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Riverbank Cultivation in the Lower Omo Valley : The Intensive Farming System of the Kara, Southwestern Ethiopia

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| メタデータ | 言語: eng 出版者: 公開日: 2009-04-28 キーワード (Ja): キーワード (En): 作成者: 松田, 凡 メールアドレス: 所属: |
| URL | https://doi.org/10.15021/00002960 |

1 Riverbank Cultivation in the Lower Omo Valley: The Intensive Farming System of the Kara, Southwestern Ethiopia¹⁾

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INTRODUCTION

When we think about agriculture in the arid and semi-arid regions in Africa, what comes first to our mind is the highly productive agriculture equipped with large-scale irrigation, namely, hydraulic agriculture, typically seen along the middle and lower courses of the Nile River. The fact that large-scale irrigation was an impelling force to advance civilization leading to today's societies and nations has become widely known through K. Wittfogel's *Theory of Hydraulic Civilization* (Wittfogel 1959). As a result, riverine agriculture has always had an ideological aspect as a theoretical mainstay to explain the development of human societies.

Riverine agriculture is indeed highly productive, giving birth to the first states in human history. Is it, however, correct to evaluate the role and value of agriculture only by productivity, namely the yield per unit area? High productivity as a special feature of riverine agriculture seems to have been overemphasized. The formation of an attractive hypothesis, "hydraulic civilization," seems to have discouraged scholars from reflecting on such questions. At the same time, scholars have overlooked the existence of hydroagriculture²⁾, utilizing the unique environment near rivers, lakes, and marshes, seen everywhere even in the arid regions.

Indigenous, small-scale riverine agriculture and the societies engaged in such agriculture are not widely studied. Why this type of agriculture has not attracted scholarly attention has to do with the above-mentioned circumstance, and also that the studies on African agriculture have centered on shifting cultivation, regardless of region. More and more areas have become arid in recent years and more and more dams are being constructed in many regions, so that riverine societies engaged in hydroagriculture are rapidly disappearing, which further contributes to the underestimation of its potentiality.

In contrast to large-scale hydraulic agriculture, hydroagriculture tends to be considered unstable and vulnerable to environmental changes. However, agriculture indigenous to Africa is not a closed system existing independently by itself, but an ever-changing open system with deep interrelations to natural and

social environments. There are few societies solely relying on hydroagriculture based on small-scale natural irrigation, and hydroagriculture has played its role fully in combination with other farming systems, including shifting cultivation, and other subsistence activities, such as hunting, gathering, and fishing. The function of agriculture and farming in human societies is not always limited to the major means of food supply. The agriculture which played the leading role in the history of civilization was, rather, a special form born by chance. I feel it is important to try to grasp the significance of agriculture as just one among the many subsistence activities to sustain a livelihood the members of each society think desirable.

This paper will describe the riverbank cultivation of an agro-pastoral people, the Kara, living in the Lower Omo Valley in the southwestern parts of Ethiopia. I conducted fieldwork on their subsistence activities in the village of Dus on the Omo River for about three months from October 1986 through February 1987. Also I conducted research in the Koegu (Muguji) living along the Omo from 1988 to 1990. They also practise riverbank cultivation. Most of the information in this paper, however, was collected among the Kara in 1986-87. The Kara people mainly engage in grain cultivation and small animal husbandry, and, occasionally, hunting and fishing. Although they regard themselves as pastoralists, what actually supports their diet are farm products obtained through riverbank cultivation on the banks of the Omo. What does agriculture provide to people who live their everyday lives with a wish to be pastoralists? With such interests in mind, I tried to clarify the characteristics of this farming system. In doing so, I pursued the interpretation of the farming system in the context of the society in which it is conducted. I thought it would more or less dispel conventional views of history and agriculture which were deeply ingrained in myself.

The first section of this paper deals with the people of Kara and the natural and social environment in which they live. The riverbank cultivation system will be described and related to agriculture indigenous to Africa. Thus, we will see the universality and significance of hydroagriculture. In the second section, based on data obtained through fieldwork, the Kara's riverbank cultivation will be explained through the distribution of cultivated land, ownership, types of land, crops, labor system, and agricultural calendar. Finally, in the third section, I analyze the utilization of the environment and farming techniques, and make clear how the intensive agriculture plays its role in Kara economic life.

THE KARA IN THE LOWER OMO VALLEY

Nature and people

The rain that falls in the Ethiopian highlands, where average altitude is higher than 2,000 m, pours into Lake Turkana in northern Kenya via the Omo, an inland river of 1,000 km long (Figure 1). The Lower Omo Valley is a long and narrow one along the lower courses of the Omo river, extending about 200 km from north to

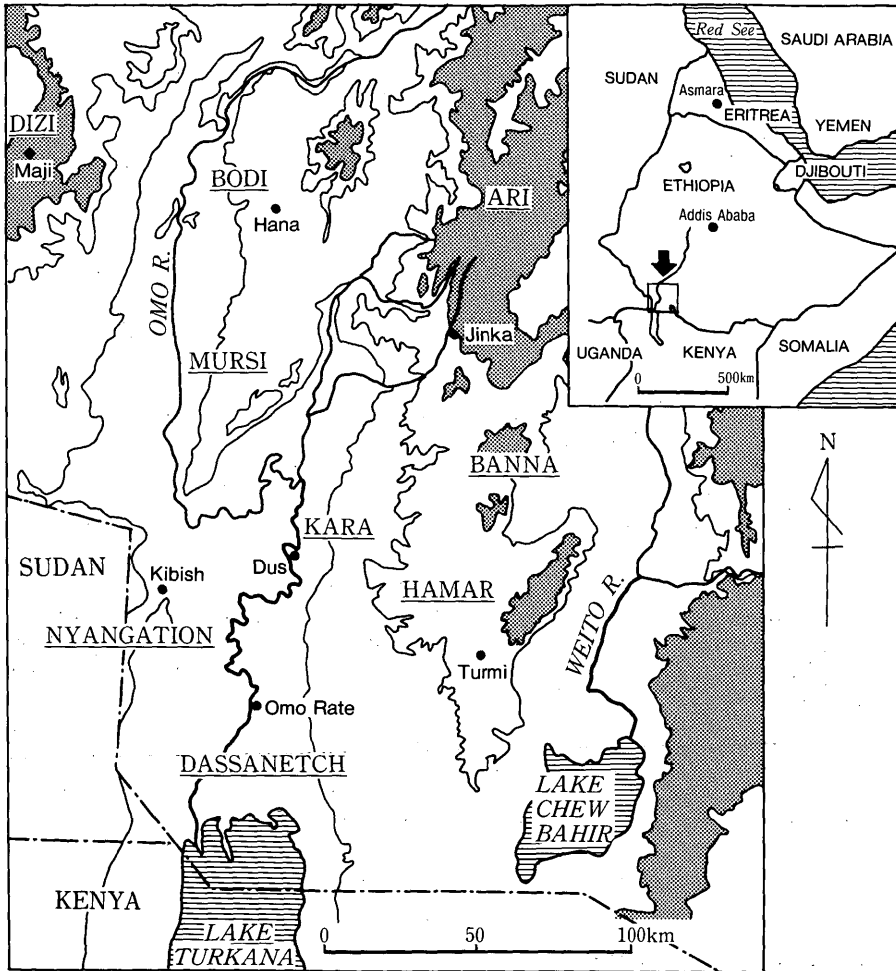


Figure 1. Ethiopia and the Lower Omo Valley

Notes: 1) Underlines indicate ethnic groups.

2) Shaded parts indicate areas above 1,500 meters sea level.

south and about 100 km from east to west, located just at the bottom of the Great Rift Valley. In consequence, the region along the Omo is a lowland at about 500 m above sea level, belonging to the savanna climate in the Tropical Zone (Figure 2). With the Omo running through the center of the valley as an axis, the vegetation changes from riverine forests, savanna, woodlands and mountain forests from east to west. Such a diversified natural environment has been reflected in the human lives of the more than ten ethnic groups crowded into this area, as shown in Figure 1.

The Kara people who live in this region form a group of people speaking an Omotic language³⁾ which belongs to the Afro-Asiatic superfamily (Table 1). The

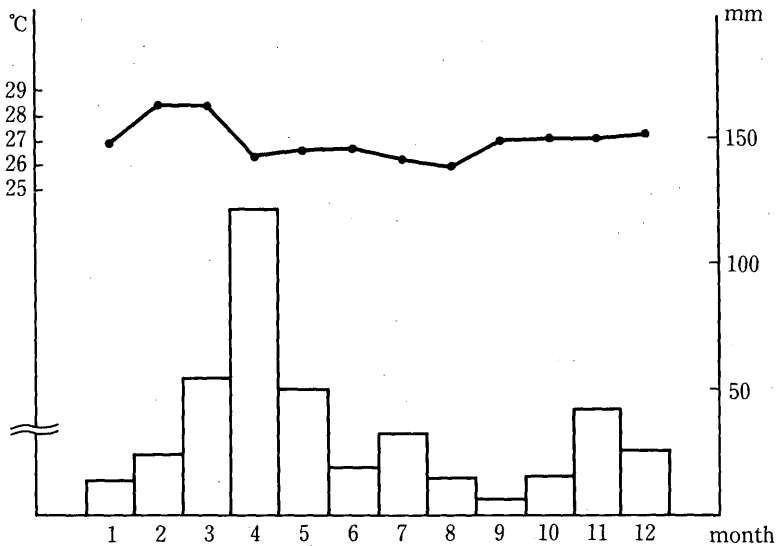


Figure 2. Temperature and precipitation in the Lower Omo Valley

- Notes: 1) Temperatures are the averages for the decade 1945–1954. Precipitation is the average for the 35 years 1933–1970 in Lokitaung (730 m, 4°15'N, 35°45'E), Kenya.
 2) The annual mean temperature is 27.0°C, and the annual precipitation is 409 mm.
 3) Sources are Stephenson and Mizuno (1978) and Butzer (1971).

Table 1. Classification of the Kara language

| Superfamily | Family | Subfamily |
|--------------|------------------|---|
| Afro-Asiatic | Chadic | |
| | Berber | |
| | Ancient Egyptian | |
| | <u>Semitic</u> | |
| | <u>Cushitic</u> | North Omotic (Dizi, Kefa, Gimira, etc.) |
| | <u>Omotic</u> | |

Notes: 1) Underlined groups are found in Ethiopia.

2) Adapted from Bender 1976.

Kara population is estimated at about 1,000. "Kara" is what they call themselves, and they are called "Karo" by local government officials and neighboring groups. But "Karo" includes a Surmic people, Koegu⁴⁾, and the village of Dus where I conducted fieldwork in 1986 was inhabited by these two ethnic groups. Between the Kara and the Koegu, however, there is a distinctive difference in subsistence activities, so that this paper distinguishes between these two groups. Accordingly,

I will use "Kara" rather than "Karo."

The first book that mentioned the Kara and their lives was a travelogue written by an Austrian explorer, L. Höhnel, at the end of the nineteenth century. In his book, Höhnel stated that "the Kerre (sic) devote themselves exclusively to the breeding of cattle, sheep and goats" (Höhnel 1894: 169). No one knows, however, whether this record is correct because he did not actually visit Kara land himself, and reported this as what he had heard. The Kara, at least today, do not breed cattle on their own, and a few people personally commission neighboring groups to raise a small number of cattle. On the other hand, an American, A. Donaldson-Smith, who traveled through the lower Omo valley in 1894 kept a record on villages of the Kara in the riverine forests and their sorghum fields. He described the Kara as a poor people who live by hunting and fishing (Wandorobbo)⁵ (Donaldson-Smith 1897: 303). U. Almagor and S. Tornay, both of whom conducted research in the lower Omo valley during the 1970s, wrote just that the Kara's subsistence activity was mainly agriculture with no further detail (Almagor 1978: 1; Tornay 1979: 99). I. Strecker and J. Lydall made anthropological and linguistic research on the Kara in the early 1970s (Lydall 1976: 393), but the results have not been published. Thus, there are many unknown points regarding the culture and society of the Kara.

Most parts of the valley are designated as wildlife sanctuaries, such as the Omo National Park and Mago National Park. At present no town regularly holds a large market, except several villages in which administrative district offices and police stations are located. Therefore, almost no one visits this region from outside, except a small number of tourists. Historically, this area has rejected the settlement of a larger group, the Amhara, even after the whole land came under the control of Imperial Ethiopia at the end of the nineteenth century. As a result, it has remained "one of the most inaccessible and least developed parts of East Africa" (Almagor 1978: 8)⁶. The closed natural and social environment makes it possible for various ethnic groups living in this region, including the Kara, to maintain self-sufficient economic systems. There has been no influx of foodstuffs from outside except that small amounts of emergency relief supplies became available in some places in the 1980s. In relation to the Kara's subsistence systems mentioned below, it should be noted that the Kara are still self-sufficient.

What is riverbank cultivation?

Riverbank cultivation in the Lower Omo Valley is a farming system utilizing the difference between water levels in the rainy and dry season to grow crops on the riverbank slopes. This is the most common way for the Kara, as well as many peoples living along the Omo, to grow sorghum, their staple food crop (Photo. 1).

There have been only fragmentary reports on riverbank cultivation in the lower Omo valley. One such report is an ethnography by Almagor who carried out fieldwork on the Dassanetch in the southern parts of the valley near the Kenyan border. The Dassanetch people are an ethnic group engaged in agriculture and

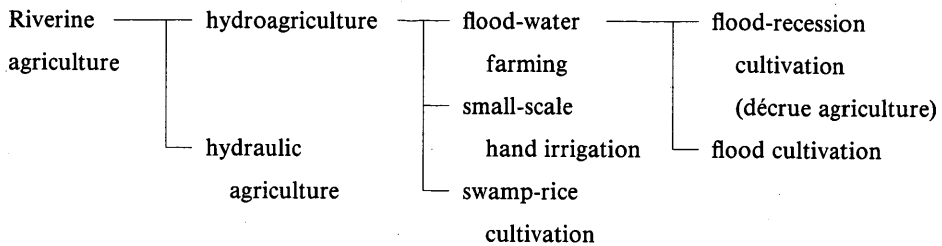


Photo. 1. Riverbank field at harvesttime in Dero, February 1987. Sorghum has already ripened.

pastoralism around the rivermouth delta where the Omo flows into Lake Turkana. He wrote that riverbank cultivation was very important as a subsistence activity while the Dassanetch found their identity in pastoralism, but gave few details on the agriculture. Tornay also investigated the Nyangatom downriver from where the Kara live, and touched upon riverbank cultivation as a part of their subsistence activity (Tornay 1981). Again, however, no details on agriculture were mentioned. The only paper written from the viewpoint of agronomy is a brief preparatory report by E. Goettsch (Goettsch 1984), which is, however, based on records and comments by Tornay and others without using primary data.

Not only in the Lower Omo Valley, but even in the whole African Continent, it is not common that riverbanks which seasonally submerge are utilized as arable land, as in the Kara riverbank cultivation. T. Scudder's ethnography suggests that the Gwembe Tonga, a Bantu agricultural people living along the middle courses of the Zambezi River in southern Africa used to cultivate riverbanks on a relatively large scale. The construction of the Kariba Dam in 1958, however, forced them to move so that they do not work on the riverbanks any more (Scudder 1980: 385).

Another cultivation form, similar to riverbank cultivation, found relatively often in the African Continent, is flood cultivation utilizing floodwater from a river, but I would like to distinguish between flood cultivation and riverbank cultivation. The Kara people use not the flood but the seasonal fluctuation of water levels, and their cultivated land is not topographically a flood plain, but a riverbank, namely the slope of a river bank. Major rivers of the African continent, typically the Zaire

Table 2. Classification of riverine cultivation

Based on Wittfogel (1956: 152–164), Harris (1976: 311–356), and Harlan and Pasquereau (1969: 70–74).

and the Nile, do not have canyons, so that when they flood, it directly leads to an overflow. These topographical features may have encouraged the cultivation of flood plains rather than riverbanks in this continent.

At the same time, a farming system that cultivates land after a flood (which may be called flood-recession agriculture), including riverbank cultivation, can be found widely in the arid and semi-arid regions of Africa. For example, J. Harlan and J. Pasquereau have reported on such a system in the Inland Niger Delta in Mali. Distinguishing between cultivation of rice, suited to the flooded wetlands, and cultivation of sorghum and pearl millet, which is done when the flood recedes (*décrue* in French), they called the latter “*décrue agriculture*” (Harlan and Pasquereau 1969: 70). Furthermore, D. Harris broke down “hydraulic systems” into three types in his classification of traditional farming systems of Western Africa⁷. These are “flood-water farming,” “small-scale hand irrigation,” and “swamp-rice cultivation” (Harris 1976: 327). Based on these studies, I have classified riverine agriculture in Table 2. The Kara riverbank cultivation may fall into the category of flood-recession agriculture where the riverbank surface is cultivated.

Other subsistence activities: pastoralism, hunting and gathering

Before describing riverbank cultivation, I would like to briefly refer to other subsistence activities of the Kara, that is pastoralism, hunting and gathering, because I think the distinctive features of cultivation as a subsistence activity may be better characterized in correlation with others.

The Kara describe their economy as “domestic animals in the right hand and sorghum in the left hand.” This expression may straightforwardly reflect the Kara perception of the full economic value of sorghum despite the importance of livestock in their ideological realm.

Pastoralism today mainly concerns small domestic animals such as goats and sheep (Photo. 2). Cattle are often put under the care of their bond-partners (*bel*) in the neighboring group, the Hamar. With regard to grazing, in the dry season, the

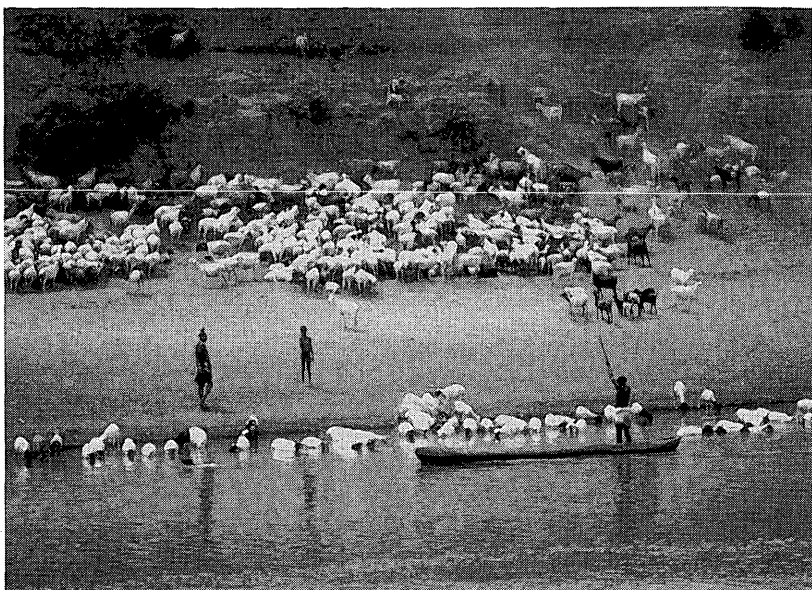


Photo. 2. Goats and sheep are taken to the Omo for watering a couple of times a week during dry season. A man on the canoe is watching out for crocodiles.

Kara make day trips of 10-20 km between the Omo, where animals drink water, and the pasture at the foot of a mountain (Figure 3). As there are many tsetse flies in riverine villages animals spend the night at a camp on the grazing land. Therefore, Kara villages are without an animal enclosure, which makes it hard to imagine that they engage in pastoralism. In the rainy season, the Kara seldom go to the riverside, and move animals around the pasture covered with grass. In the dry season, when farmers are busy, they often concentrate on farming, leaving their animals in charge of brothers or friends. During this season, a small number of adults, elderly men or boys of about ten years old are entrusted with animal husbandry and are often seen driving flocks of several hundred goats and sheep.

According to oral traditions, the Kara used to live in the mountains to the east of where they live now. One day a cow fled, and a Kara man followed the cowtrack to the riverside, around Dus where the present main village is situated. Also, when I asked the origin of a dominant clan, their answer was that they were from the territory of the Borana who are pastoralists, also located to the southeast. In light of Höhnel's remark that the Kara owned cattle, the Kara may have been cattle pastoralists at least during the 1880s.

This is also suggested by many personal names based on colors or patterns of oxen, and by a characteristic marriage preparation ritual⁸⁾ in which unmarried men jump over the backs of several head of cattle, just like the neighboring Omotic pastoralists do. The Kara can be called emotional pastoralists who have not lost mental ties with cattle even today when they no longer own them.

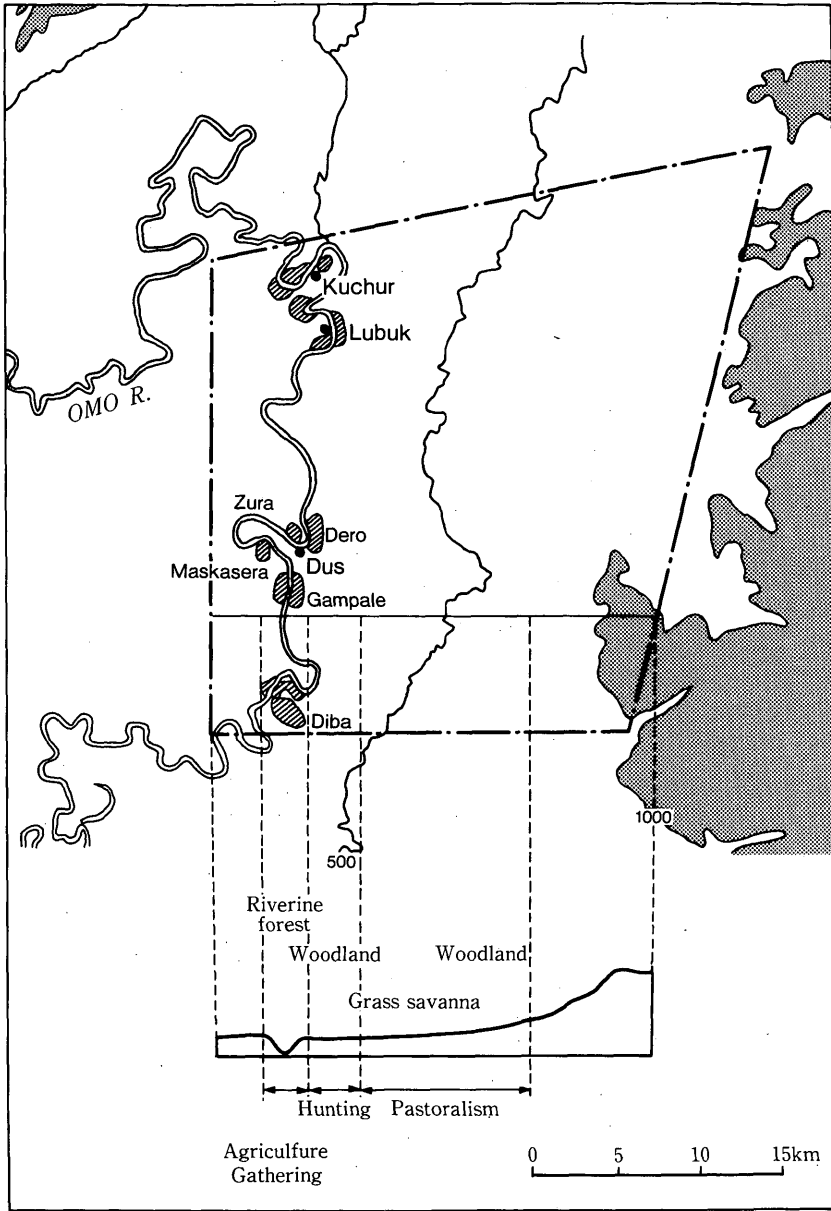


Figure 3. The Kara territory and activities

- Notes: 1)
 - - - - - : territorial boundary
 [Hatched box] : 1000 m above sea level
 [Hatched box] : cultivated land
- 2) The map shows the Kara territorial boundary in 1986. After 1990 the territory is limited in the eastern side of the Omo.

Regarding when and why the Kara abandoned cattle husbandry, I could not get a clear answer. Possibly, the reason was the aggravating disputes among ethnic groups rather than the rinderpest which attacked the whole of East Africa at the end of the nineteenth century. I have heard some Kara say, "Cattle always cause disputes. With cattle in our hands, the Kara cannot sleep in peace at night." Even though they may have given up cattle voluntarily, those words suggest that it was a hard choice for the Kara, a small and weak group of people in the Lower Omo Valley.

So, what does it mean to the Kara to breed small animals without cattle? There is no quantitative material on Kara food culture available, but as far as I have observed, milk does not seem to contribute greatly to their diet. If so, they may keep such small animals for bridewealth, ritual and barter. These can be regarded as a complimentary activity to support their identity as pastoralists. If they kept no animal, the Kara might not be regarded as pastoralists at all by neighboring groups. For the Kara, even small animals are indispensable as a cultural mainstay.

The Kara commonly use rifles to hunt, and no longer set traps (*nyatachit*) today. Major game are buffaloes, warthogs, middle-size antelopes such as hartebeest, oryx, and Grant's gazelle. They rarely go hunting so that game is not sufficient to support their diet, but may provide precious animal protein. Wild plants are eaten only when food is scarce. In this area where they produce almost all daily tools by themselves, wild plants are commonly used as raw material for material culture, including tools and houses. Further, the Kara are active in setting cylindrical beehives and collecting honey, which is, however, the forte of the Koegu rather than the Kara, so that honey is often given to them by bond-partners, *bel*, of the Koegu people as gifts. Honey is also bartered for coffee and iron tools, especially with the agricultural Ari people living in the mountains. Since the Kara do not have their own fishing method or tackle, only a handful of people keep fishing lines and hooks to go fishing. Adult men usually avoid eating fish, which is regarded as something for women and children. In recent years, however, young men have started to eat fish (Photo. 3).

Unlike cultivation and pastoralism, such subsistence activities as hunting, gathering of wild plants, gathering of honey, and fishing play no more than supplementary roles. However small in quantity the food procured by these subsistence activities may be, it contributes to the diversification of the Kara diet which is almost completely self-sustaining. This may have something to do with the limited kinds of crops cultivated by the Kara and the fact that farming labor is irregular, as will be described below.

RIVERBANK CULTIVATION OF THE KARA

Distribution and ownership of cultivated land

From Kuchur village in the north through the flood plains called Diba in the south,

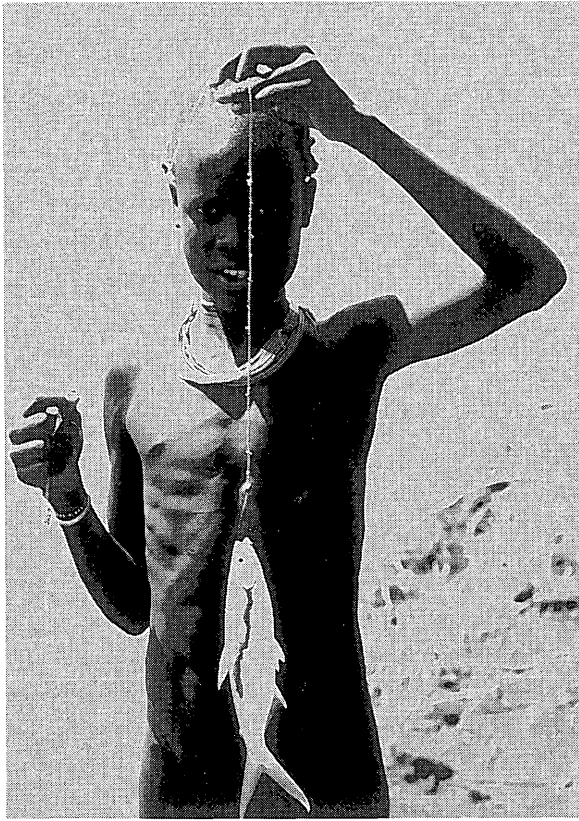


Photo. 3. A boy showing a pebbly fish, *kaara* (*Alestes dentex*). Fish is indispensable food for women, children, and elders living in the village, but adult men would not touch it.

the Kara villages (*moro*) are scattered along both sides of the Omo river (*lee* or *nunko*) for about 50 km (Figure 3). Most villages are on high ground located behind the riverine forests (*k'au*) as if to protect themselves against floods in the rainy season. Several families may live as a unit in the riverine forests away from the villages, and in many cases they are Koegu rather than Kara. The population density of the Kara is calculated at a little more than two persons per square kilometer. Since most Kara people live on the riverside, the population density along the river is much higher. Riverside fields and riverine forests are thought to have a considerably great capability to support population. Dus village had 189 households and about 800 people as of 1986. Later, the 1988-90 reinvestigation revealed that 30 households comprising about 150 people, were Koegu. Still, Dus is no doubt the largest Kara village.

Kara farms (*haami* or *aami*) are situated along the Omo without exception. There are fields clustered near large villages like Kuchur (populated mainly by the Koegu), Lubuk, and Dus, but even in the unpopulated areas among such villages,

Table 3. Locations and areas of the farms by household

| Household number | Locations and areas of the farms (m ²) | | | | | | Total estimated area (m ²) |
|------------------|--|-------|-----------|-------|---------|--------|--|
| | Zura | Dero | Maskasera | Diba | Gampale | Kuchur | |
| ① | 2,136 | 1,782 | — | — | — | *5 | 6,300 |
| ② | 2,720 | 3,375 | — | — | — | — | 6,095 |
| ③ | 2,760 | — | *2 | 3,900 | — | — | 8,100 |
| ④ | 2,100 | *1 | — | — | 2,093 | — | 6,600 |
| ⑤ | — | 1,998 | *3 | — | — | — | 3,400 |
| ⑥ | — | 2,275 | 1,445 | *4 | — | — | 7,600 |
| Average | 2,429 | 2,358 | 1,445 | 3,900 | 2,093 | 2,416 | 6,300 |

Note: Areas of the farms no.*1 to *5 are unknown. Total areas are calculated on the assumption that *1-*4 had an area equal to the average area of respective locations, and *5 had the average area of all farms.

cultivated fields are seen in the openings in the riverine forests. In the rainy season, the river overflows into the hinterland forming small and large swamps. When the floodwater recedes, it leaves another type of ideal land for cultivation.

Almost all nuclear families have their own house and constitute a household unit. Each household usually owns cultivated fields located at one to three different sites along the river. Fields are scattered so that some fields lie more than 20 km away from the village. Table 3 shows the location of sixteen fields owned by six households living in Dus (see also Figure 3). Nine fields out of the sixteen are in Dus, but three are in Maskasera and one is in Gampale, both of which are about 5 km away, two in Diba about 10 km south, and one in Kuchur more than 30 km north⁹⁾. This can be considered as a form of risk-hedge against the possibility of flooding caused by temporary or unseasonally heavy rain. Another reason for the dispersion may be as follows. The labor unit of the Kara is a household, and they do not have a large-scale cooperative labor organization. Therefore, it is not possible to procure a large labor force at a time. If cultivated fields are dispersed, the time for cultivation may shift slightly by site, which may suit the Kara labor unit.

I cannot say much about the features of their household economy, because the samples in Table 3 are definitely few in number. Thus, I will deliberately explain each case. The average area under cultivation per household was 0.6–0.8 ha (Table 3). Household No. 3 was an unmarried young man, so that land under cultivation was slightly smaller. The other households were married couples with two or three children. Since there is little disparity in wealth among households of the Kara, the figures on these, excluding No. 3, can be taken to be the average area of cultivated land owned by a household. These fields along the river are in principle owned by the men who are the household heads, but they are customarily called after the

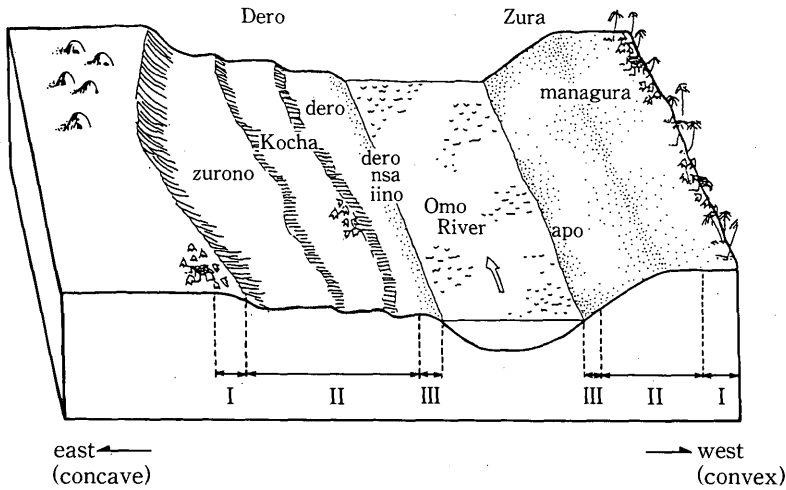


Figure 4. Classification of riverbank farms

Note: Farms are classified into the following three categories according to the crops:
 I. squash, gourd; II. sorghum, maize; III. cowpea, greengram.

names of wives, and it is the wives who bear responsibility for cultivation. There are some fields owned by young men who are about to get married, and by widows. After the death of an owner, fields are divided equally among his sons. There is still much uncultivated land along the river, and whoever clears the land for cultivation can acquire ownership of it. Few people, however, would get a new field because labor power is limited.

Types of arable land and crops

Details of riverbank topography are illustrated in Figure 4. It depicts typical riverbank fields near Dus in the dry season when the river is 50–70 m wide. In the rainy season the water level may rise more than 10 m (Figure 5), and on the west side, water may even flow into the inland riverine forests.

Riverbank fields are classified and named according to the height above the surface of the river, and to the side of the river. The inner side of the meandering river is generally called *dero* and terraced. It is classified into four types according to how close it is to the river. The terrace closest to the river is *deronsa iino* (*ii* means the abdomen of the human body), followed by *dero*, *kocha*, and *zurono* (meaning the back). *Zura* is the outer side of the river and divided into *apono* (or *apo* meaning mouth) and *managura* (meaning unknown).

The Kara discern the topographical and ecological characteristics of each terrace and plant the most suitable crops. They generally understand that the *deronsa iino* is vulnerable and easily submerged by an unseasonal overflow, and regard *dero* and *apono* as good fields; they are closer to the river and the soil is fertile. As *apono* is very steep to work on, *dero* is said to be the best as it is flat and

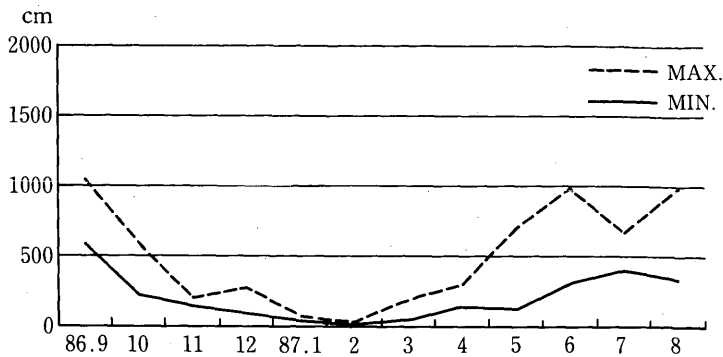


Figure 5. Fluctuation of the water level of the Omo at Dus (1986-87)
Source: Ministry of Water Resources (Addis Ababa).

| English name | Kara name | Scientific name | Variety (Kara name) |
|----------------|-----------------|----------------------------|--|
| sorghum | <i>isin</i> | <i>Sorghum bicolor</i> | <i>bataga, luwai, muruso, barumugwai, dekeni, nashidi, rogomo, elbori, michiria, akurkuri, shumagara, chauro</i> |
| maize | <i>komorsho</i> | <i>Zea mays</i> | — |
| cowpea | <i>waga</i> | <i>Vigna unguiculata</i> | — |
| greengram | <i>ketele</i> | <i>Phaseolus radiatus</i> | — |
| winter squash | <i>botolo</i> | <i>Cucurbita maxima</i> | — |
| calabash gourd | <i>koiso</i> | <i>Lagenaria siceraria</i> | — |
| tobacco | <i>dambo</i> | <i>Nicotiana tabacum</i> | — |

Table 4. Crops cultivated by the Kara

stable.

Table 4 shows the cultivated crops which are not many. Sorghum, their staple food, is planted in *dero*, *kocha*, *zurono*, *managura*, and relatively high parts of *apono*, all of which are unlikely to be submerged by a sudden rise in the water level. Sorghum is usually eaten as porridge (*daano*) after being ground into flour with a stone mill. They also eat boiled sorghum grains, called *tima* when they are fresh and *kankar* when dried. Fermented beer (*parsho*) is sometimes produced from sorghum. Maize (*kolmorsho*) is planted in the same field as sorghum, but the quantity is so small that it may not be stored. Two members of the pulse family, cowpeas (*waga*) and greengrams (*ketele*) are considered to require more water than sorghum so that they are planted only in *deronsa iino* and *apono* closest to the river. Again, only a small amount is cultivated. The leaves are used for food as well and mixed into porridge. Tobacco (*dambo*) is planted among sorghum in the corner of *kocha*. Squash (*botolo*) and gourd (*koiso*) are often grown around the hut for

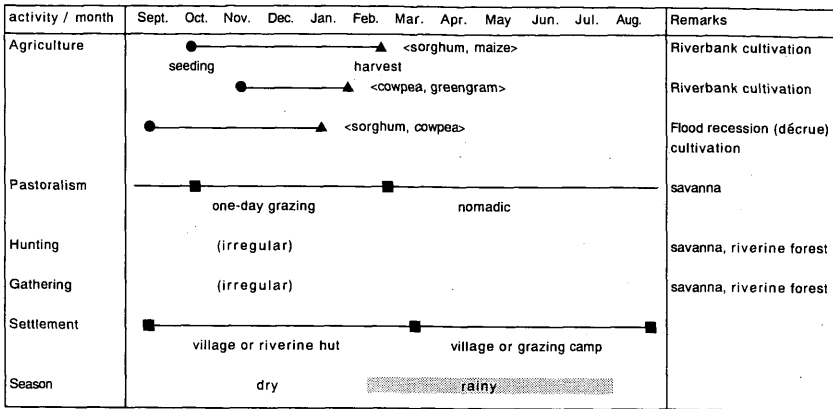


Figure 6. Subsistence calendar of the Kara

watching the field (*shoko oono*, meaning a house made of grass) on the riverbank.

Agricultural labor and calendar

Here, I describe the annual schedule of agricultural labor in response to the fluctuating water levels of the Omo (Figure 6). The Ethiopian highlands within the Omo River’s catchment areas have two distinctive rainy seasons between February and September, and the annual rainfall is 1200–2000 mm (Ethiopian Mapping Authority 1988: 12). In October, when the water level begins to fall in its lower courses one to two months after the end of the rainy season, arable land emerges on the riverbank slopes (Figure 5). The Kara mark the borders with neighboring fields with ties made of bifurcated branches of the trees growing on the shore. These trees are called *bariyo maalo*, and the borders are believed to be demarcated by a god (*bariyo*). To get rid of weeds grown tall in a short time is regarded as a men’s job, and they use big machetes called *nyapanga* (Figure 7–1). They dry the weeds at the site, and sometimes set fire to them later. The above series of work is called *pakidi*.

When the fields are prepared, sorghum is sown by women without plowing (*ia*). Using sticks about 120 cm-long (*wottsä*, Figure 7–2), two to four holes 20 cm deep are dug per square meter. They say seeds (*api*) germinate easily when they have soaked in water for one day before sowing. This may be due to the seed’s tolerance to the dry weather. They sow twenty to fifty grains of sorghum mixed with one or two grains of maize in a hole. After sprouting, seedlings that grow slowly are thinned out (Photo. 4).

Around December when sorghum grows as tall as a person, they start weeding (*harmo*). Using hand-hoes called *gaita* (Figure 7–3), they pull weeds out by the roots. From this period, they start group work (*parsho aila*) for which beer (*parsho*) is reward. Such a group is small, consisting of only a few people.

In January when sorghum ears rise, scaring away birds and baboons become a

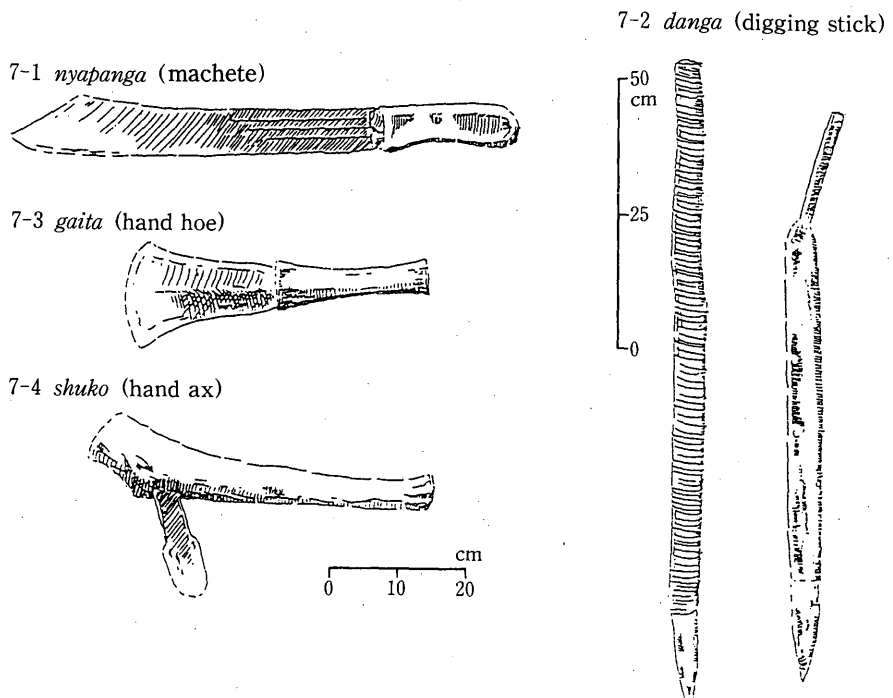


Figure 7. Kara farm tools

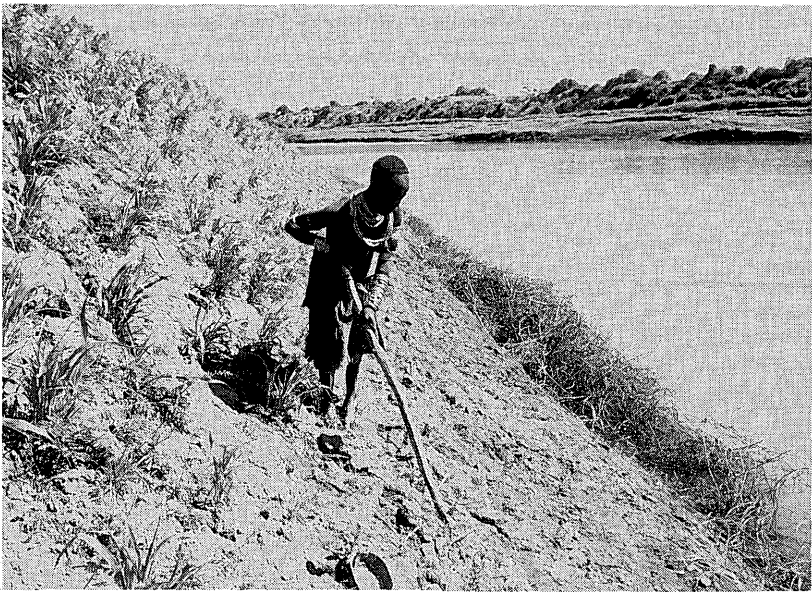


Photo. 4. A women digging holes for cowpea seeds with a digging stick, *wottsä*. Sorghum has sprouted and is about 50 cm tall. The photo was taken at Zura in November 1986.

major task until harvesting. When the sun rises, children climb up a lookout (*ansa*) made of wood at the center of the fields. Men shout and throw mud in clumps toward the fields by using stone-throwing tools (*roshe*) with ropes from the fibers of agave (*putsa*) leaves. Women also call out from both sides of the river. During this period, all the members of a family cooperate and work very hard. People leave their villages, and spend the night in the huts so they can watch the fields all day long.

They call young sorghum just before harvest *tisha*, and are fond of eating it even before its ears ripen¹⁰. Nobody can touch the crops of a field until a ritual (*kaido*) is completed in which an owner of the field tastes the first yield. For example, I have observed the mother of field owner feeding him young sorghum ears (*koldi*) still rolled in the husk and just picked from his field. The mother herself then ate some ears. Finally, the owner ate some young stems of sorghum (*worsha*), with which the ritual concluded.

From the beginning to the middle of February, harvest is carried out. Using *nyapanga*, men cut sorghum grown more than 3 m high, leaving and drying it in the field for a few days. Then, women collect only the ears and make a heap in front of the hut to dry them again. A few days later, they spread the dry ears in a circle with a diameter of 3 m on the ground, and pound them with a threshing stick (*daa*), and then winnow them.

Threshed sorghum is put into bags (*sorbi*) made of sewn hides of goats, bushbuck, or dik-dik and carried to each household's granery (*kona*) in the village. When the field is far away from the village, sorghum is transported by a dug-out canoe.

POSITIVE EVALUATION OF RIVERBANK CULTIVATION

Utilization of the environment and technology of cultivation

Agriculture is one of the main economic activities of human beings and performed in order to obtain food necessary for human existence by utilizing the natural environment. Since there is only a small amount of precipitation in the Lower Omo Valley, the Kara cannot rely on rainwater in securing water for agriculture. Securing sufficient water is the most serious problem for savanna agriculture. Therefore, under conventional ideas about savanna agriculture, Kara agriculture may be considered unstable and unproductive. But is this true?

Studies on the *décrué* agriculture by Harlan and his colleagues are very relevant in answering this question (Harlan *et al.* 1976: 15). They found that peasants in the Inland Niger Delta devised their own technology, such as selection of suitable cultivated crops and varieties, adjustment of sowing period, and transplantation, in order to adapt to fluctuating water levels. They chose the varieties of crops most suitable for the growth periods, nutrition, preservation, adaptability to soil, resistance to birds, or tolerance to sudden flooding before harvest. Harlan and his

colleagues argued that agricultural technology developed on the riversides in savanna might have been propagated along the Sahel and that at the same time as that technology, savanna crops might have been brought to the woodlands in the south. Harris pointed out that a floodwater farming system was an important and widely used technology (1976: 327). Touching upon *décrue* agriculture in Mali, P. Richards stated that the effective utilization of marshy environments and mixed cultivation technology demonstrated the advancement and creativity of peasants in Western Africa (Richards 1985: 72).

Such positive evaluations of hydroagriculture indigenous to Africa can be applied to the Kara riverbank cultivation. As discussed already, the Kara begin cultivation in riverbank fields from October to November. That is, cultivation is not started until the water level of the Omo recedes sufficiently after the rainy season in the Ethiopian highlands and the dry season begins in the Lower Omo Valley. They finish harvesting in February before the rainy season sets in again and the water level rises. Thus, Kara riverbank cultivation is basically a farming system for the dry season. Most of the farming systems implemented in the arid and semi-arid area depend on a small and unstable amount of rainwater in the rainy season; cultivation in the dry season is simply impossible, while the Kara riverbank cultivation makes the best use of the dry season.

This way of cultivation may have another advantage in relation to pastoralism. The Kara are ideological pastoralists who believe that pastoralism is their natural subsistence. In actuality, their diet overwhelmingly relies on agricultural products, whereas pastoralism is a central element forming their identity. What supports their ideology may be the fact that in the rainy season, when they do not work on farming, they can concentrate on pastoralism with a grazing camp as the base. A great advantage of riverbank cultivation is that farming, which requires settlement and heavy labor, can be performed intensively in the dry season, while setting people free in the rainy season to be engaged in pastoralism far away from villages.

Now let us examine in more detail ecological features of the riverbank cultivation. Among the essential elements for germination, namely moisture, oxygen, and temperature, the riverbank has plenty of moisture, which tends to be a problem for dryland agriculture. The Kara classify the riverbank fields, and consider the fields closer to the river the better, because the soil retains enough water to grow sorghum. Generally speaking, when the river floods, larger-grained soil tends to sink earlier. Accordingly, the closer the field is to the river, the larger the grains of soil, and the farther from the river, the finer the grains of soil. The surface of the riverbank has a layer of medium-grained soil of optimally mixed clay and sand, that is, the soil is good for both retaining and draining water, and is suitable for farming.

The Omo periodically rises to carry fertile soil full of organic matter from the upper courses to the riverbanks. As a result, this farming system does not require periods during which land should lie fallow to recover fertility as in shifting cultivation, thus making it possible to repeat cultivation of the same crop on the

same land.

Moreover, floodwater from the river in the rainy season washes away the topsoil of the riverbank, effectively preventing the accumulation of salts which is otherwise unavoidable in the artificially irrigated fields of the dry regions. I have no data regarding the ratio of evaporation to precipitation in the Lower Omo Valley. Judging from climatic conditions, however, water contained in the ground rises rapidly by capillary action so that topsoil would be expected to be quickly salinated on farms with artificial irrigation systems.

As stated above, riverbank cultivation contains a mechanism to maintain its sustainability without destroying the ecosystem, and enables cultivation to be repeated at the same place. Thus riverbank cultivation is advantageous to the Kara, who must permanently settle within a limited territory.

Seen in the light of the above argument, absence of plowing, one of the seemingly underdeveloped features, turns out to be advantageous. As often seen in farming systems in the arid area, the Kara do not plow the land before sowing. After cutting or uprooting weeds on the riverbanks, they dig holes in the ground with a stick and sow seeds. They explain that it is because the topsoil is soft enough without plowing. Sandy topsoil containing silt is certainly soft at the beginning of the dry season (October). Furthermore, it obviously helps to prevent water in the soil from evaporating if they do not plow the land. In terms of farming tools, as shown in Figure 6, there is no other tool than a digging stick and a hoe. Moreover, from a linguistic point of view, *paka*, the Kara word for cultivate, originally meant "to open the field," and implies neither "to break up the soil" nor "to destroy weeds."

Dense planting is another cultivation technology to be noted. The Kara plant sorghum in relatively small plots. They dig two to four holes per square meter, and sow twenty to fifty grains of sorghum in a hole. Although they sometimes cull seedlings, the crop is grown much more densely compared with other dry farming systems or shifting cultivation in savanna. For instance, the Iraqw, the agro-pastoral people who practice shifting cultivation in Tanzania, dig seed holes spaced 129–170 cm apart, and sow six to eight seeds in a hole in the fields where they grow sorghum mixed with maize (Fukui 1969: 52–53). Because the Kara spacing is so dense, when sorghum has grown as tall as a person, one can hardly walk in the fields. Even in the dry season, especially during the night, there is often light rain permeating the soil. This technique of dense planting is very effective for protecting moisture against direct sunlight during the day.

Moreover, dense planting contributes to a richer harvest in the limited area of fields. By sampling the riverbank fields with a 2 m wide quadrat, it is estimated that crop yield is about 3000 kg per hectare. This value is almost the same as the average yield in the United States during 1978–80 (Norman *et al.* 1984: 122). Compared with the US, the Kara riverbank cultivation may have exceptionally high yield per unit area despite being entirely dependent on natural conditions. Also, the Kara harvest is three times richer in comparison with the average yield of

Ethiopia during the same period of about 920 kg per hectare (Norman *et al.* 1984: 122). This result is brought about by the technique of dense planting rather than the variety of sorghum. This technique, however, requires more seeds, so that it does not ensure high productivity.

As shown in Figure 4, the Kara name and classify the fields by the distance from the water's edge. According to their criteria, good fields should be flat, not erode in a sudden heavy rain, and retain lots of moisture. Riverbank fields are divided by boundaries which are defined at right angles to the river so that each household is assigned a set of fields belonging to several categories. This enables each household to make effective use of small farms. They cultivate rather limited kinds of crops, namely seven, so that it is important for each family to grow all these crops in the small farms without fail. Therefore, they are careful to plant crops suited to the ecological conditions of each field.

Despite its advantages and efficiency, this farming system is characterized by many uncertain elements caused by its dependence on fluctuating water levels. Precipitation in the Ethiopian highlands, the catchment area of the river, has great impact on the location and extent of arable land during the season. There is no guarantee that the Kara can farm the fields of the same area and location every year. Some households may not be able to till all of their fields. It is also true that new arable land appears in the newly flooded places along the river. It is not certain how land distribution is decided. A sudden torrential downpour or a flood during the farming season may sink or sweep away some farms. Moreover, there is always damage from birds and insects. These may be critical to savanna agriculture utilizing natural irrigation.

How the Kara compensate for the loss if they fail in cultivation is a very interesting subject, but the period of my field work was too short to make full observations. I may conclude, however, that the Kara make up for a bad harvest of sorghum, their staple diet, by mutual aid among relatives, bond-partnership with neighboring groups, or other diversified subsistence activities. As long as these measures supplement a poor harvest, farming instability does not critically destroy their economic lives. This may be related to the perceived importance of pastoralism for the Kara.

Intensive agriculture

Riverbank cultivation utilizes the natural conditions of the riverine environment and has developed with farming techniques suited for the dry places. These features of this farming system are most rational since the Kara have to farm in the Lower Omo Valley, where every resource is scattered and limited by many conditions. I have identified a characteristic in this farming system that is most significant, namely, intensiveness.

In order to illustrate intensiveness in this farming system, I have compared it with that of shifting cultivation, representing the conventional agricultural systems commonly found in Africa. Shifting cultivation goes through the following

process: 1. selecting, 2. cutting, 3. burning, 4. harvesting, 5. fallowing (Conklin 1961: 29). From among these, only steps 2 and 4 are in common with the riverbank cultivation. But cutting the undergrowth on the riverbank is much easier than clearing bush so that, in essence, only step 4, harvesting, is common to the two systems of agriculture. In the riverbank cultivation steps 1, 2, and 3 are absent, and the significance lies in the lack of fallow. Shifting cultivation requires potential farmland several to several dozen times larger than the land cultivated at any given time. In comparison, riverbank cultivation is intensive in terms of both time and space.

Intensive agriculture generally means that a great deal of labor or capital is invested in a certain area of land, as in "labor-intensive" and "capital-intensive." Although there is no absolute criterion on the degree of intensiveness, generally speaking, agriculture becomes more intensive when a larger population needs to be supported by a smaller area of land. Indigenous agriculture in Africa is often considered less intensive and called extensive agriculture. In modern agricultural administration, agriculture is made more and more intensive with the aim of achieving better yields or improved production efficiency. We should separate the intensiveness into two categories. One is the intensiveness in African indigenous agricultural systems and the other is the intensiveness in modern agricultural systems. The largest difference is the aim for which agriculture has become intensive.

In view of the indigenous, let us now consider the riverbank cultivation of the Kara. The point is that the intensiveness of Kara agriculture is a characteristic acquired not through an effort to achieve better harvests but the result of efforts to make use of the diversified natural environment such as dry savanna, riverine forest, and river. It seems to me that by concentrating cultivation upon the riverside in the dry season, the Kara have tried to live as pastoralists in the rainy season as far as circumstances permitted. As a result, their farming system has become intensive. We may, therefore, conclude that their agriculture has inevitably become intensive as a consequence of adapting to the diversified environment, which should be distinguished from other forms of modern intensive agriculture that have been aimed at increasing productivity.

RIVERBANK CULTIVATION IN A WIDER PERSPECTIVE

Finally, I would like to conclude this paper with an analysis of the intensiveness of Kara riverbank cultivation from a broader point of view. The actual number of people who live on riversides or lakesides in the arid or semi-arid regions, and farm in the flood plains and riverbanks may be larger than we presume. In Table 5, I have classified some riverine societies in Africa by region. Here I have excluded societies furnished with large-scale irrigation systems such as the Nubian people in the middle courses of the Nile, to include only societies with small-scale agriculture using natural irrigation. For a clearer understanding of natural irrigation

agriculture, let me compare the various societies shown in Table 5.

First, in the Lower Omo Valley, six ethnic groups, including the Kara, engage in riverbank cultivation in the dry season. Five groups, excluding the Koegu, regard themselves as pastoralists. They use limited types of crops, farming systems, and cultivation techniques, and strive to diversify their economic lives by combining agriculture with pastoralism, fishing, hunting, and gathering, rather than diversifying within agriculture.

In the flood plains of the Inland Niger Delta, agricultural peoples, including the Songhai, grow rice and millet utilizing the water levels before and after the flood. Historically, in the region, advanced cultivation technology such as crop diversification and transplantation have supported large populations. The specialization of work has progressed among these peoples, and their products are sold and bartered at the markets.

The Sudd area in the upper courses of the Nile is inhabited mostly by people of the Nilotic family including the Dinka and Nuer, who have many points in common with the Lower Omo Valley regarding way of life. Floodwaters from the Nile, however, extend widely and force inhabitants to move their camps frequently. Thus they have developed a mixed economy comprising agriculture, pastoralism, and fishery.

The Tonga living in the middle courses of the Zambezi had been engaged in riverbank cultivation similar to the Kara's until the Kariba Dam was constructed in 1958. Every year they cultivated farms on the riverbank submerged in the rainy season, along with fields on river terraces that were flooded once in a few years, and shifting fields where they grew crops suited for each farming system. The Lozi, living up river from them, built a kingdom while moving between fertile riverine land and high ground. This is another good example indicating the potential affluence brought about by riverine agriculture.

A common feature of these cases is that supplementary subsistence activities compensate for the small scale of natural irrigation agriculture. Natural conditions set limits to both cultivation periods and areas for cultivation. There are many unstable elements, such as the time the river floods and the volume of water, so that it is difficult to carry out cultivation to schedule. Natural irrigation agriculture alone cannot provide enough food throughout the year. But along with agriculture, people in the lower Omo valley and the dry parts of the Sudd located in the upper courses of the Nile conduct pastoralism and fishing. In the relatively wet regions along the Zambezi, people have adopted rainwater cultivation, represented by shifting cultivation. Combining more than one agricultural system increases the kinds of crops to make up for riverbank cultivation, which tends to involve a smaller variety of crops. In the Inland Niger Delta, food supply is supplemented not within one ethnic group with more than one subsistence activity, but through the specialization of work among several peoples and exchange through well developed markets. In this regard, numerous technological inventions can be considered the result of efforts by agricultural peoples in this region to overcome

Table 5. Agricultural systems in the riverine societies

| Region | Ethnic group (population) | Subsistence economy | Cultivated land | Major crop | Farming period | Features of the economy in the regions |
|---------------------------------|--|---------------------|---------------------------|------------------------------------|----------------|--|
| Lower Omo Valley | Kara (1,000) | A/P | Riverbank/ Flood plain | Sorghum/ Maize | Sept.-Mar. | Mixed economy/ Barter |
| | Nyangatom (5,000) ¹ | A/P | Riverbank/ Flood plain | Sorghum | | |
| | Dassanetch (15,000) ² | A/P | Riverbank/ Flood plain | Sorghum | | |
| | Mursi (5,000) ³ | A/P | Riverbank/ Savanna | Sorghum | | |
| | Bodi (2,500) ⁴ | A/P | Riverbank/ Savanna | Sorghum | | |
| Inland Niger Delta ⁵ | Songhai/ Marka/ etc. (70,000) | A | Flood plain | Sorghum/ Pearl millet /Rice | Jun.-Oct. | Specialization among groups/ Exchange at large markets/ Cultivation techniques including diversification of cultivated species and transplantation |
| | Bozo/ Somono (80,000) | F | | | | |
| | Fulbe (300,000) | P | | | | |
| Sudd of the upper Nile | Dinka (900,000) ⁶ / Nuer (260,000) ⁷ | A/P/F A/P/F | Savanna (unflooded mound) | Sorghum | May-Dec. | Mixed economy/ Migration between camps |
| | Tonga (57,000) ⁸ | A | Riverbank/ Flood plain | Sorghum/ Maize/ Pearl millet | Apr.-Nov. | Double-cropping in the dry and rainy seasons/ Distinctive classification of farms |
| Upper Zambezi | Lozi (67,000) ⁹ | A/ P/ F | Riverbank/ Flood plain | Sorghum/ Maize/ Cassava | Jul.-Feb. | Double-cropping in the dry and rainy season/ Migration between camps |
| Lake Chad Basin | Kotoko (50,000) ¹⁰ | A | Flood plain | Sorghum/ Maize | — | — |
| | Massa (150,000) ¹¹ | A/ F | Flood plain | — | May-Aug. | — |
| Middle and Upper Senegal | Khassonke (97,000) ¹² | A | Flood plain | Sorghum/ Pearl millet /Rice/ Maize | — | — |

References are as follows. 1. Tornay 1981a; 2. Almagor 1978; 3. Turton 1978; 4. Fukui 1979; 5. Scudder 1980; 6. Lienhardt 1958, 1961; 7. Evans-Pritchard 1940; 8. Scudder 1962; 9. Turner 1952; 10. Lebeuf 1969; 11. Dumas-Champion 1983; 12. Montell 1915.

Abbreviations are as follows. A: agriculture, P: pastoralism, F: fishing

various natural factors.

The intensiveness found in Kara riverbank cultivation may be a feature common to natural irrigation agriculture in riverine societies. Scudder thought that small-scale natural irrigation agriculture as mentioned above cost them little, did no damage to the ecosystem, and produced enough to support a large population (Scudder 1980: 390). I would like to point out not only the advantage of this system of agriculture but another character, namely dependence, as a negative aspect of intensiveness. That is, small-scale natural irrigation agriculture cannot overcome changes in the environment and restrictions of time and space.

Hydroagriculture indigenous to Africa has been predominantly seen as "underdeveloped agriculture" of low productivity. This is due to the lack of a better standard by which this kind of farming system is to be evaluated. Accepted standards concern whether the agricultural system can support people as an independent means of food production and whether it is the driving force to impel the development of the society; in other words, how much farm surplus it can produce. This kind of preconception, I suppose, is largely influenced by modern science. At the expense of hydroagriculture, only "hydraulic agriculture" has been in the limelight as a good model. We definitely need to seek a better understanding of agricultural systems neglected by productivity-oriented researches. This paper is a first small step I have taken toward answering this question.

ACKNOWLEDGEMENTS

My fieldwork, from August 1986 to February 1987 and then from August 1988 to February 1989, was financed by the Grant-in-Aid for Scientific Research of the Japanese Ministry of Education, Science, Sports and Culture. It was part of the projects, "Comparative Studies on Agro-Pastoral Societies in Semi-Arid Africa" and "Comparative Studies on the Systems of Subsistence Economy in North-East Africa: Folk Models and Their Applicability." I wish to acknowledge my gratitude to Professor Katsuyoshi Fukui, the leader of the research projects, and other members.

I cannot thank all the people in Ethiopia who gave me help and hospitality, but should like to mention: Dr Taddese Beyene, then director of the Institute of Ethiopian Studies (IES), Addis ababa University; Dr Girma Kidane, curator of the IES museum; Drs Tasfa Mekonnen and Tasfae Hailu, co-researchers in Ministry of Culture; Mr Gert Fallsten, director of the Swedish Philadelphia Church Mission. Among the Kara who gave me help and friendship I am especially grateful to Garafu Lale and people in Dus. I should like also to mention my assistant Elengor Lasubuk.

In Japan Professors K. Sakamoto, J. Tanaka, O. Sota, K. Fukui, and Dr T. Suehara have read all or part of this manuscript and have given much valued help and criticism. I wish also to thank my former colleagues of the Department of Agricultural and Forestry Economics, Kyoto University, for many stimulating discussions in seminars.

NOTES

- 1) This paper is a revised version of "Riverbank Cultivation in the Lower Omo Valley: The

Intensive Farming System of the Karo, Southwestern Ethiopia," which was published in *Africa Kenkyu* (No. 32, 1988) (in Japanese).

- 2) Wittfogel argued that hydraulic agriculture should be distinguished from rainfall farming and small-scale hydroagriculture (Wittfogel 1956: 153). He referred to riverine agriculture in "a situation in which the dimension of the available water supply leads to the creation of large productive and protective water works that are managed by the government," as "hydraulic agriculture." In contrast, he regarded "a situation in which the members of a farming community resort to irrigation but, because of the scarcity and fragmentation of the available moisture, to irrigation on a small scale only" as "hydroagriculture." He did not seem to include agriculture that is equipped with nature-dependent irrigation like the Kara riverbank cultivation in the category of "hydroagriculture." Certainly Kara riverbank cultivation lacks a labor process for constructing irrigation facilities and a social process for the maintenance and management of the facilities. I see, however, as labor and social processes such activities as cutting weeds on the riverbanks and utilizing divided land. Consequently, I call "hydroagriculture" these types of agriculture based on small-scale natural irrigation.
- 3) Omotic speaking peoples today live only in western and southern parts of Ethiopia. This group used to be classified under Cushitic, but during the 1970s H. Fleming proposed that it should be classified as an independent linguistic group (Fleming 1976: 299). As far as the lower Omo valley is concerned, the Kara language belongs to the South Omotic language cluster, together with Hamar, Banna, and Bashada, though J. Lydall thought Kara to be a dialect of the Hamar-Banna-Bashada language and included these in another cluster (Lydall 1976: 393). I estimated the population of Kara at 1,000, based on the number of households, which came to about 200.
- 4) The Koegu (called Muguji by the Kara) form a group of about 500 people who speak a Surmic language of the Nilo-Saharan superfamily. They constitute a political unit together with the Kara, but are culturally an entirely independent group. They are "the people of the forest and river" who subsist by agriculture, fishing, honey-gathering, and hunting. They have personal bond-partnerships with the Kara people, and their relations were so close as to be seen as quasi kinship. Such symbiosis, however, has collapsed since 1990 (Matsuda 1994). There also are about 600 Koegu people living with the Bodi and Mursi (Turton 1986: 148).
- 5) "Wandorobbo" is a Swahili word derived from Il Torobo which is a Maasai expression meaning poor people without cattle who eat the meat of wild animals (Blackburn 1974: 139). This may be a word used by an interpreter or an attendant accompanying Donaldson-Smith. Moreover, as far as I know, many of the Kara people do not like eating fish, so that his description fits the Koegu rather than the Kara. If so, the Koegu may have already been living along the Omo river by the end of the nineteenth century.
- 6) I agree with the view that historically the lower Omo valley has never been isolated, and that various ethnic groups living there were greatly affected both culturally and socially by the Ethiopian Empire, which expanded its territory in the latter half of the nineteenth century (Donham and James 1986). Since then, however, neither control by the Ethiopian government nor Amhara culture has had direct influence upon this region.
- 7) He classified traditional systems of agriculture in Western Africa into three types according to the duration of land utilization: long-term fallowing, short-term fallowing, and continuous cultivation. Continuous cultivation is again divided into edaphic systems and hydraulic systems (Harris 1976: 314).
- 8) Men who participate in the Kara marriage-preparation ritual stop eating cereal six

- months before the ritual, consume only the blood of domestic animals, milk, meat, and honey, and wear a jacket made of goat hide. Thus, they prepare for the day of the jump-over-the-cattle ritual. This ritual is also performed in the Hamar and Banna societies of the Omotic family, whom the Kara consider their fellows (Haberland 1959: 428).
- 9) Diba becomes a swamp because of water flooding from the Omo river in the rainy season, and in the dry season when water evaporates, *décrué* agriculture is practiced. In 1986, I saw a flat field of circumference about 2 km, where the area under cultivation per household was far larger compared with riverbank fields, which reportedly brought about a rich harvest. In 1989, however, even in the dry season, water in the swamp remained high, and the rainy season came before cultivation. In that year, Dus village suffered a food shortage, and the Kara and the Koegu had conflicts over insufficient farmland. This incident triggered a split of the two groups later on (Matsuda 1994).
- 10) Young sorghum three to four weeks before reaping is eaten as follows. Sorghum whose ears are still green is put over a fire and grilled until the surface is a little burnt. This is called *tisha*. *Tisha* gives off a savory aroma and is sweet when chewed well, so that people are fond of having it with coffee. Next, sorghum at this stage produces an emulsified juice when it is crushed. They crush the sorghum, dry it under the sun, and grind it with a stone mill. Then they cook the flour as porridge (*shuruta*). Pressed and dried *shuruta* is formed into the shape of a bar of soap. This is boiled and drunk, which they call *kumbara*. Young stems (*worsha*) contain a sweet juice which both adults and children like to suck by breaking the stem with the teeth. This provides them with another pleasure in the harvest season.

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