

Prospecting and collecting local groundnut ecotypes in three regions of Burkina Faso

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1 ABSTRACT

This study aimed to understand the social environment of groundnut production in Burkina Faso. The prospecting was carried out in three regions of Burkina Faso, namely the Central-East, the Central-North, and the Central-West Regions. Data were collected through direct observations and individual interviews using a questionnaire guide. At the end of this study, five (05) local ecotypes were collected which varied according to the ethnic group. These were *Mayoro*, *zampou*, *dalga* in Bissa ethnic group and *Balolé*, *Wobgo* in Mooré ethnic group. It appeared that groundnuts are mainly grown by women in small areas and these local ecotypes are disappearing progressively in favour of improved varieties developed by INERA (SH470P, QH243C). Research efforts for an agro-morphological and molecular genetic characterization of local varieties are necessary to facilitate their conservation.

2 INTRODUCTION

In Burkina Faso, the main crops in the oilseed sector include peanuts, cottonseeds, sesame seeds, shea nuts, soybeans and cashew nuts. Until 1977, groundnut was the first cash crop in Burkina Faso before cotton (Dyemkouma, 2009). It is cultivated for its seeds, which are used as raw material for the extraction of oil used in cooking and for soap making. In addition, there are several ways of consuming peanuts: either in raw or roasted seeds, or in more or less elaborate forms like edible groundnuts and confectionery such as butter, dough, flour. At the national level, the consumption of groundnut and groundnut past accounts for more than 2.5% of the average annual household expenditures (INSD, 2005). However, few studies have been carried out on the social phenomenon around groundnut production (taste, colour, duration of

production, resistance of the variety to diseases). In addition, though groundnut genetic diversity is important, there is loss or an abandonment of some local cultivars for high-performance improved varieties. In addition, the heterogeneity of seed types on markets shows the existence of variability within crops cultivated and is not well known. Hence, the reason why this survey was conducted whose general objective is to understand the social environment of groundnut production in three regions of Burkina Faso. The specific objectives include:

- making the inventory of local ecotypes cultivated in these three areas,
- understand the cultivation system and the uses of this product,
- describing the local taxonomy of the cultivated groundnut.

3 MATERIALS AND METHODS

3.1 Collection areas and sites: The study was conducted in three regions (03) of Burkina Faso, namely Central-East, Central-West, and Central-North (Figure 1). The first two regions are characterized by an average annual rainfall between 600 and 900 mm. Soils are mostly of

tropical ferruginous type, less developed and hydromorphic. An average annual rainfall ranging between 200 and 600mm characterizes the Central-North Region. There are there three types of soils: ferruginous soils, Aeolian soils, and clay soils (SP / CPSA, 2002).

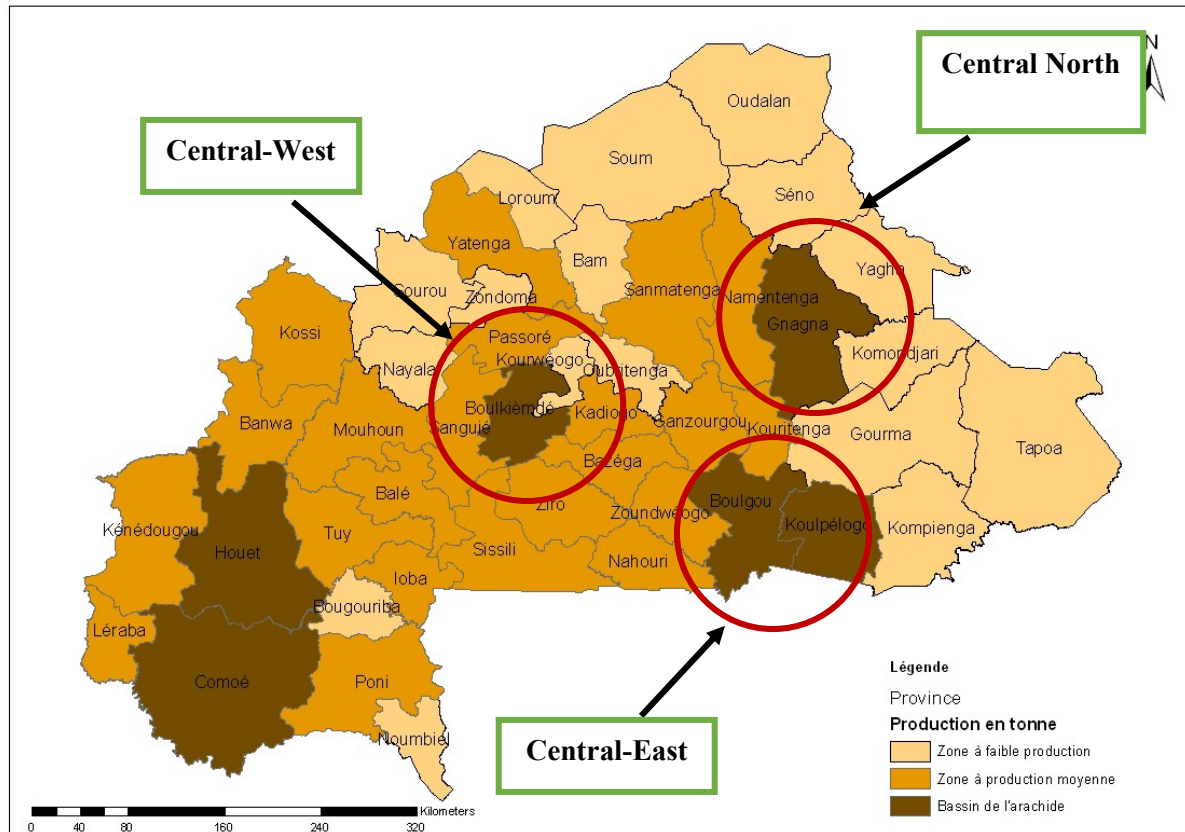


Figure 1: Map showing the various data collection areas (DGESS, 2014)

3.2 Collection method: Six (06) villages are selected based on production basins and peanut production platforms in Burkina Faso. In each of the regions, a random choice of two villages was made and in each of both villages, producers from the platform and outside the platforms were surveyed. Overall, 72 producers were surveyed in these three villages. Data are collected through the various sites during a survey carried out in November 2018, according to the tools and techniques of a participatory research approach based on direct observations, free discussions, group interviews

and individual interviews following a questionnaire guide (see annexe). Interviews are conducted in each village with the help of administrative or local authorities (Regional Director of Agriculture, President of producers' Association, agricultural advisers, village chiefs etc.) are involved to facilitate meetings with producers. Notebooks and pencils were used to record as much information as possible, observations and personal ideas made in the field. To transcribe, in the evening, raw notes taken during the day, a larger notebook was quite suitable. Kraft paper bags, which allow air

circulation and seed ventilation, were used to collect samples of available local groundnut ecotypes. These ecotypes are taken directly from their barns or from their fields. The descriptive parameters used to document the samples collected are those related to the ecotype number, the collector's name, the date of collection, the vernacular and ethnic name,

the information related to the sampling and the location of the collection site. A collection questionnaire including the identity of the holder, the origin of the material, the uses that are made of it and the constraints of the development of this material was completed at each sampling. Lastly, data obtained were analysed using the sphinx plus2 Software.

4 RESULTS AND DISCUSSION

4.1 RESULTS

4.1.1 Distribution per gender and cultivable area: Major differences are noticed per producer group in terms of number distribution per gender. Producers mainly include women. Indeed, 30.62% of producers are men while 69.4% are women (Figure 2). In addition, the surface areas devoted to groundnut production vary between 0.5 ha to 2

ha. Moreover, 77.8% of producers have a surface area less than 0.56 ha; 9.7% have surface area between 0.83 and 1.13 ha; 1.4% between 1.42 and 1.71 ha; and lastly 11.2% have 2ha and more (Table 1). Also, groundnut ranks first among other crops for 54.2% of producers and second for 45.8% of producers (Figure 3).

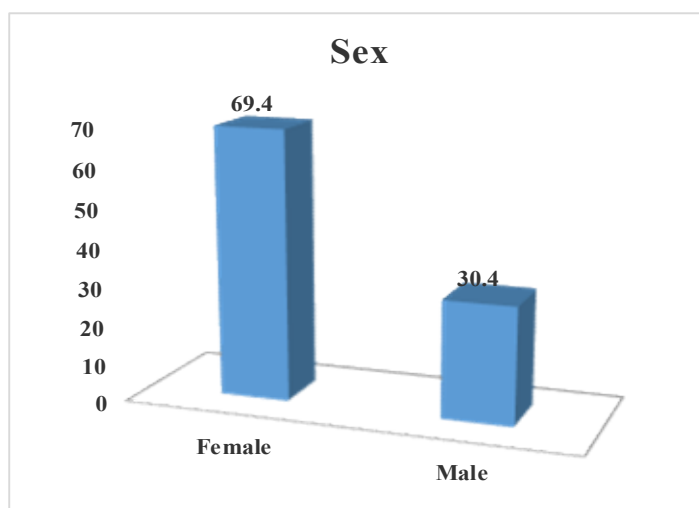


Figure 2: Distribution per gender and type of groundnut

Table 1: Groundnuts area

Area(hectare)	Number of surveyed farmers adopted	Frequency
less than 0.54	56	77.8%
0.54 to 0.83	0	0.0%
0.83 to 1.13	7	9.7%
1.13 to 1.42	0	0.0%
1.42 to 1.71	1	1.4%
1.71 to 2.00	0	0.0%
2.00 and above	8	11.1%

Total observations | 72 100%
 Minimum= 0.25, maximum=2.00, sum=51.25, average=0.71, standard deviation=0.50

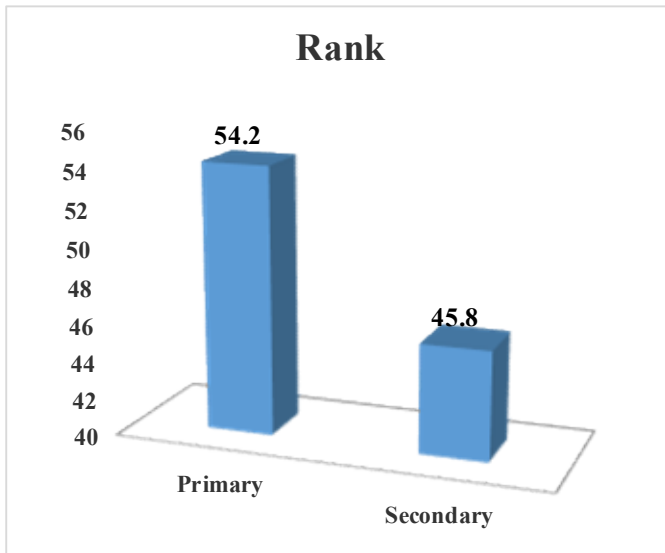


Figure 3: Size of groundnut production among other crops

4.1.2 Educational level: For the whole sample, around 50% of producers illiterate while 29.2% have a primary school level, 8.3% a secondary school level and 12.5% have received other literacy programs (Koranic school, informal education (Figure 4). From this study, it appears that 77.8% of illiterate

producers are women while men represent 22.2%. 42.85% of men against 57.14% of women have a primary school level (Table 2). The number of producers with a secondary school level is low. In fact, 16.7% of men and 83.3% of women have secondary level.

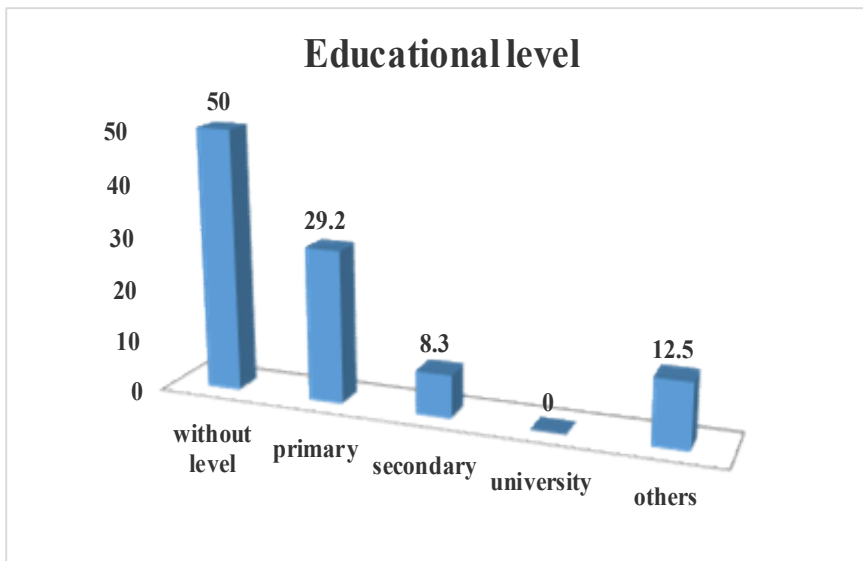


Figure 4: Household education level

Table 2: Cross-tabulation between the level of education and gender distribution of producers

Education level Sex	Without level	Primary	Secondary	University	Other	Total
1.Male	22.2%	42.9%	16.7%	0.0%	44.4%	30.6%
2.Female	77.8%	57.1%	83.3%	0.0%	55.6%	69.4%
Total	100%	100%	100%	100%	100%	100%

4.1.3 Groundnut cultivation practices:

Groundnut is produced in pure crops by the majority of producers surveyed on sandy-clay soil (95.8%) and in a minority on clay soil (4.2%). The other cash crops produced by these producers in addition to groundnuts include soy, sesame, and cowpea. With regard to food crops, millet, sorghum and maize are the main crops. Among the producers interviewed, 76.4% grow groundnuts with fertilizer and 23.6% without fertilizer (Table 3) and fertilizers used are NPK and organic manure. 59.7% of producers use chemical fertilizer NPK, most of which are not accessible while 16.7% use

organic manure (Table 4). They practice various production methods, which differ mainly in the number of cultivation operations made on the plot. Indeed, 56.9% of producers do three weeding, 37.5% two weeding and 5.6% one weeding, 23.6% no answer (Figure5). The semi-flat or log sowing method and ridging are common cultural practices. Row sowing is most preferred (83.3%) followed by flat sowing (13.9%) (Figure6). In addition, 45.7% of producers treat their fields with plant protection products and 54.3% do not treat them.

Table 3: Use of manure

Manure	Number of surveyed farmers adopted	Frequency
1.Yes	55	76.4%
2.No	17	24.6%
Total observations	72	100%

Table 4: Types of manure used

Types of manure used	Number of surveyed farmers adopted	Frequency
No answer	17	23.6%
Chemical	43	59.7%
Organic	12	16.7%
Total observations	72	100%

Average=1.22, standard deviation=0.42

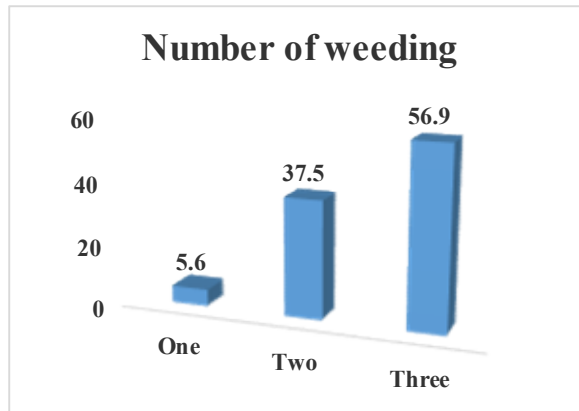


Figure 5: Number of weedings performed

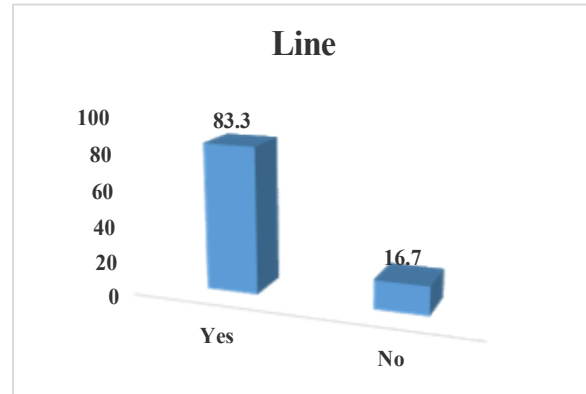


Figure 6: Type of sowing

4.1.4 Diseases: With regard to diseases, three main diseases are recorded, namely rosette, rust and leaf spot. In all these regions,

rosette is the disease recognized by producers with a percentage of 93.1% followed by rust 6.9%, leaf spot is not known (Figure 3).

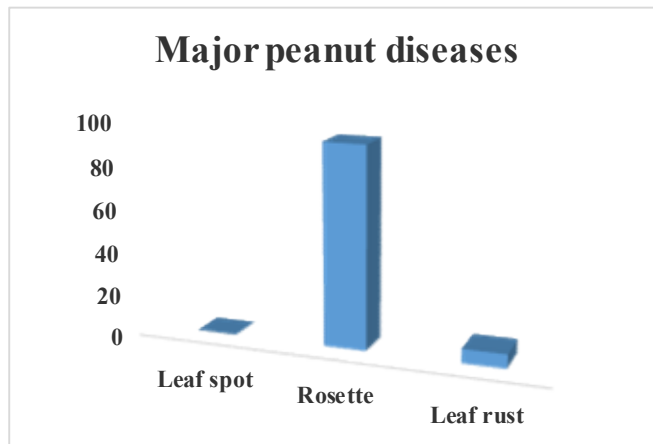


Figure 7: major groundnut disease

4.1.5 Origin of seeds: Producers purchase seeds with research institutes (INERA), which has groundnut platforms in these three regions, or with either by donation or from their production stocks.

4.1.6 Local ecotypes: In these three prospected regions, the name of the groundnut varies according to the ethnic group: *Mayoro*, *konkolo*, *zampou*, *dalga* in Bissa, *Balolé*, *Sumkam miougou*, *Wobgo* in Mooré, *Tchinebatoua*,

Tchinebania, *Abrakatoua* in Gourounsi. The criteria for the nomenclature of local ecotypes vary according to the seed colour and morphology and the place of cultivation. In these three regions, local ecotypes are about to disappear and be replaced by improved varieties from INERA. In the six villages surveyed, five local ecotypes are listed, namely *Mayoro*, *Zampou*, *Dalga* in the Central-East Region, *Wobgo*, *Balolé* in the Central- North Region.



Dalga Mayoro Zampou Balolé Wobgo
Photo 1: photos of the five local ecotypes collected

Most of producers use improved varieties developed by INERA (SH470P, QH243C). These improved varieties are mainly used by producer's members to the platforms and by the minority of producers who are not members to platforms. Among these five local ecotypes, two ecotypes are the most cultivated, Mayoro and Balolé, in the Central-East and the Central-North regions, respectively. According to all the producers surveyed, they are fairly less demanding in terms of rainfall and soil fertility. They are very appreciated for their short cycle. The factorial analysis of the correspondences

shows that there is a relationship between the various ecotypes. Ecotypes tchinebatua and tchinebania are close to the origin of the coordinate system, so their values are almost zero. The Balolé and SH470P ecotypes are similar because they have a negative value. The Mayoro, Konkolo, Dalga ecotypes and the Zampou are symmetrical to the Balolé, Wobgo, Sumkam miougou ecotypes with reference to axis1 and Qh243C is symmetry to SH470C with reference to this axis. These ecotypes are therefore similar side-by-side (Figure 8).

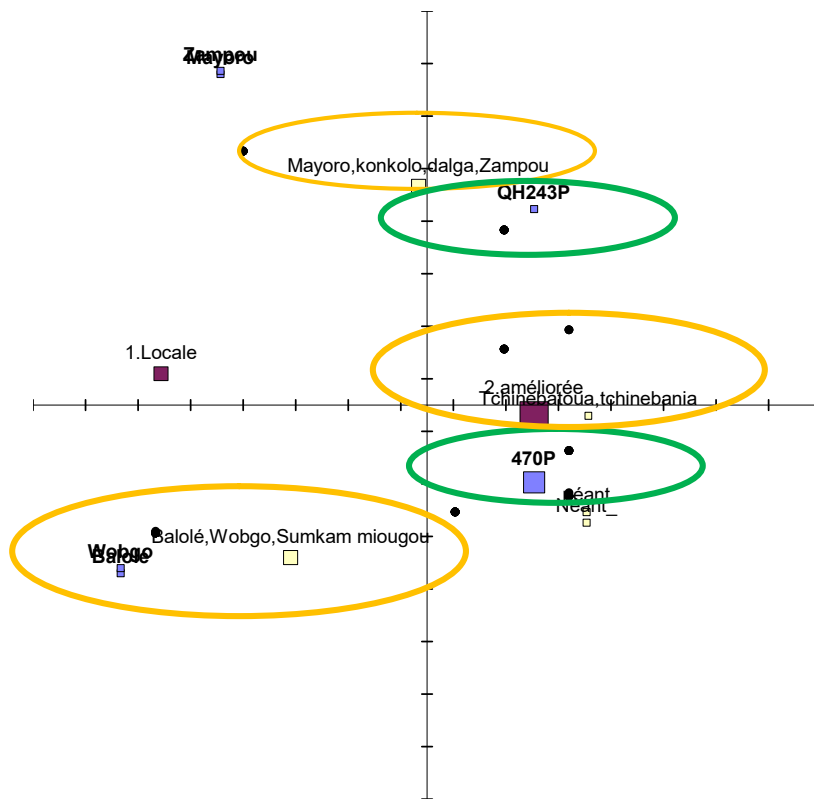


Figure 8: Factorial analysis of ecotype correspondences

5 DISCUSSION

Groundnut is mainly grown by women on small surface areas. This is due to social considerations, which confine this activity to a certain category of people, notably women (Nadembèga, 2016). These results corroborate those of Ouoba *et al.*, 2016 who conducted a similar study on earth peas. Producers grow groundnuts on sandy clay soil and rarely on clay soil. This is because fine textured, loose and permeable soils, notably sandy soils, are the most suitable. The production of groundnuts on heavy and clay soils is only recommended if the use of mechanization and timely irrigation are possible (Schilling, 2001). The majority of the producers interviewed use expensive chemical fertilizers used for cotton in their fields. A light annual mineral fertilizer NS-P-K or S-P provides an interesting benefit on the groundnut once again promoted by organic manure to be brought preferably on cereal cultivated in rotation. Indeed, fertilizer use is

experiencing a sharp decline due to the deterioration of structures and mechanisms that assist rural producers with loans, subsidies, development companies (Schilling, 2001). More than the half of producers practices three weeding. Weeding is important because the young plant is very sensitive to weed competition; it enables to smoothen and aerate soils and facilitates the root penetration. Most of producers interviewed recognize to having faced attacks of diseases. However, a large number of these producers do not treat seeds or plants over their development process. This may be due to the fact that most of them are illiterate, did not receive any training in groundnut disease, thus do not know the impact of diseases on production. The results of the inventory reveal a variety of groundnut names. They corroborate those of Missihoun *et al.*, 2012 who worked on the traditional management and status of sorghum genetic

resources. This is because the sociological and cultural attributes of human communities are known as major factors substantially influencing the level of diversity, the conservation and use of crop genetic resources (Sam *et al.*, 2006; Joseph and Antony, 2008) although there is a diversity of local groundnut names at the village and household level. In this study, the number of local ecotypes collected is low. This low intra-specific diversity noticed in villages makes groundnut ecotypes more vulnerable to extinction. Indeed, genetic diversity ensures the sustainability of species (CBD, 2009). The low use or abandonment of local ecotypes could be explained by climate

conditions that tend to reduce rainfall. Ecotypes preferred by producers meet the requirements in terms of taste, aesthetics, local market and notably, those related to the adaptation to climate change they enable to assess the scope (Loko *et al.*, 2013; Gbaguidi *et al.*, 2015). Tchinebatoua, Tchinebania, Abrakatoua ecotypes are null because we did not find one of these ecotypes. This is certainly, because producers no longer have these local ecotypes. The other ecotypes are symmetrical because some of them are local ecotypes and others are improved varieties developed by INERA that is why there is a resemblance among them.

5 CONCLUSION

The study showed that groundnuts are mainly grown by women in Burkina. Monoculture or associated cultures are common practices. Early and drought-tolerant ecotypes progressively dominate the variety of crops against late varieties that are demanding in terms of soil fertility and sensitive to drought. Varieties developed by INERA are the most used followed by the local Balolé and Mayoro

ecotypes, respectively. This study also reveals that local ecotypes are endangered. Efforts must be made in terms of research for an agromorphological and molecular genetic characterization of local varieties to facilitate an efficient conservation management and a sustainable use of their improving genetic resources.

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ANNEX

Questionnaire for farmer producer

<i>QUESTION NUMBER</i>	<i>MODE</i>	<i>ANSWER MODE</i>
1	Investigator's name:	.....
2	Survey date:	.....
3	Area / Region :	1. East center 2. North center 3. Midwest
4	Province :	.....
5	Village :	.....
6	Farmer's name :	.....
7	Phone/ Contact :	.....
8	Sex :	1. Male 2.Female
9	Age :	
10	Marital status :	1. Married 2. Single 3. Divorced 4. widower/widow
11	Education level:	1. Without level 2. Primary level 3. Secondary level 4. University level 5. Other
12	Have you received training in Agricultural production?	1. Yes 2. No
13	If yes which ones/one	.....
14	From which institution did you receive these trainings?	.....
15	What is your main activity?	1. Agriculture 2. Breeding 3. Fishing 4. Trade 5. Craft 6. Others
16	What is your secondary activity?	1. Agriculture 2. Breeding 3. Fishing 4. Trade 5. Crafts 6.



		other			
17	How many years have you been growing peanuts?	1. Less than 5 years old	2. 2.5 to 10 years	3. over 10 years	
18	On average what is the area of your field reserved for growing peanuts?				
19	How often do you grow peanuts in the year?	1. One time	2. Two times	3. Three times	
20	How often do you weed the peanut in the year?	1. One time	2. Two times	3. Three times	
21	How many types of farming do you practice each year?	.....		
22	Which place does peanut growing hold in your agricultural production?	.....		
23	What is the favorable period for sowing groundnuts in your village?	1. May	2. June	3. July	
24	When is the peanut harvest period in your village?	1. September	2. October	3. November	
25	How long after sowing can we have well-formed seeds	.....		
26	On what type of soil do you produce?	1. Lateritic peanuts	2. Clay	3. Sandy	4. Sandy clay 5. Clay-sandy



- 27 Are you satisfied with the length of the rainy season for groundnut production? 1. Yes 2. No
- 28 Why?
- 29 Indicate in order of importance your peanut preferences for production. 1. Big seed 2. Small seed 3. High yield 4. Oil content 5. Tolerant to insect, weeds, birds and rodents 6. Tolerance to diseases 7. Early maturity 8. Tolerant to drought 9. Easy to preserve 10. Other
- 30 What types of cropping systems are most used in your village for the production of groundnut? 1.Monoculture 2. Associated cultures 3. Gardening 4. Rotation System 5. Other
- 31 If associated crop, with which crop do you associate peanut? 1.Sorghum 2. Maize 3. Millet 4. Cowpea 5. Other
○
- 32 Do you use improved seeds? 1.Yes 2. No
- 33 If yes, for how long?
- 34 Why do you continue to use improved seeds?
- 35 Do you practice any treatment of seeds before sowing? 1.Yes 2. No
- 36 Why?
- 37 What type of chemical product do you use for treatment?
- 38 Do you sow groundnuts online or 1.Yes 2. No;



- on the log or online?
- 39 What is the spacing used for sowing?
- 40 Do you apply fertilizer to the peanut? 1. Yes 2. No
- 41 Why?
- 42 Do you apply organic manure to your peanut fields? 1. Yes 2. No
- 43 Why?
- 44 Describe the varieties of peanuts that you used in 2015.
- 45 What is the sown area for produced varieties in 2015?
- 46 How do you estimate the gained production in 2015 in tons?
- 47 What types of varieties did you produce in 2015? 1. Resistant 2. Sensitive
- 48 What are the advantages of grown varieties in 2015?
- 49 What are the weaknesses of produced varieties in 2015?
- 50 What is the origin of varieties that you cultivated in 2015?
- 51 Describe the varieties of peanuts that you used in 2016.



52 What is the sown surface for
 produced varieties in 2016?

53 How do you estimate the obtained
 production in 2016 in tons?

54 What types of varieties did you 1. Resistant 2. Sensitive
 grow in 2016?

55 What are the advantages of grown
 varieties in 2016?

56 What are the weaknesses of grown
 varieties in 2016?

57 What is the origin of grown 1. Local 2. Improved
 varieties in 2016?

58 Describe the varieties of peanuts
 that you used in 2017.

59 What is the sown surface for
 produced varieties in 2017?

60 How do you estimate the obtained
 production in 2017 in tons?

61 What are the advantages of
 produced varieties in 2017?

62 What are the weaknesses of grown
 varieties in 2017?



- 63 What is] the origin of produced varieties in 2017? 1. Local 2. Improved
- 64 For which reasons do you grow peanuts? 1. Consumption 2. Marketing 3. Both
- 65 List the three most important uses you make of peanuts
- 66 Do you use resistant varieties? 1. Yes 2. No
- 67 Which ones/one?
- 68 Why do you use resistant varieties?
- 69 What local varieties do you use?
- 70 Do you use varieties from abroad or from institutes? 1. Yes 2. No
- 71 Which ones?
- 72 What color of peanut seeds do you prefer? 1. White 2. Black 3. Red 4. Pink 5. Maroon 6. Purple 7. Other
- 73 Why this color?
- 74 What is the most used variety in the village?
- 75 Why ?
- 76 What types of improvements are needed for improved varieties? 1. Number of pods 2. Number of seeds in the pod 3. Seed size 4. Oil content 5. Plant size 6. Abundance of leaves 7. Resistant to



-
- diseases 8. Drought resistant 9. Long cycle 10. Early cycle
 11. Intermediate cycle
- 77 What is the growing cycle of the varieties you use?
- 78 What do you think are the main constraints of peanut production in general?
 1. Lack of improved varieties 2. High seed price 3. Lack of Materials
 4. Low yield of varieties 5. Insect attack including weeds and birds
 6. Diseases 7. Abiotic stress 8. High price of inputs fertilizers and
 chemicals 9. Problem of land ownership 10. Lack of flow market
 11. Absence of agricultural credit 12. Product conservation problem
 13. Other
- 79 Indicate in priority order the different constraints linked to groundnut production.
- 80 What do you consider to be the major problem in groundnut production?
- 81 What are the major peanut diseases in your village?
- 82 Which causes yield losses?
- 83 What are the characteristics of the seeds you want in peanut varieties?
- 84 What types of seed improvement are needed for the varieties you are
 1. Number of pods 2. Number of seeds in the pod 3.
 Seed size 4. Seed colors 5. Oil content



growing?

- | | | | | | |
|----|---|--|--------------|------------------|-----------|
| 85 | How important is the size of the peanut seed to you? | 1. Very important at all important | 2. Important | 3. Not important | 4. Not |
| 86 | How important is peanut resistance to disease? | 1. Very important all important | 2. Important | 3. Not important | 4. Not at |
| 87 | How important is the color of the peanut seed to you? | 1. Very important Not at all important | 2. Important | 3. Not important | 4. |
| 88 | Would you adopt a variety from research? | ..... |  |  |  |