State of Knowledge on Gari in Cameroon

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ABSTRACT

Gari as it is called in Anglophone regions of Cameroon or Tapioca in Francophone regions, is one of the most cassava derived products of the country. It is produced in all regions of the country, with North-West, South-West and Littoral Regions having the highest production. It is consumed largely by people from low socio-economic status (50%) , likely related to its low price and ease of preparation. This finding, coupled to the increasing market importance of gari, reinforces the need and challenge of improve its market quality, along with other cassava processing products, for poverty alleviation, and justify public initiatives in this respect. The high female representation in the gari value chain constitutes another support to bring an adaptive response to the challenge of gari development. The review of processing practices, consumer trends and quality attributes of gari raises out a formulation of the development challenge through the definition of objective relationships between cassavavarieties, gari processing practices and consumer's quality demand.

Key words: cassava, gari, market, consumer trends, quality attributes

1 INTRODUCTION

Gari, also spelled as *garri, garry* or tapioca, depending on the producing area, is a pregelatinized, fine to coarse granular product made from fermented cassava mash. In West and Central African countries, it constitutes one of the most consumed and traded products of all cassava food products (Gouado *et al*., 2008; Sanni *et al*., 2009; Cameroun, 2010; Ngueulieu, 2013; Wassmer, 2013; Njukwe *et al*., 2014; FAO, 2015; Levai *et al*., 2016; Mapiemfu-Lamaré *et al*., 2017; Fon & Djoudji, 2017) It could be compared to what potato products are to the Westerners. The popularity of gari as convenience food is growing in particular, which is mainly due to its affordability, good storage ability easy storage aptitude and its ease in preparation(Oluwafemi & Udeh, 2016). It is consumed either as snack after soaking in cold water with sugar, peanuts, or honey, or cooked in hot water to make a dough-like paste called "*eba*" in Nigeria or "*gari fufu*" in soups in Cameroon (Gouado *et al*., 2008; Funke *et al*., 2012; Bebnji, 2016). Its processing involves grating peeled cassava roots to produce a mash which is then pressed to remove water, then fermented, 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 (Udofia *et al.*, 2011; Funke *et al*., 2012; Arinola & Oluwasola, 2017; FAO, 2018).

The importance of gari is also related to the prominent role of cassava among African foodstuffs, since the root is cultivated in 40 African countries and represents the source of calories for 40% of African populations (Nweke, 2009). In addition, gari is the main cassava processed products in many countries. However, the high number of cassava varieties throughout Africa may lead to variability in gari quality, since gari, displays characteristics based, among others, on the starch properties of cassava roots, particularly its gelatinization behavior. Since all cassava varieties do not display comparable starch properties, it can be hypothesized that all cassava varieties could not lead to the same gari quality.

Despite the importance of gari in the diet of African populations, the number and type of studies conducted on the product vary from one region to another. In this respect, the Nigerian gari system is the most studied in terms of: processing parameters (fermentation, frying temperature and time, microbial aspect both technological and as contaminants) (Irtwange & Achimba, 2009; Udofia *et al*., 2011; Ahaotu *et al.*, 2011; Edward *et al*., 2012; Arinola, 2016; Olaoye *et al.*, 2015; Ikpe & Essienubong, 2016; Oluwafemi & Udeh, 2016), market system (Sanni, 2005; Afolabi, 2009; Funke *et al*., 2012; Adebayo *et al*.,2012), quality properties (nutritional, sensory and functional) (Ashaye *et al*., 2005; Adejumo & Raji, 2012; Arinola, 2016; Oluwafemi & Udeh, 2016), packaging systems, shelf-life (Amadi & Adebola, 2008; Ukpabi *et al.*, 2012), cassava characteristics (age, variety) (Apea-Bah *et al.*, 2011), and contribution to poverty alleviation (Afolabi, 2009; Oloyede & Ayinde, 2016), etc.. The wealth of literature from Nigeria may be justified by the fact that it is the largest cassava producer and largest cassava-based product markets in Africa.

Cameroon, a border country to Nigeria is also a cassava and gari production area, though at a relatively lower level than Nigeria. Meanwhile Cameroon is an exporter of gari to border countries, even to Nigeria (IRPCM, 2008). The present review aims to synthesize information on the Cameroon gari system in order to both contribute to building an African gari specification catalog and particularly to explore a scientific relationship between cassava varieties and gari characteristics.

2 CASSAVA PRODUCTION AND USES IN CAMEROON

Cassava represents 60% of roots and tubers consumed in Cameroon, and is ranked as the second most consumed crop after Banana (FAO, 2018). This high consumption rate justifies an increase of 129% of its production between 2002 and 2013 (INS, 2016). The root is cultivated on the whole territory of the country and the production is continuouly increasing (Fig. 1 & 2), with Centre, East and South Regions being the largest producers (Njukwe *et al*., 2013; MINADER, 2013; INS, 2016). The production yield varies between 35 - 40 t/ha for improved varieties, and between 3 – 7 t/ha for local varieties (PNDRT, 2006; Tentchou *et al*., 1999; PNDRT, 2006; Tricoche, 2008).

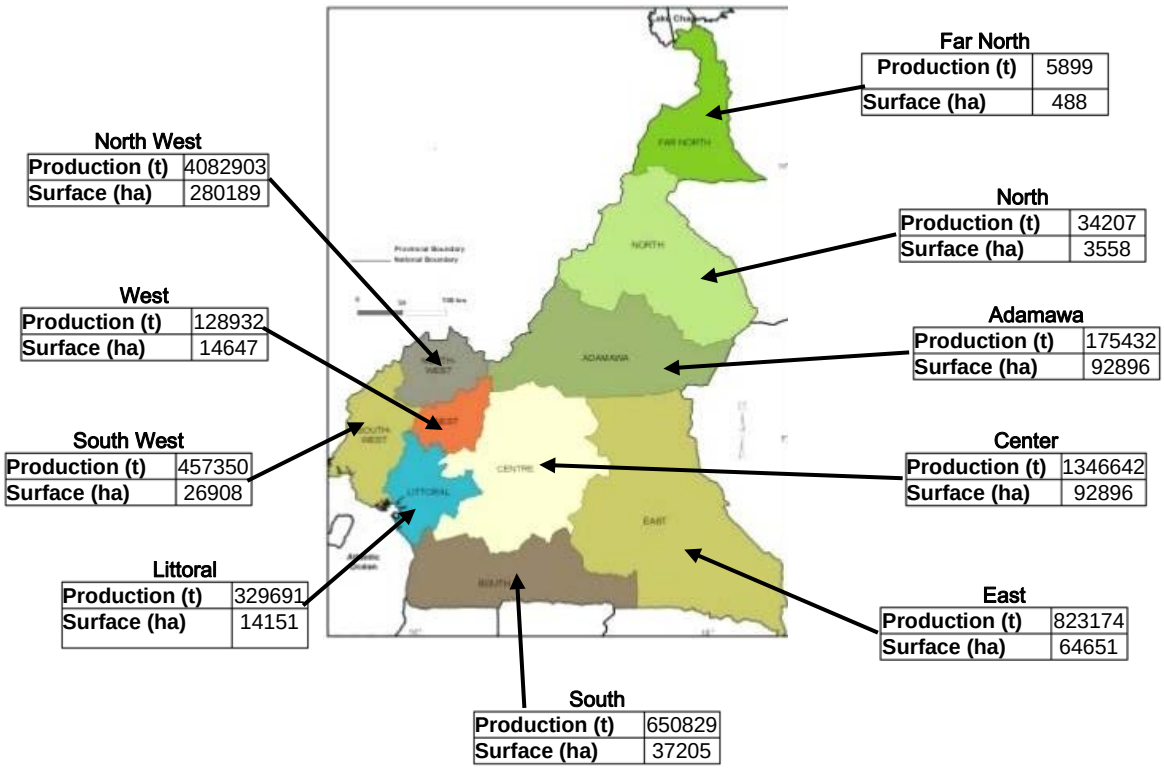

Figure 1 : Territorial distribution of cassava production in Cameroun

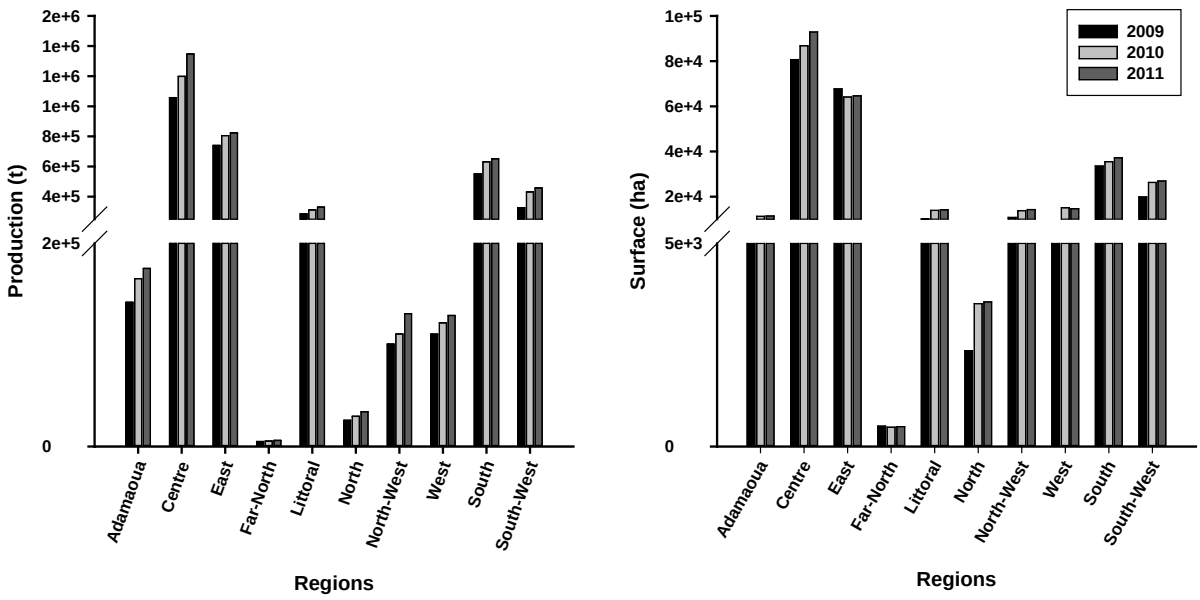

Figure 2: Regional evolution of cassava production and area planted from 2009 to 2011 in Cameroon

If cassava is initially a crop of the forest area, there is a significant emergence of its production in the savannah areas, and even in the Sahelian regions. This emergence in the Sahelian savannas of the northern region of Cameroon (North and Far North Regions) is relatively recent, since cassava was, in the 1980s, exclusively imported from southern Cameroon to the northern savannas. This emergence of cassava in a predominantly cotton-growing zone seems to accompany the emergence of maize in the region, which arose due to the cotton crisis in the 80's, where cassava was developed as a market-based food crop, in replacement or in combination with cotton (Kadékoy - Tigagué, 2011). However, unlike maize near the cotton fields, cassava cultivation seems to be mainly associated with peri-urban market gardening and the valorization of lowlands. The ability of cassava to grow on poor soils certainly justifies the choice of this root among smallholder farmers in the savanna. This evolution of cassava in

the savanna zones reflects a root trajectory that has shifted from importing cassava from forest areas to local production, with, moreover, new, local forms of consumption. Indeed, cassava is currently used in savannah areas in the preferred form of "carrot manioc", that is to say the roots consumed fresh as nibbling food. It is very likely that the evolution of uses will gradually translate into a diversification of these forms of use, in particular with the potential development of the root transformation activities and the evolution of the food styles of the region.

The activities of the cassava value chain are differentially distributed between men and women according to the regions (Fig. 3) (Ndjouenkeu, 2015). In the savanna zone, activities are predominantly male, while in the forest zone, women are more active in the whole cassava sector, and may represent up to 90% of actors (Ndjouenkeu, 2015; Fon & Djoudji, 2017). This differentiation seems to be related to the role of women in the concerned regions. In the forest zone, women are involved in the subsistence activities of the family and therefore in the decisions relating to it, whereas in the savanna zone, women are generally confined at home. In the same vein, the activities of subsistence farming are devolved to women in the forest zone, men only getting involved when the economic profitability of the activity is proven. In this respect, the emergence of cassava in savannah areas being a reaction to the fall of cotton, a cash crop for men, it appears normal and understandable that its production is carried mainly by these men. It should be noted, however, that economic development in the forest zone is attracting more and more men to the activity.

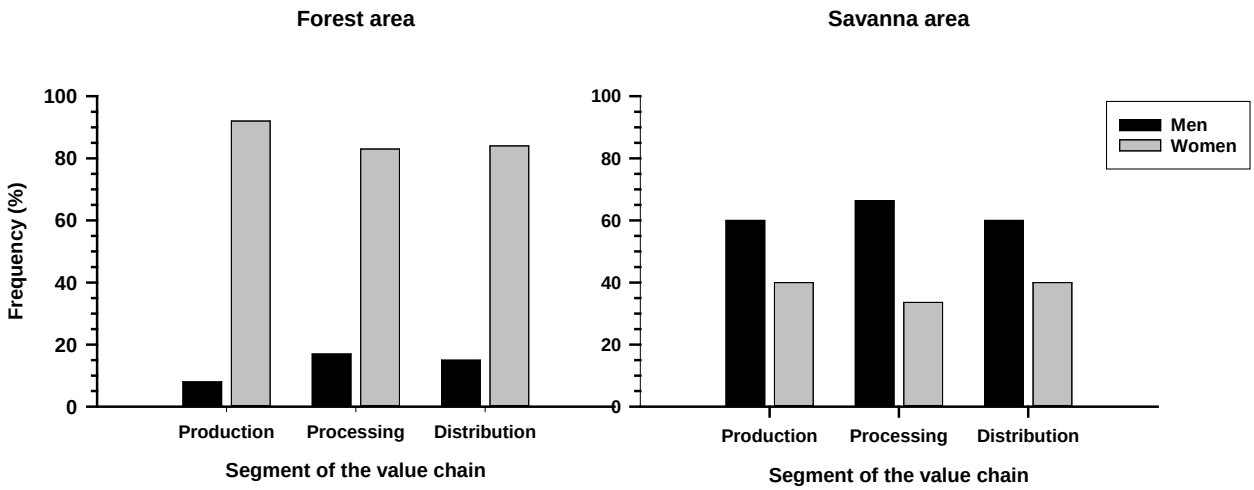

Figure 3: Gender distribution of actors in the cassava value chain in forest and savanna areas (Ndjouenkeu, 2015)

Cassava production is traditionally based on family agriculture for self-consumption, with average individual production surfaces equivalent to ¼ hectare. In general, three categories of cassava producers can be observed: (*i*) smallholder farmers, which represent 65% of actors, mainly women with production area no greater than one hectare, (*ii*) middle farmers representing 25% of actors, with cassava farm between one and three hectares, and, (*iii*) large farmers belonging generally to farmer organizations, with farm area greater than three hectares (PNDRT, 2006; IRPCM, 2008).

Different government development projects are acting to improve productivity and competitiveness of the cassava value chain. This is the case of the Agricultural Markets Investment and Development Project (PIDMA), which intervenes in all segments of the cassava value chain, in order to strengthen the relationships between production, processing and marketing. Such an initiative aims to address cassava production constraints, which consist mainly of: weakness of cultural spaces, low technological level of production tools, weak grouping of actors, and scarcity of planting material (Zundel *et al*., 2010; Ndjouenkeu, 2015).

In Africa (or in Cameroon ?), there are two main forms of cassava consumption: the peeled and cooked root, which absorbs about 30% of African cassava production, then the remaining 70% is processed into various derived products (chips, flour, cooked pasta, gari, etc.) whose processes and denominations differ from one region to another, even within the same region (Mpoko Bokanga, 1999) (Fig. 4). Fermented products are the main form of cassava consumed in almost all areas in Africa,

accounting for almost 75% of cassava-based foods (Westby, 1991). The microorganisms of cassava fermentation are predominantly lactic bacteria (*Lactobacillus plantarum, Streptococcus faecium, Leuconostoc mesenteroides*) and bacilli (Mpoko Bokanga, 1999; Assanvo *et al*., 2006, Coulin *et al*., 2006; Kastner *et al*., 2007). Their activity results in the reduction of cyanogenic compounds and in the production of pectinolytic enzymes which promote the softening of the pulp, thus facilitating subsequent manipulations of pressing, crumbling and conditioning. At the same time, they develop characteristic flavors conferring specific sensory properties to the cassava fermented products.

The diversity of cassava uses is reflective of the cultural diversity of the processors. The unit operations involved in their processing constitute, regarding the conditions, tools and means of their implementation, the framework of the constraints to be addressed in order to improve the use and market value of cassava products. In addition, the cassava variety is another factor influencing the processing and use of the root. Mastering this determinant appears as a critical issue, regarding the huge number of cassava varieties available and the necessity to define objective relations between processing practices, type of product processed and consumer expectations. In this respect, gari, one of the main cassava processed products found on African and Cameroonian markets, is considered in the following section of this review.

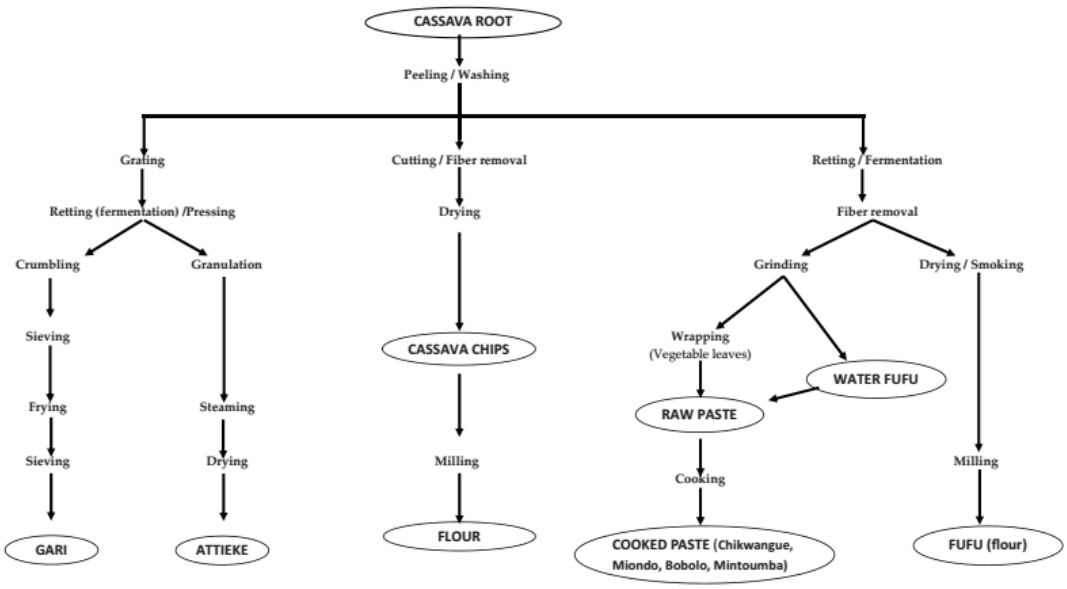

Figure 4: Main operations of traditional cassava processing

3 GARI PRODUCTION AND USE IN CAMEROON

3.1 Production, market and consumption

With 60% of roots & tubers market, cassava products constitute the first source of starchy calories in the forest regions of Cameroon, these regions representing more than the half of the whole country in terms of population and area (PNDRT, 2006). Processed cassava products (fufu, gari, “bâtons” and water fufu) occupy 40% of the market while fresh roots represent 20%. Though objective statistical evaluation has not been undergone, gari is, depending on areas, ranked as the third or fourth most consumed cassava product, after fufu, “bâtons” and fresh roots (Cameroun, 2010; Mapiemfu-Lamaré *et al*., 2017). This importance of gari is comparable to what is observed in the whole tropical area of sub-Saharan Africa (Uche *et al*., 2008; Oti *et al*., 2010). The annual gari production in Cameroon is around 49 000 tons, representing about 43 300 million USD (AGROPME, 2010; FAO, 2018). In terms of market volume and value, gari represents 45% of the Cameroonian national market of cassava products, and up to 53% in urban area, where the demand is very important, with almost 74% of households consuming gari (PNDRT, 2006; Tolly Lolo, 2013).

Though gari is known and consumed, and even produced in the whole country (Fig. 5), its production and consumption vary from one area to another and seem to be linked to socio-economic and cultural

habits of populations. The term “gari” is mainly used in anglophone areas of the country (North-West and South-West Regions), while the term “tapioca” is more common in francophone areas (Ngueulieu, 2013; Wassmer, 2013). 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 (IRPCM, 2008; Tolly Lolo, 2013; FAO, 2018). An indication of this is that, at national level, gari consumption is most strongly associated amongst people originating from South-West and North-West Regions (Njukwe *et al*., 2013). This may be related both to geographical proximity of these two regions with Nigeria, which is the largest gari producer and consumer, and to common colonial heritage.

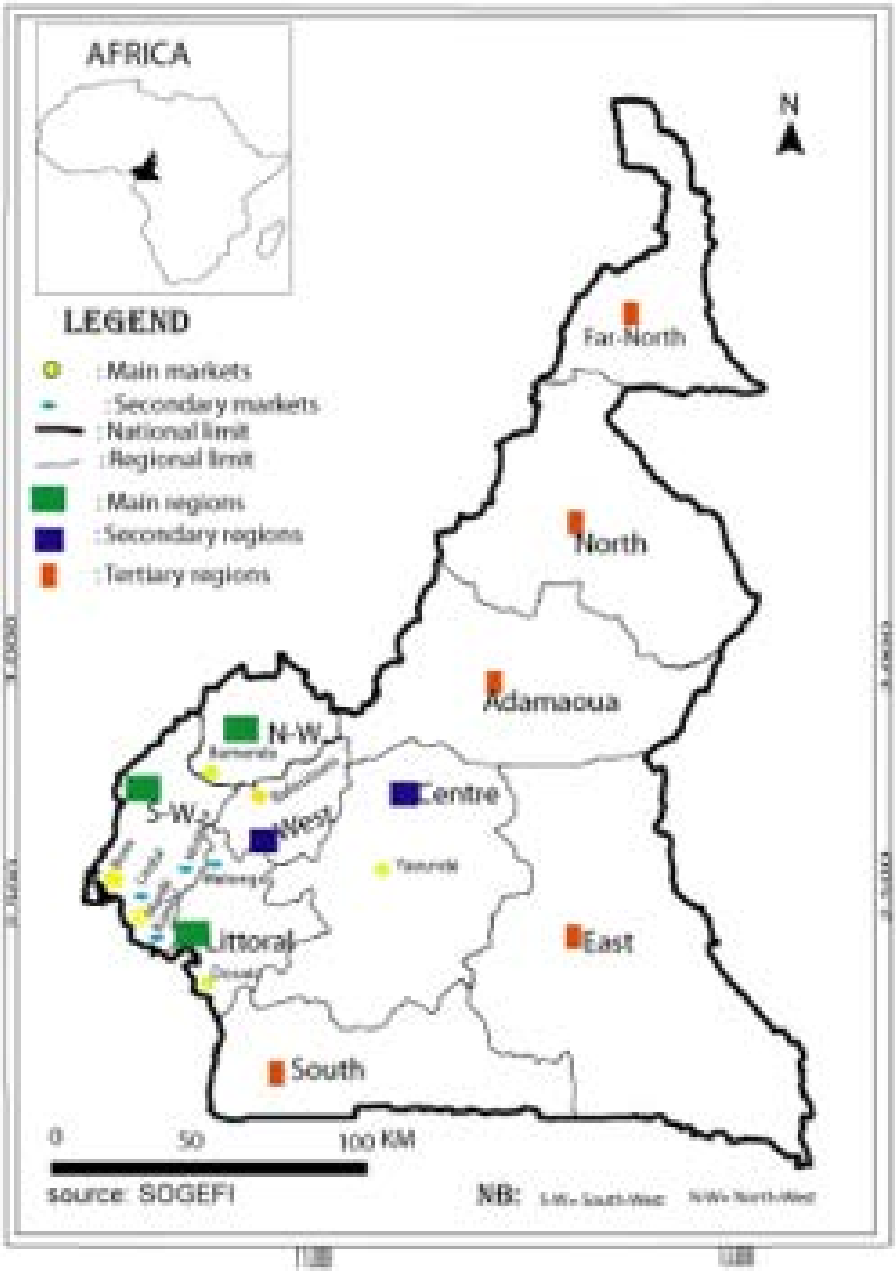

Figure 5: Processing and market areas of gari in Cameroon

From a socio-economic point of view, low socio-economic groups (laborers and similar, including students) constitute more than 50% of urban consumers, due certainly to relative accessible price of the product and the easiness of its use (Levai *et al.*, 2016; Tolly Lolo, 2013). However, demand for gari is increasing significantly among the middle and upper classes, particularly in Yaounde (Tolly Lolo, 2013).

The market flow of gari from rural to urban centers is directed by market proximity with a relative localized character. In this respect, Douala markets mainly receive gari produced in Littoral and South-West Regions, Bafoussam and Dschang markets receive the gari from West region, Yaounde and Ebolowa markets receive the gari from South and Centre Regions, and Ngaoundere, Garoua, Maroua

the gari from Adamawa Region. The market proximity of gari production areas explain this finding which is determined by the price of the product. In fact, for one Kg of gari bought by a consumer in an urban center, 38% of the cost goes to the processor, 17% for the transporter, 21% for the whole seller and 12% for the retailer (IRPCM, 2008). In general, the margin of gari processing may reach 57%, depending on factors related to cassava quality and price, to the technological level of processing, to whether processing is undergone directly by farmers or independent processors, to the season, and to the distances and road quality between gari production area and markets (Mvodo Meyo & Liang, 2012; Fon & Djoudji, 2017; FAO, 2018). In some cases, the demand for processed products may boost the local market, resulting in a restructuration of the price construction. This is the case in Muyuka, the main gari producing area in the South-West Region, where the high demand for gari has resulted in higher prices of cassava roots, compared to other cassava producing regions (Tolly Lolo, 2013).

The production, processing and commercialization system of gari is still largely informal in Cameroon, though public efforts are initiated to improve the channel. The system remains dominated by scattered and uncoordinated actors and small household units, with reduced or archaic means (Mvodo Meyo and Liang, 2012). The selling places are local markets where gari is sold in different types of measurements/containers, such as a cup, plastic bag or basin, etc. The product is not present in supermarkets (IRPCM, 2008; Mvodo Meyo & Liang, 2012; Tolly Lolo, 2013), certainly because packaging initiatives to improve the market presentation of gari are not significantly implemented. In general, the commercialization is structured in three main components: (i) collecting markets, located in gari processing areas, and which operates weekly, (*ii*) intermediary markets, located in bigger villages or small towns, easily accessible to cars and trucks; gari gathered from different collection markets is temporarily stored in this intermediary market, and (*iii*) consumption markets in big cities and borderlands (PNDRT, 2006). Cameroon border markets with Gabon, Central African Republic, Equatorial Guinea and Congo are high speculative areas of cassava products, where gari represents the third or the fourth cassava product exported by Cameroon (IRPCM, 2008).

3.2 Processing practices

The successive steps of gari processing from cassava roots are: peeling, washing, grating, bagging, dewatering, fermentation, crumbling, sieving, roasting, cooling, sieving, grinding and sieving. All these steps contribute to the building of gari quality, with dewatering, fermentation and roasting appearing as critical steps for the quality of the product. Depending on the gari processing area, variations may be observed for some steps. In this respect, fermentation may occur during dewatering, or before and separately with fermentation. In the first case, cassava is peeled, washed, grated to obtain cassava mash which is then bagged, then simultaneously dewatered and fermented by submitting the cassava mash to high pressure using either stones or tied sticks placed on opposite parts of the bag, or even appropriate machines (Adejumo & Raji, 2012; Onasoga *et al.*, 2014; Bebnji, 2016; Arinola, 2016; Fon & Djoudji, 2017; Mapiemfu-Lamaré *et al.*, 2017); in the second case, the grated cassava mash is bagged, left for fermentation, then pressed for dewatering (Graham, 1986; Adebayo *et al.*, 2012; Edward *et al.*, 2012; De Moura *et al.*, 2015; Arinola Stephen & Oluwasola Ebenezer, 2017; FAO, 2018). Both processing practices are found in Cameroon, with simultaneous fermentation / dewatering common in all gari producing areas, while the second process is mainly localized in the North-West Region. The fermentation duration in both processing practices varies between two and four days. The scientific literature on gari processing use mainly the first process of simultaneous fermentation and dewatering.

The processing yield varies between 25% and 30% (Tentchou *et al.*, 1999). Gari processing leads to high nutrient losses, certainly during dewatering and roasting. Favier *et al.* (1969) estimated these losses at around 22% for carbohydrates and largely above 50% for other nutrients and micro nutrients. These nutrient losses may be linked to the fact that the study was undergone at a period when the gari processing was completely traditional and manual. Nowadays, public development projects, particularly the National Project for the Development of Roots and Tubers (PNDRT), have initiated improvements in gari processing through introduction of processing tools. This results in the fact that, more than 60% of gari processors has mechanized at least one step of the process. For instance, manual grating is being progressively abandoned for motorized grater. Meanwhile, in some areas, particularly in the North-West Region, gari processors are still using manual grating, because they consider that mechanical grating reduces the eating quality of gari (Bebnji, 2016). This unwillingness may be related to the conception quality and efficiency of equipment available, since the conception of some local

graters just break cassava roots into pieces or get rusted as time goes on, leading to negative impact on the quality of the processed product. Some gari processing tools and equipment are presented in Figure 6.

Mobile and motorized grater

Crumbling siever

Press system for dewatering

Gari roaster

Figure 6: Some tools and equipment for gari processing (Photo Ngoualem and Takam, 2018)

The PNDRT project has contributed to the development of local equipment manufacturers who proposed equipment with more efficient technology and which is built using stainless steel for the part in contact with food. The main constraint concerning these machines is their price, which, sometimes, is above the financial capacity of many processors. Some local OEMs skirt the constraint by replacing stainless steel with aluminum. On the other hand, processors acquire equipment either through structuration in community or economic interest groups that allows mutualizing individual means and efforts. Equipment renting is another solution for the mechanization of cassava processing. In this respect, individuals or groups who own an equipment may rent their works and the equipment to processors. When the equipment is mobile (ex.: motorized grater), it could be temporarily transferred to farm for the processing of cassava roots after the harvest.

3.3 Cassava varieties for gari processing

The choice of a cassava variety for processing it into gari, depends primarily on its technological performance, represented by its processing yield (Fig. 7). The availability of the variety also appears to limit varietal choice for cassava processing. The latter observation justifies, to a certain extent, the constraints faced by some cassava processing structures in terms of supply of the raw material. Cassava processing units sometimes had to reduce or even stop their activity because of this supply constraint. This constraint can also be explained by strong competition between demand from the market for direct household consumption of cassava root and demand for processing, since 70% of cassava produced is consumed at household level by the processors (FAO, 2018). The National Project for the Development of Roots and Tubers (PNDRT) relies, among other things, on this observation to justify the need to develop cassava production for consumption and processing markets.

In the case of gari processing, there is little objective information on which cassava varieties are used and available in 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 (PNDRT, 2006; Zundel *et al*., 2010; Cameroun, 2010; Njukwe *et al*., 2013; Mapiemfu-Lamaré *et al*., 2017;). Bebnji (2016) found that in the North-West Region, almost 85% of cassava processors use improved cassava varieties for processing them into gari, particularly a variety named “six months”, so called because it is physiologically mature at six months after planting.

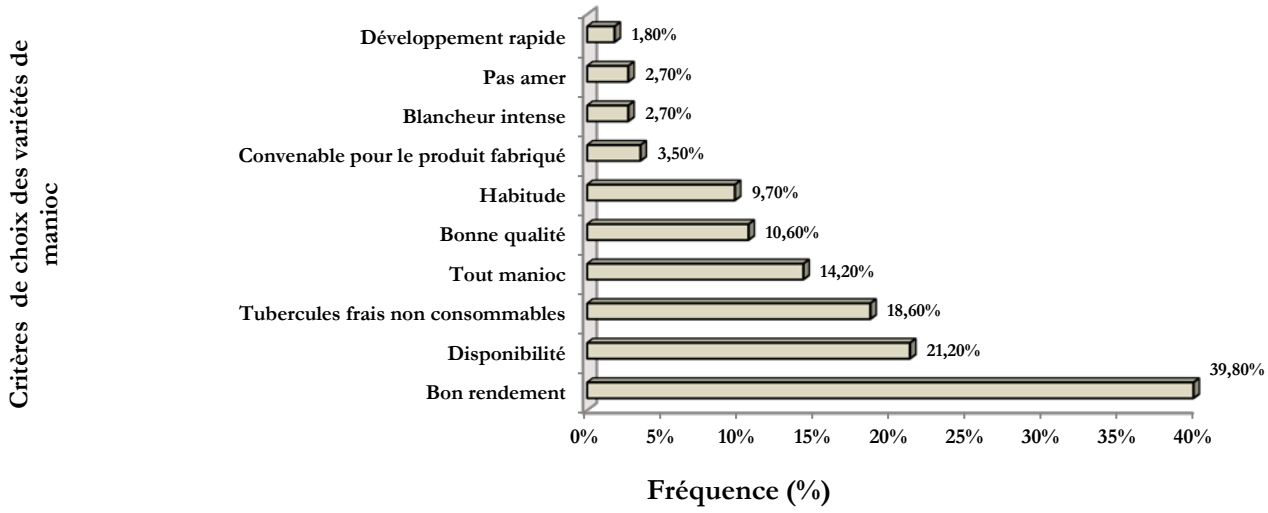

Figure 7: Criteria for selecting cassava varieties for processing (Extracted from report of the project: "production durable du manioc en Afrique Centrale et intégration au marché"; Ndjouenkeu, 2015)

4 CONSUMER TRENDS AND GARI QUALITY

Fermentation level (resulting in acid or sweet taste), color (white or yellow, depending on the use or not of palm oil during roasting) account, in general, among the main attribute of gari on buying. Grain size is another attribute considered by consumers. These attributes are differentially appreciated by consumers depending on their origin or culture. Though not objectively confirmed, Anglophones seem to have a preference for sour gari, while the preference tendency of Francophones seems to be for sweet gari. The general preference of consumers is also linked to the origin of gari, since, according to FAO (2018) gari from the North-West Region seems to be the preferred one. Levai *et al*. (2016) has found that consumers associate the quality of gari to its specific processing location. In their study, the consumers tasted gari from different locations of the country and preferred samples from Bamenda, Manfe and Muyuka, the most preferred being the one from Muyuka, regarding the fineness and uniformity of the particles, its clean aspect, bright color, good swelling capacity and low sour taste. The study indicated that the localization of gari quality refer to a specific and restricted processing area, since gari from North-West Region received very low score, while the one from Bamenda, in the same region, received the second score after gari from Muyuka. The market area of the study was Buea and the classification may change if the test is undergone in another area.

Concerning color, white gari is generally more expensive than yellow gari, with a difference which may reach up to 42% (Tolly Lolo, 2013). This difference may be related to the conservation aptitude of white gari which doesn't contain oil, and is thus less susceptible to oxidation, on the contrary to yellow gari which can easily go through oil oxidation on storage.

From a technological point of view, Mapienfu-Lamaré *et al*. (2017) showed that the type of cassava variety and age influence the acceptability of gari. In its comparative study, gari made from improved variety of cassava harvested after 8 – 10 and 14th months, and from local varieties harvested after 14th months were the most appreciated. In the same vein, Gouado *et al.* (2008) showed that increasing frying time above 10 minutes, reduces the appreciation of gari. Frying temperature, quantity of palm oil added, storage conditions of cassava roots, grating method and dewatering conditions of cassava mash are other technological factors influencing the acceptability of gari (Oduro *et al*., 2000; Udofia *et al*., 2011).

One of the main constraints, as far as gari quality is concerned, is its lower storage ability, particularly during rainy season (Tolly Lolo, 2013). During rainy season, in addition to the fact that gari suffers sometimes of insufficient drying, which greatly limits the shelf life and significantly reduces the supply, the relatively high-water absorption capacity of gelatinized starch of gari favors mold development, resulting in quality drop. This behavior justifies certainly why gari is more expensive in rainy season,

the price variation being at least a double and up to the triple (Graham, 1986). In addition, the low storage ability may also justify why consumers, generally, buy gari for direct consumption and don't keep it for further use.

Removing the above constraints is a challenge relating to consumers' quality needs, the cassava production and gari processing environment and conditions. In summary, the issue is based on the operational relationship between cassava varieties and their technological properties according to market requirements.

5 QUALITY ISSUES FOR CASSAVA PRODUCTION AND GARI PROCESSING IN CAMEROON

5.1 Rationale of Gari quality issues

The main issue in gari processing for markets is to provide to consumers a product fitting with their quality needs. It appears thus compulsory to have precise knowledge of those quality needs and their relation to both with cassava varieties and processing conditions into gari. This means having deep knowledge of cassava characteristics and of local gari technology and consumer's trends is important. This objective fit with the national vision of cassava products development, supported by public projects such as PIDMA. Undergoing a deep characterization of quality attributes of gari in Cameroon along the whole value chain, from farms to markets, passing through all segments of the channel, appears as the first step of the response to the challenge. The market structure and flow of gari, from producers to markets, described above, raises up a logical approach including: (*i*) big cities where gari is mainly consumed, (*ii*) collecting areas where gari from different processors is brought together before transport to markets, (iii) gari processing areas, and (*iv*) cassava farms. In this respect, the flow channel for characterization of quality attributes of gari in Cameroon should be centered on big cities (Yaoundé, Douala, Bafoussam, Buea, Bamenda) as main markets, coupled to secondary markets, processing areas and cassava farms surrounding these big cities. A survey in those areas is objectively supposed to create an evidence base regarding quality characteristics of gari.

5.2 Structure of the survey area

Instead of conducting a huge survey in all the above areas, a representative sample should be statistically chosen among them for more efficiency and for affordability. In this respect, the ideal structure of survey area may be as follow:

- Main markets; Douala and Yaoundé, regarding their high population, cosmopolite character and as end market for gari originating from all processing areas of the country
- Secondary markets: Buea in the South-West Region, Bamenda in the North-West Region, Bafoussam In the West Region, and Melong in the Littoral Region, since out of the fact they are gari consuming areas, they are also collecting areas for gari towards Douala and Yaoundé
- Cassava production and gari processing areas: two towns or villages surrounding each secondary market

Owing to security issues in the main producing areas of North-West and South-West Regions, the above sampling needs to be readjusted out of these areas. In this respect, the Littoral Region appears as representative for the following reasons:

- Proximity with the South-West Region
- Douala, the regional capital, is the main consumption market
- Cassava farmers and gari processors present in the region originate almost from the whole part of the country. Since people usually migrate also bring with them their culture and knowledge, in addition to awareness and use of processing practices originating from other regions of the country may be encountered in Littoral Region

Considering the above reasons, the readjusted and affordable structure of the survey area is as follows (Fig. 8):

- Main market: Douala
- Collecting markets: Melong, Souza
- Cassava production and gari processing areas: Mundani an Nylon around Souza, and Passin and Nkongsoung around Melong.

Figure 8: Survey area of gari quality attributes in the value chain in the Littoral region

6 CONCLUSION

The present review has brought out the significance of gari in Cameroon, in terms of processing practices and markets. Its increasing presence in almost all regions of the country is indicative as potential product for poverty alleviation through cassava valorization. This challenge is supported by active public initiatives through cassava development projects. In this respect, undergoing a scientific study for the building of gari quality, through the definition of objective interactions between cassava varieties, processing practices and consumer's demand constitute a significant contribution to gari valorization for markets.

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8 SUMMARY OF THE STATE OF KNOWLEDGE FROM CASSAVA TO GARI

Cassava production, yield, cultivated surfaces and advantages

Sources	Information	Confidence & Country
Assessment of Resources, Markets and the Potential for Market Development in Value Added Cassava Products in West Africa (RIAS BV, 2005)	➢ Cassava is the main staple of many rapidly expanding urban poles in west Africa; ➢ Cassava cultivation was originally introduced in the coastal and humid areas of west Africa, but steadily expanding to dryer areas where it replaced cotton as a cash crop or it was introduced in the farming system to fill the food gap during the hunger season; ➢ Cassava yields vary between 5 and 15 tons per hectare, depending of cultivars, agro-ecological conditions and crop husbandry practices.	80%
Socio-economic analysis of processing Pachyrhizus erosus (L.) Urb. tubers into gari in Benin(Adegbola *et al*., 2015)	➢ In Benin, cassava and tubers represent 60% of cultivated surfaces, cassava being ranked first with 34% of cultivated areas and 54% of production	75%, Benin
Étude diagnostique de la réduction des pertes après récolte de trois cultures: manioc-tomate-pomme de terre. Rapport de synthèse: Cameroun (FAO, 2018)	➢ In Cameroon, cassava culture is done by 584 000 producers and from 2002 to 2012, the number of producers has increased of about 9%; ➢ Cassava is generally cultivated by women and yield on-field is estimated at 11.54 tons/hectare. Cassava represents the second most consumed crop in Cameroon after Banana; ➢ 70% of cassava which is produced is also consumed and the remaining supply between 6 and 40% of annual gain of producers households; ➢ Cassava production is done at family level by women	80%, Cameroon
Farmers perception and criteria for cassava variety preference in Cameroon (Njukwe et al., 2013)	➢ In Cameroon, cassava ranks first amongst roots and tubers crops in terms of total production and consumption (PNDRT, 2005); ➢ Centre, East and South regions are the main cassava producers; ➢ Smallholder farmers in Cameroon grow various cassava cultivars and there are markets producers and consumer preferences; ➢ PNDRT(Nation Program for Development of Roots and Tubers crops was operational since 2003); ➢ PNDRT got an agreement with IITA to provide high yielding cassava varieties and associated technologies, in the course of disseminating improved cassava varieties in Cameroon, it was necessary to assess farmers' criteria for preferences;	80%, Cameroon

Sources	Information	Confidence & Country
	➢ Cassava yield of experienced cassava varieties vary between 18.5 and 36.7 tons/hectare, five varieties with a yield greater than 25 tons/hectare were then selected; ➢ Cameroon has released 5 cassava varieties	
Organisation et circulation de l'information dans les filières manioc et macabo au sud Cameroun (Tricoche, 2008)	➢ In Cameroon, cassava is traditionally cultivated in extended area for auto-consumption; ➢ In 2002, cassava production was 2.05 millions of tons in Cameroon with a yield of 7.7 tons/hectare; ➢ Many quantitative data are still lacking concerning roots and tubers crops in Cameroon: cultivated surfaces, yield and produced quantity at both regional and national level, losses, proportions which are consumed at producers household level as well as those sold, proportion which is processed; ➢ PNDRT has estimated that 65% of produced cassava is consumed by the producer and only 35% is sold(PNDRT, 2003)	75%, Cameroon
Potentials for cassava processing in the Littoral region of Cameroon (Fon and Djoudji,2017)	➢ In Cameroon, cassava has an average yield of 14.4 tons/hectare; ➢ 94% of interviewed farmers were between 30 and 59 years of age and mainly made of women (82.86%); ➢ 87.14% of these farmers have primary and secondary school level (48.57% have primary school level and 38.57% have secondary school level), 10.71% of farmers have high school level and 2.14% have university level; ➢ 46.42% of these farmers have family size varying between 6 and 10 persons and farmers are generally self-funded; ➢ In Littoral region, cassava derived products are always fermented; ➢ Centre d'Incubation Pilote is installed in Douala and cover Wouri and Mungo, these two subdivisions represent 61% of regional production; ➢ Cultivated varieties differ greatly from the point of view of their suitability for specific transformation;	80%, Cameroon
Programme National de Développement des Racines et Tubercules (PNDRT) – Prêt FIDA n°606-CM: Rapport de supervision, rapport principal et appendices(PNDRT,2013)	➢ PNDRT project has allowed to improve cassava yield from 8-10 tons/hectare to 25-30 tons/hectare;	80%, Cameroon
Amélioration de la productivité du manioc et diffusion des semences	➢ The PNDRT project has allowed to diffuse some varieties: TMS 96/0023, TMS 92/0057, TME 419, TME 8034, Excel and champion, these varieties have been	80%, Cameroon

Sources	Information	Confidence & Country
améliorées (Duval et al., 2013)	largely adopted for their resistance to diseases, their productivity and aptitude to processing; ➢ The average cultivated area for cassava is between 0.5 and 1 hectare per woman and this culture isn't mechanized;	
SWOT analysis of cassava sector in Cameroon (Mvodo and Liang, 2012)	➢ South, East, South-West, Littoral and Centre are main cassava producers regions; ➢ These authors have collected their data from the ministry of Agriculture and Rural Development; ➢ Cassava is a leading crops in terms of annual yield both for cash and food crop categories; ➢ Cassava field are usually limited to less than 2 hectares for about 11 tons/hectare of yield; ➢ Many farming communities are enclaved, with absence or inadequate transportation limiting access to the cultivated field, the transportation costs are important; ➢ Cassava farming is still on subsistence scheme and there is a lack of bulk production;	80%, Cameroon
Etude sur les potentialités de commercialisation des produits dérivés du manioc sur les marchés CEMAC(IRPCM, 2008)	➢ In 30 years, cassava production has tripled in Africa, passing from 43 millions of tons from 1973-1975 to 115 millions of tons in 2005 ; ➢ In Africa, cassava is generally cultivated for human consumption; ➢ In Central Africa (Democratic Republic of Congo and Sao Tomé and Principes included), Cameroon is the second most important producer of cassava after the Democratic Republic of Congo which produces annually 15 fold the annual production of Cameroon; ➢ Cassava advantages are its ability to grow in poor soil, its resistance to drought, its ability to be harvested progressively when in-farm; ➢ 3 categories of producers can be observed: smallholders farmers, which represent 65% and mainly made of women with field size not greater than 1 hectare; middle farmers with cassava farm between 1 and 3 hectares and which represent 25% and finally big farmers which are generally made from farmers organizations, which farm surface greater than 3 hectares;	80%, Cameroon
Stratégie de développement de la filière manioc au Cameroun 2010-2015(Cameroun, 2010)	➢ Average cassava yield in Cameroon is 14.4 tons/hectare and cassava is the second most important crop after rice; ➢ 62.5% of farmers producing cassava have cultivated areas less than 2 hectares, 17.5% have cultivated areas varying between 2 and 4 hectares and 20% have surfaces greater than 20%;	80%, Cameroon

Sources	Information	Confidence & Country
	➢ Women who produce cassava have generally less than 35 years old with at least a primary education;	
Etude sur l'observatoire des racines et tubercules: rapport de première phase(PNDRT, 2006)	➢ In Cameroon, Cassava represents 50% of roots and tubers which are consumed, followed by cocoyams, yams, sweet potatoes and potatoes; ➢ In Cameroon, observed cassava yield vary between 6-8tons/hectare, which is far from the 30-40 tons/hectare for improved varieties; ➢ Cassava is generally not cultivated alone but with others plants; ➢ 0.25 hectare seems to be the average cultivated area ; ➢ Local varieties are preferred because of their availability, their high dry matter content, their liked taste, their ability to be kept in soil for long time after their maturity;	80%, Cameroon

Cassava: types, shelf-life, composition, constraints, consumption and necessity to process

Sources	Information	Confidence & Country
Performance evaluation of an automated gari fryer (Olagoke et al, 2014)	➢ Cassava contains 60% of water	70%, Nigeria
Physicochemical, nutritional and processing properties of promising new white and yellow fleshed cassava genotypes in Nigeria (Ukenye *et al*., 2013)	➢ They did these characterizations on 12 developed cultivars of cassava. ➢ Yellow cassava varieties with high amylopectin content but low starch content (between 14 and 20%) have been released. ➢ Cassava content of carotenoids was between 0.51 and 4.79µg/g and proteins content between 2.7 and 7.92%. ➢ Yellow varieties have their carotenoids content which can be 4 to 4 times higher than those of white varieties; ➢ These varieties are characterized by their skin and pulp color. Thus cassava with cream skin have white and light yellow pulp; those with brown skin have white, yellow and cream pulp color; cassava with light brown skin have yellow pulp color and finally, cassava with pinkish brown skin color have cream pulp color. ➢ Improved cassava have starch yield varying between 13 and 52% ➢ These varieties have a production yield between 20 and 41 tons/ha ➢ Their dry matter content varies between 26.51 and 42.54%, their fat content between 0.1 and 3.66% and their ash content between 0.33 and 1.10%	80%, Nigeria
Controlling cassava mosaic virus and cassava mealybug in Sub-Saharan Africa(Nweke, 2009)	➢ About 95% of the cassava produced in Africa is used for human consumption and 5% is used for industrial purposes such as starch ➢ Cassava is cultivated in around 40 African countries, covering the wide belt stretching from Madagascar to cap Verde.	85%
Chemical Changes during the Fortification of Cassava Meal (Gari) with African breadfruit (Treculia africana) Residue (Onasoga et al., 2014)	➢ Cassava(Manihot Esculenta Crantz) belong to Euphobiaceae family; ➢ Dried cassava tubers contain about 87% of starch, 2% of proteins, free sugars, minerals and vitamins including ascorbic acid;	80%, Nigeria

Sources	Information	Confidence & Country
Evaluation of quality attributes of cassava product (gari) produced at varying length of fermentation(Olaoye et al., 2015)	➢ Cassava contain cyanogenic glucosides, mostly linamarin and lotaustralin, bitter varieties, which can be eaten raw having more important quantities of these glucosides than the non-bitter ones; ➢ Bitter varieties are preferred by people because of their higher yields and resistance to insect;	Nigeria, 20% (data of these authors seem to suggest that prepared Gari is very poisonous because after 5 days of fermentation the cyanide content of Gari vary between 57 and 126 mg/100 g of Gari
Effect of Garification(roasting) duration on the quality characteristics of Cassava Gari(Arinola, 2016)	➢ One advantage of cassava is its ability to survive during drought, it physiological deterioration occurs after 2-3 days followed by microbial deterioration in 3 to 5 days; ➢ Cassava contains two cyanogenic glucosides, linamarin and lotausraline which on hydrolysis by enzyme releases toxic hydrogen cyanide;	75%, Nigeria
Comparative study on quality attributes of Gari obtained from Some processing centres in south West, Nigeria(Makanjuola et al., 2012)	➢ Both cassava roots and leaves are consumed in some parts of Africa;	75%, Nigeria
Market structure, conduct and performance of gari processing industry in South Western Nigeria(Fuke *et al*., 2012)	➢ Cassava is less expensive to produce, tolerates poor soils, adverse weather, pest and diseases more than others major staples, stores its underground portion until needed and is therefore a classic food security crop ➢ All these characteristics have allowed the International Fund for Agricultural Development to recognize it as a crop that lent itself to a commodity based approach to poverty alleviation;	75%, Nigeria
Market structure, conduct and performance of gari processing industry in South Western Nigeria(Fuke *et al*., 2012)	➢ Cassava is less expensive to produce, tolerates poor soils, adverse weather, pest and diseases more than others major staples, stores its underground portion until needed and is therefore a classic food security crop ➢ All these characteristics have allowed the International Fund for Agricultural Development to recognize it as a crop that lent itself to a commodity based approach to poverty alleviation;	75%, Nigeria

Sources	Information	Confidence & Country
New challenges in the cassava transformation in Nigeria and Ghana(Nweke, 2004)	➢ From 1960 to 1990, Nigeria and Ghana increased their production four fold; ➢ In Nigeria and Ghana, four keys factors are driving the cassava transformation: the IITA's new high yielding Tropical Manioc Selection(TMS) varieties which have boosted cassava yield by 40% without fertilizer application, high consumer demand for cassava by rural and urban households, the use of mechanical grater to reduce female labor, the Africa-wide biological control program averted the devastating cassava mealy bug epidemic; ➢ Cassava is a major source of calories for 2 out of every 5 Africans and its deterioration in soil occurs 3 or 4 years after maturation; ➢ Cassava is a subsistence crop that depletes soil nutrients; ➢ Cassava produce the largest number of calories per hectare than any other crops and its ability to grow in poor soils, withstand severe attacks of drought, pests and diseases are some of its advantages; ➢ IITA's researchers did a Collaborative Study of Cassava in Africa(COSCA) have shown that cassava field used for up to 10 years are fertile as much as soil of others crops; ➢ Cassava serves as famine reserve, rural food staple, cash crop and urban food staple;	80%
Chemical and sensory qualities of gari fortified with groundnut flour(Arisa et al., 2011)	➢ Cassava mash has a pH of 7.82, water content of 66.35%, crude fibres of 0.483%, ashes content of 0.066%, carbohydrate content of 33.6%, protein content of 0.019%; ➢ When fermented and dewatered, the water content is 44.87%, protein content is 0.016, crude fibres content is 0.56%, ashes content of 0.690%, carbohydrates content of 54.42% and pH of 5.07	75%, Nigeria
Producing Gari from cassava: an illustrated guide for smallholder cassava processors(James *et al*., 2012)	➢ Roots that contain high amounts of cyanide normally taste bitter and shouldn't be eaten raw, which isn't the case for sweet varieties;	80%
Étude diagnostique de la réduction des pertes après récolte de trois cultures: manioc-tomate-pomme de terre.Rapport de synthèse: Cameroun(FAO, 2018)	➢ Cassava represents the second most consumed crop in Cameroon after Banana; ➢ 70% of cassava which is produced is also consumed and the remaining supply between 6 and 40% of annual gain of producers households; ➢ Cassava production is done at family level by women	80%, Cameroon

Sources	➢ Information	Confidence & Country
Recent development in cassava-based products research(Ukwuru and Egbonu, 2013)	➢ Cassava is a staple food that provides carbohydrate for more than 2 billion people in the tropics, is higher carbohydrate producer per hectare and can be growth at considerably lower cost; ➢ The adoption of disease and pests resistant varieties released by IITA(International Institute for Tropical Agriculture) has increased cassava production in many African countries; ➢ Bulky roots contain 60-65% of moisture content;	80%, Nigeria
Principal components analysis and age at harvest effect on quality of Gari from four elite cassava varieties in Ghana(Apea-Bah et al., 2009)	➢ Cassava is highly perishable and undergoes post-harvest physiological deterioration within three days of harvesting;	20%, Ghana. Exactly the same paper that the one titled " Multivariate analysis and age at harvest effect on sensory preference of Gari from four cassava varieties (Apea-Bah et al., 2011)" submitted by the same authors
Simple method to reduce the cyanogen content of Gari made from cassava (Bradbury and Denton, 2010)	➢ Cassava is easy to propagate from stem cuttings, yield well in poor soils without fertilizer and is drough resistant; ➢ Cassava contains two cyanogenic glucosides: mainly linamarin and a small amount of Lotaustralin (methyl linamarin) that are hydrolyzed to produce cyanohydrin and glucose; ➢ (FAO/WHO, 1991) say that safe level for HCN in cassava products is 10 mg/Kg	75%
Cassava value added chain: an assessment of constraints and opportunities of smallholder farmers in the North West region of Cameroon(Mah, 2015)	➢ Constraints faced by farmers include the lack of training on the use of improved varieties, pests and diseases, effects of climate, low technology, limited access to land, fluctuations in prices; ➢ There is an increase market demands and new government policies to promote smallholders.	75%, Cameroon

Sources	Information	Confidence & Country
Developing cassava cultivars based on farmers' needs and on agro-ecological conditions of North-Western Cameroon (Zundel et al., 2010)	➢ Scarcity of planting material at the time of planting is the major constraint in cassava farming; ➢ Constraints of planting a cassava field immediately after the harvest of another field were said to be the coincidence with peak labor needs for others crops, land availability, the beginning of the dry season, health and other personal problems rendering the farmer unavailable for planting.	80%, Cameroon
Etude sur les potentialités de commercialisation des produits dérivés du manioc sur les marchés CEMAC(IRPCM, 2008)	➢ Cassava leaves contain more cyanogenic glucosides than cassava roots (30 to 240 mg of HCN/Kg of fresh roots when compared to 380-590 mg of HCN/Kg of leaves); ➢ Concerning cassava, there are soft varieties with less than 50 mg of HCN/Kg, moderately bitter varieties with 50-100 mg of HCN/Kg of cassava and bitter varieties which have more than 100 mg of HCN/Kg of cassava; ➢ Cyanogenic glucosides can cause intoxications at dose of 1 mg/kg of weight/day; ➢ In Cameroon, cassava production is generally done by women at family scale and people owing these family farms aren't very receptive to technological innovations; ➢ Transformation of cassava to Gari in Cameroon is constrained by the low and irregular supply of cassava roots; drudgery encountered during peeling, dewatering and packaging; inadequate processing instruments; difficulties in the maintenance of equipment; low technical skills of technicians; bad production and manufacturing practices.	80%, Cameroon
Etude sur l'observatoire des racines et tubercules: rapport de première phase(PNDRT, 2006)	➢ In Cameroon, Cassava represents 50% of roots and tubers which are consumed, followed by cocoyams, yams, sweet potatoes and potatoes; ➢ Local cassava varieties are preferred because of their availability, their high dry matter content, their liked taste, their ability to be kept in soil for long time after their maturity.	80%, Cameroon

Farmers criteria concerning cassava varieties

Sources	Information	Confidence & Country
Assessment of Resources, Markets and the Potential for Market Development in Value Added Cassava Products in West Africa (RIAS BV, 2005)	➢ At the moment, participative screening approaches are used in order to take into account characteristics such as taste, multiples uses, some cultivars that respond to these specific requirements asked by farmers have been released by research institutes; ➢ In Sierra Leone, all research institute are screening cultivars with high starch content for industrial purposes	80%
Farmers perception and criteria for cassava variety preference in Cameroon (Njukwe et al., 2013)	➢ Producers preferences vary according to regions, however, they have some similarities in their preferences regardless of the region, thus, producers prefer early maturity yielding with high yield and which are resistant to insects; ➢ Producers from Bertoua and Ebolowa prefer leafy varieties which give sweet roots and early branching varieties; ➢ Producers from Bamenda and Ngaoundéré prefer tail plant which are drought tolerant and fibrous;	80%, Cameroon
Developing cassava cultivars based on farmers' needs and on agro-ecological conditions of North-Western Cameroon (Zundel et al., 2010)	➢ Cassava in North-West region is planted twice time the recommended planting density; ➢ Dissemination of successful varieties has been done from IITA Nigeria to others IITA research sites in others countries; ➢ 90% of cassava farmers in North-West region are women and these farmers have been selected to be representative of the group; ➢ Producers preference vis-à-vis of cassava has been done on boiling cassava; ➢ Farmers' most important criterion for cultivar selection is high yield for those planting it as cash crops, others positives traits being the option to consume the storage roots after boiling(soft tissues, nice taste, lack of bitterness), early maturity and flexibility in the harvesting period; ➢ Bitterness could be accepted if the cultivar has an important yield; ➢ In North-West, local cultivars of cassava are tall and experienced cassava farmers prefer those which are looking like the local cultivars that they grow whereas less experienced farmers prefer new short(in term of tall) cultivar; ➢ All the farmers say that at every time, they want cultivar for home consumption; ➢ According to farmers, criteria for selection of good cultivar was: its ability to give high yield, its agro-ecological zone of origin ; ➢ Producers prefer early maturity cassava varieties; ➢ Land availability and planting material are the two observed limitations;	80%, Cameroon
Stratégie de développement de la filière manioc au Cameroun 2010-2015(Cameroun, 2010)	➢ Producers prefer soft varieties(not bitter) with lower yields instead of bitter varieties with more important yield;	80%, Cameroon

Mechanical Garifier models with yield

Sources	Information	Confidence & Country
Performance evaluation of an automated gari fryer (Olagoke et al, 2014)	➢ Garification is simultaneously a drying and frying operation; ➢ In the village as done by women, the initial temperature of garification is relatively low to avoid the formation of lumps or caking, as moisture content is reduced, the developed small lumps are broken down by constant pressing and agitation, the temperature is increased in order to further cook and dehydrate the product; ➢ Regulation of heat input, adequate agitation and pressing are very important during the garification; ➢ Many models for garification have been developed: UNIBADAN model, UNN model, FABRICO model and PRODA model, however these models seem to have a feed rate higher than those which are usually used at household level; ➢ The manufactured an automated gari fryer able to produce 20.4Kg of Gari/hour with a final moisture of 12.2% by using 5Kg of charcoal	75%, Nigeria
Improved mechanized Gari frying technology for sustainable economic development in Nigeria(Gbasouzor and Maduabum, 2012)	➢ Gari frying is the most critical operation in the processing of cassava into Gari and this roasting is a combination, of cooking and drying operation; ➢ The product is firstly cooked, then dried in order to reduce the moisture content from 50-65% to 12%; ➢ Gari cooking is done for 30 to 35 minutes; ➢ For design, machine should have a metal surface at temperature of 250oC and Gari will stay on it for 15 minutes; ➢ There are few mechanized Gari plants in Nigeria market; ➢ Newell Dunford model as well as Brazilian model didn't success in a development of a whole plant Garifier which produces a good Gari. For Gari produced with Newell Dunford model, the product was looking like dried cassava instead than cooked and fried Gari; ➢ Fabrico model produces a product near to Gari(it was looking like roasted Gari); ➢ Up to now, the best Gari is obtained by village technique; ➢	80%, Nigeria

Limitations of Gari processing unit

Sources	Information	Confidence and Country
Assessment of Resources, Markets and the Potential for Market Development in Value Added Cassava Products in West Africa (RIAS BV, 2005)	➢ Pressing, sieving and inefficient roasting are encountered problems in the whole process of the production of Gari by machine; ➢ Effluents aren't collected, leading to starch losses and environmental damage; ➢ As problems, up to now , no solution has been found for peeling, peels aren't always recuperated, sieves are often primitives or absent as well as weighing seals, sanitary conditions are lacking at processing sites; ➢ Most medium-size enterprises that have tried to develop gari-processing units lines in an industrial way have failed, as they can't compete with informal women groups, also, the energy costs was too high when compared to firewood. Peeling was also difficult to be done; ➢ In the short-term, upgrading of existing women-owned processing workshop appears to be the most promising approach, this could be used to pull the cassava sector; ➢ Projects involved in processing never succeeded to develop a successful prototype of a Gari processing plant; ➢ Most of these prototypes were too expensive (heavy infrastructure), equipped with non-adapted equipment (low labour productivity), localized in wrong places, with design mistakes and couldn't compete with informal sector initiatives, women groups were often not interested, but constructed their basic low cost infrastructure.	80%
Amélioration de la productivité du manioc et diffusion des semences améliorées (Duval et al., 2013)	➢ Existing machines which are found in the market are imported and over dimensioned vis-à-vis of needs; ➢ Improvement of yields has been done with the help of IITA and Cirad	80%, Cameroon
New challenges in the cassava transformation in Nigeria and Ghana(Nweke, 2004)	➢ From the early 1990 in Nigeria, the increasing per capita cassava production leveled off and the price of cassava to consumers rose down relatively to others staples and in the early 1990, Nigerian farmers were facing a serious problem in recruiting sufficient labor for harvesting and processing the high-yielding TMS because the planting of TMS varieties shifted the cassava labor constraint from weeding to harvesting; ➢ Developing a labor saving technology for the small-holder cassava harvesting is now the most critical challenge in the cassava transformation in Nigeria and this challenge is more urgent than further increase of cassava yield; ➢ The real challenge nowadays is about cassava harvesting and peeling machine designed for small holders and if not designed, cassava breeders and engineers should work hand in hand to develop processing machine for small-holders; ➢ In Gari processing, difficult steps are peeling and toasting stages;	80%, International Food Policy Research

Gari roasting plant

Sources	Information	Confidence & Country
History of the development of the first mechanized continuous Gari manufacturing plant(Purcell and Williams, 1973)	➢ The plant has been manufactured by Newell Dunford and is made of an eccentric drum peeler and a horizontal hammer mill, fermentation is done separately from dewatering which is done by hydraulic press, dewatered mash is dried in cascade type rotary drier; ➢ Gari produced in village was more competitive in term of price than the one produced by the plant; ➢ The equipment was able to produce 2 tons of Gari per day; ➢ The Garifier section is separated from the dryer; ➢ Peeling is still an important step as this is not done properly;	80%, Nigeria
Design concepts towards electric powered gari frying machine(Adediran, 2015)	➢ Gari roasting is simultaneously a cooking and a dehydration process, Gari is firstly cooked with the moisture and then dehydrated; ➢ At village level, cassava is stirred using spatula-like paddles of wood or calabash to press and mash against the hot surface of the frying pan;	80%, Nigeria

Peeler machine

Sources	Information	Confidence & Country
Producing Gari from cassava: an illustrated guide for smallholder cassava processors(James *et al*., 2012)	➢ Cassava roots peeler with a capacity of 2 tons/hour exists at Nigeria and even the whole chain for Gari production is done there;	80%
Quality management manual for the production of Gari (Adebayo *et al*., 2012)	➢ In Nigeria, the grating operation is generally motorized and it exists mechanical peelers in Nigeria and Ghana, although at few level; and this roasting is understood as a two-steps operation: the first stage is partial gelatinization or dextrination and the second step is a drying operation; ➢ Desintegration of cassava mash, sieving and also roasting have been mechanized in Nigeria; ➢ After roasting, Gari is collected when it is dry and the color is creamy, a small amount of roasted Gari is often left in the pan to facilitate the roasting of the next batch and cooling is done during 4 to 6 hours; ➢ More efficient and high capacity cassava graters, hydraulic operated dewatering machines, stoves and stainless steel fryers and chimney have been developed; ➢ In addition, harvesters, fresh cassava peelers, mechanized fryers have been introduced in the bit eight years	80%, Nigeria

Gari process as done by authors

Sources	Information	Confidence & Country
Performance evaluation of an automated gari fryer (Olagoke et al, 2014)	➢ Cassava is peeled, washed, grated, dewatered, fermented, sieved, fried and allowed to get cool	75%, Nigeria
Physicochemical, nutritional and processing properties of promising new white and yellow fleshed cassava genotypes in Nigeria (Ukenye *et al*., 2013)	➢ Cassava is peeled, grated, bagged, dewatered/fermented(2-5 days), pulverized, garified, allowed to get cool;	80%, Nigeria
Provitamin A carotenoid content of dried fermented cassava flour: the effect of palm oil addition during processing (Gouado *et al*., 2008)	➢ Cassava is peeled, cleaned, grated, dewatered, fermented(3 days) and fried at 120 oC during 10 min ➢ In Cameroon, cassava is processed into Gari and cassava flour which is also known as fufu	80%, Cameroon
Chemical Changes during the Fortification of Cassava Meal (Gari) with African breadfruit (Treculia africana) Residue (Onasoga et al., 2014)	➢ In Nigeria, cassava flour is Lafun, cassava mash is fufu; ➢ At laboratory scale, cassava has been peeled, washed, grated, bagged, fermented(3 days), dewatered, granulated, roasted, cooled and finally sieved to obtain Gari	75%, Nigeria
Processing and characteristics soybean-fortified gari(Sanni and Sobamiwa, 1994)	➢ Cassava has been peeled, washed, grated, bagged, fermented, dewatered, granulated, roasted, cooled and sieved in other to obtain Gari	80%, Nigeria
Evaluation of quality attributes of cassava product (gari) produced at varying length of fermentation (Olaoye et al., 2015)	➢ Cassava has been peeled, washed, grated, dewatered/Fermented(simultaneously between 1 and 5 days), sieved, garified (120oC and 140oC), sieved again to obtain Gari	75%, Nigeria
Effect of Fermentation Periods on the Physicochemical and Sensory Properties of Gari(Oluwafemi and Udeh, 2016)	➢ Cassava(bitter variety) has been peeled, washed, grated, dewatered/Fermented(simultaneously between 1 and 8 days), sieved, garified, sieved again to obtain Gari	80%, Nigeria
Effect of the duration of fermentation on the quality of gari (Irtwange and Achimba, 2009)	➢ Cassava(bitter variety) has been peeled, washed, grated, bagged, dewatered/Fermented(simultaneously between 1 and 5 days), sieved and garified.	80%, Nigeria
Acidification and starch behaviour during co-fermentation of cassava (Manihot esculenta Crantz) and soybean (Glycine max Merr) into gari , an African fermented food (Afoakwa *et al*, 2010)	➢ Cassava was peeled, washed, grated, bagged, fermented(48 hours), dewatered, sieved and Garified before aallowed to get cool to obtain Gari;	75%, Ghana

Sources	Information	Confidence & Country
Effect of Garification(roasting) duration on the quality characteristics of Cassava Gari(Arinola, 2016)	➢ As done by the author, cassava has been peeled, washed, grated, fermented(4 days), dewatered, crushed, sieved and finally Garified;	75%, Nigeria
Enrichment of cassava meal(Gari) with soybean protein extract(Uche *et al.*, 2008)	➢ Cassava has been peeled, washed, grated, dewatered/fermented simultaneously (3 days), and sieved;	50%, Nigeria (They didn't provide any table of results
Production and evaluation of gari produced from cassava (Manihot esculenta) substituted with cocoyam (Colocasia esculenta) (Olatunde et al., 2013)	➢ Cassava and cocoyam have been separately peeled, grated, fermented/dewatered for 48 hours and 24 hours respectively before been mixed and the blend pressed for 24 hour again;	75%, Nigeria
Microbiological safety and sensory attributes of gari in selected packaging materials(Adejumo and Raji, 2012)	➢ As done by authors, cassava has been peeled, washed, grated, fermented for three days, dewatered, sieved, garified (with constant stirring) during 20 to 30 minutes; ➢ assessment of aroma, taste, color and overall acceptability have been done;	75%, Nigeria
Extension of shelf life of garri by hygienic handling and sodium benzoate treatment (Agiehor and Ikenebomeh, 2005)	➢ Cassava is peeled, washed, grated, dewatered/Fermented for 48 hours, sieved, fried(75 oC), cooled and sieved again;	75%, Nigeria
Chemical and sensory properties of Gari enriched with sesame seed flour(Sesamum indicum L.)(Oluwamukomi, 2015)	➢ Cassava has been peeled, washed, grated, fermented for three days, dewatered, pulverized, sieved , toasted and packaged	80%, Nigeria
Physico-thermal and pasting properties of soy-melon-enriched "Gari" semolina from cassava(Oluwumukomi and Jolayemi, 2012)	➢ Cassava has been peeled, washed, grated, fermented for three days, dewatered, pulverized, sieved , toasted and packaged	75%, Nigeria
Chemical and sensory qualities of gari fortified with groundnut flour(Arisa et al., 2011)	➢ Cassava has been peeled, washed, grated, bagged, dewatered, fermented for 72 hours, sieved and garified, then allowed to get cool and finally packaged;	75%, Nigeria
Feasibility of using sealed polyethylene film in prolonged storage of Gari(Ukpabi et al., 2012)	➢ As done by authors, Gari has been peeled, washed, grated, fermented for 48 hours, dewatered, pulverized, sieved, toasted, cooled to obtain Gari;	80%, Nigeria
Proximate and mineral composition of co-fermented breadfruit and cassava into Gari analogue (Ajifolokun and Adeniran, 2018)	➢ Cassava is peeled, washed, grated, Fermented/dewatered(5 days), sieved , roasted, cooled and packaged in polyethylene;	50%, introduction is almost identic to the one of Ahaotu *et al.*, 2011)
Principal components analysis and age at harvest effect on quality of Gari from four elite cassava varieties in Ghana(Apea-Bah et al., 2009)	➢ Cassava is peeled, washed, grated, dewatered, fermented for 48 hours and further processed	70%, Ghana

Gari process described by authors

Sources	Information	Confidence & Country
Draft for comments: African Standard CD-ARS 854 : Garri-Specification(ARSO, 2014)	➢ Cassava is peeled, washed, grated, fermented, pressed, fragmented, granulated, dried, sieved and garified.	80%
Chemical Changes during the Fortification of Cassava Meal (Gari) with African breadfruit (Treculia africana) Residue (Onasoga et al., 2014)	➢ In Village, cassava is peeled, washed, grated, dewatered/fermented (simultaneously), granulated, sifted and roasted.	75%, Nigeria
Isolation and screening of microorganisms from a gari fermentation process for starter culture development(Edward et al., 2012)	➢ Cassava is peeled, washed, grinded, fermented (48 h), dewatered, sieved, garified and sieved again;	70%, Benin
Quality Assessment of Cassava Gari Produced in Some Selected Local Governments of Ekiti State, Nigeria(Olanrewaju and Idowu, 2017)	➢ Cassava is peeled, washed, grated, fermented, dewatered, sieved, roasted and then sieved again; ➢ The roasting process which usually dextrinizes the starch and dries the granule is called Garification;	80%, Nigeria
Potentials for cassava processing in the Littoral region of Cameroon (Engwali and Temkeng,2017)	➢ In Littoral region, fermentation and dewatering for Gari production are done simultaneously and for a period of two days;	80%, Cameroon
Effect of Garification(roasting) duration on the quality characteristics of Cassava Gari(Arinola, 2016)	➢ As described, cassava is peeled, washed, grated, dewatered/Fermented(simultaneously between 3 and 5 days), pulverized, sifted and roasted to obtain Gari;	75%, Nigeria
Retention of provitamin A carotenoids in staple crops targeted for biofortification in Africa: cassava, maize, and sweet Potato(De Moura et al., 2015)	➢ Cassava is peeled, washed, grated, fermented(4-5 days), dewatered and roasted;	80%, Nigeria
Microbiological safety and sensory attributes of gari in selected packaging materials(Adejumo and Raji, 2012)	➢ As described by authors, cassava is peeled, washed, grated, fermented in solid state(simultaneously fermentation and dewatering), pulverized and roasted; ➢ assessment of aroma, taste, color and overall acceptability;	75%, Nigeria
Microbiological quality of fermented cassava (Gari) sold in Ota Ogun State Nigeria(Olopade *et al*., 2014)	➢ Cassava is peeled, washed, grated, dewatered and fermented(simultaneously) for many days. (They just stopped at this step without clearly explaining the remaining steps;	75%, Nigeria
Optimization of indigenous food (Gari) fermentation with respect to time and texture(Ikpe and Essienubong, 2016)	➢ As described by authors, Gari is peeled, washed, grated, dewatered/fermented(simultaneously)for three to four days, sieved and roasted	80%, Nigeria

Sources	Information	Confidence & Country
Producing Gari from cassava: an illustrated guide for smallholder cassava processors(James *et al*., 2012)	➢ The document reveals that fermentation and dewatering can either be done simultaneously or separately and in this case, fermentation precede dewatering;	80%
Étude diagnostique de la reduction des pertes après récolte de trois cultures: manioc-tomate-pomme de terre. Rapport de synthèse: Cameroun(FAO, 2018)	➢ Cassava is peeled, washed, grated, fermented for two days, dewatered and then roasted; ➢ Harvesting and processing of cassava to Gari is done by a group of 4 persons but selling is done individually; ➢ Processing can also be done individually or by a set persons associated in what is known in Cameroon as "Groupement d'initiatives communes"; ➢ Big wholesalers buy to processors in production regions and then sell to medium wholesalers and retailers in consumption centers which are in Cameroon Douala, Yaoundé, Bafoussam and Bamenda;	80%, Cameroon
Feasibility of using sealed polyethylene film in prolonged storage of Gari(Ukpabi et al., 2012)	➢ As described by authors, fresh cassava roots are peeled, grated, fermented (1 or 2 days or more depending on the type of Gari and end use), sieved and roasted;	80%, Nigeria
Quality management manual for the production of Gari(Adebayo *et al*., 2012)	➢ Cassava is peeled, washed, grated, fermented, dewatered or pressed, sifted, roasted, sifted again to obtain the final Gari before be packaged;	80%, Nigeria
The marketing of Gari in North-West province, Cameroon (Graham, 1986)	➢ Cassava is peeled, washed, grated, bagged and fermented for three to four days, dewatered, sieved, fried, sieved, cooled and packaged;	80%, Nigeria

Quality of Gari

Sources	Information	Confidence & Country
Effect of Fermentation Periods on the Physicochemical and Sensory Properties of Gari(Oluwafemi and Udeh, 2016)	➢ Many factors determine the final quality of Gari: cassava variety, age at harvest, processing methods, equipments and fermentation duration; ➢ Gari is obtained after fermentation of cassava for at least three days; ➢ Gari is a convenience food because of its cheapness, ease of storage and preparation, all this justify the fact that is extremely popular in Nigeria and others West African countries, it is the most consumed form of cassava in West part of Nigeria;	80%, Nigeria

Gari fermentation duration as done in village

Sources	Information	Confidence & Country
History of the development of the first mechanized continuous Gari manufacturing plant(Purcell and Williams, 1973)	➢ Fermentation in village take 4 to 6 days	80%, Nigeria
Processing of cassava into Gari and high quality cassava flour in West Africa(Oti et al., 2010)	➢ In West African countries, Gari is the most consumed and traded of all food products made from cassava; ➢ Fermentation should be done between 2 and 4 days and the same cassava variety should be used in this regard; ➢ According to Nigeria, Ghana, Togo and Benin national standard, Gari should have a moisture content of 12%(maximum, between 10 and 12% in Benin), maximum fibre content of 2%, maximum cyanide content of 2mg/Kg and maximum ash content of 2.75%;	80%

Some characteristics of cassava fermentation

Sources	Information	Confidence & Country
Application of Biotechnology to cassava processing in Africa (Oyewole O. B., 1995)	➢ Microorganisms are involved in detoxification, flavor development and preservation; ➢ Processing of cassava involve boiling, smoking, drying and fermentation, the latter being the most used, however the absence of starter yield to varying fermentation time and quality of products from one processor to another and from one production to another; ➢ There is a solid state fermentation which involve grating and pressing of cassava for 3 to 5 days, in the other form, cassava is cut into pieces or slices and spread out in the open air or under the sun, the dried products are milled into flour; ➢ In submerged fermentation process, cassava roots, peeled or not, whole or into pieces are soaked in water for the duration of fermentation of 2 to 3 days in hot season and 4 to 7 days in raining season, the fermented roots may be wet sieved and the mash cooked in boiling water known as fufu in Nigeria, or sieved, sundried, smoked and milled into flour to further prepare a meal which is known as lafun in Nigeria; ➢ Bacillus sp., Corynebacterium spp. And Klebsiella spp. Produce amylase for breakdown of starch and disappear because they can't withstand the acidity of the medium, then yeast and Lactobacillus develop, same for solid state fermentation; ➢ For fufu production, Isolated microorganisms from fermented cassava are Lactobacillus cellobiosus, Lactobacillus bulgaricus, Lactobacillus brevis, Lactobacilus coprophilus, Lactobacillus plantarum and Leuconostocs mesenteroides; ➢ 56% of Lactobacillus hydrolyse linamarin, mainly(83%) belong to Lactobacillus plantarum group; ➢ Linamarase isolated from microorganism is optimal at pH=5-7 and a temperature range of 30oC to 40oC; ➢ The ability of Lactobacilus to produce amylase and linamarase has allowed it to be selected in the formulation of one starter; ➢ Thus, 4 microorganisms (Bacillus subtilis, Klebsiella spp., Lactobacillus plantarum and Candida krusei have been selected for the formulation of a single inoculum and it has been shown that Lactobacillus plantarum is responsible of the highest level of acid production, Bacillus subtilis is responsible for the highest rate of softening and the highest flavor is obtained by Candida krusei;	80%, Nigeria

Gari: consumption form and importance

Sources	Information	Confidence & Country
Performance evaluation of an automated gari fryer (Olagoke et al, 2014)	➢ Gari is consumed after processing with hot water to form a dough-like paste called 'Eba'	75%, Nigeria
Effect of the duration of fermentation on the quality of gari (Irtwange and Achimba, 2009)	➢ Gari can be stepped in cold water, to which sweeteners, groundnut and fish is added; ➢ The most widespread method of Gari consumption is by preparing it into a paste by pouring into a measured quantity of boiled water, the resulting paste is called "Eba" in Nigeria, of which small balls are dipped into soup or stew and swallowed with or without mastication;	80%, Nigeria
Quality Assessment of Cassava Gari Produced in Some Selected Local Governments of Ekiti State, Nigeria (Olanrewaju and Idowu, 2017)	➢ Gari is consumed by soaking in cold water with sugar, roasted groundnut, or stirred in hot water to make a stiff dough known as "Eba"; ➢ There are yellow and white Gari in Nigeria; ➢ The length of fermentation, the use of high/low cyanogenic glucosides and adequate or inadequate garification yield to cassava with variable quantity of HCN;	75%, Nigeria
Provitamin A carotenoid content of dried fermented cassava flour: the effect of palm oil addition during processing (Gouado *et al*., 2008)	➢ Gari is consumed soaked with sugar or honey, cooked with boiling water and eaten as a meal with different sauces, as a pancake. ➢ Bitter variety has been used by authors for the production of Gari.	80%, Cameroon
Cassava(bitter variety) has been peeled, washed, grated, dewatered/Fermented(simultaneously between 1 and 8 days), sieved, garified, sieved again to obtain Gari(Arinola, 2016)	➢ Gari is either consumed as gelatinized dough ("Eba") serves with sauces/soups or soak in cold water with sugar and roasted groundnut;	80%, Nigeria
Quality of gari(roasted cassava mash) in Lagos State, Nigeria(Sanni et al.,2009)	➢ Gari is consumed either soaked in cool water or stirred in hot water to make a stiff paste which is known as "Eba" in South West of Nigeria;	75%, Nigeria
Comparative study on quality attributes of Gari obtained from Some processing centres in south West, Nigeria(Makanjuola et al., 2012)	➢ Gari is usually consumed by mixing with boiling water to form a stiff paste and eaten with stews, soups as accompaniments; ➢ It can be eaten by soaking in cold water with or without the addition of sugar, fried or roasted fish, coconuts, palm kernel, groundnuts;	75%, Nigeria

Sources	Information	Confidence & Country
Enrichment of cassava meal(Gari) with soybean protein extract(Uche *et al.*, 2008)	➢ Gari is largely consumed in West and Central Africa; ➢ Gari is generally eaten with vegetables stew	70%, Nigeria
An assessment of gari marketing in South-Western Nigeria(Afolabi, 2009)	➢ Gari is eaten as a paste ("Eba") or by soaking in cold water with sugar, coconut, roasted peanut, fish and boiled cowpeas	80%, Nigeria
Optimizing gari quality attributes for different groups of consumers with response surface methodology(Udofia et al., 2011)	➢ Gari is consumed in dry form, smoked with milk, sugar or salt, or prepared as a stiff paste called "Eba" which is eaten with soups;	65%, Nigeria
Food safety, weights, measures and consumption patterns: The case of gari in Enugu and Benin markets (Sanni, 2005)	➢ Gari is consumed by soaking in cold water with sugar, coconut, fish, roasted peanut or boiled cowpea. It can be prepared as a paste when mixing with hot water and in this case, it is eaten with vegetable sauce; ➢ Gari was rated as number one preferred staple from cassava products in all the urban markets in Nigeria;	80%, Nigeria
Market structure, conduct and performance of gari processing industry in South Western Nigeria(Fuke *et al*., 2012)	➢ It is consumed as processed or reconstituted with hot water to give a dough-like paste known as "Eba" which is consumed with sauce	75%, Nigeria
Microbiological safety and sensory attributes of gari in selected packaging materials(Adejumo and Raji, 2012)	➢ Gari is consumed with coconut, banana, smoked fish or peanut when soaked in cold water or processed with hot water to form a stiff paste known as "Eba" which is eaten with various types of African sauces;	75%, Nigeria
Microbiological quality of fermented cassava (Gari) sold in Ota Ogun State Nigeria(Olopade *et al*., 2014)	➢ Gari can absorb up to four times its volume in water and can be eaten with meat, roasted groundnuts, smoked fish, boiled beans, coconut, palm kernel, groundnut cake, milk;	75%, Nigeria
Optimization of indigenous food (Gari) fermentation with respect to time and texture(Ikpe and Essienubong, 2016)	➢ Gari can be consumed dry, soaked in cold water along with fish, milk, sugar, salt or stirred with hot water and consumed with soup;	80%, Nigeria
Chemical and sensory qualities of gari fortified with groundnut flour(Arisa et al., 2011)	➢ Gari can be eaten with fried or roasted fish, coconuts, palm kernel, groundnut when mixed with cold water with or without the addition of sugar or salt. Gari is consumed by mixing with boiling water to form a stiff paste and eaten with stews, soups and accompaniments; ➢ Sometimes, Gari is eaten as dry by children;	75%, Nigeria

Sources	Information	Confidence & Country
Étude diagnostique de la réduction des pertes après récolte de trois cultures: manioc-tomate-pomme de terre.Rapport de synthèse: Cameroun(FAO, 2018)	➢ In Cameroon, both white and yellow Gari are found, the yellow one being produced when red palm oil is added during the roasting step of Gari; ➢ Gari is generally consumed after hydration by adding sugar or roasted groundnuts; ➢ In North West and South-West region, Gari is prepared with hot water	80%, Cameroon
Recent development in cassava-based products research (Ukwuru and Egbonu, 2013)	➢ Gari forms a significant part in the diet of people in many countries such as Cameroon, Sierra Leone and Zaire	80%
Farmers perception and criteria for cassava variety preference in Cameroon (Njukwe et al., 2013)	➢ Gari is very common amongst people originating from South West and North-West regions;	80%, Cameroon
The marketing of Gari in North-West province, Cameroon (Graham, 1986)	➢ Gari is mixed with water and heated for a few minutes to form a porridge to be eaten with pepper soup rich in palm oil;	80%, Cameroon
Etude sur l'observatoire des racines et tubercules: rapport de première phase(PNDRT, 2006)	➢ In urban areas, more than 80% of population consume at least one of the four cassava by-product: fufu(89% of households), cassava ticks(84% of households), fresh cassava(80% of households) and Gari(74% of households)	70%, Cameroon
Stratégie de développement de la filière manioc au Cameroun 2010-2015(Cameroun, 2010)	➢ Gari is the fourth most consumed cassava derived product after fufu, cassava ticks and fresh cassava roots;	80%, Cameroon

Gari preference and quality

Sources	Information	Confidence & Country
Quality Assessment of Cassava Gari Produced in Some Selected Local Governments of Ekiti State, Nigeria (Olanrewaju and Idowu, 2017)	➢ There are yellow and white Gari in Nigeria; ➢ The less fibrous a Gari sample is, the better its quality is; ➢ The length of fermentation, the use of high/low cyanogenic glucosides and adequate or inadequate garification yield to cassava with variable quantity of HCN;	75%, Nigeria
Optimizing gari quality attributes for different groups of consumers with response surface methodology(Udofia et al., 2011)	➢ People originating from east part of Nigeria prefer yellow Gari and sweet Gari (with short fermentation time) whereas people originating from West region of Nigeria prefer creamy to slighty-golden Gari which is sour and is obtained from longer fermentation period;	75%, Nigeria
Market structure, conduct and performance of gari processing industry in South Western Nigeria(Fuke *et al*., 2012)	➢ Yellow Gari is preferred in South Western part of Nigeria and can cost twice the price of other Gari	75%, Nigeria
Evaluation and developing simple techniques for assessing Gari adulteration(Teye et al., 2017)	➢ Fermentation duration is determined by the level of sourness judged as acceptable by the target consumer; ➢ This low variability can be due to the fact that local Gari processors have been trained at national level; ➢ Ghanaians prefer Gari with the major part of particle size varying between 1 and 2 mm;	70%, Ghana
Quality management manual for the production of Gari(Adebayo *et al*., 2012)	➢ South –East population of Nigeria and most parts of Ghana accept a mild sour Gari(fermented between 1 and 2 days) while South-West people of Nigeria prefer an acidic taste (fermented during 3 to 5 days); ➢ In Nigeria, the addition of food additives like palm oil, vitamins, proteins and others nutrient are allowed for enrichment. Salt and edible oil may be added to Gari in appropriate amount.	80%, Nigeria
Consumer perception of Gari prototypes and prospects for improvement and marketing in the South West region of Cameroon (Levai et al., 2016)	➢ Sensory attributes of Gari is determined by the level of fermentation, frying temperature, quantity of palm oil added, post-harvest storage of cassava tubers before processing, method of grating and rate of dewatering during the fermentation. Others factors include the age of cassava at harvest, variety and location of the farm as well as storage conditions of Gari before consumption; ➢ Questions asked to consumer were: how do they consume Gari? How often? Whether they think the packaging can be improved? Could other items be added in the package and whether they can be flavoured?;	80%, Cameroon

Sources	Information	Confidence & Country
	➢ Frequent Gari consumers don't belong to high incomes class, but students up to university level also consume it; ➢ Consumers can distinguish up to five prototypes of Gari but the majority distinguish 2 to 3 Gari, these types been associated to their locality of origin; ➢ Consumers prefer Gari from Muyuka, Bamenda and Manfe, the most preferred being the one from Muyuka (It is fine with uniform particles size, very attractive, looking clean and brightly colored, gel well when cooked. It doesn't easily go soft as snack, has a good swelling capacity as snack and fufu and isn't too sour to the taste); ➢ In Buéa, 68% of respondents prefer Gari as fufu; ➢ Gari rapidly quenches thirst and hunger, is eaten with sugar or groundnuts or milk or all these items depending on the individual; ➢ Gari is used to patch the tires; ➢ Most respondents think that regular consumption of Gari as a snack can affect eyesight; ➢ People prefer tasting their Gari before buying;	

Cassava derived product and importance

Sources	Information	Confidence & Country
Quality Assessment of Cassava Gari Produced in Some Selected Local Governments of Ekiti State, Nigeria (Olanrewaju and Idowu, 2017)	➢ Majority of Nigerian eat cassava product at least once per day; ➢ Gari, Fufu and Lafun are cassava-derived product;	75%, Nigeria
Comparative evaluation of the functional and sensory characteristics of three traditional fermented cassava products(Shiddu and Adedokun, 2010)	➢ Lafun is obtained by washing of cassava, followed by the peeling, soaking or fermentation for 28 to 72 hours, pressing, pulverizing, drying(sun or solar) and milling; ➢ Fufu is obtained by washing of cassava, followed by the peeling, soaking or fermentation for 28 to 72 hours, sieving of cassava, settling, pressing, pulverizing, drying(sun or mechanically) and milling; ➢ Pupuru is obtained by washing of cassava, followed by the peeling, soaking or fermentation for 28 to 72 hours, pressing, defibrating, moulding (1-2.5kg), smoke-drying, scrapping, and milling;	70%, Nigeria
Microbiological quality of fermented cassava (Gari) sold in Ota Ogun State Nigeria(Olopade *et al*., 2014)	➢ Gari can absorb up to four times its volume in water and can be eaten with meat, roasted groundnuts, smoked fish, boiled beans, coconut, palm kernel, groundnut cake, milk; ➢ In Nigeria, Gari, Lafun and fufu are the main derived cassava product which are consumed at domestic scale;	75%, Nigeria
New challenges in the cassava transformation in Nigeria and Ghana(Nweke, 2004)	➢ In Ghana, per capita cassava consumption was 120 Kg/person/year before 2000 and is now 255 Kg/person/year; ➢ This per capita consumption in Nigeria has increased of 40%; ➢ In 2001, cassava was the second most important staple in Cameroon;	80%, International Food Policy Research
Étude diagnostique de la réduction des pertes après récolte de trois cultures: manioc-tomate-pomme de terre. Rapport de synthèse: Cameroun (FAO, 2018)	➢ In Cameroon, main cassava derived products are: fufu, Gari, Cassava tick(“Bâtons de manioc”), water fufu and “cosettes”; ➢ In Cameroon, both white and yellow Gari are found, the yellow one being produced when red palm oil is added to Gari; ➢ Gari is generally consumed after hydration by adding sugar or roasted groundnuts; ➢ In North West and South-West regions, Gari is prepared with hot water	80%, Cameroon

Sources	Information	Confidence & Country
Studies on the production and utilization of dried cassava chips as human food (Elohor et al.,2008)	➢ Gari is the most common food product processed from cassava in West Africa; ➢ Lafun is prepared by soaking cassava roots for 3-4 days, crushing, decantation, drying and milling; ➢ Fufu is obtained from cassava by these successive units operation: peeling, washing, cutting, soaking(4-5 days) disintegration, sieving, decantation, squeezing to obtain the wet fufu product;	80%
Chemical Changes during the Fortification of Cassava Meal (Gari) with African breadfruit (*Treculia africana*) Residue (Onasoga *et al*., 2014)	➢ In Nigeria, cassava flour is Lafun, cassava mash is fufu;	75%, Nigeria
Developing cassava cultivars based on farmers' needs and on agro-ecological conditions of North-Western Cameroon (Zundel et al., 2010)	➢ In North-West, 16 cultivars have been identified, of which 5 are widespread; ➢ Almost 70% of locally consumed cultivar are sweet and could be consumed boiled whereas the remaining 30% are bitter and are processed into Gari or Waterfufu; ➢ Gari processing is done at household level	80%, Cameroon

<u>Prepared form of Gari given to panelists</u>

Sources	Information	Confidence & Country
Chemical and sensory properties of Gari enriched with sesame seed flour(Sesamum indicum L.)(Oluwamukomi, 2015)	➢ Sensory analysis has been done with reconstituted “Eba” (1:2.2(1 part of Gari:2.2 part of water) W/V);	75%, Nigeria
Feasibility of using sealed polyethylene film in prolonged storage of Gari(Ukpabi et al., 2012)	➢ Gari has been given to panel after its preparation with boiled water to form a stiff dough known as “Eba”	80%, Nigeria
Effect of Fermentation Periods on the Physicochemical and Sensory Properties of Gari(Oluwafemi and Udeh, 2016)	➢ Gari has been given to consumers after its preparation with hot water to form a meal which is known as “Eba” in Nigeria, the Gari:Water ratio used was 1:2;	80%, Nigeria

Social characteristics of Gari consumers

Sources	Information	Confidence & Country
Amélioration de la commercialisation et de transformation du manioc au Cameroun: contraintes et perspectives de la chaîne de valeur(Tolly Lolo, 2013)	➢ Gari is mainly consumed in Douala and it is consumed by poors and the demand is more important in big towns despite the overall decrease of national demand;	80%, Cameroon
Consumer perception of Gari prototypes and prospects for improvement and marketing in the South West region of Cameroon (Levai et al., 2016)	➢ Frequent Gari consumers don't belong to high incomes class, but students up to university level also consume it;	80%, Cameroon
Determinants of urban households' demand for cassava and cassava products in Kaduna, Northern Nigeria: the application of AIDS model (Tsegai and Kormawa, 2002)	➢ Food consumes 46.4% of poor families(low incomes) and 27% for rich families(higher incomes); ➢ When incomes increase, households consume relatively more Gari when compared to lower incomes family; ➢ Richer family households have an average of 4.1 members whereas poorer households have around 8.1 members; ➢ Gari is more consumed among the household than tubers, flour and chips made from cassava;	80%, Nigeria

Effect of the addition of red palm oil on nutritional and sensory quality of Gari

Sources	Information	Confidence & Country
Carotenoid stability during storage of yellow gari made from biofortified cassava or with palm oil (Bechoff *et al*., 2015)	➢ Plant breeding methods have allowed the production of a yellow cassava with fortified quantity of vitamin A and its use allows producing a Gari which is similar in color to Gari made with added crude yellow palm oil. ➢ When red palm oil is added in excess, the darkening of Gari occurs and rancidity can happen during storage. ➢ Gari prepared with Biofortified cassava contains more provitaminA(1.5 times) than Gari prepared with white cassava. ➢ Using 10g of red palm oil/Kg of white cassava mash, losses of provitaminA increase with increasing temperature for both biofortified Gari (15% losses after 24 days and 48% losses after 80 days at 19oC; 33% losses after 10 days and 87% losses after 80 days at 33oC; 51% losses after 10 days of storage and 99.6% losses after 80 days at 40oC) and Gari prepared with red palm oil from white cassava (0% losses after 24 days and 30% losses after 80 days at 19oC; 27% losses after 10days and 54% losses after 80 days at 33oC; 19.3% losses after 10 days and 79.2% losses after 80 days at 40oC).	80%, Nigeria
Vitamin A retention in "Palm oil-Garri" during processing and storage (Uzomah *et al*., 2013)	➢ Initial Vitamin A activity of Gari sampled in different location has been done and it varies between 13.2 and 723 UI/100 g of Gari ➢ 10 g of red palm oil/Kg of dewatered mash was used and roasting decrease the vitamin A activity of 97.7% (from 40 000UI/100g of mash to 922 UI/100g of Gari, thus, they did took into account the decrease of water content) ➢ When Gari is properly kept in a container far away from oxygen and light, there is only 7% of losses of vitamin A activity after six weeks ➢ The average losses of vitamin A activity for samples collected in market and kept as it is done at household level is 34.76% after the first week (between 3% and 85%), 48.48% after the second week (between 5 and 95%), 60.73% (between 7-100%) after the third week and 75.42% after the fourth week	75%, Nigeria
Carotenoid stability during storage of yellow gari made from biofortified cassava or with palm oil (Bechoff *et al*., 2015)	➢ Gari made with crude 'red palm oil' is a common product in southern Nigeria	80%, Nigeria
Retention of provitamin A carotenoids in staple crops targeted for biofortification in Africa:	➢ When compared to others cassava derived products, Gari has the lowest retention of provitamin A; ➢ When preparing Gari from yellow variety cassava, only 10 to 58% of Beta carotene is retained as shown by some authors;	80%

Sources	Information	Confidence & Country
cassava, maize, and sweet Potato(De Moura et al., 2015)	➢ Others authors show that 16% to 30% of beta carotene is retained when cassava is fermented for three days and roasting is done between 120oC and 180oC(Failla et al., 2012); ➢ Others authors obtained 10% retention of beta carotene for roasting during 20 min at 195oC and 63% retention when roasting is done at 165oC during 10 min(Thakkar et al., 2009);	
Provitamin A carotenoid content of dried fermented cassava flour: the effect of palm oil addition during processing (Gouado *et al*., 2008)	➢ Smell, taste and appearance have been assessed; ➢ They have used 9.52, 14.29, 19.05, 23.81 and 38.1 mL of red palm oil for 1 kg of cassava roots to produce Gari and have shown that 19.05 mL allows obtaining the best yellow Gari in term of the taste according to consumers. ➢ Highest oil content allows obtaining Gari with good smell and taste but bad appearance; ➢ Gari produced in the lab is more appreciated(taste and smell) than the commercially sold Gari when added quantity of red palm oil is at least equal to 19.05 mL/Kg of cassava roots.	80%, Cameroon

Effect of fermentation duration on Gari quality

Sources	Information	Confidence & Country
Evaluation of quality attributes of cassava product (gari) produced at varying length of fermentation (Olaoye et al., 2015)	➢ Gari fermentation is done between 1 and 5 days depending of the region where it is produced and the longer the fermentation time, the more desirable is it sensory characteristics and the more appealing is the customer; ➢ Sweet Gari (NR 8082) and bitter one (TM419) have been used and fermentation was done between 1 and 5 days; ➢	70%, Nigeria
Effect of Fermentation Periods on the Physicochemical and Sensory Properties of Gari(Oluwafemi and Udeh, 2016)	➢ Fermentation has been done from day 0 to day 8 and every day, a given quantity of cassava mash was roasted and Gari prepared; ➢ Ash content and protein content increase with increasing fermentation time whereas crude fat and crude fibre decrease with increasing fermentation time; ➢ After 2 days HCN content decreases of 58%, 60% after 4 days, 78.78% after 6 days and 85.61% after 8 days; ➢ After 2 days of fermentation, the pH doesn't significantly change; ➢ No trend was observed for water absorption capacity, oil absorption capacity and bulk density; ➢ Assessment of the texture, the taste and the color have been done; ➢ Overall acceptability is better after two days of fermentation and after 8 days; ➢ Texture, color and texture are optimal after 8 days of fermentation	80%, Nigeria
Effect of the duration of fermentation on the quality of gari (Irtwange and Achimba, 2009)	➢ Fermentation of Gari has been done from day 0 to day 5, a given quantity being taken and garified every day; ➢ Characteristics which have been assessed are the color, the texture and the aroma; ➢ Fibre content of Gari increases at the fourth day (from 2.70%, 13%) and doesn't change after; ➢ Swelling index increase(when compared to 225% of gari prepared without fermentation) of 33% after 1 day, 58% after 2 days, 75% after 3 days and doesn't after the third day; ➢ HCN content decrease(when going from 12.67 mg/Kg of Gari for non-fermented Gari) of 25% after 1 day, 40% after 2 days, 45% after 3 days, 65% after 4 days, 70% after 5 days; ➢ Ashes content decreases(when going from 1.87%) of 10% after 1 day of fermentation, then increases of 13% after 2 days, 20% after 3 days, 11.4% after 4 days and 23% after 5 days; ➢ Crude fat increases of 13% after 2 days, 20% after 3 days, 11.4% after 4 days and 23% after 5 days;	75%, Nigeria

Sources	Information	Confidence & Country
	➢ Protein content increases(when going from 2.33% for Gari produced from non-fermented cassava) of 5% after 2 days, 9% after 3 days, 7% after 4 days and 6% after 5 days; ➢ Color, aroma and texture preference increase up to the third day after what their values doesn't significantly change; ➢ When cassava isn't fermented, colour, aroma and texture are badly ranked	
Quality characteristics of Gari as affected by preferment liquor, temperature and duration of fermentation(Owuamanam et al., 2011)	➢ Prefermented liquor(obtaining from three days naturally-fermented cassava) was added at different concentration (0%,5%, 10%, 15%, 20%(cassava mass/volume of liquor)) and fermentation has been done in a plastic container; ➢ The microorganism analysis of the prefermented liquor shows that the first day, microorganisms found are Leuconostoc sp., Alcaligenes sp., Corynebacteria sp. And Candida sp., after 24 hours to these microorganisms streptococcus sp. and Lactobacillus sp. are observed, after 48 hours, Leuconostocs sp., Lactobacilus sp., Streptococcus and Candida are observed, after 72 hours, only Leuconostoc, Lactobacillus and Candida are observed; ➢ pH of produced Gari vary between 4.19±0.25 and 4.58±0.52; ➢ It seems to have a decrease of HCN content with increasing concentration of the liquor	60%, Nigeria (some references don't show what authors point out
Evaluation of quality attributes of cassava product (gari) produced at varying length of fermentation (Olaoye et al., 2015)	➢ Gari is a lactic acid-fermented product which can be processed with or without the addition of red palm oil rich in carotenoids; ➢ Gari prepared from bitter variety of cassava without fermentation has a cyanide content of 235.12 mg/100 g whereas the one prepared from sweet variety has a cyanide content of 137.17 mg/100 g; ➢ Gari seems to contain phytates, tanins, oxalates and trypsin inhibitor which are generally known to occur in seeds;	Nigeria, 20% (data of these authors seem to suggest that prepared Gari is very poisonous because after 5 days of fermentation the cyanide content of Gari vary between 57 and 126 mg/100 g of Gari
Optimizing gari quality attributes for different groups of consumers with response surface methodology(Udofia et al., 2011)	➢ Many factors are susceptible to influence the quality of Gari: fermentation duration, frying temperature, quantity of added palm oil, post-harvest storage of cassava tubers, grating, dewatering rate, age of cassava plant at harvest, cassava variety, soil quality and storage conditions of Gari before consumption; ➢ These authors have assessed the effect of fermentation time(12-120 hours), frying temperature (70-120oC) and resident time(30-50 min) on the quality of Gari;	65%,Nigeria

Sources	Information	Confidence & Country
	➢ Gari with the best overall acceptability(score=4.7 with 5 being excellent, swelling capacity of 3.21 and 3.22) (12h, 95oC, 50min) and (120h, 120oC and 40min) have been obtained; ➢ Surface temperature of the frying pan was 120 oC and panelists of the different part of Nigeria have been used to assess the quality;	
Optimization of indigenous food (Gari) fermentation with respect to time and texture(Ikpe and Essienubong, 2016)	➢ Cassava has been fermented for 24 hours, 48 hours and 72 hours and the rheological properties of prepared Gari assessed; ➢ When soaked in water, Gari has a higher swelling capacity and can absorb 4 times its volume in terms of water; ➢ Garification has been done at 150oC during 5 minutes while continuously stirring; ➢ Hardness of Gari paste decrease with increasing fermentation time; ➢ Cohesiviness and adhesiveness are maximal after 48 hours of fermentation, then they decreases	80%, Nigeria
Producing Gari from cassava: an illustrated guide for smallholder cassava processors(James *et al*., 2012)	➢ Fermentation periods longer than one or two days will produce very sour products, however, it is consumer taste and preferences which determine the fermentation duration;	80%
Design concepts towards electric powered gari frying machine (Adediran, 2015)	➢ According to this author, fermentation of Gari is done between 3 and 7 days;	75%, Nigeria
Protein improvement in Gari by the use of pure cultures of microorganisms involved in the natural fermentation process(Ahaotu et al.,2011)	➢ Microrganisms were isolated from waste cassava water in a small-scale factory and used for the fermentation a cassava mash; ➢ There was cassava mash naturally fermented, cassava mash fermented with each pure culture and cassava mash fermented with the waste cassava water microorganisms; ➢ The same concentration of microorganisms has been used; ➢ Fermentation has been done for 96 hours; ➢ Microorganisms found are Alcaligenes faecalis, Lactobacillus plantarum, Bacillus subtilis, Geotrichum candidum, Aspergillus niger, Aspergillus tamari, Leuconostoc cremoris and Penicellium expansum and amongst these bacteria, only A. faecalis, L. plantarum, G. candidum and L. cremoris have linamarase activity; ➢ Amongst the microorganisms with linamarase activity, L. cremoris has 21 times activity more important than that of G. candidum, which in turn has 6 times more important activity than that of L. plantarum , which in turn has 3 times the activity of A. faecalis;	50%, Nigeria (there are many incoherences when compared to others research studies

Sources	Information	Confidence & Country
	➢ An increase of the fermentation time contributes to a decrease of pH and an increase of titrable acidity; ➢ The growth of fungi is continuous up to the 3th day where it begins to decrease whereas the growth of bacteria begin to decrease after 2 days , except fo L. cremoris which begins to decrease after the fourth day; ➢ After 24 hours of fermentation, the pH varies between 5.24 and 5.98, after 48 hours of fermentation, the pH varies between 4.31 and 4.81, after 72 h the pH varies between 4.14 and 4.57, after 96 hours, the pH varies between 4.05 and 4.42;	
Quality management manual for the production of Gari(Adebayo *et al*., 2012)	➢ Fermentation duration vary between 1 and 5 days and it impacts the taste, aroma, safety and general acceptability of Gari and acid sourness has been related to the amount of lactic acid or fermentation length; ➢ The longer the fermentation time, the lower the pH of the mash and this pH decrease from 6.9 to 4 or less after 3-5 days of fermentation; ➢ Dewatering allows reducing the moisture content of the grated mash to 40-50% and could be completed in short time(15-20 minutes) when high capacity hydraulic systems are used, however, simultaneously fermentation and gradual dewatering of cassava mash in a bag is also done in some communities;	80%, Nigeria
Effect of fermentation time on the physicochemical and sensorial properties of Gari from sweet potato(Ipomoae batatas)(Koubala et al., 2014)	➢ Gari has been prepared from 100% sweet potatoes(yellow flesh) and the fermentation carried out for 0, 1, 2, 3 and 4 days and the prepared sample has been compared with a given commercial Gari; ➢ Fermentation and dewatering were done simultaneously; ➢ 5 mg of oil was used for 1 kg of dewatered mash; ➢ Sensory analysis has been done on potatoes-Gari soaked in water with sugar and assessed parameters were the color, the smell, sweetness, acidity, mouth feel and preferences; ➢ Gari made from sweet potatoes has a yield varying between 20.2% and 24.42%, Gari yield decreasing with increasing fermentation time; ➢ There is a decrease of pH with increasing fermentation time (from 5.42 after 24 hours of fermentation to 4.65 after 72 hours of fermentation); ➢ Sweet potato Gari is poor in proteins and ashes than cassava-Gari; ➢ Cassava Gari has a better water absorption capacity and swelling capacity than sweet potato-Gari; ➢ Mouth feel of Gari fermented for 1 and 2 days is similar to the one obtained with cassava Gari; ➢ Sweet potatoes-Gari obtained after fermentation of 2 and 3 days has the same smell than cassava Gari;	75%, Cameroon

Sources	Information	Confidence & Country
	➢ Sweet potatoes Gari fermented during 3 and 4 days has the same sweetness than commercial Gari; ➢ The preferred Gari made from sweet potato is the one fermented for 2 days which is near in terms of preference to commercial Gari; ➢ Correlations show that preferences are mostly associated to the color, the odor and the sweetness;	

Effect of roasting on sensory quality, chemical composition and functional properties of Gari

Sources	Information	Confidence & Country
Provitamin A carotenoid content of dried fermented cassava flour: the effect of palm oil addition during processing (Gouado *et al*., 2008)	➢ Gari fried (210 g mash of cassava) for 10 minutes are more appreciated than Gari fried for 14 minutes and 17 minutes	80%, Cameroon
Cassava(bitter variety) has been peeled, washed, grated, dewatered/Fermented(simultaneously between 1 and 8 days), sieved, garified, sieved again to obtain Gari(Arinola, 2016)	➢ 700 g of Gari has been Garified at 95oC during 15min, 20min, 25 min, 30 min and 35 minutes; ➢ Iron surface was 2731.80 cm2 and the volume 9891 cm3; ➢ Characteristics which have been assessed are the taste, the aroma, the color, particle size and overall acceptability; ➢ Moisture content of less than 10%(8.25%) has been obtained after 30 min of roasting; ➢ There isn't significant change of protein and fat content, a continuous increase of ashes and decrease of fibers, a decrease of HCN content(15% from 15 min to 20 min, 30% from 15 min to 25 min and 40% from 15 min to 30 or 35 min), an increase of free sugars with increasing roasting time; ➢ There is an increase of pH(3.86 after 15 min to 4.21 after 35 min) with increasing Garification time; ➢ Pasting temperature decrease with increasing Garification time, peak viscosity is optimal after 25 min of garification whereas breakdown viscosity decreases with increasing garification; ➢ Peak viscosity, breakdown viscosity and final viscosity are maximal after 25 min of Garification; ➢ After 15 min, swelling index is 120% and it is optimal after 25 min of Garification(300%), Water absorption capacity generally increases with increasing garification time (4 mL/g after 15 min, 5.40 after 20 min, 6.40 after 25 min, 7.60 after 30 min, 6.80 after 35 min), bulk density generally increases with increasing garification time(0.57 g/mL after 15 min, 0.50 after 20 min, 0.62 after 25 min, 0.62 after 30 min and 0.58 after 35 min); ➢ In Nigeria, color preference is associated to ethnicity, Yorubas in South Western part prefer creamy white color whereas Igbos in south Eastern part prefer the yellow Gari, Haoussa in the northem part of the country seem to be indifferent; ➢ Taste, color, aroma, particle size and overall acceptability increase with increasing garification time up to 25 min where they don't significantly change;	80%, Nigeria

Effect of roasting on sensory quality, chemical composition and functional properties of Gari

Sources	Information	Confidence & Country
Optimizing gari quality attributes for different groups of consumers with response surface methodology(Udofia et al., 2011)	➢ Many factors are susceptible to influence the quality of Gari: fermentation duration, frying temperature, quantity of added palm oil, post-harvest storage of cassava tubers, grating, dewatering rate, age of cassava plant at harvest, cassava variety, soil quality and storage condition of Gari before consumption; ➢ These authors have assessed the effect of fermentation time(12-120 hours), frying temperature (70-120oC) and resident time(30-50 min) on the quality of Gari; ➢ Gari with the best overall acceptability(score=4.7 with 5 being excellent, swelling capacity of 3.21 and 3.22) (12h, 95oC, 50min) and (120h, 120oC and 40min) have been obtained; ➢ Surface temperature of the frying pan was 120 oC and panelists of the different part of Nigeria have been used to assess the quality;	65%, Nigeria

Effect of age at harvest on the quality of Gari

Sources	Information	Confidence & Country
Multivariate analysis and age at harvest effect on sensory preference of Gari from four cassava varieties (Apea-Bah et al., 2011)	➢ They have assessed the effect of age at harvest(harvested at 9 months and each month up to the fifteen month) for 4 cassava varieties in the appreciation of Gari and all these Gari have been prepared by one Gari processor who use to process Gari to sell; ➢ Sensory parameters assessed were the taste, the colour, the crispiness, aroma and overall acceptability; ➢ Gari taste generally increase with age at harvest and is optimal at the 15 th month regardless of the variety; ➢ Optimal sensory qualities varies according to variety (10 months for one variety, 14th month for two varieties and 12 months for one other variety); ➢ No trend was observed for each variety concerning the age at harvest effect for ash content, pH, fibre content, swelling capacity and bulk density ➢ Gari yield is optimal for two varieties at the 14th month of harvesting(22.6% and 26.2%) and the 13th month of harvesting for two others varieties(18.2% and 20.6%);	70%, Ghana

Effect of packaging material on the quality of Gari

Sources	Information	Confidence & Country
Microbiological safety and sensory attributes of gari in selected packaging materials(Adejumo and Raji, 2012)	➢ The effect of three packaging material has been assessed: polyester, polypropylene and hessian bags; ➢ Aroma, taste, color and overall acceptability were assessed for these Gari each month; ➢ The overall microbial charge increases with increasing time, regardless of the container, however polyester is better than polypropylene which in turn is better than hessian bags in term of bacterial growth; ➢ Concerning fungal growth, polyester and polypropylene are similar and better than hessian bags, which in turn is better than the unpacked one; ➢ For bacterial microorganisms, the quantity almost double when going from polyester to polypropylene, from polypropylene to hessian bags and from hessian bags to unpacked; ➢ For fungal, the quantity of microorganisms double when going from polyester and polypropylene to hessian bags and from hessian bags to unpacked bags; ➢ Beyond three months, it isn't possible to consume unpacked Gari; ➢ In term of quality, there isn't a significant difference between Gari conserved in polypropylene and those conserved in polyethylene	75%, Nigeria
Effect of moisture content and storage conditions on the storability of garri (Amadi and Adebola, 2008)	➢ Gari collected from markets has been conserved in polythene bag, jute bag and plastic bag for three months and moisture content assessed; ➢ Assessed microorganisms were moulds; ➢ Aspergilus flavus, Aspergillus fumigatus, Penicellium sp., Rhizopus sp. And Aspergillus glaucus don't develop in plastics containers regardless of the type of Gari(yellow or white) after three months of storage; ➢ Aspergillus glaucus, Aspergillus fumigatus and Rhizopus sp. Don't develop in polythene bags regardless of Gari type (yellow or white), however Penicellium sp. is found in yellow Gari and not in the white one after three months of storage; ➢ Aspergillus niger, Aspergillus flavus, Aspergillus fumigatus and Aspergillus glaucus are found in white Gari conserved in jute bags after three months whereas Aspergillus niger, Aspergillus flavus, Aspergillus fumigatus, Penicellium sp. And Rhizopus sp are found in Yellow gari conserved in jute bags;	60%, Nigeria
Feasibility of using sealed polyethylene film in prolonged storage of Gari(Ukpabi et al., 2012)	➢ The relative low shelf-life of Gari has been attributed to higher moisture content(greater than 10%) which lead to microbial infestation on storage(largely moulds); ➢ 10 varieties of cassava have been used to assess the effect of storage container and both yellow and white Gari have been produced in this respect, packaged in polyethylene film and kept between 25°C and 32°C ; ➢ Color, flavor, hand-feel and general acceptability have been assessed by panelists;	80%, Nigeria

Sources	Information	Confidence & Country
	➢ Gari produced have been prepared in the form of “Eba” before be given to sensory analysis panelists; ➢ After 12 months of conservation, the pH of both Gari (Yellow and white) don’t significantly change, as well as their pH and their swelling index; ➢ Some varieties have been more appreciated in term of color and hand-feel at the end of twelve months than others; ➢ Sensory assessors were saying that oiled Gari made from some cultivars losses their yellow color during storage;	

Microorganisms isolated during the fermented of cassava mash and their effects on the chemical composition of this mash

Sources	Information	Confidence & Country
Evaluation of quality attributes of cassava product (gari) produced at varying length of fermentation (Olaoye et al., 2015)	➢ Microorganisms which have been detected are: 32 strains of lactobacillus (Lactobacillus plantarum(15), Lactobacillus fermentum(7), Lactobacillus acidophilus(4), Leuconostoc plantarum(5), Leuconostoc mesenteroides(2)), 19 strains of moulds (Candida tropicalis (10), Candida krusei (5), Corynebacterium manihot(2), Geotrichum candida(2)) ➢ The most important microorganisms(from the higher in term of quantity to the lower) were Lactobacillus plantarum, Candida tropicalis, Lactobacillus fermentum, Leuconostoc plantarum, Lactobacillus acidophilus, the remaining three being in approximately the same quantity	70%, Nigeria
Isolation and screening of microorganisms from a gari fermentation process for starter culture development(Edward et al., 2012)	➢ 9 ml of red palm oil has been used for 1 Kg of dewatered mash; ➢ At t=0, the pH of cassava mash is 6.4, after 24h of fermentation, the pH is 5 and after 36 h, the pH is 4.7 and 4.4 after 48 hours; ➢ Microorganisms have been isolated from traditionally fermented cassava; ➢ The quantity of yeast becomes stable after 24 hours whereas bacteria strains reach their maximum after 18 hours; ➢ Bacterial strains are the most predominant and after 18 hours of fermentation, they reach their maximum in terms of quantity; ➢ 74 bacterial strains(mainly rods(89.2)) and 21 yeasts strains have been isolated from fermented cassava in the village; ➢ Both yeast and bacterial strains have alpha and beta glucosidase activities; ➢ 75.67% of bacterial strains have been isolated during the first 18 hours and 66.67% of yeast during the second half of fermentation (24 to 48 hours); ➢ Among the yeasts, the major one are candida (90.5%, Candida tropicalis(5/21) being the major one, followed by Candida rugopelliculosa(4/21)), the remaining being Cryptococcus; ➢ In terms of bacterial strains, those found amongst the 26 randomly selected strains are: Lactobacillus plantarum (44.6%), Lactobacillus acidophilus (16.2%), Lactobacillus fermentum (9.5%), Lactobacillus buchneri (4.1%) and lactobacillus pentosus (2.7%). Leuconostocs and lactococcus are also found, the latter being lactic acid bacteria	70%, Benin

Sources	Information	Confidence & Country
Characterization and distribution of lactic acid bacteria in cassava fermentation during fufu production(Oyewole and Odunfa, 1990)	➢ Cassava was peeled, washed, diced and dipped in the water for 96h and fermentation carry out; ➢ Lactobacillus which have been isolated are: Lactobacillus plantarum, Lactobacillus cellobiosus, Lactobacillus brevis, Lactobacillus coprophilus, Lactobacillus delbruckii, Leuconostoc mesenteroïde, Leuconostoc lactis; ➢ Many of these lactobacillus where isolated during the early period of the fermentation but most didn't survive to the end of the process; ➢ After 60 hours of fermentation, only Lactobacillus lactis(8%) and Lactobacillus plantarum (82%) are present and after only Lactobacillus are present; ➢ In the beginning of the fermentation, Lactobacillus cellobiosus are the most important lactic acid bacteria, followed by Lactobacillus brevis and Lactobacillus plantarum and in a lessen extend Lactobacillus coprophilus and Leuconostoc mesenteroides; ➢ The growth of Lactobacillus plantarum is optimal at pH varying between 3.9 and 4.8; ➢ At pH=4.8, the growth of Lactobacillus bulgaricus, Lactobacillus coprophilus, Lactobacillus brevis and Lactobacillus cellobiosus and Lactobacillus plantarum is optimal at this pH	80%, Nigeria
Lactic acid bacteria and yeasts associated with spontaneous fermentations during the production of sour cassava starch in Brazil(Lacerda *et al*.,2005)	➢ Lactobacillus plantarum and Lactobacillus fermentum are the most predominant bacterial strains found in the fermentation of cassava	75%, Brazil
Quality characteristics of Gari as affected by preferment liquor, temperature and duration of fermentation(Owuamanam et al., 2011)	➢ Prefermented liquor(obtaining from three days naturally-fermented cassava) was added at different concentration (0%,5%, 10%, 15%, 20%(cassava mass/volume of liquor)) and fermentation has been done in a plastic container; ➢ The microorganism analysis of the prefermented liquor shows that the first day, microorganisms found are Leuconostoc sp., Alcaligenes sp., Corynebacteria sp. And Candida sp., after 24 hours, out of these microorganisms, Streptococcus sp. and Lactobacillus sp. are observed, after 48 hours, Leuconostocs sp., Lactobacilus sp., Streptococcus and Candida are observed, after 72 hours, only Leuconostoc, Lactobacillus and Candida are observed; ➢ pH of produced Gari vary between 4.19±0.25 and 4.58±0.52; ➢ It seems to have a decrease of HCN content with increasing concentration of the liquor	60%, Nigeria(many references don't show what the authors are attributed to them in their paper)

Sources	Information	Confidence & Country
Protein improvement in Gari by the use of pure cultures of microorganisms involved in the natural fermentation process(Ahaotu et al.,2011)	➢ Microrganisms were isolated from waste cassava water in a small-scale factory and used for the fermentation a cassava mash; ➢ There was cassava mash naturally fermented, cassava mash fermented with which each pure culture and cassava mash fermented with the waste cassava water microorganisms; ➢ The same concentration of microorganisms has been used; ➢ Fermentation has been done for 96 hours; ➢ Microorganisms found are Alcaligenes faecalis, Lactobacillus plantarum, Bacillus subtilis, Geotrichum candidum, Aspergillus niger, Aspergillus tamari, Leuconostoc cremoris and Penicellium expansum and amongst these bacteria, only A. faecalis, L. plantarum, G. candidum and L. cremoris have linamarase activity; ➢ Amongst the microorganisms with linamarase activity, L. cremoris has 21 times activity more important than that of G. candidum, 6 times more important than that of L. plantarum and 3 times more important than that of A. faecalis; ➢ An increase of the fermentation time contribute to a decrease of pH and an increase of titrable acidity; ➢ The growth of fungi is continuous up to the 3th day where it begins to decrease whereas the growth of bacteria begin to decrease after 2 days , except fo L. cremoris which begins to decrease after the fourth day; ➢ After 24 hours of fermentation, the pH varies between 5.24 and 5.98, after 48 hours of fermentation, the pH varies between 4.31 and 4.81, after 72 h the pH varies between 4.14 and 4.57, after 96 hours, the pH varies between 4.05 and 4.42;	50%, Nigeria (there are many incoherences in their results when compared to many of the same kind of research)

Gari yield and losses occurring during cassava processing to Gari

Sources	Information	Confidence & Country
Physicochemical, nutritional and processing properties of promising new white and yellow fleshed cassava genotypes in Nigeria (Ukenye *et al*., 2013)	➢ For developed varieties, they obtained peels losses varying between 11.59% and 33.2%, Gari yield between 11.59% and 29.02%, bulk density between 0.51 and 0.59 g/mL	80%, Nigeria
Multivariate analysis and age at harvest effect on sensory preference of Gari from four cassava varieties (Apea-Bah et al., 2011)	➢ Gari yield is optimal for two varieties at the 14th month of harvesting(22.6% and 26.2%) and the 13th month of harvesting for two others varieties(18.2% and 20.6%);	70%, Ghana
Producing Gari from cassava: an illustrated guide for smallholder cassava processors(James *et al*., 2012)	➢ Output yield for Gari varies 25% and 33.33%;	80%
Effect of Chemical Pretreatments on the Physico-Chemical and Sensory Attributes of Sweet Potato-Gari(Sanni *et al*., 2010)	➢ Gari yield from cassava was 42%,	70%, Nigeria
Socio-economic analysis of processing Pachyrhizus erosus (L.) Urb. tubers into gari in Benin(Adegbola *et al*., 2015)	➢ Gari yield is 23.15% for 100% cassava;	75%, Benin
Les transformations technologiques du manioc au Cameroun: Leur influence sur la valeur nutritive (Favier et al.,)	➢ Gari yield when going from cassava is 37.84%;	80%, Cameroon

Nutritional losses occurring when processing cassava to Gari

Sources	Information	Confidence & Country
Les transformations technologiques du manioc au Cameroun: Leur influence sur la valeur nutritive (Favier et al.,)	➢ When going from cassava to Gari, losses which occur are: 63% for protein, 22% for carbohydrates, 66% for fibres, 62% for ashes content, 75% for thiamin, 59% for riboflavine, 55% for niacin, 94% for vitamin C, 61% for calcium, 61% for phosphorus, 54% for iron;	80%, Cameroon

Effect of storage on sensorial quality of Gari

Sources	Information	Confidence & Country
Effect of location and storage environment on the quality attributes of gari in south-western Nigeria(Ashaye *et al*., 2005)	➢ The color, taste, flavor, crispness and overall acceptability have been assessed; ➢ Regardless of the locality, the color and general acceptability tend to decrease with increasing storing time (2 weeks and 4 weeks in the study);	75%, Nigeria

Effect of single starter on cassava mash odor and texture

Sources	Information	Confidence & Country
Optimization of cassava fermentation for fufu production: effects of single starter cultures(Oyewole, 1990)	➢ Experiments have been done with sliced cassava and microorganisms concentration used varying betweem 106 and 107 cfu/mL; ➢ Cassava variety TMS 30572 of 10 to 12 months age has been used; ➢ Odour and texture have been assessed and only by four men; ➢ Lactobacillus plantarum has the most important effect in pH and tititrable acidity whereas bacillus subtilis, Klebsiella sp. And Candida Krusei have a very lessen effect; ➢ Lactobacillus plantarum growth in pure culture than any other microorganism; ➢ Candida krusei is mainly responsible of the odor, followed by Lactobacillus plantarum; ➢ Klebsiella sp. Allows obtaining the best rating in term of texture	75%, Nigeria

Chemical composition, physico-chemical and functional properties of experimentally produced Gari

Sources	Information	Confidence & Country
Chemical Changes during the Fortification of Cassava Meal (Gari) with African breadfruit (Treculia africana) Residue (Onasoga et al., 2014)	➢ Gari Produced in the laboratory contains 1.78 mg of HCN/100 g of raw material, its protein content is 1.96% and its swelling capacity 3.5 meaning that it can increase up to 3.5 times its initial volume.	80%, Nigeria
Provitamin A carotenoid content of dried fermented cassava flour: the effect of palm oil addition during processing (Gouado *et al*., 2008)	➢ Bitter variety of cassava has been used to produce the Gari used in this study ➢ Alpha carotene of Gari produced in the lab varies between 304.9 µg/g and 1572.5 µg/g for quantity of red palm oil added varying between 9.52 and 38.1 mL per kg of cassava roots. ➢ Beta carotene of Gari produced in the lab varies between 309.7 µg/g and 1624.3 µg/g for quantity of red palm oil added varying between 9.52 and 38.1 mL per kg of cassava roots.	80%, Cameroon
Processing and characteristics soybean-fortified gari (Sanni and Sobamiwa, 1994)	➢ Proteins content of Gari produced in the Lab varies between 1.9% and 2.1%(2 samples) and HCN content varies between 1.7 mg and 2.2 mg/100 g	80%, Nigeria
Nutritional composition of “gari” analog produced from cassava (Manihot esculenta) and cocoyam (Colocasia esculenta) tuber(Bamidele et al., 2014)	➢ Gari produced in the lab has a protein content of 1.57%, crude fat content of 1.48%, ash content of 1.89%, crude fibers content of 1.53% and carbohydrates content of 86.25%; calcium content is 1.02 mg/g, sodium content is 0.22 mg/g, potassium content is 0.28 mg/g, magnesium content is 1.30 mg/g, iron content is 0.17 mg/g and phosphorus content is 1.20 mg/g	75%, Nigeria
Evaluation of quality attributes of cassava product (gari) produced at varying length of fermentation (Olaoye et al., 2015)	➢ Gari is a lactic acid-fermented product which can be processed with or without the addition of red palm oil rich in carotenoids; ➢ Moisture content of Gari produced in the Lab varies between 12.79% and 12.89%, ashes content between 1.61% and 1.65%, crude fibers content between 0.38 and 0.42%, crude fat content between 0.48 and 0.52%, crude proteins content between 2.19% and 2.31%, carbohydrates content between 82.03 and 82.20%; ➢ Gari prepared from bitter variety of cassava without fermentation has a cyanide content of 235.12 mg/100 g whereas the one prepared from sweet variety has a cyanide content of 137.17 mg/100 g; ➢ Gari seems to contain phytates, tanins, oxalates and trypsin inhibitor which are generally known to occur in seeds;	Nigeria, 20% (data of these authors seem to suggest that prepared Gari is very poisonous because after 5 days of fermentation the cyanide content of Gari vary between 57 and 126 mg/100 g of Gari

Sources	Information	Confidence & Country
A comparative evaluation of the macronutrient and micronutrient profiles of soybean-fortified gari and tapioca(Adelodun and Morenike, 2009)	➢ Proteins content varies between 1% and 1.5%, fat content varies between 1.49% and 1.56%, ash content varies between 1.35% and 1.64%, carbohydrates content varies between 95.23% and 92.25%	75%, Nigeria
Effect of Fermentation Periods on the Physicochemical and Sensory Properties of Gari(Oluwafemi and Udeh, 2016)	➢ Gari(s) have been produced by fermentation for 2, 4, 6 and 8 days; ➢ Gari produced in the laboratory has a moisture content varying between 7.45% and 8.18%, ash content varying between 1.74% and 2.19%, crude proteins content varying between 2.44 and 2.72%, crude fat content between 1.20% and 1.50%, crude fibre content varying between 2.60% and 3.20%, carbohydrates content varying between 82.94% and 83.92%; ➢	80%, Nigeria
Production and evaluation of gari produced from cassava (Manihot esculenta) substituted with cocoyam (Colocasia esculenta) (Olatunde et al., 2013)	➢ Crude fibres content of 3.13%, moisture content of 7.29%, ash content of 1.13%, crude proteins content of 1.84%, crude fat content of 1.63%,total carbohydrates content of 84.99%, HCN content of 14.22 mg/Kg, pH of 3.47; ➢ Swelling capacity of 56.28%, water absorption capacity of 54.63%, bulk density of 0.57g/mL	70%, Nigeria
Extension of shelf life of garri by hygienic handling and sodium benzoate treatment (Agiehor and Ikenebomeh, 2005)	➢ pH =4.03, protein content is 1.24%, lipid content is 0.89%, carbohydrate content= 69.75%, ash content =0.64% ➢	75%, Nigeria
Proximate Compositions, Physicochemical and Sensory Properties of Gari Fortified with Soybean, Melon Seed and Moringa Seed Flours(Alozie and Ekerette, 2017)	➢ Moisture content of 9.12%, proteins content of 1.52%, fat content of 6.34%, fibre content of 2.73%, ashes content of 1.55% and carbohydrates content of 78.74%; ➢ Swelling index of Gari is 4.82 and water holding capacity is 24.34%, pasting temperature was 79.5oC; ➢ pH=5.9 and HCN content=6.73 mg/Kg	70%, Nigeria
Chemical and sensory properties of Gari enriched with sesame seed flour(Sesamum indicum L.)(Oluwamukomi, 2015)	➢ Crude proteins content=1.90%, fat content =0.33%, ash content= 1.20%, crude fibres content of 5.03%, moisture content of 10.90%, carbohydrates content of 80.64%, pH of 3.81 and phytates content of 0.196%, HCN content of 14.63 mg/Kg	75%, Nigeria

Sources	Information	Confidence & Country
Proximate and mineral composition of co-fermented breadfruit and cassava into Gari analogue (Ajifolokun and Adeniran, 2018)	➢ Moisture content of 9.25%, ash content of 1.75%, crude fibre content of 2.49%, proteins content of 3.42%, fat content of 1.84%, carbohydrates content of 81.25%,	70%, Nigeria
Principal components analysis and age at harvest effect on quality of Gari from four elite cassava varieties in Ghana(Apea-Bah et al., 2009)	➢ Ash content varies between 1.03 and 1.39%, moisture content varies between 9.54% and 10.60%,	70%, Ghana

Characteristics(chemical composition, particle size physic-chemical and functional properties) of commercially sold Gari

Sources	Information	Confidence & Country
Quality Assessment of Cassava Gari Produced in Some Selected Local Governments of Ekiti State, Nigeria(Olanrewaju and Idowu, 2017)	➢ In this study, a preliminary survey was carried out to identify major Gari processing areas amongst sellers of Gari in Ekiti state, seven samples of Gari were selected from seven processing sites in each locality; ➢ Moisture content 8.48% and 9.63%, proteins content varies between 1.96% and 2.88%, fat content varies between 0.86% and 1.58%, ash content varies 1.85% and 2.05%, crude fibres content varies between 1.77% and 1.98%, carbohydrates content vary between 82.60% and 84.40%, HCN content varies between 15.50 mg/Kg and 21.50 mg/Kg, pH of sold Gari varies between 3.90 and 4.60(their total titrable acidity varying between 0.004 and 0.015 for these limits); ➢ Swelling capacity varies between 250% and 340%, water absorption capacity between 5 mL/g and 6 mL/g, bulk density between 0.58 g/mL and 0.67 g/mL, pasting temperature between 82.56 oC and 83.66 oC; ➢ RVA has been used to determine the rheological properties: peak viscosity of Gari varies between 133.50 and 324.25 RVU whereas peak time varies between 5.33 min and 6 minutes;	75%, Nigeria

Sources	Information	Confidence & Country
Quality of gari(roasted cassava mash) in Lagos State, Nigeria(Sanni *et al*., 2009)	➢ The traditional fermentation process of 4 days is reduced to one day to save time and ensure quicks returns; ➢ 12 Gari samples were collected at random from three major rural markets, three major urban markets and their processing sites; ➢ 5 samples show HCN content greater than the recommended safe level quantity(20 mg/Kg of Gari), 3 of these samples having more than the double of the limit safe level; ➢ Moisture content varies between 10 and 14.87%, ashes content varies between 0.5 and 2.67%, fibres content content varies between 1% and 2%, 7 samples have a pH between 4.08 and 4.88 whereas the remaining have a pH varying between 3.76 and 3.96; ➢ 6 samples have a swelling index varying between 2.55 and 2.90 whereas the remaining have a swelling index varying between 3.05 and 3.21, bulk density varies between 0.54 and 0.61 g/mL; ➢ 34.88% and 39.08% of grain have their size greater than 1 mm, 51.39% and 59.16% of Gari grain have their size between 710 µm and 500 µm and 3.80% to 9.53% of Gari grain have their size lower than 500 µm; ➢ Peak viscosity varies between 195 RVU and 315.42 RVU,pasting temperature varies between 63.55 oC and 64.55 oC, peak time between 4.40 and 6.31 minutes, final viscosity varies between 195.92 RVU and 315.33 RVU.	75%, Nigeria
Comparative study on quality attributes of Gari obtained from Some processing centres in south West, Nigeria(Makanjuola *et al*., 2012)	➢ 8 samples of Gari have been collected in some processing sites; ➢ Moisture content varies between 10.7 and 12.4%, ash content varies between 0.69 and 0.78%, fat content varies between 0.33 and 0.44%, fibres content varies between 0.48 and 0.66%, HCN content varies between 80 and 100 mg of HCN/Kg of Gari, meaning 4 to 5 times higher than the admitted limit; ➢ pH of Gari varies between 4.3 and 4.5; ➢ swelling index varies between 3.16 and 3.51, bulk density between 0.821 and 0.842 g/mL and water absorption capacity between 68.36% and 72.11%; ➢ Concerning the size distribution, 15.78% to 18.06% have their grain size greater than 2 mm, 55.32% to 58.10% of grain have their size greater than 1 mm, 24.93% to 26.01% of grains have their size greater than 600 µm and 0.52% to 1.15% have their grain size greater than 300 µm; ➢ Sensory evaluation has been done in color, taste, odor and overall acceptability; ➢ The best overall acceptability was the one of repartition 14.97% for 2 mm sieve, 59.28% for 1 mm sieve, 24.93% for 600 µm and 0.83% for 300 µm , followed by sample with grain distribution of 16.78%, 56.28%, 25.11% and 0.52% for 2 mm, 1mm, 600 µm and 300 µm sieves; ➢ The best overall acceptability is neither related to the pH of Gari nor their size	80%, Nigeria

Sources	Information	Confidence & Country
Evaluation and developing simple techniques for assessing Gari adulteration(Teye et al., 2017)	➢ pH of Gari produced in 7 different localities varies between 5.2 and 5.5, ash content varies between 1.11% and 1.61%, swelling index varies between 3.0 and 3.2, moisture content varies between 4.70 and 7.71%, bulk density varies between 0.52 and 0.63g/mL; ➢ Fermentation duration is determined by the level of sourness judged as acceptable by the target consumer; ➢ This low variability can be due to the fact that local Gari processors have been trained at national level;	70%, Ghana
Microbiological quality of fermented cassava (Gari) sold in Ota Ogun State Nigeria(Olopade *et al*., 2014)	➢ 36 Gari(s) found in the market have been analyzed and it comes out from that study that their moisture content varies between 4 and 8 %, the pH of yellow Gari varies between 4.76 and 4.94 whereas the pH of white Gari varies between 4.78 and 4.91;	75%, Nigeria
Effect of moisture content and storage conditions on the storability of garri (Amadi and Adebola, 2008)	➢ Yellow Gari has a moisture content varying between 14.6% and 19.6% whereas white Gari found in markets has a moisture content varying between 10.1% and 19.5%;	60%, Nigeria(Gari can't found in market with some important quantity of moisture found in this work
Quality of Gari from selected processing zones in Ghana (Oduro *et al*., 2000)	➢ Gari were collected in three regions in the southern part of Ghana: Western, Eastern and Central regions), they are now important producers of Gari although they weren't traditionally important production regions; ➢ Food colorant is added in one of the 12 centre where the work has been done; ➢ Fermentation duration observed are:12-24 hours, 2-3 days, 3-4 days; ➢ Moisture content of these Gari varies between 4.36% and 7.44%, ash content varies between 0.72% and 1.96%, crude fibres content varies between 1.47% and 2.50%, pH between 3.58 and 4.47; ➢ Swelling capacity varies between 2.9 and 3.6, particle size also vary from one locality to another and difference up to the double are observed; ➢ In locations where fermentation is done between 12-24h, the pH of Gari vary between 4.15 and 4.47, in the place where fermentation is done between 3-4 days, the pH is 4.07 and where fermentation is done between 2 and 3 days, the pH of Gari vary between 3.75 and 4.30;	75%, Ghana

Microbiological quality of Gari sold in market

Sources	Information	Confidence & Country
Microbiological quality of fermented cassava (Gari) sold in Ota Ogun State Nigeria(Olopade *et al*., 2014)	➢ Total aerobic plate count varies between 101 and 103 cfu/g, which is acceptable; ➢ According to ICMSF(1996), ready-to-eat foods with plate counts of 103 are acceptable, those varying from 104 to 105 are tolerable whereas those greater or equal to 106 are unacceptable; ➢ Coliforms were detected although they weren't the fecal coliforms, they shouldn't be present in a ready-to-eat product; ➢ Microorganisms found specifically in yellow Gari are Enterobacter spp., Bacillus cereus, Bacillus megaterium, Fusarium spp., Mucor spp., Aspergillus fumigatus whereas those specifically found in white Gari are Lactobacillus, Penicillium spp., Staphylococcus epidermis and Rhizopus spp.; ➢ In both Gari(yellow and white) microorganisms found are Klebsiella spp., Pseudomonas spp., Staphylococcus aureus and Aspergillus niger	75%, Nigeria
Microbiological safety of gari, lafun and ogiri in Akure metropolis, Nigeria(Ijabadeniyi, 2007)	➢ Total viable count of bacteria found varies between 3.104 cfu/g and 21.104 cfu/g which isn't tolerable; ➢ Total viable count of found in Gari varies between 1.104 cfu/g and 6.104 cfu/g; ➢ Bacteria isolated from Gari found in the market are Pseudomonas spp., Bacteriodes spp., Actinomyces spp., Corynebacterium spp. And Lactobacillus spp.; ➢ Moulds isolated from Gari are: Scolecotrichum graminis, Tallospora aspera, Passalora bacilligera, Varicosporium sp., Culicidospora gravida and Diplococcium spicatum;	70%, Nigeria

Conservation of Gari with preservatives

Sources	Information	Confidence & Country
Extension of shelf life of garri by hygienic handling and sodium benzoate treatment (Agiehor and Ikenebomeh, 2005)	➢ Sodium benzoate has been used at 0.2% (W/W) for the conservation of Gari; ➢ The taste, color/appearance, mouth feel, swelling index and draw ability was assessed by panelists; ➢ After 14 months of storage of Gari treated with sodium benzoate, it wasn't observed a significant difference between these samples in term of taste, appearance, texture, aroma, mouthfeel, and swelling index with freshly prepared Gari; ➢ After 4 months and up to the 8th month, the total viable count for bacterial of conventional Gari is greater than 104 cfu/g, which is above the tolerable value for ready-to-eat food (104 cfu/g according to Olopade et al., 2014), this is also observable for fungi, up to the 10th month; ➢ For hygienically treated Gari, despite the inability to detect fungi and bacteria the first month, their quantity increase to reach the non-tolerable level after 6 months and up to the 8th month for bacteria then it decreases to reach safe level. For fungi, after 6 months, the quantity of viable count reach 104 cfu/g and up to the 12 month, this level is still observed; ➢ Gari hygienically treated with sodium benzoate don't show any detected fungi after 14 months of conservation and bacteria where detected only after 8 months and 10 months of conservation; ➢ Bacterial group found in conventional Gari are: Bacillus subtilis, Streptococcus lactis, Staphylococcus epidermis, Staphylococcus aureus, Pseudomonas aeruginosa. Those found in Hygienically treated Gari are : Bacillus subtilis, Streptococcus lactis,Staphylococcus epidermis whereas those found in Gari treated with sodium benzoate are Bacillus subtilis; ➢ Fungi group found in conventional Gari are: Aspergillus niger, Aspergillus utrinum, Fusarium monoliforme, Rhizopus stolonifer, Aspergillus fumigatus,Botritys cinerea. In hygienically treated Gari, fungi found are: Aspergillus niger, Aspergillus utrinum, Fusarium monoliforme. In Gari treated with sodium benzoate, no fungi of those which were looking for was found;	75%, Nigeria

Gari: Definition, norms, classification and quality

Sources	Information	Confidence & Country
Draft for comments: African Standard CD-ARS 854 : Garri-Specification(ARSO, 2014)	➢ Garri is a creamy-white, granular flour with a slightly fermented flavor and a slightly sour taste made from fermented, gelatinized fresh cassava tubers. ➢ Garri is either white or yellow with odor and taste which are acceptable according to localities. ➢ The maximum moisture content should be 7%, total acidity between 0.6 and 1%, maximum of crude fibers of 2%, maximum total cyanide of 20 mg/Kg, maximum total ash of 1.50% and maximum acid insoluble ash of 0.2%. ➢ Extra-fine Garri has a maximum size of grain of 355µm whereas coarse Garri has a grain size of 1.40 mm	85%
Evaluation of quality attributes of cassava product (gari) produced at varying length of fermentation (Olaoye et al., 2015)	➢ Gari is a lactic acid-fermented product which can be processed with or without the addition of red palm oil rich in carotenoids;	20%, Nigeria (data of these authors seem to suggest that prepared Gari is very poisonous because after 5 days of fermentation the cyanide content of Gari vary between 57 and 126 mg/100 g of Gari
Effect of the duration of fermentation on the quality of gari (Irtwange and Achimba, 2009)	➢ Bitter variety of cassava has been used for the production of Gari; ➢ The colour, aroma and texture of Gari have been assessed; ➢ The quality of Gari available in the local market varies from one batch to another in term of color, fibres content, moisture, particle size, starch content and residual cyanide and is due to cassava variety, age at harvest, processing methods, equipments and fermentation duration;	80%, Nigeria
Quality Assessment of Cassava Gari Produced in Some Selected Local Governments of Ekiti State, Nigeria(Olanrewaju and Idowu, 2017)	➢ The Standard Organization of Nigeria and International Institute for Tropical Agriculture recommend a maximum of 20 mg of HCN/Kg of Gari; ➢ The main advantages of Gari are its cheapness, ease of storage and preparation; ➢ Gari quality is affected by several factors as variety, age at harvest, processing methods as well as storage methods; ➢ Many Gari producers, owing to high demand, usually reduce the fermentation periods and others processing parameters in order to save time and make good returns;	75%, Nigeria

Sources	Information	Confidence & Country
Design concepts towards electric powered gari frying machine(Adediran, 2015)	➢ In Nigeria, the Standards Organization of Nigeria (SON) classified gari into three major categories which are (i) extra fine grain gari, where more than 80% of the grain pass through a sieve of less than 350 micrometer aperture; (ii) fine grain gari in which more than 80% of the grains pass through the sieve of less than 1000 micrometer aperture; (iii) coarse grain gari, where not less than 80% of grains pass through a sieve of 1400 micrometer or less than 20% of weight pass through a sieve of 1000 micrometer aperture; and (iv) extra coarse grain gari in which not less than 20% of grain is retained on a sieve of 1400 micrometer aperture (SON, 2000); ➢ Also based on the fermentation length of days and whether palm oil is added or not, we have the red gari which is also called the "Bendel gari". This is derived from the inclusion of red oil after the cassava has been grated and allowed to ferment for two to three days which aids the reduction of the cyanide content, and gives the gari a pleasant aroma; and the white gari in which there is no addition of red oil during the processing;	75%, Nigeria
Producing Gari from cassava: an illustrated guide for smallholder cassava processors(James *et al*., 2012)	➢ Gari is usually classified according to its particle size: extra fine Gari passes through 0.25 to 0.50mm aperture sieve, fine Gari passes through 0.50 to 1 mm aperture sieve, coarse Gari passes through 1 to 1.25 mm aperture sieve and extra-coarse Gari passes through 1.25 mm to 2 mm aperture sieve; ➢ Gari should be packed in polythene bags lined with plastics.	80%
Feasibility of using sealed polyethylene film in prolonged storage of Gari(Ukpabi et al., 2012)	➢ There are many types of Gari: extra fine Gari of which 80% of grains pass through 350 µm aperture sieve, fine Gari with 80% of its grains passing through 1000 µm aperture sieve, coarse Gari with 80% of its grain passing through 1400 µm aperture sieve and extra coarse Gari with more than 20% of its grains which are retained on a 1400 µm aperture sieve;	80%, Nigeria
Quality management manual for the production of Gari(Adebayo *et al*., 2012)	➢ Gari is a granular food product produced by grating cassava roots into a mash, fermenting and dewatering the mash into a wet-cake, and roasting the wet material into gelatinized particles. Particle size varies between 0.6 and 1.1 mm; ➢ Ghana and Nigeria appear to be the principal producers, consumers and exporters of Gari; ➢ In Mozambique, Gari is known as Rale; ➢ Gari quality depends mostly on the quality of cassava variety and how adequate the processing steps were taken; ➢ Gari combined norms show that HCN content shouldn't be greater than 10 mg/Kg, fibre should be 2% as a maximum, ash content should be 2.7% as a maximum, moisture content should be 12% max and total acidity between 0.6 and 1%; ➢ IITA has proposed a global construction plan for Gari factory;	80%, Nigeria

Sources	Information	Confidence & Country
	➢ In Nigeria and Mozambique, Gari is graded into three to five: Extra-fine Gari(80% of grains pass through 355 µm aperture sieve); fine Gari (80% of grains pass through 1000 µm aperture sieve; coarse Gari (80% of grains pass through 1400 µm aperture sieve) and extra coarse Gari (more than 20% of grain is retained by 1400 µm aperture sieve)	
Consumer perception of Gari prototypes and prospects for improvement and marketing in the South West region of Cameroon (Levai et al., 2016)	➢ According to Sanni et al. (2009), Gari can be defined as a creamy-white (or yellow if made from yellow fleshed roots or fortified with red palm oil during frying), partly gelatinized, roasted, free flowing granular flour with a slightly fermented flavor;	

Gari: importance, main production and commercialization areas in Cameroon

Sources	Information	Confidence & Country
Amélioration de la commercialisation et de transformation du manioc au Cameroun: contraintes et perspectives de la chaîne de valeur (Tolly Lolo, 2013)	➢ Littoral region and South West regions are important Gari production regions. More specifically, localities of importance are: Malendé, Muyuka, Bombé,Yoké, Olé, Passim(Melong), Balengui(Kumba). ➢ Malendé and Yoké are villages around Muyuka.	80%, Cameroon
Étude diagnostique de la réduction des pertes après récolte de trois cultures: manioc-tomate-pomme de terre. Rapport de synthèse: Cameroun (FAO, 2018)	➢ The main producing regions of Gari are North-West, South-West and Centre regions and Gari is produced based on market demand and supply; ➢ Gari from North West region is the preferred one and is more expensive than Gari from others regions; ➢ Losses of 33.33% can occur when Gari quality is affected; ➢ Only grating of cassava is mechanized;	80%, Cameroon
New challenges in the cassava transformation in Nigeria and Ghana(Nweke, 2004)	➢ Gari has a long shelf-life, a year or more as long as it isn't exposed to moisture; ➢ In early 2000, 95% of total cassava production was used as food; ➢ Gari alone represents in Nigeria 39% of cassava products, 43% in Ghana and 45% in Ivory Coast;	80%

Sources	Information	Confidence & Country
Amélioration de la commercialisation et de transformation du manioc au Cameroun: contraintes et perspectives de la chaîne de valeur(Tolly Lolo, 2013)	➢ In Douala, bulk sellers are found in “Marché Central” and “Marché de la Gare”. In Yaoundé, they are found in Mokolo market; ➢ Gari isn’t found in supermarkets and alimentations;	80%, Cameroon
Consumer perception of Gari prototypes and prospects for improvement and marketing in the South West region of Cameroon (Levai et al., 2016)	➢ In Buéa, Gari can be found in Muéa market and Moliko checkpoint	80%, Cameroon
Potentials for cassava processing in the Littoral region of Cameroon (Fon and Djoudji,2017)	➢ In Littoral region, “Miondo” and “Bâtons de manioc” (which are prepared cassava paste obtained by fermentation of cassava and packaged in leaves) are the main cassava by-products, followed by waterfufu, Gari representing only 17.85% of processed products;	80%, Cameroon
Etude sur les potentialités de commercialisation des produits dérivés du manioc sur les marchés CEMAC(IRPCM, 2008)	➢ Gari is produced in Littoral, Centre, East, South, West and North-West regions of Cameroon. In West and North-West regions, Gari is the main derived product from cassava; ➢ For 1 Kg of Gari bought by consumer in urban center, producer has 38% of the price, processor has 17%, transporter 21%, bulk seller 16% and retailer 12%; ➢ Gari is produced mainly for urban centre: thus Gari is produced in Littoral and South-West regions for Douala town, Gari produced in West region for Bafoussam and Dschang, it is produced in North-West region for Bamenda and Bafoussam, it is produced in South and Centre regions for Yaoundé and Ebolowa, it is produced in Adamaoua region for Ngaoundéré, Garoua and Maroua; ➢ In Littoral and south-West regions, the most important products are cassava flour, cassava ticks, waterfufu and Gari; ➢ In Centre, South and East, the most common products are cassava flour, cassava ticks, waterfufu , “cosettes” and Kasa-Kasa; ➢ In West and North-West, Gari is the main product, followed by waterfufu, “cosettes” and cassava flour;	80%, Cameroon
Rapport d'étude sur la monographie des marchés prioritaires sélectionnés pour la mise en place du système d'information sur les marchés: antenne de Bamenda(PNDRT, 2006)	➢ Gari is found in Benakuma market(located at 40 km of the Cameroon-Nigeria border); ➢ Gari is found in Guzen rural market(located at 5 km of Batibo, in Momo subdivision) ; ➢ Gari is found in Bankim market and it is available all over the year;	70%, Cameroon

Sources	Information	Confidence & Country
Report on monographic study of 12 selected markets for the market information system on root and tuber crops under the Douala antenna(PNDRT, 2006)	➢ In 2006, Gari wasn't very common in Central market of Douala and the low season is between November and June; ➢ Gari found in Central market comes from Muyuka and Mbalangui(South-West region); ➢ In New Deido market, Gari isn't too abundant and when found, it comes from Muyuka(South-West region); ➢ In Pendamboko market, located in Kombe village, Gari(which comes from Kotto-up) is the main or dominant product and the peak season is between May and November whereas the low season is between December and April; ➢ Melong market opens every day but the main market day is on Saturday and there, Gari is the second product, peak season being between September and December and the low season between January and August; ➢ At Melong market, Gari comes from Passim; ➢ Gari isn't predominant in Edea market; ➢ Gari is a very predominant product in Limbe market, peak season being between March and April and the low season between May and February. Gari found in Limbe market comes from Muyuka; ➢ In Muéa market, which is found in Buéa town, all Gari sellers are women who buy and sell ("Buyam-Sellam"), Gari found there comes from Malende and it the third product after "Taro" and waterfufu; ➢ Muyuka market holds once a week and there, Gari is the main roots and tubers derived product, the peak season being between November and June whereas the low season is between July and May; ➢ Gari found in Muyuka market comes from Yoke, located at 2 Km from the market. ➢ In Muyuka market, there is a well-constructed stalls for Gari despite the absence of water, toilets and electricity; ➢ Mbalangi market is opened on Tuesday and Friday, Tuesday being considered as the main market day; ➢ In Mbalangi market, one association of Gari traders ("Buyam sellam") exists in the market, although not registered. Gari is the main product there, peak season being between July and October whereas low season is from November to June; ➢ Gari found in Mbalangi market comes from Ediki(2 Km from Mbalangi), Bombe (4 Km from Mbalangi) and is locally produced. ➢ In Kumba main market, which is opened every day, Gari is the second most important product.	75%, Cameroon

Factors affecting Gari quality

Sources	Information	Confidence & Country
Effect of the duration of fermentation on the quality of gari (Irtwange and Achimba, 2009)	➢ The quality of Gari available in the local market varies from batch to bacth in term of color, fibres content, moisture, particle size, starch content and residual cyanide and is due to cassava variety, age at harvest, processing methods, equipments and fermentation duration;	80%, Nigeria
Quality Assessment of Cassava Gari Produced in Some Selected Local Governments of Ekiti State, Nigeria(Olanrewaju and Idowu, 2017)	➢ Gari quality is affected by several factors as variety, age at harvest, processing methods as well as storage methods; ➢ Many Gari producers, owing to high demand usually reduce the fermentation periods and others processing parameters in order to save time and make good returns;	75%, Nigeria

Gari market: prices, measures, margin and packaging

Sources	Information	Confidence & Country
Assessment of Resources, Markets and the Potential for Market Development in Value Added Cassava Products in West Africa (RIAS BV, 2005)	➢ In west African countries, Gari can compete with rice in terms of convenience and price in urban and rural markets ➢ In dryers places where firewood is expensive, Gari being precooked adds to its advantages over cereals such as maize, sorghum, millets and imported rice; ➢ Profitability of Gari depends on access to good processing equipment, to raw material and to markets, the most determining elements are: access to a power-driven greater instead of manual one, a good press and the Yield when going from cassava ➢ In Sierra Leone, Gari is cheaper than rice and is considered as a convenience food by rural consumers and there, some Gari producers have established a quality product and brand name (“Bo Gari”); ➢ Both women and men usually perform roasting of fermented and sieved cassava mash to Gari;	80%

Sources	➢ Information	Confidence & Country
Evaluation and developing simple techniques for assessing Gari adulteration(Teye et al., 2017)	➢ In Ghana, Gari is sold in a local container known as "Olanka", the weight per price being unknown; ➢ As found by these authors, this local weight allows measuring between 2 and 2.19 Kg of Gari and costs between 1.56 and 1.95 US dollar; ➢ The price varies from one place to another according to offer and demand law	70%, Cameroon
An assessment of gari marketing in South-Western Nigeria(Afolabi, 2009)	➢ Gari prices are determined by factors as the force of demand and supply, the acquisition cost, the quantity needed by the customer as well as its ability to haggle this price;	75%, Nigeria
Food safety, weights, measures and consumption patterns: The case of gari in Enugu and Benin markets (Sanni, 2005)	➢ Gari market development is limited by high processing and transport costs, absence of a strong farmers or processor organization and information system, restricted access to credit and others processing inputs; ➢ Bulk purchasers, processors and retailers are men, women, youth and widows; ➢ 85% of processors reported that they produce Gari based on consumer demands whereas the remaining(15%) produce Gari regardless of the market; ➢ Gari is sold in basin or plastic rubber; ➢ Majority of Gari retailers purchased Gari from processors in the village market or a day before the market day in the urban market or at the point of processing; ➢ In Enugu market, there is a Gari sellers/dealers association which regulate the price, quantity and quality of Gari marketing system, thus making sure that all stakeholders have very good chance of making necessary profit; ➢ There is a consumption form(dry or soaked , and in the form of "Eba") which change from one locality to another and for those preferring yellow Gari(Benin City), it costs there twice the price of white Gari and a little bit more than creamy white Gari. In Enugu city, the difference of price isn't too important. ➢ Consumers highlighted Gari quality on their taste, color and swelling capacity; ➢ In Enugu City, Yellow Gari has a very short shelf life and this dictate why there isn't much difference when compared to white one;	80%, Nigeria
Market structure, conduct and performance of gari processing industry in South Western Nigeria(Fuke *et al*., 2012)	➢ Acquisition cost of Gari represent for the sellers 15.48% of the total cost, storage cost 14.46%, labor cost 10.41%, depreciation 9.64% and a net benefit of 38.64%; ➢ Prices are determined by demand and supply forces, cost of acquisition plus margin, the ability of the buyers to haggle and the quantity of Gari;	75%, Nigeria
Microbiological safety and sensory attributes of gari in selected packaging materials(Adejumo and Raji, 2012)	➢ Gari produced in Nigeria is usually packaged and stored in hessian bags or usually sold from open containers, polyethylene sheet or on a mat using small measures which makes it become subjected to post-process contamination;	75%, Nigeria

Sources	Information	Confidence & Country
Étude diagnostique de la réduction des pertes après récolte de trois cultures: manioc-tomate-pomme de terre.Rapport de synthèse: Cameroun(FAO, 2018)	➢ Annual production of Gari is 49 000 tons/year according to AGROPME (2010); ➢ 1 kg of fresh cassava roots costs 83 FcfA(1 US dollar=550CfaF) dollar and Gari production represents 43.3 millions of US/year; ➢ The main producing regions of Gari are North-West, South-West and Centre regions and Gari is produced based on market demand and supply; ➢ In North-West region, Gari is packaged in 50 to 150 Kg bags whereas in South-West region, Gari is packaged in polyethylene bags of 2Kg, although the practice isn't too common; ➢ Big wholesalers have a margin of 6 to 13%, medium wholesalers have a margin varying between 18 and 25% and retailers have a margin varying between 10 and 15%; ➢ Gari prices in markets vary according to distance from region of production, quality, weather and economic health of the country; ➢ Gari from North West region is the preferred one and is more expensive than Gari from others regions; ➢ Losses of 33.33% can occur when Gari quality is affected; ➢ Gari is a higher added value from cassava (100 kg of cassava costs 15.10 US dollars, this same quantity of cassava allows obtaining 38 Kg of Gari which costs 31.10 US dollar); ➢ When going from production region to market, the price increase of 18.75% when Gari is sold in bulk and the increase is of 31% when sold in retail; ➢ Only grating of cassava is mechanized; ➢	80%, Cameroon
Quality management manual for the production of Gari(Adebayo *et al*., 2012)	➢ Gari market is competitive, sellers and buyers can't unilaterally impose prices on the market; ➢ In major Gari producing areas, Gari is produced by numerous smallholders units which sell Gari essentially in village markets; ➢ Big markets, which are often fewer, act as collecting centers for Gari from the numerous smallholders units; ➢ Gari quality can be defined on the basis of its safety and fitness for use by the target consumer; ➢ Processors and consumers have various Criteria for quality: taste (acidity or sourness), swelling capacity, color, texture, crispiness and absence of foreign matter and sometimes, the uniformity and brightness of the color is considered more important than the color itself; ➢ Gari standard exists in Nigeria, Ghana, Sierra Leone and at African and worldly level;	80%, Nigeria

Sources	Information	Confidence & Country
Amélioration de la commercialisation et de transformation du manioc au Cameroun: contraintes et perspectives de la chaîne de valeur(Tolly Lolo, 2013)	➢ Gari isn't found in supermarkets places; ➢ Gari is buy for direct consumption and not to keep for further use, this is mainly due to the fact that people don't want it to get spoil; ➢ Gari is more expensive in raining season than in dry season; ➢ 1 Kg of Gari costs between 0.41 US dollar and 0.63 US dollar according to season; ➢ In Douala, bulk sellers are found in "Marché Central" and "Marché de la Gare". In Yaoundé, they are found in Mokolo market; ➢ White Gari is more expensive than yellow Gari, the difference can be up to 41.67%; ➢ 1 Kg of yellow Gari costs between 0.28 and 0.41 US dollar whereas 1Kg of white Gari costs between 0.54 and 0.61 US dollar; ➢ Gari isn't found in supermarkets and alimentations;	80%, Cameroon
Potentials for cassava processing in the Littoral region of Cameroon (Fon and Djoudji,2017)	➢ The questionnaire has been administered to 140 respondents selected through the multistage random sampling technique; ➢ In Littoral region, "Miondo" and "Bâtons de manioc" (which are prepared cassava paste obtained by fermentation of cassava and packaged in leaves) are the main cassava by-products, followed by waterfufu, Gari representing only 17.85% of processed products; ➢ Processing of cassava allow adding value to cassava ➢ Processing of 100 kg of cassava cost 19.21 US dollar(1 US dollar being considered at 550 CFAF) and bobolo is the product that requires most investment per batch; ➢ Margin for Gari is 57%, 51% for starch, 65% for water fufu, 60% for dry fufu, 53% for miondo and 60% for bobolo; ➢ Inadequate equipments and inadequate training of processor are the main encountered difficulties; ➢ Difficulties are also encountered during the grating and peeling steps;	80%, Cameroon
SWOT analysis of cassava sector in Cameroon (Mvodo and Liang, 2012)	➢ Cassava derivative products aren't present in the high-class markets, supermarkets, malls, training centers and caterer services; ➢ The production, transformation and commercialization networks are still traditional, dominated by scattered and uncoordinated actors and small households processing units; ➢ Cassava transformation in Cameroon is carried out by small household units with reduced or archaic means; ➢ There are weak pricing mechanisms concerning cassava chain value and they are highly competed by imported maize and rice which have more longer life-span;	80%, Cameroon

Sources	Information	Confidence & Country
The marketing of Gari in North-West province, Cameroon (Graham, 1986)	➢ In market place, Gari isn't expensive in dry season but the price increases during the raining season, the variation being at least a double and up to the triple; ➢ Gari price setting is closely linked to the supply and demand conditions of others commodities; ➢ Gari can be said to exhibit a high degree of price elasticity of supply; ➢ Gari is generally produced for main towns;	80%, Cameroon
Etude sur les potentialités de commercialisation des produits dérivés du manioc sur les marchés CEMAC(IRPCM, 2008)	➢ In Cameroon, cassava by-products are bought in traditional market and not in supermarkets whereas in others countries like Democratic Republic of Congo and Gabon, cassava derived products are found in supermarkets; ➢ Gari is exported from Cameroon to Gabon, Equatorial Guinea and Central African Republic; ➢ For 1 Kg of Gari bought by consumer in urban center, producer has 38% of the price, processor has 17%, transporter 21%, bulk seller 16% and retailer 12%; ➢ From rural market to urban center, there is an increase of Gari price of 61.53%; ➢ In Cameroon, Gari is exported through water, by road and by plane; ➢ Amongst the derived products of cassava, cassava flour and Waterfufu are the most exported, followed by Gari in third place; ➢ 1 Kg of Gari costs 0.47 US dollar in small town(Souza) and is sold in urban town (Douala) at 0.77 US dollar(1US dollar being considered at 550 Cfaf; ➢ In Douala port, Gari is the second cassava by-product which is exported and it is ranked third in "quai Boscam" after cassava flour and waterfufu; ➢ In Cameroonian borders markets with Gabon, Equatorial Guinea and Congo, Gari is generally the third or the fourth cassava by-product which is exported after cassava flour, water fufu and cassava ticks; ➢ Gari is mainly exported to Gabon and Equatorial Guinea; ➢ In Littoral and south-West regions, the most important products are cassava flour, cassava ticks, waterfufu and Gari; ➢ In Centre, South and East, the most common products are cassava flour, cassava ticks,waterfufu , "cosettes" and Kasa-Kasa; ➢ In West and North-West, Gari is the main product, followed by waterfufu, "cosettes" and cassava flour;	80%, Cameroon

Sources	Information	Confidence & Country
Rapport d'étude sur la monographie des marchés prioritaires selectionnés pour la mise en place du système d'information sur les marchés: antenne de Bamenda(PNDRT, 2006)	➢ In Cameroon, women are mostly involved in the commercialization of tubers and roots ; ➢ Gari is found in Benakuma market(located at 40 km of the Cameroon-Nigeria border) and there, it is sold in 50 kg bags, 25 kg bassins and 15 liters bassins; ➢ Gari is found in Guzen rural market(located at 5 km of Batibo, in Momo subdivision) and there, Gari is sold in 15 liters buckets, and also in 40 kg basket. Waterfufu is also found there; ➢ In Bankim market where Gari is found, it is sold in cup(0.36-0.45 US dollar), 15 liters buckets(2.73 US dollars) or bags (10-10.90 US dollars) and it is available all over the year;	70%, Cameroon
Etude sur l'observatoire des racines et tubercules: rapport de première phase (PNDRT, 2006)	➢ There is a lacking of measures used for Gari in the whole selling chain; ➢ In term of commercialization three markets can be distinguished: collecting markets which are located in regions of production for Gari and which occur weekly; intermediary markets, found in more bigger villages or small towns where cars can easily reach at any season and which is in charge of collecting Gari from collecting markets and finally consumption markets found in big urban markets and bordering markets of countries; ➢ Traders can earn up to three fold what producers earn if they don't process cassava and their margin (of producer) increase if they process cassava; ➢ Producers who process their cassava sell at most 25 % of what they produce; ➢ Collective management has shown its limits when government policies have tried to do that ➢	80%, Cameroon

Sources	Information	Confidence & Country
Report on monographic study of 12 selected markets for the market information system on root and tuber crops under the Douala antenna(PNDRT, 2006)	➢ In 2006, Gari wasn't very common in Central market of Douala and the low season is between November and June; ➢ Gari found in Central market comes from Muyuka and Mbalangui(South-West region); ➢ For Gari, the unit of sale is 30 liters basin which costs between 10.90 and 18.18 US dollars; ➢ In New Deido market, Gari isn't too abundant and when found, it comes from Muyuka(South-West region); ➢ In Pendamboko market, located in Kombe village, Gari(which comes from Kotto-up) is the main or dominant product and the peak season is between May and November whereas the low season is between December and April; ➢ In Pendamboko, Gari is sold in 30 liters basin between 12.73 and 14.55 US dollars, 15 liters bucket is also used for the half price of 30 liters container respectively; ➢ Melong market opens every day but the main market day is on Saturday and there, Gari is the second product, peak season being between September and December and the low season between January and August; ➢ At Melong market, Gari comes from Passim; ➢ Gari isn't predominant in Edea market; ➢ Gari is a very predominant product in Limbe market, peak season being between March and April and the low season between May and February. Gari found in Limbe market comes from Muyuka; ➢ At Limbe market, 15 liters basin of Gari costs between 5.45 and 7.27 US dollars whereas 30 liters basin costs between 12.73 and 16.36 US dollars, 1 Kg of Gari costs between 0.55 and 0.73 US dollars; ➢ In Muéa market, which is found in Buéa town, all Gari sellers are women who buy and sell ("Buyam-Sellam"), Gari found there comes from Malende and it the third product after "Taro" and waterfufu; ➢ In Muéa market 15 liters basin of Gari costs between 5.45 and 5.82 US dollars in peak season and between 6.91 and 7.27 US dollars in low season. 30 liters of Gari basin costs between 13.64 and 14.54 US dollars in peak season and 16.36 US dollars; ➢ Muyuka market holds once a week and there, Gari is the main roots and tubers derived product, the peak season being between November and June whereas the low season is between July and May; ➢ Gari found in Muyuka market comes from Yoke, located at 2 Km from the market. In peak season,30 liters basin costs 10.91 US dollars and in low season, this same container costs 16.36 US dollars; ➢ In Muyuka market, there is a well-constructed stalls for Gari despite the absence of water, toilets and electricity; ➢ Mbalangi market is opened on Tuesday and Friday, Tuesday being considered as the main market day; ➢ In Mbalangi market, one association of Gari traders ("Buyam sellam") exists in the market, although not registered. Gari is the main product there, peak season being between July and October whereas low season is from November to June; ➢ Gari found in Mbalangi market comes from Ediki(2 Km from Mbalangi), Bombe (4 Km from Mbalangi) and is locally produced. 30 liters basin of Gari basin costs between 8.18 and 9.1 US dollars in peak season and 13.64 US dollars in low season; ➢ In Kumba main market, which is opened every day, Gari is the second most important product and 15 liters bucket costs 9.09 US dollar in peak season and 10.91 US dollars in low season;	75%, Cameroon

Gender issues on Gari processing and market

Sources	Information	Confidence & Country
Evaluation and developing simple techniques for assessing Gari adulteration(Teye et al., 2017)	➢ In Ghana and other West African countries, cassava is processed to Gari by women in local cottage industries;	70%, Ghana
Improved mechanized Gari frying technology for sustainable economic development in Nigeria(Gbasouzor and Maduabum, 2012)	➢ Gari is fried by women who sit sideways of fire and this result in discomfort due to heat and sitting posture	80%, Nigeria
An assessment of gari marketing in South-Western Nigeria(Afolabi, 2009)	➢ More than 92% of women (Gari marketers) were aged of less than 50 years(20% of less than 29 years old, 47.33% between 30 and 40 years old, 24.67% between 41 and 50 years); ➢ Both male(31.33%) and female(68.67%) are Gari sellers; ➢ Women are the majority of sellers and are mostly involved in retailing (retailers are more abundant than the remaining groups); ➢ As actors in Gari distribution chain, there are processors/ sellers, wholesalers, wholesellers/retailers and finally retailers (retailers are more abundant than the remaining groups); ➢ Gari association exists only at the wholesalers level.	75%, Nigeria
Food safety, weights, measures and consumption patterns: The case of gari in Enugu and Benin markets (Sanni, 2005)	➢ Bulk purchasers, processors and retailers are men, women, youth and widows; ➢ Gari markets in Benin and Enugu states are dominated by persons of 20 to 45 years old and dominated by women; ➢ Gari wholesalers and retailers are mostly women; ➢ In Enugu market, there is a Gari sellers/dealers association which regulate the price, quantity and quality of Gari marketing system, thus making sure that all stakeholders have very good chance of making necessary profit;	80%, Nigeria
Market structure, conduct and performance of gari processing industry in South Western Nigeria(Fuke *et al*., 2012)	➢ 13.5% of Gari sellers have less than 29 years old, 36.5% are between 30 and 40 years old, 13.1% have more than 50 years and 36.97% have between 41 and 50 years old; ➢ Women accounted for 66.2% of sellers whereas the remaining(34.8% and made of men), however, women are more important at retail level due to the small capital required; ➢ 78% of traders are literate, 15.33% bare processors/sellers, 12.67% are wholesellers,31.33% are wholesalers/retailers while 40.67% are retailers only;	75%, Nigeria

Sources	Information	Confidence & Country
Determinants of Profitability of Gari Processing Among Women Processors in Kwara State,Nigeria(Oloyede and Ayinde, 2016)	➢ Women play a dominant role in processing and marketing of cassava derived products as Gari; ➢ Small-scale Gari processing is the domain of women, which provides them with an income and contributes to household security; ➢ 1/3 of women implied in Gari processing also have other jobs;	80%, Nigeria
Étude diagnostique de la réduction des pertes après récolte de trois cultures: manioc-tomate-pomme de terre.Rapport de synthèse: Cameroun(FAO, 2018)	➢ Women are involved in Gari production and processing and these women are generally aged of less than 35 years old with at least a primary education level;	80%, Cameroon
Hazardous conditions of women in Gari processing industry in Ibadan, South West, Nigeria (Adebimpe and Promise, 2014)	➢ 41 persons and 5 keys informants were interviewed; ➢ Concerning work, the focus now is on removing risks from workplaces rather than excluding women from hazardous occupations; ➢ 73.9% of women processing cassava were between 16 and 40 years old. Among these women 50% didn't have any formal education whereas 39.1% had primary education level; ➢ Mostly accidents that occur during Gari processing were caused by faulty attitude to work on the part of the worker. Musculoskeletal disorders were found to be the dominant health issue across all the processing stages; ➢ Knife cuts and exposure to sun light were reported at the stage of cassava peeling where the skills and expertise of the worker present the best way of avoiding knife cuts; ➢ During washing/grating stages, body is submitted to serious strain and pain around the waist, shoulder and thigh; ➢ Women harvest different varieties of cassava, of which strong peeling increase the quantity of work; ➢ Peeling is mostly done by women and children; ➢ Peeling is still hard for women and it increases back and waist difficulties and in order to ease it, women sharp their knife regularly; ➢ Women dominate in the grating section of the processing; ➢ Children aren't involved in cassava grating, which is generally done by machine; ➢ The floor around the grating section is usually slippery as a result of water from the different activities that take place there; ➢ Women dominate in Gari frying; ➢ Pain in the eyes during and after the whole frying is generally observed; ➢ Women and children(especially girls) are the most active category of workers in frying section; ➢ Due to health issues which can be encountered at frying stage, old women are generally moved at this step.	80%, Nigeria

Sources	Information	Confidence & Country
Programme National de Développement des Racines et Tubercules (PNDRT) – Prêt FIDA n°606-CM: Rapport de supervision, rapport principal et appendices(PNDRT, 2013)	➢ Cassava production chain is mainly dominated by women	80%, Cameroon
SWOT analysis of cassava sector in Cameroon (Mvodo and Liang, 2012)	➢ Around 90% of actors involved in cassava chain are women aged between 18 and 50 years old; ➢ The Cameroonian land law doesn't attribute land to woman, consequently, cultivated fields are limited;	80%, Cameroon
Etude sur les potentialités de commercialisation des produits dérivés du manioc sur les marchés CEMAC(IRPCM, 2008)	➢ Wholesalers are always men aged of 40 to 50 years old who buy Gari in rural markets or directly to processors whereas retailers are mainly made of women who buy Gari according to the capital as well as Gari demand and supply of the market; ➢ Women are predominant in cassava production, but also in cassava processing and selling;	80%, Cameroon
Rapport d'étude sur la monographie des marchés prioritaires selectionnés pour la mise en place du système d'information sur les marchés: antenne de Bamenda(PNDRT, 2006)	➢ In Cameroon, women are mostly involved in the commercialization of tubers and roots ;	70%, Cameroon
Stratégie de développement de la filière manioc au Cameroun 2010-2015(Cameroun, 2010)	➢ Women are mostly involved in the production and processing of cassava;	80%, Cameroon
Etude sur l'observatoire des racines et tubercules: rapport de première phase (PNDRT, 2006)	➢ Cassava processing is essentially done by women who generally work alone and rarely n group;	80%, Cameroon

Effect of Gari fortification on the chemical composition and sensory quality of the final product

Sources	Information	Confidence & Country
Chemical Changes during the Fortification of Cassava Meal (Gari) with African breadfruit (Treculia africana) Residue (Onasoga et al., 2014)	➢ African breadfruit has been boiled, dehulled, wet-milled and added at two steps of the overall Gari process : after grating and after fermentation; ➢ The substitution level was 30% ➢ Appearance, Aroma, taste, texture and overall acceptability; ➢ All the substituted Gari were lower in all sensory parameters than the one made only with cassava; ➢ Gari obtained when African breadfruit was added after fermentation was the less appreciated;	70%, Nigeria
Proximate and mineral composition of co-fermented breadfruit and cassava into Gari analogue (Ajifolokun and Adeniran, 2018)	➢ Breadfruit and Gari have been processed separately to produce Gari and co-processed to produce fortified Gari, the blend(cassava: breadfruit, 80:20, 70:30 and 60:40) has been done after the slice of each and they have been grated together; ➢ Addition of breadfruit doesn't has any effect in the quantity of protein, fibre, ashes, fat and carbohydrates although Gari made from 100% breadfruit has more ash and less fat and carbohydrate content than cassava Gari	50%, Nigeria (because introduction is almost identic to the one of Ahaotu et al., (2011))
Processing and characteristics soybean-fortified gari(Sanni and Sobamiwa, 1994)	➢ Soybean was parboiled, dehulled, dried and milled to obtain soybean flour; ➢ Soybean residue has been obtained from parboiled, dehulled and wet-milled(1 kg for 6 liters of water) and soya-milk extracted; ➢ Soybeans flour and residue have been added after grating, but before bagging whereas another soybeans residue has been added after dewatering; ➢ 21.67% of soybean flour has been added whereas 29.41% of residue has been added; ➢ When soybean residue is added after dewatering, it becomes more difficult to process than when it is added after the grating step; ➢ Gari produced from cassava only is the best in term of appearance, color, texture, flavor and aroma; ➢ Gari produced with dry-milled flour is similar in appearance to gari produced from soybean residue added after dewatering for one variety (TMS 30572), but this isn't observed for another variety (TMS 4(2) 1425); ➢ Regardless of the variety, when soybean residue is added after grating, it leads to less appreciated Gari than when it is added after dewatering or when soybean flour is added after grating; ➢ The addition of soybean residue after dewatering allows obtaining the most appreciated Gari when substitution is done; ➢ Habitual consumers of Gari have suggested increasing the fermentation time in order to improve the quality of substituted Gari, also they were able to distinguish the fortified Gari from the unfortified one.	80%, Nigeria

Sources	Information	Confidence & Country
A comparative evaluation of the macronutrient and micronutrient profiles of soybean-fortified gari and tapioca (Adelodun and Monelike, 2009)	➢ Substitution of Gari has been done with 25% soybean with soybean flour and soybean residue as done by Sanni and Sobamiwa; ➢ Substitution increases the protein content and fat content of the fortified Gari;	75%, Nigeria
Acidification and starch behaviour during co-fermentation of cassava (Manihot esculenta Crantz) and soybean (Glycine max Merr) into gari , an African fermented food (Afoakwa *et al*, 2010)	➢ Soybeans have been dehulled, boiled, crushed and dried to obtain the soybean flour, which has been added to cassava mash after grating at 10%, 20% and 30%; ➢ There is a decrease of viscosity peak with increasing fermentation time; ➢ Increasing the substitution proportion leads to a decrease of viscosity peak of cassava dough and for the same substitution proportion, there is a decrease of viscosity peak with increasing fermentation duration;	70%, Ghana
Enrichment of cassava meal(Gari) with soybean protein extract(Uche *et al.*, 2008)	➢ Soybean seeds have been steam-boiled for one hour, dehulled, blended and oil has been removed from them and the resultant defatted seed cake air-dried and kept for analysis; ➢ Extraction of proteins has been done and these proteins have been blended to cassava (2 cassava:1 protein) and the blend was dehydrated and left for 24 hours; ➢ In term of taste, flavor and texture, there wasn't a significant difference with unfortified Gari;	50%, Nigeria (the authors didn't provide table of results)
Proximate Compositions, Physicochemical and Sensory Properties of Gari Fortified with Soybean, Melon Seed and Moringa Seed Flours(Alozie and Ekerette, 2017)	➢ Gari has been substituted with soybean, melon seed and moringa seeds flours at 5% of substitution level; ➢ Soybean was cleaned, sorted and steam-heated at 100oC during 30-45 min , dehulled, oven-dried at 70-80oc before be milled to obtain the flour whereas melon and moringa seeds were toasted in a steel pan at 80-90oC before be milled to obtain the corresponding flour; ➢ Addition has been done after the sieving of cassava cake but before roasting; ➢ Sensory parameters which have been assessed were the color, the taste, aroma and general acceptability. This sensory analysis has been done with Gari soaked in water; ➢ Fortification increases the protein content, ash content and fat content and decreases the carbohydrates content, the main increase of protein being observed with soy fortified Gari and of fat being observed with melong seed flour; ➢ Substitution decreases the swelling index and water holding capacity of Gari; ➢ Substitution with soybean decreases the pasting temperature whereas this substitution with melon seed and moringa increases the pasting temperature; ➢ There is a decrease of swelling index(49.59% for soybean, 53.94% for melon seed and 38.38% for Moringa seeds); ➢ There is a decrease of water holding capacity with substitution (21.04% for soybean, 4.39% for Melon seeds and 5.30% for moringa seeds);	70%, Nigeria

Sources	Information	Confidence & Country
	➢ Substitution lowers the pH of fortified Gari; ➢ Gari prepared from fortified Moringa was the most appreciated	
Physico-thermal and pasting properties of soy-melon-enriched "Gari" semolina from cassava (Oluwumukomi and Jolayemi, 2012)	➢ Soybeans and melon seeds have been used to prepare fortified Gari; ➢ Soybeans seeds have been steam-heated for 30-45 min at 100oC, dehulled, dried at 70-80oC in oven and then milled to produce soybeans flour whereas melon seeds have been toasted at 80-90oC and milled into flour; The two flours have been blended (these authors didn't supplied the blending proportion of each element; ➢ Mixture has been added before and after roasting of cassava and substitution was done at 10%; ➢ Substitution decreases the swelling index, water holding capacity, peak viscosity, breakdown viscosity and the resistance of the formed gel to penetration; ➢ N.B.: low set back and breakdown viscosity traduce the lower ability to staling	70%, Nigeria
Socio-economic analysis of processing Pachyrhizus erosus (L.) Urb. tubers into gari in Benin(Adegbola *et al*., 2015)	➢ American yam beans(Pachyrhizus spp.) has been used to supplement Gari; ➢ Pachyrhizus erosus roots have a protein content varying between 11 and 18 % and iron content which can reach 130 mg/Kg; ➢ Gari fortified with 25%, 50% and 100% Pachyrhizus erosus roots have been prepared and compared to 100% Gari produced from cassava; ➢ These Gari have been produced in the village by the same processor; ➢ ➢ Peeling, pressing, grating and breaking(to remove the fibres) of P. erosus is more difficult than for cassava; ➢ P. erosus Gari were well appreciated than 100% cassava Gari and this was due the slightly sour taste of of P. erosus Gari when compared to cassava Gari; ➢ Colour, granule size, aroma, texture on mouth and commercialization of P. erosus Gari were appreciated; ➢ Gari yield is 23.15% for 100% cassava, 20.95% for 75% cassava and 25% P. erosus and 14.34% for 50% cassava and 50% P. erosus; ➢ Higher is the quantity of substituted P. erosus, more important is the length of the overall process; ➢ P. erosus costs 4 times the cassava price;	75%, Benin
Nutritional composition of "gari" analog produced from cassava (Manihot esculenta) and cocoyam (Colocasia esculenta) tuber(Bamidele et al., 2014)	➢ Cassava and cocoyam where separately peeled, washed, diced and co-grated, dewatered, fermented, sieved and garified; ➢ Substitution has been done at 20%, 30%, 50%, 60% and 100% with cocoyam; ➢ Up to 30% of substitution, the difference between the unfortified Gari and the fortified one isn't too much important in term of taste, color, texture, flavor and overall acceptability although Gari made from Gari is the preferred one in terms of all these qualities parameters; ➢ Differences are observed when substitution is done at 50% and beyond this quantity, fortified Gari are very poorly ranked;	75%, Nigeria

Sources	Information	Confidence & Country
	➢ In Nigeria, there are two types of Gari: the yellow one and the white one, both being consumed by richmen as well as by poor; ➢ Substitution with cocoyam increases the protein content of fortified Gari as well as ash content and crude fiber content ; ➢ This substitution decreases the crude fat content and carbohydrate content; ➢ Increasing substitution yield increases mineral content of fortified-Gari (Ca, Na, K, Mg, Fe, P) but it decreases the bulk density, the water absorption capacity and swelling capacity;	
Production and evaluation of gari produced from cassava (Manihot esculenta) substituted with cocoyam (Colocasia esculenta) (Olatunde et al., 2013)	➢ Cassava and cocoyam have been separately peeled, grated, fermented/dewatered for 48 hours and 24 hours respectively before been mixed and the blend pressed for 24 hour again; ➢ Substitution has been done at 10%, 20%, 30%, 50% and 100%; ➢ Increasing cocoyam proportion increases the protein content of fortified Gari, its ash content and pH, whereas it decrease the HCN content, swelling capacity and water absorption capacity; ➢ Gari made from 100 % cassava is preferred to the fortified ones and Gari made from 100% cocoyam is more accepted than the one made with 50:50 cassava:cocoyam; ➢ Peak viscosity generally increases with increasing substitution yield while pasting temperature decrease with increasing substitution yield;	70%, Nigeria
Effect of Chemical Pretreatments on the Physico-Chemical and Sensory Attributes of Sweet Potato-Gari(Sanni *et al*., 2010)	➢ Gari made from sweet potatoes has a pH of 5.86; ➢ 0.5% and 2.5% solution of lime and sodium metabisulfite have been added and both cassava-Gari and sweet potatoes-Gari have been prepared with 100%; ➢ Cassava Gari is more appreciated than sweet potato-Gari when given in dry form, when sodium metabisulfate or lime is added, regardless of the concentration, the appearance, mouth feel, taste, crispiness and color are improved; ➢ For “Eba”, appearance, aroma and texture only have been assessed; ➢ “Eba” prepared from cassava has the same appearance and aroma that sweet-potato Gari fortified with 2.5% lime and 0.5% sodium metabisulfite, although the texture is better than the one prepared from sweet-potato; ➢ Sweet potato Gari used for the preparation of “Eba” has the worse appearance; ➢ Gari has been given in the dry form and prepared as “Eba” before being eaten by panelists; ➢ When	70%, Nigeria
Chemical and sensory qualities of gari fortified with groundnut flour(Arisa et al., 2011)	➢ Addition of groundnut flour has been done at 10%, 15% and 20% after sieving and before Garification; ➢ Substitution leads to the increase of proteins content, fat and ash content, but to a decrease of carbohydrates content , crude fibres and pH, the variation being more important for increasing substitution rate;	65%, Nigeria (pH of Gari fermented during three days and roasted at 8.59)

Sources	Information	Confidence & Country
Chemical and sensory properties of Gari enriched with sesame seed flour(Sesamum indicum L.)(Oluwamukomi, 2015)	➢ Sesame seeds were toasted and grounded, the resulting paste has been divided in two parts and one part has been defatted and the other part not; ➢ Fortification has been done at 5% and 10%; ➢ Sensory analysis has been done and parameters used were: color, flavor, taste and overall acceptability; ➢ Substitution increases the pH, protein content, fat content and ash content, but decreases the fibres content, the HCN content and carbohydrates content; ➢ Regardless of the variation trend, the decrease or increase is generally more important with increasing substitution level; ➢ Despite the fact that the control was more appreciated for all the sensory parameters than all the fortified Gari, the best Fortified Gari in term of sensory scores was the one made with 10% of defatted sesame flour;	75%, Nigeria
Functional and sensory properties of iron fortified West African cassava fermented meals; "gari" and "fufu"(Ikpeme-Emmanuel *et al*., 2011)	➢ Fortification of Gari has been done with iron sulfate II, Iron sulfate III and ferric alum at concentration of 0.2g/Kg of cassava; ➢ On Gari, sensory analysis has been done in color, mouth feel, taste, consistency, aroma and overall acceptability; ➢ Regardless of the salt which has been used, there wasn't a significant difference between the fortified and unfortified Gari.	40%, Nigeria (because characteristics of control(100% cassava Gari) are far away from common value found in Literature)

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