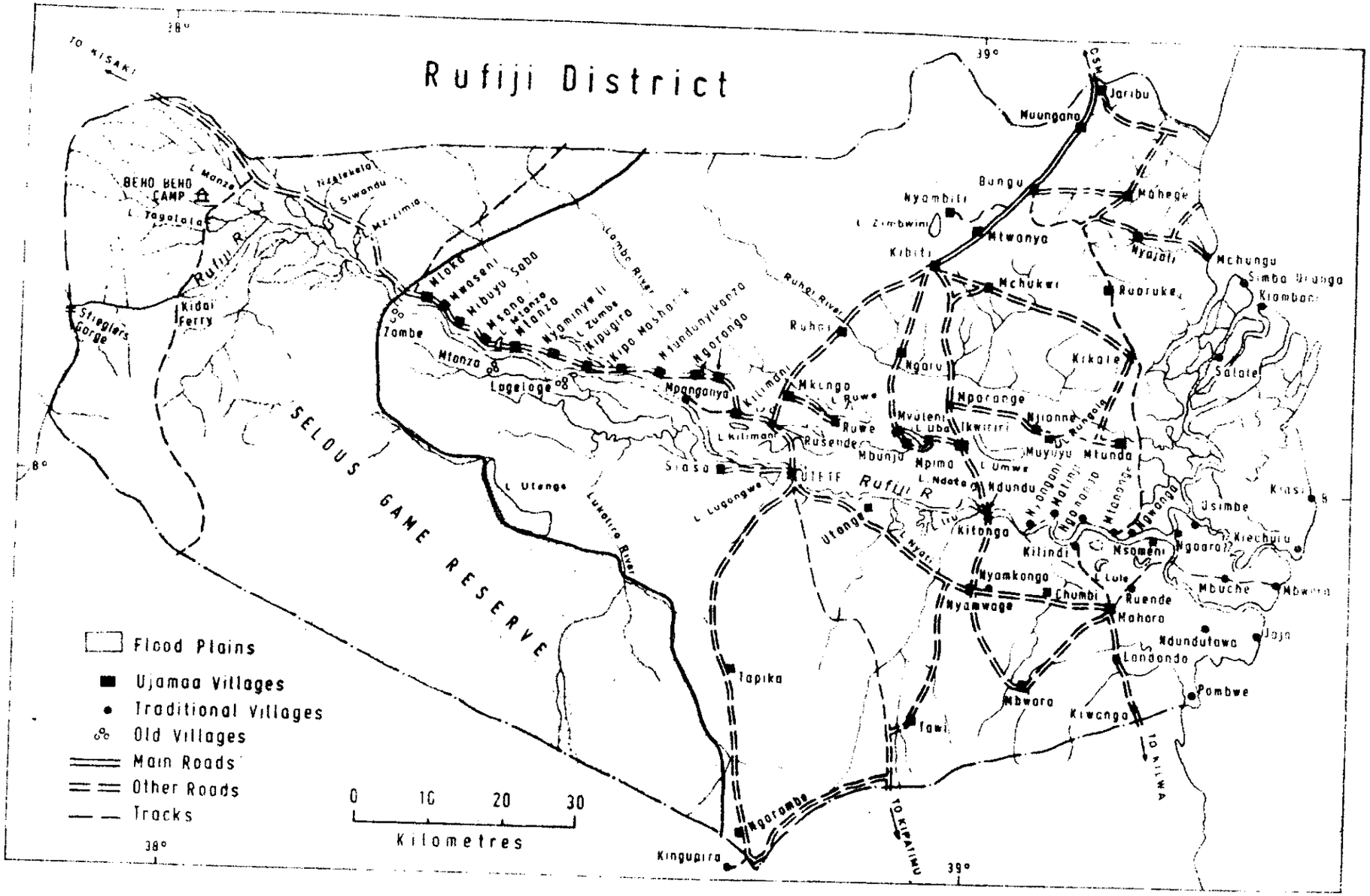
Rufiji District
TO KISAKI
38°
39°
8°
BEHO BEHO CAMP
Rufiji R.
Stieglers Gorge
Kidai Ferry
Siwandu
Mzizimia
Zombe
Mtanza
Lagelage
Mtoka
Mwaseni
Mibuyu Saba
Msona
Mtanza
Nyaminyili
Kipugira
Kipo Mashoka
Mtundunyikanza
Mgorongo
Mpanganya
Kilimani
Mkunga
Ruwe
Rusende
Siasa
Lugongwe
Utenge
Luwelire River
Lombe River
Ruhgi River
Ruhgi
Ngaru
Mvuleni
Mbunju
Mpima
Ndundu
Kitonga
Utenge
Nyati
Kilindi
Nyamkongo
Nyamwage
Chumbi
Ruende
Mahoro
Mbwara
Kiwanga
Tapika
Tawi
Ngarambe
Kingupira
TO KIPATIMU
TO NILWA
Muungano
Jaribu
Bungu
Nyambili
Zimbwini
Mtwanya
Kibiti
Mchukwi
Mahege
Nyajai
Mchungu
Simba Wanga
Kiombao
Ruoruke
Kikale
Salate
Mporange
Mjonne
Ikwiriri
Muyuyu
Mtunda
Usimbe
Kiechuru
Ngoaro
Nsomeni
Mbuche
Mbwara
Ndundutawa
Langanda
Pombwe
Jaja
SELOUS GAME RESERVE
Flood Plains
Ujamaa Villages
Traditional Villages
Old Villages
Main Roads
Other Roads
Tracks
0 10 20 30
Kilometres

BUREAU OF RESOURCE ASSESSMENT
AND LAND USE PLANNING

THE UNIVERSITY OF DAR ES SALAAM

Research Paper No. 34

SOCIO-ECONOMIC SURVEY OF LOWER RUFIJI FLOOD PLAIN
PART I: RUFIJI DELTA AGRICULTURAL SYSTEM

by
Audun Sandberg

OCTOBER 1974

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1. INTRODUCTION

This report has been prepared by BRALUP researchers for planning officers and TANU cadres at the district and regional level, and for members of the Rufiji Basin Development Authority. It deals with the specific problem: how to implement the policy of ujamaa in the Rufiji Delta, which is the lower part of the Rufiji Flood Plain. (The upper part of the flood plain is called the Rufiji Valley.) Now that the Rufiji Flood Plain has been made a special National Development Area, there is a great need for data on natural and human resources. This report aims at providing such background data which can enable the planners to make realistic plans to further the development of peasants in the Rufiji Delta.

The report is mainly an explanation of the particular agricultural system found in the Delta. This system is a precariously balanced adaptation to sea tides, soil fertility, and flood water heights. Before attempting to improve and collectivize Delta agriculture, it is necessary to understand the constraints and options on farming there.

After the explanation of the system of cultivation, the report shows how the peasants' organization of labour is a complex chain of optimal choices. Cultivation strategies seem to balance the input of labour and capital in farming against the probability of harvesting different crops at different times of the agricultural year. The report then analyses the various economic and social practices which have developed in the Rufiji Delta as the local blend of peasants' choice, the force of history, and environmental necessity. This exercise creates the basis for a discussion of possible ways of collectivizing the Delta agricultural system, and recommendations to that effect are given at the end of the report.

This report is the result of a collective research effort: Apart from the author, four students of the University of Dar es Salaam have made major contributions to the analysis: Joseph Angwazi (now with the Prime Minister's Office), Genna Ndulu (now with Economics Department at the University), Msafiri Mlanzi (now with the Attorney General's chambers) and Hababilar Ngayonga. Contributions to understanding the predicament of the Rufiji Delta peasant have also been rendered by Ibrahim Mpanyu of Mohoro, Mzee Umanga of Kitonga, and Ndugu Kisenge (former DDD of Rufiji District). We therefore feel that the recommendations submitted here represent workable solutions which can be accepted by the Delta peasants and which can enable them to utilize the vast potential of their homeland.

An advance copy of this report was circulated to district and regional planning staff in June 1973 to aid the implementation of "Operation Pwani". Partly resulting from this and partly due to the inaccessability of the Rufiji Delta, the villagization programme was postponed for 3 years. This was done in order to enable planners to draw up more detailed and realistic plans for development in the Rufiji Delta. Following the recent (1974) flood disaster in Rufiji, ecological and socio-economic data are urgently needed for planning the Rufiji Valley and Delta as a National Development Area.

We are therefore publishing the report in a revised version to aid this planning exercise.

1.1 The puzzle

Rufiji District was among the first where ujamaa villages were established; it is also among the most "successful" districts, with 75% of the population living in ujamaa villages (Angwazi and Ndulu 1973 b). The remaining 25% were in 1973 urged to come together to live and work communally ("Operation Pwani").

Most of these 25% live today in the Delta, and are, because of their refusal to move during the 1968 operation, known as the most "stubborn" of the Warufiji. They refused to move during the 1973 "Operation Pwani", and it is most likely that they will refuse to move again under the emergency operation following the 1974 flood disaster. The puzzle this paper attempts to solve is how to explain this "stubbornness" in detail. In the process of exploring this phenomenon, we found it necessary to explain the ecological constraints on farming in the Delta, and the farmer's adaptation (individual and collective) to these. From our analysis it appears that man-made constraints (lack of marketing facilities, lack of transport, lack of technical assistance, lack of political recognition) are far more serious than natural constraints imposed by soil, river, and tide. The policies of rural development in Tanzania advocate a transformation to socialism starting from the actual situation in the rural community. When the analysis then shows no correspondence between the administrative picture of living conditions in the Rufiji Delta, and the ecological and social realities in the area, there is all reason to take a fresh look at development in the Rufiji Delta. It seems clear the detailed villagization plans for Rufiji Delta must be brought in line with the realities of the Delta peasants' life and further development on their own premises.

Simplifying somewhat, we can say that the Delta people refused to move in 1968, 1973 and 1974 because they were living in the Delta: that is, there were no higher river banks to move to near enough to permit them to continue farming their ancestral land. From careful analysis it also appears that all alternatives other than farming the rich flood plain soil represent inferior solutions to the Rufiji peasant. The river terrace areas have been found to be much less fertile than the flood plain soils (Cook 1974). In addition, the Delta is less prone to flood disasters than is the upper part of the flood plain. That there is such a difference between the Rufiji Valley and the Rufiji Delta has not been clearly understood in the past. In the Valley, the movement of people from the river levees to the river terrace (across the farm land in the river basin) was a natural move following a change from river transport to road transport. That this was a natural process is proved by the "success" of villages with good road communications (e.g. Ikwiriri). For the Delta peasants on the other hand, there is no place to move to, except moving completely away - a solution unacceptable to them and also unacceptable from a national resource point of view. A solution has to be found <u>within</u> the Delta in order that agricultural production be maintained or expanded and a greater part of the environment brought under control.

Needless to say, the agricultural policy outlined in "Siasa ni Kilimo" (Politics is Agriculture) is one which is expansive and ecologically correct, not contractive and contrary to the rules set by nature. We would therefore urge the busy planner who may feel tempted to turn straight to the policy recommendations, to follow us in the analysis. Social reality is complex and nothing is gained by simplifying it.

1.2 Methodology

The results in this report are based only partly on survey data, for the analysis is evolved mainly from insights gained through prolonged stay in the area. Because of widespread suspicion, individual-based data (questionnaires) gave a false feeling of accuracy. In fact, even "neutral" data, like crop yields and labour input, took on political significance, and answers were aimed more at trying to change the present situation rather than at describing it accurately. However, in addition to two years of field work in Rufiji Ujamaa Villages, we stayed in the "madungu" (houses on stilts) for three continuous weeks during the cultivation period (Ramadhan 1972) and for one week during the flood-peak season (May 1973). Through this, we feel we managed to gain sufficient insights to complete the analysis.

During this period we traveled extensively by foot and canoe in the upper part of the Delta (Usimbe, Ngoaro, Barabarani, Kitanga, Msomeni) and participated in the activities people undertook (shamba work, trading, fishing, food preparation, etc.). By meeting the same people every day, we could after some time spot contradictions in their answers and ask explorative questions in order to get closer to the objective truth. During one week in November, upon request by the peasants, we conducted our research by collective interviewing. This has several advantages when the group of researchers already has a stock of knowledge:

(1) It makes the research activity more "open". People feel they can influence the result of the research, that they are not merely being "spied" upon with the purpose of being "manipulated" later.

(2) It gives additional data to the researcher. By publically presenting views obtained from individuals, one often sparks off discussion between groups of villagers, and uncovers latent contradictions in the society.

(3) It has educational effects: after such meetings the villagers were as grateful to us as we were to them. This opportunity for guided and purposeful discussion of their own problems was often characterized by long collective struggles to achieve clarity and to define ujamaa into the local conditions. Concensus is rated high and much time is spent on explaining to a few dissident individuals what is in the public interest. An extension of this method by the local political cadres could help fill the need for political education <u>prior</u> to moving together in ujamaa villages.

The data on agricultural output, collected from people's memory during field research, are generally in agreement with results from a quantitative agricultural survey conducted by Masao Yoshida in 1970 to 1971 (published as Yoshida 1972). However, his average figures conceal the real potential of the area, so in many cases the maximum figures quoted by the villagers are here given as the proper base for planning.

The outer part of the Delta (Kiechuru, Mbwera, Jaja) was not visited by the author and conclusions here are based on research carried on by students of the University of Dar es Salaam (Angwazi and Ndulu 1973 a.) For an assessment of the developments in the Delta following the 1974 flood disaster, we also rely on research carried out by university students (Ngayonga 1974).

2. ECOLOGY

The Rufiji Delta starts at Msomeni, where the first distributary, Kipoka, branches off. This river was created accidentally by a man called Kipoka who dug a furrow to bring water to his shamba. In physical terms the division between Flood Valley and Flood Delta is therefore not absolute, but might change as the living delta changes. More important than the geographical classification are the categories used by Delta farmers: distance between home and shamba, quality of soil, and flood regime.

Most farmers are unable or unwilling to commute daily to a shamba more than seven kilometers away. While most of the River Valley farmland can be reached from the new ujamaa villages on the river banks (Mkongo to Mtunda), most of the Delta lies more than seven kilometers away from any bank. This concept of Delta is the working definition used in this report. The Rufiji Delta covers approximately 600 km^2 or 60,000 hectares. Of this at least 40,000 - 50,000 hectares are covered with mangrove-forest, leaving about 10,000 hectares as cultivatable land. According to this definition, large areas between Kikale and Usimbe fall within the Delta. These areas, are, however, covered with mangrove forest and are not included in this report.

According to the 1967 population census, there were about 18,500 inhabitants in the part of Rufiji Delta dealt within this report. Of these, 14,370 lived in Mbwera division, while 4,112 lived in Msomeni (Mchoro division). The highest population density is found in Msomeni, with 93 inhabitants per sq. km., which even today is second only to Ikwiriri. Population density for the various parts of Mbwera division is difficult to assess, due to the presence of mangrove forests and tidal swamps and the continuous growth of arable land. But in parts of Ngorra Usimbe and on the Mbwera beach ridges, the density might be given higher than in Msomeni.

The settlement pattern in the Delta is largely decided by ecological factors beyond the control of the peasant. In terms of impact of floods and soil/water relationship, the Delta therefore differs considerably from the Rufiji Valley, where both peak floods and droughts have a more severe effect. Because of the tidal effect in the Delta, the big floods are largely offset - i.e. the water is not allowed to rush fast and dig out roots of plants and the foundations of houses. In addition, the Delta has the benefit of a high and reliable rainfall (1,000 - 1,200 mm. per year), which makes the total absence of floods less disastrous than in the upstream area. As we shall see later, however, the long-term effect of suboptimal floods is quite serious for both the upstream and the Delta areas. In order to understand how these mechanisms work, we have to examine in greater detail the concepts of soil fertility and of flood behaviour commonly used by the inhabitants of the area.

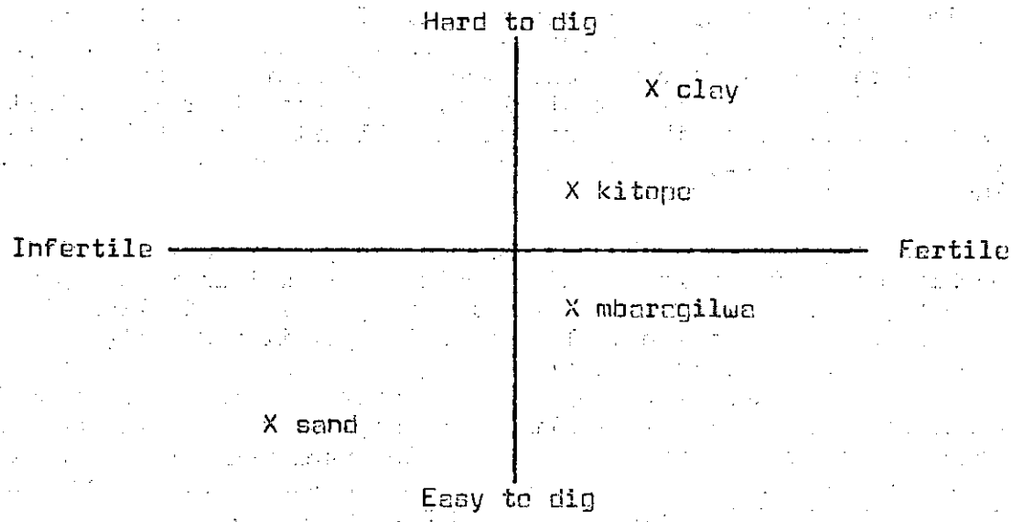
2.1 Soil fertility

The Rufiji River gives fertility to the land both in the Valley and in the Delta. Every year millions of tons of fertile

silt are deposited on the agricultural fields, thus securing a high yield for the farmers. The way the silt is deposited depends on the flow of water: where it flows rapidly, only the big particles settle and the result is sandy patches: where it flows slowly or merely stands still in puddles, the fine material settles. The latter has the highest fertility, but easily develops into clay soils which are sticky and hard to dig. The sandy soils are easy to dig, but lack fertility and have very low water retaining capacity. Between sand and clay there is a gradual variation in soil which, according to the Rufiji frame of conceptualization, can be mapped on a two dimensional variable. (See Fig. 2.1.1.)

Fig. 2.1.1

SOIL DIAGRAM



Most farmers seem to prefer the mbaragilwa soil. By adding green manure (rice straws) or planting beans, they can increase its fertility without losing the benefits of easy digging. As we shall see later, the choice of soil for one's shamba is largely an individual optimization under these two constraints. In turn, the process resulting from individual choices is responsible for the pattern of settlement in the Delta, although occasionally other factors do enter.

When the river floods, the finest silt is deposited where the water is most quiet, i.e. in the large low basins behind the raised river levees. This is where the clays (kitope-matope) are found. After long periods (2-3 years) without heavy floods, people go to farm in the lowest lying areas, because these are still moist and fertile.

The elevated ground around the low river levees has the mbaragilwa soils. Here the most continuous cultivation takes place; two or three crops are generally grown on the same plot in the course of one year. In certain areas elsewhere there is a shortage of mbaragilwa land, but in the Delta this does not seem to be the case.

The third type of soil is that of the coarse sand river-beds and sandbanks of the river. On these nothing can be grown. However, on the more gently sloping banks of the river, a thin layer of silt is left as the floods withdraw. This part of the valley is used for pumpkins and tobacco as it is still wet in September/October. It is also common to plant a second crop of maize here, which will mature around December and January when food supplies are usually running low.

The fourth type of environment is the low-lying saline land, covered with mangrove forest or remaining as salt flats during the dry season. On this land no crops can be grown, although mangrove have a considerable economic importance as building poles. In this part of the Delta, mbaragilwa soil is expanding at the expense of the saline soils (see Fig. 2.1.2 - Soil mapping 1954-56).

Finally there is the "gongo" land - valley land which is not reached by the floods but remains as islands at flood-time. Mohoro is built on such an island; Longe, Usimbe, Bomba, and the Ginnery (see map) are other such islands. The soil here is either sandy or heavy clay which becomes water-logged during the rains, but which gradually dries up during the floods. This latter kind of land is called "chacha", and is suitable for rice cultivation although the yields are 1/2 - 1/3 of those obtained from mbaragilwa or kitope type soils. The Warufiji are reluctant to settle on gongo land, because it is considered dry and infertile. Mbwera, Jaja, and Kiechuru are also built on gongo land, but these are old storm beach ridges, which provide excellent grounds for coconuts.

To add to the complexity of the flood plain habitat, soil fertility is also dependent on the size of the latest flood. If there has been no major flood for a long period, the fertility of the higher-lying parts of the flood plain starts to decrease. In addition to Cook's detailed soil analysis (1974), the farmers' observations can be taken as a reliable measure of the deterioration of soils: If a shamba (mbaragilwa land) has not been flooded for three years, its crop yield decreases by about one-half. This becomes an important factor in explaining the system of land use in the valley.

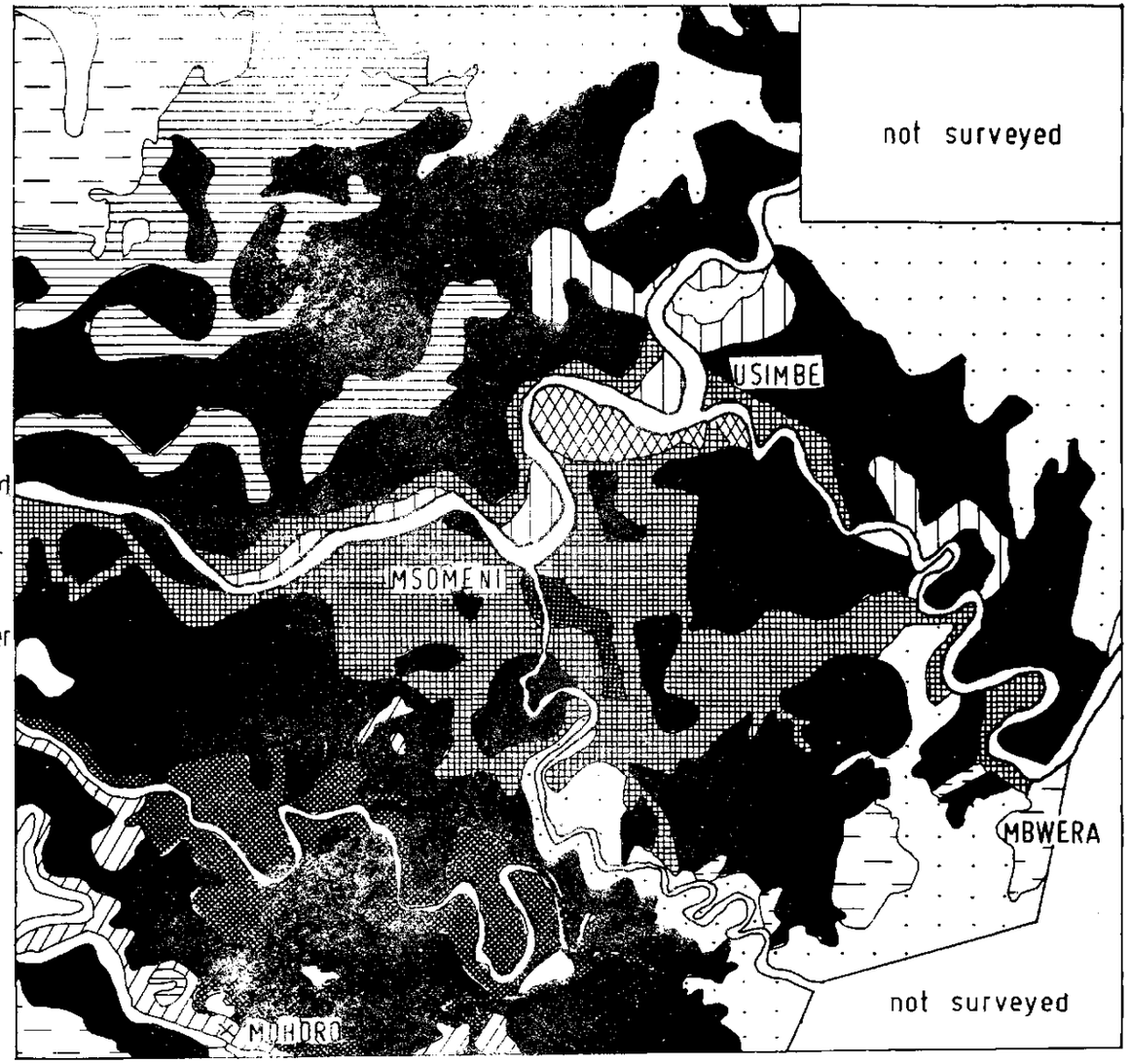
2.2 Flood regime

In Rufiji, short rains generally come in November/December, the long rains in March/April, followed by the flood in March/May. It is necessary to distinguish the effects of the floods in the upper part of the flood plain (Ruhingo) and in the lower part (the Delta). In the upper part, peak floods are characterized by fast-moving waters which destroy houses, trees, and crops. The lower down one moves towards the Delta, the less violent is the destruction. During a high flood, rice or maize might drown from Mloka to Kilindi, while farmers at Ngoara/Usimbe could still harvest a good crop. Although we lack flood data (stage heights) for the Delta, there is

Fig. 2.1.2..

KEY:

- Alluvial clay, Kitope
- Alluvial clay overlying mbowila
- Mbarogilwa
- Mbowila overlying course sand
- Alluvial clay overlying course-sand
- Looms and heavier soils of river banks
- Course sand of river beds
- Sand soils from sandstones or beach sands etc.
- Temporary saline soils



Source: FAO Report on Rufiji Basin: Soil Reconnaisse Maps (Anderson)

reason to believe that the flood curve has a flatter top in the Delta than further up. This can be accounted for by at least three factors:

a. The tidal effect helps offset the peak of the flood.

b. Along the valley are several lakes and swamps which are filled by the river when it floods. These natural water stores also act to take the peak out of the flood as it moves down the valley.

c. The ground water-table in the valley also acts as a water store and has a retarding effect on the floods.[1]

There are thus several conditions which must be met for a flood to be fatal in the Delta area. First, the three main tributaries of Rufiji (the Luwegu, the Kilombero, and the Great Rugha) must have coinciding flood peaks, for it is only the interaction effect of three simultaneous peaks which could give the "disaster". In addition, the natural stores along the river valley (the lakes, swamps, and ground water) must be satiated, either from heavy rainfall or from an earlier flood peak. Third, with record high tides (depending on the moon-phase), the probability of a big flood increases considerably, if the other conditions are fulfilled.

In recent years, there have been only two adverse floods in the Delta. In 1962 the flood came too early (during Ramadhan); the fields were not prepared and nothing was planted. Although this was not a very high flood, it led to famine, because the land remained covered with water for five to six months. This is the only time Msomeni/Usimbe had to received food relief from the government. The 1974 flood catastrophe was also adverse because it occurred at an unexpected time (May). People had given up hopes for a flood that year; their maize was drying in the fields and the rice was flowering when the waters suddenly rose. Evena six hour flood warning on the radio would have prepared the peasants sufficiently to safeguard some of their property. The big flood in 1968 did not lead to catastrophe in the Delta as it did further up. Although all the maize was destroyed in Msomeni/Ngoaro and most of the rice on kitope land drowned, there was still some food harvested from the higher places, while Mbwera and Kiechuru harvested an above normal crop. In fact, the rice harvested from gongo land near Bomba in 1968 was used as famine relief for peasants who had been moved to Chumbi Ujamaa Village. While schools and houses in Ruhinga were swept away by the water, in the Delta hardly any houses were affected, as evidenced by some mud houses in old Msomeni and in Usimbe which are more than eleven years old. After this flood the peasants harvested a bumper crop of cotton (see Section 4.1 for an explanation).

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1 For a more detailed analysis of the relationship of flood/delta, see Temple & Sundberg, forthcoming.

This leads us on to the advantages of big floods, which were pointed out to us by the farmers time and again. It is a common belief among the Warufiji living in the Delta that there must be a big flood every third year in order for the agricultural system to be maintained. Such a flood brings large amounts of fertile silt to the higher grounds. By thus replenishing the fertility of the favoured mbaragilwa soil, and offsetting the salination of Delta soils, it makes continuous farming possible. After three or more years without heavy floods, fertility decreases and the peasants tend to abandon farming on the higher river levee and dig their shambas on the lower kitope land. Although this is a perfectly rational decision as far as fertility and moisture go, it can have serious consequences if the long awaited big flood happens to come just that year.

The big flood also offers easy transport: Whereas in the rainy season moving through mud by foot or with bicycle is quite torturous, during high floods the canoe can reach every place. During such floods, marketing activities (traditional channels only), collecting firewood, etc., are made easier for the people living in the Delta. According to the peasants of Msomeni, Nguaro, and Usimbe, the big flood is also crucial for the continuity of fishing in the flood plains. The lakes and creeks become filled with water and large amounts of decomposed plants and other are available for the fish. When the waters recede, the fish (which have multiplied during the flood) are concentrated in these lakes and in the river. Quite good catches may then be obtained without much effort. In contrast, after some years without big floods the fish become scarce and difficult to catch. Fish constitutes as important a source of cash income and food as agricultural products; consequently the disappearance of the "disastrous" big floods would mean a lowered standard of living for most Warufiji.

3. HISTORICAL OBSTACLES TO SOCIALIST DEVELOPMENT

History is an integrated part of the daily life of people. Inherited ownership structures and inherited modes of production are realities which cannot be neglected. Rather, these relationships should be explained in order that socialist transformation becomes the necessary continuation of past and present historical processes.

3.1 Settlement of the Flood Plains

The Rufiji Valley and Delta have always been a melting pot for many different cultures, religions, and ethnic groups. People have settled there because of events in other parts of the country, trade relations, and intermarriage. The reasons why people have moved out have been adverse floods, change in river course (people have found their fields suddenly covered with tons of coarse sand), periodic land shortage, witchcraft, or job opportunities in Dar es Salaam.

There are no indications that it is the poor who have moved in and the rich who have moved out, or vice versa. For Rufiji as a whole, fortune and failure seem to strike randomly, under unpredictable ecological conditions. Since the hazards decrease, the lower down one moves in the Delta, we should expect greater accumulation of wealth and greater social differentiation here. This does hold for places like Mbwera and Kiechuru, but Msomeni and Usimbe seem less differentiated than e.g. Ndundu was in the past or Ikwiriri is at present. This is caused by the fact that wealth is not accumulated from agricultural production alone, but also from religious and trading activities.

Although the people in the Delta area all call themselves Warufiji, they can be divided into the Ndengereko, the Matumbi, and the Wanyagatwa. The Ndengereko have always been moving back and forth between the hills and the river plains. The Matumbi people have also been on the move for centuries, having come to Rufiji as traders of tobacco and "ungu". The hard core of residents in the lower part of Rufiji are the Wanyagatwa, who claim to be former Wahehe (Iringa) who migrated down the river to marry Rufiji girls. Most of the people in Msomeni, Ngoero, and Usimbe claim to be Wanyagatwa, but probably the genealogies would not bear this out. According to oral tradition they settled here four to five generations ago, cleared the land of the tall river plain grass (matete), and started to cultivate the fertile soil.

Wherever they came from, the people who settled here were hard-working. In a short time Msomeni, Ngoero, and Usimbe had become major agricultural areas in Rufiji - very distinct from and somehow in opposition to the plantation/slave system which had evolved in Mafia, Mbwera and Muhoro from time immemorial. In this melting pot, cultures merged together: under strong Muslim influence (Mbwera and Muhoro

have been strongholds of Islam for centuries), the people of the Delta retained a strong affinity to their graveyard places, and developed a rich variety of cults, witchcraft practices, and ngoma practices for every occasion in the human life cycle.

3.2 Economic relations under Arab, German, and British colonialism

As already mentioned, the peasants of Msomeni, Ngoano, and Usimbe were distinct from other agricultural enterprises in the Delta. In Mafia and Mbwera, Arabs had settled for centuries, and were running large coconut plantations with the help of slaves. Also in Muhoro, which can be reached from the sea, the Arabs settled and established large plantations. The slaves were mostly people from the south, from the decaying plantations in Kilwa. The inhabitants of this part of the Delta, especially the Wanyagatwa, deny ever having been slaves, and refer to former slaves as Mswahili. There is some reason to believe that this is the case. Some cultural traits point to the important fact that these cultivators were "peasantisized" already under Arab rule and that they have always been free men (wangwana). Their wholehearted acceptance of Islam and their own rigid observance of the Muslim ranking order is a possible indication that the peasants here have equated themselves with the slave-owner rather than the slaves. According to the sharia, a Muslim cannot be made a slave (Raum 1963). Therefore it seems wrong to assume that the present lack of development in this area is the result of a "historically slave-minded" population.

If we move to the German period, there are more facts available. Not only did the Germans use the Rufiji River extensively for navigation, they also introduced cotton to the farmers of the Delta, started some experimental rice irrigation in Ruhingo, and forced the Warufiji to build roads and bridges.

The Maji Maji rebellion (1906-10) was very much an uprising against the forced labour on German cotton plantations and on infrastructure projects. Also in Rufiji the free peasants rose against the rule of the "Kiboko" (the feared hippo-hide whip) and prevented the introduction of extensive plantations in the flood plains. When the British colonial period started, the notion of land ownership was already deep-rooted among Delta people. For instance, when Mr. Kent, one of the first British estate owners, set up a ginnery at Msomeni, he had to ask the local farmers where he could cultivate. He was allocated land on kitepe soil at Msomeni and at Ngumbo and brought his own people from up-country to work on the estate. Because he could use tractors on the heavy soils, he was able to farm a large, fertile area.

The most profitable combination of crops on this estate was found to be rice and cotton, and the system of agriculture followed here was in principle the same as the one developed by the farmers (see 3.1 and 3.2). The profits from these Rufiji estates were in the beginning reinvested in agriculture; the ginnery was expanded and improved, and boat services on the river were also improved. With the coming of the depression and subsequently the World War II, nothing more was reinvested in any estates in the Rufiji Flood Plain.

Consequently the later owners of the estate mostly harvested without sowing. It was a run-down ginnery and run-down tractors which were eventually taken over in the 1960s by the Coast Co-operative Union at Msomeni. Today, termites have occupied the ginnery and the once fertile cotton fields are covered with high grass. Very few of the settled farmers worked at this estate during its operation, for the various owners usually brought workers from up-country, who returned when the estate changed hands. With identical agricultural systems, the labour peaks on the estate and on the farmers' shamba coincided - the harvesting of rice and planting of cotton took place at the same time. Only during the cotton picking season could the estate hope to get some casual labour help locally, and then only after they started to provide tractor help on the peasant farms. This is the only known form of symbiotic relationship between estate and independent farmers.

Tractor ploughing hardly expanded the acreage under cultivation by peasants, but it did free a surplus labour force during the months of October/November, which was used to obtain cash through cotton picking. However, we cannot compute whether the peasants in fact earned more on cotton picking than they spent on tractor charges.

We do not know the ploughing charges per acre in the years before World War II, but in 1949 the charges in the Government schemes were raised from Shs.16.00 to Shs.23.00 per acre and in 1952 to Shs.40.00 per acre. When in 1956 the charge was raised to Shs.60.00 per acre, the farmers lost interest. Obviously this was above the break-even point for them. However, it was not only the cash income from cotton picking which attracted farmers to hire tractors; the freed labour was also spent on fishing and trading. Given the extremely low wages paid at the estate, these other activities might well have been more profitable than temporary wage labour.

Thus for Msomeni/Ngoerre and Usimbe the estates and the individual peasants were in a situation of competition for resources. The scarce resource was labour; and if peasants wanted to expand their rice/cotton fields, they also had to hire labour during the rice harvest/cotton planting season. This labour was mostly supplied by Matumbi people in Muhoro. Even today, a significant number of these people have no land of their own. On the other hand, the existence of a ginnery in the middle of a rich farming area

meant easy marketing of the cash crop. In addition, the residing estate workers (who did not own land) constituted a market for the peasants' food crops (bananas, rice, peas, mango, pumpkins), and the all-year boat service up and down the river (from Utete to Dar es Salaam) further encouraged the production of food crops.

The clearest demonstration of the effect of easy access to a market for cash crops and food crops is the rapid increase in population in the Rufiji Valley. According to population statistics, in the years 1906 to 1913, which is the main period of acceptance of cotton cultivation, the population increase in Rufiji was some 40%, as against 35% for the nation (Tetzlaff 1970, p.287). In contrast, the present growth rate for Rufiji was 1.4% for the last seven year period (1960-67), as against 2.0% for the nation as a whole.

Due to the concentration of people near the ginnery, several shops were established here; some of them were "madungu" shops (shops on stilts), a type now but a legend among Warufiji. When the ginnery closed down and the workers left, the population basis for the shops became less concentrated. Many of the shopkeepers moved their business to Muhoro, maintaining the links with their Msomeni customers.

The important lesson to draw from the final years of colonial administration is that it was above all easy marketing that contributed to the rapid development of agriculture in Msomeni, Ngoaro, and Usimbe. The ginnery lay within walking distance from most homesteads, and the payment for the cotton was cash upon delivery. We shall see how later, with changes in marketing practices, important changes took place in the agricultural system in this part of the Delta. (see 4.6) In the outer Delta (Mbwera, Kiechuru and Jaja), remnants of Arab colonialism survived through both the German and British colonial periods. This part of the Delta had direct trade links with Qatar (for mangrove poles) and India (rice) from the early 14th century, and had for a long time closer links with the Arabs in Zanzibar than with the rest of the Rufiji peasants. Today most of these links are cut off, and the population of Mbwera relies mainly on the export of coconuts, copra, and mangrove poles. At the same time, population growth, fragmentation of the coconut fields and absentee ownership of coconuts have led to a process of impoverishment in the outer Delta. Still (1974) signs of the wealth of the past are visible in Mbwera. The situation has been reported in the following way:

> With this decline in number of palms per household, and with the absence of any alternative source of income, the material well-being of the household has declined. One can get a clear picture of the relative poverty of the households there now by comparing with their deceased parents. The houses that were built by their fathers are very big, roomy and definitely of better materials, whereas the houses which the present households built are smaller, of poorer quality and less costly. Again,

> Mbwera has formerly been a thriving village, with a lot of entertainment, social activities and with frequent festivals. Musicians (taraab) were then hired from far, not only by Arabs, but also by Africans. These people were wealthier and had more coconut-palms per household than the situation is today. (Angwazi and Mdulu 1973 a).

The diversion of trade from sea and river to road transport has isolated Mbwera and transferred the opportunities to accumulate wealth to the new ujamaa villages (Mohoro, Ikwiriri, Nibiti).

Mbwera has therefore been left to rely on its own resources: coconuts, rice, cattle, mangrove poles, salt-making, and fishing. However, the exploitation of these resources is today constrained by ecological and sociological factors. After years of low floods and after a change in river course, the fields around Mbwera have (until May 1974) increased in salinity. This has in reduced the resources available for the people of Mbwera. In addition, the inherited archaic social structure of Mbwera, with pronounced religious and economic differentiation, hinders full utilization of present resources.

3.3 Political history of the Rufiji Delta

As elsewhere in Rufiji, agricultural and economic development in the Delta is dependent on the political development in the area. To the colonial governments, the Warufiji were known as the most stubborn subjects. There are the stories of the German's use of the Kiboko, and more recently of District Commissioner Young who forced the people to plant bananas, at gun-point, as a famine relief crop. Even if these bananas were a considerable success as a cash crop, it did not change the Warufiji's deep-rooted suspicion of official initiatives. Perhaps the most illustrative case is the failure of the German's enforced cotton cultivation in the valley, compared to the massive (voluntary) spread of cotton cultivation among individual farmers after the Maji Maji rebellion. Even today, more than a decade after Independence, Rufiji is one of the most difficult districts to administer. There is reason to believe that this attitude has its root in the historical fact that the peasants of Nsmmeni were free men who lived surrounded by slaves. As such, they have always been on guard against anything that might curb their freedom. Thus it is the opposite of a slave background which is the obstacle to socialist development, namely a hard-won individual economic freedom which has yet not showed significant adverse side-effects.

The people of the delta participated fully in the struggle for UHURU. Nearly every adult male joined TANU, and all were eager to develop their farms and their community. In the years 1964-67 important developments took place. A primary school was built at Bombo (due map), as well as a teachers' compound, a dispensary, a court, and several other buildings. In the course of these 3 years, some 75 families moved here and built their houses on gonga land at Bombo. The school had,

after operating for only 2 years, 200 students. In these years, there were planted several large cashew plantations (individually owned) on gongo land. With an old tractor inherited from the ginnery, these 75 families also cultivated rice on high ground alluvial loams close to their houses. At Usimbe and Mbwera important developments took place headed by the Usimbe and Mbwera Primary Co-operative Societies.

These spontaneous developments were stopped by the 1968 flood disaster and the subsequent government resettlement programme. As mentioned, the disaster was not as severe in the Delta as it was further up in the valley. Some people managed to harvest some rice (the few who had planted on the river levees), and no houses were destroyed by the waters. However, it was decided that people should move from the valley and be resettled on the drier river banks. Muhoro, which is also situated on gongo land (i.e. it remained an island during the floods), resisted the call to move. In the end it was allowed to remain, being renamed Muhoro Ujamaa Village. Msomeni, Ngoaro, and Usimbe did not have the same easy access to the political centre and officially ceased to exist. In fact it was some co-operative dignitaries from Muhoro who came down to Bomba to inform Msomeni about the decision to move. They stripped the iron roof off the school and all the other official buildings and told the people that they had been shifted to Chumbi (A). In fact, only families with school children actually moved. Of these, only 12 families shifted to Chumbi (A) and in smaller numbers people moved to Mkongo, Muhoro, Ikwiriri, Mkuii, Kibiti, Kibaa, and Dar es Salaam. The others left their houses at Bomba and moved back to their stilt-huts in the valley. Since 1960 several new families (mostly Matumbi and Makonde people) have settled in the delta. In addition many of those who shifted in 1968, although they have built houses in the various villages, came back to the Delta "to get food" and stayed in the madungu for up to nine months of the year. Nor was Msomeni an isolated case: Kitonga, Miwiliwili, Ngoaro, Ngumbe and Baraborani were also asked to shift to Chumbi (A). Of these farmers, several have built houses in Ikwiriri (Ngoaro farmers) and Mohoro (Baraborani farmers). Farmers in Usimbe were asked to move to Mtunda, but still they spend most of their time in the Delta. For Mbwera, Kiechuru, and Jaja no directive has been issued, and these areas were not affected by the 1968 operation in other ways than by a general deterioration of communications.

With the majority of the peasants refusing to move and the rest in a "nomadic" adaptation, the net effect has been that the population of the Delta remains about the same as it was in 1967. However, places like Msomeni, Ngoaro, and Usimbe do not exist officially. This condition of political vacuum has had several serious effects, which need to be explained in order for one to understand where the road to progress lies. Civil and political administrators have long treated the plan to move people as if it were physical reality. Most places in the upper part of the Delta have been deleted from administrative maps and charts. Although people are still living and farming there, neither Msomeni nor Ngoaro nor Usimbe have any ten-cell or hundred-cell leaders. Their "Jumbe" and their Chairman are not recognized

by the divisional secretary or the divisional chairman (Muhoro).

Further, as no trade licenses are issued to this area, no shops can operate legally. The former Msomoni and Usimbe Primary Co-operative Societies are dead, and farmers have to bring all their produce to Muhoro if they want to market it through the legal channels. The roads in the area are not maintained and are fast deteriorating. It is no longer possible to transport goods and crops between Muhoro and Mbwera. Thus political development in the upper Delta has placed serious constraints on agricultural and economic activity of all the people in the Delta.

These constraints have changed the basis for decisions about size and composition of production, direction of marketing, and flows of investment.

4. INDIVIDUAL ADAPTATIONS

Whatever way one looks at society, it is made up of individuals who are tied together by social obligations of varying strength and who work together in more or less collective modes of production. An understandin g of how these collective forms are produced by individual activities is needed to explain social development in the small rural societies of the Delta.

4.1 Indigenous flush irrigation in the Rufiji Flood Plains

In a complicated environment people try to safeguard themselves against the whims of nature in various ways, ways which on the individual level usually appear rational and reasonable. In this section we shall explain in detail how the flood season farming system works.

We have already mentioned the relationship between soil quality and flood regime. The problem for farmers in the Valley and the Delta is to draw the maximum benefit from the floods while avoiding crop destruction by the same flood. Consequently, the choice of soil and planting time is severely constrained by the ecology. Best yields are obtained where the plants are just high enough to reach above the flood peak. This is achieved through early planting of maize and rice. However, if the seeds are planted too early, the ground is still too dry, and the yield will decrease the longer the time span is between the planting and the rain. Moreover, both the November and January rains are relatively unreliable and might fail altogether. This would leave the plant very weak at the onset of the flood so that it might either drown or be washed away.

There are also earlier-mentioned differences in soil fertility/moisture and soil hardness. The energy or money spent on digging the hard soils has opportunity costs which can be invested in other enterprises. Important constraints are also added to the peasant's problems by the agricultural system of the dry season (see section 4.3 on "Mlau" cultivation). In attempting to safeguard his and his family's total existence, the peasant creates serious difficulties for his own economic activity. The nature and importance of these must be understood in discussing the possibilities of a transformation from an individual to a collective mode of production.

Flood season agriculture starts with the preparation of fields towards the end of the dry season. Land which has been fallow during this season is first cleared of the tall grass (by burning), and then tilled with hoe. This is hard work, and because of the heat, digging can be done only during early morning and late afternoon. For a strong man or woman with a big hoe, it takes about three weeks to prepare one acre of fallow land. For a person weakened by age, pregnancy or disease, or who has a handicap, the time needed is considerably longer. For those who can only afford to buy the small hoe the work takes even longer and is of poorer quality, i.e. the soil cannot be loosened deep enough. Tractors do the job much

faster and to a sufficient depth, but they are expensive to hire and sometimes difficult to manoeuvre inside the banana groves and fragmented fields. On the other hand, preparation of fallow land should not start too early; if prepared in August/September, when there is a labour surplus, fields will be overgrown with weeds by planting times. Those who can afford it prefer to have their fields ploughed twice. This is said to improve yields.

Most of the good land in the Delta is, however, occupied with crops throughout the year. Consequently the digging of fields for maize and rice has to wait until the cotton and kunde (cow-peas) have been harvested. The gradual process of harvest, clearing, and planting can take place during the months of October, November and December, work usually proceeds smoothly without serious labour bottlenecks. However, there are factors beyond the control of the Delta peasants (marketing, relative prices, transport, etc.) which, as we shall see, disturb the equilibrium of the individual's agricultural system. Another factor is that the digging and planting have to be done either before or after the short rains come. When the kitope soil is wet, it is sticky and impossible to dig, so that a surprise spell of rain might limit the farmers' cultivated area.

When a field has been prepared, it is first sown with maize and later planted with rice. If the soil is very dry, sowing will have to wait until significant signs of rain appear. Once the plants start to grow, the fields have to be weeded. Mixed stand maize and rice fields have to be weeded two or three times; pure stand rice is usually weeded only once before the flood comes and drowns the weeds. If the flood comes late, the maize has a good chance of yielding a good harvest (March). If, however, the flood comes in January/February, it usually digs away the roots of the maize, and the crop is either lost or has to be harvested unripe.

For rice cultivation, November to February is perhaps the most precarious period. The quality of preparation work, the choice of planting time, the quantity and timing of the November and January rains and the quality of the weeding - all these factors affect the condition of the rice-plant at the time when the flood starts.

To a limited extent the peasant has found ways of adapting to the unpredictability of rain and flood. He can vary the planting time in high and low-lying places so as to secure a strong rice plant at the right time. He can also choose seeds from at least nine different varieties of the local rice (oryza sativa) which all have different properties regarding yield, growth period, drought resistance, taste, etc. He can also select seeds within one variety. Although attempts to introduce new hybrids of rice have failed, due to inferior taste, no serious research or breeding has been done on these local varieties. The classification given (Table 4.1.1) are therefore the concepts used by the farmers themselves.

Table 4.1.1 Local Rice Varieties (Rufiji)

TYPE	Colour	Growth Period	Growing Time	Hill or Valley	Preferred Soil	Quality Test	Output Rice/paddy (weight)	Price/ kg (cents)	Flood resistance	Drought resistance	Salt resistance	Cultivated first
Afao	Black/ Red	Dec/ June	6 months	Wet	Clay	Excell.	2:3	50	Medium	High	Low	1973
Hampe	Black/ Red	Dec/ June	6 months	Wet	Cl+MB	Excell.	2:3	50	Medium	High	Low	1973
Kilombero	White	Dec/ June	6 months	Wet	Cl/MB	Good	5:6	50	High	High	Low	1973
Moshi	Black	Dec/ June	6 months	Hill	Cl/MB	Good	2:3	50	Low	High	Low	1973
Munguja	White	Dec/ June	6 months	Hill	Cl/MB	Good	2:3		Low	Low	Low	1962
Kimoto	Red	Dec/ June	6 months	Hill	Cl.	Good	2:3	50	Low	Low	Low	1973
Bora Kupata	White	Dec/ Mar.	3 months	Hill	Cl/MB	Poor	5:6	20	Low	Med.	Low	1973
Ngohe I	White/ Red	Dec/ June	6 months	Wet	Cl/MB	Poor	2:3		Low	Low	Low	1973
Kilimali	Red	Dec/ June	6 months	Wet	Clay	Good	2:3		Low	Low	Low	1962
Nyati	Red	Dec/ Mar.	3 months	Del-ta	Cl/MB	Good	2:3		Low	Low	High	1973
Meli/ Halmalia	White	Dec/ June	6 months	Wet	Cl.	Good	2:3		Low	Low	Low	1954
Bungala ya Mekka	White/ Red	Dec/ June	6 months	Wet	Cl/MB	Good	2:3		Low	Low	Low	1954
Sifala	Black	Dec/ June	6 months	Wet	Cl/MB	Good						1954
Sena	White	Dec/ Mar.	3½ months	Del-ta	Cl/MB	Poor	2:3				High	1973
Hamsin												1954
Uzuri Mwendo	Black/ Red	Dec/ June	6 months	Wet	Cl/MB	Good	2:3					1954
Marura	White	Dec/ June	6 months	Wet	Cl.	Good	2:3		Low	Low	Low	1954
Kijicho	White	Dec/ June	6 months	Hill	Cl.	Good	2:3		Low	Low	Low	1954
Kibendera												1954
Chema												1954
Kigogo												1954
Madevu	Red	Dec/ June	6 months	Wet	Cl/MB	Good	2:3		Low	Low	Low	1954
Swala	White	Dec/ June	6 months	Wet	Cl/MB	Good	2:3		Low	Low	Low	1954
Kmeno	White	Dec/ Mar.	3 months	Del-ta	Cl.	Poor	2:3		Low	Low	High	1954
Nyaga Nyali												1937

Table 4.1.1 - continued

TYPE	Colour	Growth Period	Growing Time	Hill or Valley	Preferred Soil	Quality Test	Output rice/ paddy(weight)	Price/ kg (cents)	Flood resistance	Drought resistance	Salt resistance	Cultivated last
Shindano	White	Dec/ June	6 months	Wet	Cl/MB	Good	2:3		Low	Low	Low	1954
Mibaba Mupic	White	Dec/ June	6 months	Wet	Cl/MB	Good	2:3		Low	Low	Low	1954
Mbweke	White	Dec/ Mar.	3 months	Delta	Cl/MB	Poor					High	1954
Nanjano	Red	Dec/ Mar.	3½ months	Delta	Cl.	Poor			Low	Low	High	1973
Keusi	Black	Dec/ July	7 months	Wet	Cl.	Poor			Low	Low	Low	1954
Halmalia Ngeni	White	Dec/ Mar.	3 months	Delta	Cl.	Good			Low	Low	High	1973
Ngohe II	White/ Red	Dec/ Mar.	3 months	Wet	Cl.	Poor	2:3		Low	Low	Low	1973

Cl.: Clay

MB : Mbaragilwa

We found that the choice between these is usually determined by taste and by the expected ratio of rice to paddy. The farmer also considers the nature of his field. On a low place likely to be flooded for an extensive period, he will plant a slow-growing rice. On a high place which might dry up quickly, he would choose a fast-growing rice. Thus, by selecting the right variety of rice for a given environment, the farmer should be partly able to control the returns on his labour.

However, the rice yields per acre reported by farmers show such wide variations that we cannot assume that all farmers make the optimal choice of planting time and rice variety. Some might hope for a big flood and plant 'Afao' on their mbaragilwa soil because they prefer the taste of 'Afao' and because they have no other type of land available. Other and similar miscalculations seem to occur frequently. There are a number of reasons for this:

(1) Knowledge of local ecology and rice varieties is unevenly distributed in the population. Those who are recent migrants or have spent most of their life in schools are less expert than others.

(2) The various types of rice seeds can easily be confused and can produce new hybrids. This tends to make people more careless in the choice of seeds.

(3) The land-ownership system has in some cases developed to such an extent of complexity that it limits the farmer's freedom to choose location and rice variety according to his preferences. Such cases are mostly found in densely cultivated areas, but also in sparsely populated areas the presence of pigs might force people to plant the wrong variety in the wrong place.

For Rufiji as a whole, with the movement of people out of the Flood Plain, detailed knowledge among farmers of micro-ecology and rice varieties is already on the decline. Furthermore, there is no incentive for youth to learn about rice cultivation; they are in fact encouraged not to farm in the Flood Plain. In the Delta, however, there is less danger that many hundred years of experience with rice cultivation shall be broken, than in other parts of Rufiji. Youth here have their own rice plots at an early age and have already organized collective production of rice. They would be receptive to serious research findings about the various local rice varieties and would be willing to experiment with new hybrids.

To return to the flood season farming system, there is nothing the farmer can do on ce the flood is on. If the rice plant was strong when the water started to rise, there are good chances for it to survive even in a high

flood.[1] Some of the wet rice varieties can grow as much as ten cm. per day and can survive short periods completely covered by water.[2]

Consequently, the large variations in rice yields, even among neighbours, can be largely explained by the farmer's abilities and care in the pre-flood period.

Other hazards add risks to flood season agriculture: birds are likely to eat from 5-70% of the newly sown rice seeds, so bird-scaring is a very important activity for young boys and girls. Fish also represent a hazard to the ripening rice. If the water remains high until the end of May, swarms of fish jump up to eat the rice. They can finish off an acre in half an hour. Big fish can even bite off the stem and pull the rice down to be eaten under water. There is not much the farmer can do to control such attacks by fish; but during long floods he can compensate losses in rice yield through increased fish catches.

If the rice does ripen, it is again vulnerable to attacks by birds (quelea quelea) and pigs (if the water sinks sufficiently). Again it has to be guarded by women and young children.

Finally, the harvest itself is constrained in various ways. If the farmer has planted fast-growing rice (Bora kupata) in a low place, he will have to harvest it by canoe. When the fields start to dry up after the recess of the flood, that marks the beginning of the dry-season farming system. If the rice is not ripe and harvested by this time, the farmer is likely to be in serious trouble. Thus, the two farming systems are likely to impose constraints on each other in the form of labour bottle-necks during May-June. The exception is when the rice has failed altogether, which gives the farmer more freedom to plant maize, kunde and cotton at the optimal time.

However, all factors considered, the flood-season farming system is a reasonable system on the individual level of adaptation. Faced with the unpredictability of the floods, the vulnerability of rice to attacks, and the prospects of super harvests (up to 5,000 kg. per hectare has been quoted in Msomeni), wet rice cultivation seems an optimal solution for the individual farmer. He does not put all his assets into this one crop, so that if it fails he can rely on cotton maize, kunde, bananas, fish, and mangoes.

Maize, which is often interplanted with and before rice, is usually higher when the flood starts and can be eaten shortly afterwards. However, maize is more likely to fall and drown with a sudden rise in water level than is rice. Under adverse

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1 Especially "Kilombero", the newest rice variety in Rufiji, has this ability to "fight the floods", but alas, its taste is inferior to Afao.

2 Except when the rice is "opening up" (the husks are being filled with starch). This is why a late flood peak (1974) can be fatal for one who planted early, while a late planter can get a reasonable harvest.

flood conditions (an early flash peak), the unfortunate farmer can lose both his rice and maize crops.

What then could be done to reduce the risks involved in the indigenous flush irrigation farming system? Like all uncontrolled wet rice cultivations, the Rufiji material culture seems to have been refined on a relatively low level of technology. Crop returns are usually unpredictable and impossible to budget with. Primary accumulation of capital has therefore not been directed at improving rice cultivation, but has been transformed into social and religious prestige, investment in housing in Dar es Salaam, etc.

Unless the farmer can control the flow of the Rufiji River, what scope is there for improving the present flood season agricultural system? Early planting of rice is one obvious method to minimize flood risks. However, as mentioned, even here there is an optimal time for planting, depending on the December/January rains. In theory, the farmer is able to avoid drought by simple irrigation of the young plants, but we never saw this practised. Perhaps a simple hand pump to bring water from the well and up to the rice fields would make such pre-flood irrigation feasible. Another way of securing strong plants at the onset of the flood is by transplanting rice. There are enough low, moist places in December to serve the needs for the seedlings, which can later be transplanted to the higher flood plains. However, at present, the individual land use system and the fact that all extra labour has opportunity costs (can be used for fishing, trading, etc.) preclude such a solution.

In other parts of the world, partial control of floods have been achieved through building dykes, the openings of which are often fitted with fishnets. (See e.g. Mohr 1969, p.110.) This could also in theory be applied to the Rufiji Delta, in the way that dykes are now used in the outer Delta to re-claim land in the tidal and mangrove zones. These dykes would have to be built along the higher levees and ridges in the valley, and would consequently collide with the land-ownership system. In Msomeni and Usimbe, flood hazards are not so great that dykes would be washed away, but their use would mainly be in years with early floods or above normal floods. In dry years, the rice will starve inside as well as outside the dykes, unless artificial irrigation is provided. As mentioned, the search for micro-ecological variations within each individual shamba has produced a land use system and land fragmentation which would make a rational construction of dykes highly controversial. To achieve the optimum result a complete land-consolidation or wholly collection ownership of land would be necessary (see 4.9). On the whole, therefore, with the present uncontrolled flood regime of the Rufiji River, the construction of dykes does not appear justified.

Technological advances can most easily be introduced in the task of land preparation, where in some areas (not in the Delta) tractors have taken over completely from the hoe. Even if the tractor does a better job and does it faster, the organizational problems connected with tractor service on fragmented individual plots tend to override the benefits.

In many reported cases, ploughing has been done too late, and farmers would have been better off digging the shambe themselves rather than relying on a tractor, the technology and management of which are far beyond their control. However, if the organizational problems could be overcome, tractor ploughing would be a preferable solution.

Ploughing with oxen has been tried by KILIMO, but according to our informants the soil was so hard that four oxen could not move the plow. Water-buffalo might manage the clay loams in the wet season, but unfortunately, that does not suit the agricultural calender developed through centuries of experience.

Perhaps the most important finding is that only in a few cases has the area under cultivation increased as a result of tractor ploughing. As we shall see in section 4.3, there is a constraining bottleneck also at the end of the flood season, as well as in the beginning. Mechanized ploughing is therefore not a sufficient (although necessary) condition for increased agricultural production in the Rufiji Flood Plain. If tractor ploughing of fragmented plots is not charged to the farmer, a government financed or co-operative financed ploughing scheme would seem little but a subsidy to increased leisure.

In order to expand cultivation and realize the potentials of the tractor, it is also necessary to remove or reduce the other labour bottleneck: the harvesting of rice/planting of cotton and kunde. This can be done only gradually:

(1) First small threshing machines should be introduced to relieve the people of the tedious threshing work.

(2) Marketing should be made easier and communications improved so that the farmer can get his much-needed cash from the rice crop without having to sacrifice cotton planting.

(3) Small rice mills should be introduced in ujamaa villages to free more of the women's labour time for a rapid harvest of rice and smooth planting of cotton.

(4) Finally combined harvesters (crawler type) can be introduced to speed up the harvest itself. However, these should not be introduced before a certain level of technological skill has been reached among the peasants. A precondition for introducing mechanized harvesting is also the communal ownership and levelling of extensive areas of continuous cultivation. Finally the problem of harvesting time has to be solved: With the present storing practices only rice harvested early in the morning with a combine seems to avoid breakage in the mills, because it has a higher moisture content.

If, however, labour bottlenecks can be reduced and removed in this way, the peasant household will be able to expand its flood-season cultivation four times before it reaches another labour bottleneck. This is the weeding of rice in February/March, an operation which cannot be rationalized before close control over floods and water levels has been achieved.

4.2 Tidal irrigation in the Rufiji Delta

We shall treat as separate a special form of irrigation found only in the outer Delta (Kiechuru, Mbwera, Jaja) because it does not play the same role in the agricultural system as does flush irrigation.

As mentioned in section 2.2, the destructive potential of the floods decreases as one moves downstream. At the mouth of the Delta the higher and longer a flood, the more constructive it is, because it offsets the periodic salination of agricultural land which occurs when the river is low. When the river starts to rise, the salty sea-water is pushed out. With the help of the November and January rains, the flood-water leaches the soil sufficiently for agricultural use. Thus the farmers can plant their first rice crop in December. Rice-cultivation here differs considerably from that of the Valley or the apex of the Delta (Msomeni, Ngoero). We shall describe it in some detail, in order to show the strong effect of environmental constraints.

The rice is first planted in nurseries, where growth can easily be controlled. After the plants have reached a sufficient strength they are transplanted to the rice fields. In these operations the Delta farmer can largely predict nature. Depending on moon-phase, there is a large high tide every fortnight. Then the flood water piles up because the sea outside is high. This is the time when the farmer opens his dykes (or enclosures) and lets the fertile flood water into his fields. When the tide/flood is at its peak, he closes his dykes trapping the flood water in the paddy field for a fortnight. In this way the farmer can control the growth of the plant, by allowing water in or closing it out. He can also make sure that planting and harvesting are done at the right time and under ideal conditions.[1]

In the mouth of the Delta it is common to have two rice crops a year. By planting the three-month salt-resistent water rice varieties (Nyati, Manjano, Halmalia Ngani) and exercising close control over water level, the Delta peasant can get two good crops of rice in years of large floods. This is also necessary, as in the dry season large areas cannot be utilized due to increasing soil salinity as the river sinks. In this season the Delta peasant has to rely on coconuts, salt making, cattle, and fishing. In later years (after 1968), successive low floods have led to a breakdown of this system. The rice fields at Mbwera and Kiechuru have been increasingly infiltrated with salt and yield only one crop of rice a year. This is also attributed to a change in the relative share of water carried by the distributaries. The Rufiji distributary, which brings fresh water to the rice fields at Mbwera, is blocked by a growing sand barrier at Usimbe, and most of the water flows north-east through Nyangarombe.

To a certain extent the Delta peasants can control salinity: By applying cattle manure to the rice field before

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1 This is the same rice growing system as applied in the river delta of Sierra Leone and Gambia. See Mohr 1969, p. 58.

planting, a reasonable harvest can be obtained (Angwazi & Ndulu 1973 b). Although no field trials have been conducted under these conditions, we can assume that manure both offsets salinity to a certain extent and improves the physical and nutritional qualities of the soil. But because cattle ownership is limited and the distribution uneven, this system of reclamation cannot be applied widely. The large 1974 flood did of course offset salinity over extensive areas of the Delta, but its peak was too late to have any effect on farming activities.

There does not seem to be much scope for improvement on this system, for it is a sophisticated farming system on a low level of technology. It seems doubtful whether any modern farming techniques could improve the yield per acre: tractors can be hired but they do not seem to increase production significantly. One might argue that by using modern machinery the acreage under cultivation could be expanded. This is only partly correct. Although the land use pattern in the outer Delta is very dense, there still seems to be room for expansion of the area cultivated. For centuries this has been done by cutting down mangrove trees on the inside of the mangrove forest and opening new paddy fields here, or on tidal marsh which has been sufficiently raised by the annual silt deposits to facilitate tidal irrigation.

This process can be speeded up by using modern machinery, but it will be constrained by two factors: First, as long as the tedious work of transplanting rice has to be done by hand, the availability of labour (women's labour) will be a major constraint. Second, premature cutting of mangrove forest can lead to erosion of the intertidal mud flats, and must be avoided. Thus there is only limited room for mechanization in this rice cultivation system. Production can increase only by an increase in population or by involving wider segments of the present population (men, youth, and landlords) directly in rice cultivation.

4.3 'Mlau' - cultivation

The dry season farming system, or 'mlau' cultivation, is probably the elder of the two major systems constituting the Rufiji Delta agricultural cycle. One can imagine the hill people, Ndengereko and some Matumbi, going down into the valley to plant when the flood waters had receded. It is probably safe to assume that the mlau system was fully evolved before the development of a riverine culture.

Basically, mlau cultivation as practised in the Rufiji Flood Plain is independent of rainfall throughout the whole growing season. The condition for its success is the ability of the roots of the young plants to follow the slowly sinking moisture table after the flood has receded. Mlau cultivation is possible only where there is no salinity in the dry season. Following an early description, there are four different kinds of environments suitable for Mlau cultivation (Marsland 1938):

(1) Areas which have been flooded by the river. When the flood waters subside a rich deposit of silt is

left behind and a clean, but fractured surface is left ready for cultivation. Sub-soil moisture remains sufficiently high to support crops like maize, cotton, or kunde.

(2) Areas not subjected to surface flooding, but nevertheless adequately supplied with moisture by the process of infiltration from the high waters of the river, through a highly permeable sub-stratum of sandy loam superimposed on an almost impermeable layer of clay.

(3) Areas on low-lying banks near the mouths of the Delta which are periodically flooded with fresh water caused by the piling up of river water at high tide.

(4) Pockets or depressions with semi-permeable sub-soils which are subject to inundation by heavy rains (nchacha land). As the water evaporates, semi-'mlau' conditions result, although subsequent rainfall is essential for the proper functioning of the crops.

For the three first types of environment, the height of the flood is decisive for the extent and success of mlau cultivation. The larger the flood, the larger are the areas cleared from vegetation and soaked with water. Whereas for the flood season agricultural system, a big flood can be fatal if it comes at an inappropriate time, a small flood is always fatal for mlau cultivation. In years of small (sub-optimal) and early floods, the higher fields and the fields far from the river are too dry to allow any dry season cultivation. Even a flood disaster might not always create the necessary conditions for mlau farming. The 1974 flood peak was sufficiently high to destroy most rice in the flood plain, but it did not last long enough (only five days) to soak the heavy clay soils sufficiently for successful cotton growing. This means that only a small percentage of the available land can be used continually for mlau cultivation. Together with the aforementioned constraints on the flood season agricultural system (fertility, hardness of soil, etc.), this considerably limits the farmer's choice of a place for permanent settlement. Thus the individual farmer's search for a mixture of environments permitting continuous cultivation throughout the year is largely responsible for the band-like settlement pattern to be found along the river levees.

Initially, millet and sorghum were grown in 'mlau' cultivation; later maize became popular, and today, cotton and kunde are predominant.[1] Cultivation starts as soon as the flooded areas dry up. If the ground is still moist after the rice harvest, the farmer will slash all the rice stalks and weeds in the field, trample them down in the mud and leave them to rot. If the rice cannot be harvested before the ground dries up, the rice stalks and weeds are burnt off and cotton is planted immediately afterwards. Usually the farmers wait until one inch of hard crust is formed on top, for this prevents any weeds from taking over the fields. Planting takes place successively, starting with the higher places, moving down as the moisture-level sinks and the top-soil

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1 Both cotton and kunde provide excellent coverage, thus minimizing evaporation from the top soil.

dries up. First, the crust is cut and lifted aside, then a 6" deep hole is made with a hoe (sharpened pole, 'rusinde', for maize). Ten to twelve seeds are dropped in the hole and covered with wet sand. It is considered necessary to have so many seeds in each hole because after the floods, these seeds are the sole food for insects in this environment. When the seeds germinate, at least one of them should survive. The young green plants which later appear are very conspicuous on the vast, grey surface and have to be guarded day and night against birds and pigs. When these plants have grown to sufficient strength, the ground around them is mulched with hoe, to reduce evaporation from the sub-soils by destroying the capillary system. After this operation there is not much to do until the harvest, for weeds hardly grow in the dry season insects do not thrive under the merciless sun, and the fields look clean and well tended. However, before harvest one can notice a great variation in the health and height of the plants, even within the same shamba. This is partly due to the degree of success the farmer has in timing the planting with the sinking moisture level, partly due to differences in the water-retaining capacity of the deeper sub-soils. If the moisture level sinks too fast during one part of the growing season (soils are mbaregilwa or clay on coarse sand) yields will be low. At present the farmers can avoid these failures by utilizing their long experience with the complex micro-environment. If, however, this accumulation of knowledge is broken by the movement of people to higher grounds, dry season agriculture will have to rely on the application of science. Whether even mechanized agriculture can produce sufficient surplus to cover the research expenses necessary to substitute farmers' knowledge is doubtful.

In the mlau system, as opposed to the flood season system, nothing is beyond the control of the farmer. Once the flood is over, it is the farmer's skill and knowledge which decide his yield. This is an important finding, for it helps to explain the Delta peoples' unwillingness to move to the higher grounds even after a flood 'disaster'. The mlau season is safe, output can be calculated (provided the farmer has enough experience), as there is a linear relationship between the size of the flood and the harvest of maize, cotton, or kunde. The larger the flood, the larger the area cultivatable under the mlau system, and the larger the expected yield.

There are labour constraints on the mlau system too, but they can to some extent be overcome by hard work or by hiring labour. Ideally the rice ripens and is harvested before the mlau farming starts. Sometimes, however, the ground dries up long before the rice is ripe and the farmer has to plant cotton, kunde, or maize in-between the rice. From then it can take up to three weeks before the rice can be harvested, until then the ground cannot be mulched. The result of this overlap between two farming systems is serious labour bottlenecks when harvesting and planting have to be done simultaneously, or when harvesting and mulching have to be done simultaneously. In this time-race in time against the sinking moisture level the farmer is often apt to lose, so that his planting is too late, or his digging of the ground is too late and of a poor quality, thereby causing excessive evaporation. The differences in skills

and working strategies employed by farmers during this crucial period largely explain the wide variation in height and yield of cotton and maize among neighbours.

As mentioned in section 4.1 the labour bottleneck at the end of the flood season can limit the area grown with rice and thereby the cotton acreage. This constraint is responsible for the non-expansion in cultivated areas per farmer after tractor ploughing had been introduced. On the other hand, if the entire rice harvest is washed away or drowned, all the available labour can be devoted to mlau cultivation and all the operations can be carried out at the right time. Thus 1960 saw a bumper crop of cotton in Msumani, Ngoaru and Usimbe.

Additional hazards in the mlau system are few; they consist of attacks on the cotton by insects and elephants (rare in the Delta) or unwanted rains during the picking season (which impair the quality of the cotton).

What then is the scope for improvement of the existing dry season agricultural system? As it is the flood season farming which inflicts constraints on the dry season farming system, the solution to the problem should lie here. By early planting of rice the farmer can achieve early harvest, but as mentioned in section 4.1 early planting is also risky, unless artificial irrigation can be applied. (See Fig. 4.3.1 for a summary.)

Any conventional irrigation during the 'Mlau' season would disturb the growth of the roots (following the sinking moisture level), and thus forfeit the whole purpose of 'Mlau' farming. If applied, irrigation must be sub-soil irrigation or create conditions similar to this. This can be achieved only with flood control on the Rufiji River throughout the year.

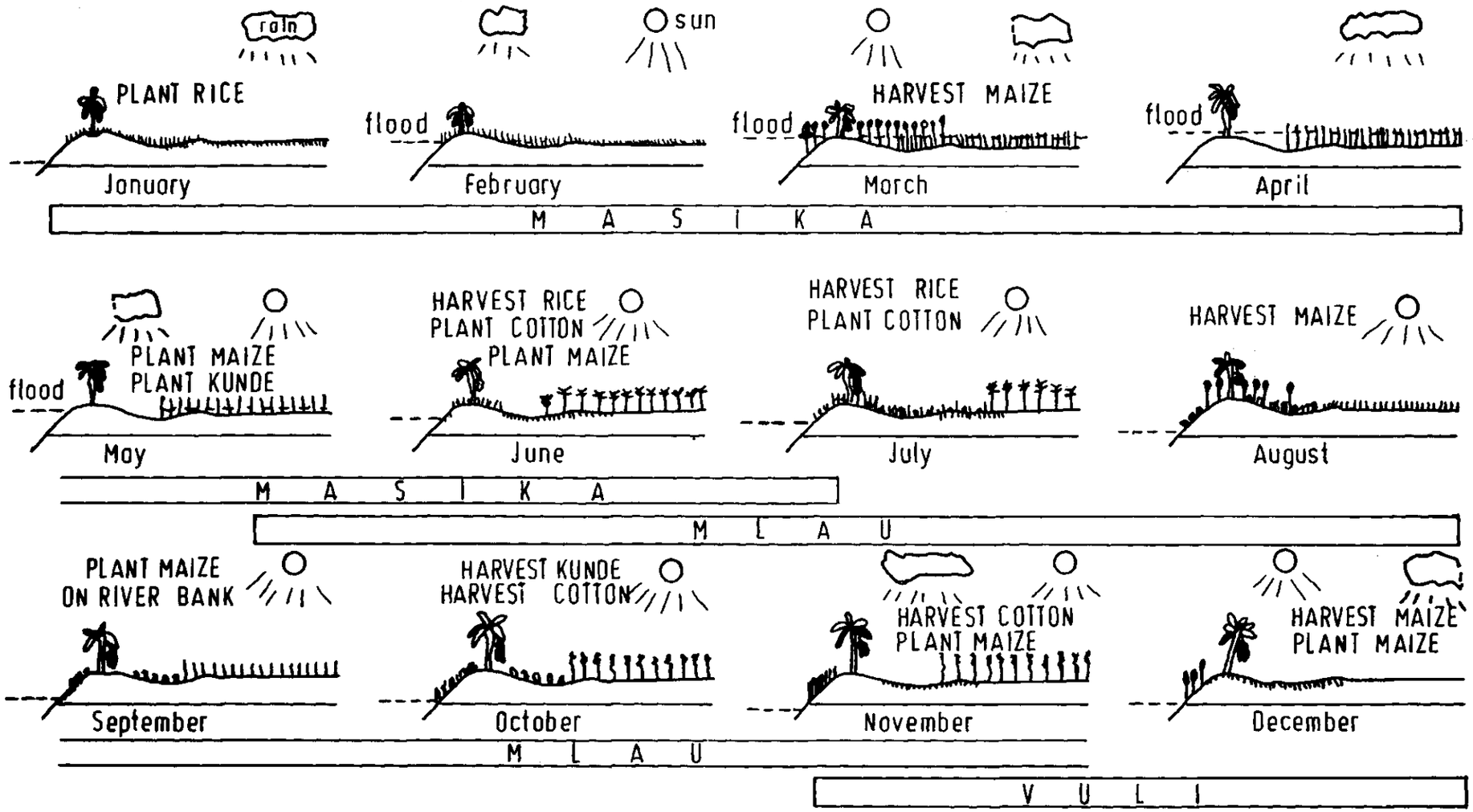
The solution advocated by farmers in the Delta is, in addition to early planting, to introduce hybrid rice which have a shorter growing period (4-5 months) without losing the qualities of taste and yield. This would give room for both mechanized harvesting of rice, row-planting of cotton, and mechanized mulching. Improved organization of tractor plowing is the first step to facilitate early planting and a precondition for this is again a rational land use system. A successful "bega kwa bega" (block-farming) system seems to be the simplest way to achieve this. (See also Sandberg 1973.)

4.4 Organization of labour in farming, fishing, and trading activities

Having explained the agricultural system in the Rufiji Delta as the result of processes of individual optimization under ecological constraints, let us now see how the individual farmer and his family adapt to the same system.

In the traditional farming system in the Rufiji Delta, crop diversification and diversification in the type of environment utilized form the optimal strategy. The farmer reasons that, as long as he alone or together with his fellowmen cannot control the nature around him, the best way to survive is to have many legs to walk with. Just as dropping many seeds in one hole

Fig. 4.3.1. AGRICULTURAL CALENDAR RUFIJI DELTA

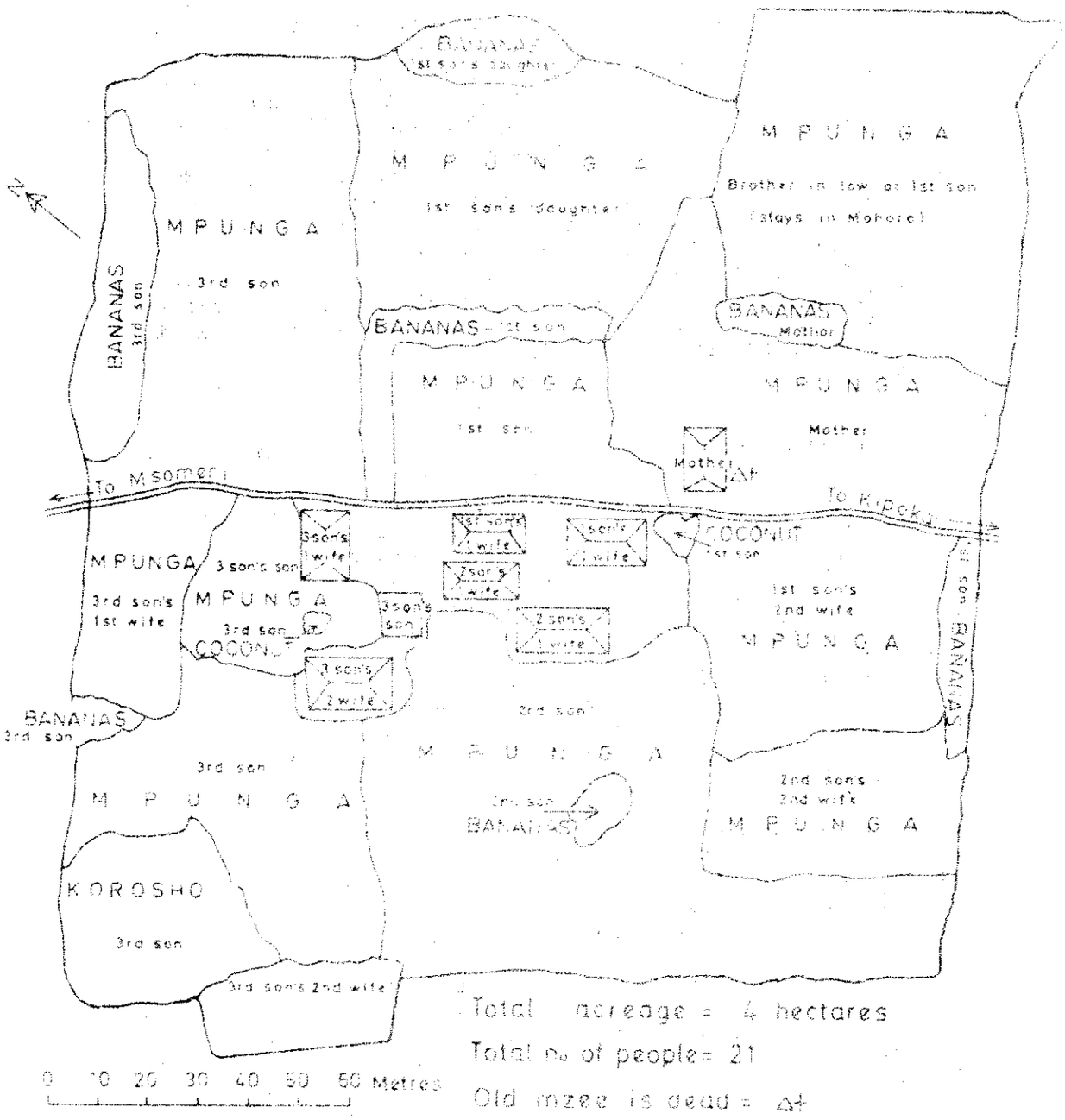


guarantees that at least one of them will germinate, having many different crops in various environments secures at least some food. Some of the old homesteads in the Delta have thus achieved a remarkable high degree of self-sufficiency. On one farm one can during the year find both millet, maize, kunde and rice, together with cotton and cassava. On higher places there are cashew, mango, and coconut trees planted. In moist places sugar-canes and banana groves thrive. In river valleys and on river banks, tomatoes, pumpkins, tobacco, and lady's finger grow willingly in the dry season. Near the houses, pawpaw can be grown, and here also roam chickens and the occasional goat. This multitude of food crops is supplemented with fish caught in the river or in the lakes. Unlike most subsistence agricultural systems, the Rufiji Flood Plains seem to have developed from monoculture towards diversity. Nor has this development been encouraged by limited markets, but by the activity of individual farmers trying to minimize the risks connected with cultivating in the Flood Plains. Consequently, the farmer has to be a specialist on all crops, and he sees no point in improving the cultivation of one of them (e.g. cotton) if this leads to less favourable growing conditions for the other crops. Thus when planning improvements in the existing farming system of Rufiji Delta, the whole system has to be regarded as a dynamic unit where change in one element requires change in another element.

In the Rufiji Delta one can still find examples of old modes of production, based on the extended family. The farm plan for the "kidugu" (family farm at Kitanga) (Fig. 4.4.1 and Fig. 4.4.2) shows how land ownership is organized and how the plots are organized around the cluster of huts. In the customary land tenure system it was usual for the new wife to be allocated her own plot for food, but she also had to work together with the other wife (wives) on her husband's shamba. A very senior wife has her own plot for cash crops, this privilege having been granted for long and faithful service to the husband. Other relatives can also have their own plots in the family farm; in this particular case, one of the daughters could as an unwed mother claim part of the land from her father.

These kidugu can contain 20-40 people and are scattered over the Delta, with fallow land or tall river grass in between. The present settlement pattern in the Delta is the result of many individual choices with regards to soil and water. Thus we find the settlements mostly along river-levees on mbaragilwa soil where the farmers can hope to harvest something in a poor year. A family farm like this usually includes various types of soil and land at various altitudes. For the father who allocates his newly-wed son some land, the choice is relatively simple: The plot must be big enough to sustain his family and it must contain sufficient micro-variations to secure some food even in the poorest year. If the land is unacceptable to the son, he can move to a new place, break new land and found a new kidugu. The prevailing land-use system in Msomeni, Ngoare, and Usimbe is based on the family farm, and only in a few instances do farmers have plots detached from the homestead. These are rice fields on kitope land for residents of old Msomeni village, and on similar land for residents of

Fig 44: KIDUGU FARM PLAN FLOOD SEASON

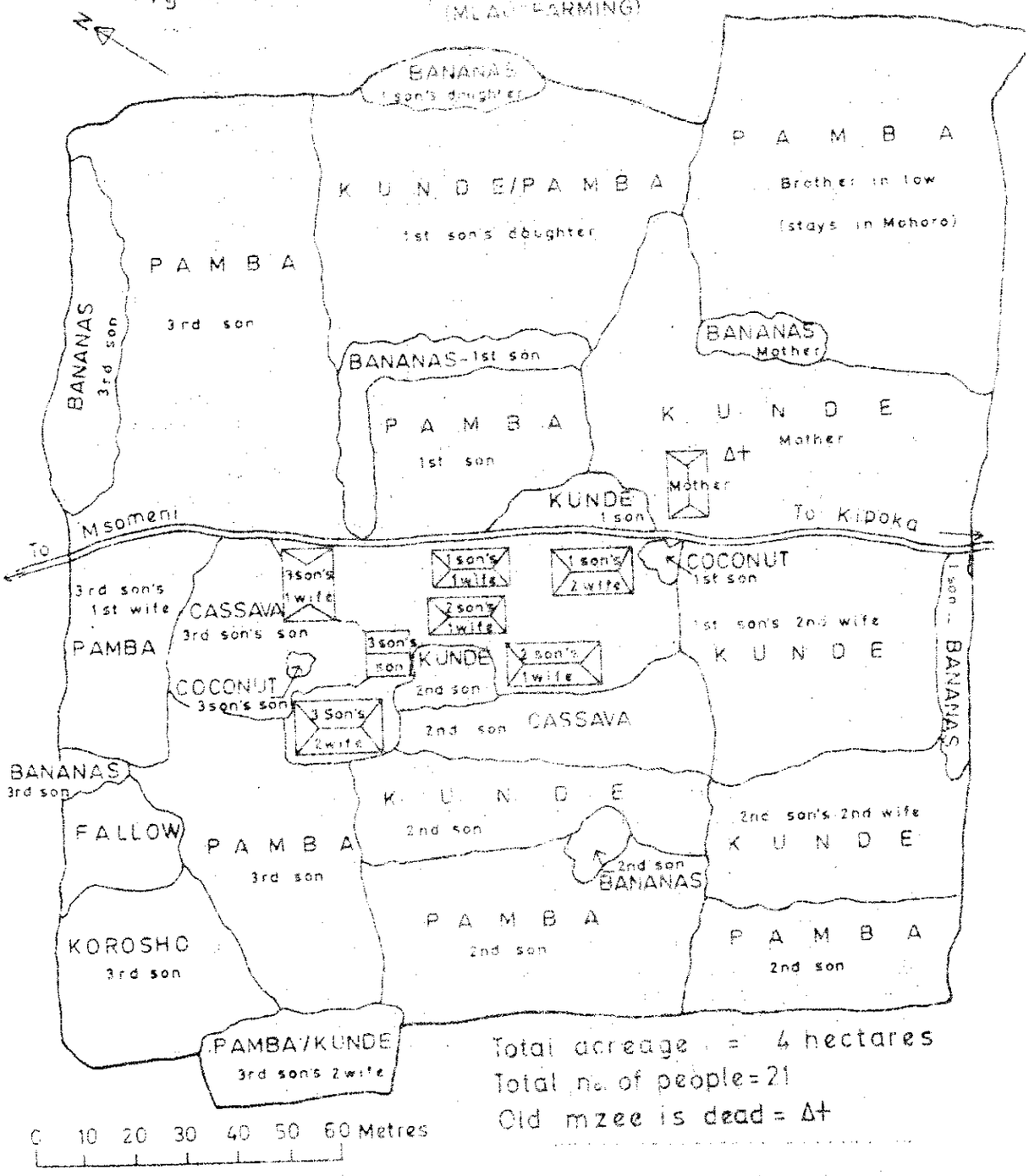


Total acreage = 4 hectares

Total no of people = 21

Old mzee is dead = Δt

Fig 4.7 KIDUGU FARM DRY SEASON
(MLAUFARMING)



Total acreage = 4 hectares
Total no. of people = 21
Old mzee is dead = Δ+

baraborani and Usimbe.

Some of these kidugu have been farmed continuously for 30-40 years, apparently without any loss in fertility or yield. The growth of sedge grass in the fields seems to be efficiently checked by rotation with kunde. This land-use system is peculiar to the upper part of the Delta. In neighbouring areas like Mbwera and Miechuru, people live together in villages and go to farm rice in the lower parts. Here the process of individuals securing land in different environments has led to a widespread fragmentation of rice land which makes efforts to advocate collective modes of rice production abortive. Sometimes a man here might own three small plots in three different places, while his wives have their plots somewhere else.

Because the farm is still concentrated, farming practices in Msomeni, Ngoaro, and Usimbe are fairly efficient. Both husband and wife (and if applicable: labourer) go out early in the morning and dig, weed, sow or harvest until the sun starts burning.[1] Then they go to take their morning meal. After this, during the hottest part of the day, as much work as possible takes place in the shade. Women pound rice and maize, or make mats. Men are engaged in house repairs bedrope-making, graveyard building, or small trading activities in preparation for the weekly trip to the market in Muhoro or Mbwera. When the afternoon breeze comes they both go to the shamba to continue the work from morning. The work goes on until dark, when the women start to prepare the evening meal while the men gather to talk or play bao. After the evening meal they go visiting neighbours or the men go fishing in nearly rivers and lakes. For the men or some older boys, the night might be spent in a small hut erected in the fields, in order to scare away pigs, hippo, and birds.

Because of the proximity of home to fields, a rational organization of labour is possible. With increasing distance (2-4 kms) the burden of work is no longer equally distributed between the sexes, but is thrown upon the women. If the family lives in a village, the woman has to travel by foot to the shamba, work during the hottest part of the day and return home in time to prepare the evening meal for her husband.[2] He mostly remains in the village, engaged in petty trade and attending village meetings. When the distance becomes even greater (8-20 kms), both husband and wife (wives) move to the Flood Plain to stay in the dungu for the cultivation season. They leave the children behind in the village to attend school and they cannot participate in village affairs. This farming practice has disruptive effects both on family life and on

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1 The custom of arranging beer parties, "kiyau", to get work done is not as common in the Delta as in Rhingo. Hired labour seems to have taken over from the communal work group.

2 20% of the labour input in rice production in Rufiji are spent on walking, and 18.8% of the overall labour input are spent walking. (Yoshida 1972)

ujamaa activities. However, as a compromise between the call to move together in villages on the higher ground and the need to secure an adequate food supply, for the poorer farmers this practice is the only choice open. Richer farmers can afford to keep at least one wife at home, hire labour or tractors to do the work, and engage in leadership functions in the village.

In section 4.0 we shall see what the experience from several ujamaa villages can teach us about the prospects for socialist transformation in the Rufiji delta.

In recent years, hired labour has been employed more frequently by Msomeni peasants. There are several reasons for this:

(1) The tractor service to Msomeni was terminated after the the call for people there to move to Chumbi.[1] This has created an immediate demand for additional labour.[2]

(2) Some of the younger men in Muhoro and Chumbi Ujamaa Villages have not managed to get good quality land for cultivation and are eager to come and work in the Delta. The charge is usually Shs.40.00 for hoeing of one acre (20-25 days' work) plus some 4 gallon "debes" of rice for food.

It is to be feared that a reintroduction of tractor services in the Delta may render these youths from the Ujamaa villages redundant and push them to Dar es Salaam to look for paid employment.

Youth living in the Delta do not have the same employment problems. They engage themselves very early in trading activities and with the small surplus accumulated here they can invest in fishing equipment (traps, nets). A young man can also start farming within the family farm without having to set up his own household. Recently (1973) a group of 19 youths from Kitonga started to farm together a 12 acre rice and cotton farm. They all stay on their family farms, and decided to start to work together on their own initiative. For the 1973 cotton season the elders joined the youth and they prepared together a 300 acre communal cotton farm, obviously to be used as a political instrument against the policy of resettlement.

As mentioned above, there some block-farming on kitope land is practiced by inhabitants of Msomeni, Barabarani, and Usimbe. While these farmers previously engaged tractors to plough the whole area, comprising many individual plots, today these farms are mostly hoed by individually hired labour, while many lie fallow.

Once harvested, the product formally belongs to the husband, who markets it and keeps the cash for expenses like

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1 It is possible to get a private tractor from Mbwera, but the charge of Shs.65.00 per acre makes most farmers prefer hired labour.

2. For the 1972/73 rice season some of the peasants who had "officially" moved to Chumbi had their fields in Msomeni ploughed, but it appears that the ploughing was done too late.

parafin, sugar, salt, tea, and tinned milk. He also has to buy his wives a new khanga for "Id-El Fitr" and clothes for his children. There are also numerous religious and social fees to be paid in cash, thus placing a heavy burden on the head of the household. It is considered futile to give the wife any cash, as she would squander the money on khanga and come to ask the husband to buy salt and sugar.[1]

However, most women keep some of their rice harvest for food, usually hidden from their husbands, and from time to time they sell small quantities to buy their own requirements (medicine, clothes, etc.). Women can also pound rice for neighbours and are then paid Shs.5.00 per bag of paddy.

Children render valuable help on the farm, for the girls help their mother in the house while the young boys scare away birds from the fields. At puberty the girls go into seclusion while the boys engage in long-distance trading and fishing. There are government schools in Mbwera and Kiechuru otherwise there is only seven-year Koran school for all children plus a continuation course for those who want to become sheikhs or "mufti". Consequently, every youth can read and write Swahili in the Arab script, they are also taught some simple mathematics. The official illiteracy rate runs at 80-90%, however.

The schooling system is controlled by the inhabitants of the Delta and adapted to the agricultural calendar. This has had two major effects. One is that the absentee rate in the schools is very low, as parents know that they will be chastized by the sheikhs if they keep their children at home. The other effects is that the youth is trained for adult life in the Flood Plains, and he is given the equipment needed to pursue a career in this locality (see 4.8). More than anywhere else in Rufiji, young people in the Delta here remained at home engaged in gainful activities rather than drifting to Dar es Salaam.

Cattle have not been mentioned as they do not enter the agricultural cycle. They are kept by Arabs, shehes or rich men, and are used for the sharia (Prophet's Birthday). From early descriptions (e.g. Berns dine 1902); cattle are said to be abundant in the Rufiji Delta and there is obviously scope for significant expansion of the cattle industry here. (See Section 4.9.)

4.5 Housing practices

A main argument for moving people out of the valley has been their alleged low standard of living and poor standard of housing. It has been argued that houses are small and crudely built in order to avoid serious losses when they are washed away by floods. For the same reason, material belongings

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1 This situation is due to the unstable relationship between the sexes, particularly the economic oppression of women in the coastal zone.

are thought to be kept at a minimum. Although this might seem to be the case at first glance, a more detailed analysis reveals the proper function of houses within the economic activities of a Msomeni family.

In Msomeni the traditional house was made out of mud and sticks with four rooms. The floor inside was built up about three feet above ground level and usually remained dry even at peak flood. As an extra precaution there was a second floor which acted as a store and a retreat during exceptionally high floods. Such housing was the prevailing type up to the big 1962 flood. This flood lasted for six months and although it was not very high, water eroded most floors and the houses became unpleasant to live in. After this flood people started to live in the "dungu". A dungu was originally a small hut erected in the rice fields for the use of young boys scaring birds. The idea of a dungu as a permanent house is said to come from Mbwera, and originally from Oman. Contrasted with the small dungu, which has only one room and an opening in the front, the permanent dungu has 3-10 rooms with an entrance on the side combined with a small veranda. (See front cover).

The major construction materials are produced locally. Mangrove poles can be gathered by canoe; likewise ebony poles for corners can be found in local forests. Planted matting (makuti) for walls and roof is bought from Mbwera and for a four-room house the expenses amount to Shs.200.00. The poles are dug about 2 ft. into the ground; completed, the house has 20 poles. The structure is remarkably stable. Depending on the elevation of the building site, the floor stands 3-6 ft. above the ground, this space being used as a sitting-room during the dry season. Acceptance of the dungu has meant a greater freedom in choice of settlement, as people do not necessarily have to live on the river levees as they did when they were confined to houses. However, only to a limited extent did this 'innovation' change the settlement pattern towards the lower and more fertile areas. A slow movement of people from old Msomeni village towards the new distributary Nipoka was temporarily arrested by the establishment of government school and services at Bombe in 1964, but since 1968 more people have been setting up their dungu here. Thus, the permanent dungu is a relatively new type of house which facilitates settlement in heavily flooded areas, thereby increasing the potential carrying capacity of the Flood Plains. In other parts of the Delta, we found other varieties of houses - e.g. in Usimbe, people have mud-houses but build a temporary floor inside in the flood season.

The dungu has several drawbacks compared to a house. These include the problems of light (difficult to make windows in thin walls), problems with washing the dead in the house (!), and various others connected with living elevated on the first floor. But the advantages should also be pointed out. The dungu is easy to keep clean, all kitchen rubbish falls through the floor and is eaten by the chickens or carried away by the flood waters. The dungu is airy and cool. Finally the dungu can last as long as a house (10-15 years) and the building materials can be re-used, as there are no termites in the Flood Plains. Although no serious research has been done into dungu construction, there is obviously a great scope for significant

improvements with simple means. Especially a cement foundation would give the dungu a much longer life, as it is the ground that finally yields and not the poles.

Some of the virtues of life on the family farm should be noted and, if possible, transferred to the new way of living. Most families in the Delta enjoy proximity to the river or its distributaries and maintain a high hygenic standard with a bath every morning and evening. This also means easy access to drinking water; and where the river is more than half an hour's walk away, a well is dug on the farm.

Consequently, for a Delta peasant to be better-off after moving from his dispersed way of life, the quality of social services offered must be fairly high. Houses will have to be bigger and of a higher quality than most of the two-room bandas one can see in the ujamaa villages. Water taps will have to be closer to the house and bathing facilities at least as good as they are today. In addition to these aspects of standard of living, the individual farmer will also compare his self-sufficiency and variety in food with what he can observe in the existing ujamaa villages.

In discussing collectivization, we should not forget that the ultimate aim must be to make everybody (except perhaps the very rich) better off, by introducing more rational modes of production. A collective mode of production will therefore entail a higher standard of living only if it produces a larger surplus than does individual production. The high standard of living already enjoyed by the Delta peasants explains their resistance to move and indicates the criteria one should apply in evaluating alternative ways of collective living.

4.6 Marketing practices

As mentioned in section 3.3, relations between the Delta and the rest of the nation have been severed following the 1968 floods. This has isolated the Delta people both economically and politically, forcing them to revert to their traditional ways of marketing. Incidentally these have proved more profitable for the individual farmer than using the official marketing channels (the Coast Region Co-operative Union). This finding is a major explanation of the Delta people's reluctance to move from the Flood Plains.

Before 1968, all marketing in the upper part of the Delta was taken care of by the Msomeni and Usimbe Farmers' Co-operative Societies, which were initially closely controlled by the farmers themselves. These primary societies had, however, lost most of their powers to the Coast Region Co-operative Union by the time they were liquidated in 1968-69. For the outer part of the Delta, the Mbwera Farmers Co-operative Society is still functioning, but this is mostly engaged in the copra industry. The Union, whose leadership comes from Muhuro and Ndundu (now Ikwiriri), has a monopoly on the marketing of copra, cotton, rice, and several other products. Local regulations have in fact stipulated punishment for anyone not marketing his crop through the co-operative.

Today there is among Delta peasants a growing resentment against the Co-operative Union. The reason is partly that since

1960, no Union services have been provided for the people in the Delta (buying of crops, transport, seed distribution, tractor ploughing of fields, etc.) And partly the reason is that even when the peasants take the trouble to transport the bulky crops (on the head or on bicycle) the 8-12 miles to Muhoro, they often have to wait there for 2-3 days because they people of the valley ("watu wa bonde"), are served last, or because the Union has run out of money.[1] Other complaints include bad management, high commission (up to 32% of crop value), and nothing in return to the peasants. Particularly the farmers in Msomeni claim that % of the produce handled by the Muhoro branch of the Union come from their farms, while they are excluded from all decision-making in the organization. As Muhoro Ujamaa Village is mainly a trading centre (Muhoro has 27 private shops), this claim may well be true.

This resentment against the Co-operative Union has at present two important consequences. The first is that individual farmers are trying to market their crops themselves. Into their cost-analysis enter both the opportunity cost of transporting crops to Muhoro and the price difference between seller's price and buyer's price.[2] This renders trading expeditions to Mafia, Kilwa, and Songo-Songo highly profitable. The Warufiji have always been renowned for their skill with the canoe, and now they are making maximum use of this skill. Most people hire a canoe and take their own crops down the river, taking dried sea-fish, salt, coconut, or mokuti back. Some professional transporters have, however, set themselves up with large canoes and helpers to carry goods down the tributaries. The charge for bringing one bag (rice orkunde) to Kilwa is Shs.15.00. It is more profitable to sell rice than paddy, both because of the decrease in volume and because of the value added in pounding the paddy. A woman who pounds rice is usually paid Shs.5.00 per bag of paddy (approx. Shs.15.00 per bag of rice) but she adds about Shs.40.00 to the value of each paddy bag by processing it. The alternatives facing the individual farmer who wants to sell his rice harvest are thus as shown in Table 4.6.1.

Table 4.6.1 ALTERNATIVE MARKETING STRATEGIES

Alt. 1: selling to Co-operative		Alt. 2: selling to Mafia	
3 bags of paddy		3 bags of paddy (Afaa)	
3 x 75 kg @ -/58	= 130.00	= 1 bag of rice	
- Transport		1 x 150 kg @ 1/70	= 255.00
by lorry to Muhoro		- pounding of	
3 x 4	= 12.00	3 bags of paddy	= 15.00
		- Transport charge	= 15.00
Farmer gets	Shs.118.50		Shs.225.00

1 This must be understood on the background that any time wasted on marketing has alternative uses. If the head of household has to spend two or three days away from cultivation for every 2-3 bags of cotton he is selling, this upsets the agricultural system considerably.

2 The co-operative buying price for 1 kg rice (equivalent) is Shs.1.05 to Shs.1.16, while the price obtained from private traders in Kilwa is Shs.1.65, in Mafia Shs.1.70 (1977)

(If rice output from paddy is higher than 2:3, the difference between the alternative prices will be larger, although not proportionally, because the weight of the paddy also increases).

Thus, illegal marketing of rice is more profitable than using the legal channels. The effect is that two-thirds of the rice crop (according to local estimates) are marketed outside official channels and thus do not enter official statistics. It must be noted, however, that without the cheap labour of women (100 hrs. to pound 4 bags of paddy which equal 20 cents per hour), this trade would not be possible. If women were to receive the minimum wage (Shs.1.60 per hour) the farmer would prefer to sell to the Co-operative - unless the woman were his wife and obliged to provide free labour for her husband. However, within the family farm one has to look at the alternative use of labour; if there is no alternative use (the case during August and September) rice milling might be a reasonable transformation of resources[1]).

The other consequence of the farmer's resentment against the Co-operative Union is a significant change in the composition of production in the valley. Farmers are abandoning cotton, which has to be sold to the Co-operative, and are planting kunde (cow-peas), which can be marketed by anyone. We have not calculated the profitability of kunde, but most probably it gives the same return per acre as cotton. However, kunde has many advantages over cotton. It can be eaten, it does not have to be taken to Muhoro (wasting time on transport and waiting for money), it does to a certain extent prevent the growth of sedge grass, and maintains the fertility of the soil. Thus, on the level of individual rationality kunde is a reasonable choice. However, it will never completely take over from cotton, for as one farmer put it: "Cotton is good because relatives cannot come and beg it for food".

When it comes to marketing kunde, the aggregate results of these individual choices are rather contrary to the socialist policies of the country. Legally, anyone can set himself up as kunde-agent. Through a system of sub-agents these traders buy large quantities of kunde from Delta farmers. The kunde is stored until the price is considered right; then the crop is transported by lorry or dhow to the markets in Dar es Salaam, Kisarawe, or Kilwa.

Some important characteristics of the kunde-agents should be mentioned. Mostly they are well-to-do inhabitants of the Flood Plain who have their houses in the Ujamaa Villages of Muhoro, Ikwiriri, or Kibiti, or in Dar es Salaam. They are thus inside the political/co-operative hierarchy dominating these villages, and as such have access to hire village lorries (Ikwiriri), private or co-operative lorries to transport their kunde. While they are members of the new hierarchy in Rufiji and thus draw the full benefit of Government investments in

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1 M. Yoshida (1972) advocates simple rice mills for the villages in Rufiji, and this would certainly revolutionize the situation.

infrastructure, these traders are careful to maintain their position of authority among the people in the Delta. Their sub-agents who buy kunde and help with local transport (by canoe) are usually kin or in-laws who are paid a considerable provision. Thus the kunde trader is an entrepreneur in the true sense of the word, making use of two environments which in many respects are banned from interacting with each other. That the presence of such opportunism in Ujamaa villages and the exploitation of the "stubborn" Delta peasants are contrary to the explicit policy of socialism and self-reliance should by now be obvious.

The fish trade is conducted in much the same way as the kunde but is due to the isolation of the Delta of less importance here than in Ruhingo.

The black market-trade with rice is, however, pursued only by individual farmers. This is partly due to the illegal nature of the trade, and partly due to its direction and historical background.

In summation, the marketing activities of individual peasants in the Delta have serious repercussions on their own society. On the one hand, the inefficiency and the high administrative overheads of the Coast Region Co-operative Union make it highly profitable to contine to farm and live in the Delta.[1] However, with one foot inside one of the big Ujamaa villages one gains political influence (including in the Co-operative Union) and can engage actively in trading crops from the Flood Plain - provided someone is still farming there. This is the dilemma of the Delta peasant. How it is likely to affect attempts to collectivize production is analysed in section 4.9.

4.7 Religious practices

So far we have dealt solely with the problems arising from the relationship between Man and Nature. This is not to say that an individual's allocation of energy and resources is not guided by social and cultural phenomena. However, in a difficult environment like this, the dialectic relationship between ideas and the material base for existence is closely woven into one social fabric. Thus religious beliefs and the "Rufiji outlook on life" serve more to explain what individuals and groups are doing, rather than to determine it.

It is often argued by outsiders that the world outlook of the Warufiji is a major obstacle to development in the area. Especially the local blend of strong Sunni Islam, witchcraft fears, and ngome obligation is seen by some as a culture blocking the path to socialist development. If true, this should mean that the culture must be crushed and substituted

1 On the granting of status as Agricultural Producers' Co-operative to several ujamaa villages in Rufiji, the Msomeni farmers gave us this analysis in open meeting: "This has nothing to do with APC, in fact they (Government)let the Coast Region Co-operative Union in through the back door, so they can continue to exploit us peasants."

with more "rational" ideas of human interaction.

However, we have argued above (section 1.1) that the strategy for socialist transformation in rural Tanzania must take as its point of departure the true situation of the peasant and further development on peoples' own premises. Thus we should look at the proper function of religious practices within the context of social life and economic activities in an "original" Rufiji community. Where people have moved from their initial adaptation to live in villages this analysis becomes difficult, even if religious practices appear to be the same.

Islam is the encompassing religious and social system in Rufiji, stricter and more orthodox the further down the river one moves. Whereas in Ruhingo social prestige is built up by giving larger and more costly ngomas than one's neighbour, the Msomeni father will most probably have a long and expensive prayer ("maulid") read when his child is "coming out" (mwali). In most instances however, both the ngoma practice and the services of a sheikh are accepted ways of transforming wealth into prestige.

While wealth can be taken by thieves and rats, or destroyed by floods and fire, prestige is a lasting investment which makes a lot of sense in the risky Rufiji environment. Most prestige-giving functions are connected to the non-material culture, and are therefore seen by many administrators as unproductive, a waste of money which could have been invested in agriculture, fishing, etc. There will always be disagreement as to whether a poor peasant society can afford to utilize its meagre surplus to train and feed artists and specialists like the lead drummer, the lead-dancer, and the sheikh. But this is probably the wrong way of posing the question: As long as prestige is a meaningful idiom in a culture, there will always be a need for agents who can help to transform temporary wealth into lasting prestige.

Linked with the prestige-giving function of these practices there was therefore also a redistributive function. Wealth was distributed, frequently from the relatively rich to the poorer, among them artists and sheikhs who spend their time specializing in performance. In the traditional settlement pattern it was easy to see who was rich, and consequently whom one should expect a big ngoma from. In this society there were relatively few exit options, and social obligations could play their full role to produce some kind of equality.

Under the new order in Rufiji there are more escapes; people can to some extent hide their wealth by having a double settlement, or they can invest in houses in Dar es Salaam. In addition there are new and competing ladders of prestige introduced - among those, visiting Dar es Salaam, individual enterprise, and accumulation of wealth become prevailing values. When wealth can thus leave the society or be hidden, the role of the ngoma changes. Only those who have no prestige-giving connection outside the local community are under the obligation to give a ngoma according to their wealth. This is usually the poorer and/or more tradition-bound people for whom a lot is at stake.

Witchcraft or sorcery also has a relation to property apart from its more esoteric characteristics. (See e.g. Lienhardt 1960.) The practices connected with "uganga" and "uchawi" (white and black magic) have as their main function to govern relations between close kin or family members. The existing fear of uchawi is probably more widespread than the evil practices and is utilized by everybody to protect land, house, crops, and wealth. The marriage institution is extremely unstable in Rufiji and the husband's fear of uchawi is often exploited by his wives for material gains. With frequent divorces and a big age gap between husband and wife, inheritance of land and property becomes important, as every wife wants to secure something for herself and her children. That jealousy and witchcraft thus have a material base should not be surprising. For instance, speculations have been made as to whether the almost epidemic occurence of witchcraft eradicators has some close connection with the ownership and inheritance of land and property (Larsen 1973). Accordingly, there should be a high correlation between the occurrence of witchcraft and the density of settlement and farming. If the land becomes congested, land inheritance becomes complex and controversial, rotation becomes difficult, and yield might drop. This seems to hold true, in the highly decentralized political system in traditional Rufiji where there had never evolved a mechanism to solve such problems collectively. The whole society tends to become clogged up with jealousy and allegations of evil practices. These originate within the family, but spread quickly to bring the whole community to a stalemate. The only solution is to have a big witchdoctor ("mganga") come and cleanse the village thoroughly of evil spirits. After such a social wash-up, people can again sit down and solve between themselves problems of land ownership and land use.

In many ways this shows the proper function of witchcraft, as something which originates from individual behaviour in order to protect personal interests. However, the aggregate result is seen by everyone as highly undesirable, and people are prepared to exercise considerable community discipline to cleanse their society of these practices.

In the Delta, land is ample and disputes few. Although the local coven of witches is expected to take one man every years to use their medicine, witchcraft is largely confined to the family sphere and does not affect production adversely. However, the fear of witchcraft is strong; it was forcefully argued that if the Msomeni and Usimbe people were to move together in a village, witchcraft would become a serious problem. This illustrates the point made earlier, that people are conscious of the causes of witchcraft and strongly deplore its effects, but are unable to do anything about it. According to this, ujamaa villages where people are farming densely should be free of witchcraft. There are still no signs of witchcraft epidemics in any village, but the development in e.g. Ikwiriri should be closely watched in the years to come.

The solution lies not in the cyclical cleansing of beridden communities, but in removing the basis for jealousies and fears of close kin. This be done partly through a rational organization of land tenure and production, partly through a change in the roles played by men, women, and youth in production and decision-making.

Finally, it has been argued that Islam and its strong belief in predestination represents an obstacle to development in the area. This misconception has been the underlying cause of several administrative blunders in the district. There is, however, nothing in the Islamic culture to bar the introduction of new technology or new modes of production, as the development achieved in Somalia should prove. There might be elements in Islamic culture discouraging development through individual enterprise, but this should not be confused with conservatism in terms of applying modern cultivation methods. The farmers' resistance to "innovations" (e.g. resistance to farm on the dry river banks) will thus be seen as originating more from ecological considerations than from any cultural traits.

The alleged fatalism of the coastal people does, however, in Rufiji have a sound foundation. The erratic river floods are definitely beyond the control of the Rufiji peasant. Even if he joins with his fellow Warufiji into large ujamaa villages, his control of environment is still negligible indeed (in the case of vermin it is actually less than when he was living on his own in the Flood Plain). To control floods takes an organization far larger than ujamaa villages, and such a control might not even be in accordance with the peasant's requirements. (See Sandberg 1974). However, as shown in sections 4.1 - 4.5, the Delta peasant has actively adapted his agriculture to the risky river as far as possible under the given constraints. What happens after he has done his utmost is rightly believed to be God's will.

4.8 Individual careers

The various constraints and conditions facing the Delta farmer and his household can now be summarized to constitute his total set of opportunities: The floods and the fertile soil make farming in the Rufiji Flood Plain by far the most profitable enterprise. Nowhere else in the district does farming yield such high output per hectare of land. According to the agricultural survey 1970/71, nowhere else in Rufiji does farming give such a high income per hour spent as in the Delta area: productivity is much higher in the down-stream part of Rufiji than in the up-stream part. This contrasts somewhat with the situation around 1926 when the upstream area showed the highest productivity for three consecutive years. The explanation for this could be extension activities and seed distribution of the Mpanganya Agricultural Research Station in Upper Rufiji in those years.

Farming is also more profitable in the Delta than in the nchache (swamps) and dry river plateaus on which some of the neighbouring ujamaa villages (Muhoro, Chumbi, Nyamwage) have partly based their agriculture.

As mentioned above, flood hazards are less in the Delta than upstream, and thus the rice has a better chance to survive. And finally, the December rains are more certain here than upstream, enabling the farmer to plant early.

Concerning choice of where to settle, many more factors enter the peasant's calculation. These can be divided into two groups, which tend to pull in different directions:

Table 4.8.1 AVERAGE RETURNS TO LAND AND LABOUR ON RICE 1970 - 1971

	Upstream	Downstream
Yield per hectare	810.4 kg	1452.9 kg
Net Return Shs. per hectare	410.85	782.82
Labour imput per hectare (hour)	2774.3	2815.2
Return to labour cents per hour	15	28
Labour imput per ha on pure farming operations (hours)[1]	1498.2	1624.3
Return to labour on pure farming operations (cents/ hour)	27	48

Source: Yoshida 1972

Table 4.8.2 AVERAGE RETURNS TO LAND AND LABOUR ON COTTON 1970 - 1971

	Upstream	Downstream
Yield per hectare	229.7 kg	335.1 kg
Net return in Shs. per hectare	225.51	321.04
Labour imput per hectare in hours	1104.1	1081.8
Return to labour - cents per hour	20	30
Labour imput on pure farming operations (hrs)[1]	600.6	544.8
Return to labour on pure farming operations (cents/ hour)	37	59

1 - Walking - bird scaring
- Threshing and Marketing

4.8.3 AVERAGE RETURNS TO LAND ON RICE

Year	Yield per hectare		
	Western	Central	Eastern
1925	2,383 kg.	2,218 kg.	1,343 kg.
1926	2,371	2,926	1,904
1927	2,432	1,879	1,454
Local Price in 1927 (cents)	14	15	17
Return per hectare (Shs.)	340/48	281/85	247/18

Source: Telford 1929

Table 4.8.4 AVERAGE RETURNS TO LAND ON COTTON

Year	Yield per hectare		
	Western	Central	Eastern
1926	694 kg.	415 kg.	390 kg.
Local Price 1925-27 (cts)[2]	30	30	30
Return per hectare (Shs)	208/20	140/50	117/00

Source: Telford 1929

1 This is gross labour imput minus time spent on walking, bird scaring, threshing, and marketing.

2 There was a collapse of cotton prices in 1926 leading to a collapse in production in 1927.

(1) The agricultural system requires the farmer to stay close to his shamba for most of the year. He and his wife's (wives') presence is required in the fields for harvesting of rice, planting cotton and kunde for the months of May, June, and July, for weeding in August, and for harvesting cotton in October/November. The digging of fields requires the work of the whole family during October, November, and December, as does the planting of rice in December and January. As the rice ripens during the floods in April and May, some members of the family have to stay in the fields to scare away the birds and hippos which often invade at night.

Thus it can be seen that the delta peasant, if he wants to exploit fully the potentials of the land, can only take a short leave in March and perhaps in September. For those who specialize in rice production, July to November are free and can be spent in an ujamaa village or in Dar es Salaam looking for work. Many peasants who are officially members of ujamaa villages (Muhoro, Chumbi, and Ikwiriri), but who farm in the Delta, adhere to this rhythm, spending 9 months on the farm in the Delta and 2-3 months in the ujamaa village.

(2) The struggle for prestige and political influence pulls the Delta peasant towards the ujamaa village. It is through the Village Development Committee that government funds are channelled to various projects. It is also here that trade licences are issued and the use of the village tractor is decided. In the case of Agricultural Producers' Co-operatives, there are usually charges levied on the products (including those sold by Delta peasants) which are accumulated in village funds to be used for development projects. As mentioned in section 3.3, the people of the Delta (Msomeni, Ngoaro, Usimbu) have been defined by the leaders in the big ujamaa villages (Muhoro, Ikwiriri) as outside the political system of the district. Consequently they are not eligible to any office or able to exert influence on the use of collective funds to which they may well have contributed the major share. This has resulted in a strong community conflict sometimes concealed as religious conflict, (Ikwiriri v.s. Mdundu) and sometimes as open political conflict as in the case of Msomeni/Muhoro. The participants are minor leaders who have used the opportunity of a new political structure to climb to a position where they can surpass their former superior: the major traditional leaders who have remained in the Delta waiting for better times. It is on this level that local politics are conducted. Sarcasm and humiliation are the weapons used, while ujamaa and government policies are a platform rather than an issue. For the prestige-hungry individual, a formal movement to an ujamaa village represents a step upwards. Although spending most of his time farming in the Delta, he feels he is more likely to earn himself a

reputation as a good socialist the more he speaks against those still remaining in the Flood Plain. Thus the struggle between personalities confuses the whole policy of ujamaa.

At present, the Delta people are regarded as criminals by those in the ujamaa villages, because they are contravening government policy. At the same time, the Delta inhabitants regard the people with shops, lorries, and tractors in the big ujamaa villages as exploiters. The overall effect of the political environment is, however to pull the individual towards the villages.

These two forces - the need for food to eat and the need for political recognition - work together to produce the processes observable in Rufiji today:

People with moveable wealth have all left the Delta for the big ujamaa villages, and from there they continue to supply their services: tractor plowing, lorry transport, consumer goods from their shops, lodging in their hotels, or communications by means of their buses. Since all buying services in the Flood Plains have ceased, these people are in an even better position to exploit the peasant than before. There is the story of the lorry-owner in Mkongo who earned himself 3,000 bags of rice in just one harvesting season; and of the tractor-owner in Ikwiriri who bought his tractor on a hire purchase contract, but paid for it after only one ploughing season. The services provided by these village capitalists are essential for the smooth running of agricultural production, and it seems difficult to combat them unless collective services can be offered at a cheaper rate to the farmer.

The next category is the well-to-do peasants, who invest in houses in the big ujamaa villages (Muhoro, Ikwiriri) or in Dar es Salaam. Because there is a demand for housing in these places, houses can be rented out, and the return on capital is certainly higher than the return on any investment in rice production. The initial capital for housebuilding originates from rice-cultivation in the Rufiji Flood Plain - areas like Temeke and Mtoni in Dar es Salaam are in some respects the other side of the coin labelled "poor material culture in the Rufiji Flood Plain." Most of these house-owners do not stay for long periods in their house in town or village, but spend their time farming in the Delta, unless they are participating in village politics.

Finally, there is the group who cannot afford this double settlement. For them there is no choice but to remain in the Delta and consequently outside the political structure. These are the "stubborn" people. The youth in the ujamaa villages, are in much the same position also they cannot afford the double settlement required to farm profitably and at the same time participate in the struggle for influence in the village. Unless village industries or real communal agricultural enterprises can be started, such youth will continue to drift to Dar es Salaam to look for employment.

In conclusion we should note that the processes caused by the individual peasant's dilemma - increased capitalist tendences in the large ujamaa villages, and investment in real estate rather than in agriculture or homes - are unfortunate and contrary to the policy of ujamaa. The solution must be to solve the dilemma for the individual farmer, by bringing political recognition to the place where he is producing: in the Delta.

4.9 Collectivization

With the exception of two ujamaa villages on higher grounds (Nyambili and Tawi) all attempts at collective farming in Rufiji Flood Plains have been frustrated. The reasons are varied, the one most frequently mentioned by village and district cadres being "people are lazy and do not want to work together." This, however, does not suffice as an explanation of why ujamaa farming has failed. To understand this, one has to probe much deeper into the problem. We shall first see what lessons we can draw from attempts to collective production in other parts of Rufiji.

Historically, the concept of Ushirika (the co-operative movement) has negative associations for most peasants in Rufiji. They do not miss any opportunity to point out instances of mismanagement of funds, theft, and bureaucratic arrogance in the Coast Region Co-operative Union. As the collective farms in most instances are called the co-operative farm ("shamba la ushirika") farmers have come to associate them with the Co-operative Union. In most cases where the collective farms in Rufiji have given returns, these are accumulated into village funds, in fact often with the purpose of taking over co-operative shops currently owned by the Co-operative Union.

It is difficult to convince the peasant that "ushirika" is for his own good; and at the prevailing low level of political consciousness, the policy of ujamaa is commonly confused with the policy of shifting from the Flood Plain to a village on the higher ground. On the concept of "shamba la ujamaa" none of the farmers interviewed had any clear ideas of what it involved, except perhaps that it had something to do with the higher, infertile grounds.

This brings us to the second reason why attempts at collective farming have failed: insufficient ecological considerations were taken in planning the collective farms. Most of the ujamaa villages with which the Delta peasants compare themselves, had been allocated communal farms close to the houses on the higher grounds. Here villagers participated faithfully in communal cultivation of food crops in the first year after resettlement. However, due to the poor quality of the soil (mostly coarse sand) and the un reliability of rainfall, these efforts gave almost no returns. As a consequence the peasants became reluctant to farm on the drier river banks, whether individually (except for their cassava plots) or communally.

Searching for a suitable crop for the higher grounds, the district agricultural office has experienced good results in Central Rufiji with cashew-nuts. Most villages below Utete have tried to plant ujamaa shambas with cashew-nuts. If the trees are tended properly for the four years they take to grow,

they will give the village a steady flow of income. Cashew-nut trees do not require a large amount of work, and the harvest season competes with the labour requirements of the Flood Plain agricultural system only to a limited extent. Thus cashew would seem suitable as a complementary crop. However, from experiments conducted so far, it appears that no other crops grown on the higher river banks can completely substitute the major food and cash crops grown in the Flood Plain - rice, maize, cotton, and kunde.

In discussing the confusion of ujamaa and infertility it should be noted however, that in many cases where farmers were asked to choose a plot for their ujamaa farm, they chose the most infertile land because nobody wanted to give up their fertile individual plot. Thus the peasants themselves have in many instances contributed to the negative experience with ujamaa farming.

The third cause of frustration for ujamaa farming is the competition for labour between the private agricultural system and collective farming. In some cases ujamaa farming has been tried in the fertile valley e.g. Ikwiriri and Mkongo. Here several hundred acres were ploughed by tractor and sown with rice. However, when it came to the crucial operations of weeding, bird scaring, and harvesting, all the peasants were too busy in their private farms to attend communal work. It has been shown that especially the harvesting of rice/planting of cotton is the period where lack of labour limits the farmer's acreage (Yoshida 1972). Consequently, peasants were unable to attend the communal work, so the communal farms ended up overgrown with weeds and the rice was eaten by birds and pigs.

When the same crop is grown on the individual shamba and the communal shamba, competition for labour kills the collective initiative. On the other hand, when a different crop can be grown with complementary labour requirements (e.g. cashew-nuts) the ujamaa shamba can succeed as a complementary activity to individual farming. Well-tended cashew-trees can yield up to 3,500/- per hectare (as against a maximum of 2,800 shs/ha for rice)[1], while requiring little toil. Harvest time coincides with the digging of the rice fields; consequently, successful collective cashew-nut farms should be found where tractor services can be provided for the individual rice plots.

Thus, for the many ujamaa villages between Kilimani and the Delta, the combination of cashew-nut collective farms in the upland area and individual rice/maize/cotton farms in the Flood Plain seems a feasible solution. As block-farming with tractor expands, labour saved should be used for expanding the collective farms, and the increased communal earnings from these should be used for further mechanisation of Flood Plain agriculture (seed drill, combined harvesters, feeder roads, selective weed killers, pre-flood irrigation pumps, automatic

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1 If we base the profitability on the buying price for rice, one hectare is worth a maximum of 3,800.

bird scarers, etc.). Thus this part of Rufiji is already at the start of a good circle of development. If local political fractionalism can be eliminated through educating new local political cadres, the block farms might also be transformed into ujamaa farms by the people themselves.

The western part of Rufiji Flood Plain (Ruhingo) is in the most serious position: rainfall here is too unreliable to allow good rice or cashew-nut crops, the floods are often destructive, and valley farms have become infested with vermin from Selous Game Reserve after the people moved to the other side of the river. Here collectivization is not sufficient. Direct government intervention and small-scale public works are necessary to save people from starvation. (See Sandberg 1973.)

The position for the Delta is very different from the two other ecological zones of the Flood Plain. First, here are no dry river banks close enough to allow the conventional type of ujamaa settlement combined with farming the old farms. The Delta also shows a larger variety of crops and agricultural activities than other parts of the Flood Plains. Crops suited for collectivization at this stage are bananas, coconut, cotton (not following rice) sugar-cane and tobacco, while the acreage under rice/cotton/kunde cultivation can be expanded through block farming.

Most of the area within the Delta, Msomeni/Ngoaro/Usimbe/Mbwera/Miechuru/Jaja, is completely free of tsetse flies and ticks and is excellently suited for dairy cattle and/or water buffalo.[1] With the proper incentive (in the form of marketing channels for milk and meat) raising cattle/buffaloes can become the core of ujamaa activities in the Delta. Contrary to many administrators' beliefs about coastal people, the Delta people know how to handle cattle. What has hampered the development of the industry is partly the feudal structure of cattle ownership, and partly the heavy constraints on marketing of milk and meat in an area where roads are deteriorating and boat services have gone from machines to paddles. Other activities suitable for communal ownership are salt-works and fishing industries, provided technology is changed together with collectivization.

Given the present level of farm technology, it is not feasible to start collective farms with rice/cotton in the Delta. Because of the above-mentioned labour constraints in the rice/maize/cotton syndrome, no serious inequalities have developed as a result of rice cultivation. It therefore seems necessary to first collectivize those activities which do produce inequalities: ownership of bananas, coconuts, and cattle. A second reason for not attempting comaunal rice/cotton cultivation in the initial phase of socialization is that having communal rice/cotton fields alongside with private fields with the same labour requirements is bound to fail.

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1 Without doubt water buffalo are better suited in the flooded parts of the Delta. See Yoshida 1972.

In the outer Delta, the difficulty of land fragmentation and the complexity of dykes make collectivization of rice cultivation a slow process.

It thus seems necessary to transform individual ownership through block-farming into communal ownership. This can best be achieved through a gradual mechanization aimed mainly at eliminating labour bottlenecks. In this part of Rufiji, December rains are quite certain so that early planting can be achieved, provided ploughing is well organized. When the overlapping of the two agricultural systems is thus eased on the individual level of farming, combined harvesters and small threshing machines can be used to remove the labour bottleneck and enable the farmer to plant cotton at the correct time. This is, according to our findings, the only way to expand acreage under cultivation. After such expansion and the introduction of mechanized harvesting, the advantages of eliminating boundaries between their plots will be more evident for the peasants farming together in the same block.

From this point, where produce is shared according to the acreage held before pooling it together in the same block, there is still a long way to go to true socialism, where everybody (including women and unmarried youth) is paid according to work. However, this only underscores the point that political education must be strengthened along with any increase in individual productivity. Otherwise collectivization through imposed technology will be only a surface reflection of socialism.

5. POLICY RECOMMENDATIONS

Since the Rufiji Delta is one of the most neglected, yet potentially richest, areas in the Coast Region, we have found it advisable to present in condensed summary form, the solutions reached through the preceeding analysis. This will, we hope, enable district and regional planners to indicate key areas where limited government investment can have a maximum effect towards fulfilling the national policy objectives of ujamaa and self-reliance.

5.1 Resource assessment

As repeatedly stated above, each year the Rufiji River is replenishes the fertility of her flood plain and delta, thus making these areas the potentially richest agricultural areas in the Coast Region. In addition the Delta itself does not suffer as much from the erratic floods as do the other parts of the Flood Plain. From Nature's side, the farmer is faced with a relatively predictable environment, both rains and floods being reliable enough to produce a good crop in most years.

Not only is the Delta vast and relatively underpopulated, but also the cultivatable area is constantly expanding due to the continuous rising of the tidal mud-flats. After a new distributary breaks away from the main river course, new cultivable land is created. For instance, the people of Jaja are now able to farm large areas of rice where 10-15 years ago there were only brackish tital swamps (kipoko). The important and expanding role of this food bowl near Dar es Salaam should definitely be acknowledged and reflected in the District Development Plans.

The most important resource in the Rufiji Delta is the peasant himself. As explained above (Section 4.1 - 4.3), those who have spent their whole lives farming in the plains know their environment well and have adapted their farming to this as far as possible. Without such detailed knowledge and experience of micro-variations in the environment, composition of soils and flood-rhythm, farming in the Delta becomes almost impossible. Thus the continuity of Delta farming should be secured to guarantee the use of this resource for future generations.

The water of the Rufiji River does, however, have other alternative uses. At present there are technical feasibility studies conducted to assess the possibility of constructing a high dam at Stiegler's Gorge for generating electricity. It must be noted that the dam as planned would disturb the flood rhythm of the river and have a serious impact on the Rufiji Delta agricultural system. (See Sandberg 1974.) For the Delta, the elimination of floods would render the existing cultivable plains dry and infertile, stop the expansion of farmland and make the now-temporary salinity of large areas a permanent phenomenon. As much of the agricultural produce from the Delta is currently not marketed through official channels (see section 4.6), the value of the expected loss in production is difficult to assess. However,

from a resource perspective it is the loss of potential production which is the issue, rather than the loss of actual production. (The latter is infact most probably decreasing due to gross negligence of the Delta area.)

The solution advocated by the FAO team (1954-55) (FAO 1961) of irrigating the whole valley, including the dry river banks by the use of furrows from below the dam or from discharge basins on the river levees is infeasable on three accounts:

(1) It does not eliminate the problems of salination and erosion of the cultivable soil in the Delta.

(2) It does not solve the problem of decreasing fertility in the Flood Plain. Large amounts of fertilizers will have to be applied to maintain (if at all possible) present fertility.

(3) Because of relatively low population density, there would not be enough manpower to fully utilize an intricate furrow irrigation system.[1]

The solution we have advocated (Sandburg 1974) as the optimal strategy is, from January to June, to open the dam every fortnight and let out sufficient water to create an average flood. If this can be done according to the moon-phases, the flood should coincide with high tide, thus solving the problem of salination and delta-building. Valley farmers would also be able to improve their agriculture as a result of the higher predictability of floods. Although farmers would have to build small bunds to trap the water in fields when the flood is "turned off", they would still benefit by achieving greater control over their environment without disrupting their traditional farming system. In the technical plans, no such solution has been provided for, neither has the subsequent loss of potential energy been calculated. This needs to be done before any policy decisions can be taken on whether to build the dam or not.

5.2 Development policies for Rufiji Delta

Current policies on the development of the Delta are neither clear nor based on any serious ecological and agro-economic considerations. Since 1968, there has been a call for people of Msomeni, Ngoaro, Usimbe, etc. to join specific ujamaa villages outside the Delta (Chumbi, Mtunda etc.). In the 1973 "Operation Pwani" this call was repeated, while the people of Mbwera, Kiechuru, Pombwe, and Juja were urged to move together in villages in the Delta. They did not, however, heed this call. Unless the detailed plans for resettlement after the 1974 flood disaster are changed compared to the 1968 plans, it seems likely that the call to move away from their agricultural land.

To add to the urgency of the situation, in the last four years many farmers in this area have built houses in the growth

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1 The present population density of the irrigable area is calculated to 12.8 inhabitants/sq. km. See Yoshida 1972.

centres of Rufiji (Muhoro, Ikwiriri) and in Dar es Salaam. Not only does this reinforce the capitalist tendencies in the big ujamaa villages: it will also make collective farming in the Delta Section of the Flood Plains virtually impossible in the near future. This is because the people farming together will formally be members of different ujamaa villages or of no village at all (Dar es Salaam).

As to the expectation from 1968 - that peasants here should give up farming their ancestral land and open new fields close to the new ujamaa villages (Chumbi and Mtunda) - this has proved totally unrealistic. Delta peasants know that their land is the most fertile in the District, and their historical experience has been a continuous struggle to protect their land from being taken over by various companies or estates (see 3.2). This is the background to the seemingly paradoxical claim of the Msumeni and Ngoare peasants that they be paid "compesation" for their land if they are to go to ujamaa.

In view of the gravity of the situation - both in terms of continued agricultural production, and in terms of the credibility of the policy of ujamaa in this area - immediate steps should be taken to acknowledge the peoples' right to live and farm in the Delta.

Following the analysis in this report, we may now proceed to suggest ways of correcting the situation and realizing the full agricultural potential of the Rufiji Delta. Agricultural production is the backbone of the nation's economy; it is also one of the few areas where collective accumulation of capital is possible. Consequently, everything possible should be done to remove or minimize constraints on farming activity. Examples include: minimizing time wasted by the farmer on walking between home and field, minimizing time wasted on marketing crops and purchasing supplies, and by rationally organizing the process of production (ploughing, weeding, scaring vermin, harvesting, etc.).

As far as possible, an ujamaa village should be located in the middle of the fields. This makes every hour spent on agricultural work more effective. (Most workers are women who do not use bicycles.) More important still, it makes the ujamaa village a permanent place to live, as opposed to some of the villages located outside the farmed area.

In contrast to the River Valley, the Delta does not suffer from very serious flood damage. Sufficiently large "gongos" (elevated terraces) exist at various places in the Delta to allow villagization of the whole Delta without disrupting the precariously-balanced farming system. Several old villages exist: Mbwera, Kiechuru, and Jaja. We recommend that these be transformed into ujamaa villages, with coconuts and cattle as the core of ujamaa activities. This would mean a break with the present local religious/feudal structure, but would be a highly welcome move for most peasants in the area.[1] In the

1 Collectivization of cattle ownership will be very difficult to achieve unless carried out by the introduction of improved stock and/or water buffalo and grazing is extended to cover the whole area between Mbwera and Usimbe.

plans for "Operation Pwani" the people of the "Rufiji Islands" were urged to "join their friends in the fishing ujamaa villages and small salt factories." However, except for in Songe Songe, Paje, and Pombwe, most of the people in the Delta are agriculturalists, and the location of ujamaa villages should primarily follow the requirements of agricultural production. Later, when marketing channels for fish have been improved, collective fishing enterprises may be started. The Usimbe Mbuche island should mainly be used to help the people of Mbwera and Kiechuru. Here is ample land for expansion of cattle-rearing and cotton-farming as central collective activities. The island forms a natural farming entity with a considerable potential (5,000 hectares good farming land), which can be fully utilized only through mechanized collective farming.

We also recommend that an ujamaa village be established for the people of Msomeni, Kitonga, and Barabarani at Ruende, a gango between Msomeni and Mohoro (see map). This is sufficiently close to the agricultural fields (4-5 kms) for farming to continue without interruption. The area between Mohoro and Ruende is not flooded by river water and an all-weather road (ridge) can be built to serve the village. This would enable the 4,000 peasants here to utilize some of the 3,500 ha. of perhaps the best rice/cotton land in Rufiji. Msomeni is at the apex of the Delta. The distance to Muhoro (the ujamaa village it would be natural for the people here to move to) is 8 miles; this is twice the distance the farmer can tolerate for day-commuting. In addition comes a deep-seated political conflict between leaders in Muhoro and the people of Msomeni, which, if the latter were forced to join Muhoro, would destroy the good communal spirit now existing in Muhoro. A forced union would bring this conflict into the Muhoro Village Development Committee, at the same time as the peasants would spend most of their time in their dungus at Msomeni/Kitonga, farming their individual plots. If collective agricultural production is at all an issue, it can in this particular case only be achieved by allowing people to establish their ujamaa village at Ruende. As mentioned above, the people here have already started a communal cotton farm which can be expanded considerably. Bananas are also a potential cash crop suitable for communal farming in this part of the Delta.

In creating these new ujamaa villages in the Delta, only modest government investment is necessary, probably less than the Delta peasants already have paid in taxes and commissions. Primary schools already exist in the old villages Mbwera, Jaja, and Kiechuru, so a new lower primary school would have to be built only at Ruende. Roads will also have to be improved in the area; the old Muhoro-Mbwera dry season road have to be made passable by means of a pontoon bridge or a cement drift across the Kipeke River. Without any improvement in communications and marketing facilities, the full potential in agricultural production can never be realized. With the above-mentioned road in functioning order 7-9 months of the year, and with a regular boat service between Mohoro, Mbwera, Kiechuru, and Jaja in the flood season, these villages will have better links between each other and with the outside world (Kafia) than Utete and Chumbi have at present.

Summing up our recommendations for development of the Rufiji Delta: three ujamaa villages should be formed out of the old villages Kiechuru, Mbuera and Jaja with improved cattle stock and coconuts as communal activities. A new village should be formed at Ruende, with cotton and bananas under communal cultivation. The importance of rice throughout the area should be appreciated and the acreage under rice cultivation should be expanded by mechanization of ploughing and harvesting in the "bega kwa bega" block system of landholding. Tractor ploughing charges should be adjusted so as to favour large continuous blocks, e.g. varying from 70 shs./acre for individual plots down to 20 shs/acre for above 300 acre block-farms. The further transformation towards communal rice production should follow the rising level of political education among the villagers.

On the basis of our findings from other ujamaa villages in Rufiji, the socialization of Delta peasants should start with political recognition of their right to farm in the Delta, followed by election of balozi and village Development Committees for each of the four villages. These committees will have to work closely with the district planning officers to ensure that the detailed village plans are both realistic and correct with regard to the ecological conditions we have outlined in this report.

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