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<th>Present Condition of the Sudanese Agricultural Complex: The Case of Western Niger</th>
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<td>SAKUMA, Yutaka</td>
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Kyoto University
PRESENT CONDITION OF THE SUDANESE AGRICULTURAL COMPLEX: THE CASE OF WESTERN NIGER

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ABSTRACT As regards the agriculture of Niger today, what aspects are changing and what are persisting? In this article, we will reflect on the agricultural changes of western Niger starting from its relation with its lasting tradition, based on the agricultural complex theory of the late Dr. Sasuke Nakao, a Japanese botanist.

After conducting a field survey in the northern savanna area in western Niger and West Africa at the end of the 1960s, Nakao claimed that the area is in fact one of the sites of the origin of agriculture in the world, and that he had found evidence of a combination of agricultural culture (Sudanese agricultural complex) in cultivated crops, farming equipment, farming methods, and processing methods.

After almost half a century since Nakao’s research, even after experiencing droughts and other climate changes, two main changes in farming and cultivation methods have taken place in western Niger in spite of the persisting characteristics of the Sudanese agricultural complex. Specifically, these changes are from hoe-farming to plow-farming, and from rain-fed rice cultivation to irrigated rice cultivation.

In this article, we will identify the origin of the changes that occurred in western Niger, while at the same time, show that there was a change to the national rural development policy accompanying the development of uranium as the new export revenue and source of international trust. We will also point out that the changes in the region’s agricultural and cultivation methods brought about by this policy match the characteristic values of Songhai society, which places great importance on the weeding process. The background of the spread of the use of plows is this farming tool’s (instead of tillage) usefulness in weeding, while the background of the switch to irrigated rice cultivation is the spread of herbicides that can only be used in irrigated farmlands (in rain-fed rice cultivation performed on flooded fields, spreading herbicides will only cause them to be washed away by the river so herbicides cannot be used). With the considerations above, this article will identify that there was a secondary agricultural culture (holding a moral value) in this regional society behind the fundamental change of agricultural culture in western Niger.

Key Words: Agricultural complex; Sasuke Nakao; Niger; Songhai; Weeding.

SUBJECT

“The history of agriculture is written in cultivated plants.”

Sasuke Nakao

What is changing in agriculture in modern Africa and what is being sustained there? This paper clarifies the changes in agriculture in the Songhai group society in western Niger based on the relationships of cultivators with planting and weeding during the sustainable phase with reference to the agricultural complex.

Nakao is a famous Japanese botanist and one of the key persons in the Kyoto School centered at Kyoto University. With Koumei Sasaki (1929–2013), he was a noted advocate of the East Asian “evergreen forest culture theory (shoyo jurin bunka ron in Japanese)” and proponent of the unique theory on the origin of crops known as the concept of the “agricultural complex.” The concept of an agricultural complex was introduced in Origin of Cultivated Plants and Farming in 1966, as follows. In agriculture, “there are always heterogeneous things gathered, such as crop varieties, cultivation techniques, processing techniques, religious ceremonies, agricultural land institutions, so that they mutually intertwined to make one group” (Nakao, 1966: 13). Such a group is an “agricultural complex.” Also from the reference, the process from “seed to stomach,” such as crop varieties, cultivation techniques, and processing technologies are limited to four groups worldwide (basic agricultural complex), and they can be distinguished from the “secondary parts,” in which regional deviations, such as farmland systems and religious ceremonies, are remarkable (Fig. 1).

These are the four groups of the basic agricultural complex. These consist first of the Mediterranean basic agricultural complex, second, the Vegeculture basic agricultural complex, third, the Savanna basic agricultural complex, and fourth and finally, the New Continent basic agricultural complex. Among these four groups, the finding of its own agricultural complex originating in Africa and secondarily having developed in the Indian subcontinent is Nakao’s “greatest intellectual contribution to the theory of agricultural origin” (Hotta, 2004: 718); specifically, his Savanna basic agricultural complex (cf. other famous theories on

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Fig. 1. Basic agricultural complex.  
Source: Nakao (1966)
African farming systems like Murdock (1959) and Richards (1985)).

However, what is important on the theme of this paper rather than of origins is the fact that Nakao traversed western Niger as a member of “Kyoto University’s Great Saharan Scientific Expedition” (Oct. 1967–May 1968) just after he had made this intellectual contribution. After returning home, based on the results of this survey, he submitted his opinion that in West Africa there is a combination of the Sudanese and Guinean types of agriculture, which consists of two complexes. Among them, the characteristics of the Sudanese agricultural complex, including the western part of Niger, are roughly four:

1. Agricultural base is made on the plants that are domesticated in West Africa, and which constitute the complex system that consists of legumes, fruits, vegetables, and oleaginous plants.
2. Tillage with iron stick and hoe.
3. Mixed seeding and mixed cropping.
4. Milling with mortar and pestle.

(Nakao, 1969: 50–51)

But the change in agriculture that attracts attention in this paper is particularly concerned with the cultivation method of (2) and the cultivation method (3). That is, our focus is on the transition from tillage with a hoe to tillage with a plow and the introduction of irrigation rice production. The main theme of this paper is to consider how these changes have taken place.

OVERVIEW OF THE SURVEY

According to the classification of the Niger Meteorological Department, the climate of the country is classified into four zones, depending on rainfall amount (Fig. 2). My research site (i.e., Tillabéri Region, Tillabéri Department, D Canton, Sahara zone
Annual rainfall: less than 150 mm
Sahel and Sahara zone
Annual rainfall: 150–300 mm
Sahel zone
Annual rainfall: 300–600 mm
Sahel and Sudan zone
Annual rainfall: 600–750 mm

Fig. 2. Climatic zone.
Fig. 3. Tillabéri: Annual precipitation (1923–2008).
Source: MFE-INS (2019a)

Table 1. Crops domesticated in the Sudanese agricultural complex.

<table>
<thead>
<tr>
<th>Common name</th>
<th>Scientific name</th>
<th>Songhai name</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cereals</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rice</td>
<td>Oryza glaberrima</td>
<td>no</td>
<td>Staple food.</td>
</tr>
<tr>
<td>Pearl millet</td>
<td>Pennisetum typhoides</td>
<td>hayni</td>
<td>Staple food.</td>
</tr>
<tr>
<td>Sorghum</td>
<td>Sorghum spp.</td>
<td>hamo</td>
<td>Staple food.</td>
</tr>
<tr>
<td>Fonio</td>
<td>Digitaria exilis D. iburua</td>
<td>firow</td>
<td>Only wild species around my field site villages.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beans</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cowpea</td>
<td>Vigna sinensis</td>
<td>dunguri</td>
<td>Boiled with rice. Boiled and paste.</td>
</tr>
<tr>
<td>Bambara-bean</td>
<td>Voandzeia subterranea</td>
<td>damusi</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>kudurku</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fruits and vegetables</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Okra</td>
<td>Hibiscus esculentus</td>
<td>la</td>
<td>Main ingredient of soup (sauce).</td>
</tr>
<tr>
<td>Roselle</td>
<td>Hibiscus sabdariffa</td>
<td>gisima</td>
<td>Main ingredient of soup (sauce).</td>
</tr>
<tr>
<td>Kenaf</td>
<td>Hibiscus cannabinus</td>
<td>rama</td>
<td></td>
</tr>
<tr>
<td>Watermelon</td>
<td>Citrillus vulgaris</td>
<td>kaney</td>
<td>Only wild species. Main material of soup (sauce).</td>
</tr>
<tr>
<td>Calabash</td>
<td>Lagenaria siceraria</td>
<td>tanda</td>
<td>Material of utensils.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oleaginous plants</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sesame</td>
<td>Sesamum indicum</td>
<td>lamuti</td>
<td>Main ingredient of soup (sauce).</td>
</tr>
<tr>
<td>Black beniseded</td>
<td>Ceratotheca sesamoides</td>
<td>zulumbu,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Polygala butyracea</td>
<td>ganda hoy</td>
<td></td>
</tr>
<tr>
<td>Fruit trees</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tamarind</td>
<td>Tamarindus indica</td>
<td>boosey pa</td>
<td>Spice.</td>
</tr>
<tr>
<td>Néré</td>
<td>Parkia biglobosa</td>
<td>dooso</td>
<td>Spice.</td>
</tr>
<tr>
<td>Palmyra palm</td>
<td>Borassus flabellifer</td>
<td>sabbize</td>
<td></td>
</tr>
<tr>
<td>Baobab</td>
<td>Adansonia digitata</td>
<td>ko pa</td>
<td>Main ingredient of soup.</td>
</tr>
<tr>
<td>Kapok</td>
<td>Ceiba pentandra</td>
<td>bantay pa</td>
<td></td>
</tr>
<tr>
<td>Doum palm</td>
<td>Hyphaene thebaica</td>
<td>kangaw</td>
<td>Material of utensils.</td>
</tr>
</tbody>
</table>

—: Not cultivated in my research site.
Source: Author’s survey data
Present Condition of the Sudanese Agricultural Complex

G village) is the second northern limit of the Sahel and Sahara area’s agricultural zone, which has under 300 mm of annual precipitation.

The rainfall in this area is on a long-term declining trend, especially since the end of the 1960s, and it has frequently experienced drought (Fig. 3). This can be confirmed from rainfall data about 50 km south of the survey site. However, despite these changes in weather conditions, or maybe it is the cause, the nature of the Sudanese agricultural complex pointed out by Nakao is particularly noteworthy in modern Niger’s agriculture.

The first is cultivated plants (Table 1). Concerning most of the crops cultivated in the Sudanese agricultural complex area, which we have surveyed with reference to Nakao’s theories, these still meet the process of “seed to stomach” in this area. Cereals such as pearl millet and sorghum, and beans such as cowpea are especially important.

For example, from the 2005 agricultural census conducted by the government of Niger, we can confirm that these three crops are cultivated in more than 70% of the cultivated land throughout the country, and that there is a strong tendency for these crops to be mixed and cultivated (Table 2). Of the table’s contents, only groundnut was cultivated outside the Sudanese agricultural complex area, and it is not grown in the western parts, such as Tillabéri, Dosso, and Niamey.

Table 2. Agricultural census in 2005 (ha).

<table>
<thead>
<tr>
<th></th>
<th>Tillabéri</th>
<th>Dosso</th>
<th>Niamey</th>
<th>Whole country</th>
<th>Proportion of all farming areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millet + cowpea</td>
<td>533,127</td>
<td>682,204</td>
<td>68,821</td>
<td>2,100,717</td>
<td>32.1%</td>
</tr>
<tr>
<td>Millet + sorghum + cowpea</td>
<td>82,647</td>
<td>73,819</td>
<td>5,050</td>
<td>1,774,169</td>
<td>27.2%</td>
</tr>
<tr>
<td>Millet</td>
<td>430,408</td>
<td>76,776</td>
<td>137</td>
<td>857,303</td>
<td>13.1%</td>
</tr>
<tr>
<td>Millet + sorghum</td>
<td>65,568</td>
<td>15,321</td>
<td>2,572</td>
<td>404,752</td>
<td>6.2%</td>
</tr>
<tr>
<td>Fallow soil</td>
<td>96,962</td>
<td>71,876</td>
<td>1,164</td>
<td>355,581</td>
<td>5.4%</td>
</tr>
<tr>
<td>Sorghum + cowpea</td>
<td>11,446</td>
<td>*</td>
<td>*</td>
<td>145,075</td>
<td>2.2%</td>
</tr>
<tr>
<td>Millet + cowpea + roselle</td>
<td>6,894</td>
<td>116,777</td>
<td>8,330</td>
<td>140,969</td>
<td>2.2%</td>
</tr>
<tr>
<td>Millet + sorghum + groundnut</td>
<td>*</td>
<td>*</td>
<td>3,312</td>
<td>123,376</td>
<td>1.9%</td>
</tr>
<tr>
<td>Sorghum</td>
<td>29,062</td>
<td>2,993</td>
<td>64</td>
<td>115,679</td>
<td>1.8%</td>
</tr>
<tr>
<td>Millet + groundnut</td>
<td>*</td>
<td>9,292</td>
<td>*</td>
<td>109,809</td>
<td>1.7%</td>
</tr>
<tr>
<td>Millet + cowpea + groundnut</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>86,546</td>
<td>1.3%</td>
</tr>
<tr>
<td>Groundnut</td>
<td>8,568</td>
<td>24,908</td>
<td>0</td>
<td>45,602</td>
<td>0.7%</td>
</tr>
<tr>
<td>Cowpea</td>
<td>12,913</td>
<td>5,290</td>
<td>479</td>
<td>31,925</td>
<td>0.5%</td>
</tr>
<tr>
<td>Rice</td>
<td>10,324</td>
<td>7,869</td>
<td>2,962</td>
<td>23,160</td>
<td>0.4%</td>
</tr>
<tr>
<td>Bambara-bean</td>
<td>3,201</td>
<td>16,972</td>
<td>0</td>
<td>20,941</td>
<td>0.3%</td>
</tr>
<tr>
<td>Others</td>
<td>35,680</td>
<td>40,630</td>
<td>3,955</td>
<td>199,077</td>
<td>3.0%</td>
</tr>
<tr>
<td>Total</td>
<td>1,326,800</td>
<td>1,144,727</td>
<td>96,846</td>
<td>6,534,681</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

* No data.
Source: MFE-INS (2019b)
CHANGES OF THE AGRICULTURAL COMPLEX

Cultivation Method

While the characteristics of the Sudanese agricultural complex certainly have been sustained as above, Niger’s agriculture has recently changed in certain ways. One is the cultivation method. The human-powered cultivation method, which consists of plowing cultivation by an iron hoe, stems from the characteristics of the agricultural complex that originated in Africa, which Nakao emphasized in contrast with the cultivation of the Mediterranean basic agricultural complex, which uses a plow. In a field study to support this assertion, what he observed in the western part of Niger was tillage with a hoe (Olivier de Sardan, 1995: 118, 121–123). That is why, when he observed tillage by plow in the northern part of neighboring Nigeria for the first time, he described it as a “quiet revolution” in northern Nigeria (Nakao, 1969: 51). About 40 years after that, Niger’s agriculture had experienced this revolution.

Depicted below is a plow in western Niger (Fig. 4), for which the Songhai name is “saariya.” Etymologically, the term derives from the French word “charrue.” In my research site, it was common that there was one plow per family. I would like to explain how people use the plow as a case example of the cultivation method of pearl millet, which is the most important plant in this region.

Pearl millet cultivation starts with the soil preparation before the rainy season begins. Specifically, the process includes tilling the soil using plows, removing the pearl millet roots and small shrubs left behind, gathering them, and burning them. However, it is rare that this work is performed rigorously. There are quite

Fig. 4. A plow in western Niger.
Present Condition of the Sudanese Agricultural Complex

a few people who do the tillage before the seeding. But the fields that receive this treatment are limited to the relatively small fields close to the villages where the farmers live.

The sowing procedure is performed as follows. Adult men use a hoe with a long handle to dig seeding holes about 10 cm deep in a straight line on tilled or non-tilled soil. Children and women sow several seeds in each hole, then they close the hole with their feet. Sometimes, they sow cowpeas using the same method before sowing the pearl millets (no mixed seeding). Weeding is done at least once, ideally three times. The first weeding is called the “farmi,” and performing the work itself is called “far.”(2) The farmers use a plow to till the space between the pearl millet plants to crush the weeds, or use a large weeding sickle pulled by an ox.(3) In the Songhai language, we call this work the same name as weeding by sickles. It is rather the weeding after sowing that a plow really helps.

The harvest depends on the cultivar, but usually it starts around three months after the sowing. The farmers bend down the pearl millet plants, which can grow to two meters tall, then use a small knife to harvest only the panicle parts. The harvested ears are gathered in a bundle of 20–30 panicles, then they are brought to the granary or inside the house to be dried and stored. It is common that adult women participate in the harvesting, in which case the male family chief will give one bundle of the pearl millet panicles as a thank you even if the one participating is his wife or daughter.

This is how the pearl millet is cultivated. Sorghum, which is often cultivated together with pearl millet as another main crop, is cultivated in roughly the same way.(4) In the cultivation method, it is critical that it was weeding rather than plowing, even though it was called “plowing.”

However, there is also another crop cultivation, rice, is also related to agricultural and cultural history changes.

Rice Cultivation

West Africa is known as an area where rice is cultivated and planted, the same as China, and where Oryza glaberrima is cultivated (Portères, 1962; Havinden, 1970). Cultivation areas and methods are roughly divided into two categories: upland rice cultivation by fire-fallow farming in forest areas and paddy rice cultivation by floodplain farming in savanna areas. There are various opinions on which is the origin source, but what concerns this paper is the cultivation of rice planted with flooded land cultivation. Below, this is referred to as rain-fed rice production. The cultivation area of rice in Niger is limited to the Niger River basin in the western part, but, after the survey in Africa, Nakao submitted that the flooded area around this river is the origin of the area of Black Africa’s own agriculture.(5)

In this area, rain-fed rice production is closely linked to the characteristics of Africa’s third-longest river, the Niger River. The Niger River plays a role as a natural dam, the part that is gouged through the Sahara desert, which is the so-called “large curved part,” and even when the rainy season comes, the
downstream water volume does not immediately increase (Olivier de Sardan, 1969: 2–4, 85–87).

The flow of the river reaches two maximum levels due to rainfall, one in December and one in August (Fig. 5). Utilizing the gap between the rainy season and the rising water amount, rice cultivation is possible with rainwater only, with little management of water artificially. This is the principal characteristic of rain-fed rice production.\(^6\)

However, from the viewpoint of at least the production volume, current mainstream of rice cultivation in Niger is not rain-fed rice production, it is irrigation rice production.

As mentioned here, irrigated rice cultivation refers to rice cultivation in state-owned farms built in various places of the Niger River basin, through the government’s public investment and overseas aid. In French, these farms are called “Aménagement Hydro-Agricole (AHA).” Special features include the second term work through irrigation facilities such as a large electric pump. About 70\% of the rice currently produced in Niger is produced on irrigated farmland (Table 3). The introduction of irrigation rice cultivation, which is also said to be “the largest development project in the west” (Olivier de Sardan, 1995: 121), became full scale after the 1970s and after the Nakao survey and is the other change that

**Table 3.** Nigerien rice: cropping system and production.

<table>
<thead>
<tr>
<th>System</th>
<th>Area in Production (1,000 ha)</th>
<th>Share of nat’l rice area</th>
<th>MT/ha</th>
<th>Production (MT)</th>
<th>Production (% of total)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditional, rain-fed</td>
<td>13.9</td>
<td>57%</td>
<td>1.1</td>
<td>15,000</td>
<td>20%</td>
</tr>
<tr>
<td>Irrigated, AHA</td>
<td>8.5</td>
<td>35%</td>
<td>6.0</td>
<td>51,000</td>
<td>70%</td>
</tr>
<tr>
<td>Irrigated, private</td>
<td>1.9</td>
<td>8%</td>
<td>4.0</td>
<td>7,500</td>
<td>10%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>24.3</strong></td>
<td><strong>100%</strong></td>
<td><strong>3.0</strong></td>
<td><strong>73,500</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

Source: IFDC (2008: 38)
occurred in Niger’s agriculture.\(^\text{7}\)

In this section, I discuss the above-mentioned problem of farming with a plow. The work using a plow in the cultivation of rice consists of plowing and not weeding, in contrast to the cultivation of pearl millet. The soil color of rice field is black unlike the pearl millet field, but the soil of the floodplain of the Niger River consists of a clay soil. This soil becomes hard during the dry seasons, so plowing before seeding is necessary. A plow demonstrates its utility in this work. In irrigated rice cultivation, unlike rain-fed rice cultivation, fertilizer is added, but this chemical fertilizer will make the soil very hard like rock, so a plow is still essential. Meanwhile, weeding of rain-fed rice cultivation is carried out while water rises to the knees and waist and the water level of the river rises, so the farmers cannot use a plow and must pull out the weeds one by one by hand. Regarding the weeding of irrigated rice cultivation, the environments are almost the same, but as we will see later, further changes have been made in recent years.

**AGRICULTURAL CHANGES**

Rural Development Policy

We have reviewed the changes in the introduction of rice cultivation with a plow and the irrigation rice production. How these changes took place? First of all, it is critical the rural development policy implemented in the 1970s and 1980s (Robinson, 1991; Abdoulaye, 2002; Gado, 2010). During this period, when a military regime was established under the military officer Seyni Kountché, not only agriculture but also the whole political and economic structure of Niger experienced a turning point. Traditionally, the country was an agricultural region that exported groundnut products grown in the central and eastern parts of the country, but from the 1970s, mining and the export of mineral resources, uranium in particular, became full scale. The groundnut, which had been responsible for 72% of the total export value over a period of 60 years at the time of independence, became nearly 0% by the early 1980s, and instead uranium became responsible for more than 70% of exports (Robinson, 1991: 8).

With the maximum budget provided by these new export earnings and using international credit sources as a lever, the government promoted rural development. It was an urgent policy issue to realize the stable supply of food for the Kountché government, which had legitimized the coup d'état mainly on the grounds that the previous government had not taken effective measures against drought since the late 1960s (Robinson, 1991: 10; Gado, 2010: 354).

One of the policies taken at that time to raise productivity was to distribute agricultural input materials such as plows through cooperatives organized throughout the country.\(^\text{8}\) Though the plows, known as “*annasaara saariya* (the plow of white),” were produced by a domestic agricultural equipment manufacturer, they were durable and difficult to wear out, and are distinguished from plows that later were made by local smiths (*boro-bi saariya*). Subsequently, these plows
have become an industrial product and even now are traded at high prices.

The current policy adopted by the Seyni Kountché government is the construction of irrigated farmland in the western Niger River basin (Robinson, 1991: 10; Abdoulaye, 2002: 5–9; Gado, 2010: 352, 357, 364). The construction of farmland involved the nationalization of land, but the residents were not compensated. After the construction of the farmland, if the residents could not pay the required fees for using the land, it was then confiscated. People call rice paddies in farmland “pala” and distinguish them from the Songhai word meaning field, “fari.” Pala is derived from the French word “plat,” and the English word “flat.”

According to Nakao, “the history of agriculture is written in cultivated plants” (Nakao, 1966: 191), but it may be said that the modern history of Niger is written in the names of these agricultural tools and lands.

As I mentioned earlier, Nakao was able to observe the state of farming with a plow in northern Nigeria. However, he regarded its usage as a result of population density increase, and he did not ask for whom the product was produced and distributed by, and what were the political economic conditions that made it possible. From the perspective of contemporary anthropology, where it has become indispensable to capture society in relation to the nation-state and development, it cannot be denied that Nakao’s argument had some sort of time constraint. But here I would rather pay attention to one point of the agricultural complex theory, which says, “It is not history of power and war, and it is not history of art and so-called consumption culture, but the history of agriculture that the people of the whole world participated” “must be written” (Nakao, 1966: 191), which is supported by such a recognition of an era. That is why the same argument includes a discussion of contemporary anthropology; for example, a viewpoint that includes a discussion of the degree to which farmers in Niger accept changes as far as their survival is maintained; otherwise, they are sure to resist making any such changes (cf. subsistence theory by Olivier de Sardan (1995)). Below, I will explain a case study of my research site, and I will show the factors of agricultural change that can be gained by considering this viewpoint.

Moral Values Concerning Weeding

My research site is an administrative village centered on the islands section of the Niger River, and the floodplain, which holds about one-third of the island part, used to practice rain-fed rice cultivation (Fig. 6, 7). Plows began to be introduced and spread from the mid-1970s, while it was in 1991 when state-owned farms, AHA, were built. At the time of the survey, the plow was regarded as indispensable for plowing rice cultivation for both rainwater and irrigation, but there were other reasons why the plow was popularized in the 1970s other than any other periods.

In earlier times, the central agriculture of this village was rice production. But, as a result of successive droughts since the end of the 1960s, the floodplain has shrunk, while the importance of cultivating pearl millet with “the resistance to drying compared to the most of all cereals” (Nakao, 1969: 54) has increased. However, the sandy soil suitable for this crop is not available on the islands of
the Niger River, but on its west side. Therefore, while growing continued in the islands, pearl millet cultivation began in remote areas, though with results that went beyond mere inconvenience.

The range of rainfall in this area is unstable, and even over distances of only a few kilometers, there will be rainy places and places without rain, so having more than one mutually grown field disperses the risk, and works to the advantage of the growers.

Under what specific circumstances, what is important for the cultivation of
pearl millet? It is necessary to take into consideration rainfall conditions to decide when to seed at which field, and to seed in a short time once such a decision has been made. That is, the preparation work such as plowing has low importance. It can be inferred that these conditions are common to people in the western part of Niger who suffered from a decrease in rainfall. But, even if there are multiple fields in remote areas, there is one farming activity that people in the Songhai society do not neglect: weeding.

Why do we focus on weeding? Even if we do not weed, we can harvest the minimum harvest; and in fact, such fields were also found, but such fields were scorned because that field was “zoobu.” Zoobu refers to the state where weeds have grown or “(field) be overgrown with weeds and brush” (Heath, 1998). But in this society, for a farmer to neglect weeding would make him a laughingstock. In other words, weeding is a work that is emphasized in terms of the value unique to the Songhai society in a moral dimension. In the first place, the word for farming in the Songhai language is “far,” the same word as weeding. Farms (fari) and farmers (alfari) also use this far as a stem. Unlike the evergreen forest culture where “cultivating” means “agriculture” and the Mediterranean basic agricultural complex where cultivātus turns into agriculture, in the Songhai society it is not plowing, but weeding that is the original image of agriculture and farmers.

Before conducting his survey in Africa, that is, before developing the Sudanese agricultural complex theory, Nakao suggested that this development of agriculture in Songhai society offers a background of the agricultural complex history. At that time, Nakao had speculated that “millet agriculture” began from “agriculture without plowing soil” in the Niger River basin, and a “farming method with only seeding and weeding” (Nakao, 1966: 108). In addition, in the theory of “kharif agriculture,” which is the prototype of the Sudanese agricultural complex theory, “one characteristic is the elaborate weeding,” but “millet,” that is, “kharif agriculture with nucleus as pearl millet” is said to inevitably make it difficult to create a large area field, “because it goes to complete weeding” (Nakao, 2004: 115). It is not evident that these discussions were further developed in the Sudanese agricultural complex theory, as the field survey was conducted in Africa during the agricultural period, but I believe this discussion hints at interpreting changes in the modern Niger’s agriculture.

As we have already seen, as long as it is the cultivation of pearl millet of modern Niger that is the subject, it is weeding that the introduction of plows influenced. As in the research site, it is impossible without a plow to weed several pearl millet fields in remote areas over a short period of time. In other words, this is explained by Nakao’s statement, “A plow makes it possible to create a large area field because it enables complete weeding.”

Moreover, the problem is not limited to the cultivation of pearl millet. As for the introduction of irrigation rice production, the problem of weeding also appears.

The number of rice paddies in irrigated farmlands is limited, but as I learned during my own survey, the number of those who wish to do rice paddy farming with irrigation rice crops is large. For example, we were informed that even if free spaces could be made available, it would be impossible to acquire rice fields without paying bribes. However, the situation immediately after the construction
of the farmland was completely different, and quite a few people left the paddies of their own choice. Why did the situation change? According to the explanation of the young villager quoted here, the reason is that herbicide was introduced:

“There was no herbicide in the past. So people hated ‘flat [irrigated farmland, AHA].’ If they transplanted rice, after weeding season in flat, there were many people who could not weed in flat. Then weeds wasted the rice, which could not ripen. When the time came, even if the owner worked seriously and reaped rice on flat, he could not pay the rental fee, much less could he harvest enough rice to feed himself. So people almost completely left flat.

But now there are some people who never suffer [from weeding] because they can buy herbicide and put it into flat. People’s minds were very satisfied, because they can get their rice by their flat.”

Since there was no herbicide in the past, people hated flat, which is irrigated farmland. After that, herbicides were introduced and their minds were satisfied. But we should not accept this explanation unquestioningly, and there are many problems that need to be considered, such as increases in rice prices and so on. Rather, what we would like to pay attention to here is whether the diversified social value for weeding work is high enough to reduce the reality to the single point of herbicide introduction.\(^{(10)}\)

From this point of view, the last reference worth mentioning is the description of rice cultivation in elementary school textbooks at the time when the construction of irrigated farmland became full scale (Fig. 8). On the left page are rain-fed
rice crops, and on the right are irrigation rice crops, the former being traditional, extravagant, and nonproductive, and the latter being modern, intensive, and productive. The point is that it is the propaganda of the government, but the photographs on the left and right are interesting. On the left is a cluttered black-and-white photograph that seems to be represented as *zoobu* for people of the Songhai society; and on the right, there are color photographs where weeds have been weeded all the time. By the way, on the left is a photograph of the harvest of rain-fed rice, and the right is a picture of the weeding of irrigation rice cultivation for some reason. If the young man mentioned earlier saw this textbook in his elementary school days, what he perceived may not have been productivity, but our perception of this weeding scene would likely have been that of modernity. However, my view now is the reason for it being there is to depict a nation that seeks to encourage social morals so that people will voluntarily attach themselves to state-owned farmland.

**CONCLUSION**

This paper indicated that the change in agricultural history such as shifting to rice cultivation and introducing irrigation rice production is inseparable from the moral values associated with weeding. By the way, weeding morals and weeding works are different; the morals are not the “basic” part of “seed to stomach” but may be regarded as a “secondary part” like the religious ceremony and the farmland system. If so, it can be concluded that the secondary part of the agricultural complex promoted the change of the basic part. But here I would rather conclude as follows. The fact that the basic and secondary parts, change and sustainability, national representation and social morals are “mutually intertwined” in a totally unreasonable manner is the present state of the Sudanese agricultural *complex*, which is the history of agriculture written on farmland and tools.

**NOTES**

(1) “Songhai” is a third-person reference associated with the empire that this ethnic group established in the past. Locals refer to themselves by the names of their subgroups (linguistically the same group): Zarma, Cado, Wogo, Kurtey Sorko, and so on. For further details, see Olivier de Sardan (2000).

(2) The second weeding is done in the same way as the first one, but it is called “keyya” instead.

(3) When performing the weeding using human labor, they use a sickle with a long handle called “*kumbu*.” Adult women may sometimes participate in the weeding using human labor.

(4) There is no real difference between cultivating pearl millet and sorghum. The two are often companion crops. The same can be regarded for cooking techniques. Other than the fact that foods using pearl millet are white and those using sorghum have a red tinge, there is no real difference between them. Nevertheless, the people make a distinction.
Pearl millet is likened to an aristocrat (borocin) while sorghum is likened to a slave (bannya). Thus you can see that the latter carries an inferior value in society. Also, when entertaining guests, pearl millet is preferred over sorghum. For example, when preparing a special porridge called donu, which is used as a dowry in marriage, pearl millet is always used in lieu of sorghum.

(5) “There is the flood plain farming area along the Niger River ..., African agriculture started” (Nakao, 1969: 142).

(6) Rain-fed rice cultivation is a rice cultivation method performed by utilizing the gap between the rainy season’s arrival and the Niger River’s high water period, as detailed below. The foundation of the rain-fed rice cultivation is the soil preparation carried out from the beginning of summer (the Niger River’s dry season) until the rainy season. Through the tillage and ground-leveling process, the soil is stirred and the weeds are crushed. There are people who do not do the soil preparation, but the sowing and weeding will become harder. The sowing is performed from late June to early July, when the pearl millet sowing has finished its first stage. Direct seeding is performed more commonly, while transplanting is rarely done. Unlike the pearl millet seeds, which are sowed in spaced seed holes, soil lumps are smashed with a long-handled hoe on top of the seeds scattered all over the tilled soil. This ground-leveling work ensures that the rice seeds will not be exposed to the surface (there are, however, people who do the tilling and ground leveling after the sowing). After the sowing work, a gutter about 30 cm deep heading toward the rice fields from the river is created in the boundary between rice fields. This gutter is used to quicken the flooding. It is rare that the whole rice field is sowed all at once, so the sowing is done from the lower spots of the field centered around the gutter while confirming the rainfall conditions and the Niger River’s water level. The first weeding, called “dooga,” is performed when the weeds have flourished (late September–late October), after the flooding has progressed to a certain extent. Unlike the pearl millet, animal labor cannot be used here. In shallow places, the people assume a kneeling position to prevent sinking, and in deep places, they kneel down until the water is up to their waist, all while pulling out the weeds (dooga) one by one. About one month after the first weeding, the second weeding, “sarbante,” is performed. In this stage, the people will have to submerge themselves until the water is up to their waists and even chests. Harvest starts from late November, and it goes full swing all the way through December. During this period, it is essential to keep watch for pest birds. A boat is indispensable for both keeping watch and harvesting. The harvested rice is gathered to the designated place near each rice field to be dried after taking the portion to be eaten immediately away. Unlike pearl millet and sorghum, women are never involved in this work sequence aside from watch-keeping.

(7) Irrigated rice cultivation is performed at the state-managed irrigated farmlands equipped with large electric pumps and concrete waterways, as detailed below. First, preparation for the rice nursery starts at the same time as the end of the previous agricultural season. Following the instructions of staff members from the Office National des Aménagements Hydro-Agricoles (ONAHA), which is the public corporation that manages irrigated rice cultivation and representatives from the association, those adjacent to the causeway section make several groups among themselves, and they perform the tilling and sowing of the rice nursery, “fangal,” jointly. They use seeds selected at ONAHA’s headquarters; cultivators are not allowed to choose seeds on their own judgement. Locals are hired by the association and they watch over the entire rice nursery until the time for transplanting. The land preparation of the rice paddy begins after that. Water is distributed all over AHA, then they perform tilling using animal labor and ground leveling using human labor. After that, they immediately start the transplantation, “tilam.” The rice nursery can
be a few hundred meters to two kilometers away from the causeway area, so animal labor is indispensable here. The cultivators stretch out strings in evenly spaced straight lines and use them as guides for transplanting by hand. After half a month has passed, they conduct the first weeding, “dooga.” Just like the rice-fed rice cultivation, the weeding here is done by hand. Fertilizer is spread after the first weeding. The ONAHA staff procures the fertilizer and the association distributes it. The transportation of the fertilizer also requires wagons. Half a month after applying the fertilizer, they do the second weeding (since the mid-1990s, agricultural chemicals are used for the weeding). When the grains start to break, they start keeping watch for pest birds, which, unlike the watch-keeping for the rice nursery, is the responsibility of each cultivator. About 130 days after the sowing, harvesting begins. The water is already drained at this point, so the harvesting work is easier than rain-fed rice cultivation. The threshing and wind winnowing, “faaru,” are done at the causeway district. The threshing is the men’s duty, and the wind winnowing is the women’s duty. They dedicate their commodity to the association as a contribution known as “hari-nooru” (meaning “the water money”), and take the remaining portion for themselves.

(8) During the time when West Africa was a colony, plowing and tilling were not carried out with the use of animals (Goody, 1971). Owning a cow had value as a sign of affluence, and horses and donkeys were exclusively used as a means of getting around. What was used for farming were implements made of iron, such as digging sticks and hoes. During the French colonial period, especially after the First World War, when the French colonies of West Africa, starting with Niger, tried plowing methods using animals, iron plows, and the introduction of carts (Abadie, 1927: 263; Labouret, 1941: 236–238; Suret-Canale, 1964: 383). However, this attempt led by the colonial authorities as well as the Nigerien administration did not necessarily yield fruitful results at the start. From the 1960s to the 1980s, monographs written centering on the stretch of land in the western part of Niger reported that the number of plows were insufficient compared to the number of cultivators, and that the plows and carts were abandoned after their brief introduction (COGERAF, 1962: I-13, I-20; Easton, 1966: 1–2; Diouldé, 1973: 58, 126; Keita, 1983: 52).

(9) “People in this region had suffered from depopulation a long time, but now revolutionary advancement started because the population density had risen appropriately” (Nakao, 1969: 52).

(10) In the village where I carried out my research, there was another drastic change, from rain-fed rice production to irrigated rice production in the 2010s. This irrigated rice production took place on private farms rather than official farms (AHA) and used small engine pumps instead of large electric pumps. Why did this change occur? Perhaps due to a drop in gasoline prices for engine pumps. However, the villagers reported that they could use herbicides in irrigated rice fields but not in rain-fed fields.

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