

Original Research Article

**FARMERS' PERCEPTION ON MAIZE
PRODUCTION IN THE HUMID FOREST AREA
OF CAMEROON**

ABSTRACT

A Participatory Rural Appraisal (PRA) was conducted in five villages in the Bimodal Humid forest zone (BHFZ) of Cameroon in 2013. The objectives of the study were to elucidate farmer's perceptions on maize cultivars and to identify farmer's constraints on their maize production system. Ten farmers were randomly selected from each of the five villages to form the main focus group of 50 people. A total of 178 farmers were individually interviewed. Quantitative data analyses were performed using least square means of the Statistical Package for Social Scientists (SPSS) version 17. Ranking, scoring and pair wise scoring were used in each of the focus groups. Results showed that poor soil fertility was among the major six problems listed by farmers in the BHFZ. Maize was the main cereal produced as food and cash crop in the study area. The main land management practice was slash and burn with a fallow system. The major constraints facing farmers were inadequacy of improved varieties, post-harvest handling challenges, weeds infestation, poor soil fertility and high cost of fertilizers. Therefore, it became necessary to explore for more sustainable and affordable ways of increasing yield of the crop through identification of high-yielding and stable maize tolerant to these farmer's constraints. The practice of appropriate agricultural system associated with the utilization of improved and adapted varieties could significantly increase their maize yield.

Keywords: Participatory Rural Appraisal; farmer's constraints; focus group; soil fertility, Maize tolerant.

1. INTRODUCTION

Maize productivity in sub-Saharan Africa as in Cameroon is low due to the variable production environment, stress and limited access to essential inputs. Maize (*Zea mays* L.) production in Cameroon is mainly in the hands of small scale farmers. Farmers grow the crop in highly variable and stress-prone environments [1]. The level of adoption of improved maize varieties was estimated in some villages in the humid forest zone of Cameroon and found to be low compared to the use of local varieties in those areas [2]. For effective breeding program, farmers' preferences for varieties should be clearly identified through researcher-farmer interaction and collaboration [3]. Breeders should involve farmers in their breeding programs to learn more about the most important selection criteria of male and female farmers for the cultivars preferred in their environments [4]. This encourages the use of locally adapted cultivars resulting in less dependence on introductions. Such a strategy has resulted in selection and development of new wheat, barley, common bean, quinoa, potato and maize cultivars in various part of the world [4]. This is a clear indication that breeders must be well acquainted with the farmer preferences such as the requirements for

specific agronomic criteria, storage, processing and marketing traits if adoption rate is expected to be high [4]. The Bimodal Humid Forest Zone (BHFZ) of Cameroon has in the recent past seen the integration of maize into the cropping system. This has largely been due to the high demand for maize especially the fresh green cob in the administrative capital, (Yaounde), and the high return on the per unit area compared to the traditional root crops. However most of the soils in this zone are acidic, decreasing the yields [5]. The Acid Tolerant Population (ATP) introduced to the area decreases in yield when grown in the acid soils [6]. With the farmers' inability to correct acidity of the soils by applying agricultural lime, it has become imperative to develop acid tolerant hybrids which are also high-yielding. These hybrid varieties should have stable yield in most of the soils of the BHFZ. To develop a successful and adopted maize improved variety, it is very important for the researcher to consider farmers' preferences in terms of their ideal maize variety and also their specific needs vis-à-vis the cropping of the crop. It is with this reason that a participatory rural appraisal (PRA) in the South Region of Cameroon was carried out with the objectives of: (i) Elucidate farmer perceptions on maize cultivars (ii) Identify farmers' constraints on maize production.

2. MATERIALS AND METHODS

2.1 Study site

The study was conducted in the Bimodal Humid Forest Zone (BHFZ) of Cameroon which covered three regions out of 10 in the country. Five villages (Asso'osseng, Biyeyem, Djop, Ndengue and Nkoemvone) were involved in the study. The annual rainfall in BHFZ is 1800 mm with bimodal distribution [7]. The soils are Oxisols and typically Kandiodox highly weathered and dominated by kaolinitic clay with high Aluminium (Al) toxicity [8]. The study site mainly has forest vegetation with mixed cropping as the main farming system. The crops grown include cocoa, maize, groundnut, cassava and yam. The villages were selected based on their acidic nature of the soils where maize is a major cereal crop cultivated.

2.2 Sampling procedure and data collection

A multidisciplinary research team comprising of a Plant Breeder, (the principal investigator), a social scientist, a facilitator, an agricultural extension officer, three students at the Masters level from the University of Yaounde and SupAgro Institute of Montpellier, France.

The selection of the households within each of the five villages was done through random sampling of farmers who were planting maize either as a sole crop or as a mixed crop in the studied area, their willingness and availability to cooperate with the research team. Focus group discussion was used where, 10 farmers were randomly selected from each of the five villages to form the main focus group of 50 people. These farmers were subdivided into five groups. For socio-cultural reasons and free discussion among the farmers, male and female groups were formed separately. Contact was established with the group via telephone and or government zonal extension agent.

The focus group discussion was done using the format below as guidelines in developing a questionnaire:

- Introduction and purpose of the meeting
- Presentation of research team
- Presentation of the representative of farmers in the village
- Questions on farming system(s)

- 72 • Questions on crop production with more emphases on maize cropping
- 73 • Questions on the difficulties encountered in farming
- 74 • Questions on marketing, labor and expectations including other comments.

75 A recorder was discretely used during the group discussion to facilitate information
 76 gathering. In addition, illustrated charts were used to help elicit farmers' preferences,
 77 difficulties and their geographical location. [9] also adopted the same way in their work. The
 78 questions were translated into local language to help farmer understanding and for
 79 clarification of information. This was either done by a research team member or a participant
 80 from the farmers' group.

81 Although a leader guided the discussion, other scientists could intervene at any moment in
 82 case some relevant information may have been skipped. The zonal extension agent was the
 83 key informant and when necessary, added information when farmers were not able to
 84 provide. Care was taken to avoid people monopolizing the discussion because of their
 85 wealth status or their leadership role.

86 The group discussions involved listing of production constraints, varieties grown and
 87 identifying the preferred traits of maize cultivars. In the focus group discussions, individuals
 88 and group members were at times asked to write their contributions and present to the
 89 farmer group. Additional relevant data were also collected from secondary sources such as
 90 published and also from the Agriculture ministry in relation to agriculture production in the
 91 study areas. Farmers were randomly selected to list the five most pertinent problems of
 92 farming which were characterized. The weight of each problem was estimated by attributing
 93 the coefficient 1 to 5 to the best five pertinent problems with the coefficient 5 attributed to the
 94 main difficulty encountered.

95 A structured questionnaire was prepared based on the information gathered from the focus
 96 group discussions. A questionnaire was drafted to gather individual household information in
 97 each village. Individual interviews were used to assess thoughts, opinions, and feelings of
 98 individual farmers. A total of 178 farmers were individually interviewed.

99 **2.3 Data analysis**

100 The qualitative data were analyzed using descriptive statistics to characterize the sample
 101 households in terms of different socio-economic and biophysical features. While the
 102 quantitative data analyses were performed using least square means of the Statistical
 103 Package for Social Scientists (SPSS) version 17. Descriptive statistics, Stata software for
 104 modelization and mean comparisons were used for data collected in each village followed by
 105 comparisons among villages. Ranking, scoring and pair wise scoring were used in each of
 106 the focus groups.

107 **3. RESULTS AND DISCUSSION**

108

109 **3.1 Focus group discussion**

110 Farmers were randomly selected the five most pertinent problems listed by the selected
 111 farmers. Farmers ranked change in weather as the most important constraint followed by
 112 post-harvest decay and weeds infestation (Table 1).

113

Table 1: Production constraints by farmers and their classification in order of priorities

Problem	Weight	Ranking
Change in weather	22	1
Conservation problem (post-harvest problem)	17	2
Weeds control	13	3
Market problem	12	4
Maize shelling problem	10	5
Poor soils (set-aside)	9	6
High cost and lack of fertilizers	9	7
Field road management problem (infrastructure problem)	5	8
Unawareness on improved and adapted seeds	5	9
Pests and diseases	3	10

Pests and diseases were reported to be the least important (rank 10). All the constraints were grouped into biotic and abiotic problems (Figure 1). The expression of abiotic constraints was higher at Asso'ooseng, Nkoemvone, Ndjop and Ndengue.

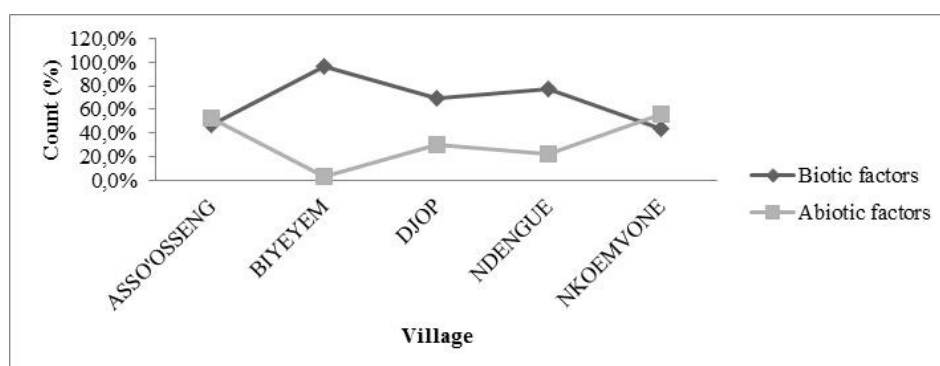


Figure 1: Major constraints to maize production

3.2 Individual interviews

3.2.1 Farmer characteristics

The sample of farmers from Ebolowa was composed of 53% women and 47% of men. At individual village level, there were more women than men in Asso'ooseng and Djop (Figure 2).

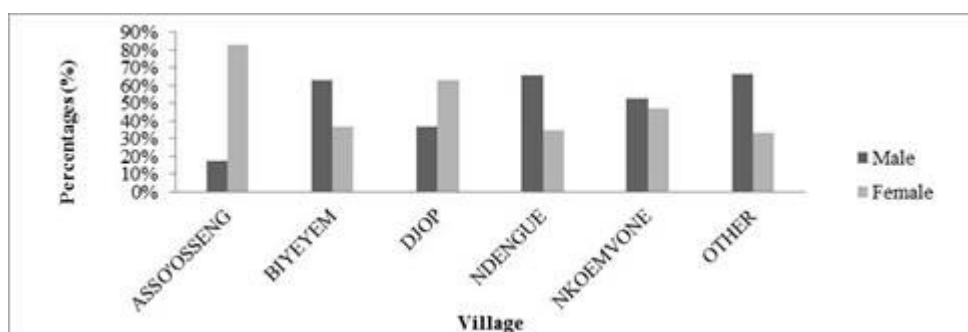


Figure 2: Farmers' distribution according to gender

Farmers were also classified according to their age per village and their level of education (Table 2). Many (43.8%) farmers were between 31 – 45 years old while 34.4% of farmers were between 46-65 years old. At Biyeyem, there were no farmers less than 30 years and over 65 years old. The highest level of study achieved by farmers was secondary school and 56.9% of them had reached that level (Table 3).

Table 2: Farmers' distribution according to the age per village (%)

Characteristics	Villages					Overall
	Asso'osseng	Biyeyem	Djop	Ndengue	Nkoemvone	
Age of farmer						
< 30 years	17.2	0.0	40.7	13.8	17.6	18.8
31 – 45 years	20.7	56.5	44.4	48.3	58.8	43.8
46 – 65 years	55.2	43.5	14.8	34.5	17.6	34.4
>65 years	6.9	0.0	0.0	3.4	5.9	3.1
Level of studies						
No formal education	10.3	4.0	0.0	10.3	0.0	5.4
Primary	51.7	16.0	51.9	34.5	23.5	36.2
Secondary	37.9	80.0	48.1	51.7	70.6	56.9
Tertiary (University)	0.0	0.0	0.0	3.4	5.9	1.5

None of the female farmers reached the tertiary school. The level of education as well as the age of the farmers was significantly observed in the size sample of the population (Table 4).

143 **Table 3: Farmers' characteristics according to the level of instruction per gender (%)**

	Gender		
	Male	Female	Overall
Age of farmer			
< 30 years old	18.7	18.5	18.6
31 – 45 years old	50.5	43.2	47.1
46 – 65 years old	29.7	34.6	32.0
> 65 years old	1.1	3.7	2.3
Level of studies			
No formal education	4.3	3.7	4.0
Primary	22.8	42.7	32.2
Secondary	63.0	53.7	58.6
Tertiary (University)	9.8	0.0	5.2

144

145 None of the female farmers reached the tertiary school. The level of education as well as the
146 age of the farmers was significantly observed in the size sample of the population (Table 4).

147 **Table 4: Chi square of some characters coming from the survey**

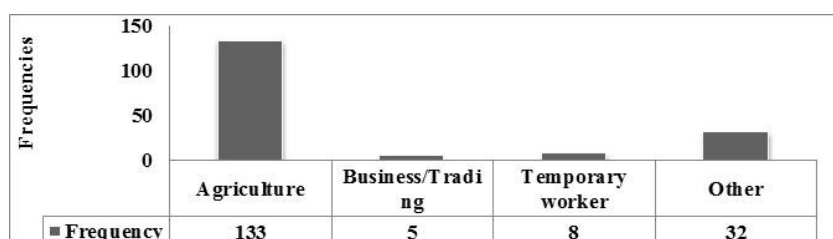
	Farmer sex				
	df	χ^2_{cal}	χ^2_{read}	P-value	Significance
Age of farmer	3	7.82	7.82	0.05	*
Level of education	3	14.26	7.82	0.003	**

148

149 *: significant at 5%; **: significant at 1% Independence: The null hypothesis is that the response category is
150 independent of the treatment group. The alternate hypothesis is that there is some sort of (ill defined) association.

151 **3.2.2 Farmers' activities**

152 The main activity practiced by farmers in all the five villages was agriculture (Figure 3).



153

154 **Figure 3: Sample distribution of farmers according to their main activity**

155 Also, the distribution of farmers based on their main activity per village (Table 5). At
156 Asso'osseng and Nkoemvone, 2.4% and 17.9% of farmers were temporary workers in the
157 Research Institute. Few of them manage small businesses (2.4% at Asso'osseng, 3.3% at
158 Ndengue and 7.7% at Nkoemvone) while most of them farmed (Table 5).

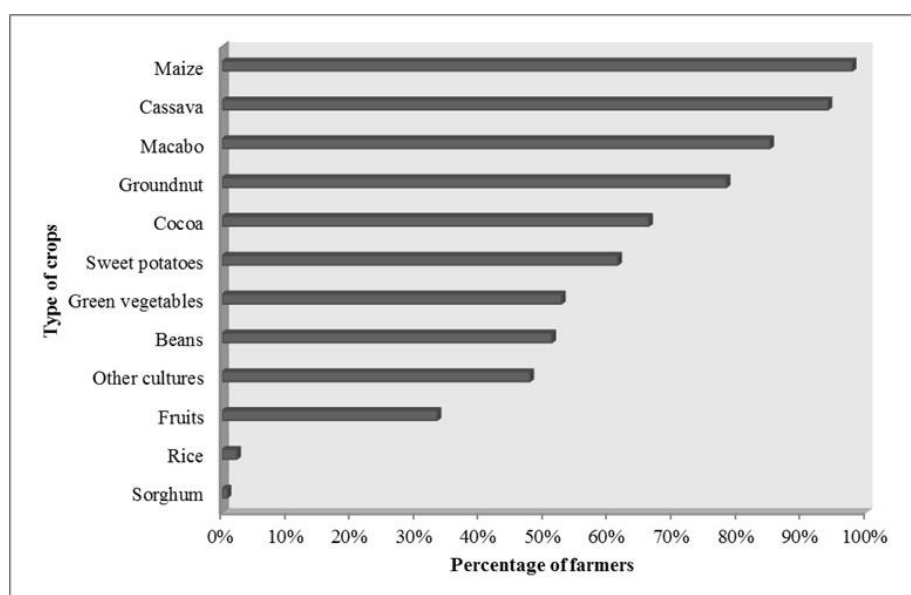
159 **Table 5: Sample distribution according to the main activity by village (%)**

		Main activity				TOTAL
		Agriculture	Business/Trading	Temporary	Other	
VILLAGE	ASSO'OSSENG	70.7	2.4	2.4	24.4	100.0
	BIYEYEM	93.3	0.0	0.0	6.7	100.0
	DJOP	96.4	0.0	0.0	3.6	100.0
	NDENGUE	96.7	3.3	0.0	0.0	100.0
	NKOEMVONE	43.6	7.7	17.9	30.8	100.0
	OTHER	30.0	0.0	0.0	70.0	100.0
	ALL	74.7	2.8	4.5	18.0	100.0

160

161 3.2.3 Maize and other type of crops grown in different villages

162 There was a diversity of crops grown in the villages. Among them, maize, cassava,
 163 cocoyam, groundnut, cocoa and sweet potato were the most important (Figure 4). Rice and
 164 sorghum were not widely grown in that part of the country.



165

166 **Figure 4: Distribution of farmers based on their village and the type of crop grown**

167 The most important cereal produced in all the villages was maize where averages of 97.7%
 168 farmers were producing it. Only 3.4% of farmers grew rice at Asso'osseng, 3.4% at Ndengue
 169 and 5.9% at Nkoemvone. Sorghum was grown at Ndengue by 3.4% of farmers (Table 6).
 170 Vegetables such as beans (51.1%), groundnut (78.2%) and green vegetables (52.6%) were
 171 also produced.

172 3.2.4 Agricultural and production system used by farmers

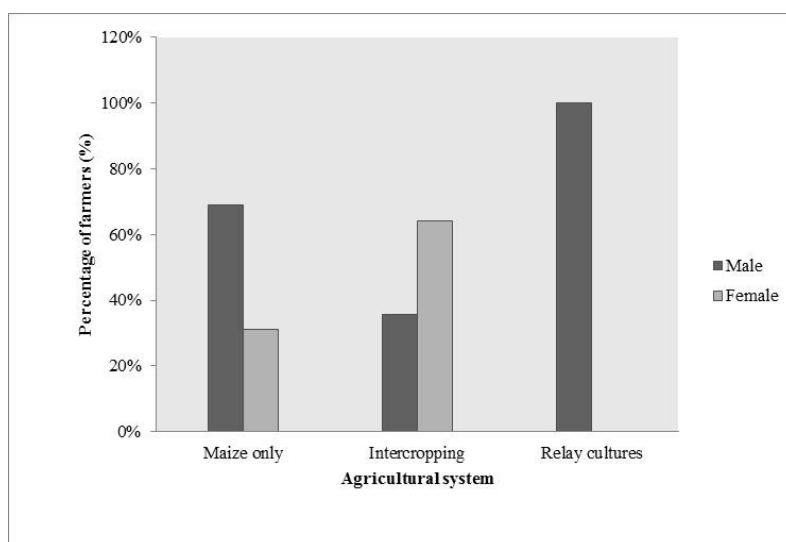
173 In all the villages, most farmers (72.5%) practiced intercropping system (Table 6).

174 **Table 6: Agricultural system used and type of maize variety grown by farmers (%)**

	Villages					
	Asso’osseng	Biyeyem	Djop	Ndengue	Nkoemvone	Total
System used						
Monoculture (maize only)	18.5	28.6	37.0	20.7	5.9	22.9
Intercropping	81.5	53.6	59.3	79.3	94.1	72.5
Relay cropping	0.0	17.9	3.7	0.0	0.0	4.6
Provenance of water for crop						
Rain	92.3	96.2	92.3	100.0	88.2	94.5
Irrigation	0.0	0.0	0.0	0.0	0.0	0.0
Rain and irrigation	0.0	3.8	0.0	0.0	0.0	0.8

175

176 22.9% grew maize only (monoculture) in their field during a given agricultural season (69%
 177 of men and 31% of women) while 4.6% of farmers practiced relay cropping system (100% of
 178 men) (Figure 5). In all the villages, farmers produce under rain-fed agriculture (94.5% of
 179 farmers) while few of them (4.7%) used irrigation system (Table 6).
 180



181

182 **Figure 5: Farmers' distribution according to the agricultural system by gender**

183

184 3.3 DISCUSSION

185 3.3.1 General constraints

186 Poor soil fertility was among the six major problems listed by farmers in the BHFZ. According
 187 to [5], soil acidity is a major constraint in the humid forest area of Cameroon and this acidity
 188 is mainly due to Al toxicity ,while in western Ethiopia, two major constraints of the production
 189 of the maize are the unavailability of improved seed and lack of production inputs[10] .The
 190 soils in this region are of poor fertility due to a combination of Al toxicity and deficits caused
 191 by leaching or decreased availability of P, Ca, Mg and some other micronutrients, especially
 192 Mo, Zn and B [11]. As a consequence the productivity of the crop in general, particularly
 193 maize reduced significantly. Farmers mentioned that the change of weather was among the
 194 major problems facing maize farming. The weather patterns have become unpredictable.
 195 The raining seasons are no more following exactly the calendar of cropping seasons. This is
 196 a general constraint globally and therefore, is not specific to the study environment.

197 3.3.2 Increasing population in farming

198 In the present research, 47% of farmers were between 31 to 45 years old while 32% of them
 199 were between 46 to 65 years old indicating that young people were involved in agricultural
 200 activities. This result could be explained by the fact that the 1990's economic crises in
 201 Cameroon made the Government to reduce by half the number of youth employed.
 202 Consequently, most of these youths became self- employed and farmers, especially in
 203 maize production, which is considered like one of their target areas because of the wide
 204 consumption of the crop. Additionally, about 55% of the Cameroonian population lives in the
 205 rural environment with agriculture as their main activity [12].

206 3.3.3 The redundancy appearance of women in agriculture

207 Results from the study indicated that 59% of farmers had reached the secondary school
 208 level while only 4% were found to be illiterate. The government policy in the country is to
 209 provide basic education to every citizen. This reflects the level of education observed among
 210 the farmers. It was revealed from this study that male farmers were more educated than
 211 female meaning that girls dropped from school very early and started farming activity
 212 especially when they gave birth. It has been noted that the female farmers started farming
 213 earlier than males and stopped during their old age (after 65 years) while most men stopped
 214 early (between 46 to 65 years old). This could be explained by the fact that young ladies
 215 stopped going to school earlier than the young men. The age and the level of study of
 216 farmers in the survey area depend on their gender. More women were involved in farming
 217 than men in this study region of the country. This could be explained by a higher number of
 218 women than men in those areas. The result matched with those of [13] on the size of
 219 population which was approximately 16.5 million inhabitants, 51% was composed of women
 220 and only 49% of men. Among women, 65% of them lived in the rural areas.

221 3.3.4 The common food crops

222 The principal crops produced in most of the villages were: maize, cassava, macabo,
 223 groundnut, cocoa, sweet potato, green leaves, beans, other crops (such as plantain,
 224 banana, yam, and pepper), fruits, rice and sorghum. This result is similar to that of [14] which
 225 stated that subsistence food crops grown in the Southern Region were comprised of taro,
 226 yams, cassava, rice, banana, plantain, maize, potatoes, roots and tubers, avocado, beans,
 227 okra, and were traded largely outside the cash economy. Farmers were forced to abandon
 228 cocoa or coffee plantations for other income – generating opportunities such as food crops

[15]. Among the cereals produced, maize is the most important (98%) and has become one of their cash crops. According to [10], maize was ranked number one as both food and cash crop by 82%.

3.3.5 The agricultural system still precarious

The agricultural system used by smallholders was based on traditional slash-and-burn agriculture or shift cropping. In this system, farmers slashed the forest vegetation, burned the biomass and then cropped before abandoning the land to fallow. The length of the fallow varied from about three years in high population areas with relatively fertile soils to over ten years where population density was low and soil acidity was a major constraint [16; 17]. This technique improved the nutrients elements of plants in the soil. The problems of low productivity and food security had been attributed to slash and burn cropping systems [18].

4. CONCLUSION

In this study, many young people were involved in farming activity. Farmers usually grow maize for subsistence and as a cash crop where maize was produced as a source of income. From the results, maize production is facing different constraints in the region including the problem of low production per unit area, low soil fertility, high cost of fertilizers, post-harvest conservation of maize and weeds control are prevalent. Breeding maize variety with multiple traits will curb most of these constraints hence enhance adoption of maize in the BHFZ region. In this respect, some numbers of efficient, tolerant and susceptible lines were identified under Aluminum and Manganese toxicities soil acidity following this study. The best genotypes at Nkoemvone were: Clgp1 17 (3.9 t/ha), CML 322 (2.24 t/ha), CML 479 (2.24 t/ha) and CML 533 (2.05 t/ha) [19]. Moreover, genotype by environment interaction and yield stability of these maize varieties were evaluated [20] and farmer's adoption of improved one popularized [2] in the bimodal humid forest zone of Cameroon.

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