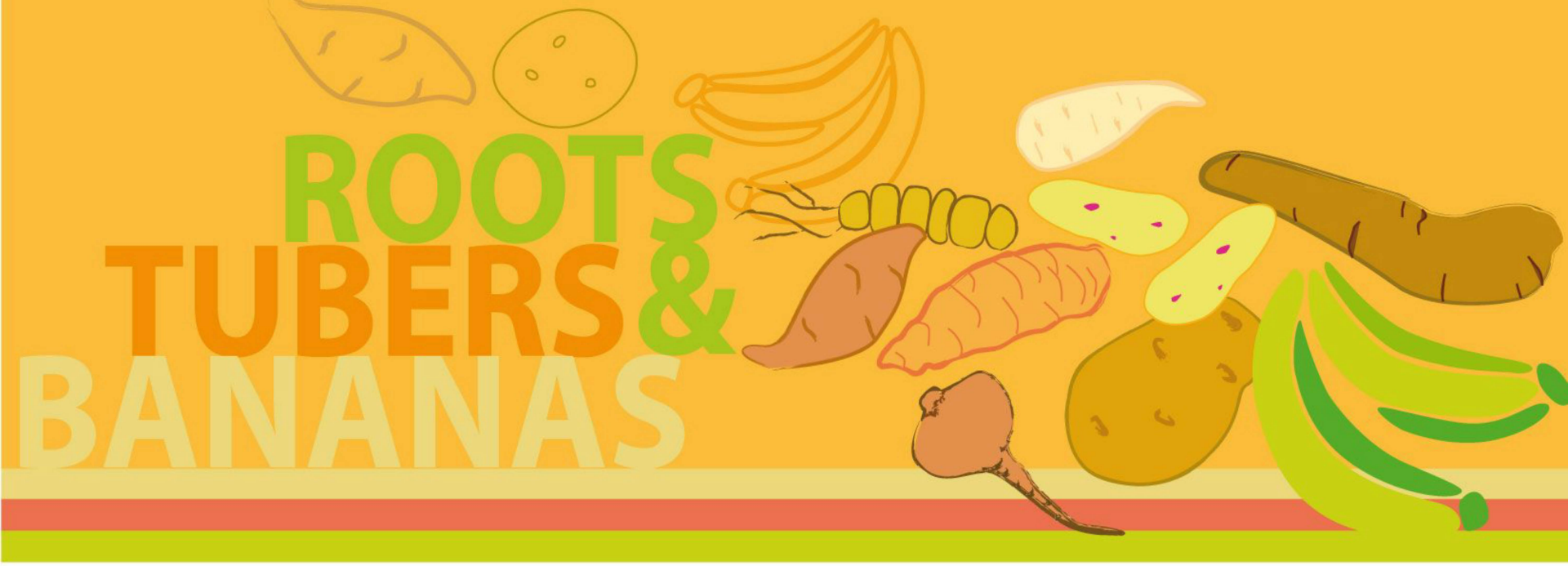

New approach for better assessing consumer acceptability of improved cassava food products

Fliedel G., Monteiro M.J., Tomlins K., Maraval I.,
Bouniol A., Prin L., Adinsi L.,
Akissoë N., Hanna R., Dufour D.

WCRTC Nanning China, 18-22 January 2016

CGIAR | Research Program on Roots, Tubers and Bananas

Why consumer acceptability study ?

Research Program on Roots, Tubers and Bananas

A study on consumer acceptability of new products is useful :

- To know if a new or improved traditional process developed for making new or improved traditional products could be adopted
- To know if improved varieties used for making new or improved traditional products could be adopted

New or improved traditional products are acceptable by consumers

CRP Complementary funding on Cassava
Case Study 3 : Consumer Study

Research Program on Roots, Tubers and Bananas
CGIAR

The objective : Ensure that cassava products from new varieties and new processing technologies meet consumer taste

Nigeria	Tanzania	Cameroon	Benin
Fufu	**Ugali**	**Gari** **Fufu** **Bâton**	**Gari**
Drying Flash-dried Sun-dried Wet paste	1 Cassava variety 3 Drying (Flash-dried, Sun-dried, Cabinet-dried) 1 Traditional Cassava Flour 1 Maize flour	17 improved varieties in 3 regions	3 Supplemented Gari with Soybean and/or Palm Oil 9 traditional Gari

Workshop in Dar es Salaam, January 2014

Sensory evaluation or consumer acceptance study ?

Research Program on Roots, Tubers and Bananas

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Sensory evaluation

- Trained panellists (8 to 15)
- Products (8 to 12)
- In a sensory laboratory
- Standardized methodology (Quantitative descriptive analysis)
- Generation of sensory descriptors
- Scoring of each sensory descriptor
- Mapping of all the products (sensory profile)
- Cluster analysis (groups of products with different sensory properties)

Consumer acceptability

- Consumer (100 and more)
- Products (3 to 5)
- In different locations
- Several methodologies :
  - ✓ Hedonic tests
  - ✓ CATA question
  - ✓ JAR tests
  - ✓ Willingness to pay
  - ✓ Questionnaire on consumption habits
  - ✓ Consumer preferences

Methodology in three steps

Research Program on Roots, Tubers and Bananas

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1

Sensory Profiling (QDA)

3

Physicochemical analysis

2

Consumer Acceptance

Hedonic tests

JAR Tests

CATA question

Willingness to pay

Four steps

Research Program on Roots, Tubers and Bananas

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1

Qualitative Surveys
Food chain Surveys
With each stakeholder

Variability of products, processes, varieties
Various forms of consumption

Quality criteria

Processing
Buying
Consuming

2

Sensory Profiling (QDA)

4

Physicochemical analysis

3

Consumer Acceptance

Hedonic tests

JAR Tests

CATA question

Willingness to pay

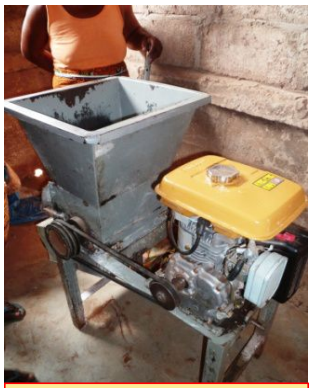
Workshop in Dar es Salaam, January 2014

Gari in Benin

The Objective of the study : Acceptability of gari supplemented with soybean and/or palm oil compared to traditional gari

- Gari is a sort of « semolina » with dried, white and little sour particules
- Gari is a cassava product obtained after
  - . Peeling the roots,
  - . rasping,
  - . fermentating, pressing
  - . sieving
  - . cooking-drying (roasting)

Peeling



Rasping

Pressing

Cooking / Drying

Sieving

Gari in Benin : Food chain surveys two regions in the South and in the Centre

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Region	Processors	Retailors	Consumers
Southern region	14	22	51
Centre region	12	24	55
Total	26	46	106

Gari in Benin

The Objective of the study : Acceptability of gari supplemented with soybean and/or palm oil compared to traditional gari

Research Program on Roots, Tubers and Bananas

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- Large variability of traditional Gari with very different characteristics, depending on the process

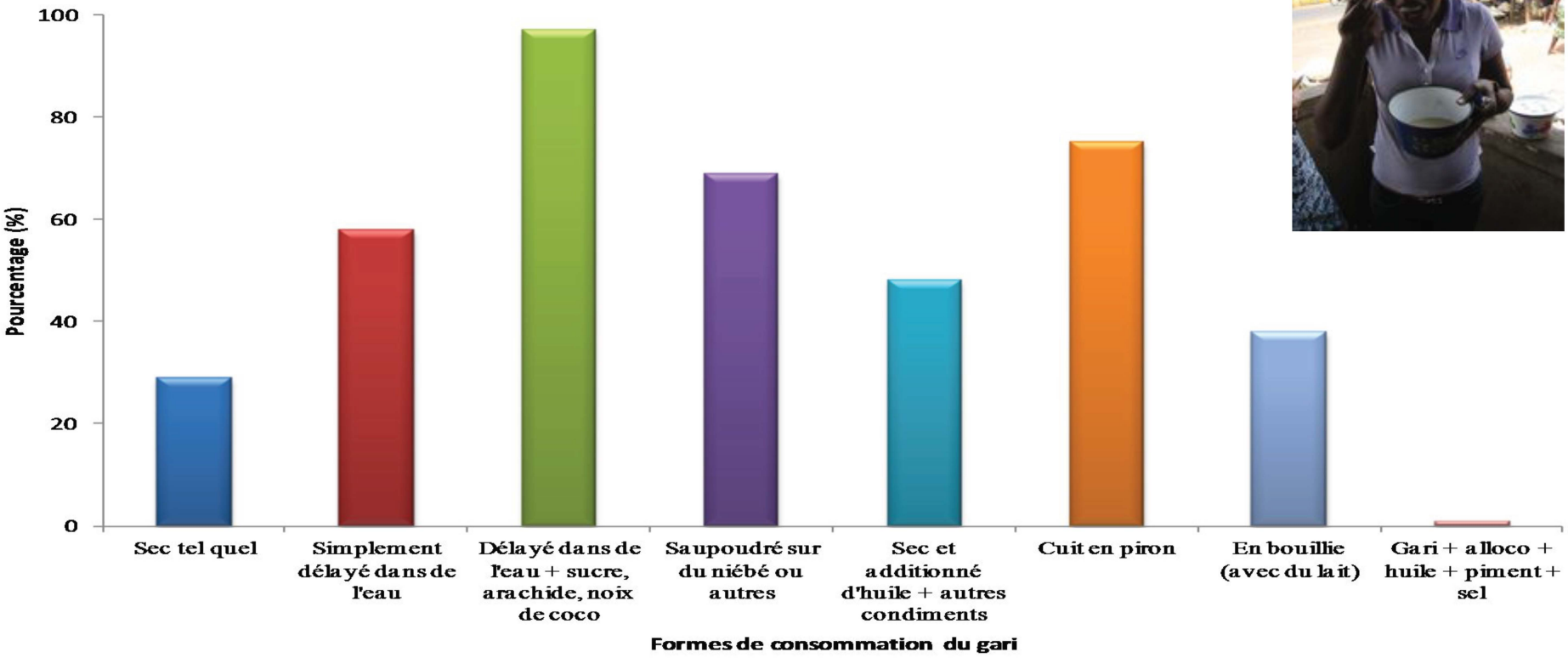
- Colour : white to brown
- Particle size : fine to coarse particles
- Homogeneity of particle size : homogeneous to heterog
- Presence of fibers : few or many fibers
- Dryness : very dried to slightly humid in the heart
- Sour taste : little to very fermented

Dantokpa market

Missè Gari

Djeffa Gari

Consumption form of Gari in Benin



Quantitative descriptive analysis of gari

Research Program on Roots, Tubers and Bananas

18 panellists
In the University of Abomey Calavi

9 Traditional Gari
3 supplemented Gari

Tested dry and added with water

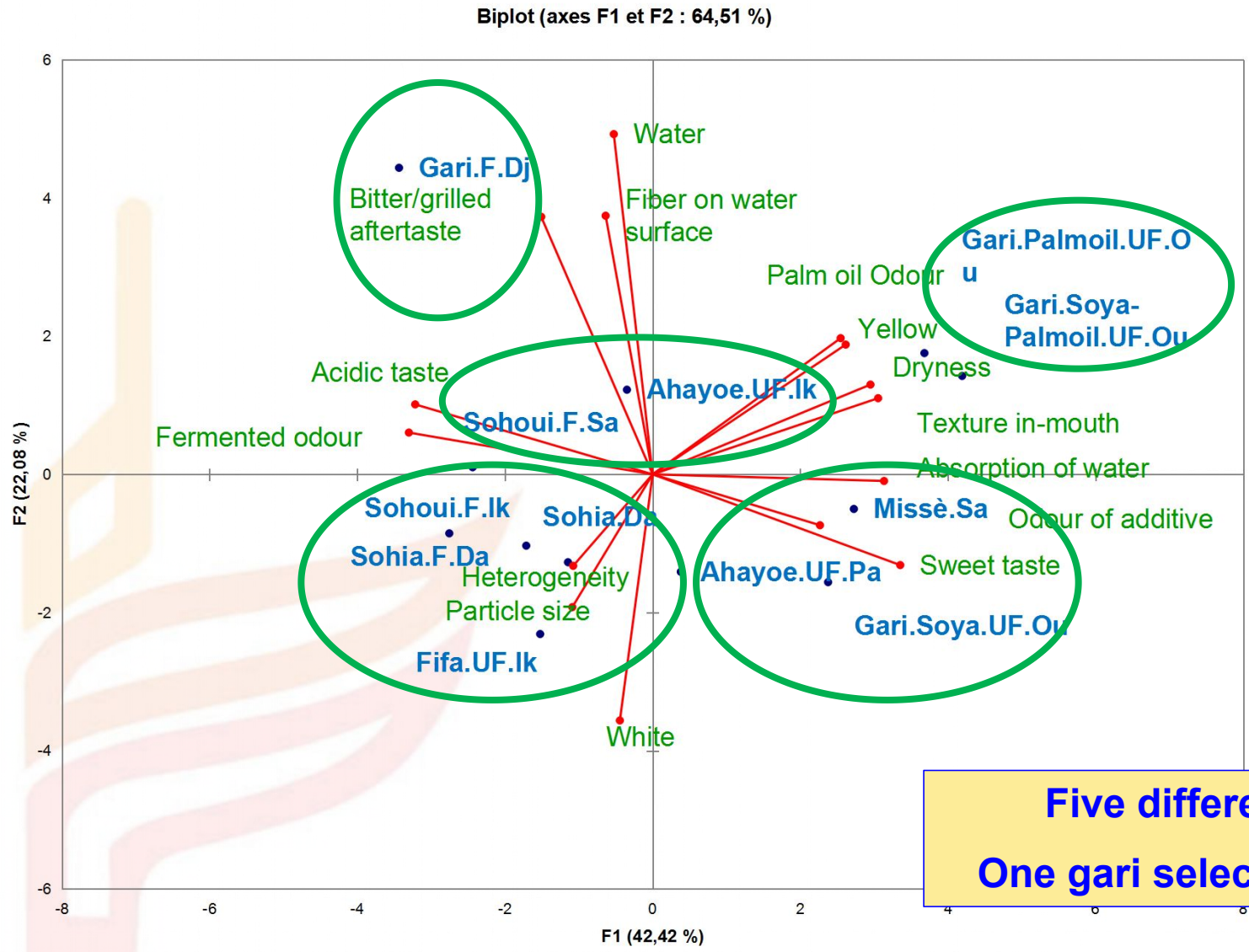
9 traditional gari

- 2 Gari Sohoui
- 2 Gari Ahayoé
- 2 Gari Sohia
- 1 Gari Fifa
- 1 Gari Missè
- 1 Gari from Djeffa

3 supplemented gari

- Gari supplemented with palm oil
- Gari supplemented with soybean
- Gari supplemented with soybean- palm oil

Sensory profile of supplemented and traditional gari



Five different clusters

One gari selected per cluster

The study in Cameroon

- IITA Cameroon has planted 17 improved cassava varieties in 9 different agro-ecological regions in Cameroon
- IITA Cameroon would like to test the acceptability of three traditional products made from these 17 varieties
  - Gari in Buea, South-West region
  - Bâton in Mbalmayo, Centre region
  - Fufu in Foumbot, North region

Cameroon

Gari
Fufu
Bâton

17 improved varieties in 3 regions

Four steps

1

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Food chain Surveys
With each stakeholder

Variability of products, processes, varieties
Various forms of consumption

Quality criteria

Processing
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Consuming

2

Participatory Involvement of processors

Physicochemical analysis

3

Consumer Acceptance

Hedonic tests

JAR Tests

CATA question

Willingness to pay

4

The bâton de manioc or Bobolo

Objective of the study : Acceptability of « bâton de manioc » or « Bobolo » made from 17 IITA improved varieties

- Bâton is a traditional product made from cassava roots
- It is a whitish, translucent and elastic gel
- - It has the shape of a long cylinder of 60 to 65 cm long and 2.5 cm in average diameter, with tip ends

Surveys in Centre region in Cameroon

Research Program on Roots, Tubers and Bananas

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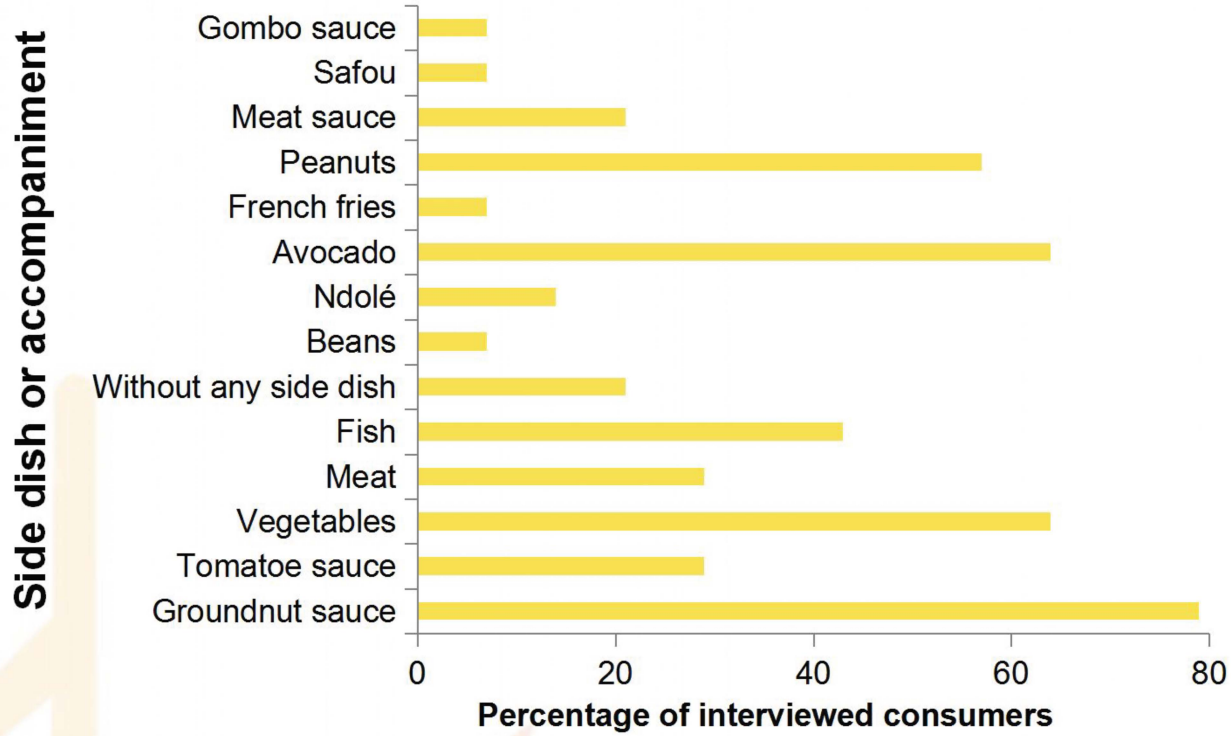
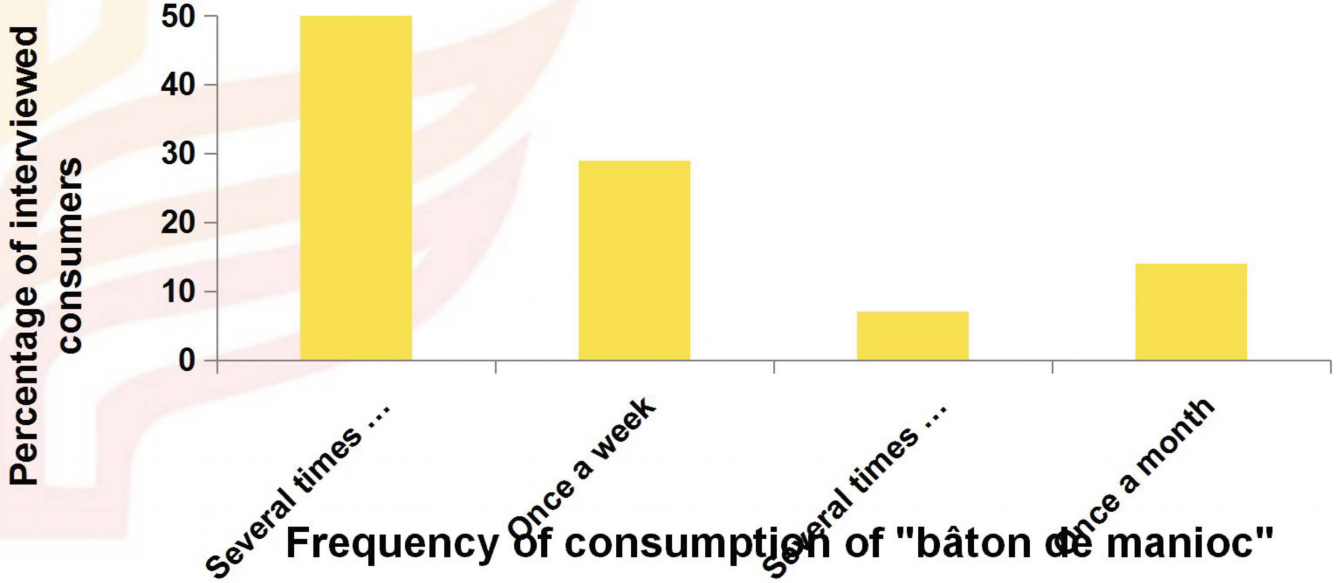
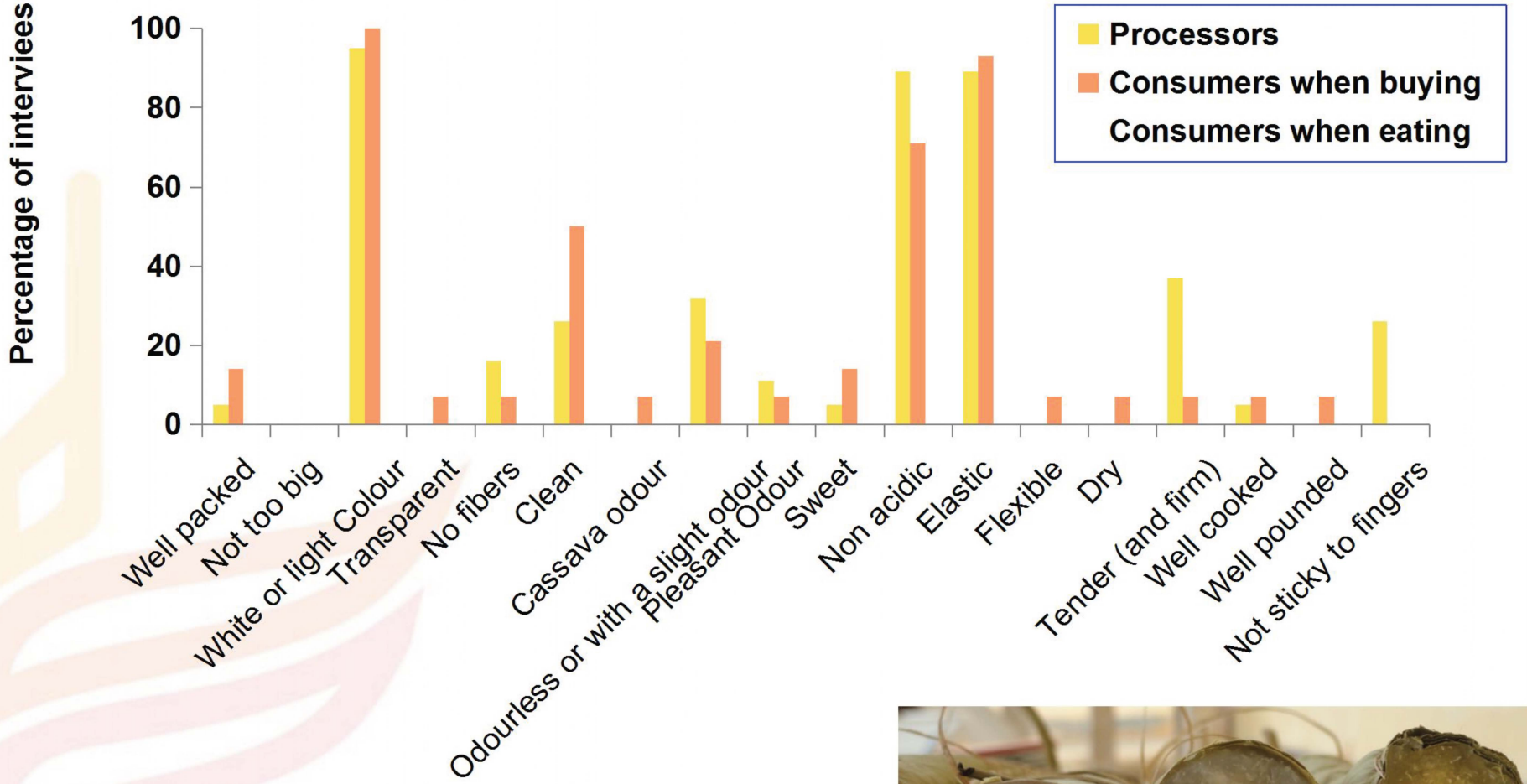
Habits of consumption of bâton



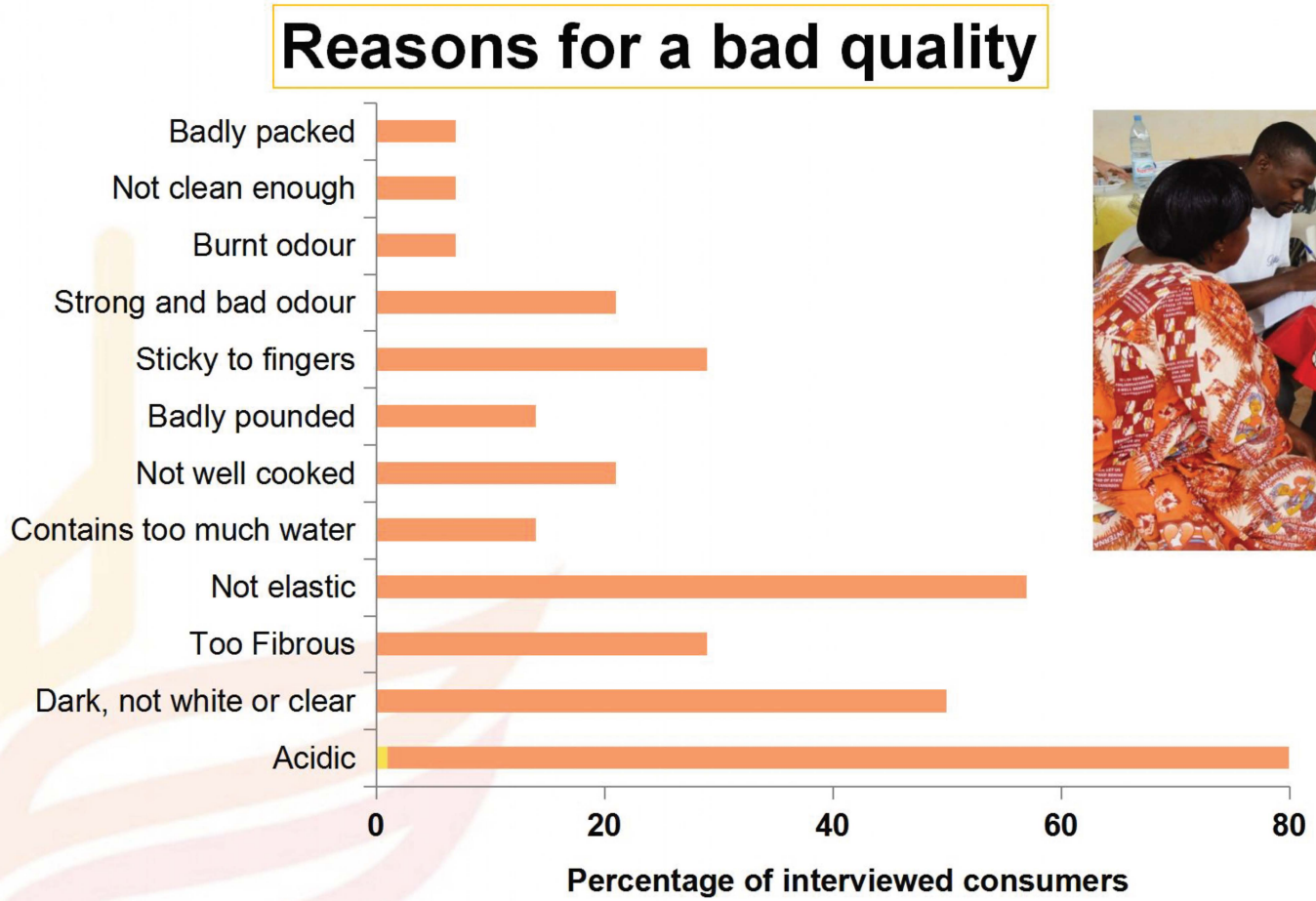


Quality criteria of bâton de manioc

Research Program on Roots, Tubers and Bananas



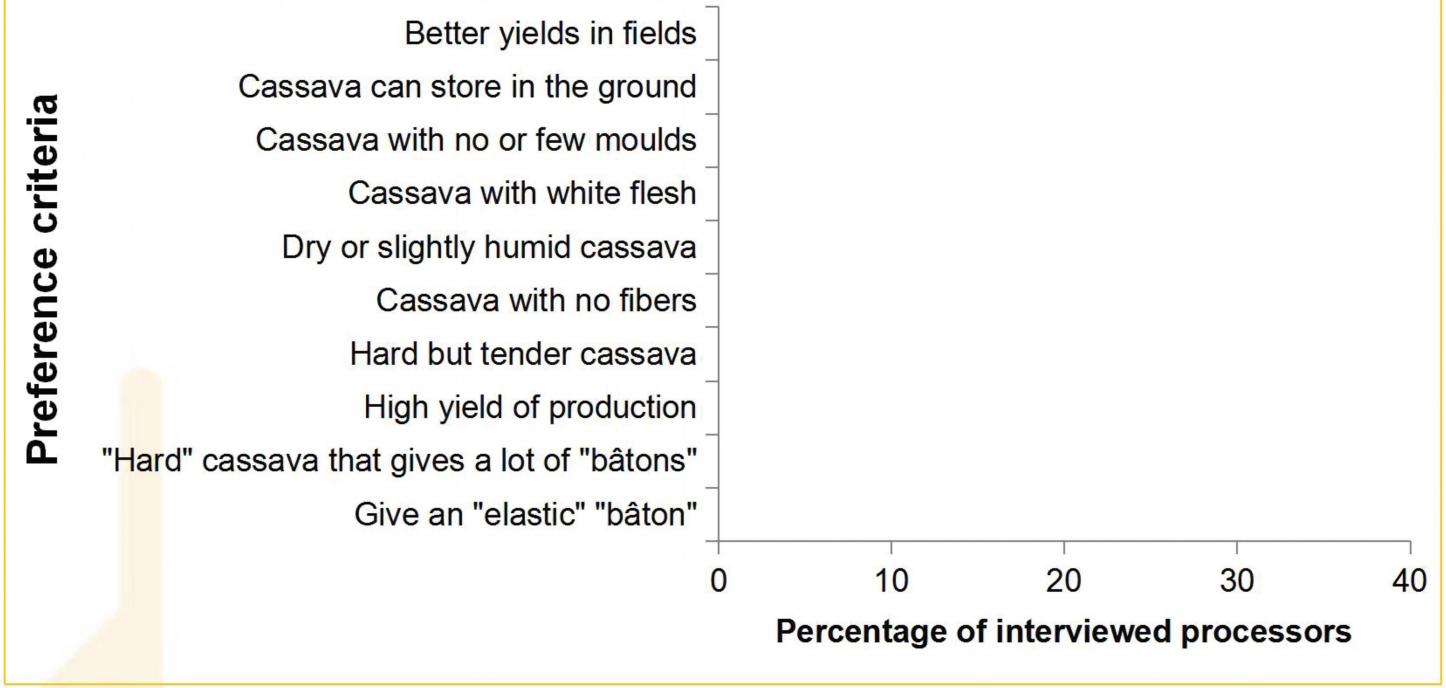
Bad quality according to the consumers

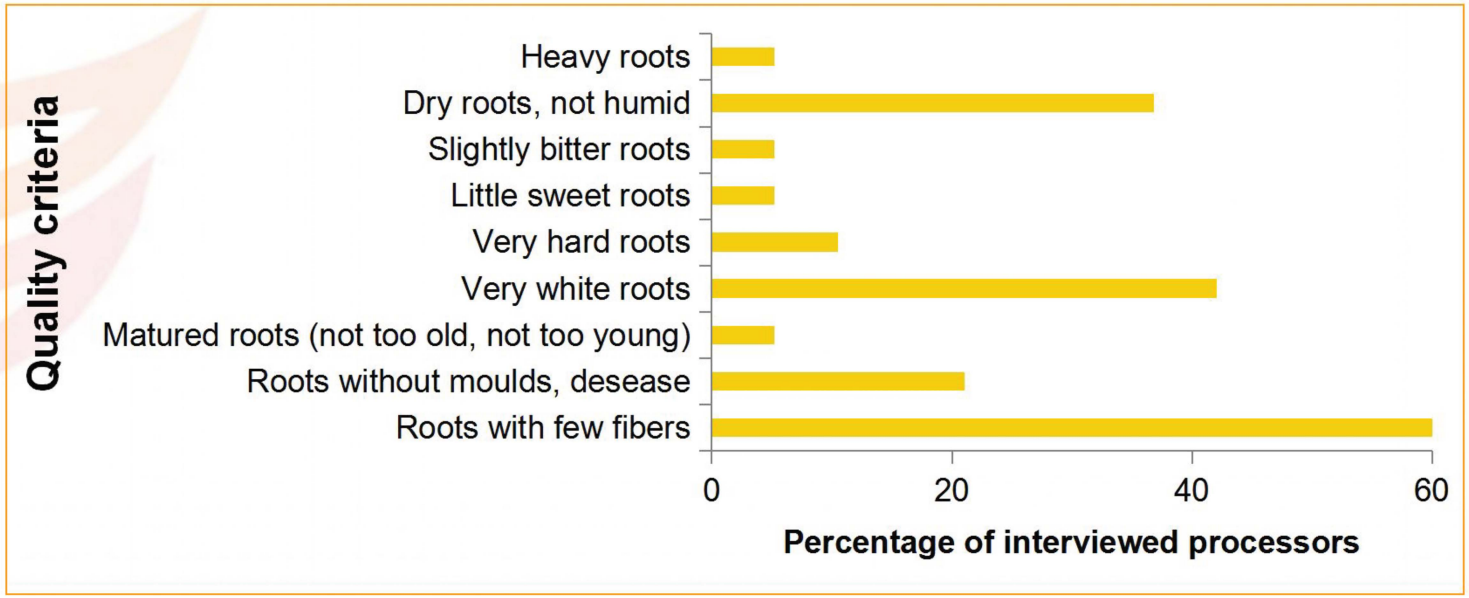


Cassava local varieties preferred by processors

	Mbalamayo	Awae III	Evodoula
CITED VARIETiES	- Variety with white peel and flesh - Variety with a red peel - Nkolovone - Ntolobikoua (bitter cassava) - Ola - Manafobo - Mimboudou - « 6 month » - Ziambomadzé	<u>Local varieties</u> : - Mevini - Mvousou - Director - Sola - Ngon-Ebe - Ignuma <u>Improved varieties</u> : - Mademoiselle (023) - 326 - 057 - Marcel (211)	- « 6 month » - Kampo - Ziambomadzé - Cassava from Bassa - Moon - Gabon - Manmbon
PREFERRED VARIETIES	Not predominant preference	Mevini and Mademoiselle (023)	Not predominant preference

Cassava varieties preferred by processors





“Le bâton de manioc” in Cameroon

- Qualitative surveys all along the food chain :

  . Identification of the « champion » processor

- Processing of cassava roots into « bâton »

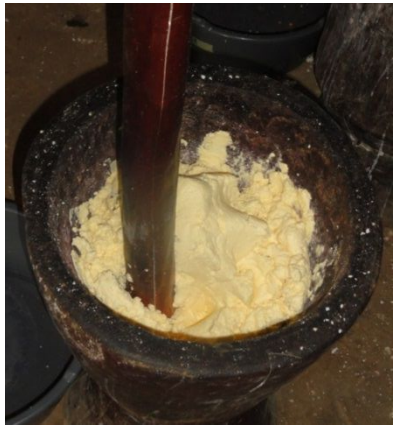
  . Adoption or rejection of some varieties : 8 out of 17 have been selected

- Acceptability by consumers: with 5 out of 8 bâtons, finally selected with the agronomists

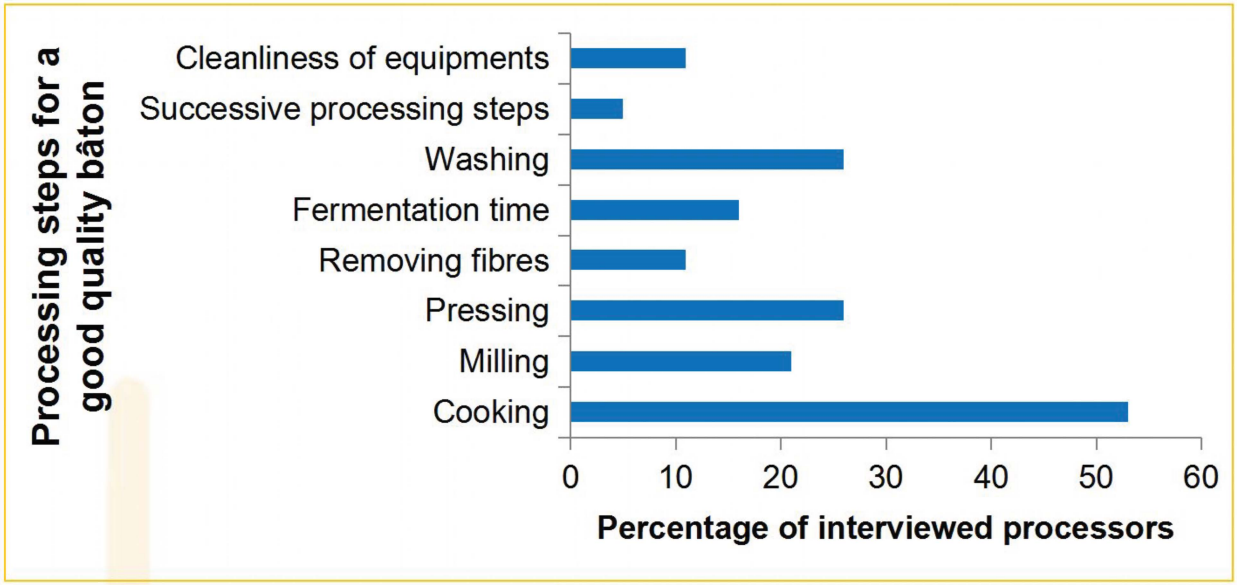
Processing of bâton de manioc

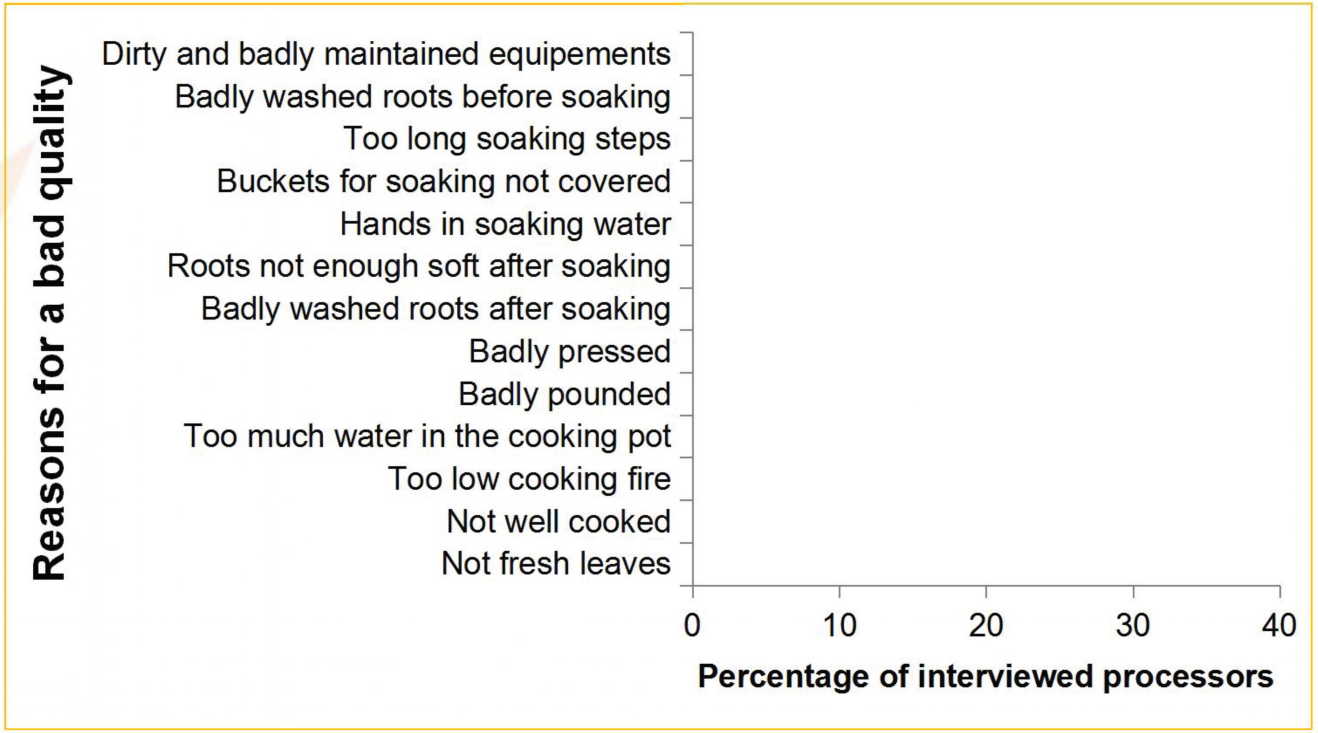
Bâton is a cassava product obtained after

- **Peeling of the roots**
- **Soaking, fermentating**
- **Removing fibers**
- **Pressing**
- **Pounding and/or milling**
- **Shaping into leaves** of *Megaphrynium macrostachyum* or other *Marantaceae*
- **Steam cooking**



Quality according to the processors





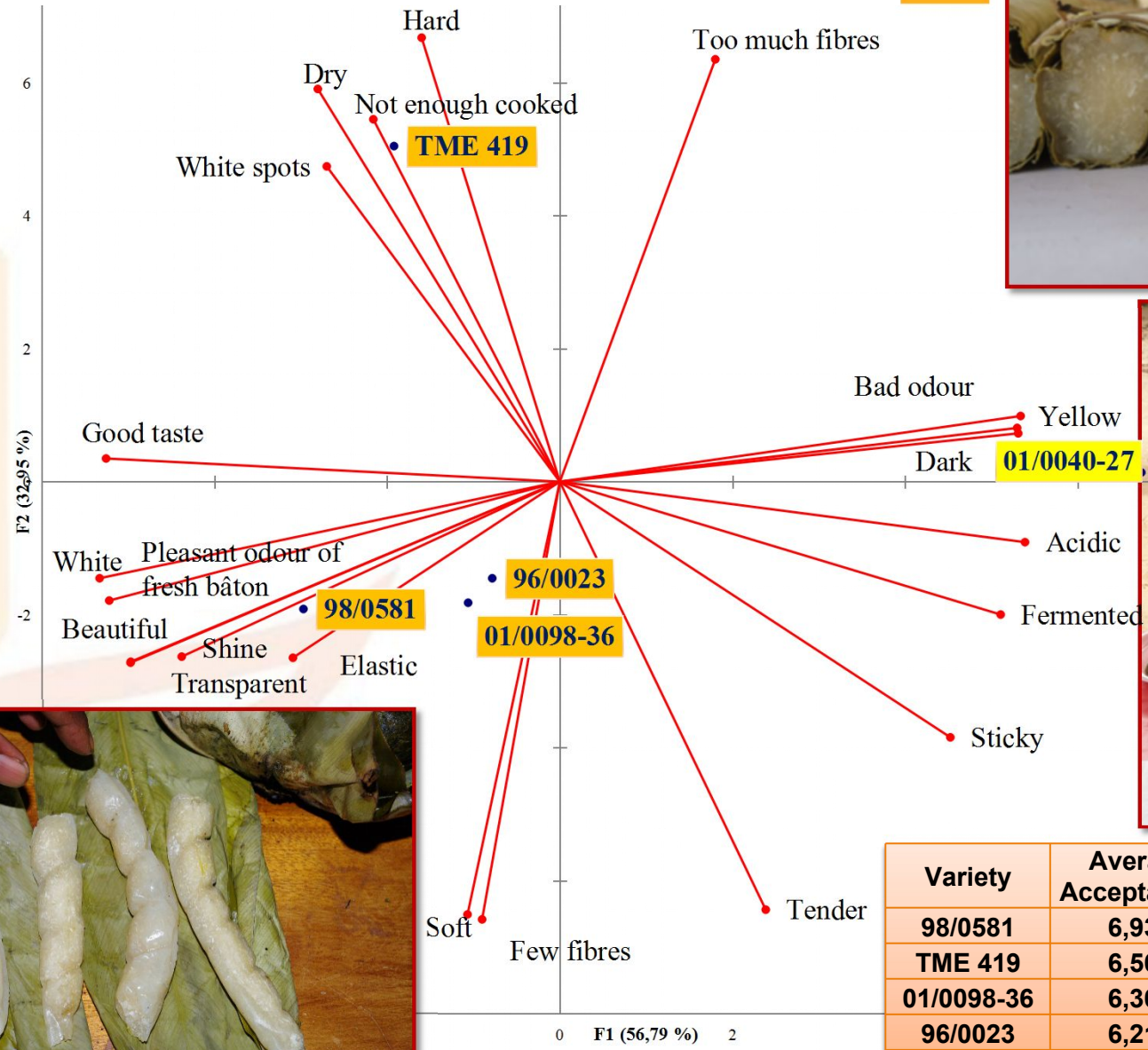
Participation of processors in the adoption of the 17 IITA improved varieties

Varieties	Observation at the harvest	Processors' comments during peeling
01/0098		Tender and very white roots, with no fibres, but seem very wet
96/0023	Moulds but many and beautiful roots	No fibres, big roots with a high weigh, that will produce a lot of bâtons
8034		Too tender and too wet roots ; they will not give a lot of pulp
01/1814-9		Yellow cassava : not good for making bâton (difficult to sell it at markets), difficult to be peeled, too much fibres, The processor would not choose a yellow variety to make and sell bâton
92/0057		Too fibrous, plus que 01/18149, la machette passe difficilement pour couper la racine
98/0581		Good cassava because white, not a lot of fibres
95/0211		Beautiful cassava, no fibres but roots are too small
01/009836		Easy and fast to peel, not humid, not too many fibres
01/009832		Too small roots, more difficult to be peeled, no fibres, not too much humid
01/108655		Too much fibres but very dry
96/1414		Beautiful , dry and big roots that will produce a lot, Few fibres . Moulds on some roots
92/0326	Moulds but many and beautiful roots	Humid, no fibres
01/0040-27		Yellow cassava with a red peel, no fibres., not bitter, not humid, just the colour
MM97/JW2-2		Yellow cassava, no fibres, dry, problem with the colour only
LMR	A lot of moulds	Good, roots are very big, tender, not humid, no fbres
95/0109		Peel is attached, dry, not too much fibrous
TME419	Moulds	Well dry, very white, no fibres

Processors'participation in the adoption of the varieties

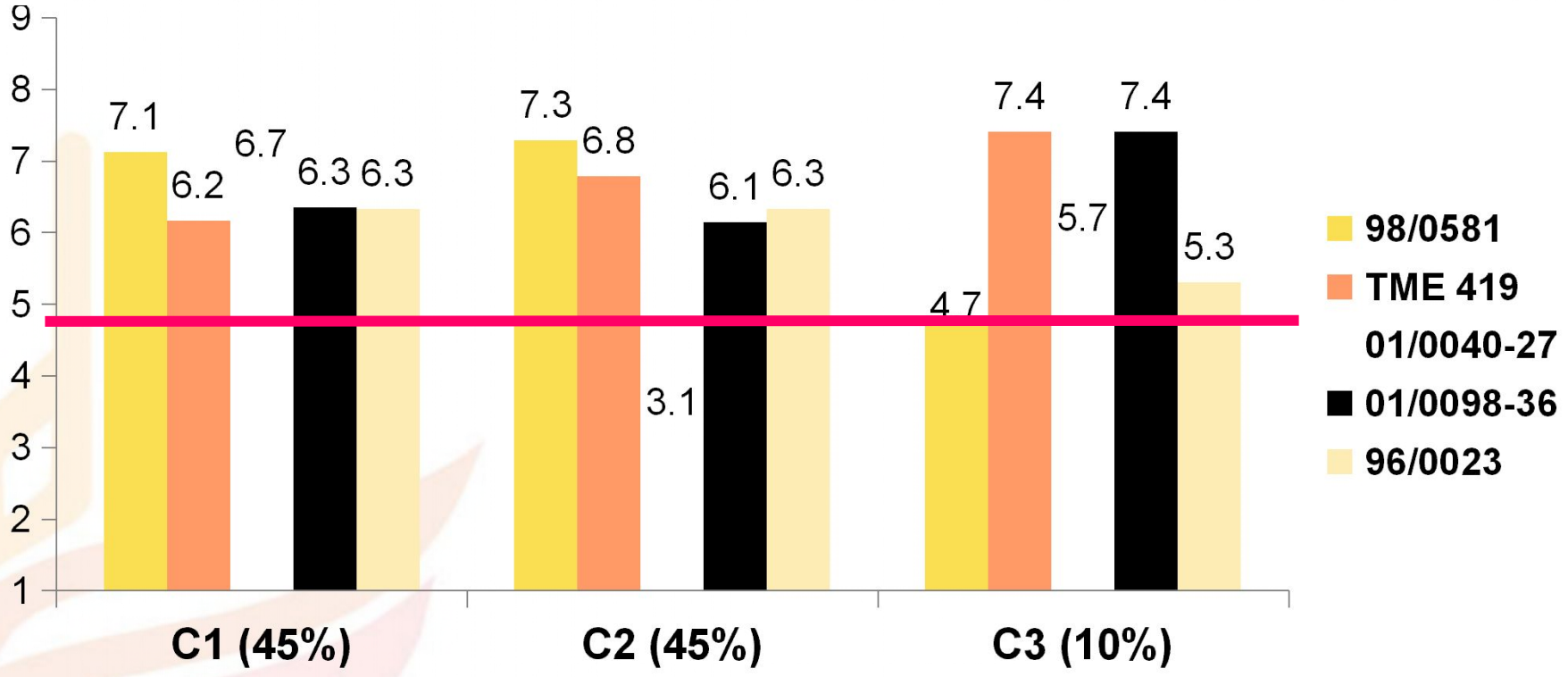
Varieties	Comments after pressing	Comments after steam cooking
01/0098	Good for bâton	Very elastic, no fibres, stick slightly to fingers, not acidic
96/0023	Good for bâton	Not elastic at all, slightly acidic, soft, the whitest
8034	Good for bâton	Fermentation odour, not acidic, well white, excellent
01/1814-9	Good, except the colour	Yellow bâton, smell soaked and spoiled cassava, no fibres, not enough elastic
92/0057	Too much fibres	X
98/0581	Good for bâton	Very white, good, slightly sweet, not acidic, not sticky, no fibres
95/0211	Not too bad, but a lot of fibres, need a lot of work to remove fibers	X
01/009836	Good for bâton	Very white, look nice, elastic, not acidic
01/009832	Too much fibres	X
01/108655	Too much fibres	X
96/1414	Not too bad, but a lot of fibres, need a lot of work to remove fibers	X
92/0326	Too hard, did not soften after three days of soaking	X
01/0040-27	Good, except the colour	No odour, more elastic than 01/1814-9, not acidic. The best yellow variety !
MM97/JW2-2	Not too bad, presence of some fibres, a little bit hard, the colour is not accepted	Not elastic, break easily, fermentation odour, slightly acidic
LMR	Good for bâton	Not elastic, too soft, light, watery, few fibres
95/0109	Good for bâton	Really very elastic, white, not acidic, no fibres, very good ++
TME419	Good for bâton	Look nice, very elastic, very good ++, not acidic

Acceptability of cassava « bâton » made from 5 IITA improved varieties in Cameroon



Variety	Average Acceptability	Groups		
98/0581	6,938	A		
TME 419	6,565	A	B	
01/0098-36	6,365		B	
96/0023	6,219		B	
01/0040-27	5,021			C

Overall acceptability of the 5 selected bâtons Hedonic test



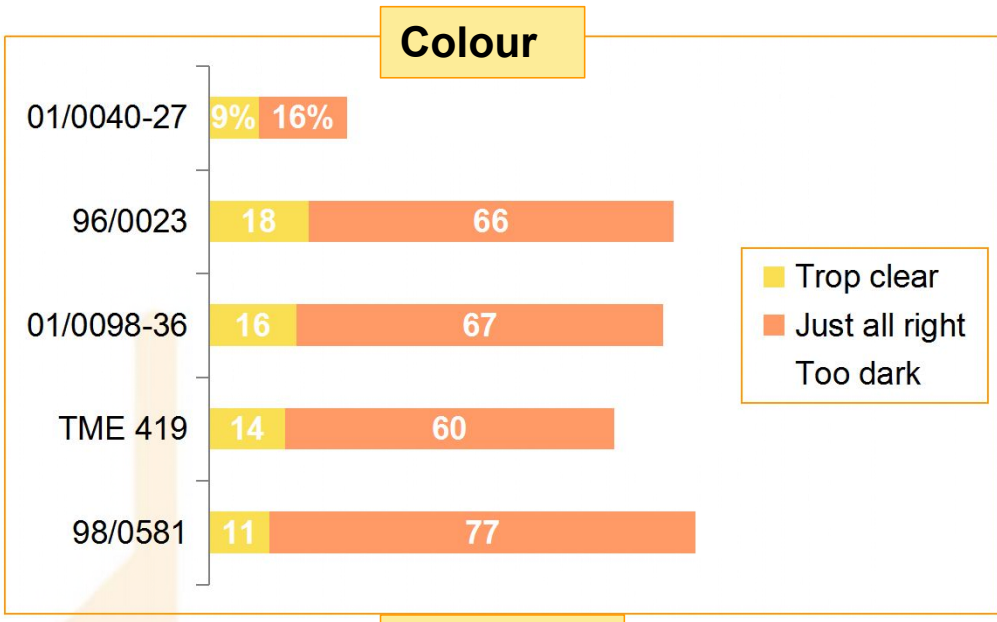
Bâton
All likers

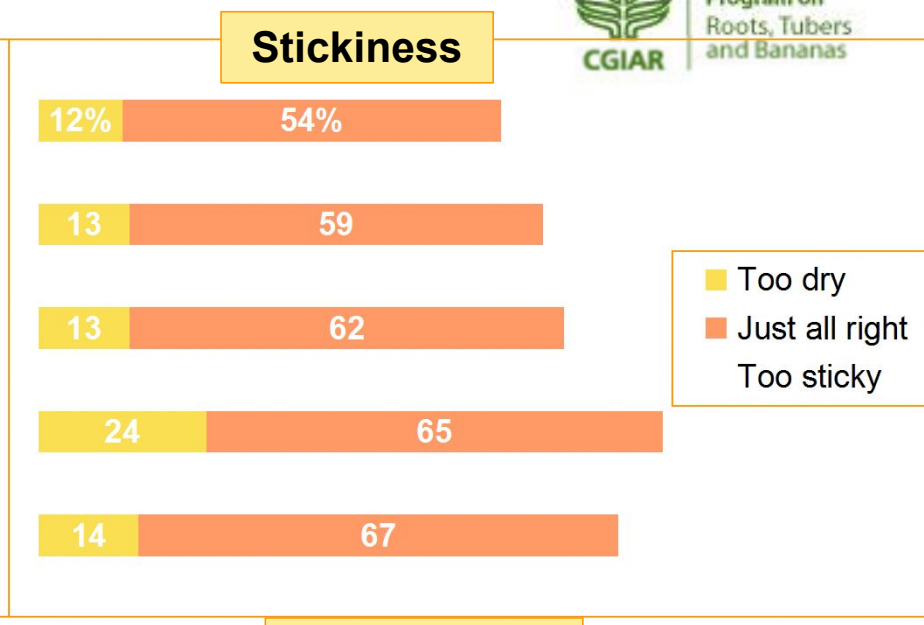
01/0040-27
dislikers

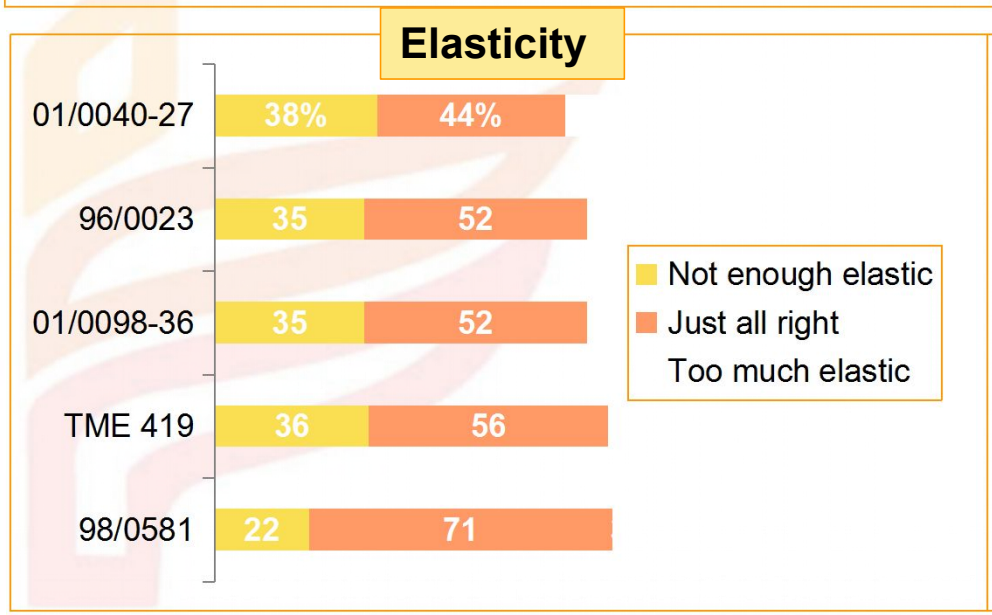
TME419 and
01/0098-36 likers

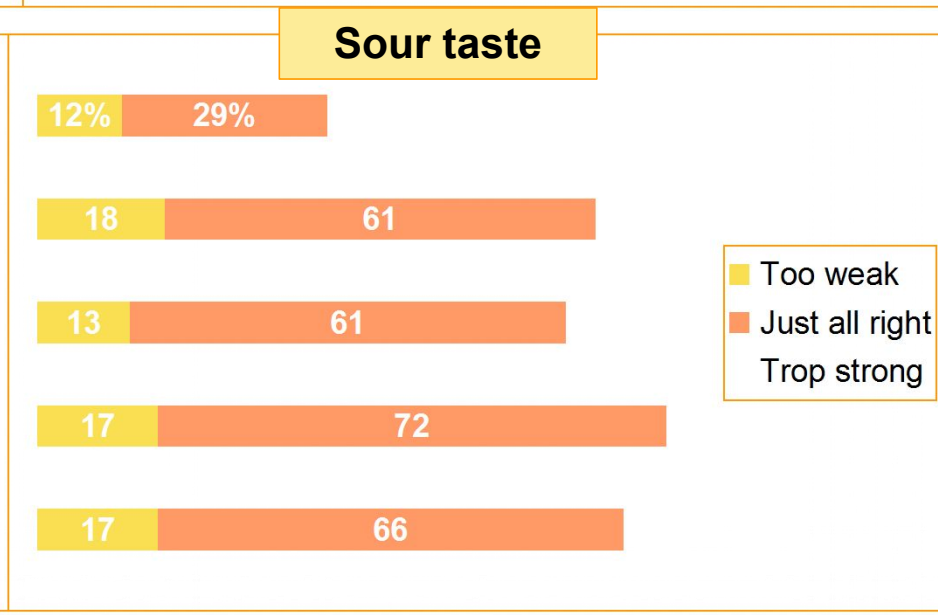
Overall acceptability of the 5 selected bâtons

JAR test









The Gari in Buea, South-West region, Cameroon

Research Program on Roots, Tubers and Bananas

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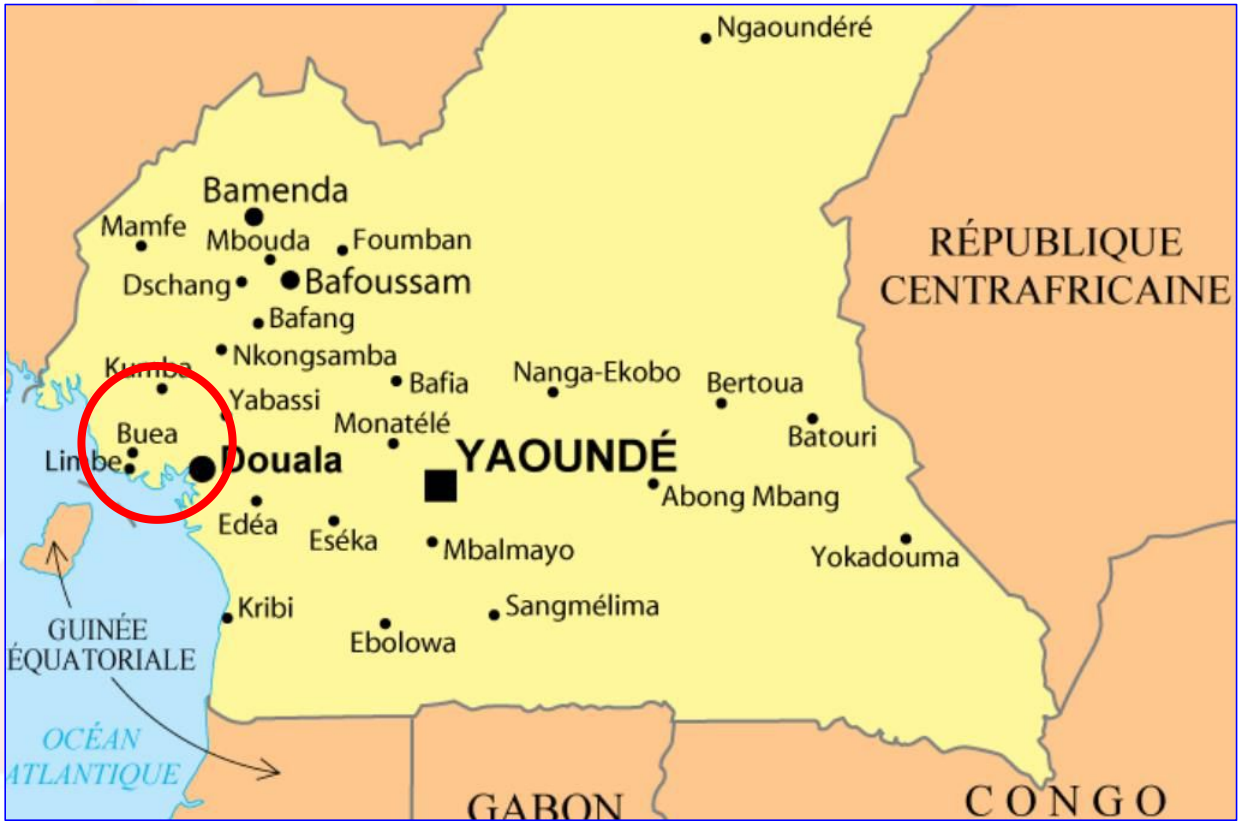
Several points to underline :

- ✓ Buea is an anglophone part in Cameroon with a **local language : pidgin**, difficult to understand even by british people !

- ✓ The process for making Gari is not so “delicate” than the one for making bâton and the “champion processor” could **process all the 17 varieties**



Five steps

1

Qualitative Surveys
Food chain Surveys
With each stakeholder

Variability of products, processes, varieties
Various forms of consumption

Quality criteria

Processing
Buying
Consuming

2

Participatory
Involvement of processors

3

Focus groups
Ranking test

Physicochemical analysis

4

Consumer Acceptance

Hedonic tests

JAR Tests

CATA question

Willingness to pay

5

Gari processing in Buea Cameroon

Peeling

Washing

Rasping

Pressing

Pressing

Sieving

Drying

Cooking

Processors' comments on roots and during processing

Varieties	Weight (d.b.)	Dryness	Size	Colour	Fibres	Moulds	Difficult to peel	Long to peel	
01/0040-27		x	++	Yellow					
01/0098	-	x	++	Not white shine		x			
01/009832				x	x	x			x
01/009836	-		++						x
01/108655	++			x		x			x
01/1814-9	-	x	++	Yellow			x	x	
92/0057	+	x	++	x					x
92/0326	++		+	x					x
92/0067				Not white shine		x	x	x	
95/0109	++	x		x		x			x
96/0023	++		++	Not white shine			x	x	
96/1414	++	x	++	x					x
98/0581		x	+	x					x
8034		x		x					x
MM97JW22			++						
LMR	++	x	++	x					x
TME419	+	x	+	x					x

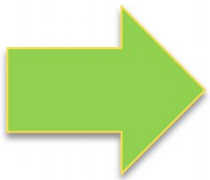
Processors' comments of the 17 gari products

Research Program on Roots, Tubers and Bananas

Colour	Shine	Fiber	Particle size	Draw	Dryness	Odour	Taste	Acidity	Willingness to buy	Varieties
										01/0040-27
x			x		x	x	x	x	x	01/0098
x	x		x	x	x	x		x	x	01/009832
x	x			x			x		x	01/009836
x				x				x	x	01/108655
				x						01/1814-9
x				x			x	x	x	92/0057
	x			x			x	x	x	92/0326
		x		x			x	x		92/0067
			x							95/0109
			x					x	x	96/0023
x	x		x	x	x			x	x	96/1414
				x				x		98/0581
x			x	x	x	x	x	x	x	8034
										MM97JW22
			x	x	x			x	x	LMR
x			x	x		x	x		x	TME419

Focus groups : Ranking test of the 17 gari

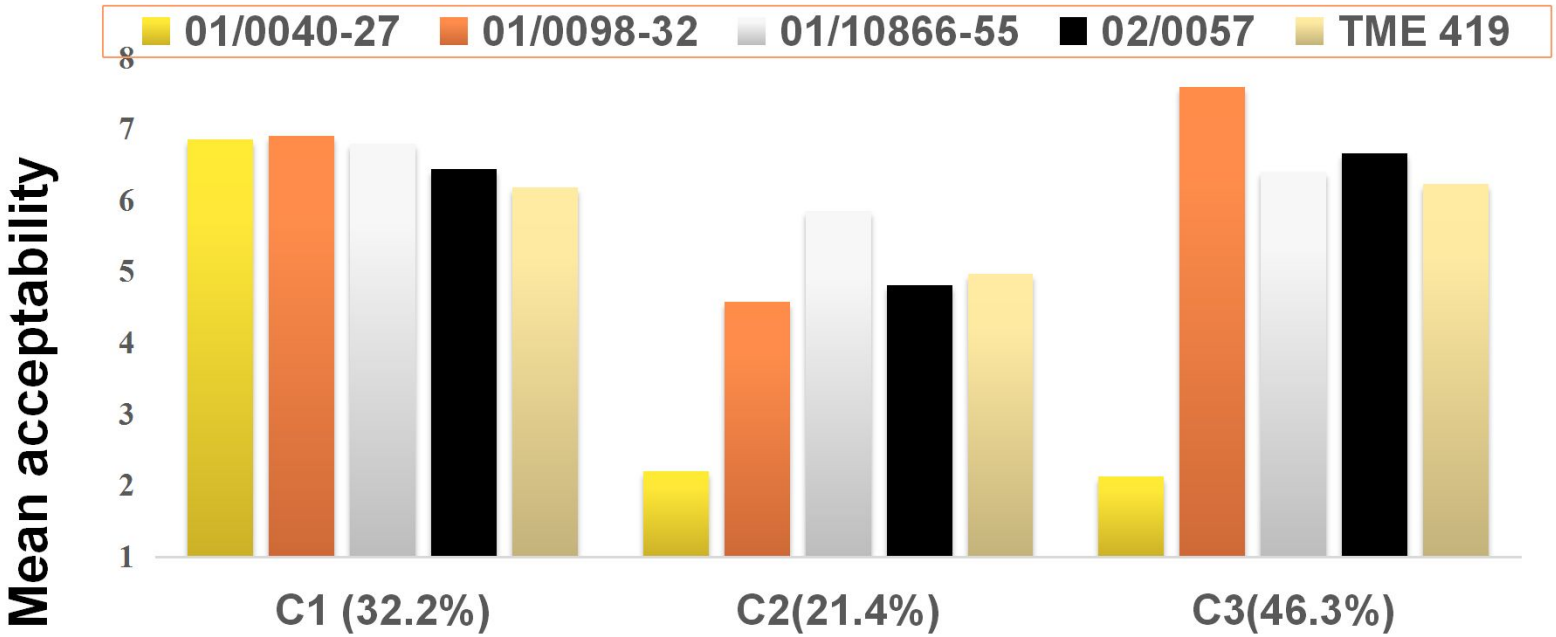
Varieties
01/0040-27
01/0098
01/009832
01/009836
01/108655
01/1814-9
92/0057
92/0326
92/0067
95/0109
96/0023
96/1414
98/0581
8034
MM97JW22
LMR
TME419



Varieties
01/0040-27
01/0098
01/009832
01/009836
01/108655
01/1814-9
92/0057
92/0326
92/0067
95/0109
96/0023
96/1414
98/0581
8034
MM97JW22
LMR
TME419

Overall acceptability of the 5 selected gari

	Overall acceptability mean
01/0098-32	6.7 a
01/1086-55	6.4 a b
02/0057	6.2 a b
TME 419	5.9 b
01/0040-27	3.7 c



Sensory descriptors relative to the 5 selected Gari CATA question

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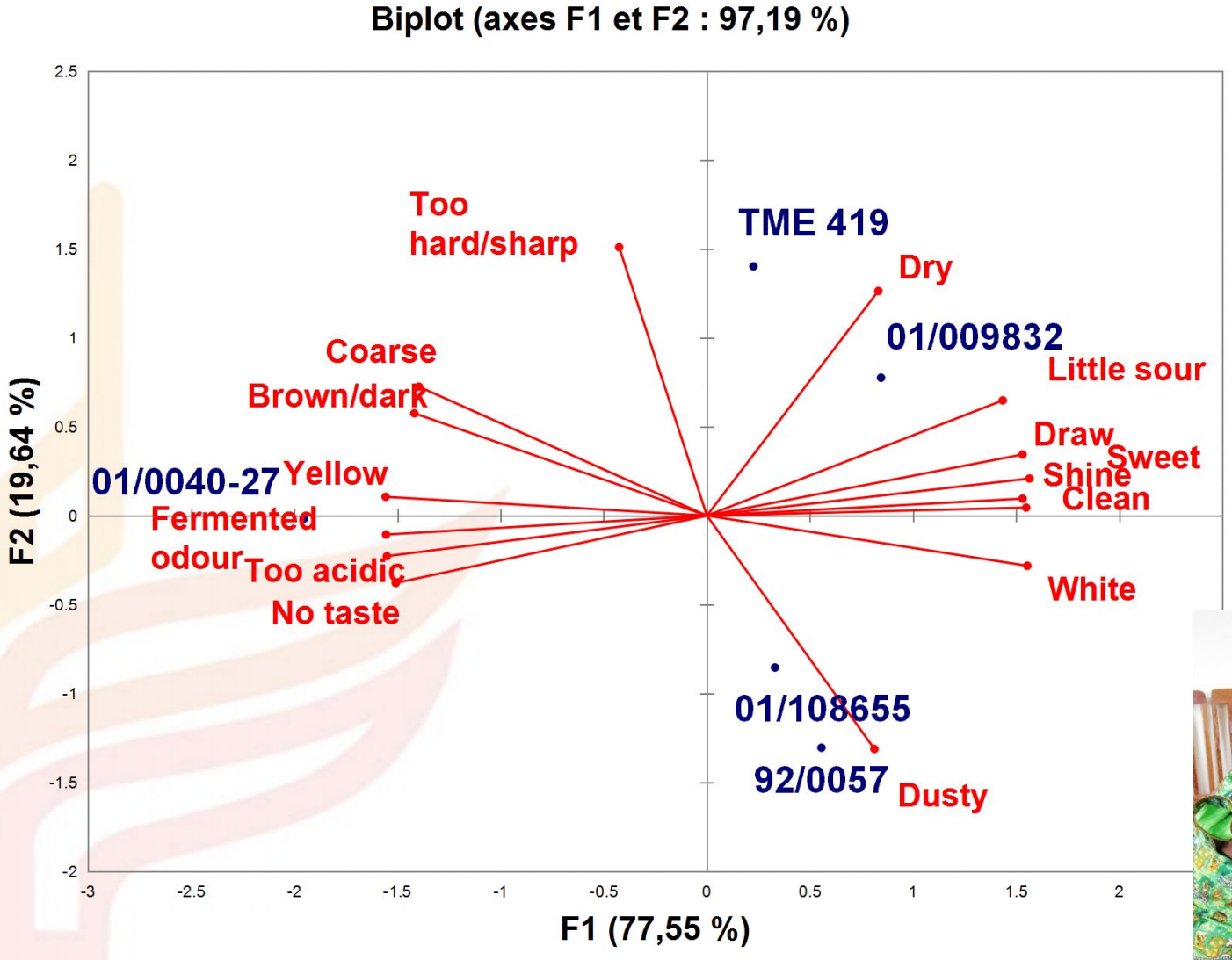
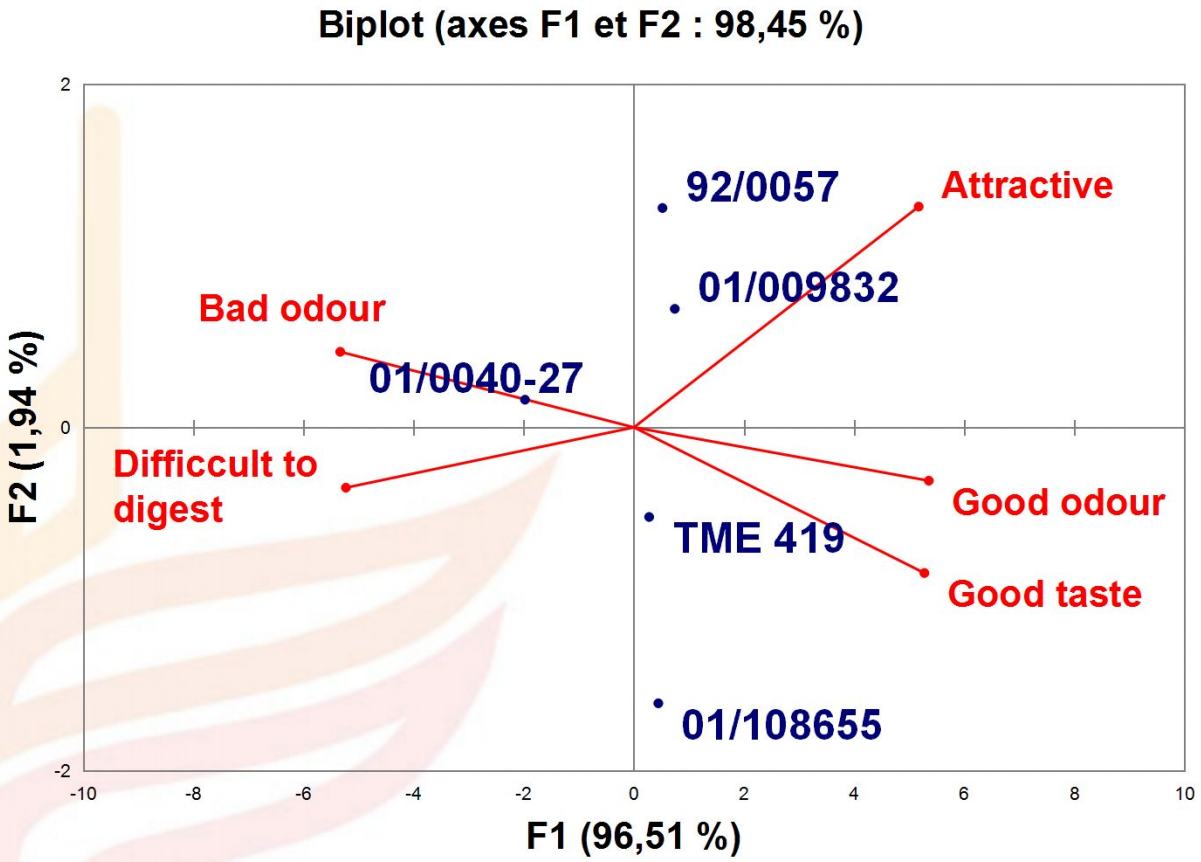
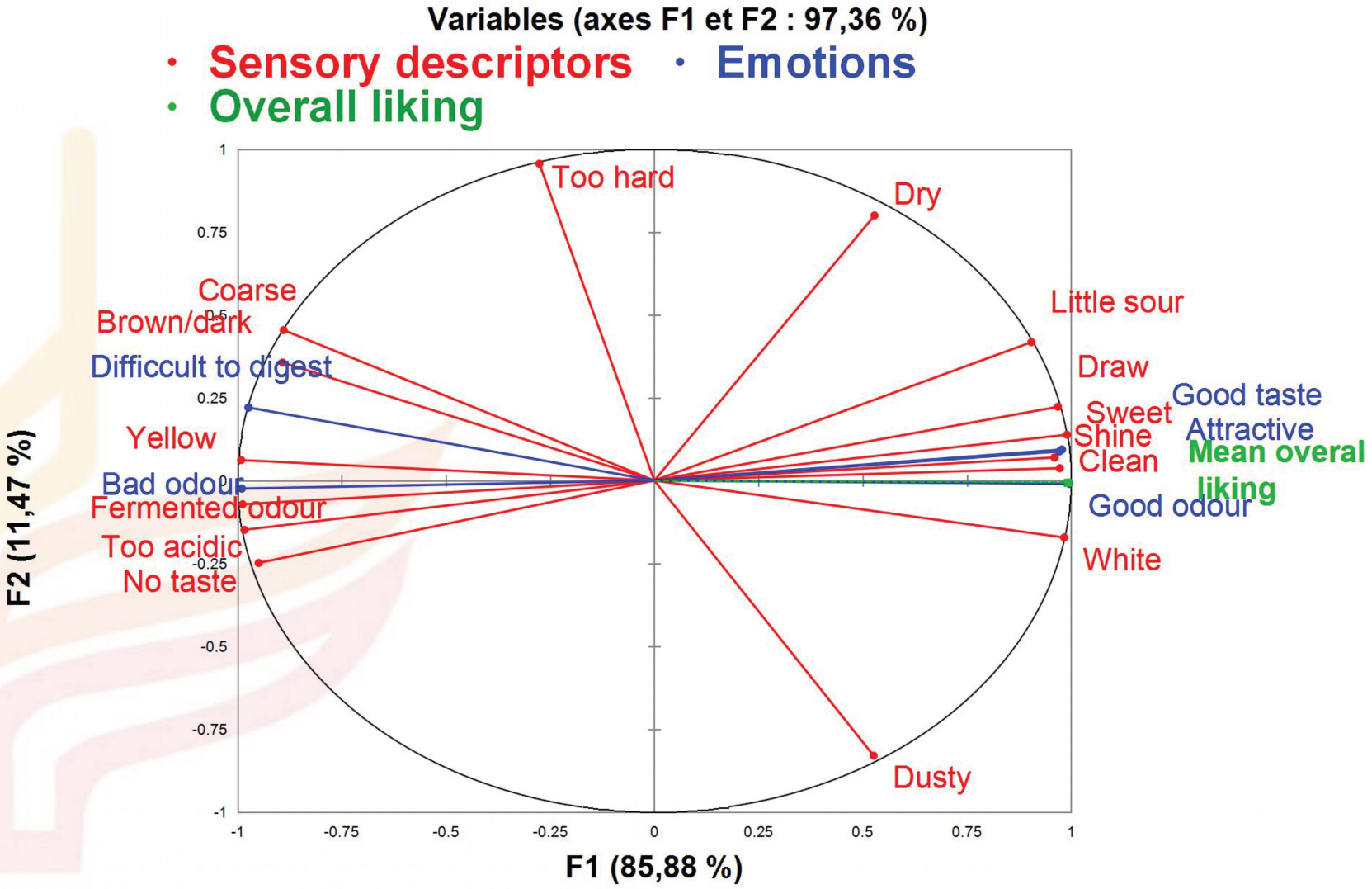


Emotional descriptors relative to the 5 selected Gari CATA question



Sensory and emotional descriptors and overall liking of the 5 selected Gari



The most liked cassava varieties for gari and for bâton were different

	Overall acceptability mean
01/0098-32	6.7 a
01/1086-55	6.4 a b
02/0057	6.2 a b
TME 419	5.9 b
01/0040-27	3.7 c

	Overall acceptability mean
98/0581	6.94 a
TME 419	6.56 a b
01/0098-36	6.36 a b
96/0023	6.22 b
01/0040-27	5.02 c