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Cassava Commercialization and Reactions in Producing Areas: A Case Study in Rural Eastern Cameroon

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Abstract Cassava is an important staple food crop in sub-Saharan Africa and currently, it has also become an important commodity crop as a source of cash income for rural households. The challenge is how to balance the production of this crop as both a food and a commodity. This study examines people's orientation and background toward cassava commercialization and subsistence crop production, focusing on their choices and responses to cassava production, processing, and marketing in rural eastern Cameroon. A field study was conducted in the community of Andom for 24 months from 2013 to 2022. Data were collected from participatory observations and semi-structured interviews. The results describe how people's orientation toward cassava commercialization is characterized by the dual nature of cassava as a 'staple food crop' and a 'commodity crop', based on their food culture and local processing technic. It also points out that while its orientation does not necessarily contribute to cassava commercialization quantitatively, it is a key component of urban food security. This study articulates the dynamics of cassava commercialization in recent years in Cameroon and the commercialization of cassava in the production areas does not necessarily mean a shift from subsistence crop production to simply commodity crop production.

Keywords: Cameroon; Cassava processing; Commercialization of food crop; Improved varieties; Urban food security.

Introduction

Cassava (*Manihot esculenta*) is an important staple food crop in sub-Saharan Africa (hereafter referred to as Africa), and recently it holds a dual purpose for rural households in production areas: it is a staple food and a source of cash income. The challenge is how to balance the production of this crop as both food and commodity.

Cassava has many qualities that make it a highly profitable plant. It has a high caloric supply per unit area, is easy to propagate in poor soils, and is highly resistant to drought, disease, and pests. It is also adapted to conventional African agriculture practices mainly seen with yams and plantains, and its cultivation has expanded from coastal to inland areas since the 20th century (Jones 1959). However, despite its easy cultivation, cassava cannot be stored for long periods

after being harvested due to its high moisture content, leading to a rapid deterioration after being picked. After harvest, it is a crop that requires immediate and thorough processing. It is therefore a commodity crop that must be understood from the standpoint of its processing, sales, and distribution.

The commercialization of cassava is expanding in the context of wide-ranging social changes such as huge increases in the urban population and the resulting growing demand for food and participation in the global market. Under these circumstances, the commercialization of cassava in Africa is progressing in two directions. The first is commercializing cassava as a food supply that meets the needs of the growing urban population. The second is exporting cassava as a processed food and industrial ingredient (cassava starch) for the global market.

Nweke *et al.* (2002) described the structural changes in production, processing, distribution, and consumption as stages known as the 'Cassava Transformation'. These are driven by increasing urbanization and the commercialization of cassava in the global market. The 'Cassava Transformation,' similarly, refers to four developmental stages of cassava use: (1) As a security crop against hunger, (2) as a rural staple food, (3) as an urban staple food (commercialized and processed), and (4) as an industrial raw export material (Nweke *et al.* 2002).

The developmental stages of cassava utilization presented by Nweke *et al.* (2002) are occurring simultaneously in Cameroon. In other words, cassava is (2) a staple food in rural areas, (3) a staple food in urban areas, and (4) part of an export policy that is being promoted as an industrial raw material. In this context, the sustainability of subsistence production and commercialization in production areas within rural communities is directly related to relevant issues such as improving the income of rural households as well as ensuring food security for urban areas.

Hirano (2015) argues that it is necessary to consider African agricultural issues not only as rural problems but also from the perspective of national economies. He pointed to the increase in grain imports and the decline in grain self-sufficiency in Africa as one of the reasons for this. He then argued that Africa's agricultural problems appear in cities, not rural areas, against the backdrop of the increasing urban population rate in Africa, and that it is necessary to improve agricultural productivity and logistics to meet urban food demand (Hirano 2015). Indeed, one of Africa's agricultural problems lies in the logistics between urban and rural areas. As the urban population grows, logistics is a condition for meeting urban food security. In Cameroon, the conditions for connecting producers and urban buyers are not only transportation infrastructure but also the establishment of information networks.

On the other hand, what about agricultural productivity? Is the increase in grain imports in Africa solely due to low agricultural productivity? It is true that grain imports are increasing in Cameroon. However, as mentioned above, cassava, a staple food crop, is being exported as a raw material for food and industrial processing. The increase in grain imports cannot be explained solely by agricultural productivity. In addition, since crops are the source of cash income in the producing rural areas, it is impossible to understand rural problems without considering the linkage with the consuming urban areas. This paper examines the productivity

problem pointed out by Hirano from the perspective of the production area, focusing on the connection between the production area and the consumption area in terms of the commercialization of staple food crops.

To consider these issues, this study focuses on how rural people in production areas respond to cassava commercialization including production, processing, and marketing. A rural village in the eastern region of Cameroon was surveyed as a case study. Focusing mainly on the recent improvements in processing and marketing and the people's responses and choices, this study (1) shows the dynamics of cassava commercialization in recent years in rural villages in Eastern Cameroon, and (2) examines the balance of production and processing for subsistence and cash income from the perspective of people's responses in the production areas studied.

The paper is structured as follows: First, an overview of cassava commercialization in Cameroon is presented, followed by a discussion of the impacts of cassava commercialization on the production sector with a focus on improved cassava varieties. Finally, the impacts in the processing and marketing sectors are discussed, particularly regarding processing technology and processing labor.

Research Area and Methodology

This study was conducted in Andom village (5º15'N, 13º30'E), which is in the Lom and Djarém division in the eastern region of Cameroon. Andom stretches on both sides of a road called National Highway 1, which leads to Bertoua, the regional capital (about 50 km), and Yaoundé, the nation's capital (about 350 km). All along National Highway 1 is savanna where most residential areas reside. Behind this area is a tropical rainforest where the average annual rainfall is 1,500mm (Araki & Saito 2013).

Based on survey data from 2015, the village is mainly inhabited by approximately 800 *Bamvélé* (1) members from the *Tuki* tribe, a Bantu-speaking group of cultivators. The village contains four quarters labeled as Andom I–IV. In Andom I, there are 24 households, then 48 households in Andom II, 58 households in Andom III, and 58 households in Andom IV in 2015.

In Andom, the main means of livelihood is agriculture with hunting, fishing, and gathering occurring as seasonal activities. Coffee, cacao, and pineapple were grown as cash crops until the late 1990s; however, due to crop failure and a lack of demand, the cultivation of these crops heavily declined. In recent years, with the increasing demand for food in urban areas, the sale of processed cassava products has become increasingly important as a source of cash income.

The agricultural area is divided into two zones: the farmlands in the forest zone, about 4–5 km from Andom, grow plantains, maize, and groundnut, with a variety of other crops such as tubers, leafy vegetables, and fruit trees. The farmlands in the savanna zone are where cassava and maize are grown, the staple foods of the village. Cassava is the main staple food, supplemented by plantain, maize, and tubers.

Cassava cultivation is done on a household basis. The production, processing,

and marketing of cassava are mainly carried out by women. At the time of the survey, there were no cassava plantations or communal arable lands in the village, with an average arable area of about 0.37 ha in 2015. Generally, the women cultivate this size of land in two to three locations. While processed cassava products are sold year-round, maize is sold after the harvest season and Plantain, cultivated by men in the forest zone, is sold opportunistically. The reason Plantain is not sold year-round is due to limited means of transportation from the forest zone and high transportation costs.

A field survey was conducted in Andom for 24 months from July 2013 to April 2022. In addition, complementary surveys were conducted in the capital Yaoundé and the nearby city of Bertoua. This study focuses primarily on survey data from 2013 to 2019. The survey methodology employed participatory observation, semi-structured interviews with stakeholders, and random sampling surveys.

Background of Cassava Commercialization

This section provides an overview of cassava commercialization in Cameroon. First, an overview of the market for processed cassava products and the cassava commercialization policy in Cameroon are described. Next, I describe the historical experience of cassava commercialization in the study area to understand the dynamics of cassava commercialization in the production areas against the background of national policies and social conditions.

I. The expansion of the market for processed cassava products

Cassava can be of the bitter or sweet variety depending on the number of cyanide glycosides present, which are toxic to the human body.(2) Bitter cassava needs to be de-poisoned (processed) before consumption. Ankei (2003) traces the history of the spread of cassava on the African continent through a regional comparison of cassava de-poisoning methods. According to Ankei, there are three major methods of de-poisoning the bitter cassava, which can be further sub-classified into eight methods. Each of these methods has given rise to a variety of cooking methods in different regions of Africa (Ankei 2003: 207–211). The demand for processed cassava products based on the various cooking methods differs from region to region. Based on this, the commercializing of cassava requires carefully selected processing technologies and markets in consideration of regional demand.

Figure 1 shows the processed cassava products and demand in Cameroon. Demand for processed products can be broadly divided into national, regional, and global markets.

Cassava starch has been a promoted export by the Cameroonian government since the beginning of the 2000s, as described below. Demand for cassava starch is growing in the global market as it is a raw material for food processing and industrial products.

The wide variety of processed products used in the national market is further

subdivided according to regional food culture. Figure 1 shows the most typical processed cassava products that are widely consumed and commercialized across regions in Cameroon.

Chips (dried cassava), which are used to make the porridge-like *couscous*, as well as *Bâton de Manioc* (French for 'cassava sticks') and *gari*, are sold at markets and street stalls throughout Cameroon to meet the demands of the national

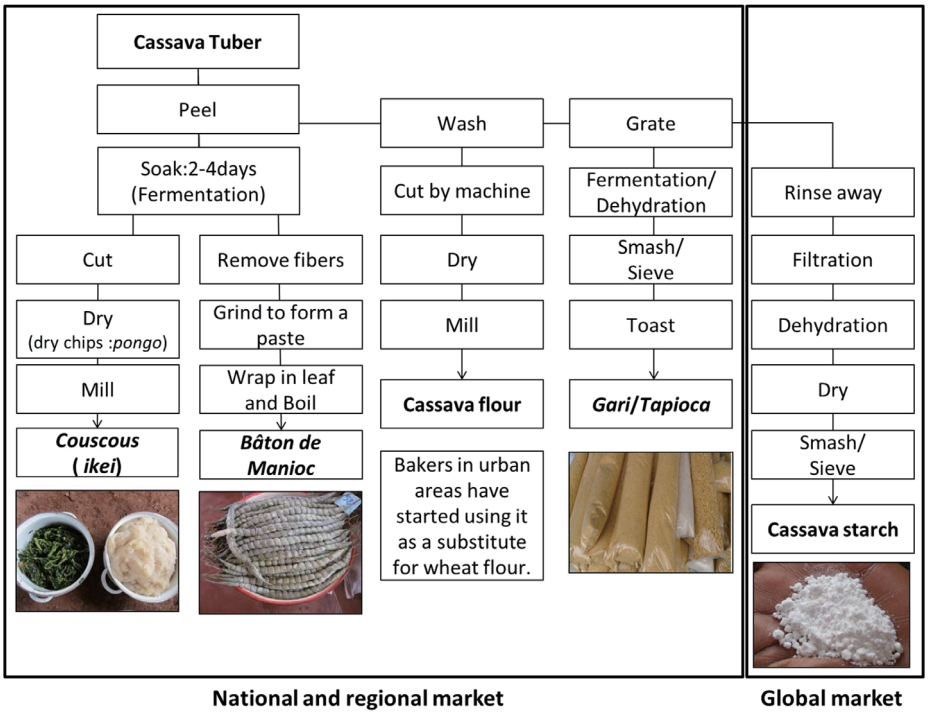

Figure 1 Cassava products and demand in Cameroon.

Figure 2 Sale of *Bâton de Manioc* on the streets in Yaoundé.

and regional markets. *Bâton de Manioc* is a ready-to-consume product that is distributed as an essential processed food in the urban food service. It can be found at food stalls at train stations, bus terminals, and street restaurants (Figure 2).

Couscous and *Bâton de Manioc* are both distributed in French, the official language of Cameroon, but each has its own ethnic language corresponding to the local food culture.[3] *Gari* is consumed throughout West Africa, including Nigeria, but it is also commonly sold at urban markets in Cameroon. It is called 'soldier's food' (or student's food) in Cameroon because it is easy to prepare, requiring only the addition of water and sugar, and it is very filling.

These processed cassava products are easier to distribute than the tuber because there are no challenges with preserving and storing it, it requires minimal labor to prepare, and it is easy to transport. In urban food distribution, chips and a product known as *water-fufu*, which are intermediate processed products of *couscous* and *Bâton de Manioc*, are widely commercialized.

Processing is a necessary condition for cassava commercialization. In commercializing cassava, it is necessary to consider the following: the importance of the processing involved, the diversity of the processed products, and the differences and expansion of markets. In the rural areas where cassava is produced, the choice of which processed products to produce is directly related to the question of which markets to access.

II. Cassava commercialization policies in Cameroon

Policies targeting cassava commercialization in Cameroon began only in the 2000s. The cassava commercialization policy has brought about changes in the farming communities where it is produced, such as the introduction of improved varieties and processing machinery.

Although cassava breeding began in the 1930s during the colonial period in Africa, it was not until the latter half of the 20th century that comprehensive research with the aim of commercialization made progress. The first step in this direction was a project called the Collaborative Study of Cassava in Africa (COSCA), which was conducted from 1989 to 1997. This project was spearheaded by the International Institute of Tropical Agriculture (IITA). The COSCA project surveyed 281 villages in the Democratic Republic of the Congo (DRC), Cote d'Ivoire, Ghana, Nigeria, Tanzania, and Uganda, where cassava is widely grown, to collect information on cassava production, processing, marketing, and consumption. The objective of the COSCA project was to improve not only cassava productivity but also urban and rural food security and increase the income of rural households through the commercialization of cassava (Nweke *et al.* 2002).

In Cameroon, policies directly targeting cassava did not begin until the 2000s. From 2004 to 2012, the Cameroon Ministry of Agricultural Development implemented a program, the Programme National de Développement des Racines et Tubercules (PNDRT), aimed at food security and rural development with funding from the International Fund for Agricultural Development (IFAD). This program aimed to promote improved varieties of processing machinery in collaboration

with the IITA.

For Africa as a continent, the PNDRT is linked to 'The global cassava development strategy,' which is jointly implemented by the Food and Agriculture Organization (FAO) of the United Nations and the IFAD. The global cassava development strategy aims 'to ensure that cassava promotes rural industrial development, increases income for producers, processors, and traders, and provides food security for producers and consumer households' (FAO & IFAD 2000). In short, it was a global program to promote and develop the cassava industry. As part of this program, two improved varieties and processing machinery were introduced in Andom village.

The international organizations' initiative to promote the cassava industry was implemented as a policy and program by the Cameroonian government in 2013, a year after the PNDRT program ended. At this time, the Cameroon Ministry of Agriculture and Development signed a contract with Nestlé and Guinness to export 10,000 tons of processed cassava starch as an ingredient for food processing annually, pledging that 10,000 tons would be exported. A large-scale processing plant has since been built in Sangmelima in southern Cameroon, which has a daily production capacity of 120 tons of cassava starch.

In 2014, the Ministry of Agricultural Development and the Ministry of Economy, Planning, and Land Development, along with funding from the World Bank, launched the 'Investment and Development of Agricultural Markets Project' (Projet d'Investissement et Développement des Marché Agricole: PIDMA). This project aimed to establish an agribusiness that exports cassava and corn as industrial raw materials and strengthen ties with global markets based on large-scale transactions with international companies. They estimated an annual need for 1.4 million tons of cassava tubers as a raw material. This is equivalent to 35% of Cameroon's total cassava production, or 4,082,903 tons counted in 2011 (INS 2013).

Thus, the cassava commercialization policies in Cameroon have positioned cassava tubers as a valuable export. However, there are reports that claim the supply of cassava tubers has not kept up with demand. In 2015, the Cameroon Tribune, a government newspaper, reported that the supply of cassava tubers as a raw material was less than 15% of the required amount, and in response, the government announced the cultivation of 4,000 ha of new land and the introduction of improved varieties of cultivation.

In summary, the cassava commercialization policy in Cameroon promotes productivity improvement through the introduction of improved varieties in terms of production, value addition through the production of processed products at factories in terms of processing, and sales aim to meet the demands of the global market. In other words, cassava is positioned as a raw material for processed products for export, and the aim is to increase the production of cassava tubers without the need for processing in the farming villages where they are produced.

III. Cassava commercialization experiences in Andom

With the growing demand for cassava in the domestic and global market, the question persists of how the position of cassava has changed for the people of

Andom, if at all. This section explores the background of cassava commercialization in the village from a historical perspective.

Andom is a migrant village triggered by colonial rule. The villagers were forcibly moved from the forest zone and forced to work for the construction of a national highway by the German colonial government in the early 1900s. According to village elders, settlements in present-day Andom date back to 1928.

> "My parents grew cassava in the forest. But my parents' father and mother did not know cassava and ate wild yam."
>
> (Woman A: estimated age 80s, interviewed in 2014)

Historically, people started cassava cultivation in the forest before settling in Andom. After settling, the forest continued to be cultivated for cassava until the 2000s, when planting moved to the savanna.

The commercialization of the processed cassava product *pongo* is thought to have proceeded simultaneously with the settlement of the country following the construction of the national road. Guyer (1987) studied the distribution of agricultural products in Cameroon and stated that the commercialization of agricultural products in Central, Southern, and Eastern Cameroon started with colonial rule. According to Guyer, the Cameroonian government's intervention in the agricultural commodity market only began after Cameroon gained independence in the 1970s (Guyer 1987).

Woman B was born in Andom in 1960, the year Cameroon gained independence; A remembers her mother selling *pongo* as a child, during the 1960s and 1970s.

> "When I was a child, my mother sold *pongo* in baskets on the side of the road for 100 FCFA.(4)"
>
> (Woman B: born in 1960, interviewed in 2014)

Sales of processed cassava product *pongo* were already underway around the time of Cameroon's independence. However, it is believed that these were very situational, small-scale sales. It was confined to a small basket held by village women who did not sell their products outside the village limits. It was not until the late 1990s that processed cassava *pongo* gained importance as a source of cash income.

In Andom, coffee and cacao are traditionally cultivated by men. In addition to these cash crop cultivation activities, pineapple cultivation was also active in Andom until the late 1990s and was an important source of cash income for households. Later, pineapple cultivation declined due to the deterioration of fertile land and the spread of pineapple production in suburban areas where the fruit is more widely consumed. This resulted in a decrease in the number of middlemen from urban areas.(5) In parallel with the decline of pineapple cultivation, cacao, and coffee, as cash crops, also declined due to the collapse of international prices in the early 1990s.(6) The former coffee and cacao fields behind houses in the village remain abandoned today.

Cassava cultivation expanded around the time of the decline of cash crops such as coffee and cacao. In 2004, a group of women in Andom began to cultivate cassava in the savanna. They described the reasons for this as follows: (1) The savanna expanded and the arable land in the forest has become more distant, and (2) since there is more space, more cassava can be harvested in the savanna than in the forest. The arable land in the forest is about 5 km away from the settlement. Contrarily, savanna arable land is adjacent to the residential area. Cultivating the savanna has therefore reduced the amount of labor required to transport heavy crops such as cassava. A transition from forest to savanna cultivation will describe the expansion of cassava cultivation.

In addition, the cultivation of savanna land has granted access to land ownership for women. Customarily, land use in Andom allowed for ownership of forest land within a vertical extension from one's house. For arable forest land, ownership, and inheritance rights were granted to men, and usufruct rights were granted to women. Meanwhile, ownership of arable land in the savanna is granted to the cultivator. The fact that women gained access to land ownership through savanna cultivation is one of the factors behind the rapid expansion of savanna cultivation since 2004.

Additionally, improved cassava varieties were introduced to the village during this period of cultivation. The period when women began to sell processed cassava *pongo* at the regular village market and the provincial capital coincided with the period of savanna cultivation and the introduction of improved varieties. During this period, the unit of sale was no longer the small baskets of the past, but basins (20 kg) or bags (50 kg). In other words, women began to process cassava for sale to a wider market.

In Andom, the sale of processed cassava products has occurred on a small scale since Cameroon gained independence. While women had experience selling, this was limited to the confines of the village. It was not until the early 2000s that processed cassava products were marketed outside the Andom and processed for sale. It can be said that processed cassava products have become valuable as a commodity over the past 20 years or so in the village. For women, processing cassava products for sale has changed their daily lives and routines.

Cassava Production and Impact of Improved Cassava Varieties

One of the impacts of the development of cassava commercialization on the production areas was the introduction of improved varieties. Disease- and insect-resistant improved varieties were introduced to production areas to improve cassava productivity, which is a prerequisite for commercialization. This section discusses the impact of the introduction of improved varieties on the production areas in terms of productivity and variety selection. Finally, the response of the local people to the improved varieties will be examined in terms of their orientation toward commercialization.

I. Introduction of improved cassava varieties and changes in cassava yield

Cassava cultivation in Andom involves a fallow style based on the slash-and-burn method. Cassava is planted twice a year. Land clearing occurs during the dry season (July through August and February through March). When the dry season ends and the rainy season begins, the cultivated fields are set on fire (burning fields). Planting takes place at the beginning of the rainy season in April and September (Figure 3).

In savanna fields, cassava is intercropped with maize and groundnut. Maize and groundnut are planted first, and cassava is planted about 3–4 months after the maize harvest is finished. The cultivation method involves nutrient propagation by cutting. After harvest, cassava stems are cut to about 20 cm and inserted diagonally into heaped soil at about 30 cm (mounting method). The harvesting of cassava of local varieties begins 12 months after planting and lasts up to 3 years. After the harvest, the fields fallow for three or more years.

Fields can be broadly classified into growing season fields (fields that have been planted), harvest season fields (fields planted in the previous year), and fallow fields. Maize and groundnut can be harvested while cassava is still in its growing season field. Ultimately, this system allows people to have multiple fields and obtain food through crop rotation.

In Andom, there is a wide variety of cassava plants, categorized as bitter and sweet. Five of the local varieties are bitter cassava and nine are sweet cassava. The nine sweet varieties were brought by women who had married into Andom from other villages.

In addition, national and international projects introduced seven improved cassava varieties in the 2000s. Two of the seven varieties were introduced by a national program called the Programme National de Développement des Racines et Tubercules (PNDRT). Five of the seven improved varieties were introduced through the FOSAS Project,[7] an international cooperative project between Japan and Cameroon, conducted from 2011 to 2016.

In 2010, the year before the FOSAS project began, a survey found cassava cultivation in Andom was suffering from an infestation of Cassava Mosaic Disease[8] (CMD), which drastically reduced the yield of local varieties. A woman in the village described the situation as “I couldn’t gather enough leaves to make *pom* (the sauce for side dishes)”.

The FOSAS project introduced two high-yielding and disease-resistant improved varieties, TMS92/0326 and TMS96/1414, in experimental plots in 2011 and three varieties, TMS92/0057, TMS92/0067, and TME-419, in 2012. Stems were distributed to people one year later during harvest, so the first two varieties were

<table>
<tr><td>Season</td><td colspan="3">Short Rainy Season</td><td colspan="2">Short Dry Season</td><td colspan="3">Long Rainy Season</td><td colspan="4">Long Dry Season</td></tr>
<tr><td>Month</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>1</td><td>2</td><td>3</td></tr>
<tr><td rowspan="2">Cassava</td><td colspan="3">Planting (Farm1)</td><td>Cleaning (Farm2)</td><td>Planting (Farm2)</td><td colspan="3"></td><td colspan="4">Cleaning (Farm1)</td></tr>
<tr><td></td><td colspan="3">Weeding (Farm1)</td><td colspan="3">Weeding (Farm1 & Farm2)</td><td colspan="4"></td></tr>
<tr><td>Maiz / Groundnut</td><td>Seeding</td><td colspan="3">Weeding</td><td colspan="2">Harvesting</td><td>Seeding</td><td colspan="2">Weeding</td><td colspan="4">Harvesting</td></tr>
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Figure 3 Agricultural calendar (savanna zone).

Table 1 Yield of improved cassava variety

Sample No.	Harvesting Area (m^2)	Amount of Yield (kg)	Yield per ha (t/ha)
1	56.160	115.665	20.590
2	80.730	170.685	21.140
3	121.120	243.470	20.100
4	78.860	173.340	21.980
5	86.000	231.125	26.875
6	95.289	228.050	24.000
7	116.600	162.090	13.900
8	148.280	199.600	13.460
9	106.450	271.355	25.490
10	70.168	110.640	15.760
11	34.927	79.325	22.710
Average	20.546 ± 4.275 t/ha (Mean ± SD)		

NB. Yield shows as the fresh weight of cassava tuber.

available in 2012 and the next three in 2014. These improved varieties are known as the Tropical Cassava Selection (TCS) or Tropical Manioc Selection (TMS), which was researched and developed by IITA's cassava breeding program (JAICAF 2006: 30–31).

After two years of cassava cultivation in the experimental plots, cassava stems were distributed to almost all households in the village. Over time, the cultivation of improved varieties was started in neighboring villages, significantly impacting the distribution and diffusion of the improved varieties. People's evaluation of the improved variety was positive due to its high yield and shortened growing time (1 year compared to 1.5 years for the conventional variety). It can be said that the project has achieved a high diffusion rate.

Table 1 shows the yields of improved cassava varieties in people's fields. The survey was conducted in the third year of introducing the improved varieties in the village and was conducted in the fields of 11 farmers by random sampling.[9] The average yield was about 20 t/ha, although the values varied. This value is well above the 5.8 t/ha yield of local varieties in the project plots (Sarr *et al.* 2013). Except for two cases (sample no. 7 and 8), the yield was higher than the national average of 14.57 t/ha (INS 2013). In other words, introducing improved cassava varieties contributed to increased cassava production.

II. Diversity in cassava variety selection

A survey conducted in 2015, the third year following the introduction of the improved varieties, revealed that people grew at least one improved variety of

five per household (Figure 4). The reasons for selecting the improved varieties included less growing time, high yields, and improved processing quality. In particular, TMS92/0326 which had the highest retention rate (95% of the total), was highly valued by the residents for its high productivity.

People cultivated several local varieties while growing improved varieties. The average number of varieties grown by households was 5.4, with some households having up to 11 varieties. While the reasons for selecting improved varieties can be summarized as early maturity, high yield, and processing quality, why some people grew local varieties as well is due to several reasons including eating quality, flavor preference, the cooking time when fresh tubers were boiled, leaf condition (especially harvestability during the dry season), leaf spreading (weeding and leaf harvesting), ease of peeling, and whether the tubers were fibrous or not, as well as color when processed (related to sales conditions as well as eating quality).

In other words, people‘s preferences and convenience are taken into account in the selection process, which involves not only productivity and early maturity, but also food preference, cooking labor, farm labor, and marketing conditions. Cassava is a ‘staple food crop,’ as well as a commodity, and its leaves are a ‘side dish.’ This multiplicity of the positioning of cassava gives people a wide criterion of selection.

It is true that improved varieties have achieved high yields. However, high

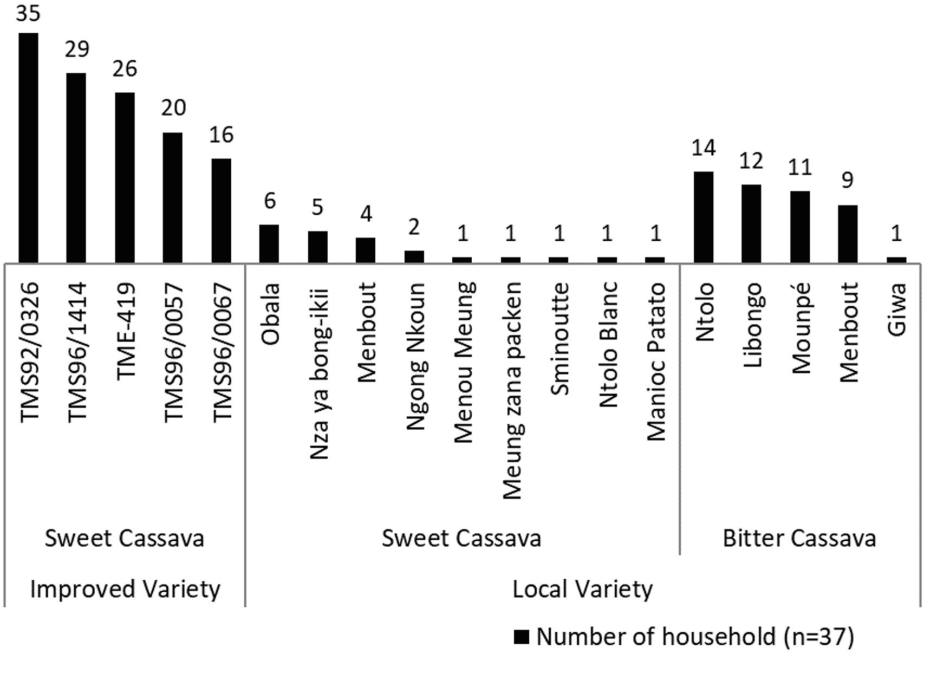

Figure 4 Selection of cassava variety by producer.
NB. Survey of 37 randomly selected households was conducted on August-September 2015, multiple answers available.

yield is not the only valuable quality. For the people who grow, eat, and sell cassava, its value is indicated by its usefulness in terms of cultivation, cooking, processing, and marketing. In this process, improved varieties are also selected and discarded all the same.

III. People's responses to improved varieties

The improved varieties are not perfect, and community members note that while the improved varieties reach maturity sooner, they begin to rot earlier than local varieties. In general, yields of local varieties increase slowly after 10 months of planting and then reach a maximum after about two years (JAICAF 2006: 31). Therefore, people of Andom continue to harvest cassava after two years, while improved varieties begin to rot after 18 months. TME-419, in particular, has a limited harvest period due to black spots that develop inside the tubers after 12 months. This characteristic results in the cassava not having a long 'shelf life' in the field. On the other hand, some producers say that TME-419 produces 'white, high-quality processed products' of high commercial value when processed.

People's evaluation of improved varieties, as described above, is much more diverse than the criteria considered in the breeding process.[10] People discern the nature of the varieties through their experiences in growing, processing, cooking, and marketing. Within these processes, improved varieties are also selected or discarded. In this sense, the TME-419 was a variety that proved to be a remarkable example of a split evaluation by the local people. While some people chose not to grow TMS-419, which requires early harvesting, others, who valued its processing quality, actively cultivated it.

People tend to use multiple varieties based on a number of factors including the cultivation, processing, cooking, and marketing processes. At the same time, production and processing labor is adjusted according to the characteristics of improved varieties. For example, the improved variety of TME-419 deteriorates in quality only after 12 months, but it produces good quality processed products. This variety requires intensive harvesting to produce high-quality processed products, rather than the situational harvesting used in the past. The following AT cases are production and labor adjustments considering these characteristics of improved varieties, market conditions, and living conditions.

Case study 1: Processing and marketing of female AT (Interview in 2014)

AT planned to plant TME-419 from July to August and harvest one year later from July to August. July to August is the holiday season when children return to their village. The children help with harvesting, transportation, and processing, such as peeling cassava tubers.

Additionally, during this period, many people concentrate on processing and selling to earn money for school fees for the new school year which starts in September, resulting in an overabundance of products in the market. During this period of oversupply, quality processed products are more likely to attract buyers.

AT's plan is based on the balance between increased cassava yields and the processing labor associated with the introduction of improved varieties. Cassava processing requires a wide range of work, including harvesting, transporting, peeling, and fetching water to soak the cassava, and AT found it difficult for all of this work to be done by just one person.

With the increase in cassava yields, Andom experienced an issue with large amounts of cassava rotting in the fields due to a lack of processing labor. In 2013, the improved cassava varieties introduced in the project were already spreading across people's fields, and in the words of the people, "we now have more cassava than we can process. The cassava is now too much to process!".

What this phenomenon indicates is the question of whether an increase in cassava production does not necessarily mean an increase in the production of processed products. Fresh cassava is difficult to preserve after harvesting, especially in production areas far from consumption areas like Andom. Cassava can be commercialized only after processing and thus, the balance between production volume and processing labor is a condition for commercialization. In the next section, we examine the processing labor and the processing conditions.

Cassava Processing and Commercialization

In this section, the current status of the balance between cassava production and marketing clarifies in terms of processing labor and processing conditions in the village. It then identifies people's orientation toward the marketing of processed cassava products.

I. Cassava food culture and conditions of processing labor

Cassava is eaten in a variety of ways. Figure 5 shows a classification of the cooking methods of cassava in Andom. Sweet cassava is sometimes eaten raw while being harvested in the field.

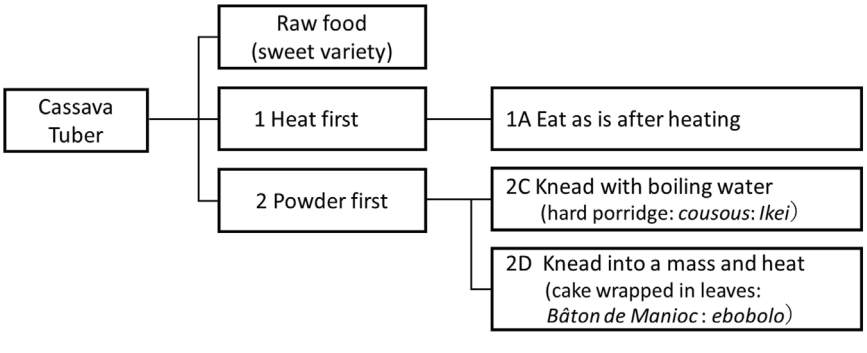

Figure 5 Classification of cassava preparation in Andom.
Revised by the author based on Ankei *et al*. 2016: 27.

The most common way of preparing cassava in Andom is called *ikei* (Figure 5, 2C), or creating flour ground from dried cassava. In terms of food culture, Andom considers itself a 'flour culture' from the way cassava is used and prepared. The processing of cassava is a daily job for women in addition to other farm work.

Figure 6 to 10 show the cassava processing methods and products in Andom.

Harvested cassava is first brought to the garden of the house where it is peeled

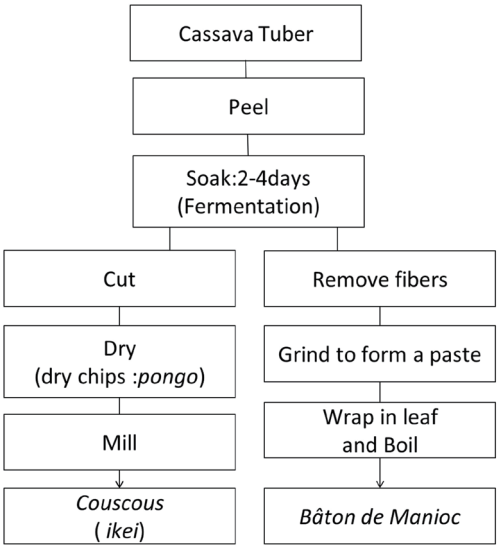

Figure 6 Cassava processing methods and products.

Figure 7 Soaking cassava in water.

Figure 8 Cut cassava soaked in water.

Figure 9 Dry in the sun.

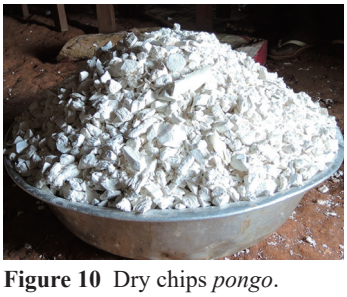

Figure 10 Dry chips *pongo*.

and soaked in water for two to four days. This process, which involves fermentation, effectively removes the poison that is carried in the bitter varieties. This process also adds a distinctive flavor and softens the cassava. After the soaking process, the softened cassava is cut into pieces with a machete and then dried in the sun. This dried block is called *pongo*, which is milled and then kneaded with boiling water to form a hard porridge called *ikei* in *Bamvélé*. In French-speaking Cameroon, both dried blocks (*pongo*) and cooked products (*ikei*) are generally called *couscous*.

In this region, the cassava tuber, as well as its leaves, are used. The leaves are harvested and cooked with oil palm seeds and groundnuts to make a sauce that goes with the cassava *ikei*. This basic meal is behind a common saying in Andom, which is 'all you need is cassava and you'll never go hungry.' This meal is traditionally served during communal labor and funerals.

From a nutritional point of view, cassava leaves contain high amounts of protein, of which the tuberous portion contains only 1–2%. The use of the leaves can supplement not only protein but also potassium, vitamin A, vitamin B1, and vitamin B2 (JAICAF 2006: 22). A traditional meal containing the tubers and leaves is therefore not only a bountiful and profitable staple but also nutritious.

The use of cassava is not limited to meals. In Andom, two types of liquor are made from cassava (Kubo *et al.* 2014). Cassava liquor is home-brewed by women and sold out of their houses and at periodic markets, providing a source of cash income for the women. Damaged processed cassava products (*pongo*) are also used to make liquors too. Cassava is almost a zero-waste crop in the area allowing the tubers and the leaves to use.

Cassava processing is done by women, and the daily processing routine includes making *pongo*, which is used to make the staple food or porridge (*ikei*). This processing labor includes harvesting, transporting, peeling, fetching water for soaking, shredding soaked cassava tubers, drying shredded cassava tubers in the sun, taking the vegetables at night and during rainfall, and storing and managing the dry conditions. The processing time ranges from three to six days, depending on the sunlight conditions involved in the soaking and drying processes. *Pongo* processing is difficult to produce on a mass scale due to the following factors that define the amount of processing.

The first factor is the tools required for processing *pongo*. The survey conducted in 2015 shows that the availability of a soaking tank (200 L) defines the amount of *pongo* processed at one time, and the average household in Andom owned an average of 1.2 tanks. Women in Andom expressed that 'one tank is equivalent to two and a half *pongo* in a basin' and the tank is the unit of measurement for processing volume. The number of tanks owned by a household defines the amount of processing possible, and in Andom, one tank is the higher limit of the amount of processing per time.

The second factor is the number of days required for processing. First, the soaking tanks require two to four days, and no new processing can be done during this period. Additionally, it takes a minimum of two days for the shredded cassava to finish drying after flooding. If a household has only one tank for flooding, it can process cassava up to two times per week, factoring in the time needed for soaking and drying. In terms of the *pongo* volume, the amount that

can be processed per week is 100 kg.

The third factor is the labor required for processing. Harvesting, transporting, peeling, and fetching water are all done on the same day. It is a one-day job, starting early in the morning and ending in the evening. The following is a discussion of each type of labor.

1. Harvesting

A well-grown and harvestable cassava field becomes bush-like more than one year after planting. Harvesting cassava begins with clearing the surrounding area to make it easier to dig out the cassava plants. The harvesting method in Andom includes digging out all the plants, cutting off the stems, and piling the tubers in a corner of the field.

2. Transporting

Cassava is heavy and misshapen, and in Andom, tubers are generally transported by placing them in a basin after harvesting and carrying them on top of one's head. The amount of weight carried at one time is about 35 kg for an adult female.[11] The weight of tubers to fill a 200 L tank for soaking is about 170 kg. In other words, an adult female would need to make about five journeys to process one tankful.

3. Peeling

It is a peaceful scene to see village women peeling cassava while chatting with one another. However, it takes more than two hours for one adult to peel a quantity of cassava that would fill a 200 L tank.

4. Fetching water for soaking

The peeled tubers are immediately placed in a water tank. Therefore, the next task after peeling is to fetch water to fill the flood tanks. Andom's water sources are the river, springs, or hand-pumps. An adult woman then carries at most 25 L of water at a time. It takes two to three round trips to fill a 200 L tank, which is about one hour of hard labor.

5. Shredding soaked cassava tubers

After two days of soaking, the then fermented and softened cassava is shredded with a machete. This work is often done early in the morning before going to work in the fields. This is so the shredded tubers can dry during the day. It takes about an hour to shred a tankful of cassava.

6. Drying shredded cassava tubers in the sun

Shredded tubers are spread out to dry on a plastic sheet or colander so that they do not overlap. The tubers are spread by folding them in half at the waist. The colanders and in the case of the plastic sheets wrapped the wet cassava in are taken into the house each night. The next morning, they are spread out the wet cassava again. This process also takes about an hour and is done every day until the tubers are sufficiently dry.

7. Taking the cassava in at night and during rainfall

Pongo often dries in front of the house. Rain during the drying process presents a huge challenge. When it rains, people must rush back home to rescue their drying *pongo*, otherwise, the quality deteriorates.

In summary, it is clear that (1) *pongo* processing requires a wide range of labor, and (2) each type of processing labor requires not only physical strength but also time. The production conditions for *pongo*, a processed cassava product, are defined by three factors: (1) processing tools, (2) processing time, and (3) labor. While (1) processing tools are a variable factor in the sense that they can be purchased, it is significant that the number of water-soaked tanks owned by a household is 1.2. This is because even if the number of tanks is increased, labor is not always available.

When considering the conditions to produce processed products, an increase in cassava yield does not necessarily translate to an increase in products. Depending on the balance between processing labor and production conditions, it could increase overwork and reliance on wage labor.

II. Market value and processing technic

The production of good quality products is a prerequisite for the process of cassava commercialization. The processing technic is one of the market values. This section discusses the relationship between local processing technic and market value.

In addition to the availability of tools, processing time, and labor, seasonal conditions also contribute to the conditions of processed products. During the rainy season, the soil in the fields is softer, making it easier to harvest cassava. It is also easier to obtain water for soaking. However, the disadvantage of this is that it takes longer for the *pongo* to dry. During the dry season, *pongo* dries quickly, while the soil in the field is hard, making harvesting more difficult. It is also difficult to obtain water for soaking. In other words, the rainy season determines the production of processed products in terms of drying, while the dry season determines the production of processed products in terms of tubers and water acquisition.

These seasonal conditions also affect the quality of products. The people's standards of good quality products have been described as 'white, large, and well dried' (Shioya 2014).

'Whiteness' is related to taste preference, which determines eating quality. At the same time, it is a marketing condition. The color, or 'whiteness,' of processed products is the first thing that urban buyers pay attention to when buying. This means discolored processed products are not marketable and urban consumers prefer whiteness in cassava products. Size is related to sales conditions as well. The unit of sale for processed products is measured with a scale in a basin or bucket, and it is weighed in terms of bulk, not actual weight. The larger the mass of the processed product, the more bulk it has. The larger the bulk, the less likely

it is to collapse during the transportation process, and this is also considered a valuable trait. Urban buyers, who are used to long-distance transportation in poor road conditions, prefer to buy 'large' processed products. Finally, 'dryness' is related to storage conditions, and *pongo* absorbs moisture easily and is prone to mold. If not dried well, *pongo* will deteriorate quickly. They may stand up to self-consumption but are not considered a viable commodity.

The most important condition for good quality processed products, from the standpoint of self-consumption, is 'white and well dried.' People's preferences overlap with the market conditions presented by urban buyers in terms of color and dryness. Thus, people often decide at the cutting stage whether to process *pongo* for their own consumption or for sale. The *pongo* for self-consumption is cut smaller so that it dries as quickly as possible, while the *pongo* for sale is cut larger to suit the buyers' preferences.

In other words, for producers, the difference between processed cassava products as 'self-consumption/commodity' is within the range that can be addressed by fine-tuning at the processing stage. Even if the cassava is processed in 'small' batches for self-consumption, there are still buyers who will take interest in it.(12) At the same time, 'large' batches for processing do not pose a problem if the product cannot be sold as a commodity and is instead used for self-consumption. That means, for people, *pongo* processing is not a choice between 'self-consumption or commodity,' but rather a guarantee of the possibility of choice, where 'both self-consumption and commodity sales are possible'.

In the next section, the possibility of choices for processed cassava products is examined.

III. Processing efficiency and the possibility of choice for processed cassava products

Women in Andom earn cash income by selling processed *pongo* in their yards facing the national highway or at the regular village market. The unit of sale in the village is a basin, and the price of one basin of *pongo* was 3,500 FCFA in 2015.

As mentioned above, people do not weigh processed *pongo* products as they are measured by their bulk. Weight also varies depending on the way the processed product is cut (size) and the degree of dryness. However, in the author's survey, the average weight of *pongo* was around 20 kg, which is equivalent to the weight of one basin. To produce enough *pongo* for one basin requires about 70 kg of cassava tubers. In terms of the basin, this is the equivalent of two basins. In other words, processing 70 kg of cassava tuber yields 3,500 FCFA worth of processed product.

Before processing, 70 kg of cassava tubers is gathered (which is equivalent to two basins). However, when harvesting was not possible due to issues such as animal damage, it was traded for 2,500 FCFA in 2015. The difference between the same amount of processed and unprocessed cassava tubers is 1,000 FCFA. This is equivalent to the price of a beer bottle sold in Andom.

When converting the efficiency of cassava processing into cash, the question arises whether it is appropriate to measure the value of *pongo* in cash, or whether

it would be more efficient to sell the cassava tuber as is, without any processing. A question persists of whether it would be easier to sell the tuber as it is harvested, without the labor and time required for processing.

One answer to this question lies in the choices made by the women who are eager to process cassava.

Case Study 2: "We don't sell cassava tubers."

In May 2016, a buyer from Bertoua, a local city located 50 km from Andom, came to buy cassava via truck. The trader offered to buy a total of five tons of cassava tubers in the village, but MN (a woman in her 50s) in Andom refused the buyer's offer, saying, 'I don't have five tons in my field, and if I sell such a large quantity, what will I eat tomorrow?' MN was not the only one who refused to sell. The buyer left Andom without being able to collect five tons of cassava tubers as he had hoped.

The reason MN refused to sell had nothing to do with the price. It was because of the perception that the cassava in the field is 'tomorrow's food' and that cassava is not just a commodified resource, but it is a staple food for the community. Cassava in the field means food security. It guarantees MN's livelihood. It can be eaten, and if processed, it can be sold. It is the fact that there is cassava in the field that makes these two options possible.

What this case demonstrates is the attitude of the people that cassava and its processed products are 'food' before they are 'commodities' and that the vegetable should be sold efficiently and sustainably. The value is in the continuity of eating and selling the product and the possibility of making choices before considering sales volume and price.

In terms of increasing the scale of cassava commercialization, the bottleneck for cassava as a commodity crop lies in the processing process. Selling cassava without processing is a rational choice that also reduces labor. It is also consistent with Cameroon's cassava commercialization policy, and cassava tubers are in high demand. The buyer in Case Study 2 is based on this situation. It remains to be seen whether Andom villagers will expand their cultivated land to produce cassava tubers for sale and self-consumption. This is a subject for future research. During this study, there were no cases of people selling cassava tubers. Currently, processing and selling cassava enables people to sell small quantities continuously, i.e., to earn cash income as needed throughout the year, and to consume processed cassava products as a staple food for their consumption. The choice of the people of Andom was not oriented toward supporting large-scale commercialization, but rather toward the selectivity of cassava and its processed products first as 'food' and then as 'commodity.'

IV. People's choices about processing and new product sales

While choosing not to sell cassava tubers, the people of the village began selling new processed cassava products in 2018.

The opportunity for sales was provided by urban buyers, and one urban buyer

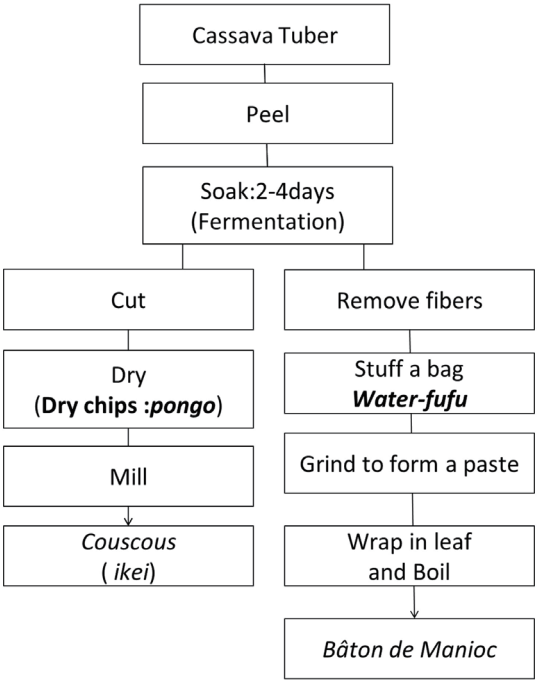

Figure 11 Commercialized cassava products in Andom from 2018 and process.

Figure 12 Bagged *water-fufu* process.

visited Andom and asked the women of the village to sell *water-fufu*. Before 2018, *water-fufu* was never commercialized in Andom. This new processed product is made during the process of *pongo* processing (Figure 11). The water-soaked, softened cassava tubers are not shredded but are drained and bagged (Figure 12).

Behind the new processed product sales are political issues in English-speaking Cameroon. In October 2017, radical leaders declared that the northwest and southwest regions of Cameroon are independent as the Republic of Ambassonia. This triggered a clash between French-speaking Cameroon and English-speaking Cameroon, which led to a logistical split. English-speaking Cameroon was the

main supplier of *water-fufu*.

Water-fufu is an intermediate processed cassava food product in high demand in urban areas. Cooked cassava products (prepared cassava) are sold on the street and in restaurants. Demand for these food service products increase with the growth of the urban population. While the most consumed processed cassava product is *Bâton de Manioc*, of which *water-fufu* is an ingredient. *Water-fufu* is also an ingredient in *fufu* (*couscous*), mainly in English-speaking countries. The Mfoundi Market, a wholesale market in the capital city of Yaoundé, sells materials (leaves and strings) for processing into *Bâton de Manioc* and a dedicated sales area for *water-fufu*, and a series of operations for processing and cooking *water-fufu* into *Bâton de Manioc* are conducted in the market. According to interviews conducted at the market, buyers of *Bâton de Manioc* come not only from Yaoundé, but also from the neighboring country of Gabon.

In Andom village, before *water-fufu* was commercialized in 2018, *Bâton de Manioc* was made for household consumption or small-scale sales at regular village markets, but *water-fufu* did not consume or sold. *Bâton de Manioc* was not commercialized because it only lasts about a week and is labor-intensive to process and prepare. The processing of *Bâton de Manioc* requires harvesting the leaves and wrapping them leaves in cassava paste. For these reasons, *Bâton de Manioc* has never been processed for sale outside the village.

The advantage of *water-fufu*, however, is that it can be stored for about a month after bagging. People generally work for about two weeks, bagging the amount they can process, and then selling it. The decentralized nature of urban demand and processing labor led to the acceptance of the new commodity of *water-fufu*.

The change in the political situation in the country affected the market for processed cassava products and the shift of supply to French-speaking Cameroon created a new opportunity. While the political context was a factor, the reason for accepting this new product was that *water-fufu* production did not require new processing technologies. New sales opportunities were created by commercializing a process of local processing technology in Andom. The widespread acceptance and marketing of new products based on local processing technologies were made possible by the regional expansion of the cassava food culture. The sale of *water-fufu* also did not preclude the possibility of choice: it is both a food and a commodity. The initiation of *water-fufu* sales resulted in people keeping the choice of choosing both food and commodity.

Conclusion

Cassava commercialization in Cameroon is proceeding in two directions. One is the production and commercialization of processed cassava products that meet the demands of the global market. This is driven by national policies and international projects. The other is the production and commercialization of processed cassava products, like the *pongo* or the *water-fufu*, that meet the demands of domestic and regional markets.

The former is that the cassava commercialization policies in Cameroon promote vast improvements in production and in processing through the implementation of improved varieties and factories. Value was added through the production of processed products in factories, and sales aim to meet the demands of the global market. Such large-scale commercialization is predicated on the production of raw materials in the farming villages where the crop is grown. In other words, cassava is positioned as a raw material for exports, and the aim is to increase the production of cassava tubers without requiring processing in the farming villages where they are grown. In this case, local processing technology is not a condition for cassava commercialization.

In the latter case, processed cassava products produced with local processing technology meet the demand of the national and regional markets. Here, local processing technology is a prerequisite for commercialization. However, unlike large-scale commercialization, the production of processed products by local processing technology is subject to several determinants, such as labor and processing conditions, and the yield of cassava tubers does not necessarily translate into higher sales volumes.

It is important to note that in cassava commercialization, added value is brought about by processing technology. In the direction of commercialization in Cameroon, the former, which is based on the global market, is essentially a differentiation between production and processing technology and a quantitative increase in agricultural productivity. In the latter, on the other hand, the expansion of the market based on the cassava food culture has led to the creation of commercial value from local processing technology. This suggests the possibility of a direct contribution to the improvement of household livelihoods in the production area.

The case studies conducted in rural eastern Cameroon show that people's orientation toward cassava commercialization is not reliant on large-scale commercialization, rather, toward commercialization using local processing techniques. In other words, people's orientation toward cassava commercialization is not a transition from subsistence crop production to simply commodity crop production. Rather, it is toward preserving the dual value and selectivity of cassava, maintaining a balance between the two. The dual role of 'staple and commodity crop' is risk avoidant for household livelihoods in the production areas, and local processing technology is a factor in maintaining this duality.

The growth in urban food demand has created new opportunities for local processing technologies to be commercialized, as in *water-fufu* as a regional expansion of cassava food culture. While local processing technologies are not easily linked to quantitative productivity, they may contribute to meeting urban food demand as a value that cannot be industrialized.

This study shows that eating and selling cassava are positioned side by side for people in cassava-producing areas. However, if cassava is large-scale commercialized, there is a possibility that its position as a staple food crop will change, cassava cultivated land will expand, and the use of cassava as wage labor in the village will increase. Examination of these possibilities is a future issue. Commercialization is a constant fluctuation in the relationship between production and consumption areas, as one approach to understanding how people in production

areas cope with this change and how the balance between self-consumption and sales changes, it is practical that an approach focusing on changes in dietary habits.

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Notes

(1) In this paper, ethnic terms and proper names used in the study area are italicized.
(2) The sweet variety group does not require toxic removal. However, it is difficult to clearly distinguish between the bitter and sweet variety groups because the content of toxic components is affected by the growing environment (JAICAF 2006: 23–24).
(3) *Bâton de Manioc*, for example, is well known as *ebubolo* (*Beti* language, central Cameroon), *miondo* (*Douala* language, Gulf of Guinea), which is thinner, and shorter than the one pictured, and *mintumba* (*Bassa* language, central Cameroon to the Gulf of Guinea), which is thicker, shorter and contains palm oil (Grimaldi & Bikia 1985).
(4) The currency in circulation in Cameroon is the FCFA (Franc de la Coopération Financière en Afrique Centrale) issued by the Banque centrale des Etats d'Afrique Centrale (BEAC). Currently, the exchange rate is fixed with the euro. The exchange rate is 566.957 FCFA per euro (1 Japanese yen = approximately 5 FCFA as of 2022).
(5) Pineapple cultivation in Andom began around 1900, when a man of the village who was working in Douala, a city on the Gulf of Guinea, brought back several pineapple plants from there. After eating pineapple for the first time in Douala, the man brought it back to his Andom and cultivated it, hoping that his children would also enjoy the delicious fruit. At the time, there were no pineapple-growing villages in the neighboring areas, and many middlemen came to Andom by truck to buy pineapples. Nowadays, pineapple cultivation has started in the suburbs of the city, and none of the traders come to Andom to buy pineapples, which is far away and has no infrastructure.
(6) From 1990 to 1992, the price of coffee dropped from 600 F/kg to 400/kg, then to 350 F/kg, and finally to 50 F/kg. 1 sack (100 kg) sold for only 5,000 F. 20–30 kg per hectare was possible, but that yield had also dropped. As of 2015, the price was 350–400 F/kg and 3,500–4,000 F/100 kg per sack, and it is starting to pick up. However, to start coffee fields already abandoned, 'you have to start from scratch.' Cacao prices have similarly plummeted, leading people to abandon cultivation, he said. Cacao is harvested and dried in December. They start selling it in March, waiting for prices to rise. However, due to the need for cash, some producers sell as early as February, and some middlemen buy them. In such cases, one sack is worth only 10,000 F.
(7) The project titled 'Establishment of Sustainable Livelihood Strategies and Natural Resource Management in Tropical Rain Forest and its Surrounding Areas of Cameroon:

Integrating the Global Environmental Concerns with Local Livelihood Needs(Forest Savanna Sustainability: FOSAS Project)' was conducted by the SATREPS (Science and Technology Research Partnership for Sustainable Development) program conducted as a collaboration between the Japan Science and Technology Agency (JST) and the Japan International Cooperation Agency (JICA). The implementing organizations are Kyoto University in Japan and the Agricultural Research Institute for Development of Cameroon /Institut de Recherche Agricole pour le Développement (IRAD) in Cameroon.

(8) Viral disease. Disease incidence in Cameroon was 67%/1 million ha in 1994 (JAICAF 2006: 65–67).

(9) The survey method was based on the measurement of the area harvested at one time and the amount harvested (number of stems and weight), which were then converted per hectare.

(10) IITA uses farmer participatory breeding, in which selection criteria are not only disease resistance and yield but also the difficulty of cultivation, harvesting, and processing, as well as quality, in farmers' fields (JAICAF 2006: 36). In these efforts, feedback from farmers after the distribution is utilized, and it is expected that this will lead to more.

(11) 20 adult women in Andom were randomly selected and weighed the weight/time tubers were transported from the field to their homes after harvest. The mean value was 35 kg, and the maximum value was 40 kg (Survey conducted in 2015).

(12) According to interviews conducted at a permanent market in a local city near Andom, merchants from the northern part of the country prefer to sell *pongo*, which is cut into small pieces. Although the same dried cassava (*pongo* in Andom) is used for *couscous*, regional preferences differ depending on how the tubers are cut and dried and also how many days it soaked.

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