Field Scientific Report

Gendered Food Mapping on Boiled Cassava in Benin

Understanding the Drivers of Trait Preferences and the Development of Multi-user RTB Product Profiles, WP1, Step 2

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Ethics: The activities, which led to the production of this document, were assessed and approved by the CIRAD Ethics Committee (H2020 ethics self-assessment procedure). When relevant, samples were prepared according to good hygiene and manufacturing practices. When external participants were involved in an activity, they were priorly informed about the objective of the activity and explained that their participation was entirely voluntary, that they could stop the interview at any point and that their responses would be anonymous and securely stored by the research team for research purposes. Written consent (signature) was systematically sought from sensory panelists and from consumers participating in activities.

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ABSTRACT

The current report deals with “gendered food mapping of boiled cassava quality characteristics”. A survey was carried out to identify the key user-preferred quality characteristics of boiled cassava in rural communities of South-east Benin (Bonou and Dangbo), along the food chain. Cassava farmers, processors and consumers were interviewed on varieties grown, the reasons of varieties choice, and the good and bad characteristics of cassava varieties for making boiled cassava. This was based on methodologies including the triangulation of data collection tools and informants’ sources (community members and leaders; farmers; processors and consumers of boiled cassava; market leaders). Cassava planting practices varied from one location to another, and depended also on the wealth category within location. A great diversity of cassava varieties comprising nine ecotypes were processed into various products. The top two preferred cassava varieties for boiling were “Agric” and “Dossi” known as the first and second most important varieties, respectively, in the district of Dangbo, and for Men and women while the best varieties in Bonou district were Kpèkè and Attinwéwé. Irrespective of gender and regions, the producers preferred early maturing varieties (5–7 months for maturity) with heavy and big roots at harvest, and which final products (boiled cassava, gari, tapioca, lafun, klacou, ablo, agnan, etc.) possess the characteristics demanded by consumers. In the specific case of boiled cassava, the high quality is expected to be white, soft, crumbly, attractive, softened to the touch, easy to swallow and not bitter.

Key Words: Boiled cassava, cassava varieties, consumption habits, farming practices, gender, quality characteristics, social segmentation.

1 KEY INFORMATION FOR BREEDERS

Cassava is processed into a large range of end products with specific characteristics; and therefore it is important that varieties are bred with the quality characteristics in relation with derivated products (e.g. gari, boiled cassava, lafun). Concerning boiled cassava, a good raw cassava for making a high quality boiled cassava was evaluated through the appearance of the peel and that of the flesh of the root, the humidity level (low moisture content) of root and the taste (no bitter) of the root flesh. As far as peel appearance is concerned, cracked and thick peel have been cited as good quality while smooth and red/dark were recognized as poor quality of cassava intended to be boiled. The white colour of the flesh was recognized as good quality characteristic for raw cassava, whereas too yellow colour is not appreciated. To a certain extent, the presence of fibres was also cited as poor quality. Quality characteristics of the final product – boiled cassava – can be grouped into four categories including appearance, texture (crumbliness/friability), odour and taste. Accordingly, all socio-demographic consumer groups like the sugary taste, the crumbly texture and the white color of the flesh, irrespective of age, gender and marital status. New varieties should include farming characteristics such as the ability to thrive in mixed-cropped farms, unfallowed lands, and poor, stoney and dry soils where crops spacing can be minimal. No highly big sized root but with short maturity duration is much requested; Men and women agreed on the quality of the two best varieties for boiled cassava (Agric and Dossi) in Dangbo, while, Kpèkè and Attinwéwé were considered to be the best varieties in Bonou district. When breeders are selecting varities for their trials, it is hopeful to consider the four aforementioned varieties.

2 CONTEXT

This report presents the results from Step 2, Work Package (WP) 1, of the RTBfoods project, which aims to identify the key user-preferred quality characteristics of boiled cassava in two high production/consumption areas of Benin, along the food chain. Boiled cassava is considered as an important food product that can be consumed at all meals and as a snack. Specifically, the Step 2 aims to: (i) understand who is producing, processing, selling and consuming cassava and its processed products, from a gendered perspective, (ii) understand the multiple uses and products of the crop and possible trade-offs between uses, (iii) identify the quality characteristics and descriptors by stakeholder groups and demand segment (iv) understand how gender influences preferences and prioritisation of quality characteristics.

This report provides information on the socio-economic context and product preferences of boiled cassava, with emphasis on the quality characteristics demanded of raw and boiled cassava, prioritised by gender and district. The information from the study are based on fieldwork in eight Beninese rural communities, including focus group discussions and individual interviews to assess demand from a range of users, such as producers, processors, retailers and consumers along the food chain. A bief market study was also conducted.

3 METHODOLOGY

The study was carried out using the multidisciplinary methodology as described by Forsythe et al. (2021), which triangulates data from different informants along the food chain. The study took place in eight rural communities in South-East Benin, in Bonou and Dangbo Districts, two important cassava production and consumption zones (Photo 1) (DPP/MAEP, 2004). For Step 2, four sub-activities were undertaken that integrated key informant group interviews (KII) with community leaders, gender-disaggregated Focus Group Discussions (FGD) with people who produce, process and consume the boiled cassava, individual interviews (II) with community members and market interviews (MI) with key individuals or groups involved in marketing and trading activities. Accordingly, sixteen FGDs were held with men (eight) and women (eight), and seventy seven individual interviews with community members were undertaken. Individual interviews with eight

market and eight community leaders were also undertaken. Qualitative data was transcribed, and descriptive statistics, mainly frequencies, were calculated on some datapoints.

Regarding preferences of quality charactersistics, the number of citations of characteristics was collected and compared to the verbatim words and phrases used by respondents that were transcribed by researchers. The descriptions were grouped by similarity. The importance of crops, cassava's varieties and characteristics was determined according to the prioritisation by the weight of citations. Thus, the number of citations of each items was multiplied by a weight, depending on how their importance according to respondents: by 3 when cited as the first priority, by 2 when cited as the the second priority, and by 1 when cited as the third priority by the respondents. The sum of the counts (number of citations multiplied by the weights) was calculated. If this sum is more than 10, the items are ranked in order of importance.

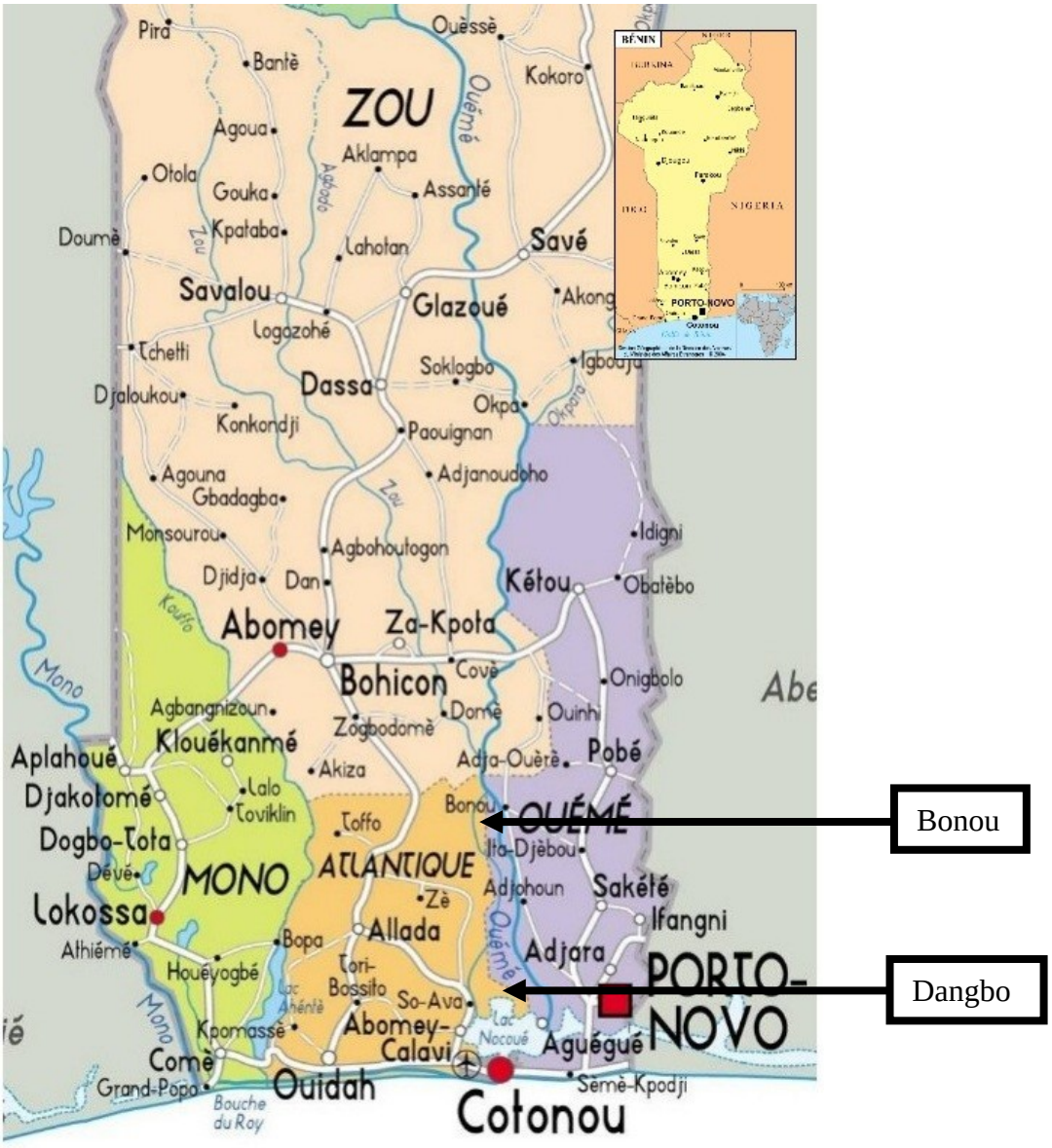

Photo 1 : Survey Area

4 RESULTS

4.1 Socio-economic context and product preferences

4.1.1 Social segmentation and livelihoods

- **What are the different groups of people in your community? (Probe gender social segmentation). What is the relative proportion of the community population in each of the categories? KII Q2**

Table 1: Social segments and their relative proportion (KII Q2)

District, village	Social segments (%)
Bonou, Adido	Ethnicity: Wémè (70%), Yoruba (30%) Wealth: Rich (0%), Moderately rich (40%), Poor (10%), Very poor (50%) Gender: Men (30%), Women (70%)
Bonou, Agbomanhan	Ethnicity: Goun (30%), Wémè (70%) Wealth: Rich (0%), Moderately rich (20%), Poor (30%), Very poor (50%) Gender: Men (40%), Women (60%)
Bonou, Atchonsa	Ethnicity: Goun (50%), Wémè (40%), Yoruba (10%) Wealth: Rich (0%), Moderately rich (10%), Poor (20%), Very poor (70%) Gender: Men (40%), Women (60%)
Bonou, Ouégbossou	Ethnicity: Goun (30%), Wémè (60%), Yoruba (10%) Wealth: Rich (0%), Moderately rich (20%), Poor (30%), Very poor (50%) Gender: Men (30%), Women (70%)
Dangbo, Akpame	Ethnicity: Fon (70%), Toli (30%) Wealth: Rich (20%), Moderately rich (50%), Poor (20%), Very poor (10%) Gender: Men (30%), Women (70%)
Dangbo, Fingninkanmè	Ethnicity: Wémè (100%) Wealth: Rich (10%), Moderately rich (30%), Poor (30%), Very poor (30%) Gender: Men (40%), Women (60%)
Dangbo, Honmè	Ethnicity: Toli (10%), Wémè (90%) Wealth: Rich (0%), Moderately rich (10%), Poor (30%), Very poor (60%) Gender: Men (40%), Women (60%)
Dangbo, Zounta	Ethnicity: Goun (20%), Toli (10%), Wémè (70%) Wealth: Rich (10%), Moderately rich (20%), Poor (30%), Very poor (40%) Gender: Men (40%), Women (60%)

The communities interviewed were very diverse: differences between and within communities were evidenced with respect to wealth, gender and ethinicity. Thus, key informant interviews revealed that most of the communities distinguished differences in their community by wealth status, gender and ethnicity. Irrespective of municipality and villages, the population of women was higher than men, in the range of 60 to 70%. The largest proportion of the population in Bonou were from three ethnic groups (Goun, Wémè and Yoruba) (≥ 30%), compared to two ethnic groups (Goun and Toli) in Dangbo (≤ 30%). However, the dominant ethnical group is Wémè except in Akpame (Dangbo, Fon: 70%) and Atchonsa (Bonou, Goun: 50%) villages. In both regions, different wealth categories were cited and distributed among very poor, poor, moderately rich and rich people. People are distributed in these four wealth categories in villages of Dangbo while in the villages of Bonou, there are only three wealth categories (very poor, poor and moderately rich). According to informants' perception of wealth in their community, there are more very poor people in the villages of Bonou than in Dangbo villages whereas the inverse trend appeared for moderately rich and poor people.

- **What are the livelihood activities of people in the community involving food crops? How important are these activities for people in the community? FGD Q2**

Table 2: Livelihood activities (FGD Q2)

District, village	Livelihood activities and (people they are important for)	
	Men's Focus Group	**Women's Focus Group**
Bonou, Adido	Production of maize (men, adults, Goun, Wémè); beans (young, Goun, Wémè); cassava (men, adults, Goun, Wémè, Yoruba); sweet potato and groundnuts (young, Goun); pineapple and rice (men); palm nuts (adults); yam and cocoyam (Yoruba); yellow yam (léfé); Market gardening; vegetables (women); tomato and pepper (men, young, Yoruba); Fishering (Wémè).	Production of cassava (women, rich); maize (women, Wémè, rich); yam (Yoruba, rich); sweet potato, cocoyam and pepper (Yoruba); groundnuts (women); beans; yellow yam (léfé); bambara groundnut; Market gardening (Wémè); tomato (men, young); okra; jute mallow.
Bonou, Agbomanhan	Production of maize and groundnuts (adults, Wémè); cassava (men, adults, Wémè); beans; yam; sweet potato, rice and palm oil (Wémè); Egusi (adults, Wémè); Market gardening (women, Holi); Processing of cassava into gari (women).	Production of maize (men, Wémè), cassava (women), palm nuts (men), groundnuts (rich), beans, sweet potato; Market gardening, tomato (adults); Processing of cassava into gari and tapioca (women).
Bonou, Atchonsa	Production of cassava, maize, groundnuts, beans, sweet potato and palm nuts (men, adults); Market gardening, vegetables and pepper (women, young); tomato (men, young).	Production of maize, beans, groundnuts, cassava, sweet potato, palm nuts (rich), vegetables, pepper and tomato.
Bonou, Ouégbossou	Production of cassava and maize (men, adults, rich); beans and groundnuts (men); palm nuts (rich); Egusi; vegetables (women); tomato and pepper (young); okra.	Production of maize and cassava (adults, rich), beans, vegetables, Egusi, groundnuts, sweet potato, Trading (women).
Dangbo, Akpame	Production of cassava, maize and groundnuts (men); sweet potato; beans; Market gardening.	Production of cassava; sweet potato; maize (poor); groundnuts (Tori); beans; Market gardening and tomato (women); pepper (women, Wémè, rich); okra.
Dangbo, Fingninkanmè	Production of cassava and groundnuts (rich); maize; rice; sweet potato; cowpea; cocoyam; palm oil; coconut oil; Market gardening, leafy vegetables and pepper (women).	Production of cassava, sweet potato and cocoyam (men, poor); maize (poor); groundnuts (rich); Market gardening (women).
Dangbo, Honmè	Production of maize, cassava, cowpea, sweet potato, cocoyam, groundnuts, Egusi, palm nuts, vegetables, tomato, banana and plantain (men, adults: 31–70 years, Wémè, rich).	Production of cassava (women, rich); maize (men, rich); groundnuts and sweet potato (poor); beans; Market gardening; Field works (aged women); Processing of cassava into gari (women).
Dangbo, Zounta	Production of cassava, maize, palm nuts, groundnuts, cocoyam, sweet potato, beans (men, young, Wémè).	Production of cassava (men, Goun, Tori and Wémè); sweet potato (men); maize (Goun, Tori and Wémè); palm nuts (rich); beans; groundnuts; Egusi; Market gardening (women, Goun, Tori and Wémè); vegetables (young).

Farming was the core livelihood activity for all communities in the study area. Generally, the production of cassava, maize, sweet potato, groundnuts, beans and market gardening were the main livelihood activities identified. All community members of the villages of Bonou and Dangbo were involved in these activities, regardless of gender, age and wealth categories. However, production of some crops was reported to be performed by women (market gardening in Dangbo villages), rich people (palm nuts) in the study areas. Although the ethnic group Wémè was mostly involved in all livelihood activities, being the dominant ethnic group in the study villages. The ethnic groups Goun

(in Bonou and Dangbo districts), Tori (in Dangbo district) and Yoruba and Holi (in Bonou district) were also involved in production of these crops. Also, in Agbomanhan (district of Bonou) and Honmè (district of Dangbo) villages, women process cassava into various products including gari and tapioca.

Interestingly, some women's FGD reported that only rich adults (Ouégbossou) or rich women (Honmè) produced cassava. Another women's group reported that only men grew the crop (Zounta). This is contrary to common perceptions that cassava is a poor person's crop, and women's crop, and therefore gender-related differences are important to identify in different contexts. Generally, rich people had financial ressources to engage land-workers, and to buy all nercessary inputs and materials for farming, especially cassava production (see below Table 5). Moreover, women benefit loans from microfinance institute which enhance their financial investments in their activities, especially cassava production. In other communities, women and men reported that they produced the crop and it is important to their respective gender.

- **In your community, imagine there are four different wealth categories, wealthy, moderate, poor, and very poor. How would you describe the differences between the groups in your community? FGD Q3**

Table 3: Description of wealth categories (FGD Q3)

District, village	Wealth categories, meaning and descrption (FGDs)	
	Men's Focus Group	**Women's Focus Group**
Bonou, Adido	**Rich (Olowo/Dokounon/Djènon)**: he has beautiful tiled house, car, motorcycle, and milling machine; his children go to school and have home tutor/teacher. **Moderately rich (Abouya/Akouènon)**: has clay house with rough casting, motorcycle, and eats to his fill. **Poor (Wamonon/Talaka)**: he eats by the sweat of his brow, has motorcycle, bicycle, clay house without roughcasting, and his children go to school. **Very poor (Talaka)**: doesn't have the means of transportation, has clay house covered with straw, and he is not able to eat to his fill.	**Moderately rich (Etonkponté)**: have palm groves, lands, and machines to extract palm oil; builds beautiful cement houses and his children go to university. **Poor (Wamonnonmanadouko)**: buys motorcycle, land but he doesn't have palm grove; and his children go to university with difficulties. **Very poor (Wamamonnon)**: builds clay house covered with sheet-metal, has bicycle, borrows and owes money to everyone.
Bonou, Agbomanhan	**Rich (Akouènon)**: has beautiful brick houses, motorcycle, takes/hires land-workers, and his children are well-dressed and go to ''good''/ famous school. **Moderately rich (Ekponténi)**: has a motorcycle, solves his problems by himself, and his children go to school. **Poor (Wamonnon)**: has clay house, manages daily, and his children go to school even though with difficulties. **Very poor (Wamamonnon)**: he is always land-worker, lives in a house with an opened roof, brings back cuts of meat from the ceremonies, and his children uniform is often torn.	**Moderately rich (Etonkponté)**: buys motorcycle and lands, builds cement house, takes/hires some land-workers, and his children go to university. **Poor (Etinkponkpèdé)**: builds clay house roughcasting, buys motorcycle and land (with difficulty). **Very poor (Wamamonnon)**: eats with difficulty, builds clay house covered with straws, and is always worker for other people.
Bonou, Atchonsa	**Rich (Dokounon)**: has cars, beautiful houses, takes cares of his children who go to private school, eats to his fill and well, and solves his problems by himself. **Moderately rich (Ekpontenin)**: has motorcycle and clay house with roughcasting and sheet-metal roof, eat to his fill, send his children to school, and solves his problems by himself. **Poor (Wamonnon)**: has motorcycle, clay house without roughcasting, eat his to fill, and his children go to public school. **Very poor (Mandodenon)**: he is jack-of-all-trades, permanent land-worker, doesn't have motorcycle, and cannot eat his to fill daily.	**Rich (Dokounon)**: builds cement houses with tile, buys cars and things of value, is well-dressed, and has everything he wants. **Moderately rich (Gbèdonannon)**: builds clay house with roughcasting, has motorcycle, some lands and wealth, his children don't progress at school and are not going no further than first class of junior high school. **Poor (Wamamonnon)**: builds a precarious house, has neither motorcycle nor land, and his children don't go to school. **Very poor (Wamamonnon toton):** he is land-worker for other people, stays in family house, and his children don't go to school.
Bonou, Ouégbossou	**Moderately rich (Akouènon)**: has houses, motorcycle and shops, eats well, dress well and costly. **Poor (Minkponténin)**: has motorcycle and clay house with sheet-metal roof, manages to feed his family, and his children go to school with difficulties. **Very poor (Gbèdonanon)**: doesn't have motorcycle, has clay house with straw roof, borrows money to everyone, and his children don't go to school.	**Rich (Agbonnon/Akouènon)**: he is well-dressed, builds cement houses with tiled floor, and his children go to university. **Moderately rich (Etonkponté)**: builds cement house, and manages to pay at time his children school fees. **Poor (Watchobadou)**: builds clay house, and manages to send his children to university.

District, village	Wealth categories, meaning and descrption (FGDs)	
	Men's Focus Group	**Women's Focus Group**
		Very poor (Yatonon): he depends on someone to eat.
Dangbo, Akpame	**Rich (Dokounon):** has motorcycle and/or car, and his children go in private school and/or out of the village to continue their studies. **Moderately rich (Ekponténinkpèdé):** buys some lands and motorcycles, eats to his fill, and his children go to school. **Poor (Wamonon):** solves his problems by himself, eats to his fill, and builds brick houses. **Very poor (Wamamonnon):** has difficulty to eat and to send his children to school, builds clay houses and receives help from people.	**Rich (Akouènon):** builds beautiful houses and buys cars and lands. **Moderately rich (Ekponténin):** has difficulty to buy car and to send his children to university, buils cement house. **Poor (Wamonon):** builds clay houses, manages to satisfy daily food needs, and his children stop their studies at senior high school. **Very poor (Wamamonnon):** has difficulty to build clay houses and to eat, his children don't go to school.
Dangbo, Fingninkanmè	**Rich (Akouenon)**: has lands, vast fields, palm groves, houses, cars to transport his harvest, and he commands respect. **Moderately rich (Min ékponténin)**: can cultivate vast lands, has motorcycle, house, and children. **Poor (Wamonon):** manages and can be an occasional land-worker, tries to make a living, and has a small straw house. **Very poor (Wamamonnon)**: doesn't want to do anything, drunkard, beggar and asking help everywhere, living at his family or his spouse's expense who feeds him.	**Moderately rich (Etonkponté):** buys motorcycle, builds a small house, and his children do high studies but with difficulties. **Poor (Edokanho)**: doesn't have motorcycle, builds clay house, and his children have to find jobs in order to get money needed to continue their studies. **Very poor (Wamamonnon)**: doesn't have anything to eat, lives with his friends and parents help, builds rack houses, and his children stop their studies at primary school.
Dangbo, Honmè	**Rich (Akouènon/Adokounnon)**: has houses, lands, big farms, palm grove, processing machines and takes some land-workers. **Moderately rich (Ekponténin/Akouènonkléoun)**: have houses and palm grove but not as much as rich people. **Poor (Wamamonnon)**: has straw house, doesn't have bicycle, and to provide food to his children. **Very poor (Gbedonanon)**: is slothful, drinks alcohol, and doesn't have land and house.	**Moderately rich (Akouènon)**: has cars and brick houses, buys lands, takes land-workers, and his children go to university. **Poor (Wamonnon)**: has clay house and motorcycle, has difficulty to send his children to university, and cannot buy any land. **Very poor (Wamamonnon)**: has bicycle, clay house, doesn't have food, and gets help from people.
Dangbo, Zounta	**Rich (Akouènon)**: builds brick houses, plows field with machines; his fields are well-maintained, has cars to transport his harvest, and takes enough land-workers. **Moderately rich (Akouènon)**: buys motorcycle (new or second hand) and builds clay house with roughcasting **Poor (Wamonnon)**: has small field just for home consumption. **Very poor (Hintonon)**: asks food to eat, doesn't have field, and makes does small jobs regardless his age.	**Rich (Agbonnon/Akouènon)**: buys lands and cars, has enough palm groves and builds beautiful houses. **Moderately rich (Edoétonkpèdé)**: has motorcycles, brick house with sheet-metal roofing, and buys few lands. **Poor (Wamonnon)**: has motorcycle, clay houses, and works everytime to builds brick house. **Very Poor (Wamamonon)**: doesn't have house, does small job anytime, finds to eat but doesn't money, and has bicycle.

According to the community members interviewed, the wealth categories were defined with the following criteria:

- being independent and autonomous;
- having enough food to eat to his fill and that of his family;
- being able to easily educate his children (from primary school to university);
- having movables (car, motorcycle, bicycle, processing machines) and/or real estate (house, land, fields, palm groves, shops) goods;
- being able to delegate his tasks to other people (home teacher, land-workers, jack-of-all-trades) against payment;
- being able to solve his problems by himself.

Thus, depending on quality and quantity of the holdings, the community members' interviewed had identified four wealth categories including very poor, poor, moderately rich and rich people, in the increasing order of wealth categories. The definition of wealth categories did not reveal any huge difference between very poor and poor as well as between moderately rich and rich. Likewise, this lack of differences is also perceived in the terminology used to name the wealth categories in the local languages. For instance, "Akouènon" can be used to name a "moderately rich" and a "rich" among the communities of Ouégbossou in district of Bonou as well as those of Honmè and Zounta in district of Dangbo. Similarly, "Wamamonnon" is used as a name for poor and very poor people in Atchonsa (district of Bonou) and in Honmè (district of Dangbo). In the four villages in Bonou or Dangbo, there were very poor, poor and moderately rich people whereas Dangbo communities have a higher rich statuts than Bonou communities according to their description of wealth categories.

4.1.2 Farming practices and social segmentation

- **Are there differences in the ways in which people farm in your community? FGD Q 4.1 Are these differences related to different groups of people in your community? Probe social segments. FGD Q4.2**

Table 4: Farming practices (FGD Q4)

District, village	Farming practices	
	Men's Focus Group	**Women's Focus Group**
Bonou, Adido	Intercropping (maize + cassava or groundnuts or tomato) and monocropping are performed. Land size varies depending on financial means, inherited lands and/or physical capacity (strength) of landowner. Members of producer groups don't all have the same financial means and don't all cultivate the same crops. Men give a small portion of lands to their wives.	Rich people buy fertilizer while other people use animal manure. Everyone cannot cultivate the same land size. Lands cultivated for more than 3 years are not fertile anymore. Depending on their physical and financial capacities, men and women rent separate plots on which they grow the crops of their choice.
Bonou, Agbomanhan	People who don't have enough land perform intercropping such as maize + cassava or cocoyam and cassava + groundnuts or cocoyam or bean. Land size and type depend on technical and financial assets required for the cultivated crops. Lands are given to the producer groups by the landowners. Swamp lands are more fertile than laterite soils and dry lands. Men give little plots to their wives to do market gardening and a little cassava. Each cultivates according to its needs depending on the season. Adults and rich people grow more maize and cassava than the young and poor ones. Wémè, as indigenous people, are more involved in food crops production more than the other ethnic groups.	Land size differs according to the financial capacity of the landowner. In swamp lands, cassava and beans have good yields compared to dry land. However, Agric variety was recognized as having a good yield on dry land also. Women can cultivate the same crops as men, or they can choose to grow other crops. Having individual plots depends on the capacity of each (men and women).
Bonou, Atchonsa	Farming practices are the same with some crops intercropping (e.g., maize + cassava) or not (beans production and market gardening are conducted alone). Men practise more intercrop than women. Land size differs according to people's financial means; number of land-workers; inherited, owned or rented lands. Dry lands with stones are not fertile as swamp lands or dry lands without stones. Each producers group works according to the number of his members. Women have small plots to do market gardening and any other crops they want. Young people are more involved in market gardening than adults. Rich people have more lands than the poor ones; thus, they usually perform monocropping. Some rich women rent lands to increase their production.	When soil is impoverished, they leave it to go elsewhere. Areas which can be flooded are rich after the rainy season. Women get a portion of lands from their husbands or buy it when they have financial means. Men and women cultivate according to their physical and financial capacities.
Bonou, Ouégbossou	Farming techniques are not the same; both intercropping (maize + cassava or Egusi or tomato) and monocropping are performed. Cassava and maize have good yields in swamp lands and on laterite soils inversely to on sandy lands. Rich people having more financial means always make more than the others and buy more lands. Inversely, poor people sell their lands to the rich ones when they need money. Those who inherited land from their parents have many lands too. Everyone produces according to his strength and financial means. Men give a little land to their wives. Women prefer market gardening, especially vegetables. Adults produce more than young people.	Lands size vary. Rich have more lands than poor people. Men have physical strength contrary to women. Adults cultivate more lands than young people (15–18 years).
Dangbo, Akpame	Lands are of different sizes due to the fact that financial means are not the same. Rich people have more plots than the poor ones. When men have enough lands, they can	Cultural practices are the same but some use fertilizers while others use coal ashes. Everyone

District, village	Farming practices	
	Men's Focus Group	**Women's Focus Group**
	give a whole land to their wives if not they share their land. Individual plots are got by inheritance or depending on financial means. Swamp lands are more fertile than dry lands. Men and women are free to cultivate what they want. Cassava is more cultivated than other crops. Men and adults grow cassava more that women and young.	cannot have the same plots size. Men and rich people have more lands than women and poor people. Swamp lands are 10 times more fertile than dry lands. Women cultivate on their land following their preference.
Dangbo, Fingninkanmè	Maize can be grown either in rotations or in intercropping (maize + cassava for example). Rich people have big surfaces and can get help from occasional workers whereas the poor ones work by themselves on small surfaces. Farming practices, variety, maintenance are of great importance for good harvests. Hence, poor people can get better yields with good care of their fields than the rich ones without any care of their fields. The fertility of some lands is decreasing and financial means are needed to buy fertilizers of which use are necessary to improve the outputs. Men and young people cultivate more than women and old people. Old people have more lands but need help from young land-workers. Women do market gardening and also produce the same crops as men for home consumption. There are some groups of market gardeners and rice producers at district level.	Everyone doesn't have the same financial capacity and cannot buy fertilizers. Plots don't have the same size. Soils are not fertile everywhere. The husbands give few lands to their wives who are free to produce what they want on it. Adults people are more involved in crops production that the young ones. Producion of crops in association or alone is highly performed. Rich used to do monocropping, except for market gardening. Women are more involved in vegetables production.
Dangbo, Honmè	The levels of wealth play a key role on cropping and its quality. Rich people have big/vast lands. Women and middle aged people have their own plots. Men and adults cultivate more than women and young people (18–30 years).	Cultural practices are the same but everyone cannot have the same land sizes (some lands are inherited) and buy fertilizers because of financial means. Cultivated crops can be the same or not. Swamp lands are more fertile than dry lands. Women grow more cassava and sweet potato than men who produce more maize. Rich people cultivate maize and cassava more than poor people. Wémè people are more involved.
Dangbo, Zounta	Rich people buy fertilizer for the crops. Men, adults, rich and Wémè people have more fertile lands and cultivate them more than women, young, poor and Tori people. When plots are separated, there is competition between men and women although men have big/vast plots.	Rich people use fertilizers in their fields because less fertile soils induce fewer outputs. Men and rich people have bigger plots (including palm groves) than women and poor people. Men give lands to their wives and each of them grown what they want. Men grow maize and cassava more than women. These livelihood activities were more practiced by Wémè people.

In the communities, there are no collective plots for cassava but market gardening and rice production are carried out by some male cooperative groups in one village at Dngbo (Fingninkanmè). The levels of wealth play a key role on cropping and its quality. Land sizes vary according to the size of inherited lands or the financial and physical (strength) capacities of the farmers. Moreover, lands size and type depends on technical and financial requirements of cultivated crops.

Thus, everyone cannot have and cultivate the same land size. Indeed, men and rich people, with larger land sizes than women and people who are poor, receive occasional help from young land-workers. Otherwise, soils are not fertile everywhere, and the fertility of some lands are decreasing as a result of excessive use. Hence, land fertility is inversely related to number of years of cultivation Thus, it is necessary for farmers to have the financial means to buy fertilizers (mineral and/or organic) which contributes to improve soil fertility. Some people (the rich ones) buy and use mineral fertilizers while the others use animal manures or coal ashes. However, swamp lands are more fertile than red, sandy and dry lands. Men, adults, rich and Wémè ethnic groups have more fertile lands than women, young, poor and Tori ethnic group. Individual plots are acquired by inheritance or depending on financial means. When men have enough lands, they share their lands with their wives or they can give them a whole land. Conversely, men and women rent separate plots of which size and type depend on their physical and financial capacities, although men and rich people have bigger plots. Both of them grow the crops of their choice according to their physical and financial capacities. Men, adults and rich people grow maize and cassava more than women, young, old and poor people. Women have small plots for market gardening and the production of vegetables and other crops intended for home consumption such as cassava and sweet potato. Farming practices vary from monocropping to intercropping (e.g., cassava-maize, cassava-groundnuts, cassava-cocoyam or cassava-bean). Men without much land will perform intercropping while rich people will do monocropping.

- **Do men and women farm on separate plots or shared farms in this community? If separate, what are the differences and similarities between men and women's plots? If shared, what proportion are each? If men and women farm together, are there differences in the type of work that men and women do? FGD 4.3**

Table 5: Differences in men and women's plots (FGD 4.3)

District, village	Men's Focus Group	Women's Focus Group
Bonou, Adido	Lands: Men (80%), Women (20%).	Lands: Men and women farm rented lands. Women can cultivate the same crops as men and decide what to cultivate and the way to do it. Men do the ploughing and remove weeds whereas women sow and harvest.
Bonou, Agbomanhan	Lands: Men (80%), Women (20%). Men do the ploughing, planting and sowing but women sow and harvest only.	Lands: Men (70%), Women (30%). Men and women farm as they want and can work together. Men make ridges, ensure transportation of harvests by bicycle whereas women sow, plant and harvest.
Bonou, Atchonsa	Lands: Men (70 – 80%), Women (20 – 30%). Plots don't have the same sizes but men and women can do the same crops or different crops. Men do ploughing, clearing and harvesting while women plant cassava cuttings with men.	Lands: Men (80%), Women (20%). Women choose crops to grow on their plots and the way to grow them. Women sow and harvest while men and women remove the weeds.
Bonou, Ouégbossou	Lands: Men (90%), Women (10%). Men and women can do the same crops or that of their choice. Men do clearing and	Lands: Men (70%), Women (30%).

District, village	Men's Focus Group	Women's Focus Group
	ploughing while women sow, harvest and collect. Women also help to plant cassava cuttings.	Men have money to recruit land-workers for their farms. Women do the ploughing and remove the weeds as men.
Dangbo, Akpame	Lands: Men (70%), Women (30%). Cultivated crops are sometimes the same but usually women grow what they can quickly harvest and sell. Men do the ploughing and clearing whereas women sow, harvest (with men) and collect.	Lands: Men (80%), Women (20%). Men and women can do the same crops or not and can cultivate on separate plots. Men do the ploughing, make ridges while women sow and harvest.
Dangbo, Fingninkanmè	Lands: Men (80%), Women (20%). Men have big/vast plots while women have small plots and women make more market gardening. Sometimes, men and women grow the same crops. Men do the ploughing whereas women sow and help to harvest.	Lands: Men (70%), Women (30%). In case of shared plots, the wives always help their husband. Men make ploughing while women sow and plant. Men plant sweet potato and cocoyam because they dig the hole that must be deep.
Dangbo, Honmè	Lands: Men (60%), Women (40%). Men have more money and use it to buy fertilizers and to take land-workers. Women sow, plant, add fertilizers, harvest and sell harvest products. Men do the ploughing.	Lands: Men (90%), Women (10%). Men and women can do the same crops or each makes what they want. Men do the ploughing and women sow.
Dangbo, Zounta	Lands: Men (70%), Women (30%). Men have bigger plots than women although both grow the same crops. Women sow, harvest and collect while men do the ploughing. Men and women remove the weeds.	Lands: Men (80%), Women (20%).

In all communities, men have larger plots compared with women. The custom is that men give access to an average of 20–30% of their lands to their wives. Women decide what crops and how to farm on their plots, but they usually cultivate crops that can be harvested and sold quickly. In general, women always help their husbands on their plots undertaking activities such as weeding, ploughing and planting of cassava cuttings although men are able to do all tasks that women do. Men perform tasks such as ploughing, clearing, planting, making ridges, digging holes, ensuring transportation of harvests, while women sow, weed, add fertilizers, harvest, etc. In addition, it is often men who have capital to purchase fertiliser and recruit labourers to assist their farm work, where this is not common practice among women.

4.1.3 Important crops in the community

- **What are the three most important crops for people in your community, in order of importance (1 is most important)? FGD 5.1**

Table 6: Important crops in rural communities (FGD 5.1)

Crop importance	Gender		Regions	
	Men	Women	Bonou	Dangbo
1st	Maize	Maize	Maize	Maize
2nd	Cassava	Cassava	Cassava	Cassava
3rd	Groundnuts	Beans & Palm nuts	Palm nuts & Tomato	Groundnuts
4th	Tomato	Groundnuts	Beans	Beans

Overall, the most important crops cultivated in the communities were beans, cassava, groundnuts, maize, palm nuts and tomato, irrespective of gender and the region under study. Among these crops, maize and cassava were the most important crops, regardless of gender and regions. This may be

because maize and cassava are important starchy staple foods for household consumption that also generate income through their trading as raw or processed products. Moreover, maize and cassava's end-products can be stored for relatively long time, thereby being available for use at anytime since the majority of Beninese people consume maize- and cassava-based products daily. The fact that maize was the most important crop and cassava the second most important suggests that maize had a better market value than cassava. The third and fourth most important crops for men were groundnuts and tomato, compared to beans, palm nuts and groundnuts for women. The importance of tomato for men is likely related to its ability to bring income and provide food for the household. By region, groundnuts and beans were the third and fourth most important crop in the district of Dangbo, and palm nuts and tomato, and beans, in Bonou.

- **Why are those crops important? FGD 5.2 Are there groups of people in the community for whom the crop is more important? (Probe differences in social segments) FGD 5.3**

Table 7: Reasons why the crop is important and for whom (FGD 5.2 and 5.3)

Crops	Reasons why the crop is important (Q 5.2)	People for whom the crop is important (FGD 5.3)
Maize	Staple food, home consumption, several derived products (massa, akassa, coco, wô), income provider/generation (all FGDs, Bonou and Dangbo); good yield, quick harvests (men's FGD Dangbo); daily consumption, short (3 months) growth cycle (women's FGD Bonou)	Men and women (all FGDs)
Cassava	Income provider, many derived products (boiled cassava, gari, tapioca, lafun), home consumption, long (7 months) growth cycle (all FGDs, Bonou and Dangbo); good yield in swamp lands (women's FGD Dangbo)	Men and women (all FGDs)
Groundnuts	Income provider (all FGDs Dangbo); short (3 months) growth cycle, (men's FGD Dangbo); many derived products (oil, grilled groundnuts), home consumption (women's FGD Dangbo).	Men and women (all FGDs Dangbo)
Palm nuts	Sign of wealth, income provider (all FGDs Bonou); derived products (palm oil and oilcakes) (men's FGD Bonou)	Men and women (all FGDs Bonou)
Beans	Income provider, home consumption (all FGDs Dangbo); short growth cycle, mono-seasonal and -annual crops, cultivated either in swamp lands or on dry lands (women's FGD Bonou)	Men and women (all FGDs Dangbo) Women (FGD Bonou)
Tomato	Income provider (all FGDs Bonou); short growth cycle, fast harvest (men's FGD Bonou)	Men and women (all FGDs Bonou)

Overall, there is a huge similarity between the FGDs of the "Reasons why the crop is important" for priority crops among the community members' interviewed. Crops are considered to be important when they are used for household consumption and for income generation among households through selling of either raw or derived products. Except for cassava, their short growth cycles facilitate their availability all throughough the year and their high comparative market value. Income generation was a key reason cited by men and women FDGs to justify the production of palm nuts and tomato in district of Bonou and that of groundnuts and beans in district of Dangbo. Similalrly, the diversity of groundnuts and palm nuts derived products appeared as an important reason respectively for women in district of Dangbo and for men in district of Bonou. As far as growth cycle is concerned, the short growth cycle of maize and beans are considered as important reasons by women's FGD in district of Bonou while that of groundnuts and tomato were important for men's FGD in district of Dangbo and Bonou respectively. Regarding yield, it was an important reason for growing maize and cassava in district of Dangbo for men and women respectively.

4.1.4 Crop of focus

- **Please describe how the crop is generally grown in this community (KII Q4)**
- **What is the estimate proportion (%) of people in the community who grow the crop? KII Q5**

Table 8: Planting ways/pratices: Differences in men and women's plots (KII Q4, 5)

Community	Description of how the cassava is grown	Proportion (%) of people in the community who grow the cassava	Proportion (%) the average household consuming boiled cassava
Bonou, Adido	Planting method: make the ridges and plant cassava cuttings. Cassava is planted either in monocropping (by rotation with tomato) or in intercropping with maize or beans.	Gender: Male (80%), Female (20%) Ethnicity: Wémè (70%), Yoruba (30%) Age: 18–29 years (20%), 30–49 (40%), 50–69 (20%), > 69 (20%) Wealth: Moderately rich (40%), Poor (50%), Very poor (10%)	Ethnicity: Wémè (1.2%), Yoruba (0.8%) Age: < 18 years (20%), 18–29 (20%), 30–49 (20%), 50–69 (20%), > 69 (20%) Wealth: Moderately rich (10%), Poor (30%), Very poor (60%)
Bonou, Agbomanhan	Planting method: make the ridges and plant cassava. Cassava is cultivated in monocropping in swamp lands while it is grown in intercropping with maize on dry lands. Cassava is also produced in rotation with pepper.	Gender: Male (40%), Female (60%) Ethnicity: Goun (30%), Wémè (70%) Age: 18–29 years (25%), 30–49 (40%), 50–69 (25%), > 69 (10%) Wealth: Rich (50%), Moderately rich (30%), Poor (10%), Very poor (10%)	Ethnicity: Fon (50%), Wémè (50%) Age: < 18 years (40%), 18–29 (35%), 30–49 (15%), 50–69 (10%) Wealth: Moderately rich (20%), Poor (30%), Very poor (50%)
Bonou, Atchonsa	Planting method: make the ridges and plant cassava cuttings. Cassava is grown in association with maize or in rotation with maize and groundnuts.	Ethnicity: Goun (50%), Wémè (30%), Yoruba (20%) Age: 18–29 years (40%), 30–49 (50%), 50–69 (10%) Wealth: Moderately rich (70%), Poor (20%), Very poor (10%)	Ethnicity: Goun (40%), Wémè (60%) Age: < 18 years (25%), 18–29 (30%), 30–49 (15%), 50–69 (20%), > 69 (10%) Wealth: Moderately rich (10%), Poor (40%), Very poor (50%)
Bonou, Ouégbossou	Planting method: make the ridges and plant cassava cuttings. Cassava is planted in association with maize or in rotation with beans.	Gender: Male (50%), Female (50%) Ethnicity: Goun (40%), Wémè (50%), Yoruba (10%) Age: < 18 years (20%), 18–29 (20%), 30–49 (20%), 50–69 (20%), > 69 (20%) Wealth: Moderately rich (10%), Poor (40%), Very poor (50%)	Ethnicity: Goun (20%), Wémè (70%), Yoruba (10%) Age: 18–29 years (30%), 30–49 (30%), 50–69 (20%), > 69 (20%) Wealth: Moderately rich (5%), Poor (30%), Very poor (65%)
Dangbo, Akpame	Planting method: plow, make the furrows, put fertilizers and cover. Cassava is grown in intercropping with maize or in rotation with maize and groundnuts.	Gender: Male (70%), Female (30%) Ethnicity: Wémè (70%), Toli (30%) Age: 18–29 years (10%), 30–49 (50%), 50–69 (30%), > 69 (10%) Wealth: Rich (40%), Moderately rich (30%), Poor (30%)	Ethnicity: Wémè (50%), Toli (50%) Age: < 18 years (50%), 18–29 (30%), 30–49 (10%), 50–69 (5%), > 69 (5%) Wealth: Rich (10%), Moderately rich (20%), Poor (30%), Very poor (40%)
Dangbo, Fingninkanmè	Planting method: clear stumps (weeding), plant the cuttings in rainy season, and perform regular clearing to remove weeding. Cassava is produced in rotation with cowpea and maize.	Gender: Male (70%), Female (30%) Ethnicity: Wémè (100%) Age: < 18 years (10%), 18–29 (20%), 30–49 (30%), 50–69 (30%), > 69 (10%) Wealth: Rich (30%), Moderately rich (40%), Poor (20%), Very poor (10%)	Ethnicity: Wémè (100%) Age: < 18 years (12.5%), 18–29 (12.5%), 30–49 (37.5%), 50–69 (37.5%) Wealth: Rich (50%), Moderately rich (25%), Poor (25%)

Community	Description of how the cassava is grown	Proportion (%) of people in the community who grow the cassava	Proportion (%) the average household consuming boiled cassava
Dangbo, Honmè	Planting method: make the furrows, put fertilizers and cover with sand and plant the cuttings. Cassava is cultivated in intercropping with maize.	Gender: Male (80%), Female (20%) Ethnicity: Wémè (60%), Toli (40%) Age: 18–29 years (20%), 30–49 (50%), 50–69 (20%), > 69 (10%) Wealth: Moderately rich (50%), Poor (40%), Very poor (10%)	Ethnicity: Wémè (90%), Toli (10%) Age: < 18 years (40%), 18–29 (15%), 30–49 (20%), 50–69 (15%), > 69 (10%) Wealth: Moderately rich (20%), Poor (30%), Very poor (50%)
Dangbo, Zounta	Planting method: make the ridges, put fertilizers and cover with sand. Cassava is planted in intercropping with maize or in rotation with maize and beans.	Gender: Male (80%), Female (20%) Ethnicity: Goun (10%), Wémè (70%), Toli (20%) Age: 18–29 years (70%), 30–49 (25%), 50–69 (2.5%), > 69 (2.5%) Wealth: Rich (20%), Moderately rich (40%), Poor (40%)	

Two planting types are used to grow cassava in the districts of Bonou and Dangbo. The different steps of the planting method in the district of Dangbo are: weeding (clear stumps), plowing, ridging, fertilizer application (spreading), plant cassava cuttings (preferably in rainy season) and regular clearing to remove weeds. In the district of Bonou, cassava is planted by making the ridges and planting the cuttings without clearing and spreading of fertilizers. In both districts, cassava is cultivated either by monocropping (rotation with beans, groundnuts, maize, pepper and tomato) or by intercropping (association with maize or beans). ~~Generally,~~ there were socio-economic differences within the communities of who produced cassava and consumed boiled cassava by gender, ethnicity, age and wealth status. In Dangbo district, among all the cassava producers in the areas, men were estimated to be greater proportion compared to women (70-80% male, 30-20% female).

In contrast, men's involvement varied in Bonou district by village: in Ouégbossou village, women and men's participation in production were equal, whereas in Adido village men were more involved (80%), and in Agbomanhan village men were a smaller proportion compared to women (40%, compared to 60%). In both districts, people from the largest ethnic group (Wémè) were more involved in cassava production (>50%), except in Atchonsa village (district of Bonou) where people from Goun ethnic group were dominant (50%). Similarly, people belonging to Wémè ethnic group were more involved in making boiled cassava (>60%), although in Agbomanhan (district of Bonou) and in Akpame (district of Dangbo) villages, people from Fon and Toli ethnic groups were involved in making boiled cassava at a comparable level with that of Wémè ethnic group (50%) dominant in the study villages.

As far as age is concerned, heterogeneity was observed in the production of cassava and consumption of boiled cassava in Bonou and Dangbo districts. Overall, adults (30–49 years old) were thought by key informants to be more involved in cassava production. In Dangbo district this rate was higher (50–70% in Akpamé, Honmè and Zounta villages) compared to Bonou district (40–50% in Adido, Agbomanhan and Atchonsa villages). Inversely, young people (≤29 years old) were more involved in consuming boiled cassava and at similar level in Bonou (40–75% in Adido, Agbomanhan and Atchonsa villages) and Dangbo (55–80% in Akpamé and Honmè villages) districts. Regarding elders (≥50 years old), they were involved in both cassava production and boiled cassava consumption at a comparable rate (40%) in Adido and Ouégbossou villages (district of Bonou) as well as in Fingninkanmè village (district of Dangbo). However, the level of elders involved in cassava production in Ouégbossou and Adido villages (district of Bonou) were comparable (40%) with those of young people of Ouégbossou village and adults of Adido village involved in this activity. Similar results were recorded for boiled cassava consumption by elders in Adido village (district of Bonou) and in Fingninkanmè village (district of Dangbo) when compared to boiled cassava made by young people of Adido village and adults of Fingninkanmè village.

Regarding wealth status, cassava production is performed by people within all wealth categories but the extent varied between and within investigated districts. Hence, in district of Bonou, rich people (either very or moderately) were more involved in cassava production in Agbomanhan (80%) and Atchonsa (70%) villages contrary to Adido (60%) and Ouégbossou (90%) villages where cassava production was associated with poor people (either very or moderately). In district of Dangbo, rich people (either very or moderately) were mainly involved in cassava production (50–70%). Considering boiled cassava making, very poor people (either very or moderately) were those mainly involved in Bonou (80–95%) and Dangbo (70–80%) districts. Indeed, boiled cassava is not considered as prestige food and can be consumed with minimum ingredients.

4.1.5 Varieties of the crop and planting material

- **What are the varieties of the [crop under study] that you grow? Rank in order of importance 1=most important. (Note local and technical name – verify with key informant) II Q15.1**

Table 9: Cassava varieties grown in order of importance in Bonou and Dangbo districts (II Q15.1)

Importance	Gender		Region		Ethnicity		
	Men (n=31)	Women (n=46)	Bonou (n = 39)	Dangbo (n=38)	Goun (n=9)	Toli (n=5)	Wémè (n=63)
1st	Agric	Agric	Kpèkè	Agric	Agric	Agric	Agric
2nd	Dossi	Dossi	Attinwéwé	Dossi	Dossi	Dossi	Dossi
3rd	Kpèkè	Attinwéwé	Agoula	Hanmadou/Gbomadou	Kpèkè	Attinwéwé	Kpèkè
4th	Agoula	Kpèkè	Agric	Adjaha	Hanmadou/Gbomadou	Hanmadou/Gbomadou	Attinwéwé
5th	Ahotonontin	Hanmadou/Gbomadou	Dossi	Djègodotin	Agoula		Hanmadou/Gbomadou

Generally, nine cassava varieties were named as the most important varieties: (local names) “Adjaha”, “Agoula”, “Agric”, “Ahotonontin”, “Attinwéwé”, “Djègodotin”, “Dossi”, “Hanmadou/Gbomadou” and “Kpèkè”. The varieties “Agric” and “Dossi” were the first and second most important varieties, respectively, in the district of Dangbo, for men and women and for Goun, Toli and Wémè ethnic groups in both districts combined. Although these two varieties were grown in the district of Bonou, they were respectively the fourth and the fifth most important varieties produced by local communities in the district of Bonou. Regarding the quality criteria of boiled cassava, Dossi variety is cited as high quality for making product. Considering the first and second most important varieties grown, the differences in regions could be explained by the relationship between soil characteristics and production yield. Instead, “Kpèkè” and “Attinwéwé” varieties were the first and second most important varieties in Bonou district even though they were found as the third (“Kpèkè” for men and for Goun and Wémè ethnic groups; “Attinwéwé” for women and Toli ethnic group) and the fourth most important varieties (“Kpèkè” for women and “Attinwéwé” for Wémè ethnic group). Additionally, “Hanmadou/Gbomadou” was an important variety in Dangbo district (the third), for Goun and Toli ethnic group (the fourth) and for women and Wémè ethnic group (the fifth). “Agoula” was also an important variety in Bonou district (the third), for men (the fourth) and Goun ethnic group (the fifth) whereas “Adjaha” and “Djègodotin” were important varieties only identified in Dangbo and “Ahotonontin” for men. Regarding the gender, there were two varieties that only men identified as being important, Agoula and Ahotonontin varieties, and two that only women identified as being important, Attinwéwé and Hanmadou/Gbomadou.

- **Why do you grow this variety? II Q 15.2 a+b**

Table 10: Reasons why the variety is grown (II Q15.2)

Reasons why preferred	Preferred varieties by gender (% of citation)											
	Agric		Agoula		Attinwéwé		Dossi		Hanmadou/ Gbomadou		Kpèkè	
	M	W	M	W	M	W	M	W	M	W	M	W
Sale	41.9	39.1	3.2	_	3.2	2.2	45.2	23.9	6.5	6.5	19.4	8.7
Good production yield (many / big roots)	58.1	32.6	3.2	8.7	_	15.2	29.0	6.5	_	4.4	9.7	2.2
Home consumption	6.5	15.2	16.1	8.7	_	6.5	32.3	26.1	_	_	9.7	6.5
Processing into boiled cassava (ability and sensory)	6.4	23.9	16.2	10.8	3.2	13.0	51.7	30.4	_	_	6.5	8.7
Processing into Gari	19.4	34.8	_	_	3.2	13.0	12.9	10.9	16.1	21.7	16.1	13.0
Processing into others derived products (ablo, agnan, klacou, lafun, tapioca)	29.1	28.3	3.2	_	_	_	_	4.3	_	4.3	6.5	10.8
Short growth cycle (5–7 months)	3.2	2.2	_	_	_	_	_	2.2	_	_	_	2.2
Long growth cycle (12 months)	_	_	_	_	_	_	_	_	_	2.2	_	_
Long roots	_	_	_	_	_	4.3	_	_	_	_	_	_
Long stems	_	_	_	_	_	2.2	_	_	_	_	_	_
Medium size roots	_	_	3.2	_	_	_	_	_	_	_	_	_

Legend
M = Men (n=31); W = Women (n=46)
- means 0

The main reasons why the varieties were grown vary in relation to their production yields (especially for men), process-ability into various derived products (ablo, agnan, boiled cassava, gari, klacou, lafun, tapioca, etc.) mainly for women and market value for both gender. Irrespective of gender, Agric had the highest market value and production yields followed by Dossi although the production yield depended on soil characteristics. Overall, Agric had the highest process-ability into ablo, agnan, boiled cassava, gari, klacou, lafun and tapioca, whereas Dossi had the process-ability into boiled cassava and was the most used variety for home consumption. Conversely, Agoula was the least cultivated for its low processing abilities and market value.

4.1.6 Important characteristics of the crop

- **What are the most important characteristics that would make it a good crop you would use? Rank in order of importance. The question aims to understand the indicator the participants use to assess a good crop – (agronomical characteristics, post-harvest characteristics: morphological and storability characteristics, technological characteristics) II Q14.1 and 14.2**

Table 11: Characteristics of a good cassava (II Q14)

Importance	Gender		Region	
	Men	Women	Bonou	Dangbo
1st	Cracked peel	Cracked peel	Cracked peel	Cracked peel
2nd	White flesh	Heavy roots	Heavy roots	Big roots
3th	Big root	White flesh	Many roots	Dark/black/red peel
4th	Heavy roots	Big roots	White flesh	White flesh
5th	Many roots	Many roots	Short growth cycle (5–7 months)	Good production yield
6th	Dark/black/red peel	Short growth cycle (5–7 months)	Big roots	Heavy roots

Most of the characteristics cited are common to both gender and region although their ranking depends on gender and regions. Irrespective of gender and region, “cracked peel” was the most important characteristic while the others are common to men and women but with different ranking. For example, “white flesh” is ranked as the second important characteristic for men, as the third one for women. Likewise, “heavy roots” was the second important characteristic for women and in district of Bonou while it was ranked fourth for men and sixth in district of Dangbo. “Dark/black/red peel” was an important criterion for men and in district of Dangbo whereas “short growth cycle (5–7 months)” was an important characteristic for women and in the district of Bonou. Short growth cycle likely relates to having food and income on relatively short timescales. Otherwise, “good production yield” is mentioned only in district of Dangbo as an important criterion.

4.1.7 Decision making and trade-offs between the different uses of the crop

- **What is your level of independence in making decisions regarding… IIQ31.1-31.4**

  31.1 what [variety of crop] material to plant
  31.2 a) use of crop (what product)
  31.2 b) Marketing
  31.3 use of profits from sale of [product under study]
  31.4 use of profits from sale of alternative product sold from [crop under study], if different household member (e.g. fresh

Table 12: Mean score of independence in decisions making by gender and region (II 31.1-31.4)

Decision	Mean score of independence 1-4*			
	Gender		Region	
	Men	Women	Bonou	Dangbo
Variety of cassava to plant	4.0	2.5	3.1	3.1
Use of cassava and marketing	3.2	3.4	3.4	3.3
Use of profits from sale of boiled cassava	3.8	3.9	3.9	3.9
Use of profits from sale of alternative product	3.5	3.4	3.4	3.5

***Legend:**
mean ≤ 1: no independence, the decision is made by someone else,
1 < mean ≤ 2: a little independence in suggesting ideas but decision is taken by someone
2 < mean ≤ 3: most independent but need to consult someone
3 < mean ≤ 4: complete independence to make ones decision

Regarding gender and regions, there is an overall complete independence (3 < mean ≤ 4) in decision making and trade-offs between the different uses of the cassava, except for women who need to consult someone (usually their husband) in decision making about "variety of cassava to grow" (mean independence score = 2.5). Men have great experience in cassava production than women.

- **Who makes decision on how the crop would be used among the different products? About what is consumed at home or sold? Who was involved and what was considered? II Q17.2**

Table 13: Frequency of citations of people who make the decision

Decision making on the use of cassava		Respondents (% of citations)			
		Gender		Region	
		Men	Women	Bonou	Dangbo
Who makes decision on how the crop would be used among the different products?	Men	32.3	6.5	15.4	18.4
	Women	3.2	37.0	30.8	15.8
	Men and women	38.7	30.4	35.9	31.6
Who makes decision about what is consumed at home or sold?	Men	38.7	17.4	15.4	36.8
	Women	6.5	19.6	20.5	7.9
	Men and women	25.8	34.8	38.5	23.7

Overall, men and women interviewees both feel that they makes the decisions regarding how the crop is used among the different products (>30%), but a comparable figure of interviewees field that men and women make the decision together. However regarding the decision about what is consumed at home or sold, the largest proportion of men feld they made the decision (39%), followed by both men and women (25%) and women (7%), whereas the largest proportion of women stated that both men and women (35%) made the decision, followed by women (20%) and men (17%). This may indicate that men and women may perceive that they have more authority in decision making than the opposite sex. Interestingly, these are decisions that may be typically assumed to be in women's jurisdiction, as it relates to processing work and home consumption, typically women's domains. Another interesting finding was in Dangbo, decisions on what product to process had a higher proportion of women and men staying they took decisions together, compared to the decision of how much to sell and keep for home consumption. Findings from Bonou were similar between the two questions.

4.1.8 Household food budgeting

- **Thinking about when you harvest the [crop under study]. How much of the harvest was used for consumption at home? As what product? (kg/t) (II Q33.1)**

Table 14: Quantity of harvest used for home consumption evaluated by gender and region

	Gender		Region	
	Men	Women	Bonou	Dangbo
Range (%)	5 - 100	10 - 100	10 - 100	5 - 100
Mean (%)	28.4	31.8	29.7	31.1

- **How much of the harvest was sold? (kg/t) Fresh or processed into what product(s)? To what market(s)? Probe between rural or urban market, trader, restaurant, food vendor, large company. II Q33.2**

Table 15: Quantity of harvest sold evaluated by gender and region

	Gender		Region	
	Men	Women	Bonou	Dangbo
Range (%)	10 - 100	0 - 90	0 - 90	10 - 100
Mean (%)	70.9	62.5	65.8	66.3

Irrespective of gender and region, there is large variability in the percentage of total cassava quantity used for home consumption or sold at market. Sometimes and in case of need, all the harvest is used for home consumption. Mean values indicated that approximatively the third of the harvest was used for home comsuption whereas more than the three fifth of harvest was sold.

- **Have changes in the production, processing or sale of the product affected you/your spouse/children? II Q34.1**

Table 16: Changes in the production, processing or sale of the boiled cassava that affected spouse/children, % of citations

	Gender		Region	
	Men	Women	Bonou	Dangbo
Increase/decrease of sales	33.3	42.1	50.0	26.3
Increase of production	22.2	15.8	22.2	15.8
Use of fertilizers	16.7	0.0	0.0	15.8
High level of processing	0.0	15.8	11.1	5.3
Lack of cuttings/varieties	5.6	10.5	5.6	10.5
Producer's ageing	5.6	5.3	11.1	0.0
Decrease of hand-workers	5.6	5.3	5.6	5.3

Irrespective of gender and regions, the largest proportion of interviewees think that "increase of sales and production" affects their families (wife, children and themselves), with a slightly higher number of women and people in Bonou citing this. For men and people met at Dangbo, the use of fetilizers affects the production yield and consequently, the socio-economic status of their family contrary to women and people from Bonou. Inversely, women and people living in Bonou believe that the high level of processing affects their families (their husbands, children and themselves).

- **Have there been any changes in the market or mechanization in your community? How has this affected your work? What about other groups of people? II Q34.2**

According to respondents, there were more changes in the market (40.3%) than in the mechanization (5.2%) in the districts of Bonou and Dangbo. Regarding mechanization, only few people of a wealthier status had the financial means to buy the machines needed to increase their production. This may be the reason why the changes did not affect the majority of the community (94.8%). Changes in the market affected more women (64.5%) than men (35.5%) while their impacts were similar in the districts of Bonou (51.6%) and Dangbo (48.4%). The decrease in the market prices lead to more domestic consumption/processing than sale which is preferably made on harvesting larger amoungs then harvesting piecemeal. When prices fall, farmers don't have a choice other than selling their harvest, especially when they need money. Thus, they search the way to get the maximum of profit regarding the circumstances even if they should harvest small quantities to sell, delay the harvest or stock cassava roots as much as possible. In addition, when the selling price decreases, production will decrease, as it is the crops market value which determines the level of production. Moreover, production requires manure, however it is not affordable for many people. At the same time, overproduction or oversupply, facilitated by mechanization (case of PCM project in Adido village, disrict of Bonou), can induce a decrease in market price. Thus, cassava processing is a profitabile way to add value to raw cassava, especially gari and tapioca. Currently, machines can assist with some of the most time consuming steps of cassava processing (e.g. grinding and milling). Although most of cassava products have a long shelf life, as opposed to the roots themsevles, the quality can still be affected if the product is overproduced and not consumed, due to the lack of significantly large enough storage capacity at the household and market level.

4.1.9 Preparation and processing the product

- **What are the processing and preparation steps for the [product]? FGD Q12**

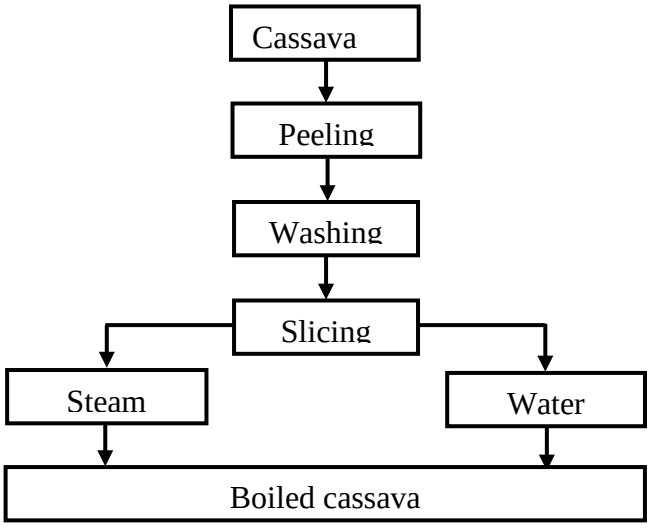

Figure 1 : Flow diagram of boiled cassava

Boiled cassava pieces are obtained by cutting raw cassava into big pieces, peeling, and first washing, cutting into small pieces, second washing, and cooking of the small pieces by steaming or boiling in water. Boiling is done by completely immersing the cassava pieces in water, while steaming is carried out when the cassava pieces to hot steam. The washing is performed after peeling and before cooking. Some processors carried out two cutting steps while others are used to directly cutting the raw cassava into small pieces, thereby performing one washing step. Although boiled cassava processing is usually performed by women, men can also make it.

- **Are there variations of the product and variations of the processing of the [product] in your community? Are the variations related to different varieties, food processes or food preferences? Please describe. FGD Q13**

Table 17: Variations of the product and processing of boiled cassava and their origins

Community name	Variation of the product and processing of boiled cassava and their origins	
	Men's Focus Group	Women's Focus Group
Bonou, Adido	The quality of boiled cassava varies with the varieties of cassava used and the quantity of cooking water.	No information.
Bonou, Agbomanhan	The varieties are not the same for boiling. The quantity of cooking water used influence the characteristics of boiled cassava.	All boiled cassavas are steam-cooked but they are not all crumbly nor have good taste.
Bonou, Atchonsa	The varieties play a key role in the quality of boiled cassava. A variety can be good but using too much or not enough water for cooking could lead to a pasty texture or a bitter taste due to burning.	No information
Bonou, Ouégbossou	Variations are more related to the variety but the processing is fundamental, especially quantity of water used. Few water will make it burn while too much water will make it pasty.	Salt can be added before or during cooking.
Dangbo, Akpame	The varieties are different, thereby the boiled cassava are not the same. Both steam cooking and cooking in boiling water are perfomed. Many people preferred soft boiled cassava.	Some people do steam cooking while others used to cook cassava in water. Adding salt during the cooking is preferred since its addition at the beginning of the cooking make the end-product no crumblier.
Dangbo, Fingninkanmè	The variations are linked to the diversity of the varieties: the variations associated to the variety Dossi are more diverse.	When the roots are big, it is necessary to cut them into small pieces before peeling. Steam cooking is not related to the variety.
Dangbo, Honmè	Some varieties are good for making boiled cassava. Crumbliness can be obtained by adding bicarbonate of soda or sugar. The insects millepede "mille-pattes" are often used during to obtain crumbliness	Steam cooking is used for selling while cooking in water is performed for home consumption.
Dangbo, Zounta	No information.	Variations of the product depend on variety and cooking methods (steam cooking or cooking with little water).

The quality of the boiled cassava depends on the varieties of cassava and the processing method used. Although boiled cassava can be processed by cooking in water or steam cooking, there are some specificity for cooking in water. Indeed, the quantity of cooking water used and the addition of salt before or during cooking are of great interest for some sensory properties (pasty and crumbly texture or not as well as good or bitter taste) of boiled cassava. Thus, cassava varieties don't have the same behaviour during cooking. There is no specificity between region and gender. In rural communities, firewood and water are widely available although the water is not always safe.

- **What are the most important processing steps or parameters you need to control very well to obtain of high quality [product under study]? II Q22.**

Table 18: Most important processing steps to obtain a higher quality of boiled cassava cited by gender and region (II Q22)

Most important processing steps	Respondents (% of citations)			
	Men (n=31)	Women (n=46)	Bonou (n = 39)	Dangbo (n=38)
Peeling	54.8	63.0	59.0	60.5
Cutting	48.4	19.6	28.2	34.2
Washing	45.2	65.2	61.5	52.6
Cooking	41.9	23.9	30.8	31.6
Steam cooking	67.7	50.0	69.2	44.7

Irrespective of gender and region, peeling and washing as well as cooking were cited as the most important unit operations. The peeling is important because at this step, all external/foreign matter unfit to consumption are removed. The fresh roots must be carefully handle before peeling by avoiding their falling down in order to keep their crumbliness as much as possible. Regarding washing step, a good washing contributed to keep or improve the attractiveness. Likewise, during cooking, the intensity of the fire, and particularly the water/cassava ratio is of great importance in the crumbly and non pasty texture of boiled cassava prepared by cooking in water method while salt/water ratio as well as the moment of adding salt influence good or bitter taste of boiled cassava. When using cooking in water method, it is recommended to add the salt during the cooking, as soon as cassava begins to cook. The cassava cutting is a mandatory operation to get small pieces that softened more quickly and easier than the big cassava pieces.

4.1.10 Consumption of the product

- **What is the [product] consumed with? FGD Q16.2**

Table 19: Food/ ingredients accompanying of boiled cassava

Community name	Food/ingredients/sauce+boiled cassava	
	Men's Focus Group	Women's Focus Group
Bonou, Adido	Beans, palm oil, fried tomato and pepper.	Palm oil, beans, groundnuts oil and fried tomato.
Bonou, Agbomanhan	Palm oil, salt, groundnuts oil, beans, palm nuts and groundnuts.	Palm oil, beans and fried tomato.
Bonou, Atchonsa	Palm oil, groundnuts oil and beans.	Palm oil, groundnuts oil and beans.
Bonou, Ouégbossou	Palm oil, beans, pepper, salt, fried tomato and groundnuts oil.	Palm oil, groundnuts oil, kluiklui and beans.
Dangbo, Akpame	Oil, fried tomato, pepper and beans.	No information
Community name	**Food/ingredients/sauce+boiled cassava**	
	Men's Focus Group	**Women's Focus Group**
Dangbo, Fingninkanmè	Palm oil, groundnuts oil, pepper, cowpea, coconuts and fried tomato.	Palm oil, groundnuts oil, coconuts oil, coconuts, beans and fried tomato.
Dangbo, Honmè	(Palm oil or groundnuts oil) + salt, fried tomato, beans, sauce, coconuts and palm kernels.	Palm oil, groundnuts oil, coconuts oil, coconuts and beans
Dangbo, Zounta	Oil, salt, beans and coconuts.	Oil, fried tomato, beans and pepper.

No difference was evidenced between gender or region regarding foods consumed with boiled cassava, such as oil (from palm nuts or groundnuts, sometines coconut oil), pepper, fried tomato, beans, groundnuts, kluiklui (get from groundnuts).

Thinking of people in your community, how often is the product consumed. Is this the same for everyone in the community? Probe on social segmentation. How has this changed in the last five years? KII Q9.

Table 20: Changes in the last five years on how often is boiled cassava consumed

Community	Changes in the last five years on how often is boiled cassava consumed
Bonou, Adido	No change in boiled cassava consumption in the last five years.
Bonou, Agbomanhan	Cassava production had increased but the making boiled cassava did not.
Bonou, Atchonsa	People eat more boiled cassava because they don't have financial means to diversify their daily meals.
Bonou, Ouégbossou	The consumption is increasing among young and poor people because they don't have enough foods. The cost of life is expensive.
Dangbo, Akpame	It depends on the food preference of each person.
Dangbo, Fingninkanmè	There is an increasing interest for consumption of boiled cassava and other derive products.
Dangbo, Honmè	The consumption increased because of poverty and the disability to diversify foods.
Dangbo, Zounta	The production of cassava decreases.

There were different perceptions among key informants between the communities of the change in boiled cassava consumption in the last five years, as shown in the table above. Key informants in three communities reported that household consumption is inversely related to their purchase power and their ability to diversify their daily meals. Hence, boiled cassava consumption is increasing among young and poor people.

- **Do you think people are buying more or less compared to five years ago? Why? Probe on social segmentation. How has this changed in the last five years? KII Q10.**

Table 21: Level of buying boiled cassava compared to five years ago

Community	Level of buying compared to five years ago
Bonou, Adido	No one buys or sells boiled cassava.
Bonou, Agbomanhan	No change during the last five years.
Bonou, Atchonsa	All households produce cassava, thereby making boiled cassava at home. No one buys boiled cassava.
Bonou, Ouégbossou	No one sells.
Dangbo, Akpame	Cassava's price decreases.
Dangbo, Fingninkanmè	Women, young, moderately rich and poor people buy more that men, adults and rich people respectively. The consumption has increased in the last five years. Moreover, women sell the root near the road.
Dangbo, Honmè	Consumption by young people is increasing because they have less resources. The consumption has considerably increased in the last five years.
Dangbo, Zounta	No change in the last five years.

In the district of Bonou, they do not sell boiled cassava because most of households cook it at home. Conversly, in the district of Dangbo (inhabitated by 100% Wémé), the sale of boiled cassava has decreased during the past five years. Women, young, moderately rich and poor people buy more than men, adults and rich people. Again, consumption of boiled cassava is associated to povety (e.g. Honmè and Fingninkanmè).

4.1.11 Product characteristics

- **Q20: If you were to purchase the crop on the market to make the product, how do you recognise and perceive a good crop variety for making a high-quality product? By looking at it, by touching, smelling or by tasting it?**

Table 22: Quality characteristics of raw cassava for making high quality boiled cassava

Characteristics	Citation ranking (%)		Frequency (%, n = 77)
	Men (n=31)	Women (n=46)	
Medium size *	6	1	5
Cracked peel	34	37	59
Crumbly peel	8	10	18
Smooth/without buds/without holes peel	5	7	13
Thick peel *	5	0	13
Red/pink/dark/black peel	3	7	9
Clear/clean peel	2	3	5
White flesh	7	11	21
Low humidity *	7	0	9
Sweet/slightly sweet	16	17	31

Note: * significant difference between men and women at 5% (p-value<0.05)

- **Q21: What are characteristics of a variety of the crop that give a poor quality product so that you would not use or buy it?**

Table 23: Quality characteristics of raw cassava for making poor quality boiled cassava

Characteristics	Citation ranking (%)		Frequency (%, n = 77)
	Men (n=31)	Women (n=46)	
Big size	4	2	5
Not crumbly peel	2	6	8
Smooth/without buds/without holes peel	22	21	35
Rough peel	2	5	8
Red/pink/dark/black peel	6	11	15
Yellow flesh	9	6	14
High humidity *	16	8	23
Fibrous	12	11	23
Brittle fiber	1	3	5
Bitter *	25	14	36

Note: * significant difference between men and women at 5% (p-value<0.05)

A good raw cassava for making a high quality boiled cassava was evaluated through the appearance of the peel and that of the flesh of the root, the humidity level (moisture content) of root and the taste of the root flesh. In general, men have cited more and variable quality characteristics than women. As far as peel appearance is concerned, cracked, crumbly and thick peel have been cited as good quality while smooth and red/dark were recognized as poor quality of cassava intended to be boiled. The most highly cited characteristic for a good quality cassava were cracked peel, by both men and women. Other important characteristics that were not cited as often as cracked peel, were sweet/slightly sweet, white flesh and crumbly peel, also with minimal gender differences.

The flesh colour of raw cassava, cited by respondents, was related to white or yellow. The white colour of the flesh was recognized as good quality characteristic for raw cassava, whereas yellow colour is not appreciated. High humidity showed bipolar considerations because it was considered as good and poor quality by the respondents, depending on variety. In order to predict the taste of processed product, the respondents evaluated the raw cassava taste after peeling with nails. A sweet taste was recognized as good quality and bitter taste a poor quality. To a certain extent, the presence of fibres was also cited as poor quality.

Regarding gender differences, men mentioned other additional two high quality characteristics that were not mentioned by women, low humidity and thick peel, resulting in significant gender difference for citations of these two characteristics. For men, low humidity is an indicator for high market-value of cassava. Another significant gender difference was 'medium size', where men cited this characteristic more than women. This likely indicates that women perceive other characteristics to be more important. Regarding poor quality characteristics, men were significantly more likely to cite high humidity and bitter taste poor quality characteristics compared to women.

- **Q23: Thinking about when you process the crop. What would be the characteristics that show it has good processing ability into the product?**

Table 24: Good quality characteristics of raw cassava during processing into boiled cassava

Characteristics	Citation ranking (%)		Frequency (% of respondents, n = 77)
	Men (n=31)	Women (n=46)	
Good smell	**35**	**30**	**60**
White flesh	**17**	**18**	**34**
White and gluey/heavy cooking water	**8**	**9**	**25**
Presence of foam on surface of the cooking water	**11**	**10**	**23**
Easy to peel/peelability	**9**	**10**	**21**
Crumbly/easy to break/soft cassava	**6**	**9**	**20**
Cracked flesh *	**4**	**10**	**19**
Low humidity	**3**	**2**	**9**
Easy to cut *	**6**	**1**	**5**

Note: * significant difference between the men and women at 5% (p-value<0.05)

Processing characteristics of raw cassava were evaluated during peeling, cutting and cooking. Good smell was the most highly cited characteristic for boiled cassava by men and women. White colour of cassava pieces is an important criterion for good quality of boiled cassava, followed by white and gluey/heavy cooking water. The peelability was highly cited by both men and women as important characteristic for good quality of cassava. Before end-cooking, cracked flesh was observed and this characteristic is an important criterion to predict the friability of final product especially for women (women were significantly more likely to report this characteristic than men). Indeed, the friability, as easy to break, evaluated by the fork during cooking was reported to be important for a good acceptability of cassava pieces. As a rule, when cooking water is viscous/heavy and white due to the presence of starchy material, it is an indicator of the end of cooking; the end of cooking is also indicated by the presence of foam on surface of cooking water and good smell of cooked cassava. Men were significantly more likely to report easy to cut as a high-quality characteristic for boiled cassava compared to women.

- **Q28: Describe the characteristics of a high-quality product prior to consumption.**

Table 25: High quality characteristics of boiled cassava prior to consumption

Characteristics	Citation ranking (%)		Frequency of citation (%, n = 77)
	Men (n=31)	Women (n=46)	
Crumbly/easy to break/soft	46	51	99
White flesh	26	26	71
Good smell of cassava	10	11	33
Attractive appearence	10	3	14
Without fibers	4	3	11

- **Q28.1: When you eat the product, what are the characteristics of a high quality product in the mouth and how do you evaluate it? Taste, texture in the mouth, aroma, etc.. depending on the consumption form?**

Table 26: High quality characteristics of boiled cassava in mouth

Characteristics	Citation ranking (%)		Frequency of citation (%, n = 77)
	Men (n=31)	Women (n=46)	
Sweet	41	39	80
Crumbly/easy to break/soft	37	31	75
Easy to chew	4	9	26
Good smell of cassava	8	5	25
No sticky	4	6	18
Good taste	5	7	15

Quality characteristics for the final product – boiled cassava – can be grouped into four categories including appearance, texture, odour and taste. No significant gender differences ($P > 0.05$) were evidenced. Attractiveness, absence of fibers as well as white colour were cited for appearance prior consumption. The crumbliness/friability as easiness to break with hand was the important criterion of texture prior to consumption and in mouth. Boiled cassava must have a good smell and sweet taste when it is eaten. In mouth, the easiness to chew is also considered for a good quality boiled cassava.

- **Q29: When a person (you or a member of your family) says that the quality of the product is not good when they eat it, what are they complaining about/what are the reasons?**

Table 27: Poor quality characteristics of boiled cassava

Characteristics	Citation ranking (%)		Frequency (%, n = 77)
	Men (n=31)	Women (n=46)	
Bitter taste	44.2	37.1	72.5
Hard	23.9	18.8	37.5
Fibrous	11.6	11.7	26.3
Yellow/yellowish flesh	5.1	10.3	20.0
Difficult to chew *	1.4	10.3	15.0
Dark/red/black flesh	5.8	7.0	13.8
No crumbly/cracked flesh	8.0	4.7	11.3

Note: * significant difference between the men and women at 5% (p-value<0.05)

Poor quality boiled cassava is identified when the taste is bitter or not sweet at all, which was the most frequently cited poor quality end product characteristics among men and women. Texture is also determinant of poor quality of boiled cassava. Accordingly, hard, difficulty to chew and not crumbly were cited more often. Regarding colour, boiled cassava with yellow, red or dark colour was rejected. In addition to these criteria, the presence of fibers was highly cited as poor quality of boiled cassava. Women cited difficult to chew as reason for poor quality boiled cassava, which was cited less frequently among men. Otherwise, gender differences were minimal.

- **Synthesis of quality characteristics of cassava in the food chain of boiled cassava**

The summary of the demand for quality characteristics gathered along the food chain of

1. raw cassava are :appearance of peel and flesh, humidity level of roots and taste of roots flesh,
2. during processing are :easy to peel, aspect of flesh, aspect and odour of cooking water, and of
3. boiled cassava pieces are :colour, odour, texture, taste.

The diagnosis processing activity should provide more descriptors of raw cassava and during its processing into boiled cassava. Thereafter, an overview of boiled cassava descriptors is important to establish a comprehensive sensory mapping.

Table 28: Overview of cassava root quality characteristics and its behaviour during processing into boiled cassava

Items	Characteristics	Indicators	Frequency (%, n = 77)
A good cassava VARIETY for making a HIGH-QUALITY product (by looking at it, by touching, by smelling or by tasting it) (Q20)	Cracked peel	By looking at	59
	Sweet/slightly sweet	By tasting	31
	White flesh	By looking at	21
	Crumbly peel	By looking and touching	18
	Smooth/without buds/without holes peel	By looking at	13
	Thick peel	By looking and touching	13
	Low humidity	By weighing in hand	9
	Red/pink/dark/black peel	By looking at	9
	Middle size	By looking at	5
	Clear/clean peel	By looking at	5
Characteristics of the VARIETY that give a POOR QUALITY product (that you would not use or buy it) (Q21)	Bitter	By tasting	36
	Smooth peel	By looking at	35
	High humidity	By weighing in hand	23
	Fibrous	By breaking	23
	Black/dark peel	By looking at	15
	Yellow flesh	By looking at	14
	Rough peel	By looking at	8
	Sticky peel	By looking at	8
	Big root	By looking at	5
	Brittle fiber	By breaking	5

Items	Characteristics	Indicators	Frequency (%, n = 77)
Characteristics that show it has good PROCESSING ABILITY into the BOILED CASSAVA (Q23)	Good smell	Know-how on odour characteristic of boiled cassava	60
	White flesh	By looking at	34
	White and gluey cooking water	By looking at	25
	Presence of foam on surface of the cooking water	By looking at	23
	Easy to peel	Not require physical strength	21
	Crumbly/easy to break/soft cassava	Easiness to push the fork	20
	Cracked flesh	By looking at	19
	Low humidity	By weighing in hand	9
	Easy to cut	Not require physical strength	5

Table 29: Quality criteria of boiled cassava

Items	Characteristics	Indicators	Frequency (%, n = 77)
Characteristics of a HIGH-QUALITY BOILED CASSAVA PRIOR TO CONSUMPTION (Q28)	Crumbly/easy to break/soft	By pressing in fingers	98.8
	White flesh	By looking at	71.3
	Good smell of cassava	Know-how on odour characteristic of boiled cassava	32.5
	Attractive/clean	By looking at	13.8
	Without fibers	By pressing in fingers	11.3
Characteristics of a HIGH QUALITY BOILED CASSAVA IN THE MOUTH and how it is evaluated (Q28.1)	Sweet	By tasting	80.0
	Crumbly/easy to break/soft	Easiness to break with teeth	75.0
	Easy to chew	Easiness to chew/ numbers of chews	26.3
	Good smell of cassava	Know-how on odour characteristic of boiled cassava	25.0
	No sticky	No sticky to the teeth	17.5
	Good taste	By tasting	15.0
	Sticky	Slightly stick to the teeth	7.5
Characteristics of a POOR QUALITY BOILED CASSAVA when we eat it? (Q29)	Bitter taste	By tasting	72.5
	Hard	Difficult to break with fork	37.5
	Fibrous	By tasting	26.3
	Yellow/yellowish flesh	By looking at	20.0
	Difficult to chew	Long duration of chewiness	15.0
	Dark/red/black flesh	By looking at	13.8
	No crumbly/cracked flesh	By looking at	11.3

5 MARKET STUDY

5.1.1 Sample information

Background information on sample MI Q1-7

Table 30: Background information on sample

Location	Bonou, Adido	Bonou, Atchonsa	Bonou, Agbomanhan	Bonou, Ouégbossou	Dangbo, Akpamè	Dangbo, Fingninkanmè	Dangbo, Zounta	Dangbo, Honmè
Gender	Male	Female	Female	Female	Male	Female	Male	Male
Age (profile)	66	60	56	60	54	25	58	64
Ethnicity	Wémé	Wémé	Wémé	Wémé	Wémé	Wémé	Wémé	Wémé
Household size	10	10	7	10	7	5	13	10
Level of education	Primary school	Illiterate	Illiterate	Illiterate	Illiterate	Secondary school	Secondary school	Illiterate
Ownership of means transportation (If yes, type)	Yes, Motorbike	No	No	No	Yes, Motorbike	No	No	Yes, Motorbike
Ownership of means of communication (If yes, type)	Yes, Phone	No	Yes, Phone	Yes, Phone	Yes, Phone	No	Yes, Phone	Yes, Phone
Road to nearest town is good (Y/N)	Yes	Yes	No	Yes	No	Yes	No	No
Marketing experience (years)	21	10	20	30	8	5	30	15
Main occupation (Specify)	Producer/ Trader	Producer/ Trader	Producer/ Trader	Producer/ Trader	Producer/ Trader	Trader (wholesale)	Producer/ Trader	Producer/ Trader

All the market leaders interviewed belong to Wémè ethnic group and most of them were aged of 54–66 years old with a household size varying from 5–13 members and had farming as main occupation. More female market leaders were met in Bonou contrary to Dangbo. According to the gender and regional dissegregation, there were some differences in the respondent socio-economic features. Most of market leaders encountered in the district of Bonou were illiterate had phone as means of communication without any transportation means although the road to the nearest city is good. Conversely, market leaders met in the distict of Dangbo had variable education level (illiterate and secondary school) and goods (motorbike and/or phone) transportation means.

- **What is the proportion (%) of the crop kept by the farmer for home consumption and what is sold by farmers, and to which markets in (MI Q9): ● Fresh form; ● Processed form: [product]; ● Processed form: other products from the crop**
- **What is the proportion (%) of the crop consumed in urban areas around the market you are situated; in: Fresh form, Processed form: [what product], Processed form: alternative products from the crop. (MI Q10)**
- **What are the major locations where the boiled cassava is processed and marketed? (MI Q11)**

Table 31: Proportion (%) of crop used in fresh and processed forms by stakeholders and as reported by market leaders (MI Q9)

Crop use (home consumption vs sales)			Home consumption	Place of sales	
			Rural	Rural	Town/Urban
Bonou, Adido	Fresh form		ni	Ni	50.0
	Processed form	Boiled cassava	10.0	Ni	ni
		Gari	ni	Ni	40.0
Bonou, Agbomanhan	Fresh form		ni	60.0	ni
	Processed form	Boiled cassava	5.0	Ni	ni
		Gari	15.0	15.0	ni
		Tapioca	5.0	Ni	ni
Bonou, Atchonsa	Fresh form		ni	50.0	ni
	Processed form	Boiled cassava	5.0	Ni	ni
		Gari	10.0	30.0	ni
		Lafun	5.0	Ni	ni
Bonou, Ouégbossou	Fresh form		ni	70.0	10.0
	Processed form	Boiled cassava	2.0	5.0	ni
		Gari	2.0	10.0	ni
		Klacou	Ni	Ni	1.0
Dangbo, Akpamè	Fresh form		Ni	Ni	80.0
	Processed form	Boiled cassava	5.0	5.0	ni
		Gari	5.0	5.0	ni
Dangbo, Fingninkanmè	Fresh form		Ni	30.0	45.0
	Processed form	Boiled cassava	2.0	Ni	ni
		Gari	2.0	10.0	10.0
		Lafun	1.0	Ni	ni
Dangbo, Honmè	Fresh form		Ni	60.0	ni
	Processed form	Boiled cassava	5.0	Ni	ni
		Gari	10.0	20.0	ni
		Tapioca	2.0	3.0	ni
Dangbo, Zounta	Fresh form		Ni	70.0	ni
	Processed form	Boiled cassava	2.0	2.0	ni

Crop use (home consumption vs sales)	Home consumption	Place of sales	
	Rural	Rural	Town/Urban
Gari	7.0	Ni	19.0

Generally, cassava grown in the districts of Bonou and Dangbo and their derived products (boiled cassava, gari, tapioca, lafun and klacou) were mainly intended for sales either in raw or processed forms, although farmers in rural areas kept a little/low proportion of their harvest for home consumption. Irrespective of the district, cassava roots and gari were often sold in rural areas compared to urban areas or town, while boiled cassava is more likely processed either at home or at field for household consumption. The proportion of gari (dried product) kept for home consumption is higher than the propotion of boiled cassava (wet product) intended to the same use. A very low propotion of cassava roots are processed into tapioca, lafun and klacou with home consumption as main end-use.

- **What are the demand segments associated with the [product]? (at the applicable level, i.e. community, processing site, city)? (MI Q12)**

Table 32: Demand segments associated with the boiled cassava

Community	Purchaser	Consumption place	Proportion consumed	Consumption pattern
Bonou, Adido	Boiled cassava is consumed by all household members but it is not sold. Some people make boiled cassava for school canteens.	Home: 70% School: 30%	Rural level: 50% Urban level: 30% Town level: 20%	No difference in the consumption pattern within the same household.
Bonou, Agbomanhan	No one sells therefore no one buys.	Home: 70% Field: 30%	Rural level: 40% Urban level: 40% Town level: 20%	Village people (cassava producers) consumed more frequently than those of the city who must necessarily buy it. No difference in the consumption pattern.
Bonou, Atchonsa	No one buys in the village. Boiled cassava is not sold.	Home: 70% Field: 30%	Rural level: 70% Urban level: 20% Town level: 10%	People in rural areas consumed boiled cassava more frequently than people in urban areas. People living in either the village or city consumed boiled cassava in the same way.
Bonou, Ouégbossou	Boiled cassava is not sold.	Home: 80% Field: 20%	Rural level: 70% Urban level: 20% Town level: 10%	Village people consumed boiled cassava more frequently than people in the city. Village people eat boiled cassava with oil while those who lives in city eat boiled cassava with fish.
Dangbo, Akpamè	Everyone buys and consumes boiled cassava near the road.	Near the road: 100%	Rural level: 100%	No difference.
Dangbo, Fingninkanmè	No one buys. Boiled cassava is not sold.	Home: 70% Field: 30%	Rural level: 50% Urban level: 30% Town level: 20%	Village people consumed boiled cassava more frequently with oil and salt than the city-dwellers who consume it with cowpea.
Dangbo, Honmè	Everyone (men, women and children) buy the boiled cassava at urban market.	Home: 40% Field: 10% Urban market: 50%	Rural level: 60% Urban level: 30% Town level: 10%	Village people consume boiled cassava more frequently than those in city. The the consumption pattern don't differ according to rural or urban areas.
Dangbo, Zounta	All social classes (young, man, child, aged people, Goun, Wémè) consume boiled cassava.	Near the road: 16.7% Home: 50% School: 16.7% Hospital: 16.6%	Rural level: 50% Urban level: 30% Town level: 20%	In city, people eat less boiled cassava and prefer it with beans or fried tomato whereas village people eat boiled cassava alone or with pepper.

In the district of Bonou as well as in Fingninkanmè village in the district of Dangbo, boiled cassava is not sold or bought. Boiled cassava is mainly processed for household consumption either at home (40–80%) or at fields (10–30%) in both districts, except in Akpamè village (district of Dangbo) where boiled cassava is sold at the roadside (100%). However, in Adido (district of Bonou) and Honmè (district of Dangbo) villages, a high amount of boiled cassava is sold at schools (30%) and at urban market (50%) respectively. Similarly, in Zounta village (district of Dangbo), half (50%) of the boiled cassava processed is sold near the road (16.7%), in front of hospital (16.6%) and at schools (16.7%). Irrespective of the districts, there were more consumers of boiled cassava in rural areas than in urban areas or in towns. The proportion of village people who consume boiled cassava in the district of Dangbo (50–100%) higher than those in the district of Bonou (40–70%). Generally, urban (30%) and town (10–20%) dwellers of both districts consumed boiled cassava at comparable levels. In rural areas, boiled cassava is consumed alone or with oil and/or pepper whereas in urban areas, fish, beans and fried tomato are among the accompanying dishes.

- **What are the demographics of the customer groups / buyers of [product]? e.g. female customers, male customers, youth, high-end restaurants, wealth categories) MI Q22**
- **What are these customers demanding (e.g. what crop characteristics are they interested in?) MI Q23**

Table 33: Consumer demand segments and preferred characteristics of the boiled cassava

Level and/or demand segment	Consumer groups (MI Q22)	Preferred characteristics (MI Q23)
Community level	**Age:** Everyone (children, young, adults and aged people). Children consume it more frequently (daily) than adults (weekly: 2–3 times per week). **Gender:** Men and women consume boiled cassava in the same way. Men eat as much as or more than women. **Civil State:** The single people, the married ones and the widows eat boiled cassava in the same way with the same frequency.	**Age:** Sugary taste and crumbliness (young, adults, children and aged people). Children like the sugary taste of boiled cassava while adults can eat the ones without sugary taste or with bitter taste. **Gender:** Sugary taste, crumbliness and white flesh (men and women). **Civil State:** Sugary taste (single, married and widows people).
Retail market	Overall, boiled cassava is processed for consumption at household level. Sometimes, boiled cassava is sold near the road in retails outlets or by itinerant sellers.	

At community level, the demand for boiled cassava is among all socio-demographic consumer groups who like the sugary taste, the crumbly texture and the white color of the flesh, irrespective of age, gender and marital status. However, children had a high consumption frequency (daily frequency) of boiled cassava when compared to adults (weekly frequency: 2–3 times per week). Similarly, men eat as much as or more than women. Moreover, children like the sugary taste of boiled cassava while adults can eat those without sugary taste or with bitter taste.

5.1.2 Variations of the product

- **What are the different variations of boiled cassava? e.g. varieties, processing key steps, processing parameters, quality differences of the pre-processed and the final products. The information is based on frequency of replies. (MI Q14)**

Table 34: Quality differences of boiled cassava demanded by consumers

Importance	Gender		Region	
	Men	Women	Bonou	Dangbo
1st	Crumbliness	Crumbliness	Crumbliness	Crumbliness
2nd	White flesh	Sugary taste	White flesh	White flesh
3th	Sugary taste	Good smell	Sugary taste	Good smell
4th		White flesh		Sugary taste
5th		Without fibers		Without fibers

The crumbliness of boiled cassava was the most important characteristic demanded by consumers, irrespective of gender and regions. The “white flesh” and the “sugary taste” were also important characteristics although their importance had different ranking for men and women as well as in the districts of Bonou and Dangbo. Moreover, the good smell of boiled cassava and lack of fibers the third and the fifth important characteristics respectively for women and in district of Dangbo while these characteristics were not mentioned by men and in the district of Bonou. The main characteristics for boiled cassava mentioned by community members (through individual interviews or FDG) were confirmed by market leaders.

- **What are the different varieties of the crop demanded?**

Table 35: Frequency of varieties of cassava demanded for end-products

Variety	Frequency (%)	Characteristics	End-products
Dossi	50.0	Crumbly texture and good smell	Boiled cassava
Adjaha	37.5	Bitter taste	Gari and tapioca
Agric	25.0	Fibrous	Gari and lafun
Hanmadou/Gbomadou	25.0	Bitter taste	Gari and tapioca
Agoula	12.5	Sugary taste	Boiled cassava, gari and klacou
Ahotonontin	12.5	Bitter taste	Gari, tapioca and klacou
Akpassa	12.5	No Crumbly texture	Gari
Ounfera	12.5	Bitter taste	Gari and ablo
TMS	12.5	Bitter taste	Gari

Overall, nine cassava varieties were mainly used for processing products intended to marketing. These varieties, in order of importance, are locally named “Dossi”, “Adjaha”, “Agric”, “Hanmadou/Gbomadou”, “Agoula”, “Ahotonontin”, “Apkassa”, “Ounfera”, and “TMS”. Adjaha, as the second most processed variety, is a new finding which highlights a limit of the market study. Indeed, for this study, only eight leaders were interviewed vs seventy seven individuals for community

members in individual interview. So, the results from later group are more robust. “Dossi” and “Agoula” had the suitable processing characteristics demanded by consumers (Crumbly texture, good smell and sugary taste) for making boiled cassava. All the other varieties are characterized by bitter taste, except “Agric” which is fibrous and “Apkassa” which lacks in crumbliness. Many derived products were obtained from these varieties including boiled cassava, gari, tapioca, lafun, klacou and ablo. All the nine varieties were processed into gari, except “Dossi” which was mainly for boiled cassava. In addition to gari, the variety “Agoula” was used for boiled cassava and klacou. Moreover, the varieties “Adjaha”, “Hanmadou/Gbomadou” and “Ahotonontin” were also processed into tapioca while the varieties “Agric”, “Ahotonontin” and “Ounfera” were processed into lafun, klacou and ablo, respectively.

5.1.3 Quantities of the crop and product traded

- **Quantities of the crop produced (during a year; specify the duration) (MI Q15)**

Table 36: Quantities of cassava produced and traded (%) by region

Part of the year	Bonou	Dangbo
Abundance period (April-July)	40 – 60	50 – 60
Hunger period (September-march)	20 – 45	20 – 40

The quantities of cassava produced in the peak period in Bonou and Dangbo districts were comparablely higher than the quantities produced in the hunger period in both districts. The peak period (abundance) corresponds to rainy season which is appropriate for stems planting. Generally, cassava is traded in peak period in both districts (Bonou and Dangbo). In the hunger period, more cassava is sold in the district of Dangbo compared to Bonou. In addition, during festive periods and at the beginning of the academic year, cassava is only sold in the district of Bonou.

- **Transport, storage, and means of selling the crop (MI Q17)**
- **What are the important characteristics of the crop associated with product transportation, storage and sale? (MI Q18)**

Table 37: Means of selling the raw and boiled cassava and important characteristics associated with transport and storage

	Means (MI Q17)	Important characteristics (MI Q18)
Transport of the cassava	Car, motocycle, bicycle, feet	Cassava roots have a short shelf life. Cassava is harvested to sell, cook or process.
Storage of boiled cassava	Icebox or pots covered with plastic bags. Boiled cassava must be grilled to be stored beyond 12–24 h	It is necessary to keep the heat of boiled cassava as long as possible otherwise the product becomes cold and hard to eat.

Cassava transportation is mainly performed by men. The transportation means of fresh cassava vary depending on the quantity that is needed to transport. Hence, car, motocycle, bicycle and feet were the means of transportation used in the districts of Bonou and Dangbo. Otherwise, the ability to keep the heat of boiled cassava as long as possible was the main criterion for the selection of a means of storage of the boiled cassava. Thus, warm boxes and pots covered with plastic bags were used as storage means of the boiled cassava.

- **Drivers of change in terms of demand for crop and final product (MI Q20)**

Table 38: Drivers of change regarding demand for cassava and boiled cassava

	Bonou	Dangbo
Drivers of demand	**Poverty is the first factor limiting demand of high quality cassava, other factors lack money and no food diversification. A part of the production is used for home consumption. Thus, cassava roots are quickly boiled to eat, sometimes without any other ingredients. In addition, boiled cassava processing is easy to perform.**	**Population is increasing thereby leading to the arrival of new purchasers while the former purchasers want more too. In addition, boiled cassava is quick and easy to prepare.**
Major changes	**No change**	**No change**

In the district of Bonou, demand for boiled cassava has decreased due to poverty. In contrast, in the district of Dangbo, the increase in population has led to the increase in demand for boiled cassava. Regarding the major characteristics of boiled cassava, there was no change in both districts.

5.1.4 Trend lines for consumption

- **Trend lines for consumption trends per main demand/customer segment (MI Q21)**

Table 39: Trend lines for consumption trends

Demand segment	Bonou	Dangbo
Fields / Rural areas	**People consume more than the previous years. Consumption increases with years.**	**People eat boiled cassava at field and it won't change. Consumption increases in rural areas.**
Urban areas / Town	**Consumption decreases because people living in urban areas/town have more money. They eat what they want and when they want it.**	**Consumption decreases because of the increase of wealth in urban areas. People in city live better.**

In fields / rural areas of the districts of Bonou and Dangbo, the consumption of boiled cassava is rooted in the dietary habits of people and increases with years. Conversely, the consumption of boiled cassava decreases in urban areas / town.

5.1.5 Economics of the product

Economics of the product, in terms of (MI Q19)

a) price by season, and trends over the last 10 years; for budget calculations try and use average prices and costs for the last 4 months.
b) cost elements in the value chain per kg or tonne? (e.g. transport, packaging, taxes, loading, off-loading, stallage rents etc.)
c) profitability of the crop? (i.e. gross income minus costs, or % of profit margin as a share of gross income); this can be calculated after the interview has taken place, e.g. during the recap of the session or in the office. Also, if the information for this question is available in another, recently conducted study, then it's better to extract it from there and quote the source.

Overall, boiled cassava is mainly processed for home consumption and in a lesser extent for sale (only in District of Dangbo). The respondents (mainly cassava producers) were not able to estimate:

a) the price by season and the trends over the last 10 years;
b) the cost elements in the value chain per kg or tonne;
c) the profitability of the crop.

6 CONCLUSION

- **Provide bullet points or text on important findings and their implications for WP2 and breeders.**

Table 40: Main quality characteristics of cassava in the food chain of high quality boiled cassava

Items		Quality Characteristics
Raw material (cassava roots)		Cracked peel
		Sweet/slightly sweet
		White flesh
		Crumbly peel
		Smooth/without buds/without holes peel
		Thick peel
		Red/pink/dark/black peel
		Clear/clean peel
		Easy to peel
During processing (Preparation steps)	Peeling/cutting	Easy to break/soft cassava
		Cracked flesh
		Low humidity
		Easy to cut
	Boiling	Good smell
		White flesh
		White and gluey/heavy cooking water
		Presence of foam on surface of the cooking water
Final Product (Boiled cassava)	Prior to consumption	Crumbly/easy to break/soft
		White flesh
		Good smell of cassava
		Attractive
		Without fibers
	In mouth	Sweet
		Crumbly/easy to break/soft
		Easy to chew
		Good smell of cassava
		No sticky
		Good taste
		Sticky

The important findings for WP2 and breeders are the main quality characteristics of cassava in the food chain of high quality boiled cassava regarding all its three forms (Tables 28 and 40). Irrespective of gender and regions, a great diversity of cassava varieties is processed into various products based on their quality characteristics defining the preferred varieties through prioritisation. Thus, breeders should taken into account high quality characteristics as well as the bad ones when breeding new cassava varieties. Casava growing conditions (agronomic and environmental factors such as climate, soil type, water and nutrient supply, pest and diseases control, cultivation methods and harvest time) varied from one location to another and from one farmer to another depending on his wealth category thereby, affecting production yield. Given that cassava derived products including boiled cassava are starchy staple food highly consumed (irrespective of gender, age, wealth and ethnicity), it is important that further new varieties include plant characteristics leading to a better response to growing conditions under intensive and sustainable agricultural production systems with limited input ressources. The producers prefer early maturing varieties (5–7 months for maturity) with heavy and big roots at harvest, and which final products (boiled cassava, gari, tapioca, lafun, klacou, ablo, agnan, etc.) possess the characteristics demanded by consumers. In the specific case of boiled cassava, it is expected to be white, soft, crumbly, attractive, softened to the touch, easy to swallow and not bitter.

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