on the fields during harvesting time?
96. Did you hire casual labour during one of these periods last season?
97. Are you going to hire casual labour present season?
98. Time expenditure on the fields per day, per person, per activity (planting, weeding, etc.).
99. Other activities of these persons?
100. Which persons are involved in off-farm employment?
101. Amount of income.
102. Which person is in charge of that income?
103. What has the money been used for?
104. Are you saving money for a special purpose?

I. Questions concerning rainfall
105. How were the rains of the long rainy season of last year?
106. How were the short rains of last year?
107. Was the harvest of both periods enough to last until now?
108. If not, what did you do to get enough food?
109. If the rains are good this year, will your harvest be enough to provide your food until next year?
110. If not, what are you going to do?
111. What do you think of the rainfall of this year's long rainy season?
112. Are there losses of harvest, due to too much or too little rainfall?
113. What do you think of the role of the rain prayers, which have been practiced by the medicine men this season?
114. Did the rain cause any soil erosion?
115. Did you undertake anything against this?

J. Questions concerning the harvest
116. How many times did you plant maize?
117. Which period provided the bulk of harvest?
118. Percentage of harvest losses.
119. What was the reason for these losses?
120. Can you count your harvest in bags or baskets?
121. How long will this harvest provide you food?
122. How long is this in other years?
123. Did you grow a special amount for sale?
124. Are you going to sell a part of your harvest?
125. To whom and for which price?
126. How much will you preserve for next year's planting material?

K. Questions concerning the short rainy seson
127. When do you expect the short rains to start?
128. When will you start preparing your fields?
129. Which fields are you going to prepare for the short rains?
130. Which crops are you going to plant?
131. What is the average quantity of rainfall during the short rainy season?

L. Questions concerning the history of drought
132. Can you remember any periods of drought and food scarcity?
133. What were the ways of obtaining food in those days?
134. Do you think the climate has changed during your lifetime?
135. Have there been other changes during your lifetime?
136. What did the landscape look like when you were small?
137. Was there already any type of off-farm employment during that time?
138. Was there more livestock in the area than nowadays?
139. What was the reason for a decline/increase in livestock?

140. Do you remember the occurrence of livestock epidemics?

M. Questions concerning food history
141. Is there always enough food in your house?
142. If not, what do you do about it?
143. Do you know any symptoms of malnutrition?
144. When your children show any of those symptoms, what do you do?
145. Did you ever visit a hospital?
146. What kind of products do you gather in the bush?

N. Questions concerning farm management
147. Why don't you grow more maize/cassava/rice?
148. Why don't you grow more cash crops?
149. Why don't you keep more livestock?
150. What is the main problem of farmers in this area?
151. What are your main problems?
152. Did you ever make use of credit?
153. Have you ever been visited by a technical assistant?
154. If so, what were the topics you discussed?
155. Did he give you any concrete advice?
156. Did you follow this advice?
157. What do you expect from a good technical assistant?

O. Miscellaneous questions
158. What is your religion?
159. How do you feel about the Duruma/Digo traditions?
160. In which way can spirits or witches have an influence on your field or produce?
161. Can witchcraft or spirits keep you from expanding your farming activities?
162. What is the difference between Duruma and Digo?
163. Are there differences between them in agricultural regard?
164. Is there a household member who has joined any social or other organisation?
165. Do the women in the household have any contact with the local women's group?
166. Did the women ever think of joining the women's group?

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