

WP1 Synthesis for Period 1

Activities Conducted, Key Research Findings & Perspectives

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This synthesis refers to the following teams

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Abstract

of the full document summarizing each section (NB: This section will be copied & pasted in the Annual Report delivered to BMGF). (2 pages) HIGHLIGHT MAJOR ACTIVITIES, OUTPUTS AND IF RELEVANT OUTCOMES

Work Package 1 (WP1) provides the evidence base for end-user preferences for characteristics of focus products. The primary goal is to enhance the capacity of RTB breeding programs to define and implement demand-led and gender responsive breeding priorities, integrating traits to meet multi-user demands and needs, and adding value. The WP1 approach uses interdisciplinary methods and lines of inquiry (food science, gender and economics) to collect evidence on the preferences of RTB product characteristics for different user groups in the product chain and identify the factors that influence these preferences for men, women and other social segments, and how they may be prioritized differently.

We had four major activities this year, which revolve around the development and implementation of a common, interdisciplinary methodology. The methods are grounded in a food science approach developed from a previous CRP-RTB project (2015), but adapted to include a socio-economic and breeding focus, in addition to product profile development, and applied with rigorous and robust sampling. The accomplishments for this year are as follows:

WP1 State of Knowledge Review (SoKs) (Activity 1): the aim of this activity was to establish what is currently known about the product and gaps in knowledge. For this activity the Coordination team developed guidance for developing a knowledge base from a disciplinary perspective, to identify gaps in knowledge to be addressed by the project. This activity resulted in two outputs:

- **SoK Guidance document** developed by the WP1 Coordination team and other collaborators, which is structured in three modules: food science, gender and social context, and demand.
- **10 Product-based SoK reports** covering 7 products, were developed by 11 partner teams, with support from the WP1 Coordinator team and other collaborators. The reports will inform the fieldwork for WP1, but also the knowledge gaps addressed in WP2 and WP5.
- **Summary for each product** on established characteristics, gaps in knowledge and how they are addressed by RTBfoods is provided in the full WP1 Synthesis report.

WP1 Capacity Strengthening and Sharing materials and workshop (Activity 2): The WP1 methodology was developed by the WP1 Coordination team and other partners in a collaborative process and documented in the form of four, comprehensive manuals. The delivery of the material was conducted at the Capacity Strengthening and Sharing workshop held from 16-25 April, 2018 in Cotonou, Benin. The outputs under this activity are:

- **4-part 'living' manual:** Inputs were received on an ongoing basis for adaptation through the year, from management, crop breeders, other work packages and partner teams. The current versions of the manuals are available on the project platform for all RTBfoods partners to use and will be shared with a wider scientific community when finalized at the *end of year two* and a DOI has been created. The manuals consist of:
 - o WP1 Introduction and product profile
 - o Activity 3: Gendered product mapping
 - o Activity 4: Community-based RTBfoods processing/preparation diagnosis
 - o Activity 5: Consumer taste tests in rural and urban market segments

- **10-day WP1 Capacity Strengthening and Sharing workshop, report and kit:** The workshop was the first project event following the inception meeting and was attended by all WP1 teams, including 31 participants from six countries. The outputs of the workshop were: a workshop report on how the workshop met objectives; revised methodology, as presented in the four manuals, a Capacity Strengthening and Sharing Kit, including all presentations and learning materials, such as:
 - RTBfoods overview
 - WP1 approach and methods
 - Building on the State of Knowledge
 - Scope and sampling
 - Ethics
 - Qualitative Data Analysis - full session
 - Qualitative Data Analysis - simplified
 - Product Profile
 - Activity 3 Gendered Product Mapping
 - Activity 4 Processing methods and measurement
 - Activity 5 Consumer testing
 - Activity 5 Consumer testing - data analysis

Fieldwork for Gendered food mapping (Activity 3): This activity involves consultation in rural communities where people grow, process and consume the crop in important consumer geographies, and involves key informant interviews with community leaders, focus groups discussion, individual interview and rural-level market interviews.

To date, **10 out of 11 WP1 partner teams, covering 8 products, have started and/or completed fieldwork for Activity 3.** As part of Activity 3, partners have delivered the following outputs with support from the WP1 Coordination team and other collaborators:

- **9 product-teams covering 8 food products have uploaded their raw data and consent forms** to the RTBfoods platform* (9 product teams include 11 partners)
- **6 datasets (coded data) from 9 teams** were received and reviewed by the Coordination team.

As part of Activity 3 fieldwork, the WP1 Coordination team and collaborators organized support visits during piloting in Benin, Nigeria, Uganda and Ivory Coast. **Lessons learned documents** for Nigeria and Uganda were developed and shared with teams.

WP1 Coordination team, with the support and feedback from the Benin UAC/IITA team and WP2, is also currently finalizing **Activity 3 Data Analysis Guidance**, a document that includes description of how mixed method data can be analyzed, how the data can feed into the first iteration of the product profile, and priority data required for WP2. This will be circulated to teams prior to the March annual meeting in 2019.

WP1 also achieved the **WP1 Data Management Plan**, a document describing the process and principles of data management for WP1 purposes, which provides guidance to partners on specific data issues relating to WP1.

WP1 has also achieved several **partner-led collaborations**, whereby teams of joined together to revise and test the methods and tools and conduct fieldwork together (e.g. Uganda and Nigerian teams). We have also had extensive collaboration with NextGen, ongoing discussions with Excellence in Breeding (EiB) and participation of WP1 coordinators in CGIAR Gender Breeding Initiative (GBI) Workshops.

WP1 has also had **numerous successful interactions with other WPs**, specifically in the sharing of tools and methodology. This includes: WP1 roadmap; all manuals, and Activity 3 Data Analysis guidance. Two calls with held with WP2 leadership to define type of data necessary from WP1 to inform WP2. The Nextgen evaluation of mother-baby populations in the field were used as a model for WP5 population processing protocol. In addition, there is daily communication with the Project manager for Monitoring and Evaluation.

For period 2, the following activities are planned:

- Activity 3, data analysis and reporting.
- Preparation and presentation at the Second Annual RTBfoods Meeting.
- Capacity strengthening for Gendered Food Mapping, Activity 3, data analysis at the Second Annual RTBfoods Meeting.
- Planning and commencement of participatory demonstrations, Activity 4 and 5, with close coordination with WP2 and WP5.

WP1 Results-Tracker: Activities & Milestones achieved

Output 1.1.1: *Gendered knowledge produced on quality characteristics, demands and consumption patterns for 11 RTBfoods/processed products in 5 African countries*

Activities conducted	Deliverables
<i>Desk literature review</i> <i>Interviews involving experts</i>	A.1 - State of Knowledge (SoK) by food product: Note: teams conducted either an 'Extensive SoK' (food science, gender and demand modules completed) or an 'Abbreviated SoK' (one to two modules completed) depending on the resources available to the team. A.1.1- Boiled and Pounded Yam in Nigeria (food science module) A.1.1bis- Boiled and pounded Yam in Nigeria (gender and market modules) A.1.2- Gari/Eba in Nigeria (food science, gender and market modules) A.1.3- Boiled Cassava in Uganda (food science, gender and market modules) A.1.4- Matooke in Uganda (food science, gender and market modules) A.1.5- Boiled Yam in Benin (food science and gender modules) A.1.6- Attiéké in Côte d'Ivoire (food science, gender and market modules) A.1.7- Gari in Cameroon (food science and market modules) A.1.8- Boiled Plantain in Cameroon (food science and market modules) A.1.9- Sweetpotato in Uganda (food science, gender and market modules)
<i>Capacity Strengthening and building common methodologies workshop</i>	A.2- Capacity strengthening kit: A.2.1- State of Knowledge Guidance A.2.2- Capacity Strengthening and Sharing Workshop Report A.2.3- Guidance Report Part I – Introduction, sampling and food product profile

	A.2.4- Guidance Report Part II – Activity 3 Gendered product mapping A.2.5- Guidance on Data Analysis - Activity 3 (work in progress) A.2.6- Guidance Report Part III – Activity 4 Participatory diagnosis and quality characteristics A.2.7- Guidance Report Part IV – Activity 5 Consumer tasting in rural and urban user segments A.2.8- WP1 Data management plan A.2.9- WP1 Capacity Strengthening and Sharing Materials: Workshop Presentations - Period 1 A.2.10- Additional learning material - Period 1
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Output Indicators	1.1.1 Targets / Milestones		
	Planned for Period 1	Achieved	Variance & Brief Explanation
Nb of studies conducted on quality characteristics, demands and consumption patterns for RTBfoods products	9 SoKs	10 SoK reports (extensive and abbreviated combined)	10 SoKs completed. At the inception meeting, teams stated if they would conduct an ‘Extensive SoK’ (food science, gender and demand modules completed) or an ‘Abbreviated SoK’ (one to two modules completed), depending on their available resources and expertise. However, some teams delivered beyond what was agreed at inception meeting, which is to be applauded. There are varying levels of depth of the reports. SoK guidance was developed to achieve standardization of the knowledge base collected on each product. However, literature was sparse for some products, particularly specific to geographical contexts. Partner budgets were also prioritized for WP1 fieldwork, and therefore partners had less time for the SoK. This approach was supported by the Coordination team and PMU.

Knowledge Baseline

- *Key findings from the SoKs (Del. A.1.1 to A.1.9): Gaps identified and Lessons learnt disaggregated by food product for the food product studied in Period 1 (NB: Please refer to each deliverable with the code mentioned above)*

The objective of the SoK exercise was to establish what is known and what the gaps are in relation to characteristic preferences, gender and social context and product demand. This provides formal documentation of the contribution of RTBfoods in addressing current gaps in knowledge.

The key findings from each of the SoK reports are provided below, by product and team. This is followed by 1) a table summarizing the lessons gained on key characteristics and 2) gaps in knowledge (food science, gender and demand) for each product and their relevance to RTBfoods.

Key Findings from WP1 SoKs

Boiled Cassava (Del. A.1.3) - Uganda (food science, gender and demand modules)

Food Science

The characteristics of raw cassava established in literature and key informant interviews as being important for a good boiled cassava were (in order of importance): sweet taste when bitten; roots should not be watery when chewed fresh, easy to chew; low fiber content, and a long and slender root shape. Other important characteristics were: a root of 12 to 18 months maturity; soft to break; disease free; pink cortex (associated with sweet taste). To prepare boiled cassava, the root is wrapped in banana leaves and steamed (central and mid-western Uganda) or boiled (Eastern Uganda). Important characteristics during processing are: self-retracting peel or easy to peel; roots glitter after washing; easy to cut without uneven breaks; quick cooking (30 minutes), nice aroma; soft to pound (without fibers or cut into fiber). Important characteristics for boiled cassava are: soft to bite and easy to chew; sweet taste; feeling energetic after eating; nice aroma or mild aroma; white or not so brown after pounding; less fiber- middle fibre only; mealy; friable- fluffy texture when pressed in the hand; doesn't stick in the hand- easily makes a depression when a finger is pushed in ponded cassava, and less starch.

The review identified gaps in information on preferred characteristics specifically for boiled cassava and disaggregated by sex and other factors of social difference. The evidence pointed to few differences in consumption patterns of boiled cassava by gender, but more significant differences by age. However, triangulated evidence is required.

Gender and socio-economic context

Cassava is commonly intercropped with crops of short maturity, particularly among women who experience land limitations and need to reduce weeding time. Women often farm on a separate garden and in some cases allocated land by their husbands to farm. However, in other places of Uganda, where cassava is the main staple (e.g. Eastern Uganda), it is often monocropped. There are clear distinctions in gender roles and activities regarding cassava production and processing, and a gap in knowledge on gender differences in adoption and varietal preferences. Information seems contradictory relating to gender roles and control over cassava processing income. Processing cassava is typically a women's role in Uganda, however there were differences in the literature about who in the household controlled processing income. A common perception is that men sell cassava and women use their cassava for household consumption.

NASE 14 and NAROCASS 1 are popular new varieties due to their high yields and CBSD and CMD tolerance. Nase 14 has high dry matter, nice taste, makes nice paste and has good storability in the

ground. NASE 17 and NASE 13 were initially preferred in central Uganda due to its pink cortex associated with long shelf-life and mealiness, and sweetness, respectively. NASE 19 was preferred in northern Uganda because it makes a nice paste. NASE 13 also has low dry matter content and is grown where cassava is processed in to flour. However, these varieties are vulnerable to CBSD. Literature did not examine adoption by gender, but informants found that NAROCAS 1 and NASE 14 were widely adopted by men because stems were more marketable. Wealthy people in communities initially adopted improved varieties because stems are expensive. However, government programs such as operation wealth creation (OWC) which distributed free stems improved adoption.

Demand

Boiled cassava is the most common product consumed in Uganda followed by kalo and katogo. It is evident from the report that boiled cassava was common in Central and Northern Uganda while kalo was common in West Nile, Western and Eastern Uganda. There is also high and growing potential of cassava being used in industry. Consumers prefer boiled cassava from sweet varieties (that may be associated with low levels of cyanide). Some of the preferred varieties for preparing boiled cassava include: NASE 1, NASE 14, TME 14, TME 204, Bukalasa, Bao, Nyaraboke, Gwalanda, NASE 13 and Mufumba-Chai, as they are associated with a sweet taste and ease of cooking.

Boiled cassava for home consumption is mainly for the women and children as a snack since they rarely eat away from home. While the boiled cassava supplied in restaurants, food kiosks and roadside points is mostly consumed by men. The men who consume away from home are associated with having low economic status. Urban areas have higher consumption of boiled cassava, but availability of the fresh cassava roots daily for preparing the product is challenging. There seems to be little difference in consumption of boiled cassava by gender but there are differences by age. There is need to evaluate the preference of the product across different ethnic groups and socio-economic status.

Granulated Cassava (Gari/Gari for Eba - Nigeria and Attiéké - Cameroon) (Del. A.1.2 ; A.1.6 ; A.1.7):

Nigeria (food science, gender and demand)

Food Science

The literature and key informant interviews found that there is a diverse range of preferences and processing styles for gari and eba, which are strongly related to ethnicity and socio-economic status. South West (SW) consumers generally like a soft, low elasticity eba and a sour and an off-white, ivory, butter-like color for gari. South (SS) and South East (SE) consumers generally prefer hard, elastic eba and non-sour, white or yellow gari, the latter achieved from the addition of palm oil, which in turn might reduce storability.

In terms of end product characteristics associated with varieties and processing, some key informants stated that there are differences in the glycemic index of fermented and unfermented gari/eba, differences in cooking time/rehydration, swellability etc., but this requires further evidence. Low starch cassava varieties may affect a gari that is traditionally cooked for a short time (SW), as after preparation there will not be enough rehydration of the starch to make the eba hold together. Also, high starch and dry matter provide more gari yield. The drawability and hardness of the eba seems majorly determined by the way eba is made: longer cooking means more rehydration and complete gelatinization and a harder more drawing eba. A significant indicator of the quality of gari and eba lies in the expertise with which it is processed, however, low dry matter /starch content and variety specific mash color after pressing can contribute to a lower quality product.

Other characteristics found to be important are the swelling of gari is important (the higher the density the greater the expansion from gari to eba). Swelling of gari in cold water is significantly higher for fermented gari. This is a preferred trait for people that drink gari. Granule size is also important, which is influenced by the equipment used, but mainly by the contact temperature between the mash and the roasting board/pan (controlled by the speed of stirring and amount added per batch). Granules that are fine but not too fine are most liked. Consumer preferences for granule size requires clarification. Attractiveness, particularly color, is highly valued, and is affected by fermentation, variety and sanitation during processing.

Additional information is required on how and what kind of gari from the rural areas is assembled in towns/suburbs before it is bulked and sold as wholesale in cities.

Gender and socio-economic context

Processing is a mainly considered to be a women's role and processing labor is mostly conducted by women. Processing equipment in processing centers is usually owned by men which women access through small fees. The future dynamics of this with regards to equity requires investigation. Cassava and gari have been an important historically providing a way for women in the SE and SS to empower themselves given the inequalities created by male dominated colonial rule. This still explains some gendered roles today. If we want to know the specific preferences of gari and eba in relation to the production and especially the processing steps and product quality, it is mostly experienced women that we have to consult.

Demand

The Nigerian market for *gari* is characterized by perfect competition in that there are many buyers and sellers who are not in a position to influence marketing transactions by refusing to either sell or buy. This illustrates the high demand for *gari* in the country. Most of the *gari* traded is white *gari* but a substantial part is yellow *gari* as a result of adding palm oil, and its market price is higher; not only because of the palm oil added but also because of the more limited shelf life. Almost all of the yellow *gari* comes from the South or South East. About one third to one fourth of the *gari* traded in Lagos is yellow *gari* according to the CAVA project. Kano in the North of Nigeria is a great hub for the export of *gari* from the Southern belt to the North: North Cameroon, Chad, Niger, Burkina Faso, and Mali. This shows the large role of *gari* in Nigeria, as a dry (transportable) and storable food product (in that respect comparable to rice).

There is some but limited qualitative information about how and what kind of *gari* from the rural areas is assembled in hubs in towns or suburbs of cities before it is bulked and sold as wholesale in cities. There is also little information on the specific quantities of each type of *gari*, and how they relate to different traditions. Divisions between coarse/sweet *gari* at the one hand and fine/sour *gari* on the other hand and *gari* where palm oil is added (mostly to the coarse/sweet type) are informative but do probably not do full justice to general trends and insights regarding the relation between *gari* product quality and cassava varieties.

Cameroon - food science and demand

Food Science

Gari, also spelled as *garri*, or *garry*, depending on the producing area, is a pregelatinized, fine to coarse granular product made from fermented cassava mash. The popularity of gari is mainly due to its affordability, good storage ability and its easiness to prepare. It is consumed either as snack after

soaking in cold water with sugar, peanuts, or cooked in hot water to make a dough-like paste called “eba” in Nigeria or “gari fufu” in soups in Cameroon.

Its processing involves several successive steps: grating peeled cassava roots to produce a mash which is pressed to remove water, fermented, then sieved and roasted with or without palm oil. The pregelatinized granules are either yellow when roasted with palm oil or white when roasted without palm oil. Depending on the area, variations in the process can be observed: fermentation may occur simultaneously during dewatering, or before and separately with fermentation. Both processing practices are found, with simultaneous fermentation/dewatering common in all gari processing areas, while the second practice is mainly localized in the North-West Region. The fermentation duration in both processing practices varies between two and four days. Gari processing leads to high nutrient losses, certainly during dewatering and roasting. Processing yields rank between 25% and 30%.

Fermentation level resulting in acidic or sweet taste, color (white or yellow, depending on the use or not of palm oil during roasting) account among the main attributes of gari when buying. Grain size is another attribute considered by consumers. These attributes are differentially appreciated by consumers depending on their origin or culture. Anglophones seem to have a preference for sour gari, while Francophones should prefer sweet gari. Gari from the North-West Region seems to have higher demand.

Local cassava varieties are generally preferred because of their availability, their high dry matter content, their liked sweet taste and their ability to be kept in soil for long time after their maturity. In the North-West Region, almost 85% of cassava processors use improved cassava varieties for gari, particularly a variety named “six months”, so called because it is physiologically mature at six months after planting. Cassava variety and age influence the acceptability of gari. Gari made from improved varieties harvested after 8 – 10 and 14 months, and local varieties harvested after 14 months were the most liked.

Factors influencing the acceptability of gari include the frying time (10 minutes + reduces the quality), frying temperature, quantity of palm oil, and the storage conditions of roots. Consumers most preferred gari was the one from Muyuka, regarding the fineness and uniformity of particles, its cleanliness, bright color, good swelling capacity and low sour taste.

In the SoK report from Cameroon team, no information was given on the methodology used for identifying quality characteristics of gari: surveys, measurement of processing parameters, physico-chemical characteristics of cassava varieties, sensory analysis, and consumer testing. Since few studies have been done in Cameroon, it should be interesting to give these precisions and go deeper in the list of characteristics already identified. It should be also important to draw up an inventory of identified quality characteristics in Nigerian literature, to better visualize the gaps to be addressed by RTBfoods project. Cameroon team has already done an extensive literature review but has limited the report to Cameroon literature, according to WP1 demand.

Demand

Gari production and consumption in Cameroon vary from one area to another and seem to be linked to socio-economic and cultural habits. The term “gari” is mainly used in anglophone areas (North-West and South-West Regions), while the term “tapioca” is more common in francophone areas. The main areas of gari production are North-West, South-West, Littoral and Centre Regions, with the first two Regions (North-West and South-West) having the highest production. Gari consumption is most strongly associated to people originating from South-West and North-West Regions. This may be

related to geographical proximity of these two regions with Nigeria, which is the largest gari producer and consumer.

Attiéké – Ivory Coast (food science, gender and demand)

Food Science

Attiéké is a fermented cassava granular product, steamed with agglomerated appearance, obtained from fresh cassava roots after several successive operations: peeling, washing, crushing, grating, fermentation, dewatering, sieving, granulation, pre-drying, sieving, winnowing and steam cooking.

Processors distinguish three qualities of attiéké: garba, standard attiéké and abodjama. The difference between them related to the presence of fibers and granule size. Attiéké "Garba" is a product of inferior quality. It is obtained by the suppression of some steps (granulation, winnowing and drying) and a lower amount of added ferment (mangan). It is sticky with many fibers. Abodjama attiéké is of superior quality: it is made as standard attiéké, but with a calibration of the granules, small, medium, or coarse granules. The residual fibers are eliminated during this sieving step. The steam cooking is longer than for the garba and done in two steps.

The processing steps affect the final quality of attiéké. The granule size increases with the water content of the pulp. The fermentation time of 24 to 36 hours with added ferment gives granules of good particle size. The addition of ferment at rates of 8 to 10% gives granules of texture similar to the standard ones. The attiéké producers use three types of ferment: the "fresh mangnan", "braised mangnan" and boiled mangnan ". The last is the most used. The ferment is ready for use at a pH of 5.4 to 6.1 and at a temperature of around 30 °C. It is the basis of the sensory quality of the different types of attiéké sold on the market. Lactic acid bacteria are one of the most important groups of microorganisms involved in the cassava fermentation step, mainly because of their known roles in the development of flavor and preservation of the food.

Cassava roots that provide a good quality attiéké have a high yield (20 t/ha) and a high dry matter content (at least 30%), no or slight mechanical, pest, or insect damage, no decay, no physiological or microbial deterioration, a firm flesh texture, a fresh state (no more than 1 day after harvest), a fresh cassava root odor. The Improved Africa Cassava (IAC) variety is the most widely used (26 - 44%) in Ivory Coast, especially in the traditional production areas (South of Ivory Coast) because of its high dry matter content (36%) compared to Bonoua variety (29%) and because it has a good ability to be processed into attiéké. Other cassava varieties are also used depending on the area: in Grand-Lahou, there is the variety Ahoussakplin, in Jacqueville, the variety Ghana, and in Dabou, the variety Bocou 1. Tinandjo is one of the oldest cassava varieties used in the Grand-Bridges region, however producers abandon it because of its long period before harvest (24 months) and lower yields. Among some improved high-yielding cassava varieties, those which gave the most appreciated Attiéké were the varieties Bonoua 2, I88/00158, TMS4 (2) 1425, IM84, and CM52.

The desired characteristics of cassava roots for making a good Attiéké are a high dry matter content, freshness (≤ 1 day after harvest), a good sanitary quality, an ease of peeling and absence of fibers.

A good attiéké has a yellow chick color, absence of fibers and impurities, visible and well-rounded granules moldable in the hand, a hard texture, a pleasant and salty-sweet taste, and an odor of freshly cooked fermented cassava product.

Adjoukrou, Alladjan and Ebrié are the three ethnic groups in southern Côte d'Ivoire considered as the largest Attiéké producers and consumers. Attiéké Adjoukrou and Attiéké Alladjan have both a pleasant

aroma, with loosely bound granules. However, Attiéké Alladjan has a more heterogeneous texture and Adjoukrou Attiéké has a sweeter and less sour taste. Attiéké Ebrié has a sharper taste than the others and it is less sweet. Attiéké Adjoukrou has a finer granule size.

In the SoK report from Ivory Coast team, most of papers collected on Attiéké related to the effect of processing, mainly fermentation step and the important role of the ferment, on physicochemical characteristics of Attiéké. However, some papers reported on sensory quality of Attiéké, with a detailed methodology described by the team. Hedonic tests were conducted with no more than 50-60 consumers (with no details on gender, education, age, occupation) and sensory scoring by a panel were carried out on only global descriptors (appearance, taste, texture). The team is invited to propose a summary of quality characteristics of cassava roots and Attiéké at the end of the SoK, with an analysis of more papers already collected. RTBfoods WP1 activities will certainly provide more precise information on quality characteristics to deliver to WP2 activities by asking up to 300 consumers to describe different Attiéké products with 20-25 descriptors collected during Activity 3 & 4.

Gender and socio-cultural context

Cassava production is more typically done by women on separate plots to men. Men may be involved in some production activities, but women will take over the management role of cassava due to its important role in household food security. Cassava is typically planted in lines, which is easier for weeding, often considered a women's role. However, in the south, cassava is typically monocropped and in plots under one hectare for men and women, and intercropped (yam, rice and corn) in the rest of the country, including on cash crop farms (rubber, palm oil, cashew and cocoa). Production generally does not involve fertilizers and herbicides, however use is increasing. The activities under male control are cassava fresh roots harvest, and transport of cassava products (fresh roots, and distribution of attiéké). The most popular cassava varieties for attiéké are traditional varieties. There are also improved varieties such as Yacé and Bonoua that have been introduced recently but have low adoption. In particular, processors (predominately female) report that Bocou varieties do not make good attiéké.

There is strong competition between attiéké and placali, another product from cassava, however, placali has less tedious in processing compared to attiéké. Cassava processing labor including the principle cassava products attiéké and placali processing, are done by women who sometimes hire immigrant women (Burkinabe and Malian). The people of the South (Ébrié, Adjoukrou, Alladjan...) in Abidjan and its surroundings are dominant in attiéké processing. Most wholesalers are typically from the ethnic groups in the south. However, retail sellers are from all ethnic groups and tend to be women between 20 and 40, with primary or secondary education. Most of the fresh placali is produced by women country wide from South to North. Marketing of cooked placali is women's tasks and is dominated by Baoulé ethnic group.

Attiéké processing is dominated by women because of the important of the product for household consumption. For some ethnic groups such as Ebrié and Avikam, attiéké processing influences the social status of women. But, as cassava is becoming a cash crop, more and more men are engaged in its production.

Constraints specifically for women are limited knowledge of the market, lack of market coordination, poor cassava yields, lack of access to credit, and lack of access to land. There is a high demand for cassava yet it is difficult for processors to meet the demand due to their capacity. There may be opportunities for Attiéké processors in cooperatives to increase their income and reduce the drudgery of their work by pooling the efforts of individual – however currently cooperatives are weak.

In terms of gaps, there could be further investigation with key informants to fill gaps in knowledge. And while the review did uncover regional and ethnic differences in farming, processing and marketing by gender, general findings need to be further evidence.

Demand

The national consumption of attiéké is estimated at 100-110 kg/capita in 2016. National consumption of attiéké is estimated at 2.475 million tonnes of fresh cassava equivalent. The local market is the dominant market in terms of total revenue. However, consumers are increasingly demanding about quality and hygiene regarding the product. Studies have differed in how the Attiéké value chain is described. One example from a study are: 1) Producers, who are mainly women; 2) Carriers/transporters who transport by vehicle; 3) Processors who are mainly independent women or women organized into cooperatives; 4) Some industrial or semi-industrial units managed by men; 5) Wholesalers, 6) Retailers, 7) Caterers; 8) Haoussa traders; 9)

Exporters. At the same time, although the cassava/attiéké value chain is well understood as a result of several recent studies, little connection appears to have been made between the characteristics of cassava varieties and the quality or value of the end product.

Boiled Plantain (Del. A.1.8)

Cameroon (food Science only)

Bananas and plantains constitute an important staple food to millions of people in the world. In Cameroon, fruit physicochemical characteristics such as fruit girth, fruit length and peel thickness are important criteria for consumers in the choice of plantain cultivars used for specific uses. This is supported by the fact that some consumers assume that plantain fruits with high peel thickness are easier to peel.

Other parameters such as pulp to peel ratio, pulp firmness, total soluble solids, pH, total titratable acidity and dry matter content which are evaluated during ripening are also of great importance. Using various sources of energy (firewood, gas or kerosene cooker), unripe and ripe plantain pulps are sometimes cooked with salt and specific average quantity of water within a well-defined time. The boiling time been dependent on the ripening stage of the pulp, its grade and the plantain cultivar. The steps involved in plantain pulps preparation are: (i) fruit peeling and scrapping off the tiny membrane covering the pulps; (ii) pulp washing and cutting into pieces if they are large enough; and (iii) pulp cooking with a sufficient quantity of water within a precise cooking time. Apart from the consumers' physical traits preferences in Cameroon, few or no information is given regarding the organoleptic characteristics and the quality of boiled plantain at each steps of processing. The supply system of plantain include producers, wholesalers, collectors, loaders and transporters. Plantains are an important source of income for smallholder farmers and sellers in west and central Africa.

Matooke (Del. A.1.4):

Uganda

Food Science

For matooke, a mature bunch of bananas is harvested (after 3-4 months of flowering) for preparation. Maturity is assessed by changes in finger size, shape, angularity, and peel colour. Strips of banana fibers and stalks are at the bottom of a cooking pan to avoid the boiling water the matooke. Peeled and washed (sometimes) banana fingers are tied up in a bundle of banana (fresh) leaves and placed into the pot with water to steam the leaves. After steaming, the bananas are smashed with the palm of the

hand and served hot, usually with sauce (beans, meat, groundnut etc). Good quality matooke has a: golden yellow color, good aroma (some believe it is brought about by the leaves), good taste (e.g. no feeling of sap), soft texture (e.g. like chewing gum), smooth on the tongue (e.g. like a sponge), among others.

Traits/characteristics of varieties that make good matooke/traits before preparation are smooth peeling skin, soft peel/easy to peel and straight and big fingers which are easy to peel (e.g. Muvubo, Musakala and Nakitembe) in Luwero. In Mbarara it is: yellowish when peeled, straight and big fingers hence easy to peel e.g. Butobe, Embururu, Entaragaza and Enjagata, easy to cook, yellow when cooked, mature fast e.g. Entaragaza, big and fat fingers, attractive and appealing to the eye, makes good matooke even if not ripened (Embururu, Butobe and Enjagata can make nice matooke even when not fully mature unlike Kibuzi that can only make nice matooke when fully grown).

The main methods of the studies reviewed are surveys, focus group discussions (FGDs), participatory varietal selection (PVS), participatory rural appraisal (PRA) and sensory evaluations. Studies with consumers collect data on preferred traits and cultivars using sensory evaluations and taste assessments of a variety of food or dishes prepared from a set of new/introduced cultivars in comparison with a local check. There is scanty data on gender disaggregated studies.

Gender and socio-economic context

Matooke is the main staple food crop in Uganda and mainly cultivated for subsistence purposes and in the Central and Western regions. It is increasingly an important source of income for farmers and a main staple for urban consumers. There are few studies that have focused on various social aspects. Most studies indicate the preferences of a generalized group of participants but does not differentiate results for different social groups.

There were only four studies that reported gender-disaggregated trait preferences, indicating a significant gap in the literature. In some contexts, male and female banana farmers mention similar traits related to production constraints, such as host plant resistance to pathogens and pests, a common goal such as food security, marketability and preference for cultivars with ceremonial uses. Both mention preference for cultivars with big bunches and fingers, or cultivars with a commercial value. On the contrary, Musimbi (2007) found that women mentioned traits related to production (high suckering ability and early maturity because of the potential to earn income from selling suckers), whereas men emphasized consumption-related traits (good taste and color). Nasirumbi (2017) however also reports that men mentioned production related traits such as big bunch for the market whereas women mentioned traits related to consumption characteristics.

Both men and women grow cooking banana mostly for home consumption in the central region, but in the west it is mostly for commercial reasons. Banana is referred to as a 'women's crop' in some areas e.g. in Eastern Uganda (Musimbi 2007). Commercial banana gardens controlled by men, planted further away for better yield, whereas bananas for food are grown by women close to the home in Masaka and Bushenyi districts (Karamura et al. 2004). Banana can be monocropped or intercropped with coffee and legumes. Commercial banana production is often monocropped, others intercrop due to land shortages.

Demand

Banana consumption (and production) in Uganda is concentrated in the Central and Western Regions with the latter having the highest consumption; consumption is least in the Northern Region. Production is mostly done by smallholder farmers who usually grow diverse varieties for home

consumption. According to two studies, producers consume about 70% of harvested bananas in their homes whilst 20-25% is sold fresh to traders who supply local, national and urban markets. In a study in Western Uganda, researchers found that 65% of the banana produced is consumed and about 30% is taken to the market; 60% of the produce sold in the open markets in the urban centers goes to individual households, while the rest is sold to hotels and restaurants.

Kilimo Trust (2012) noted that women of all ages, including youth, dominated banana retailing in Uganda; most of these actors were relatively young entrepreneurs aged between 31-40 years. It is estimated that market vendors have a higher profit margin than farmers since their costs are on average lower. Another study (Nalunga et al., 2015) found that the most profitable node in the value chain is at the wholesale level and that men are predominantly positioned in the most profitable nodes of the value chains. The study provides a good contrast of profit margins between high and low seasons, between genders and bunch size of matooke. Small roadside food vendors also roast the green banana fingers as a snack that can be eaten with roasted goat or pork. Restaurant owners also use cooking bananas to make the above-mentioned food products.

Given the discrepancies within and between studies and the scanty literature, there is need to conduct a comprehensive study on demand and consumption trends for cooking banana in Uganda. It is suggested that the study should bring out the seasonal differences in the supply and demand of the crop and provide nationally representative and robust statistics.

Boiled sweet potato (Del. A.1.9):

Uganda

Food Science

Sweet potato is the fourth most important crop in Uganda in terms of production volumes (1.8 million MT) after maize, cassava and bananas, and high per capita consumption 73kg/person/annum. Sweet potatoes are consumed in 3 main modes: boiled, mashed and fried. At household level, sweet potatoes are mainly prepared in two ways; steaming in banana leaf wrapping and boiling in water till soft. Fried sweet potato is the third most popular form of consumption after boiled/steamed and roasted and urban folk as well as medium income earners in the rural areas mainly consume it. For each of these consumption patterns, the characteristics of the desired raw materials are relatively well known: high dry matter content, optimal root shape, and color. Other studies have also identified different organoleptic criteria expected for each of these products. Nevertheless, they need to be consolidated over a larger number of varieties and consumers (Activity 5).

Finally, it should be noted that the studies conducted have shown that differences in product preferences exist between adult and child consumers. Disaggregating this element, along with by gender and other factors of social difference may constitute a GAP to be achieved during the project.

Other gaps that need to be addressed are: the specification of processing according to the proposed sampling scheme. In particular, various studies have made it possible to address the link between the level of dry matter content of the raw material and the physical properties of the finished products. This will be one of the main GAPs that the RTBfoods project will be able to achieve by working on a large number of samples (Activity 5 and WP2 link).

Gender and socio-economic context

The importance of sweet potato for food security and income is increasing, particularly due to pest and disease problems with alternative staples such as cassava and banana. It is an important food

security crop due to its drought tolerance, nutrition, early maturity and flexible growing season. Piecemeal harvesting is widely practiced and an attribute particularly valued by women. There has been a significant push to promote Orange Fleshed Sweet potato (OFSP) in the country to target vitamin A deficiency; however, consumers have reported to dislike the taste and smell of the crop, its low dry matter content and perceptions that the crop is genetically modified and less drought tolerant. However, children have been attracted to the color. Ejumula and NASPOT varieties of OFSP are popular, due to their nutritional benefits, sweet taste and greater yield – which is linked to higher income.

Sweet potato planting material is often obtained through social networks. The crop is commonly planted on large mounds with five to six vines on land demarcated for food security, and rotated with maize, beans and groundnuts. Women tend to intercrop with beans, but not men. Women also perform most of the labor activities regarding production, harvesting, washing and peeling, and packaging for sale. Men will participate in selling if there is a surplus. Women are reported to have most of the knowledge on production activities and varieties, and also have an active role in decision making regarding sweet potato but men influence decisions.

Constraints reported for women are drudgery in making ridges/mounds, weeding, harvesting, Post-slicing and drying SP, low bargaining power, prices, untrustworthy buyers, and chronic back ache. Men report limited access to mechanization (animal traction), quality herbicides, low prices, untrustworthy buyers.

There is a lack of evidence of preferences by gender and other factors of social differences, from production activities, processing labor and consumption. There also lacks more nuanced data on gender decision making, and greater amount of quantitative data attached to gender roles, linked to activities and preferences, in order to interrogate generalizations.

Demand

Uganda is the third largest producer of sweet potato in Africa, and the demand and income-generation potential for sweet potato and products is growing in the country. The high season occurs during Ramadan. Demand segments are urban and rural consumers consuming boiled sweet potato prepared at home. In urban areas, people commonly consume boiled or fried sweet potato purchased from hotels or from roadside vendors. There is some indication that fried sweet potato is preferred by men and in urban areas as a snack.

Sweet potato is very popular in eastern Uganda. Varietal preferences are Kampala, Boy, Socadido, Soroti and Tanzania varieties - the latter two are particularly valued by traders due to their longer shelf-life. In the central region (Buganda), sweet potato with high dry matter content and high sugar content is preferred. Varieties that have deep roots because they can be piecemeal harvested with little damage by the weevils are also preferred. The crop is traded informally, particularly by women. Wholesale trade is an Activity conducted by men, however there is a lack of information on the scale of activities. Marketing constraints include the crops bulkiness, high perishability, high transport costs, minimal storage facilities, limited market information services and absence of processing. Although the crop is not commonly stored as it is mainly harvested on a piecemeal basis, improved storage techniques are being increasingly used, such as pit stores (favored by women) and clamp stores (favored by men).

In terms of gaps, while there is data available on production and consumption of sweet potato it is not product specific. An overview of demand trends and consumer segments by product is needed, to understand how fried sweet potato compares to other products in terms of scale of demand and important. Overall, there is a paucity of data specifically on fried sweet potato.

Boiled Yam (Del. A.1.1; A.1.1bis; A.1.5)

Benin

Food Science

Boiled yam is considered an important food product in Benin, and throughout West Africa more generally. It is consumed for all meals (breakfast, lunch and dinner) and also as a street food in both rural and urban areas. However, not all yam varieties are suitable for cooking. The main quality characteristics looked for in raw yam are maturity of tuber, variety types, color, tuber size. The processing steps that are very important to make a high-quality boiled yam are that there is no oxidation or browning, an acceptable cooking duration, and is a white to milky boiling water. These characteristics are detailed in the full report.

The quality characteristics of yam tuber and boiled yam pieces were reported by several research works. Most of the research was collected through surveys or focus group discussion. Although, some surveys were designed at urban and rural levels, data were analyzed without focusing on those factors. In general practice, data obtained were not disaggregated between or by gender and other factors of social difference such as ethnicity, richness, age, marital status etc.

Furthermore, most of the mean ranges for the quality characteristics were not available from literature. As far as the SOK is concerned, the confidence in the information gathered along the food chain is high for some quality attributes of raw yam (maturity of tuber, variety types, color, tuber size), processing steps (no oxidation/no browning, cooking duration, white to milky boiling water) and boiled yam piece (color, texture, taste). However, the confidence in the information is still medium for other attributes. Thus, the WP1 activities will help confirming the confidence of the latter. No study integrating all food chain actors for quality traits identification is available.

Gender and socio-economic context

Yam is an indicator of wealth and well-being in rural areas and used to fulfil social and ritualistic obligations and represent social prestige. Yam is processed in to a variety of products, but also used in traditional pharmacopoeia, specifically treating high cholesterol and diabetes. Interestingly, in Couffo, women are more involved in production than men, whereas in other places in the country, it is only men. Assets required for yam include finance, well decomposed organic manure, seeds for yams and fertilizer. This is mostly the domain of men.

Preferred species of yam are *Dioscorea alata* (greater or water yam), *Dioscorea rotundata* (white guinea yam), *Dioscorea cayenensis* (yellow guinea yam). The most common varieties are Gangni, Gnidou, Laboko, Morukorou, Orukonai (early varieties); Kokoro and Florido-*Dioscoreaalata* (late varieties) in the major production areas of Zou, Central and Northern Benin. There are specific varieties are used for cultural and ritualistic practices e.g. Laboko and Gangni, which were more likely to be grown by men. Women also prefer varieties that are less labor intensive, particularly for pounding, as they are mainly involved in processing.

Overall, there is a lack of information on gender roles for the yam products and at each production and processing step. More information on why differences in gender norms between regions exist, and how it influences yam preferences is required. This will in part be filled with the research conducted under RTBfoods.

Demand

Yam is of primary importance in West and Central Africa. Benin is part of the yam belt which extends from central Côte d'Ivoire to the mountain ranges of Cameroon. This zone produces about 90% of the world yam crop. Benin ranks fourth among producers on the African continent behind Nigeria, Ghana and Côte d'Ivoire. Regarding the quality criteria of boiled yam, texture, color, taste, smell and digestibility are the major drivers of the preferences of Beninese consumers. There are two categories of varieties: good varieties to make crushed or pounded yam, which make up the majority of the varieties and belong to the *Dioscorea rotundata cayenensis* complex. These varieties are also good for other forms of consumption (boiled, fried, stew....). Varieties that are not good for crushed or pounded yam and most of which belong to the species *Dioscorea alata* are just good to eat in boiled or stew form. Perceived values allow a categorization of yam varieties into two major groups: one group with varieties characterized by high socio-cultural and economic values and another characterized by low socio-cultural and market values, but high food security value. Between them, the two groups provide farmers and consumers with a range of technological and agronomic aptitudes and provide food at different periods of the year.

The yam trade historically declined in Benin with competition from Nigeria. There are three main yam markets – based on specific ethnic group for each market e.g. Fon traders tend to trade in fresh yams. The majority of traders are Bariba and Tchabè. Smaller traders are usually women, whereas wholesalers are mainly men, except in Bariba- Tchabè where they are mainly women. The main market issues are access to transportation, access to the marketplace and access to customers. Concerning boiled yam, women, young girls mainly are the ones who make its sale although they are a minority compared to the ones who sell the pounded yam. Men are only involved rarely when they are hungry in the field or at home when their wives or children are not at home. They do not market it for the sake of honor because they say "It's the women's thing".

The drivers of the preferences of Beninese boiled yam consumers are presented in literature, however, there appears to be a dearth of information as far as recent studies are concerned, including on future trends of products, and the link between varieties of yam tubers and the quality of the end-product.

Pounded Yam (Del. A.1.1; A.1.1bis)

Food Science (Bowen University)

Physico-chemical composition of yam tuber such as the granule morphology, pasting properties, swelling, water binding capacity of yam starch, nutrient composition such as proximate, minerals, vitamins, and anti-nutritional factors in the yam tuber describes the food quality in yam. It is clear from the literature that textural quality is an important indicator of yam food quality. In this way, various works have identified the textural criteria of boiled yam (mealiness, waxiness, sogginess, stickiness and hardness) and pounded yam (stretchability, smoothness, cohesiveness, moderately adhesive and moderately soft). The SOK review also demonstrated that the quality and acceptability of pounded yam depend on the type of variety used to obtain it. In another way, it is known that yam storage duration impact positively the quality of the pounded yam.

There is the dearth of knowledge of what farmers, processors and consumers perceive as food quality characteristics, along with differences by gender or ethnicity. This is another gap that the RTBfoods project aims to address, is that according to the literature food quality to farmers is commercial profitability of the yam variety and ability to make the preferred yam food product. One of the gaps that the RTBfoods project aim to address is to identify indicators in yam tubers, as raw material, which can predict the quality of the pounded yam.

Gender and socio-economic context (NRCRI)

Yam growing and handling involves many operations, some of which follow gender lines/stereotyping in some regions. In the south-eastern part of Nigeria, for instance, men and women combine efforts to do the planting; the women carry out weeding which is usually done 2-3 times before harvest; and men and women combine efforts again at crop maturity to do the harvest.

In three locations of Nigeria in the South Region (Ibibio (Akwa Ibom State); Efik (Cross River State); Igbo (Anambra State), gender aspects are similar: Yam is predominantly a “male” crop and farming tasks are common for men to undertake bush clearing, ground preparation, rituals, seed selection and deposition, staking, trailing, harvesting, barn preparation and storage; and for women, covering yam seedlings, weeding, conveying tubers for storage, and cooking. These are the traditional division of labor between the sexes. In Ibibio farming is mainly subsistence, where as in Efik it was more commercial and subsistence farming. But generally, in all locations farming is small-scale and family-centered .Large-scale cultivation creates the need for polygamous relationship as a means to support labor. Men enjoy absolute access and ownership rights, whereas women’s rights of access are at the will of their husbands. In all three locations, yam was seen to enhance the social status of men and symbolize wealth. Yam also has important cultural role in ceremonies and rituals.

There are different varieties preferred by men and women, but literature did not explain reasons behind these different preferences. Greater evidence to support gender roles and activities is required, as a significant amount of the literature provides broad generalizations. As yam is traditionally seen as a man’s crop, it can overlook the important women play in yam value chains (e.g. trading) and undermine the importance of consulting women for their unique preferences.

Demand (NRCRI)

Nigeria is the largest yam producer in the world, contributing two-thirds of global yam production each year. In 2016 Nigeria’s yam production was 44.1 million tones, which represented 67% of the global production. Several observations stand out in a report by Nweke et al (2013): there is direct association between the frequency of yam consumption and consumer’s income group and there is inverse association between the frequencies of yam consumption and retail market price of yam relative to the prices of its substitutes. The two observations underscore the argument that an increase in consumer income in the representative countries (Nigeria, Ghana, Burkina Faso, Mali as covered in the study) or improvement in road network within and among yam producing and consuming countries impact positively on the frequencies of yam consumption. From 2005 to 2009, average annual per capita yam consumption was Nigeria, 84.4 kg; Ghana, 127.4; Mali, 5.2; and Burkina Faso, 2.2 kg (Nweke et al, 2013). Growth in yam consumption was higher than growth in population in Nigeria and Ghana, kept pace with population in Mali and was lower than population growth in Burkina Faso.

As part of the YIIFSWA project, Mignouna et al (2014) conducted a baseline study which established the link between preferred varieties related to criteria such as agronomic performance (e.g. tuber yield, drought tolerance, disease tolerance), marketability, and cooking and utilization. The study was

conducted in three Agro-Ecological Zones (AEZ) of Nigeria, and the results show that, overall, Hembamkwase is the preferred yam variety in the Southern Guinea Savanna, Amula in the Derived Savanna, and Obiaturugo in the Humid Forest.

Overview of SoK findings on important product characteristics

An overview of the important product characteristics in the SOKs is summarized in the table below.

Table 1 Summary table of important product characteristics from food science reports

	<i>Quality characteristics of product</i>		
<i>Product/country</i>	<i>Raw</i>	<i>During processing</i>	<i>Final</i>
Boiled cassava / Uganda Nb. In the case of cassava roots, characteristics are in order of importance for the first five characteristics	• Sweet taste when bitten; • Roots should not be watery when chewed fresh; • Easy to chew; • Low fibre content; • Long and slender root shape; • A root of 12 to 18 months maturity; • Soft to break; • Disease free; • Pink cortex (associated with sweet taste).	• Self-retracting peel or easy to peel; • Roots glitter after washing; • Easy to cut without uneven breaks; • Quick cooking (30 minutes), • Nice aroma; • Soft to pound (without fibers or cut into fibre).	• Soft to bite and easy to chew; • Sweet taste; • Feeling energetic after eating; • Nice aroma or mild aroma; • White or not so brown after pounding; • Less fibre- middle fibre only; • Mealy; • Friable - fluffy texture when pressed in the hand; • Doesn't stick in the hand - easily makes a depression when a finger is pushed in pounded cassava; • Less starch.
Granulated cassava / Eba Nigeria	• Low starch cassava varieties may affect a gari that is traditionally cooked for a short time (South West), as after preparation there will not be enough rehydration of the starch to make the eba hold together; • Also, high starch and dry matter provide more gari yield;	• Drawability and hardness of the eba influenced by the way eba is made: longer cooking means more rehydration and complete gelatinization and a harder more drawing eba. • Low dry matter /starch content and variety specific mash color after pressing can contribute to a lower quality product;	• South West consumers prefer soft, low elasticity eba and a sour and an off-white, ivory, butter-like color for gari. • South South and South East consumers prefer hard, elastic eba and non-sour, white or yellow gari, the latter achieved with palm oil, which may reduce storability.

	<i>Quality characteristics of product</i>		
<i>Product/country</i>	<i>Raw</i>	<i>During processing</i>	<i>Final</i>
		• Swelling of gari is important (the higher the density the greater the expansion from gari to eba); • Swelling of gari in cold water is significantly higher for fermented gari - this is a preferred trait for people that drink gari; • Granule size is important, and it is influenced by the equipment used, and contact temperature between the mash and the roasting board/pan.	• Attractiveness, particularly color, is highly valued, and is affected by fermentation, variety and sanitation during processing. • Gari granules that are fine but not too fine are most liked.
Gari / Cameroon	• Local cassava varieties are generally preferred because of their availability, their high dry matter content, their liked sweet taste and their ability to be kept in soil for long time after their maturity. • In North-West region ~85% of processors use improved cassava varieties such as “six months” (it is mature after 6 months); • Gari made from improved varieties harvested after 8 – 10 and 14 months, and local varieties harvested after 14 months were the most liked.	• Factors influencing the acceptability of gari include the frying time (10 minutes + reduces the quality), frying temperature, quantity of palm oil, and the storage conditions of roots.	• Fermentation level resulting in acidic or sweet taste, color (white or yellow, depending on the use or not of palm oil during roasting), and grain size are important when buying. • Characteristics are different by region and culture. Anglophones seem to have a preference for sour gari, while Francophones should prefer sweet gari. Gari from the North-West Region seems to have higher demand. • Consumers’ most preferred gari was the one from Muyuka, regarding the fineness and uniformity of

	<i>Quality characteristics of product</i>		
<i>Product/country</i>	<i>Raw</i>	<i>During processing</i>	<i>Final</i>
			particles, cleanliness, bright color, good swelling capacity and low sour taste.
Attiéké / Ivory Coast	- The desired characteristics of cassava roots for making a good Attiéké are a high dry matter content, freshness (≤ 1 day after harvest), a good sanitary quality, an ease of peeling and absence of fibers. - Varieties used for attiéké making include: Improved Africa Cassava (IAC), and regional varieties such as Ahoussakplin, Ghana, Bocou 1.		A good attiéké has a yellow chick color, absence of fibers and impurities, visible and well-rounded granules moldable in the hand, a hard texture, a pleasant and salty-sweet taste, and an odor of freshly cooked fermented cassava product.
Boiled plantain / Cameroon	- In Cameroon, fruit physicochemical characteristics such as fruit girth, fruit length and peel thickness are important criteria for consumers in the choice of plantain cultivars used for specific uses (it is assumed that plantains with high peel thickness are easier to peel). - Other parameters include pulp to peel ratio, pulp firmness, total soluble solids, pH, total titratable acidity and dry matter content which are evaluated during		Apart from the consumers' physical traits preferences in Cameroon, few or no information is given regarding the organoleptic characteristics and the quality of boiled plantain at each steps of processing.

	Quality characteristics of product		
Product/country	Raw	During processing	Final
	ripening are also of great importance.		
Matooke / Uganda	• Traits/characteristics of varieties that make good matooke are smooth peeling skin, soft peel/easy to peel and straight and big fingers which are easy to peel (e.g. Muvubo, Musakala and Nakitembe) in Luwero. • In Mbarara it is: yellowish when peeled, straight and big fingers hence easy to peel e.g. Butobe, Embururu, Entaragaza and Enjagata, easy to cook, yellow when cooked, mature fast e.g. Entaragaza, big and fat fingers, attractive and appealing to the eye, makes good matooke even if not ripened (Embururu, Butobe and Enjagata can make nice matooke even when not fully mature unlike Kibuzi that can only make nice matooke when fully grown).		• Matooke should be served hot. Good quality matooke has the following attributes: golden yellow color, good aroma (some believe it is brought about by the leaves), good taste (e.g. no feeling of sap), soft texture (e.g. like chewing gum), smooth on the tongue (e.g. like a sponge). More characteristics were identified in the main SOK report.
Boiled sweet potato / Uganda	• The characteristics of the desired raw materials are relatively well known: high dry matter content, optimal root shape, and color. Other studies have also identified different organoleptic criteria	• At household level, sweet potatoes are mainly prepared in two ways; steaming in banana leaf wrapping and boiling in water till soft. Fried sweet potato is the third most popular form of consumption.	• Differences in product preferences exist between adult and child consumers. Disaggregating this element, along with by gender and other factors of social difference may constitute a GAP to be

	Quality characteristics of product		
Product/country	Raw	During processing	Final
	expected for each of these products. Nevertheless, they need to be consolidated over a larger number of varieties and consumers (Activity 5).		achieved during the project.
Boiled yam / Benin	The main quality characteristics looked for in raw yam are maturity of tuber, variety types, color, tuber size.	The processing steps to make a high-quality boiled yam are that there is no oxidation or browning, an acceptable cooking duration, and there is a white to milky boiling water.	Boiled yam piece characteristics that are important include: color, texture, taste. The confidence in the information is still medium for other attributes.
Pounded yam / Nigeria	- Quality and acceptability of pounded yam depend on the type of variety used to obtain it. - Yam storage duration impact positively the quality of the pounded yam.		Various works have identified the textural criteria of boiled yam (mealiness, waxiness, sogginess, stickiness and hardness) and pounded yam (stretchability, smoothness, cohesiveness, moderately adhesive and moderately soft).

Gaps in knowledge identified in the SOKs

The gaps in knowledge identified in the SOKs are summarized in the table below.

Table 2 Gaps in Knowledge identified in the SOKs and proposed action

Product	Food Science	Gender	Demand
Boiled Cassava - Uganda	Disaggregation by sex and other factors of social difference. <i>This is expected to be addressed by RTBfoods Activity 3, 4 and 5.</i>	Systematic and robust evidence on gender roles and control over cassava processing income to avoid over-generalizations. <i>This will not be addressed by RTBfoods.</i> Knowledge regarding gender differences in adoption and	Market and demand segments linked to preferences for characteristics. <i>This is expected to be addressed by RTBfoods with the market interviews proposed in Activity 3, 4 and 5.</i>

		varietal preferences. <i>Investigating product preferences using gender and social difference lens is expected to be addressed by RTBfoods Activity 3, 4 and 5.</i>	
Gari/Eba-Nigeria	Priority and range of the characteristics; consumer preferences on granule size, color/attractiveness and swelling of the gari and their relative importance in different regions and how they relate to varietal differences. Methodology for previous studies unclear, particularly by gender and other factors of social difference. Quality characteristics collected through a larger sampling and several precise consumer tests. These gaps are <i>expected to be addressed by RTBfoods Activity 3, 4 and 5.</i> The relation between fermentation time, preparation method and the “starchiness” and texture of the food (hard or soft eba). Consumer preferences for granule size requires clarification. <i>These are expected to be addressed by RTBfoods Activity 4.</i>	Influence of commercialization over the means of production and income change. <i>This will not be addressed by RTBfoods.</i> Knowledge regarding gender differences in trait preferences and how they relate to varietal preferences and adoption. <i>Investigating product preferences using gender and social difference lens is expected to be addressed by RTBfoods Activity 3, 4 and 5.</i>	Size of gari markets by their variation. How and what kind of <i>gari</i> from the rural areas is assembled in hubs in towns or suburbs of cities before it is bulked and sold as wholesale in cities. Specific quantities of each type of <i>gari</i>, and how they relate to different cultural traditions and their notions on food product quality and how they relate to varietal differences. <i>This is expected to be addressed by RTBfoods with the market interviews proposed in Activity 3, 4 and 5.</i>
Gari, Cameroon	Greater specification of important characteristics for Gari in Cameroon. <i>This is expected to be addressed by RTBfoods Activity 3, 4 and 5.</i>	*Not conducted.	Evidence on the size of different demand segments and how the regional dynamics play out in urban centers. <i>This will not be addressed by RTBfoods Cameroon team.</i>
Ivory Coast, Attiéké	Information provided on the effect of processing, mainly fermentation step, on physicochemical characteristics of Attiéké. Some papers reported on sensory quality of Attiéké,	Information on gender roles in attiéké value chains, supported by evidence is lacking, and how it links to preferences. <i>Investigating product preferences using gender and</i>	Trends in demand for the three attiéké products along gender and age groups can be analyzed in more detail; also, how this is related to the characteristics of cassava roots. Knowledgeable

	with a detailed methodology. Hedonic tests were conducted with no more than 50-60 consumers (with no details on gender, education, age, occupation) and sensory scoring by a panel were carried out on only global descriptors (appearance, taste, texture). More precise information on quality characteristics is expected to be addressed by RTBfoods Activity 3, 4 and 5.	<i>social difference lens is expected to be addressed by RTBfoods Activity 3, 4 and 5.</i>	traders, who can provide the information, need to be sought at different levels in the value chain. This is expected to be addressed by RTBfoods with the market interviews proposed in Activity 3, 4 and 5.
Plantain, Cameroon	Quality characteristics at each processing steps and the quality characteristics of the final product (including some nutritional facts and sensory characteristics) in Cameroon. <i>This is expected to be addressed by RTBfoods.</i>	<i>* Not extensively covered and will not be addressed by RTBfoods.</i>	<i>* Not extensively covered and will not be addressed by RTBfoods.</i>
Matoke - Uganda	Gender and socially segmented evidence. <i>This is expected to be addressed by RTBfoods Activity 3, 4 and 5.</i>	Social aspects of Matoke preparation and preferences. Gender and socially segmented evidence. <i>Investigating product preferences using gender and social difference lens is expected to be addressed by RTBfoods Activity 3, 4 and 5.</i>	Comprehensive study on demand and consumption trends for cooking banana in Uganda. It is suggested that the study should bring out the seasonal differences in the supply and demand of the crop and provide nationally representative and robust statistics. <i>This is not expected to be covered by RTBfoods.</i>
Sweet Potato - Uganda	Preferences by gender and other factors of social difference. The processes for obtaining the products, although described, need to be specified. <i>This is expected to be addressed by RTBfoods Activity 4, 5 and 6.</i>	Preferences by gender. Regional differences, more nuanced data on decision making, more quantitative data attached to gender roles - need to be linked to preferences and activities. <i>Investigating product preferences using gender and social difference lens is expected to be addressed by RTBfoods Activity 3, 4 and 5.</i>	Overview of demand trends and consumer segments by product. There was a paucity of data specifically on fried sweet potato. <i>This is expected to be addressed by RTBfoods with the market interviews proposed in Activity 3, 4 and 5.</i>
Boiled yam - Benin	Urban/rural differences in preferences.	There is a lack of information on gender roles for the yam products and at each	Future trends of products, and the link between varieties of yam tubers and

	Disaggregated data by gender and other factors of social difference such as ethnicity, wealth, age, marital status etc. Mean ranges for the quality characteristics. Specific characteristics identified where more information is required. <i>This is expected to be addressed by RTBfoods Activity 3, 4 and 5.</i>	production and processing step. Reasons for differences in gender norms in relation to product/preference variations. <i>Investigating product preferences using gender and social difference lens is expected to be addressed by RTBfoods Activity 3, 4 and 5.</i>	the quality of the end-product. Identification of specific demand segments with up-to-date information, along gender and age groups, and for rural areas, secondary centers, and big cities. <i>This is expected to be addressed by RTBfoods with the market interviews proposed in Activity 3, 4 and 5.</i>
Boiled yam – NRCRI / Bowen	Perceptions among farmers, processors and consumers on food quality characteristics, along with differences by gender or ethnicity. <i>This is expected to be addressed by RTBfoods Activity 3, 4 and 5.</i>	Reasons behind gender differences in varietal preferences. Evidence to support gender roles and activities is required to unpack generalizations. <i>Investigating product preferences using gender and social difference lens is expected to be addressed by RTBfoods Activity 3, 4 and 5.</i>	Demand segments, quantities traded and consumed, and where, and how this links to preferences. <i>This is expected to be addressed by RTBfoods with the market interviews proposed in Activity 3, 4 and 5.</i>

Methodology development

Please, refer & cite the deliverables produced using the codes mentioned in the table above when relevant.

- Which methods developed for WP1 framework (Activity 3 to 5)? For which reasons were these methods developed? What for? Which Originality?

The WP1 4-part Guidance manual showcases the methods developed to guide partners in fieldwork for Activities 1, 3, 4 and 5, and are available on the RTBfoods platform (Del. A.2.1 to A.2.10). They are living documents that will be continually updated. The methodology documented in the manuals is an interdisciplinary and multi-staged, aimed to identify, triangulate and prioritize user preferences to inform breeding priorities. The method is described below.

SoK (Activity 1) is a method developed to systematically guide partners through a literature review, expert interviews and critical self-reflection relating to existing knowledge on quality characteristics, gender and socio-economic context, and demand for the crop and product. This method also determined the gaps in knowledge to be the focus for RTBfoods WP1 activities and beyond.

Gendered Product Mapping (Activity 3) involves consultation in rural communities with people who grow, process and consume the crop in major production and consumption areas in the country, considering geographic and cultural diversity. The methods developed as part of Activity 3 include: Key informant interviews with community leadership, focus groups discussions and individual interviews with community members. Market interviews at the community level also take place as part of Activity

3 fieldwork. Importantly, the method involves consultation for different actors involved in the value chain at a rural level. The aim is to identify the quality characteristics along the food chain (production, post-harvest and market) by different types of stakeholders, the multiple uses and trade-offs between uses, which may reflect different interests of men and women. This will provide a robust evidence base for understanding preferences among different user groups to inform breeding programs of the range of consistency to diversity of preferences. As the SoKs demonstrate that obtain information on these areas will address a significant gap in current knowledge. Priority data for WP2 will be extracted from the dataset as the first stage of analysis.

The method for **Participatory processing diagnosis and quality characteristics (Activity 4)** is to conduct participatory processing demonstrations in processing hubs/ medium size towns. This combines two complementary tools: 1) the diagnosis of the processes by measuring technological parameters at each step of the process, while processors make products from varieties with different quality characteristics, 2) collecting processors' opinions through a semi-structured discussion guide before, during and after processing, on the different quality characteristics of varieties which could influence the final quality of the products, and also on the most liked and least liked characteristics of the final products. Market Interviews are also conducted at this level. Given the large number of product profiles and contexts that are subject to this work, it should be noted that the tools, especially for the conduct of the diagnosis, must be adapted on a case-by-case basis using results from Activities 1 & 3, and the needs of Activity 5, in mind. Activity 4 experiments must be carried out in connection with the WP2 to collect information and samples of the raw materials and the final products for characterization and physico-chemical analysis.

Consumer testing in rural and urban user segments (Activity 5) involves urban and rural consumer testing of products of different sensory properties made by processors in Activity 4, to understand what local consumers, from different demand segments, consider the characteristics of a high-quality product to be. Consumer testing in rural areas is particular is innovative as it is normally conducted in urban centers. But as these products are important food security products, WP1 feels it is important to test these products in rural locations as well. The method involved in this activities include an "all-in-one" method with two small questionnaires and three successive tests while consumers are invited to taste each product, one after the other: a small questionnaire on demographic information and consumption habits, a nine-point scale hedonic test to score the liking of each product, a 3-point scale JAR "Just About Right" test on 2-4 specific descriptors identified as important in Activity 3 & 4 to know if each descriptor is as the consumer likes or not, a CATA "Check-All-That-Apply" test including a table with sensory and perceptions descriptors collected during Activities 3 & 4 to better describe each product. Finally, a small questionnaire on consumer's views and opinions about each product. Market Interviews are also conducted at this level.

The final method is for **the WP1 – food product profile – first iteration**. This is method involves the extraction of key data (characteristics, user group, and characteristic prioritization) from each of the previous activities to develop and build on a product profile. The product profile is a set of quality characteristics of a product that are required to meet user demand and be successfully released onto a demand segment. The quality characteristics of the product are linked to the bio-physical characteristics of the crop variety and the processing parameters used to make a good quality product. It is envisioned that WP1 will provide the first iteration of product profile to WP2 for bio-physical analysis and work package 5, to help established breeding priorities.

- *Function/ Objective of each manual from the Capacity strengthening kit (Del. A.2.1 to A.2.10)? (NB: you can provide here manual abstracts). How have they been tested on the field?*

Gendered product mapping - Activity 3: The objectives of the Activity 3 manual is to understand who is producing, processing, selling and consuming the crop and product, from a gendered perspective; understand the multiple uses and products of the crop and possible trade-offs between uses; identify the quality characteristics and descriptors by stakeholder group (e.g. producers, processors) and demand segment (e.g. rural consumers), and to understand how gender influences preferences and prioritization for characteristics. Each partner has tested these tools in the field, except for Cameroon gari team who has not started fieldwork.

Participatory processing diagnosis and quality characteristics - Activity 4: The objective of the Activity 4 manual is to conduct participatory processing/preparation demonstrations for the product under study to understand processors' demand for quality characteristics of the crop, while processing different RTB varieties with various technological properties. The methods will not be tested in the field until year 2.

Consumer testing in rural and urban user segments - Activity 5: The objective of the Activity 5 Manual is to provide a research approach and tools that enable researchers to understand the consumers' demand for quality characteristics of the product under study, i.e. to understand what a high-quality product is for local consumers. The sensory and perception descriptors of several products that have very different sensory properties, will be related to the overall liking with a large number of consumers. The products will be made from local varieties and/or genotypes that were selected by processors and research team because of their different quality characteristics (in Activity 4). Consumer testing will be conducted in rural and urban user segments in year 2.

- *How first feedback from partners have been integrated to adapt/improve the methodology (learning dimension)?*

Feedback from partners on the WP1 methodology was received at multiple points in time during Year 1, as the manuals are considered 'living documents' and will continue to evolve over the project lifespan with learning from partners. To date, feedback has been integrated into the methodology in the following ways:

- Drafts of the manuals were circulated to PMU, work package leaders and other key resource people, particularly breeders, for their input and suggestions prior to the March 2018 Capacity Strengthening and Sharing Workshop. The manuals on the portal reflect additional input from collaborators following the workshop and will be updated on an ongoing basis.
- The Capacity Strengthening and Sharing Workshop (April, 2018) provided an opportunity for the team to present and receive feedback on the tools and approach which were integrated into the manuals and are reflected in the current versions on the portal.
- Feedback on the approach and tools for Activity 3 was received from partners during preparation, piloting and implementation Activity 3 fieldwork. In most cases, this feedback has focused on tailoring the tools to the country and product context, and the overall approach has not significantly changed.
- The WP1 Coordination team and collaborators undertook learning visits during Gender Food Mapping - Activity 3 pilots in Benin, Nigeria, Uganda, and Ivory Coast. Lessons from the pilots were documented for Benin (June, 2018), Nigeria (August, 2018) and Uganda (September, 2018). See box 1 below for lessons from Nigeria and Uganda experience and box 2 from Ivory Coast.

Box 1: Summary of lessons from learning visits for Activity 3 facilitated by Lora Forsythe for Nigeria (August, 2018) and Uganda pilots (September, 2018)

General

- Input from breeders on the first day was EXTREMELY valuable. Ask breeders to review/comment on the questionnaires. If they do not have time, ask what they think is the priority data they need. Breeders should have also be interviewed as part of the SoK.
- Link the preferred characteristics back to the varieties. This will help breeders.
- Questionnaire should identify difference characteristics for processing and product variations.
- If all parts of the crop are used, vines, roots, seeds, for animal feed etc., it should be included in the questionnaire as prompts.
- Storage (pre and post-harvest) is something not specifically prompted in the questionnaires. Consider if it is important for the product to probe on this specifically.
- Need to understand how trends and popularity for products is changing.

Questionnaires/tools and preparation – before fieldwork

- Pilot the tools and immediately follow with a debrief with the whole research team to discuss and agree how questions should be asked, challenges and modifications.
- Roles for facilitation and notetaking should be defined clearly. While there should be interaction and support by all team members, we should be empowering one another. Showing organization and a friendly disposition – along with continual engagement with the respondents is necessary.
- Scheduling is very important. Especially for women. Discuss expectations with the mobiliser and clarifying expectations at start of the interview.
- Piloting the tools is vital and each team members needs to have the same interpretation of the questions.
- Adapt the market interview questions to the level of interview that is being conducted. For Activity three it is only village level.

Conducting interviews/focus group – during fieldwork

- “Active” note taking: identifying when to ‘skip’ questions to avoid repetition, manage time etc.
- Importance of verbatim notes, quotes etc. Using words as the community expresses.
- The interview will need to go beyond statements such as “sour” or “easy to peel” for important characteristics– add value by asking for detail on the type of sour, indicators of sourness or peel ability. Use pictures in the sand, bottles, to compare sizing, shape etc.
- Ask the question open-ended first. If the person is having trouble use prompts as an example. It is not necessary to ask about gender, ethnicity, age, wealth for every question. Remind the interviewer to ask if the responses is true for everyone in the community.
- For pairwise/simple ranking. After piloting and the team has a better understanding of how the time needs to be managed, decide if simple ranking or pairwise ranking will be used. The approach will need to be consistent. Pairwise is more reliable in terms of understanding priorities compared with ranking but is still not perfect.
- Be specific with the questions.
- Some respondents are less responsive and have more trouble with the questions. The interview may need to ask a series of “step by step” questions that can be worked out in the pilots, which would help the respondent along.
- Sometimes you will need to end the interview or wrap up quickly if the person is not responsive – that is OK. If the person says they don’t know, that is also an answer!

Time management is essential. Here are some tips we learned:

- Note taker can manage time and guide the facilitator on the speed. Divide your target time for completion (FGD=2hrs, Interviews=1-1.5hrs) by the number of sections in the questionnaire. Give more time to priority questions and areas important for WP2 and breeders (preferences, characteristics, descriptors).
- If you lack time, focus on questions with a *. Critical questions with an asterisk (*) to ensure they are not missed and we can make comparisons across products.
- Skip the question if it has been answered already – but be careful that the question has been well understood (e.g. there are similar questions regarding on the crop and the product, but they are different and both need to be asked).
- If a respondent provides an answer to a question that is later in the questionnaire that is OK. Take the notes and include the appropriate question number. Notetaker to guide the facilitator and let them know when they already have an answer to the question so there is no repetition.

Box 2: Summary of lessons from learning visits for Activity 3 facilitated by Geneviève Fliedel for Ivory Coast (September, 2018)

- First experience by a research team in a first village. Misunderstanding of some questions in the English version of the questionnaire, even in the translated version
- Discussion by skype (several sessions) with the team, then during the field visit, to precise the objective of some questions (food science, gender and market study).
- Research team will need to revise and better translate all the questionnaires and adapt them to their product, region and country
- The team will need to better precise the objective of the project to the village chief and other village notables or officials, to avoid questions and loss of time before starting key informant interviews
- Research team will record the FGD or KII if taking many notes is difficult for some members
- Five days were necessary in one village to conduct Activity 3, so 4 weeks for one region.

The team consisted of 5 persons: 2 scientists (gender and economist) and 3 students (1 PhD in Food science, 1 master student in socio-economy and 1 master student in food science) with a food scientist as a supervisor. The team was very complementary and did a very good job.

Training in Benin

- *Provide a Summary of the training organized in Benin including: Dates, Trainers Curricula, Training Objectives, Nb of participants, Institutes, any other useful information (NB : you can provide the abstract of the training reports or a summary table).*

The Capacity Strengthening and Sharing workshop was held between the 16th and 24th of April, 2018 in Cotonou, Benin. The workshop provided the coordination team with the opportunity to present a ‘core’ methodology for identifying user preferences, and to receive feedback and input from project partners on best practices for the methodology based on their experience and expertise. The methods are nonetheless envisioned to be adapted with the results from fieldwork to ensure success into the future of project implementation. The objectives of the WP1 workshop were twofold:

1. Design robust interdisciplinary methodology bridging economics, food science and gender, employing participatory approaches to identify quality characteristics in RTBfoods products.

2. Foster a co-creative environment to ensure the diverse group of researchers input into, understand and own the methodology.

The workshop was facilitated by Lora Forsythe (NRI), Genevieve Fliedel (CIRAD), Ulrich Kleih (NRI) and Alexandre Bouniol (CIRAD). Logistical and organization support was provided by Noel Akissoe and Laurent Adinsi (UAC-FSA), Alexandre Bouniol (CIRAD), and Caroline Troy (NRI).

There were 31 participants at the workshop from six countries. Out of 31 participants, 15 were women (48%), which demonstrates good representation of women at the event. Out of the 29 technical participants, food science was the most highly represented (16 participants), followed by socio-economics (8) and gender (5). Participants represented the following institutions: Bowen, CARBAP, CIP, CIRAD, CNRA, ENSAI, FSA-UAC, IITA, NaCCRI, NARL, NRCRI and NRI.

The output from the workshop was revised WP1 manual and Capacity Strengthening and Sharing Kit. Initial feedback was provided to teams who provided draft SoKs prior to the workshop. Partners also provided workplans and their sampling frame following the workshop.

- *Beyond training objectives, what did the training « bring in » for the WP1 framework? Lessons learnt? (e.g. knowledge, experience share, whatever being all together brought to the team).*

The WP1 being multidisciplinary by nature, the Capacity Building and Strengthening Workshop provided a way to understand the expertise and experience of each partner. This has resulted in an effort to draft guides so that they are accessible and usable by all partners, reflecting both existing knowledge and new ideas. It also provided an opportunity to integrate partner feedback into the framework. It was also an opportunity to propose support to partners in carrying out activities.

A point of reflection for the Workshop facilitators, based on comments from the workshop evaluation, is how the workshop could have been more participatory and make better use of the knowledge and experience of the participants.

Output 1.5.1: *Gendered socio-economic databases on consumer/user preferences for 11 RTBfoods/processed products in 5 African countries*

Activities conducted	Deliverables
<i>Uploading Raw data + Coded Data + Processed/Analyzed Data on secured repositories</i>	I.1- Raw data from surveys on RTB consumption habits and preferences secured on RTBfoods platform (Questionnaires + Consent forms): - I.1.1- Boiled and pounded yam at Bowen - I.1.2- Boiled and pounded yam at NRCRI - I.1.3- Gari/Eba at IITA - I.1.4- Boiled cassava at NaCCRI - I.1.5- Matoke at NARL - I.1.6- Boiled yam at UAC-FSA - I.1.7- Attiéké at CNRA - I.1.8- Boiled Plantain at CARBAP - I.1.9- Boiled Sweetpotato at CIP - I.1.10- Gari/Eba & Fufu at NRCRI

Output Indicators	Targets / Milestones		
	Planned for Period 1	Achieved	Variance & Brief Explanation
Nb of food product profiles for which Raw Data + Coded Data + Processed Data (Analysis) is secured on repositories (Cirad dataverse &/or BTI repositories)	Raw + Coded data from surveys secured on RTBfoods platform for 9 teams (covering 6 food products)	9 out of 9 teams conducting surveys on 8 food products in Period 1 have uploaded their raw data attached with consent forms signed by each respondent. * To date, 6 datasets (coded data) have been uploaded from 9 teams.	*1 team (Attiéké) had not completed fieldwork due to University strikes in the country. Remaining databases, and cleaned databases, are planned to be received by the coordination team by the Annual Meeting in March 2019.

Field Activities

- *Activities conducted by WP1 partner teams: Fill-in the table hereunder to synthesize activities conducted on the field by the different teams. (Please, treat each food product separately = even if the surveys have been conducted during the same interviews & by the same team – Keep the food product as an entry point)*

Activities for the Gendered Food Mapping - Activity 3 fieldwork started for 9 teams at staggered times (appropriate to season, staff availability etc.) starting from May 2018. To date, all teams have completed their fieldwork except for Ivory Coast – Attiéké, who will need to complete one region which was delayed due to country-wide strikes, and Cameroon – Gari, due to funding delays.

The table below displays the details on Activity 3 fieldwork by product and country.

11 RTBfoods Products	Countries covered in Period 1		Dates of Field Surveys		Regions surveyed	List of Localities: Big cities Small cities Villages	Nb of Individual Interviews conducted		Nb of Focus groups organized	Questionnaires uploaded on RTBfoods platform	
			start	end			M	F		Yes	No
Boiled cassava	Primary country	Uganda	26 September 2018	6 October 2018	APAC (Northern Uganda)	ATANA	6	5	2	Y	
						AKERE	4	5	2	Y	
						CHEGERE	4	5	2	Y	
						ATIGOLWOK	6	4	2	Y	
			08 October 2018	18 October 2018	LUWEERO (Central Uganda)	BUKAMBAGA	2	5	2	Y	
						BWAZIBA	5	5	2	Y	
						KABAKEDI	5	8	2	Y	
						KAKINZI	5	5	2	Y	
Gari/Eba	Primary country	Nigeria - NRCRI	10/8/18	30/8/18	South-East (Imo State)	Uzoagba Ikeduru, Imo State	4	6	2	Y	
						Akwakuma, Owerri North, Imo state	2	8	2	Y	
						Amandugba, Isu LGA Imo state.	3	7	2	Y	
						Isinweke Ihitte Uboma, Imo State	2	8	2	Y	
		Nigeria - IITA	5/08/2018	28/10/2018	Benue state	Al' Okete (Okpokwu LGA)	7	2	2	Y	
						Tyomu (Makurdi LGA)	4	6	2	Y	
						Nyam II (Gwer East LGA)	3	7	2	Y	
						Shangev (Kwande LGA)	3	7	2	Y	
					Osun state	Oyan (odo-otin, LGA)	0	10	2	Y	
						Ago-Owu farm settlement (Isokan LCDA)	2	7	2	Y	
						Wasinmi (Irewole LGA)	0	9	2	Y	
						Elefon (Ife Central LGA)	2	7	2	Y	
	Spillover Country				South	ABIDJAN					
						Bingerville					

		Côte d'Ivoire (Attiéké)	10 September 2018	29 September 2018		• Bregbo	0	10	2	Y	
						• Eloka-Te	0	10	2	Y	
						• Achokoi	0	10	2	Y	
						Dabou				Y	
						• Akradio	0	10	2	Y	
						• Opoyounem (Okpoyou)	0	10	2	Y	
			18 October 2018	27 October 2018	Centre	BOUAKE – in 2019					
Fufu	Primary Country	Nigeria	10/8/18	30/8/18	South-East (Imo State)	Uzoagba Ikeduru, Imo State	4	6	2	Y	
						Akwakuma, Owerri North, Imo state	2	8	2	Y	
						Amandugba, Isu LGA Imo state.	3	7	2	Y	
						Isinweke Ihitte Uboma, Imo State	2	8	2	Y	
Boiled Plantain	Primary Country	Cameroon	05-September 2018	20-September 2018	West region	Balessing	8	2	2	Y	
						Bafounda	4	5	2	Y	
						Penka Michel	5	5	2	Y	
						Bamendjing	5	5	2	Y	
					Littoral region	Bouba	4	5	2	Y	
						Kombe	5	5	2	Y	
						Sokelle	3	7	2	Y	
						Song-mayo	4	6	2	Y	
Matoke	Primary Country	Uganda			Mbarara	Nyindo	10	3	2	Y	
						Kacuucu	11	7	2	Y	
						Mutuumo	9	7	2	Y	
						Keiba	9	6	2	Y	
					Luwero	Kabala	6	10	2	Y	
						Kabila	7	8	2	Y	
						Kalagala	8	8	2	Y	
						Nakaseeta	5	10	1	Y	

Boiled /FRIED Sweet potato	Primary Country	Uganda	15 th October 2018 12 th November 2018	19 th October 2018 16 th November 2018	Lira	Barkwoyo		12	12	2	Y	
						Obato		2	2	2	Y	
						Abalalai		12	12	2	Y	
						Aweo		2	2	2	Y	
					Kamwenge	Byabasambu		14	14	4	Y	
						Kyakanyemera		10	9	4	Y	
Boiled Yam	Primary Country	Benin			Dassa	DASSA II	KPEKOUTE	5	5	2	Y	
						KERE	IGOHO	5	5	2	Y	
						KPINGNI	ADIHINLIDJI	4	6	2	Y	
						LEMA	LEMA	4	6	2	Y	
					Djidja Centre	DAN CENTRE	HANNANGBO	1	9	2	Y	
							LALO	2	8	2	Y	
						DJIDJA CENTRE	MANDJAVI	3	7	2	Y	
							ZINKAMIN	5	5	Y	Y	
	Spillover Country	Nigeria	6/9/18	15/9/18	South-East(Ebonyi State)	Onueke, Ezza, Ebonyi State		7	3	2	Y	
						Amagu Izzi, Abakiliki Ebonyi state		6	4	2	Y	
						Umuebe, Ezza Ohaukwu Ebonyi state		6	4	2	Y	
						Obinagu Ishiagu, Ebonyi State		7	3	2	y	
Pounded Yam	Primary Country	Nigeria	31/10/18 30/11/18 5/12/18 Next week	31/10/18 30/11/18 5/12/18 Next week	Osun	Ife-Odan		4	7		Y	
						Iwo		4	5		Y	
						Gbongan		2	6		Y	
						Ilesa						Not yet

Team coordination

- *Successful collaborations on some activities and/or for some food products among WP1 partners? (e.g. collaboration between Bowen/NRCRI/IITA in Nigeria on 4 food products i.e. Gari/Eba, Boiled & Pounded Yam, Fufu).*

Collaboration between teams

There have been a number of examples in year one that demonstrate innovative collaboration between partners. For example:

- In Nigeria, IITA, Bowen and NRCRI have undertaken the fieldwork (each focusing on specific regions), piloting and demonstrations together to ensure the field teams have a consistent approach and make the best use of resources.
- Similarly, in Uganda, Bioversity/NARO/NARL, CIP, and NACCRI undertook the fieldwork together for the three products, shared a piloting workshop and field testing, to ensure field teams have a consistent approach and make the best use of resources.
- IITA Cameroon (Noël Takam, socio-economist, new PhD student) and ENSAI (Franklin Ngoualem Kégah, post-doctoral fellow in Food Science and Robert Ndjouenkeu Professor in Food Science) on Activity 1 SoK on gari and on Activity 3 sampling and workplan with a prospection in the regions of study, before receiving project funding.

Support visits to ensure a successful WP1 coordination

Lora Forsythe travelled to Umudike in Southeast Nigeria August, 2018 to support local partners – the International Institute for Tropical Agriculture (IITA) and National Root Crops Institute (NRCRI) – in piloting survey tools for Activity 3 *Gendered Product Mapping*. Lora and Ulrich Klieh also traveled to Uganda to support the matoke, boiled cassava and sweet potato teams in their pilots in September, 2018. Learning from both pilots were documented in lesson learning reports. In addition, while Lora visited Benin for the Global Cassava Partnership – GCP 21 Conference in June, 2018, meetings were held with UAC and IITA to provide support as it was required.

In October, Lora and Genevieve Flidel conducted a visit to Cotonou, Benin to work with IITA and UAC Activity 3 datasets and to develop a data analysis plan to support other partners to 1) extract priority data for WP2, and 2) suggestions on how to analyze and report data for Activity objectives. This Activity has resulted two separate documents that are currently being finalized and will be circulated in January, 2019.

Genevieve Flidel visited Cameroon to support funding arrangements and management issues and provide guidance on the SoK and Activity 3 fieldwork. Visit in Cameroon was focused on SoK, on Activity 3 new sampling with a choice of other regions (difficult politic situation in Anglophone regions, those that mainly produce gari), their workplan, and clarification on IITA and Cirad funding, and Takam PhD (inscription and supervision).

Other activities

To spread awareness and highlight the importance of this project, and specifically the innovative approach of WP1, a news article piece on the RTBfoods project was published on CIRAD and NRI's website. Additionally, information and photos were posted on NRI's Facebook group after the workshop, and support visits to countries. Documents are regularly uploaded onto the CIRAD collaborative platform to allow all project partners to access information and tools, as well as track progress in meeting project goals and projected outcomes.

Online email and skype support was available to partners throughout the year. In some countries, Whatsapp groups were started among field teams, and Coordinators. (Nigeria and Uganda)

- *Challenges faced in coordination of WP1 partner teams & Strategies to be reinforced/developed by WP1 coordination team for Risk mitigation?*

The RTBfoods project is unique in its approach to design and delivery of research activities for WP1. The collaborative nature of the project then creates the space for each country team to take the tools and adapt them to reflect their interests, with the exception for core questions that remain standard across all sites.

There are advantages in obtaining different types of information on an issue by using a range of survey methods (e.g. focus group interviews, individual interviews, consumer testing, measurements of processing parameters). At the same time, the coordination of different professional disciplines, which complement each other, leads to more in-depth information.

This structure however does also run the risk of leading to variability in data quality or depth, and completeness, in addition to creating potential for spill-over activities that are beyond the scope of WP1. The challenge to WP1 leadership has been to balance delivering high quality results for outputs defined at the project inception, with supporting teams to carry out additional work.

We have also encountered issues with funding. The country/crop budgets are variable and in some cases are not large enough to cover all WP1 activities – to address this, the scope of activities had to be cut from the original proposal (e.g. specific fieldwork on gender and demand). This could especially prove problematic if issues around data quality arise, necessitating more research. From the inception of the project there has been a tension around collecting enough information for good data quality and budgets.

Activity specific challenges

Workshop: It is broadly felt by the facilitators that the objectives of the workshop were met and the participants were highly engaged with the material. However, there were naturally some challenges. The mix of experience in qualitative research within the combination of fields represented by the attendants made it challenging to address everything comprehensively given the length of the training (10 days). Also, given that there were different levels of capacity, it was difficult to satisfy the needs all participants. For example, some gender specialists are advanced and would like to learn more advanced techniques for qualitative data analysis such as using software like Atlas ti. Other gender specialists, however, lack basic skills in qualitative research methods. It was felt that the workshop could be more participatory, such as greater time for the participants to use and comment on the tools. The Coordination team decided it would develop the tools in advance due to the time constraints, size of time, and the need for coordination and consistency in data and approach between the teams. How to manage the balance these constraints while at the same time creating ownership among the team, was a challenge. Given that there were different levels of capacity, it was difficult to satisfy the needs all participants. Another challenge was the lack of preparation time for developing the methodology and content for the workshop, in addition for securing a budget for the workshop. From the inception meeting there were two months to make the preparations. Budgetary issues were a significant constraint on the workshop and the participants.

SoKs: SoK guidance was developed to achieve standardization of the knowledge base collected on each product. There are gaps in partner capacity in terms of finance and staff expertise (we recommend a gender specialist, economist and food scientist to fully execute the planned work package), which limit the implementation of WP1 as outlined in the RTBfoods proposal submitted to BMGF. It is difficult to backstop on these capacity gaps, so different types of outputs proposed (see extensive and abbreviated outputs as described further in this report) that reflect the gaps and lay out realistic and achievable plans for each country/product. As far as possible, the outputs are modular, and therefore parts can be included in the future with increasing capacity or complementary funding in the future.

In terms of outputs, there are varying levels of depth to the reports. This is for a number of reasons: literature was sparse for some products, particularly specific to geographical contexts. Partner budgets were also prioritized for WP1 fieldwork, and therefore partners had less time to conduct thorough research. This approach was supported by the coordination team. With regards to food science, some reports required greater specification of the important characteristics that have already been identified in peer-reviewed or grey literature. In addition, some reports lacked critical review of the methodology existing literature e.g. assessing if sample size was represented, if gender desegregation was conducted, which would have added nuance to what were identified as the gaps in knowledge. Regarding the gender and demand SOK modules, greater nuance in information and analysis would be helpful in providing better quality and depth of information for some of the SoKs, this would require more time and support in research and report development.

Activity 3: stratifying Activity 3 data analysis to prioritize WP2 relevant outputs was necessary but carries with it a risk of the remaining Activity 3 data being left by the wayside. It will be a challenge to motivate teams to complete full analysis of Activity 3 data after the partial analysis. Other challenges with Activity 3 data are variability in the depth of demand and gender-related data between the teams. Furthermore, as the individual interviews are focused on processors to obtain a critical mass of knowledgeable individuals to discuss product-specific characteristics, it has the de facto result of a sample including mainly women, and therefore characteristics cannot be disaggregated by gender – however, this was a trade-off acknowledged by the Coordination team.

Cross-WP Coordination & Collaboration

- Fill-in the table below with a brief description or bullet-point lists of interactions with other WPs (successful ones & gaps) and propositions for risk mitigation.

	Successful Interactions/Coordination with other WPs (specific actions concerned, frequency, tool sharing)	Gaps in Interactions/Coordination with other WPs: What is needed from other WPs ? (NR = not relevant)	Risk mitigation : How to Improve (specific actions to be taken, frequency, tool sharing?)
WP2	- WP1 roadmap circulated just after kick-off meeting to inform all the WPs and management - Guidance document and Activity 3 data analysis circulated - Two calls with WP2 leadership to define type of data necessary from WP1 to inform WP2. - Planning WP1 Activity 3 analysis to deliver list of characteristics to WP2 as a priority	Greater responsiveness to documents circulated	- Regular calls (quarterly) - Sharing research tools and plans - Phased data analysis to prioritize WP2 relevant data.
WP3	Guidance document and Activity 3 data analysis circulated	None	Not directly relevant to WP1
WP4	- Guidance document and Activity 3 data analysis circulated - Call with WP1 Coordinator on WP1 process	None	Not directly relevant to WP1
WP5	- Guidance document and Activity 3 data analysis circulated - Nextgen evaluation of mother-baby populations in the field were used as a model for WP5 population processing protocol	- Need greater coordination with WP5 to identify populations that will be evaluated and informing the protocols to do so - Greater links between Activity 4 and WP5 evaluation. Not clear how these protocols align	- Regular calls (quarterly) - Comparing workplans to harmonize activities
WP6	Continual communication with the Project manager for Monitoring and Evaluation	None	Regular calls (1-2 per month)

Collaboration with other projects:

- Extensive collaboration with NextGen project, through use of overlapping respondents and field sites for WP1 and WP5 activities. The NextGen mother trials have been maintained in Nigeria for WP1 Activity 5 in 2019.
- Ongoing discussions with Excellence in Breeding (EiB) Platform to harmonize RTBfoods and EiB definitions of “product profiles”.
- Participation of WP1 coordinators in CGIAR Gender Breeding Initiative (GBI) Workshops November 2018 to:
 - Broadly discuss product profiles and mainstreaming gender in breeding activities
 - Input into a prototype tool specifically on gender responsive product profiles, drawing on RTBfoods experience in WP1
 - Lora Forsythe presented on WP1 during workshop, which was very well received

Conclusion on Progress & Key Achievements

- *Synthesis on what worked well in Period 1 - Successful achievements – Strengths & Complementarities of WP1 teams in the different countries.*

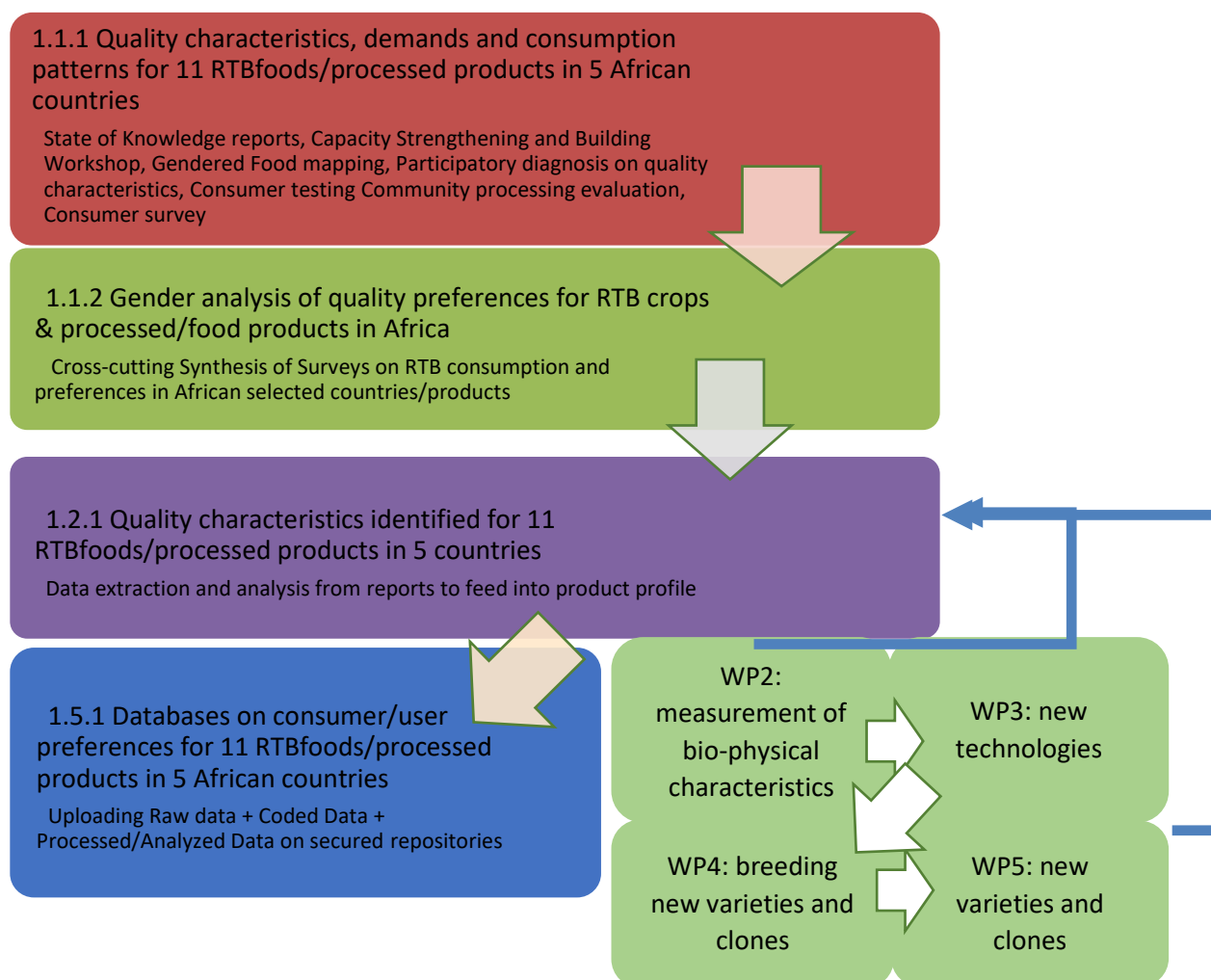
Good Practice:

- Communications: at least two face to face meetings per year, and at least monthly calls within the work package
- Research coordination: provision of clear and concise instructions for data collection, analysis and reporting.
- Training: teams responsive and highly motivate to contribute to the improvement and refinement of the approach
- Transparent, collaborative and participatory method development, allowing for flexibility and adaptation to country contexts
- Institutional collaboration between partners in the same country (e.g. Uganda, Nigeria, Benin)
- Independent initiative of partners in French translation and resource sharing between Francophone countries
- Significant commitment of teams to the project (e.g. obtaining complimentary funding and resources to execute activities)

Challenges:

- Adherence to deadlines and follow through on some activities
- Variable team composition and available expertise
- Competing priorities vying for research teams’ time
- Funding limitations for WP1 activities in some countries

- *Please, Modify / Annotate the WP1 flow chart hereunder (from project narrative).*
- *Indicate the Steps achieved or being completed in Period 1.*



Perspectives for Period 2:

Data analysis, Surveys on other Food products, Interactions with WP2 (results sharing for product profiles), Publications, etc.

For period 2, the following activities are planned:

Activity 3 - Gendered Food Mapping, data analysis:

- Virtual support to partners from the WP1 Coordination team and collaborators
- Extraction of Activity 3 relevant data for WP2
- Full reporting Activity 3 data
- Preparation and presentation of initial findings on 1-2 selected products at the Second Annual RTBfoods Meeting
- Capacity strengthening for Gendered Food Mapping, Activity 3, data analysis at the Second Annual RTBfoods Meeting

Activity 4- Participatory processing diagnosis and quality characteristics:

- Planning and commencement of participatory demonstrations, Activity 4, while integrating the needs and constraints necessary for the implementation of the Activity 5.

- The various partners who have been able to follow during the first period the training on sensory analysis and the acceptability of products (Activity 5) will have to pay particular attention to the implementation of Activity 4 so that it reaches all of its objectives.
- In the same way and from the planning of the implementation of the experiments of the Activity 4, a coordination with the WP2 must be assured in order to collect the useful information to the development of the methods of characterization of the products.

Activity 5 - Consumer testing in rural and urban user segments:

- Planning and commencement of Consumer testing, Activity 5, most often just after implementation of Activity 4 and processing of the 4-5 products from very different varieties in quality characteristics. If the products are dry (such as gari), the implementation of Activity 5 consumer testing may be delayed and the products stored.
- A list of quality characteristics collected during Activity 3 & 4 will be required to prepare the questionnaire (JAR & CATA tests).
- A well knowledge on consumption habits and the most frequent consumption pattern will be necessary to be able to plan this Activity 5.
- Locations with different ethnicity, education or occupation will be selected before conducting this Activity 5.