Characterization of food consumption patterns in Southern Mali: Districts of Bougouni and Koutiala Sikasso

Fatou Diawara

Produced by World Vegetable Center

Published by International Institute of Tropical Agriculture

December 2013

www.africa-rising.net

The Africa Research In Sustainable Intensification for the Next Generation (Africa RISING) program comprises three research-for-development projects supported by the United States Agency for International Development as part of the U.S. government's Feed the Future initiative.

Through action research and development partnerships, Africa RISING will create opportunities for smallholder farm households to move out of hunger and poverty through sustainably intensified farming systems that improve food, nutrition, and income security, particularly for women and children, and conserve or enhance the natural resource base.

The three regional projects are led by the International Institute of Tropical Agriculture (in West Africa and East and Southern Africa) and the International Livestock Research Institute (in the Ethiopian Highlands). The International Food Policy Research Institute leads the program's monitoring, evaluation and impact assessment. http://africa-rising.net/

This document was made possible with support from the American people delivered through the United States Agency for International Development (USAID) as part of the US Government's Feed the Future Initiative. The contents are the responsibility of the producing organization and do not necessarily reflect the opinion of USAID or the U.S. Government.

Acknowledgements

Our thanks go to:

- AVRDC for its efforts in supporting and assisting agriculture and nutrition in Mali;
- The populations of the three villages of the district of Bougouni: Dieba, Madina, Flola, and the three villages of the district of Koutiala: Nampossela, Sirakela and M'Pessoba; and
- The health teams of the districts of Bougouni and Koutiala.

Contents

Summary

Introduction: In Sikasso there is a great potential of food crops with high nutritional value. However, food security cannot be ensured, justifying the completion of this study whose objective was to provide information on dietary diversity, knowledge of basic nutrition, access to food, intake of vegetables, composition of food, frequency, number of meals and their distribution within the family.

Methodology: The study was a cross sampling simple random cross-sectional survey. It lasted 30 days and involved three villages from the district of Koutiala and three villages from the district of Bougouni, women of childbearing age from 15 to 49 years and heads of families. In total 134 women were interviewed and 12 focus groups conducted with six women and six heads of families. The data were entered on the software Epi Data 3.1 and analyzed with the software SPSS 20.0. We used the “khi deux” test of Pearson and Fisher's exact test.

Main results: In Bougouni and Koutiala women had little knowledge about nutrition. It appeared that trained women had more knowledge compared to untrained women. The staple diet was cereal and baobab leaves, other foods were not used and undervalued and households had an average of three meals per day. The diet was not balanced and dietary diversity score was predominantly low to medium.

As a conclusion, nutritional security was not achieved especially as food use was not ensured. Training had brought more noticeable knowledge in the village of M'pessoba than that of in the village of Sirakele.

Keywords: knowledge, nutrition, dietary diversity score.

Context and justification

Within the scope of “Africa RISING” project, modes of food consumption in Sikasso region represent an essential part. Vegetable consumption of 200 g/day observed in the region (FAO Nutrition Country Profiles, 2004) is much lower than the rate of 400 g/day recommended by the World Health Organization (WHO).

This is especially valid for the region of Sikasso in Mali, where over 77% of the rural population lives in poverty and without means for a balanced diet (Development Program of United Nations, 2009). In this region there is a great potential for food crops with high nutritional value.

This study is part of a series of activities conducted from May to December 2013, on selected representative sites of South Mali in Sikasso region. Its objective was to contribute to the achievement of the overall long-term objective of the project.

This study aimed to provide information on the diversity of food, give an overview of basic nutrition knowledge of the villages surveyed, an overview on the access to food intake including vegetables, to know the composition of foods, the frequency of the number of meals and their distribution within the family. It covered six villages of the project "Africa RISING", three villages of Koutiala and three villages of Bougouni.

Objectives

Specific objectives

1. Assess the basic knowledge of nutrition;
2. Describe the characteristics of food consumption;
3. Identify the dietary habits and the way food is cooked;
4. Monitor the availability and accessibility of food in households;
5. Determine the scores of food diversity and consumption in households; and
6. Describe the existing food diversity and the parts of cereals, vegetables and animal products.

The results of research focus on improving the diet of households:

a. Study and understand the basic knowledge of nutrition through meetings of focus groups;
b. Collect and document family recipes including baby food / weaning, in detail - composition and cooking;
c. Collect data on the diversity of local products available for household consumption (food groups, species by group, varieties by species);
d. Identify the species cultivated by women in their own fields during the rainy season;
e. Study the agreement on work and responsibilities sharing between women and men within family diet;
f. Collect information on the main source of income and expenses for vegetables in households;
g. Return the results of this study to stakeholders and if possible to villages.

Operational definition of concepts

Food
It's a substance that serves as food for living beings (Hachette Dictionary 2012 Edition.

Diet
Action, manner to provide or take food (Hachette Dictionary 2012 Edition).

Supplementary diet
Process is implemented when breast milk alone or formula milk alone is no longer sufficient to meet the nutritional needs of a baby. Therefore, other foods and liquids should be added to breast milk or breast milk substitute. The age trend of babies targeted by supplementary diet is usually from 6 to 23 months (Lexicon UNICEF, July 2011).

Exclusive breastfeeding
The infant is fed only with breast milk (including breast milk or sucked at a nurse). Drugs, oral rehydration solutions, vitamins and minerals, since they are recommended by health care providers are authorized during exclusive breastfeeding (UNICEF Glossary, July 2011).

Micronutrient deficiency
State observed when the body lacks vitamins or minerals due to a diet poor in vitamins and minerals, a generally inadequate food and / or a non-optimal assimilation of vitamins and minerals by the body (Glossary UNICEF, July 2011).

Knowledge
Exact idea of a reality, of its situation, its meaning, its characters and its functioning (Hachette Dictionary 2012 Edition).

Diversification
It's the progressive introduction of nutrients other than milk at six months to get the child used, in a few months to a varied diet similar to that of adults (FAO, 2007).

Emaciation
A child may be suffering from moderate emaciation (weight between 70 and 80% of the average weight compared to the height) or severe emaciation (weight inferior to 70% of the average weight compared to the height) (Glossary UNICEF, July 2011).

Malnutrition
General term that is often substituted for the term of malnutrition or under nutrition, although, from the technical point of view, it also refers to over nutrition. A person is malnourished if his diet does not include nutrient suitable for his growth or his maintenance in good health or if he cannot fully digest the food he eats because of an illness (under nutrition).He is also malnourished if he consumes too many calories (over nutrition) (Lexicon UNICEF, July 2011).

Household
Food household, which brings together people who share most of the meals (FAO)

Micronutrients
Essential vitamins and minerals required by the body throughout the life cycle, in tiny amounts (UNICEF Glossary, July 2011).

Nutrient
A nutrient is anything that nourishes a living being which contribute to metabolism and growth Hachette Dictionary2012 Edition).

Nutrition
Process by which living organisms use food to ensure their growth and vital functions (Hachette Dictionary 2012 Edition).

Edema
Abnormal fluid retention in the body tissues (UNICEF Glossary, July 2011)

Practices
This is the usual way of acting (Hachette Dictionary2012 Edition).

Diet
This is the amount of food that a person must eat to ensure his normal growth and maintain his weight and health status (AG IKNANE A, OURRARA F, DIARRA M et al. Fundamentals of nutrition, vol 1, 2002)

Stunting
Stunted growth or stunting is a reduced growth rate in human development. It is a primary manifestation of malnutrition and recurrent infections, such as diarrhea and helminthiasis, in early childhood and even before birth, due to malnutrition during fetal development brought on by a malnourished mother. (UNICEF Glossary, July 2011).

Food security
Exists when all people, at all times, have economically, socially and physically access to sufficient, safe and nutritious food that meets their dietary needs and food preferences to enable them to lead an active and healthy life (FAO, 2007)

Nutritional security
Nutritional security is an ideal situation where everyone enjoys: a food security, adequate care, a prevention and a suitable disease control, a stable environment (AG IKNANE A, OURRARA F, Diarra M et al. Fundamentals of nutrition, vol1, 2002).

Weaning
Gradual replacement of breast feeding by a more varied diet (Hachette Dictionary 2012 Edition)

Literature review

The United Nations Fund for Food (FAO) in its 2012 report notes that between 2010 and 2012 chronic undernourishment affects approximately 870 million people worldwide, of which 15% live in developing countries [1]. In West Africa, according to FAO, hunger and malnutrition touched structurally in 2006-2008 over 33 million people. [2] These people are then in food and nutritional insecurity.[2] Food security: covers four dimensions: availability, access, stability and utilization. All these dimensions must be sustainable over time and be applied simultaneously.

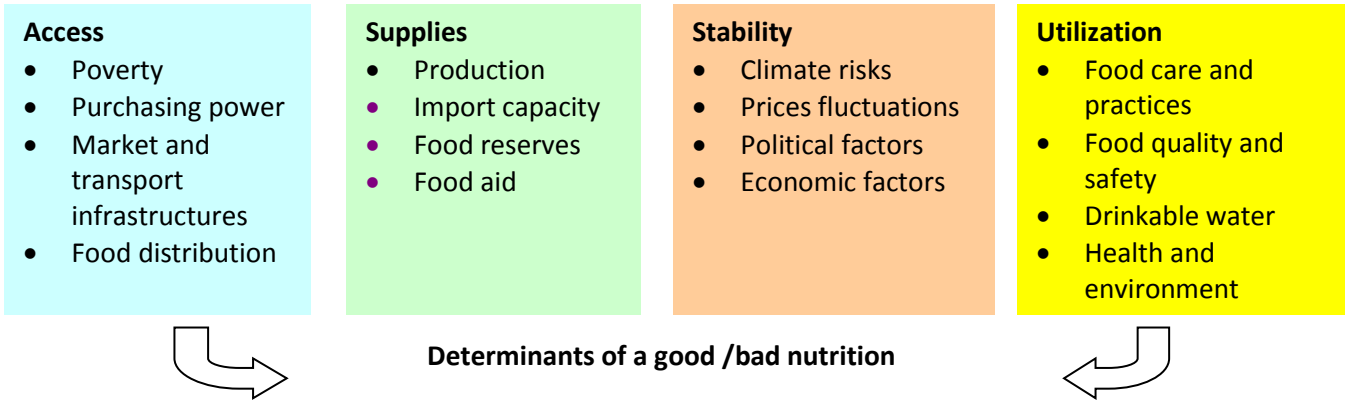

Figure 1: Appropriate concept of food security and nutritional security

Compared to nutritional security, every year 7.6 million children under five years die. About a third of these deaths are due to malnutrition and more than 70% occur in Africa and Southeast Asia. This mortality is higher in rural areas and in poor and less educated families. [3] Poverty is a major cause of malnutrition, although it is not alone. There are physical, psychological and social reasons why people do not eat enough food or do not have a quite varied diet. [4].

The causes are presented on three levels, namely the immediate causes, underlying causes and root causes.

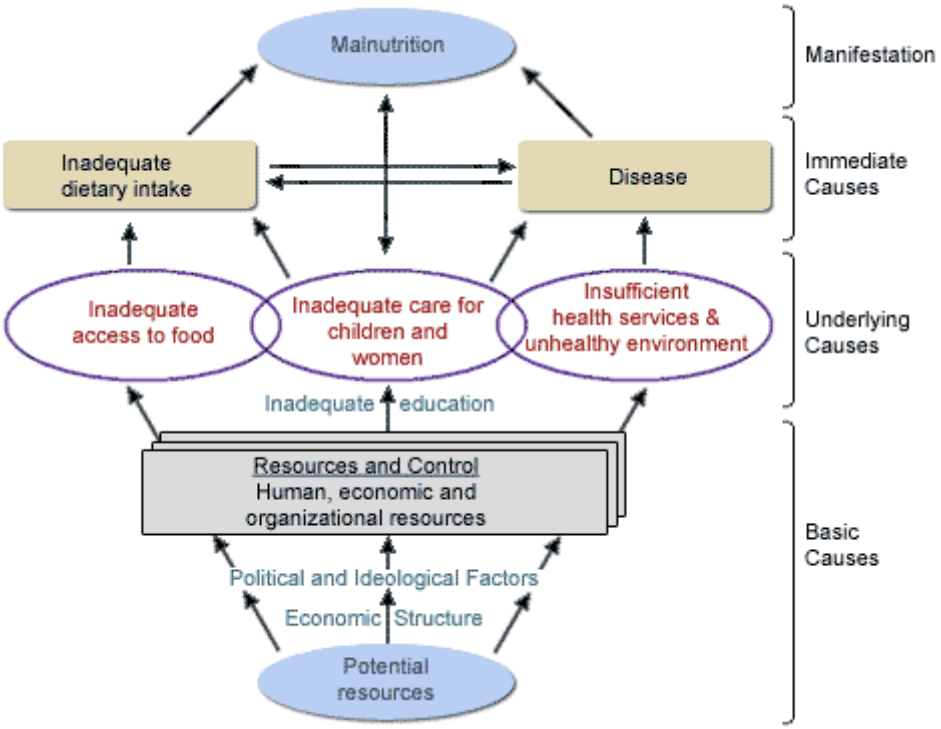

Figure 2: Conceptual framework of malnutrition causes adapted by UNICEF, 1991

High prevalence of Malnutrition can be the result of poor knowledge, attitudes and practices related to food and health as observed in Mauritania. [5]

In Mali, according to the SMART survey (Standardized Moritoring and Assessment of the Relief and Transition) 2011, 10.4% of children under 5 years suffer from emaciation, 27% from stunting and 19.7% from underweight [6]. These prevalences observed in 2011 are higher than the threshold set by WHO (World Health Organization) to consider the nutrition situation as a matter of public health concern, which are 10% for emaciation and 30% for stunting. The chronic energy deficiency for women of childbearing age is 12.1% according to the same survey [6]. The stagnation of nutritional status in Mali since the last decade is mainly due to inappropriate feeding practices of young children (0 to 23 months) and to a poor complementary diet, a weak health system [7].

In Mali, although the region of Sikasso meets food security, nutritional security is not ensured there. In 2011, the prevalence of emaciation was 7.5%, 39.5% for stunting and 22.0% for underweight while emaciation prevalence was 12.9% [6].The fight against malnutrition is therefore necessary and logically emerges as a public health priority.

It is in this context that appears The World Vegetable Center (AVRDC), an international non-profit organization of research on vegetable and development, founded in 1971 in Shanhua in the south of Taiwan [8]. Its main objective is "to reduce malnutrition and alleviate poverty in developing countries through improved production and consumption of vegetables [8]. Vegetables production promoted by AVRDC can be used in the poorest areas, where they can serve as "an important source of income" and can help to fight against micronutrient deficiency [8].

Within the scope of "Africa RISING" project, AVRDC conducts nutrition activities in partnership with ICRISAT, USAID, ICRAF, ILRI, AMEDD, by innovating in the context of research action and by making innovations accessible (improved seeds, recipes, cultivation techniques) at the village level [9]. The first phase of activity took place from June 2012 to September 2012 [10]. The center creates so opportunities to enable small farmers to fight against hunger and poverty through sustainable intensification systems to improve food, nutrition and income stability, especially for women and children while maintaining and improving natural resources [9].
People have nutritional needs which are assessed at three levels, namely energy needs (proteins, lipids, carbohydrates), non-energy needs (vitamins, minerals) and fluid needs (water) [11].

Foods according to their chemical composition are classified into seven groups. [11]

- **Group1:** Water, liquids and drinks bring mineral ions and trace elements necessary for the functioning of cells.
- **Group 2:** Fruits and vegetables rich in water, minerals and trace elements, vitamins and dietary fiber.
- **Group 3 : C**ereals, starches, legumes, rich in slow sugars have a good energy value with starch and also contribute to intakes of dietary fiber, B vitamins, minerals (iron and magnesium).
- **Group 4:** Milk and milk products provide essential proteins, animal fats, calcium, phosphorus, soluble vitamins.

- **Group 5: Meat, fish, eggs**: Foods in this group are mainly rich in animal protein and essential amino acids. They also provide the iron necessary for the synthesis of hemoglobin and the integrity of the immune system, vitamin B12 and trace minerals. **Group 6:** Sugar and sugary foods provide the body with simple carbohydrates, and energy
- **Group 7:** Drinks that promote biochemical reactions.

AVRDC achieves the development and promotion of the consumption of local foods rich in micronutrients. Vegetables fruits and leafy vegetables as sources of micronutrients especially of pro-vitamins A are available in the area, nearly throughout the year, at a low cost and accessible to households. Vegetables are usually eaten raw or cooked. The present study was initiated by AVRDC in the districts of Bougouni and Koutiala in Sikasso region as part of the characterization of food consumption patterns of these areas.

Methods

Study Type: It was a cross-sectional simple random sampling survey.

Time and place of study: It lasted 30 days and involved villages of Serekela, M'Pessoba, Nampossela from Koutiala district and Dieba, Madina and Flola from Bougouni district.

Figure 3: Map of the region of Sikasso (Source DRPSIAP Sikasso)

Study population: We included in the study women of childbearing age from 15 to 49 years and heads of families who were all present and who agreed to participate in the study.

Sampling: The selection of villages was done in a reasoned way by the AVRDC team. The random selection was made for 10 trained villages and 10untrained ones. For individual interviews within each family a woman of childbearing age was chosen at random. In total 134 women were interviewed.

Focus group discussion

Semi-structured focus groups which lasted 30 minutes on average were organized. 12 focus groups carried out on the basis of 2 by villages. Six interviews were conducted with women of childbearing age and 6 with heads of families that is a ratio of one for each village. To collect the information we used multi-section individual questionnaires, an interview guide and audio recordings with a Dictaphone.

Data Collection: Data was collected about:

- The basic knowledge about nutrition: definition causes and signs of malnutrition, what is a balanced diet, nutrition of pregnant/ lactating women diet, nutrition of a sick person;
- The composition of the household diet, cooking time of family meals, infant feeding;
- The local products available and consumed in households and the share of cereals, vegetables, animal products;
- The species cultivated by women in their own fields during the rainy season;
  The agreement on work sharing between women and men within the family and the

distribution of responsibilities concerning the diet of the family;
The main source of income and expenses for vegetables within households;

- Themes addressed in focus groups for women of childbearing age focused on the basic knowledge in nutrition, family recipes, recipes of babies complementary food and their method of preparation, the existing food diversity and the share of cereals, vegetables, animal products, proposals for greater vegetable consumption in households.

The themes addressed for fathers focused on the diversity of local products available for diet during the study period, the availability of food in the household, the agreement on work and responsibilities sharing between women and men compared to the diet of the family, propositions for greater vegetable consumption in households.

The research team: consisted of one principal consultant, three investigators including one locally recruited and a driver. Interviewers were trained and data collection tools were pre-tested.

Processing and analysis of data
Data collected were entered manually; the record was made with the EpiData3.1 software. The quality control of field data was provided by the consultant. A double data entry was made as well as a thorough cleaning of the database.

Data analysis was performed with SPSS 20.0 software. We used the chi-square test of Pearson and Fisher's exact test (cases of theoretical numbers inferior to 5) for the relationship between vegetable consumption and the main variables. The risk of error α was equal to 5% and the values of p-value inferior to 0.05 were considered statistically significant.

The information gathered during the focus groups were transcribed with a labeling of all the verbatim according to the theme and a weighting of the results was made.

For ethical considerations: the free and informed consent of the community was obtained at the village level. No financial incentive was offered for the participation in the study. The interviews were confidential and were carried out taking into account the availability of participants. The latter could choose not to answer questions that would be uncomfortable and they could stop the interview at any time without harm.

Results

Households' characteristics

Table I: Distribution of surveyed households in the districts of Bougouni and Koutiala in 2013

District	Village	Number of households	Number of surveyed households
Bougouni	Madina	300	20
	Diéba	202	24
	Fola	51	25
	Total	753	69
Koutiala	M'pessoba	500	22
	Nampossela	405	23
	Sirakele	350	20
	Total	1255	65

In "nutrition" villages of Mpessoba and Sirakele households were divided into equal number between trained and untrained. Heads of households in Bougouni were male at 100% and at 99% in Koutiala.

Table II: Distribution of households based on the average number of people in the district of Bougouni in 2013

	Average number of people per household		
Gender	**Dieba n=24**	**Flola n=23**	**Madina n=20**
Male	5.75 ± 8.639	3.00 ± 1.826	4.05 ± 2.164
Female	8.17 ± 10.897	3.48 ± 2.002	3.40 ± 2.349
Total	13.92 ± 19.188	6.48 ± 3.380	7.45 ± 3.939
	Average productive people per household		
Productive males	1.87 ± 1.849	1.36 ± 0.638	1.05 ± 0.224
Productive females	1.92 ± 2.701	1.20 ± 0.645	1.15 ± 0.587
Total	3.79 ± 4.452	2.56 ± 1.121	2.20 ± 0.696

In the district of Bougouni about a third of people in households was active and it was the same for three villages

Table III: Distribution of households by the average number of people in the district of Koutiala in 2013

	Average people per household		
Gender	**Mpessoba n=24**	**Nampossela n=23**	**Sirakele n=20**
Male	6.68 ± 7.266	4.13 ± 4.093	4.60 ± 1.903
Female	6.41 ± 7.744	4.43 ± 3.342	4.95 ± 3.348
Total	13.09 ± 14.540	8.56 ± 6.953	9.55 ± 4.651
	Average productive people per household		
Productive males	1.82 ± 1.532	1.57 ± 1.161	1.70 ± 0.979
Productive females	2.09 ± 2.543	1.48 ± 1.201	2.05 ± 1.317
Total	3.91 ± 3.987	3.05 ± 2.099	3.75 ± 2.173

A quarter of household members in M'pessoba and a third of them in Nampossela and Sirakele were active.

Main source of household income

The main source of income in all the surveyed villages was obtained through the sale of agricultural products with 100% in Dieba, 96.0% in Flola, 70.0% in Madina, 86.4% in M'pessoba, 82.6% in Nampossela and 100% in Sirakele.

Participation of men in household expenses

100% of households in Dieba and Flola from the district of Bougouni and households in Nampessola and Sirakele productive men contributed to expenses. In the villages of Madina in Bougouni and M'pessoba in Koutiala, men participated in expenditures respectively with 95% and 95.5%.

Table IV: Distribution according to the main household expenses in the districts of Bougouni and Koutiala in 2013

	Districts					
	Bougouni			**Koutiala**		
Household expenses	**Dieba**	**Flola**	**Madina**	**M'pessoba**	**Nampossela**	**Sirakele**
Condiments costs	6	8	8	13	8	5
	25.0%	32.0%	40.0%	59.1%	34.8%	25.0%
Health costs	13	12	10	5	5	8
	54.2%	48.0%	50.0%	22.7%	21.7%	40.0%
Clothing	0	0	2	-	3	2
	0.0%	0.0%	10.0%	-	13.0%	10.0%
Taxes	1	3	0	-	1	3
	4.2%	12.0%	0.0%	-	4.3%	15.0%
Wedding costs	4	2	0	-	1	2
	16.7%	8.0%	0.0%	-	4.3%	10.0%
Purchase of agricultural equipment	-	-	-	3	1	0
	-	-	-	13.6%	4.3%	0.0%
school fees	-	-	1	-	4	0
	-		4.5%	-	17.4%	0.0%
	24	25	20	22		20

Health care costs were the most important in Dieba, Flola and Madina. In other places condiments costs were predominant.

Basic knowledge in nutrition

Definitions of malnutrition

Table V: Distribution of women of reproductive age according to the definition of malnutrition in Bougouni in 2013

Definitions	Dieba n=24	Flola n=25	Madina n=20
Do not know	14 (58.3%)	21 (80.0%)	13 (65.0%)
Weakness	1 (4.2%)	-	-
Lack of useful food for the body	5 (20.8%)	-	1 (5.0%)
Do not have the food you want to eat	3 (12.5%)	-	1 (5.0%)
Lack of foods rich in vitamins	1 (4.2%)	2 (8.0%)	2(10.0%)
Childhood disease	-	1 (4.0%)	1 (5.0%)
Poor quality of consumed food	-	1 (4.0%)	-
If no vaccinations received	-	-	2 (10.0%)

The majority of women did not know the definition of malnutrition. During focus groups activities it was clear that the definition of malnutrition was little known by women. Some, however, in the focus groups said that it was called "balo dèssè bana" (disease due to the lack of food).

Table VI: Distribution of women according to their definition of malnutrition in the district of Koutiala in 2013

	M'pessoba		Nampossela	Sirakele	
	Trained	Untrained		Trained	Untrained
Do not know	1 (9.1%)	9 (81.8%)	10 (43.5%)	0 (0.0%)	6 (60.0%)
Lack of vitamin in the body	3 (27.3%)	0 (0.0%)	-	-	-
Childhood disease	1 (9.1%)	1 (9.1%)	1 (4.3%)	1 (10.0%)	0 (0.0%)
Foodborne disease	0 (0.0%)	1 (9.1%)	-	-	-
Lack of food rich in vitamin	5 (45.4%)	0 (0.0%)	9 (39.2%)	4 (40.0%)	1 (10.0%)
Lack of blood	1 (9.1%)	0 (0.0%)	-	-	-
Vitamin deficiency in meals	-	-	2 (8.7%)	5 (50.0%)	3 (30.0%)
Poor diet of the mother	-	-	1 (4.3%)	-	-

Some women knew malnutrition and some of them in Sirakele said that there is a link between malnutrition and hygiene and breastfeeding during focus groups activities. The majority of women didn't give any definition.

Causes of malnutrition

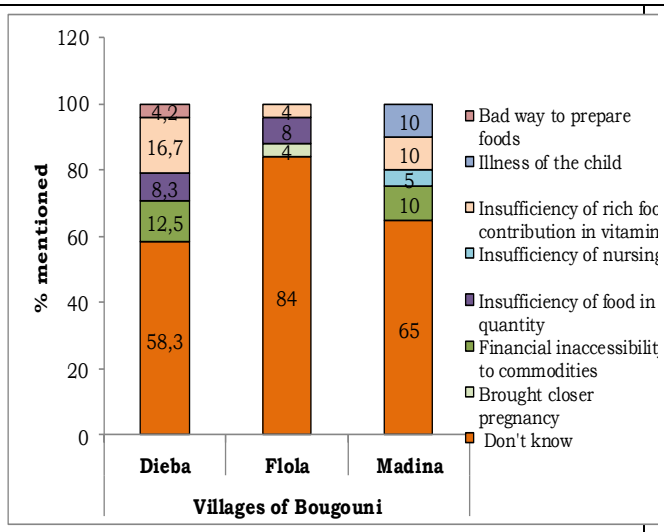

Chart 1: Distribution of women of childbearing age according to their knowledge of the causes of malnutrition in the district of Bougouni in 2013

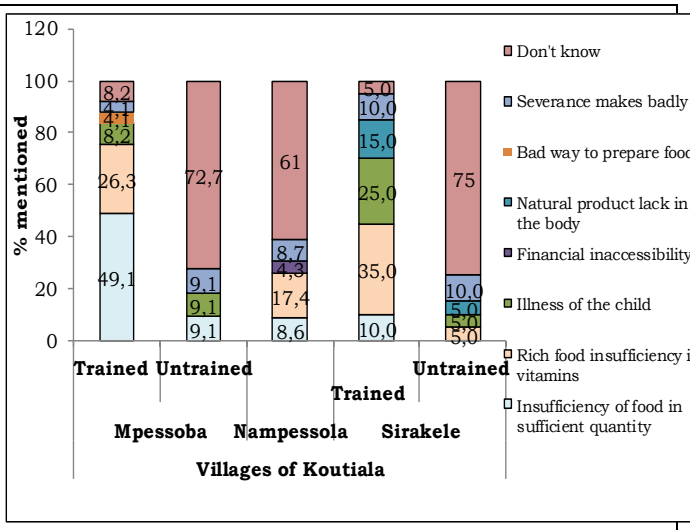

Chart 2: Distribution of women of childbearing age based according to their knowledge of the causes of malnutrition in the district of Koutiala in 2013

The majority of women in Bougouni didn't know any cause of malnutrition. According to the respondents who were able to answer this question there are three main causes, namely: financial inaccessibility to food, ignorance of the disease and lack of food rich in vitamins.

During focus groups activities in Bougouni and Koutiala, women of childbearing age who knew no cause of malnutrition were the most numerous and there was confusion between the definition and the causes. It stemmed from the focus groups that some women had prerequisites they did not seem to realize

Signs of malnutrition

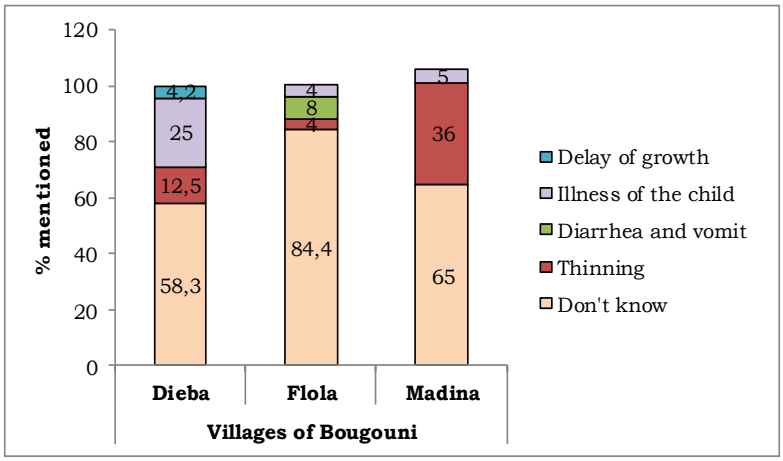

Chart 3: Distribution of women of childbearing age according to their knowledge of the signs of malnutrition at Bougouni in 2013

Female respondents overwhelmingly knew no sign of malnutrition. During focus groups, respondents recognized malnutrition because of certain signs like growth retardation, swollen belly, red hair, weight loss, body edema and nonchalance.

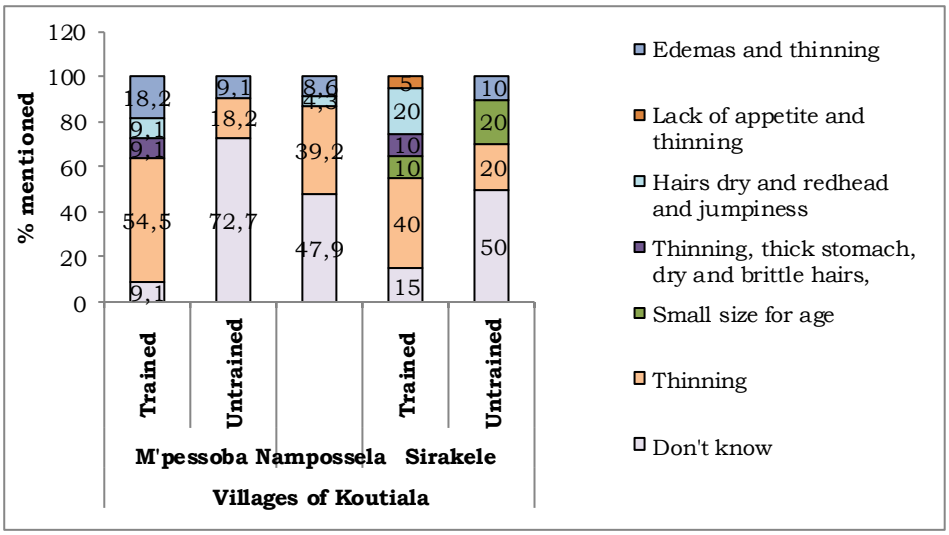

Chart 4: Distribution of women of childbearing age according to their knowledge of the signs of malnutrition at Koutiala in 2013

At Koutiala in trained villages M'pessoba's women had better knowledge of malnutrition signs. At Sirakele 15% of trained women do not know any malnutrition sign. At Nampessola an untrained village, women were able during the focus groups to name signs. On the whole signs were not known by women.

Balanced diet

Definition of a balanced diet

In the district of Bougouni, 62.5%, 92.0% and 75.0% of women respectively in Dieb, Flola and Madina did not know what a balanced diet should contain. The majority of women in all the villages had cited beef, mutton, fish, poultry and eggs separately or together as being a balanced diet. Vegetables were cited as part of this diet in 8.4% of cases at Dieba, 4.0% at Flola and 10% at Madina.

In the district of Koutiala like in Bougouni, animal proteins were the most cited among other foods. 18.2% of trained women at M'pessoba did not know the definition and the same proportion cited vegetables as part of it. Untrained women did not know up to 81.8% and did not cite any vegetable. At Nampossela, 65.2% of women did not know the definition and 8.6% had cited vegetables.

At Sirakele, trained or untrained women were 30% who did not know what a balanced diet was. Trained women had cited vegetables in 10% of cases against 20% for untrained women. In most cases vegetables were few cited by women. And just like in Bougouni animal proteins were the most cited among other foods.

Pregnant / lactating woman's diet

At Bougouni animal proteins have been reported in the majority of cases. In villages vegetables were cited respectively 16.6% in Dieba, 15% in Madina and 16% in Flola.

At Koutiala, trained women argued that a balanced diet for pregnant / lactating women included vegetables with 45.5% in M'pessoba against 18.2% for the untrained, 20.0% in Sirakele against 10 0%. In the village of Nampossela 30.2% of the food included vegetables. All women who did not know had not been trained, with 63.6% in M'pessoba, 43.5% in

Nampossela and 30% in Sirakele. Women were able to cite vegetables and some other foods. Vegetables were most cited by women who benefited from training on nutrition.

Sick person's diet

Cited meals for sick people included few vegetables in the villages **of Bougouni** at the rate of 16.8% in Dieba, 12.0% in Flola, 25.0% in Madina.

In the villages of Koutiala meals cited for sick people did not include vegetables in Sirakele for trained women against 20.0% for the untrained. They included few vegetables in Nampossela with 12.9%, 27.3% in M'pessoba for trained women and 9.1% for the untrained.

Diet for old people

No difference was made between the diet of an old person and that of a healthy adult. Vegetables were not cited and no difference was made during the focus groups between the diet of the sick person and that of the persons mentioned above.

Concerning the balanced diet, apart from the fact that the majority of respondents did not know what the different definitions were, those who were able to answer did not know the different food groups and this regardless of the village. Focus groups didn't bring additional elements.

Advantages of vegetables consumption

Table VII: Advantages of vegetables consumption cited by women in the district of Bougouni in 2013

Advantages	**Villages of the district of Bougouni**		
	Dieba	**Flola**	**Madina**
Improves health	4 (16.7%)	2 (8.0%)	3 (15.0%)
Provides energy	13 (54.2%)	10 (40.0%)	3 (15.0%)
Provides vitamins	2 (8.3%)	4 (16.0%)	6 (30.0%)
Enhances health	-	-	1 (5.0%)
1) Do not know	5 (20.8)	9 (36.0%)	7 (35.0%)

Most women knew the advantages of vegetables consumption

Table VIII: Advantages of vegetables consumption cited by women in the district of Koutiala in 2013

Advantages	Villages of the district of Koutiala				
	M'pessoba n=22		Nampossela n=23	Sirakele n=20	
	Trained	Untrained		Trained	Untrained
Improves health	2 18.2	0 0.0%	1 4.3%	- 	1 10.0%
Provides vitamins	1 9.1%	0 0.0%	4 17.4%	1 10.0%	2 20.0%
Good for health	-	0 0.0%	0 4.3%	-	1 10.0%
Balances the diet	1 9.1%	-	-	-	-
Strengthens the body	-	-	2 8.6%	1 10.0%	1 10.0%
Protects health	1 9.1%	-	-	1 10.0%	- %
Enhances health	6 54.5%	1 9.1%	5 21.7%	7 70.0%	1 10.0%
Do not know 2)	-	10 90.9%	10 43.5%	0 0.0%	4 40.0%

In M'pessoba the advantages of vegetables consumption were most known by trained women. At the level of untrained women, those who did not know were the most numerous with 90.9% in M'pessoba, 43.5% in Nampessola and 40.0% in Sirakele.The majority of women in Bougouni knew the advantages of vegetables consumption. All trained women in Koutiala knew at least one advantage of vegetables consumption.

Accessibility and availability of food in households

Accessibility

Expenses on vegetables

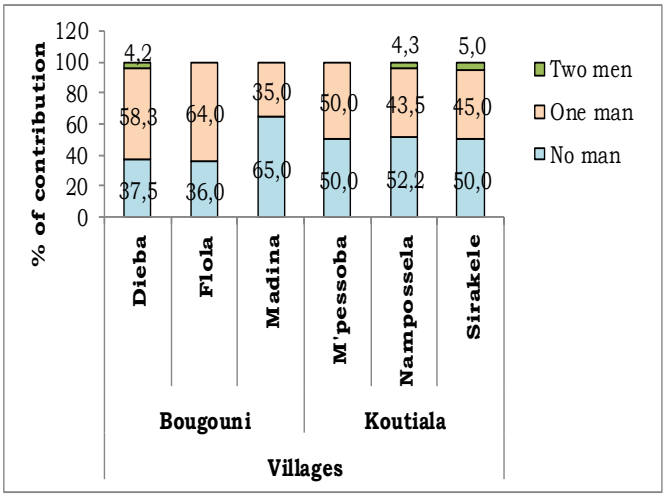

Chart 5: Distribution of households according to the number of men participating in expenses for growing market garden crops in the districts of Koutiala and Bougouni 2013

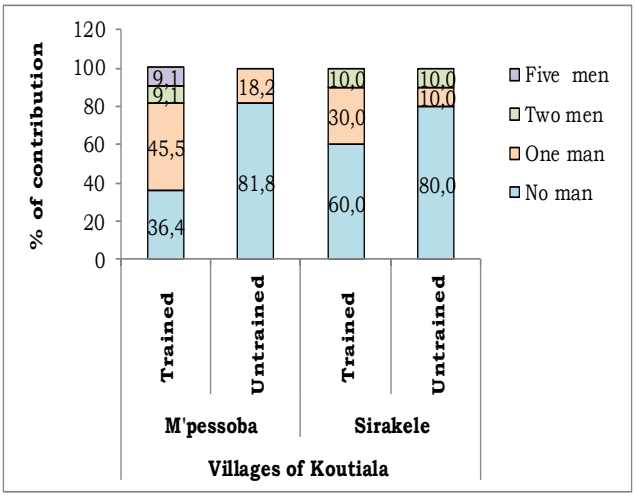

Chart 6: Distribution of households according to the number of men participating in the expenses for the purchase of garden produce in the districts of Koutiala and Bougouni 2013

In the villages of Dieba and Flola less than 50% of men participated in the expenses for vegetables in the household. The maximum men participating in the expenses for vegetables in households came from M'pessoba with trained women.

Availability

Family cultivable plots

Almost all households in the district of Bougouni (97.1%) and Koutiala (95.4%) had a cultivated family plot.

Table IX: Distribution of women according to the possession of cultivable plots in the District of Bougouni in 2013

	Plots farmed by the woman		**P**
	Yes	**No**	**0.000**
Dieba	20	4	
	83.3%	16.7%	
Flola	8	17	
	32.0%	68.0%	
Madina	14	8	
	63.6%	36.4%	
M'pessob	16	4	
	80.0%	20.0%	
Nampossela	10	13	
	43.5%	56.5%	
Sirakele	20	0	
	100.0%	0.0%	

There was a statistically significant relationship between the possession of plots by women and the village they belong to.

Gardening practice by women

Table X: Distribution of women according to the practice of gardening in their plots in the Districts of Bougouni and Koutiala in 2013

District	Villages	Garden crop		P
		Yes	No	
Bougouni	**Dieba**	5	19	**0.663**
		38.4%	33.9%	
	Flola	4	21	
		30.8%	37.5%	
	Madina	4	16	
		30.8%	28.6%	
	Total	13	56	
Koutiala	**M'pessoba**	7	15	**0.555**
		30.4%	35.7%	
	Nampossela	7	16	
		30.4%	38.1%	
	Sirakele	9	11	
		39.1%	26.2%	
	Total	23	42	

The practice of gardening by women had no statistically significant relationship with the village.

Table XI: Distribution of women according to the practice of gardening in trained and untrained villages of the District of Koutiala in 2013

Gardening	Training		P
	Trained	Untrained	0.057
Yes	**11**	**5**	
	52.4%	23.8%	
No	10	16	
	47.6%	76.2%	
Total	21	21	

The practice of gardening had no statistically significant relationship with training in the district of Koutiala.

Table XII: Crops grown by women in their plots in the district of Bougouni in 2013

Gardening		**Dieba**		**Flola**		**Madina**	
Local name	**French name**						
Djaba	Oignon	2	Home consumption =2	4	Home consumption/sale=12	1	Home consumption/sale=4
Tomati	Tomate	2		4		3	
Ngan	Gombo	2					
Forotô	Piment	1	Home consumption / sale=7	2			
Goyo	Aubergine	1		2			
Concombre	Concombre	1					
Pomporo	Poivron						
Naboulou	Naboulou			2			
		Cereals					
Kaba	Maïs	4	Home consumption /sale=28	3	Home consumption/ sale=27	4	Home consumption/sale=7
Sagno	Petit mil	3		4		2	
Malo	Riz	16		8			
Kenike/bimbiri(flola)	Sorgho	1		5		1	
Fini	Fonio	4		7			
		Others					
Tika	Arachide	20	Home consumption /sale=22	8	Home consumption/ sale=6	13	Home consumption/sale=12
Chô	Haricot						
Banancou	Manioc	1			Exchange with rice=2		Sale solely=1
Sira	Tabac	1					

Table XIII: Crops grown by women in their plots in the district of Koutiala in 2013

Local name	French name	M'pessoba		Nampessola		Sirakele	
				Gardening			
Djaba	Oignon	6	Home consumption /sale=18	4	Home consumption/ sale=4 Sale solely=8	7	Home consumption/ sale=28
Tomati	Tomate	4		4		7	
Ngan	Gombo	5				7	
Forotô	Piment			2		2	
Goyo	Aubergine			2		2	
Concombre	Concombre					1	
Pomporo	Poivron					1	
Salade	Salade	1					
Melon	Melon	2					
Naboulou	Naboulou			2		1	
	Cereals						
Kaba	Maïs	9	Home consumption /sale = 17 Home consumption=8	12	Home consumption / sale=29	11	Home consumption/ sale=32
Sagno	Petit mil	5		4		12	
Malo	Riz	8		6		4	
Kenike/bimbiri(flola)	Sorgho	2		2		4	
Fini	Fonio	1		5		1	
	Others						
Tika	Arachide	3	Home consumption=6	13	Home consumption / sale=10 solely=3	18	Home consumption/ sale=34
Chô	Haricot	2				8	
Banancou	Manioc	1				1	
Tikanicourou	Pois de terre					4	
Pomme de terre	Pomme de terre					2	
Wosso	Patate douce					1	
Cori	Cotton			3			

Table XIV: List of vegetables grown in plots owned by women in the districts of Koutiala and Bougouni in 2013

Local name	French name	Scientific name	Group/Family	Kind	Specy
Djaba	Oignon	*Allium cepa L.*	Liliaceae	Allium	cepa L.
Djaba	Echalotte	*Allium cepa var.aggregatum*	Liliaceae	Allium	cepa var.aggregatum
Tomati	Tomate	*Lycopersicon esculentum*	Solanaceae	Lycopersicon	esculentum
Ngan	Gombo	*Abelmoschus esculentus*	Malvaceae	Abelmoschus	esculentus
Forotô	Piment	*Capsicum frutenscens*	Solanaceae	Capsicum	frutenscens
Goyo	Aubergine	*Solanum aethiapicum*	Solanaceae	Solanum	aethiapicum
Concon	Concombre	*Cucumis sativus*	Cucrbitaceae	Cucumis	sativus
Pomporo	Poivron	*Capsicum annuum*	Solanaceae	Capsicum	annuum
Naboulou					
Aubergine	Aubergine	*Solanum melongera L.*	Solanaceae	Solanum	melongera L.
Choux	Choux	*Brassica oleracea*	Cruciferes	Brassica	oleracea
Salade	Salade	*Lactuca sativa*	Composites	Lactuca	sativa
Melon	Melon	*Cucumis melo*	Cucurbitaceae	Cucumis	melo

Table XV: List of cereals grown in plots owned by women in the districts of Koutiala and Bougouni in 2013

Local name	French name	Scientific name	Group	Kind	Specy	Variety
Sagno	Mil	***Pennisetum glaucum* (L.) R. Br.**	Graminaceous plants	Pennisetum	Typhoïd or glaucum	Sanioba, Toroniou C1, Souna, Djiguifa, M9b3, ITMV, M12D1
Malo	Riz	***Oriza sativa/glaberrrima***	Graminaceous plants	Orysa	sativa or glaberrima	Nerica4, BG 90-2, ITA 304, Gambiaca kokoum, BH2, Dourado précoce, MSP10, DM16, Kogoni 91-1, DK3, Segadis, Mali sawn
Kenike/bimbiri(flola)	Sorgho	***Sorghum bicolor (L)***	Panicoïdées/ graminaceous plants	Sorghum	bicolor	Grinka or Tiandougou Coura, Seguenata, Mutant Sorg-88-10-02, Tinbora, IRAT S6, CSM388, Malisor 92-1
Fini	Fonio	***Digitaria exilis***	Graminaceous plants	Digitaria	exilis	CFIGE 26, 37, 48,60, 1, 3 Sotubaka, Dembanyma, Malihybride 7, DMR (Niéléni), SR 22 et T Z E S R

Table XV: List of others crops grown in plots owned by women in the districts of Koutiala and Bougouni in 2013

Local name	French name	Scientific name	Group	Kind	Specy	Variety
Tika	Arachide	***Arachis hypogaea***			Hypogaea	Virginia variety: 28-206; 1040; GH119-20/ Valencia-Spanish variety: 47-10; 28-204; 55-437; Valencia variety; valencia 247.
Chô	Haricot (niébé)	***(Vigna unguiculata (L.) Walp***	Papilionaceous plants	Vigna	Unguiculata	KVX 745-11P, Dounanfana, Korobalen
Tikanicourou	Pois chiches (voandzou)	***Vigna subterranea***	Papilionaceous plants	Vigna	Subterranea	les CMV: CMV3-1, CMV8-4
Wosso	Patate douce	***Ipomea batatas***	Concolvulaceae	Ipomea	Batatas	
Pomme de terre	Pomme de terre	***Solanum tuberosum***	Solanaceae	Solanum	Tuberosum	Sahel, Pamina, clostar, Mondial
Banancou	Manioc	***Manihot esculenta***	Euphorbiaceae	Manihot	utilissina et esculenta	Manihot palmata, Manhot aïpi
SIRA	Tabac	***Nicotiana tabacum***	Solanaceae	Nicotiama	Tabacum	Burley 21, Bringh cospaia, Paraguay, Kentucky 104

Work and responsibility sharing agreement between men and women

For women, in the two districts : It appeared from analysis of the information obtained during the focus groups, that women worked in the family farms and practiced mainly gardening without men support.

For the responsibility for household nutrition, men were responsible for providing households with cereal and women sometimes to care for condiments costs. They had the responsibility to enrich meals. Sometimes in case of cereal shortage women sold vegetables to buy some. But the head of household could also allow a portion of grain to be sold so that to buy condiments.
Women sold vegetables to meet their personal expenses and those of their children. Vegetables were mostly for sale, so not consumed much in households. Within households only unsold vegetables, or not being good quality or enough for sale were consumed.

At mealtime, everyone in the household ate the same meal is shared between men, women and children. Those faster in eating had the largest share at the expense of the very young, sick or elderly. Sometimes porridge was offered to these three groups. In case of meals improvement privilege was given to heads of households when sharing.

For men

Market gardening was mostly practiced by women, they sold a portion to pay for condiments. Men grew cereal and were in charge of providing the household with cereal. The vegetables were for sale and not much consumed or used to enrich meals in households. Some men from M'pessoba said they supported women in their business. Men argued that if women gardening grew more they may then invest financially in the household.

Characteristics of households' food consumption and dietary patterns

Feeding the under 5 years child

Breastfeeding time

At Bougouni respectively 50%, 52.0% and 80.0% of children were breastfed immediately after birth in Dieba, Flola and Madina. Few children were breastfed more than 24 hours after birth with 9.1% Dieba, 15.0% in Madina.

At Koutiala

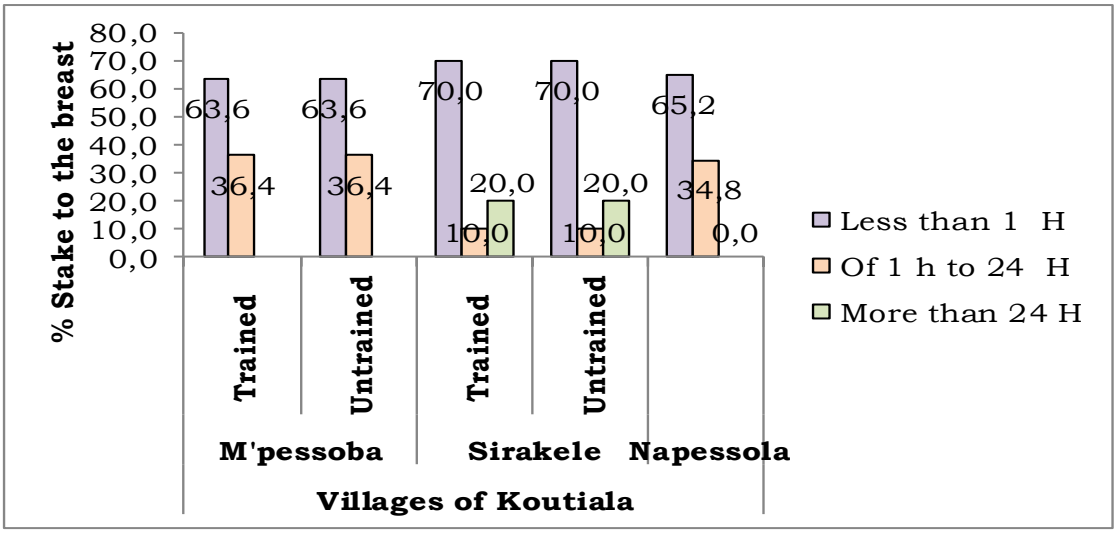

Chart 7: Distribution of women of childbearing age based on the breastfeeding timeframe of their children in the district of Koutiala in 2013

Colostrum and exclusive breastfeeding

In the surveyed villages more than 90% of children had received colostrum except at Flola with 88.0% and Sirakele with 80%.

Compared to exclusive breastfeeding, the lowest rate was recorded at Sirakele with 50.0%. It was 59.1% in Dieba, 64.0% in Flola, 68.2% in Madina, 73.7% in M'pessoba and 63.6% in Nampessola.

Some respondents said during the focus groups that especially exclusive breastfeeding is a determining factor in the growth of the child but also an insufficiency of breast milk may be a cause of malnutrition.

Complementary feeding

Table XVI: Distribution of women of childbearing age in terms of the average age of introduction, in months, of complementary feeding in the districts Bougouni and Koutiala in 2013

Villages of Bougouni		n	%	Average age of introduction	Standard deviation
Dieba		20	18 .2	6.67	2.887
Flola		18	16.4	5.53	3.533
Madina		18	16.4	12.80	9.089
M'pessoba	**Trained**	10	9.1	8.67	5.987
	Untrained	10	9.1	7.85	4.234
Nampossela		16	14.5	7.93	3.494
Sirakele	**Trained**	9	8.2	7.42	3.906
	Untrained	9	8.2	8.00	4.456

The age of introduction of complementary feeding set at national level at 6 months was not observed in all the surveyed villages.

The food supplement was given on average 3 times in all villages and this regardless of the age of the child.

In the focus groups, respondents in the majority recognized the role complementary feeding in the prevention of malnutrition.

24-hour recall

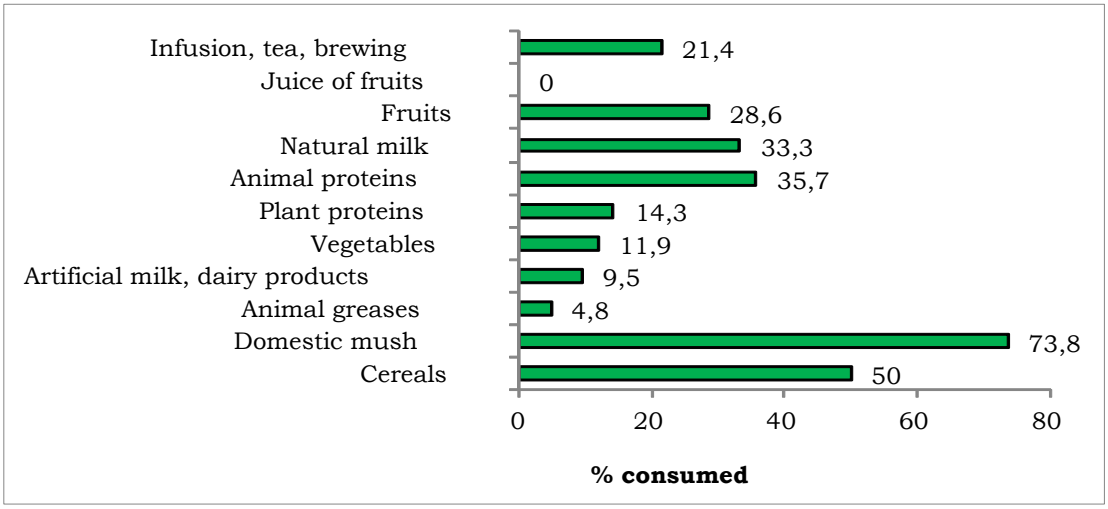

Chart 8: Food consumed in the previous 24 hours by children aged 6 – 59 months in Bougouni 2013

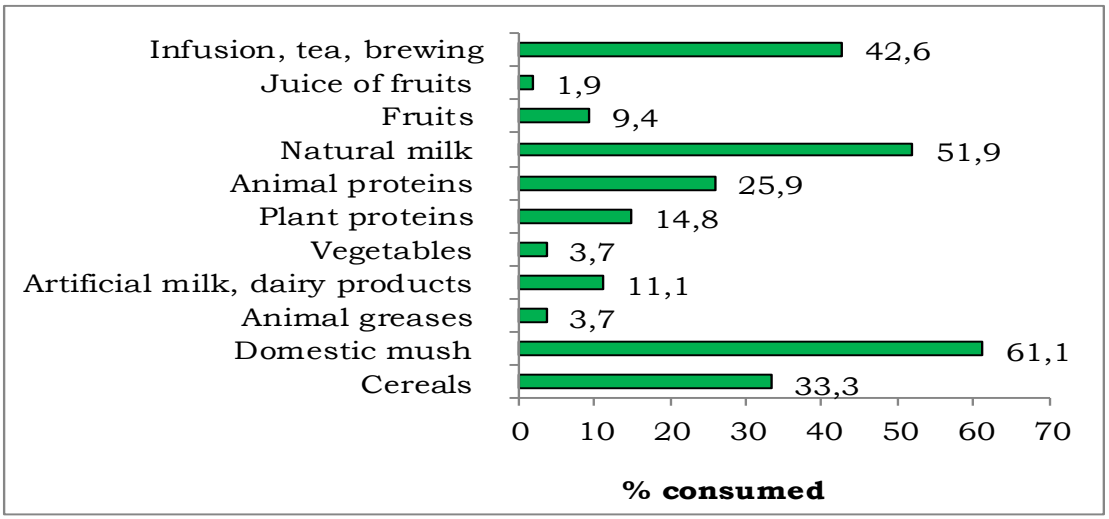

Chart 9: Food consumed in the previous 24 hours by children aged 6-59 months in Koutiala in 2013

Children's 24-hour food recall showed that 11.9% contained vegetables in Bougouni against 3.7% in Koutiala. The vast majority of children had eaten the family porridge with 73.8% in Bougouni and 61.1% in Koutiala.

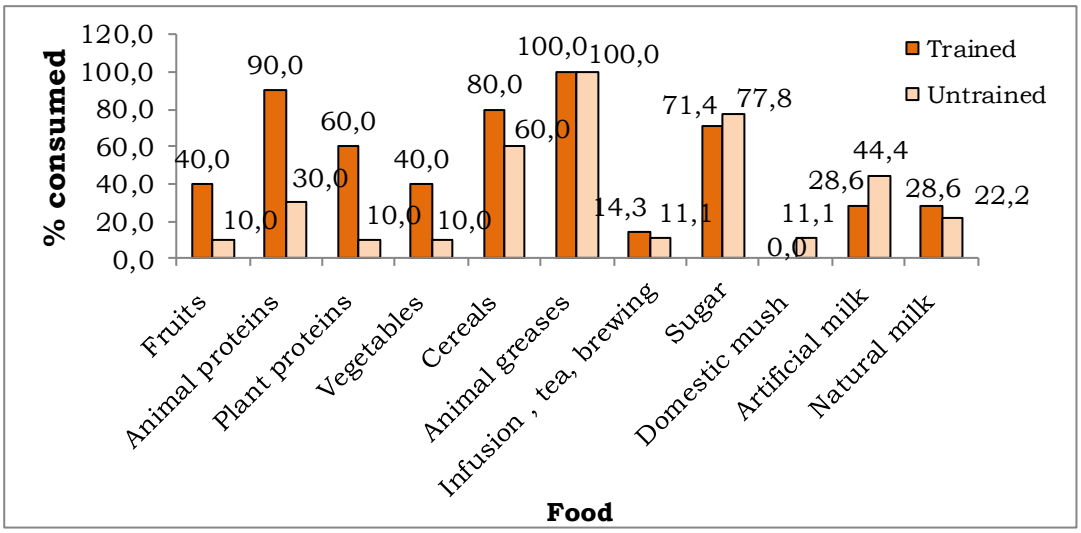

Chart 10: Food consumed in the previous 24 hours by 6-59 months children in the village of M'pessoba in 2013

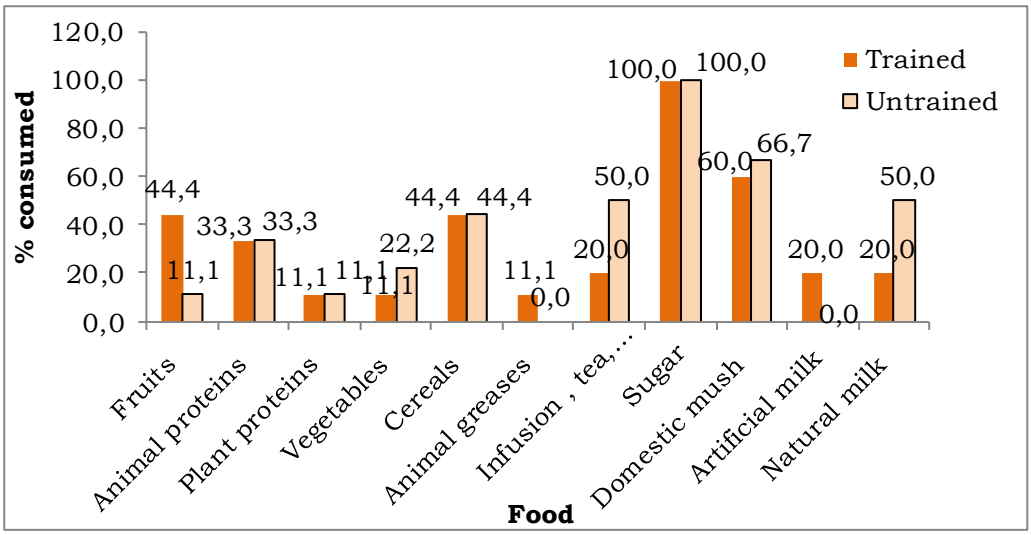

Chart 11: Food consumed in the previous 24 hours by 6-59 months children in the village of Sirakele in 2013

At M'pessoba 40% of children whose mothers had benefited from training had received vegetables against 10% for those untrained. In the village of Sirakele children of untrained women had received more vegetables with 22.2% against 11.1% for those trained.

Infant porridge

It appears that just over a quarter of trained women cooked infant porridge in Koutiala and 18.2% of the untrained women also cooked. In Bougouni 20.0% of trained women and 25.0% of untrained women cooked infant porridge. Most of infant porridge (68.2%) had a liquid consistency regardless of the child's age.

Table XVII: Composition of infant porridge in the district of Bougouni in 2013

		Composition	Number	%	Cooking time	Consistency
Dieba n=24		do not cook	16	66.7%	-	Liquid
	Moni	maize, water	1	4.2%	60 mn	Liquid
		maize, water, lemon	4	16.7%	35 mn	Liquid
		maize, water, sugar	1	4.2%	15 mn	Liquid
	Roui	maize, water, pearl millet, beans, sugar	1	4.2%	20 mn	Liquid
		maize, water, salt, sugar	1	4.2%	15 mn	Liquid
Flola n=25		do not cook	12	48.0%	-	Liquid
	Moni	maize, water	2	8.0%	60 mn	Liquid
		maize, water, salt, sugar	1	4.0%	60 mn	Thick
		maize, water, salt, sugar, lemon	1	4.0%	60 mn	Liquid
		maize, water, sugar	3	12.0%	50 mn	Thick
	Baka/seri	maize, water	1	4.0%	60 mn	Liquid
	Baka	maize, beans, water	2	8.0%	35 mn	Thick
	nafama	maize, beans, water, oil, sugar			60 mn	Thick
	/Séri nafama		1	4.0%		
	Moni nafama	maize, groundnuts, beans, water	1	4.0%	don ’t know	Liquid
	Roui	maize, water, rice, beans, sugar	1	4.0%	60 mn	Liquid
Madina n=20		do not cook	10	50.0%	-	
	Moni	maize, water, sugar, lemon	1	5.0%	18 mn	Liquid
		millet, beans, maize	1	5.0%	18 mn	Liquid
		rice, beans, maize	1	5.0%	15 mn	Thick
	Baka/seri	maize, water, sugar	3	15.0%	60 mn	Liquid
	Roui	maize, water, rice, beans, sugar	3	15.0%	60 mn	Thick
		maize, milk powder	1	5.0%	15 mn	Thick

Table XVIII: Composition of infant porridge in the district of Koutiala in 2013

	Local name	Composition	Number	%	Cooking time	Consistency
M'pessoba n=22		do not cook	12	54.5%		Liquid
	Baka/Seri	millet, beans, maize, water, milk, sugar	4	18.2%		Liquid
		petit millet, beans, maize, water, milk, sugar	2	9.1%		Thick
		maize, water, sugar, beans, salt, milk	1	4.5%		Liquid
	Moni	maize, water, sugar, lemon, milk	1	4.5%		Thick
	Roui	maize, water, salt, sugar, millet, groundnuts oil	2	9.1%		Liquid
Nampossalta n=23		do not cook	15	65.2%		Liquid
	Moni nafama	maize, beans, groundnuts, monkey bread, oil, salt, water, sugar	2	8.6%		Thick
		maize, beans, groundnuts, rice, millet, water, sugar	1	4.3%		Liquid
		maize, beans, groundnuts, rice, millet, water, sugar, oil, tamarind	1	4.3%		Thick
	Moni	maize, water, salt, sugar	1	4.3%		Liquid
		maize, water, sugar, milk	3	13.0%		Liquid
Sirakele n=20		do not cook	11	55.0%		Thick
	Moni nafama	maize, beans, groundnuts, rice, millet, water, sugar	1	5.0%		Liquid
		maize, beans, groundnuts, rice, millet, water, sugar, oil, tamarind	1	5.0%		Liquid
		maize, beans, water, sugar	1	5.0%		Liquid
		maize, rice, millet, water, sugar, soya, monkey bread	1	5.0%		Liquid
	Moni:	maize, water, salt, sugar	1	5.0%		Thick
		maize, water, salt, sugar, lemon	1	5.0%		Thick
	Baka /Seri nafama	maize, beans, groundnuts, monkey bread, oil, salt, water, sugar	3	15.0%		Liquid

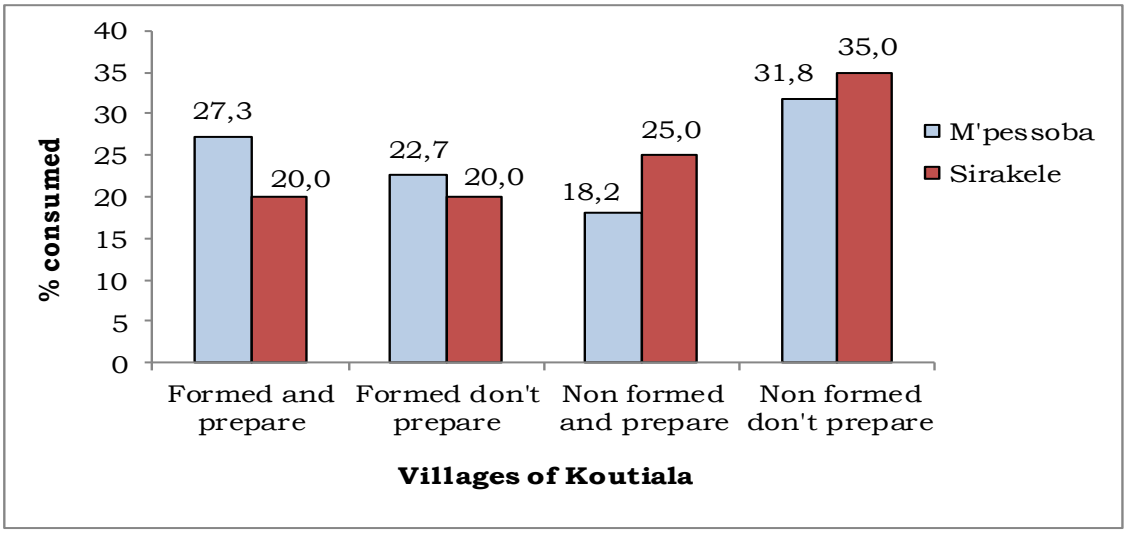

Chart 12: Infant porridge cooking in the trained villages of the district of Koutiala in 2013

Millet flour at Flola

Corn flour and green leaves at Flola

Children's weaning

Table XIX: Average age for children's weaning in the villages of the districts of Bougouni and Koutiala in 2013

Districts	Villages	Number	Minimum	Maximum	Average age for weaning	Standard deviation
Bougouni	Dieba	7	14	27	22.00	4.655
	Flola	19	6	24	14.74	6.261
	Madina	8	19	24	23.13	1.808
Koutiala	M'pessoba	6	17	36	24.83	6.145
	Nampossela	15	10	24	19.27	5.837
	Sirakele	11	6	24	15.45	6.977

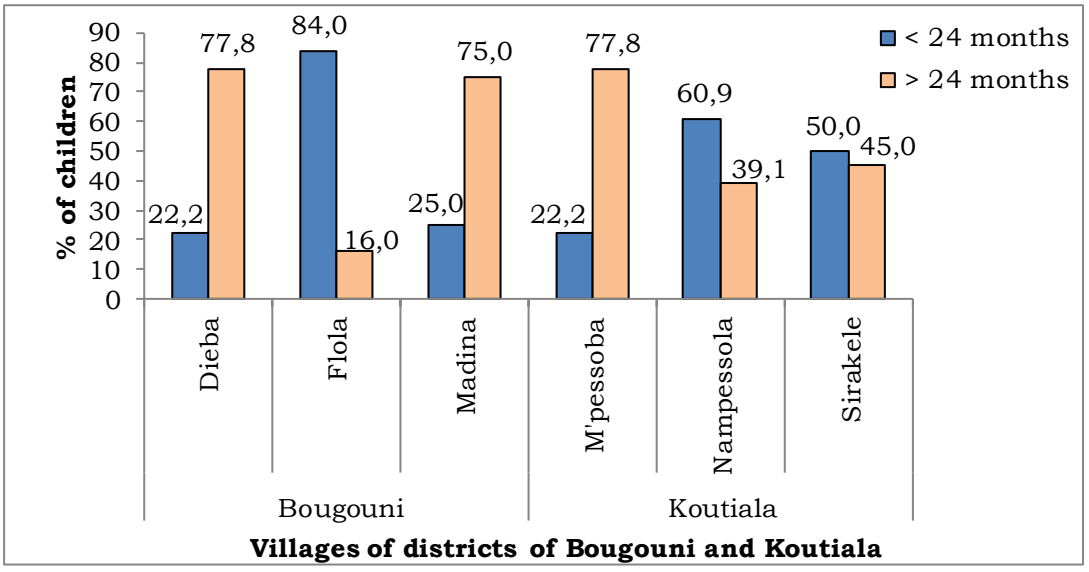

Chart 13: Weaning month for children in the villages of the districts of Bougouni and Koutiala in 2013

Households' food patterns

Family food

The staple food in households in the two districts was cereals, specifically maize and baobab green leaves. On average, families both in Bougouni or Koutiala had on average three meals, regardless of the village.

Maize in Flola

Baobab leaves being dried-Nimpessola

Sorghum in M'pessoba

Table XX: Households' breakfast composition in the district of Bougouni in 2013

Local name	Composition	Number	%	Cooking time
Moni	maize, water	1	4.2%	60 mn
	maize, water, lemon	1	4.2%	40 mn
Baka/Seri	maize, water	10	41.6%	23 mn
	maize, water, lemon	1	4.2%	30 mn
	maize, water, sugar	1	4.2%	40 mn
	maize, water, shea butter	8	33.6	32 mn
	millet, water	1	4.0%	40 mn
Tô	maize, water, potash, okra, salt	1	4.0%	60 mn
Moni	maize, water	2	8.0%	52 mn
Baka/seri	maize, water	12	48.0%	40 mn
	maize, water, lemon	1	12.0%	37 mn
	maize, water, sugar	9	28.0%	30 mn
Wosso	sweet potato, salt	1	4.0%	40 mn
Moni	maize, water	9	45.0%	58 mn
	maize, water, milk	2	10.0%	60 mn
Baka/seri	maize, water	4	20.0%	48 mn
	maize, water, lemon	1	5.0%	30 mn
	maize, water, sugar	2	10.0%	30 mn
	maize, water, potash, baobab leaves, salt	1	5.0%	60 mn
Tô	maize, water, potash, okra, salt	1	5.0%	60 mn

Table XXI: Households' lunch composition in the district of Bougouni in 2013

	Local name	Composition	Number	%	Cooking time
Dieba n=24	Baka/Seri	maize, water	1	4.2%	30 mn
	Tô	maize, water, potash, baobab leaves, salt, soumbala	18	75.0%	60 mn
		millet, water, potash, baobab leaves, salt, soumbala	1	4.2%	60 mn
	Foyo	fonio, okra, water, salt, shea butter, onion	1	4.2%	90 mn
	Kini	rice, water, okra, salt, soumbala	1	4.2%	90 mn
		rice, water, groundnuts dough, salt, onion, dried fish	1	4.2%	90 mn
	Nièǹekini	maize, water, okra, salt, soumbala	1	4.2%	60 mn
Flola n=25	Bassi	maize, water, salt, shea butter, onion	1	4.0%	90 mn
	Chô	beans, potash, salt, shea butter	1	4.0%	90 mn
	Kini	rice, water, groundnuts dough, salt, onion, dried fish	1	4.0%	12 mn
	Baka/seri	maize, water	4	16.0%	60 mn
	Tô	maize, water, potash, baobab leaves, salt, soumbala	18	72.0%	60 mn
Madina n=20	Moni	maize, water, lemon, sugar	1	5.0%	60 mn
	Baka/seri	maize, water	1	5.0%	60 mn
	Chô	beans, potash, salt, shea butter	1	5.0%	90 mn
	Tô	millet, water, potash, baobab leaves, salt	1	5.0%	60 mn
		maize, water, potash, baobab leaves, salt	15	75.0%	90 mn
		Maize, water, potash, okra, salt	1	5.0%	60 mn

Crushed corn seed in Dieba

Table XXII: Households 'dinner composition in the district of Bougouni in 2013

Dieba n=24	Local name	Composition	Number	%	Cooking time
	Baka/Seri	maize, water, sugar	1	4.2%	20 mn
		maize, water	2	8.3%	40 mn
	Tô	maize, water, potash, baobab leaves, salt, soumbala	19	79.1%	60 mn
		millet, water, potash, baobab leaves, salt, soumbala	1	4.2%	90 mn
	Diétô	pumpkin, water, salt	1	4.2%	40 mn
Flola n=25	Baka/Seri	maize, water	1	4.0%	40 mn
	Kini	rice, water, groundnuts dough, salt, dried fish	2	8.0%	60 mn
		rice, water, groundnuts dough, salt,	2	8.0%	58 mn
	Tô	maize, water, potash, baobab leaves, salt	18	72.0%	90 mn
		millet, water, potash, baobab leaves, salt	1	4.0%	60 mn
	Niènièkini	maize, water, okra, salt	1	4.0%	60 mn
Madina n=20	Moni	maize, water, lemon, sugar	1	5.0%	40 mn
	Baka/seri	maize, water	1	5.0%	60 mn
	Chô	beans, potash, salt, shea butter	2	10.0%	90 mn
	Kini	rice, water, groundnuts dough, salt, onion, dried fish	2	10.0%	60 mn
	Kini	rice, water, salt, onion, tomato paste	1	5.0%	60 mn
	Tô	millet, water, potash, baobab leaves, salt	1	5.0%	60 mn
		maize, water, potash, baobab leaves, salt	10	50.0%	90 mn
		maize, water, potash, okra, salt	1	5.0%	90 mn
	Tieké	cassava, fish, pepper	1	5.0%	60 mn

Maize at Dieba

Tomato at Flola

Table XXIII: Households' breakfast composition in the district of Koutiala in 2013

	Local name	Composition	Number	%	Cooking time
M'pessoba n=22	Baka/Seri	maize, water, lemon, sugar	2	9.1%	60 mn
		maize, water	5	22.8%	20 mn
		maize, water, milk	1	4.5%	60 mn
		maize, water, salt	1	4.5%	30 mn
		maize, water, sugar	1	4.5%	40 mn
		maize, water, sugar, milk	1	4.5%	40 mn
		rice, water, sugar	1	4.5%	30 mn
		millet, water, sugar, salt	4	18.4%	15 mn
	Tô	millet, water, potash, baobab leaves, salt	2	9.1%	60 mn
		maize, water, potash, baobab leaves, salt	2	9.1%	60 mn
	Bassi	millet, groundnuts dough, tomato paste, salt	1	4.5%	90 mn
	Kini	rice, groundnuts dough, salt, dried fish	1	4.5%	60 mn
Nampessola n=23	Moni	maize, water, salt, milk	4	17.4%	60 mn
	Baka/seri	maize, water, oil	1	4.3%	60 mn
		maize, water, salt	3	13.0%	40 mn
		maize, water, sugar	8	34.9%	30 mn
		maize, water, sugar, milk	1	4.3%	40 mn
		millet, ginger, water, sugar	1	4.3%	60 mn
	Tô	maize, water, potash, baobab leaves, salt	5	21.8%	60 mn
Sirakele n=20	Moni	maize, water, milk, sugar, lemon	1	5.0%	60 mn
	Baka/seri	maize, water, salt	2	10.0%	40 mn
		maize, water, salt, sugar	10	55.0%	30 mn
		maize, water, sugar, milk	1	5.0%	30 mn
		maize, water, sugar, salt, shea butter	5	25.0%	40 mn

Table XXIV: Households' lunch composition in the district of Koutiala in 2013

	Nom	Composition	Number	%	Cooking time
M'pessoba n=22	Baka/Seri	maize, water, sugar	1	4.5%	20 mn
	Tô	maize, water, potash, baobab leaves, salt	14	63.9%	65 mn
		maize, water, potash, baobab leaves, salt, dried fish	1	4.5%	90 mn
		maize, water, potash, okra, salt	1	4.5%	60 mn
	Kini	rice, water, okra, salt, died fish	1	4.5%	60 mn
		rice, water, groundnuts dough, salt, onion, dried fish	2	9.1%	60 mn
	Niènièkini	maize, water, groundnuts dough, salt	1	4.5%	90 mn
	Tiganicourou	peas, water, salt	1	4.5%	60 mn
Nampessola n=23	Kini	rice, water, groundnuts dough, salt, onion, dried fish	3	13.0%	67 mn
		rice, water, groundnuts dough, salt, onion, soumbala	1	4.3%	60 mn
	Baka/seri	maize, water, sugar, milk	4	17.4%	60 mn
	Tô	maize, water, potash, baobab leaves, salt	10	43.6%	60 mn
		maize, water, potash, baobab leaves, salt, soumbala	1	4.3%	60 mn
		maize, water, potash, okra, salt	2	8.7%	90 mn
		millet, water, potash, baobab leaves, salt	2	8.7%	88 mn
Sirakele n=20	Moni	maize, water, lemon, sugar	1	5.0%	60 mn
	Baka/seri	maize, water, sugar	1	5.0%	60 mn
		maize, water, sugar, milk	1	5.0%	60 mn
	Kini	rice, water, groundnuts dough, salt, onion, dried fish	1	5.0%	60 mn
	Niènièkini	millet, water, groundnuts dough, salt	1	5.0%	90 mn
	Tô	maize, water, potash, baobab leaves, salt	10	50.0%	90 mn
		maize, water, potash, okra, salt	3	15.0%	60 mn
		maize, water, lemon, baobab leaves, salt	1	5.0%	60 mn
	Bassi	maize, water, salt, tomato paste, onion	1	5.0%	90 mn

Table XXV: Households' diner composition in the district of Koutiala in 2013

	Local name	Composition	Number	%	Cooking time
M'pessoba n=22	Baka/Seri	maize, water, sugar	1	4.5%	20 mn
	Tô	maize, water, potash, baobab leaves, salt	15	68.2%	60 mn
	Foyo	fonio, okra, water, salt, tomato paste, onion	1	4.5%	90 mn
	Kini	rice, water, okra, salt, dried fish	3	13.6%	90 mn
	Nièǹèkini	maize, water, groundnuts paste, salt	1	4.5%	90 mn
	Tiganicourou	peas, water, salt	1	4.5%	120 mn,
Nampessola n=23	Kini	rice, water, groundnuts paste, salt, onion, dried fish	1	4.3%	60 mn
	Baka/seri	maize, water, sugar	4	17.4%	60 mn
		maize, water, potash, baobab leaves, salt	16	69.6%	60 mn
	Tô	maize, water, potash, baobab leaves, salt, soumbala	1	4.3%	90 mn
		maize, water, potash, okra, salt	1	4.3%	60 mn
Sirakele n=20	Moni	maize, water, lemon, sugar	1	5.0%	60 mn
	Baka/seri	maize, water, sugar	1	5.0%	60 mn
	Kini	rice, water, groundnuts paste, salt, onion, dried fish	1	5.0%	60 mn
	Chô	beans, potash, salt, shea butter	1	5.0%	90 mn
	Nièǹèkini	millet, water, groundnuts paste, salt	3	15.0%	90 mn
	Tô	millet, water, potash, baobab leaves, salt	2	20.0%	60 mn
		maize, water, potash, leaves de baobab, salt	8	40.0%	90 mn
		maize, water, potash, okra, salt	2	10.0%	60 mn
		maize, water, lemon, baobab leaves, salt	1	5.0%	90 mn

Food groups consumed during the day in households in the districts of Bougouni and Koutiala

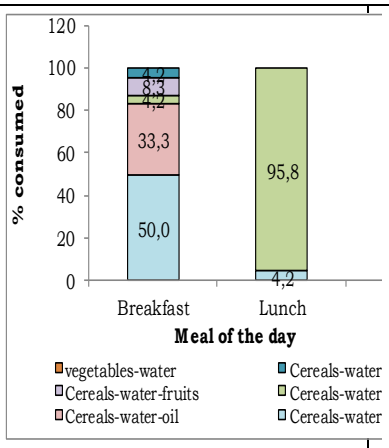

Chart 14 : Food groups consumed in a day in Dieba in 2013

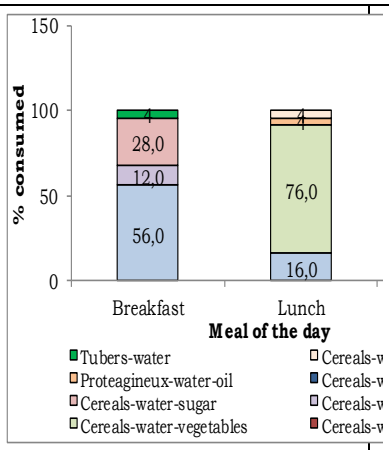

Chart 15: Food groups consumed in a day in Flola in 2013

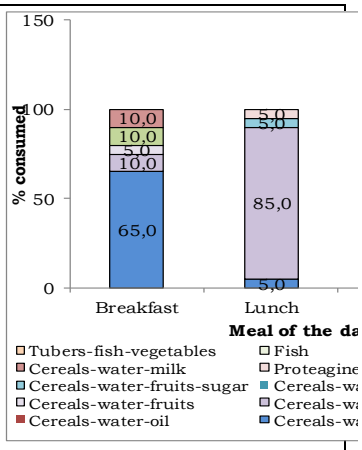

Chart 16 : Food groups consumed in a day in Madina in 2013

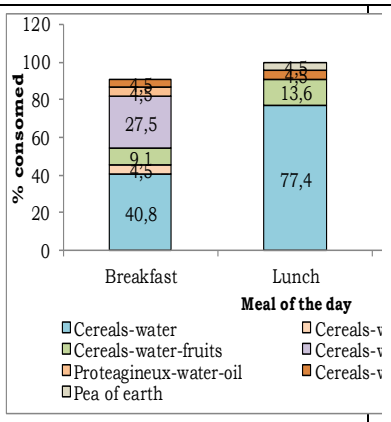

Chart 17: Food groups consumed in a day in M'pessoba in 2013

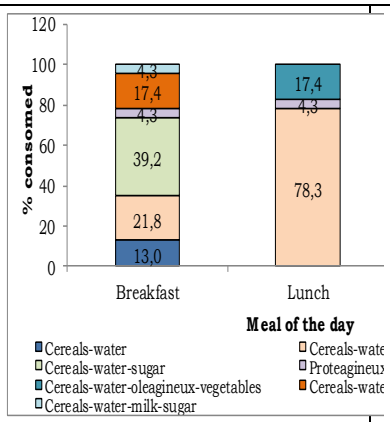

Chart 18: Food groups consumed in a day in Nampessola in 2013

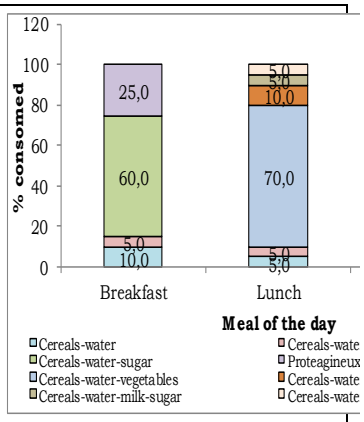

Chart 19: Food groups consumed in a day in Sirakele in 2013

Vegetables consumption

Table XXVI: Distribution of women according to vegetable consumption in the districts of Bougouni and Koutiala 2013

District	Village	Vegetable consumption		Total	P
		Yes	No		0.420
	Dieba	15	9	24	
		62.5%	37.5%		
Bougouni	Flola	11	14	25	
		44.0%	56.0%		
	Madina	10	10	20	
		50.0%	50.0%		
Koutiala	M'pessoba	12	10	22	**0.217**
		54.5%	45.5%		
	Nampossela	10	13	23	
		43.5%	56.5%		
	Sirakele	14	6	20	
		70.0%	30.0%		

Vegetable consumption was higher in the district of Koutiala in M'pessoba and Sirakele without this relationship being statistically significant.

Table XXVII: Distribution of respondents according to vegetables consumption in the district of Bougouni in 2013

Village	Vegetable consumption	Training		P
		Trained	Untrained	
M'pessoba		9	3	**0.010**
		81.8%	27.3%	
Sirakele		7	7	**1.000**
		70.0%	70.0%	

Vegetable consumption had no statistically significant relationship with the training at the village Sirakele.

Hygiene measures

Hands washing with soap and water
Most women washed their hands before meals by 69.4% in Bougouni, by 62.5% in Dieba and by 73.7% in Flola and Madina.

In Koutiala 87.3% of women washed their hands before cooking food, with 77.3% in M'pessoba, 93.3% in Nampossela, and 94.4% in Sirakele. At M'pessoba, trained women washed their hands by72.7% and those untrained by 81.8%. At Sirakele 100% of women trained were doing this activity against 87.5% for those untrained.

Children's hands washing with water and soap before meal: it represented the majority with 70.1% in Bougouni and 68.8% in Koutiala. In the district of Koutiala Dieba achieved 62.5%, Flola 73.9% and Madina 75.0%. At Koutiala Nampossola reached 50%, M'pessoba trained women 81.8% and 72.7% for those untrained. At Sirakele both those trained and untrained accounted respectively for 80.0%.

Before the consumption of raw vegetables disinfection was made in 36.4% of these cases at Bougouni and in 40.0% of cases at Koutiala. At Sirakele (trained village) 60% of respondents practiced disinfection against 36.4% at M'pessoba

Storage of drinking water
Water storage container was clean at 100% in all the villages except for a household at Sirakele. It was covered in 100% of cases at Dieba and over 95% in the other villages.

Dietary diversity score

Table XXVIII: Score of household dietary diversity for the districts of Bougouni and Koutiala in 2013

Villages	Dietary diversity score		
	Low	Average	High
Dieba	25.3%	58.0%	16.7%
Flola	44.0%	36.0%	20.0%
Madina	50.0%	22.7%	27.3%
M'pessoba	25.0%	40.0%	35.0%
Nampossela	39.1%	39.2%	21.7%
Sirakele	45.0%	25.0%	30.0%

Place of cereals: They were consumed by 100% of the surveyed households in all the villages.

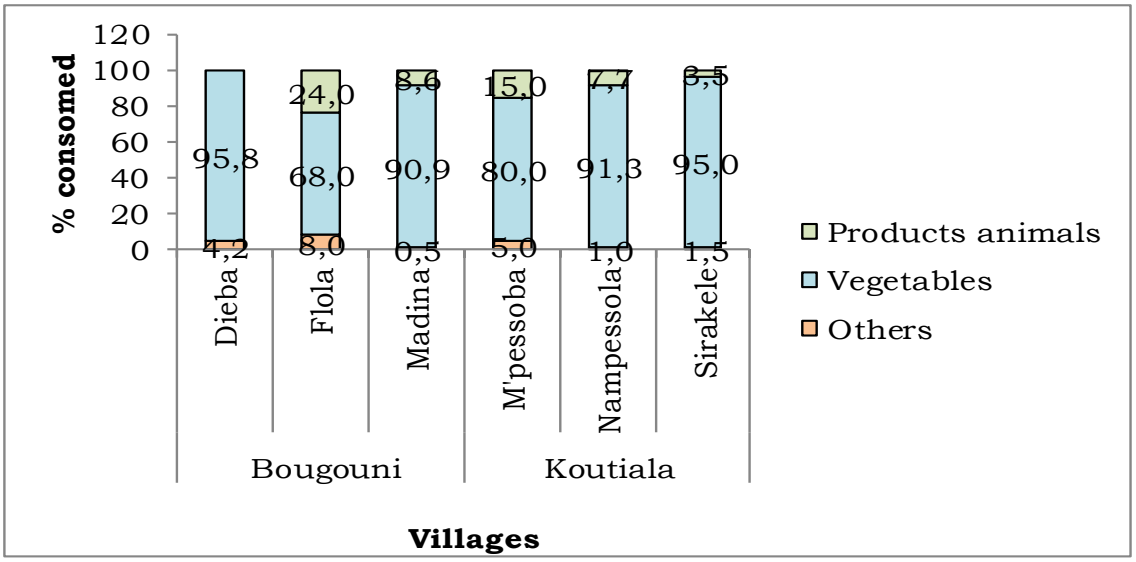

Chart 20: Share of vegetables and animal products in the dietary diversity score in households of Bougouni and Koutiala in 2013

Almost all vegetables consumed were baobab leaves. Sometimes it was okra and onions and tomatoes rarely.

Difficulties reported by respondents and suggestions

Concerning gardening the major difficulties reported by women were water shortages with the drying up of wells and the lack of fences for the gardens. In the dry season they cultivated in the river bed, but the gardens were destroyed by animals for lack of fences.

Concerning gardening the major difficulties reported by men were water shortages which constituted an obstacle to the development of market gardening and the use of poor quality seed.

Difficulties concerning gardening activities

Bougouni

At Dieba, we listened to this 27 year old woman "*we face difficulties. We have no more water, and on top of that we carry wood on our head to the river bank. We dig and we drive in the poles. Despite the harsh sun we tie them; but after the passage of cows we have to resume the work. There is no water. Wells diggers work the dry season long, but we do not find water.* "

Koutiala

At Sirakele an 18 year old woman spoke, *"When we dig wells, and there is water, that can boost your gardening."*

Still at Sirakele, a 43 year old woman said, *"I think we love gardening, but the water problem is a constraint. When we find water we can do gardening, but if there is no water it's impossible. ". She added, "Regarding gardening, it is very difficult here. We do not have equipment. If what is used to prepare the sauce is not enough.*

Suggestions for enhanced vegetables consumption

From women

- Solving the problem of water shortage by digging deeper wells and installing pumps;
- Installing fences around gardens to protect them against animals.
- Lacking the financial means to achieve all these works, they rely on external partners.

From men

At Dieba

- Establish a cooperative to enable women to generate resources;
- Fences for farms;
- Dig boreholes;
- Make quality seeds available;
- Train women and their husbands to good farming practices;
- Explain to men the importance of vegetables in the diet.

Comments and discussions

Concerning the objectives' achievement

The main objective of the study was to provide information on the diversity of food, basic nutrition knowledge, food access including vegetables intake, the knowledge of the composition of food and the frequency of meals, and their distribution within the family.

The study focused on six villages of "Africa RISING" project, i.e. three (3) villages in the district of Koutiala and three (3) villages in the district of Bougouni. Of these, two villages had benefited from training in nutrition. Our sample was representative with 134 individual interviews conducted, with 69 in Bougouni and 65 in Koutiala. 12 focus groups carried out on the basis of 2 by villages. Data collection tools were reliable and standardized.

Sample characteristics

There were on average, in the district of Bougouni 13 people per household in Dieba, 6 in Flola and 7 in Madina. In the district of Koutiala the average number of persons per household was 13 in Mpessoba, 8 in Nampossela and 9 in Sirakele. In 2008, the average number of persons living in the same household was 12 at the national level according to EBSAN II survey [12].
The high number of people living in households could justify the low consumption of some groups of food that can be expensive for them, and result in a significant financial gap.

Main results

Regarding women's knowledge about nutrition

In the districts of Bougouni and Koutiala women had little knowledge about nutrition. The definition of malnutrition was not known by more than 50% of them, as well as the causes. The different food groups were not known by women.

It appeared that trained women had more knowledge compared to those untrained. Malnutrition signs could not be cited by at least 50.0% of untrained women. This poor knowledge of women could be at the basis of nutritional issues, namely malnutrition that we could probably meet with children and women of childbearing age. These observations are similar to what observed in Mauritania in 2008 where high rates of malnutrition were related to poor knowledge, attitudes and practices in the area of food and hygiene [5].

Similarly in 2006 in the district of Kita, the high prevalence of malnutrition was due to a poor understanding of the causes of malnutrition by 32.3% of women [13].

Regarding food patterns

Exclusive breast feeding in our study ranged between 59.1% and 68.2% at Bougouni and between 50.0% and 73.7% in Koutiala. The majority of women especially in Bougouni (80.0%) had given colostrum to their children. Our results were higher than those of the study conducted in Sikasso in 2010, in which 51.2% of children were put on breast milk immediately after delivery [14]. They were also significantly higher than those of MIV EDS in 2006 where only 46% of children were breastfed within the first hour after birth, and this at national level [15]. This difference could be due to all the outreach activities conducted on this subject, but also to the training in nutrition conducted by Africa RISING project.
The average age of introduction of complementary feeding of six month was not observed in almost all the villages surveyed. Complementary foods were given to children on average of 3 times a day regardless of the age of the child. That suggested that the quantitative and qualitative nutritional requirements for some children were not covered.

In the focus groups, respondents in the majority recognized the role of complementary feeding in the prevention of malnutrition. However, this knowledge was poorly reflected in dietary practices; this inadequate diet, often, was due to a lack of time, women being busy.

Our results regarding children's 24-hour recall food were identical to those obtained in Sikasso in 2010 with cereals as the most consumed food. In contrary some local products (tubers, fruits, vegetables, milk ...) were not used and valued. [16]

Infant porridge was not much given as complementary food, it is the family porridge that was given to children by 73.8% in Koutiala and 61.1% in Bougouni. Trained women gave a little more frequently infant porridge in Koutiala compared to untrained ones and 20.0% did it in Bougouni.
These results highlighted the fact that children from 6 months not receiving essential nutrients for their healthy growth. This situation was compounded by the non-diversification of the daily diet.

These child porridges had liquid consistency in 68.2% of cases and this regardless of the age of the child leading to insufficient daily energy intake.In the district of Bougouni in 2009, poor infant feeding practices were one of the causes of the high prevalence of malnutrition [17]. Also in Burkina Faso in 2009, poor food cooking for children is responsible for malnutrition [18].
Weaning children was practiced in majority of cases before 24 months in 3 villages out of 6 namely Flola (84.0%), Nampessola (60.9%) and Sirakele (55.0%). Early weaning in a 2010 study in Sikasso was one of the determinants of malnutrition, with nearly 26% of children weaned before the age of 6 months [16].

Concerning hygiene
Hands washing with soap and water by women of childbearing age was not systematic before feeding the child or when leaving the toilet. It was the same for those with children. The present result is similar of the one observed in Kita in 2007 [9].. Poor practices of breastfeeding, weaning and hygiene can also explained the high rate of malnutrition observed within the Target villages observed [19].

Before the consumption of raw vegetables disinfection was not systematic. It was done in 36.4% of cases in Bougouni and 40.0% of cases in Koutiala. At Sirakele (trained village) 60% of respondents practiced disinfection against 36.4% at M'pessoba.
In the Sahel in 2009 [20] sanitation and hygiene practices were also identified as the cause of high rates of malnutrition among children.

Concerning dietary diversity score
Cereals were the staple diet for the three main daily meals of the households. Other foods such as fruits, vegetables, milk, eggs and tubers were only slightly consumed. This could be justified by the fact that these foods were not taken into account in dietary habits and consumption patterns, that the level of knowledge on the nutrients intake of these foods was low and that the nutritional needs of each category of people were unknown.Vegetables consumed consisted in most cases in baobab green leaves. Other vegetables were a bit more consumed in the village of Mpessoba by trained women.

The diversity score was mostly acceptable at Dieba, M'pessoba and Nampessola. It was mostly low at Flola, Madina and Sirakele. The highest diversity score was at Mpessoba. This

could be explained by the fact that on top of the increase in knowledge due to training in nutrition, men participated in nutrition and gardening related expenses. However, the biggest expense was the cost of condiments highlighting the insufficient use of local production.

In the villages of Bougouni the biggest expense was related to health care costs; this could be understandable since there is a link between health, nutrition and hygiene. Yet in these villages most households had a low score of diversity, hygiene conditions were not observed and they had very little knowledge about nutrition.

Conclusions

At the end of the study it appeared that:

- Women in general have little knowledge about basic nutrition. However, trained women had more knowledge than untrained ones.
- Men began to support women in gardening activities especially at Dieba and Flola but mostly M'pessoba.
- The dietary diversity score was not high and vegetables apart of baobab leaves were hardly consumed.
- The main difficulties reported that hinder more cropping and vegetable consumption were the lack of water for gardening activities and the lack of fences to protect gardens. According to assertions, consumption will increase only if production increases.
- Training brought a more noticeable increase of the level of knowledge in M'pessoba compared to Sirakele where training just started, the process of behavior change being slow with adults.

Recommendations

- Continuing villages training in adapting the themes to the realities of each village, taking into account the prior growing of garden produce, in involving men to ensure women with a support in farming, but also in family vegetable consumption. Especially insist on a balanced diet through the different food groups and the link between nutrition, health and hygiene;
- Focusing actions on the use of foodstuff for food diversification in conducting continuous and permanent participatory communications for behavioral change in favor of women and men;
- Encouraging women farmers to grow vegetables during rainy season
- Providing women with seed not requiring large quantities of water.
- Conducting a study integrating the evaluation of the nutritional status of children and women of childbearing age in order to assess the links that can affect health through a balanced diet.

References

1. **FAO**
   L'état de l'insécurité alimentaire dans le monde. Résumé 2012.
   http://www.fao.org/docrep/016/i2845f/i2845f00.pdf. Consulting le 15 /11/2013

2. **SOULE B G.**
   Les perspectives de sécurité alimentaire pour l'Afrique de l'Ouest jusqu'en 2025.
   http://www.inter-reseaux.org/IMG/pdf/Soule_-Les_perspectives_de_securite_alimentaire.pdf. Consulting le 10/11/2013.

3. **UNICEF**
   Faire reculer la malnutrition c'est faire avancer le droit des enfants. Document électronique ; reculer- la- malnutrition -c'est-à-dire- avancer-les-droits-de l-enfant.html », www.infosdelaplanete.org/4816/faire- Consulting 05/11/2011.

4. **Diakité BD.**
   Rapport d'étude : Placer la Nutrition au Cœur des Politiques de Développement. Analyse du financement de la nutrition au Mali, Banque Mondiale Juin 2009, 75p.

5. **AG IKNANE A, DIARRA M, KANTE N, YATTARA H, TRAORE M, FOFANA A.**
   Evaluation rapide de l'état de santé et nutritionnel dans la commune de Medbougou (Préfecture de Ayoune El Atrous) en Mauritanie. Mars 2008, 87p.

6. **INSAT/UNICEF/DNS.**
   Enquête nationale nutritionnelle anthropométrique et de mortalité Rétrospective SMART. Mali juin-juillet 2011, 80p.

7. **AG IKNANE A, KANTE N, MAIGA M.**
   Evaluation du projet de lutte contre la malnutrition infantile et maternelle dans trios aires de santé du cercle de Kangaba, 2007, 80p.

8. **Centre mondial des légumes**
   https://.en.wikipedia.org/wiki/Word_Vegetable_Center.&usg. Consulting 03/11/2013.

9. **Institut international de recherche sur les cultures des zones tropicales semi-arides, Centre Mondial des Légumes, Association Malienne d'Eveil au Développement Durable, Institut International d'Agriculture Tropicale.**
   Rapport de l'Evaluation 2012 et planification 2013 Intensification durable de l'agriculture pour l'amélioration de la sécurité alimentaire et nutritionnelle dans le cercle Koutiala, Mali. Octobre 2013, 9p.

10. **Africa RISING**
    Evaluation 2012 et planification 2013 Intensification durable de l'agriculture pour l'amélioration de la sécurité alimentaire et nutritionnelle dans le cercle Koutiala, Mali. Institut International d'Agriculture Tropicale. Octobre 2012, 9p.

11. **AG IKNANE Akory**

Cours de nutrition, les aliments, 1ère année de master en santé publique. 2011, FMOS.

12. **SAP, UNICEF, PAM, HKI**
    Enquête de base sur la sécurité alimentaire et la nutrition (EBSAN-II), 2008, 127p.

13. **ACF-Espagne**
    Situation alimentaire et nutritionnelle au nord du Mali,région de Gao et de Kidal « Mieux comprendre pour mirux répondre » Aôut 2006, 22p.

14. **AG IKNANE A1, SOMBIE C2, KAMIAN K3, DIAWARA F4, KONATE K5, DRAME K6, TOURE H7**
    Pratiques des mères en matière de santé - nutrition des enfants de moins de 5 ans à Sikasso au Mali. MALI SANTE PUBLIQUE 2013; 3 (001): 92-96.

15. **CPS-Santé/DNSI, Macro Inc.**
    Enquête Démographique et de Santé du Mali 2006, Cellule de Planification et de Statistique du Ministère de la Santé (CPS/MS), Direction Nationale de la Statistique et de l'Informatique du Ministère de l'Économie, de l'Industrie et du Commerce (DNSI/MEIC) et Macro International Inc, juin 2007, 535p.

16. **OUMAR AA1, AG IKNANE A², KAMIAN K3, DIAWARA F4, DRAME M3, TOURE H3, KONATE K3**
    Pratiques alimentaires et suivi nutritionnel des enfants malnutris dans deux communes rurales de la Région de Sikasso au Mali. ISCOS. MALI SANTE PUBLIQUE 2013; 3 (001) : 97-99.

17. **AG IKNANE A, AG AYOYA M, DIAWARA A et al.**
    Pratiques des ménages en matière d'alimentation, nutrition et santé dans le cercle de Bougouni au Mali. Mali Santé Publique. 2011; 1(1) : 22-23.

18. **Direction Générale de la Promotion de l'Economie Rurale (DGPER)**
    Enquête Nationale sur l'Insécurité Alimentaire et la Malnutrition (ENIAM), Burkina Faso, 2009, 193p.

19. **ACF-Espagne**
    Etude sur les connaissances, attitudes et pratiques et la nutrition dans le cercle de Kita (région de Kayes) au Mali, 2007, 5p.

20. **Oxfam, Commission Européenne – aide humanitaire**
    Trois études pour améliorer les connaissances en matière de malnutrition dans le Sahel, DG ECHO Consultations sur la Stratégie Sahel 2009/10, MALI, 14 octobre .2008. Document électronique www.aucoeurdeshommes.org/index.php?option=com_weblinks&view=we... Consulting 10/11/2013

Appendix 1: Socio demographic information

Table XXIX: Level of education of the heads of households in the districts of Bougouni and Koutiala in 2013

District	Village	Level of education of head of household				
	None		Primary	Secondary	Higher	Literate
Bougouni	Dieba	15	8	0	0	1
	n=24	(62.5%)	(33.3%)	(0.0%)	(0.0%)	(4.2%)
	Flola	21	0	1	0	3
	n=25	(84.0%)	(0.0%)	(4.0%)	(0.0%)	(12.0%)
	Madina	7	7	4	1	1
	n=20	(35.0%)	(35.0%)	(20.0%)	(5.0%)	(5.0%)
Koutiala	M'pessoba	16	4	0	0	2
	n=22	(72.7%)	(18.2%)	(0.0%)	(0.0%)	(9.1%)
	Nampossela	20	1	1	0	1
	n=23	(87.1%)	(4.3%)	(4.3%)	(0.0%)	(4.3%)
	Sirakele	17	1	1	0	1
	n=20	(85.0%)	(5.0%)	(5.0%)	(0.0%)	(5.0%)

In the district of Bougouni the literacy rate for men was, 37.5 in Dieba, 16.0% in Flola and 65.0% in Madina. In Koutiala it was 27.3% in M'pessoba 12.9% in Nampossela and 15.0% in Sirakele.

Table XXX: Distribution of heads of household and women of childbearing age according to their average age in the districts of Bougouni and Koutiala in 2013

District	Village	n	Minimum	Maximum	Average age in years	Standard deviation
Heads of household						
Bougouni	Dieba	24	16	40	35.33	7.682
	Flola	25	23	54	40.92	9.721
	Madina	20	25	65	40.70	9.895
Koutiala	M'pessoba	22	27	77	46.59	14.188
	Nampossela	23	27	54	38.87	6.511
	Sirakele	20	25	70	52.00	14.586
Women of childbearing age						
Bougouni	Dieba	24	16	40	23.92	6.379
	Flola	25	17	45	26.80	7.616
	Madina	20	18	48	28.15	7.278
Koutiala	M'pessoba	22	17	49	31.27	9.632
	Nampossela	23	17	48	27.57	7.186
	Sirakele	20	21	49	38.65	8.139

Table XXXI: Level of education of women of childbearing age in the districts of Bougouni and Koutiala in 2013

District	Village	Level of education of women of childbearing age				
	None		Primary	Secondary	Higher	Literate
Bougouni	Dieba n=24	15 (62.5%)	8 (33.3%)	0 (0.0%)	0 (0.0%)	1 (4.2%)
	Flola n=25	18 (72.0%)	5 (20.0%)	0 (0.0%)	0 (0.0%)	2 (8.0%)
	Madina n=20	10 (50.0%)	9 (45.0%)	1 (5.0%)	0 (0.0%)	0 (0.0%)
Koutiala	M'pessoba n=22	19 (86.4%)	2 (9.1%)	0 (0.0%)	0 (0.0%)	1 (4.5%)
	Nampossela n=23	16 (69.7%)	5 (21.7%)	1 (4.3%)	0 (0.0%)	1 (4.3%)
	Sirakele n=20	16 (80.0%)	1 (5.0%)	0 (0.0%)	0 (0.0%)	3 (15.0%)

The literacy rate of women was 37.5 in Dieba, 28.0% in Flola, 50.0% in Madina. In the district of Koutiala it was 13.6% in M'pessoba, 30.3% in Nampossela and 20.0% in Sirakele.

Occupation: Men were farmers by 97.0% in Bougouni and 98.0% in Koutiala. The main occupation of women was farmer with respectively 63.8% in Bougouni and 56.9% in Koutiala.

Appendix 2: Focus groups

Women focus groups

Definitions of malnutrition

At Bougouni
At Dieba, a 30 year old woman said, *"What I have to say here is difficult. We have food, but what we grow is without vitamin and that is why we do not have enough the water in our bodies. "*
Another woman aged 20 in Dieba said: "*We eat, we have something to eat but it is without vitamins."*

At Flola, a 26 year old woman said: "*the idea that we have on malnutrition among children as well as pregnant women, is that we do not find much complete food here and we eat what we can find ".*

At Koutiala
At Nampossola a 32 year old woman said, "*We know a little, it is a disease caused by the fact that children do not find enough elements necessary for their body; so make sure that children eat properly at mealtime ".*

Some women established a relationship between malnutrition and hygiene. At Sirakele, a 30 year old woman said that malnutrition was "H*ygiene means, for a woman when you sleep and wake up, you must go right to the toilet and wash. The clothes you wore at night you must change them. You clean your house, you wash your utensils with soap.* "

In the same village another woman established the relationship between malnutrition and breastfeeding: *"malnutrition means when you give birth to a child and that you don't have enough breast milk because you eat family meal. »*

Causes of malnutrition

At Bougouni
In Madina, a 30 year old woman mentioned as being a cause "*it is the way you eat and cook. If there are other ways of cooking different from what we do, we could adopt that. "*
Another woman from the same village to add *"Malnutrition is present here, we eat only dry sauce; we like bananas if we can afford them."*

A of 25 years old woman at Dieba said *"the problem we face now is that our children until they reach six months we do not give them thick food except water, from that date on when we were said that we must combine beans, maize, along with many other things and add salt and sugar a little. But we do not know how to do that. That is why our children are malnourished. "*

At Flola a woman aged 27 said "*what I know about malnutrition, is that mothers do not know what to do. They don't know how to cook food to address malnutrition. Combining ingredients to come up with a beneficial food for the child, we do not know. If you can give us those kinds of information, we will be pleased. "*

At Koutiala
In the focus groups, to a woman 18 years Sirakele said *"malnutrition happens when there is not enough breast milk and when you eat common meals; you need to cook another meal to eat."*

Signs of malnutrition

At Bougouni
Some women of Flola said "*some children are swollen and weak" and at Madina "the child loses weight, he is permanently sick and the family is worried."*

At Koutiala
At Nampessola an untrained village, women were able to mention signs. A 32 years old woman said "*The child has light hair, the body shows oedema, it becomes thin, the belly becomes large, and he becomes sad with his mother."*

Another 38 years old woman in the same village said, "*I wish to add that when a child is malnourished, he becomes amorphous, he is stunted compared to the other children of his age."*

Preparing infant porridge
This infant porridge, very often, was not prepared for lack of funds.

Bougouni
At Dieba, a 29 year old woman said, "*When we cook porridge we put a few sugar in. This is what we can afford".*

Still in Dieba a 20 year old woman said: "*When we wean children we do not give them porridge, but coffee (milk, sugar, instant coffee) because we do not have the products for porridge."*

At Flola a 26 year old woman admitted: "*You need to cook the porridge for your child so that he does not cry for lack of breast milk. It replaces breast milk and strengthens your child."*

"At Flola, a 36 year old woman explained" Regarding infant porridge, you take millet or pearl millet. You wash it, dry it, and then process it when adding beans flour."

Koutiala
At Sirakele a 40 year old woman knew a fairly complete porridge recipe: *"The enriched porridge given to children must be cooked with hygiene. You process the non-pounded millet into flour. You also transform groundnuts and beans into flour. This is how enriched porridge is cooked. And Baobab powder. Baobab powder gives health. Non-pounded millet brings sugar, beans strengthen bones. We cook it for sick children also. "*

Similarly at Flola a 25 year old woman said, *"What we eat is sorghum, maize, millet, beans; we pound them and we cook them, after having incorporated groundnuts dough and sugar; the meal is then given to the child."*

Family meal

Bougouni

At Dieba a 20 year old woman said: "*What is frequently cooked at home is To. We grow maize but often prepares "To" with it*."

Another 29 year old woman from the same village said: "*We cook properly "To", but the sauce does not contain vitamins."* Then she added: *"we have children and feeding them is a concern. We do not have vitamin food to give them."*

It appears that women frequently prepared kini, tô and nièniè kini using maize or sorghum flour and the sauce was cooked with beans or baobab leaves.

Koutiala

At Sirakele to cook the traditional meal "to" a 30 year old woman explained, *"When water boils in the pot, you pour the flour and you stir; you keep stiring when adding flour until it is thick. For Kini, Nièniè kini" you "used grounded cereals. For the sauce you use groundnuts dough. You need to observe hygiene when cooking".*

Vegetables consumption

At Dieba a 31 year old woman said: "*We grow gardening products, we need to consume them as well. "*

Another woman from Dieba added: "*Regarding our vegetable crops, changes need to be made; even if we grow these crops for consumption, because of difficulties we sell them progressively."*

Suggestions for improving the accessibility and availability of vegetables

Beyond suggestions for making water available, a suggestion regarding the sale of the production arose from most villages.

Bougouni

At Dieba a 27 years old woman said: *"I have an idea of how to draw profits. We suggest if we could consume what we are growing, and not sell them. If not the products will be sold away progressively."*

Koutiala

At Nampossela a 32 years woman said: "*I think we should increase the amount of vegetable crops so that all the families can afford some; we need to reduce the sales of garden produce".*

<u>Men focus groups</u>

Work and responsibility sharing agreement between men and women

At Bougouni

At Dieba

"Regarding food expenditures, men and women are doing something because when we have food we measure and give women; for fresh condiments costs there are days when you give a little money and other days when you do not give; they take a few cereals to pay for condiments."

"The crops we grow, much is not sold. We grow sorghum and rice; as *for gardening crops, during the dry some women practice it. If the produce is much we may to sell part of it but if it is not we just keep it for consumption. "*

"Women practice gardening here and men are not many. What women get, they use it to cook for their husbands."

"As we talk about gardening there are some men who practice it but not much. They grow pepper, eggplant but large gardening is practiced by women; men do not help them much, they do it by themselves. "

At Flola

"Here *we only grow maize, sorghum which is rare, as well as rice and fonio. Now for water sake and since there is not much space to grow rice everybody crops a small plot on the bank."*

"My main activity is gardening; I grow tomatoes, pepper which is our base; right now I finished watering them; the difficulty we face is related to animals; we need to prevent animals from destroying our plots; we also face problems with pests that destroy our crops; women also practice gardening by our side."

At Madina

"For food men and women are not equal. I think the largest part is ensured by men; women do less. "

"*Cereal production we keep it, but if we know we may have something later we sell it."*

Koutiala

At M'Pessoba

"There is no big difference with regard to the access of men and women; what is cooked is accessible to all, except when there a special dish for the family head in some families, maybe for children."

"It's easy to have food as people grow and that's what they eat, but some is also sold."
"During this period of the year we have lots of things like millet, maize, rice, which are all accessible, fresh products are not available now, there are also fruits like guavas, oranges. Beans are also available now; it is very helpful for the diet. Vegetables are also available currently in Mpessoba."

At Nampossela

"I am a farmer in Nampossela, and I practice gardening at home; carrots, cabbage, salads are grown here; potatoes, even rice is grown in our plain and plenty of other things like millet and cotton; we also have mango plantations, banana plantations."

"In my place, women play an important role because they work in garden and fields, they have their own cooperative; right now they have a hectare of land where they grow all kinds products (onion, cabbage, sweet potato, carrot and salad; they have a groundnut field of one hectare, they have a machine to make various types of soaps, they help men in farms. "

"When it has rained, we harvest and we sell what is for sale like cotton, bananas, and garden produce but we keep millet for our own consumption. But when we have a lot of millet we may sell part of it. "

At Sirakélé

"Much of the food rests with men; it is the man who cares of all the family expenses. There are women who do gardening. The income is for the expenses of the wife and children. They do not care for the family expenses; it is the man who cares of everything. "

Appendix 3: Survey forms

Questionnaire on the characterization of food consumption patterns in southern Mali (Sikasso)
District _____ Commune _____ Village _____ Number of households |___|___|___|
Household N° |___|___| Date :|___|___| |___|___| |___|___|___|___| administrator: |___|___|
Name of respondent: _____

1.	**Socio demographic information**		
Q01	Age of head of household (CM) in years		|___|___|
Q02	Educational level of CM	0. No education 1.Primary 2.Secondary 3.Higher 4. Literate	|___|
Q03	Gender of the head of CM	1. male 2.female	|___|
Q04	Age of respondent in years		|___|___|
Q05	Ethnic group of respondent 1. Bambara 2. Mianka 3.Malinké 4. Other _____		|___|
Q06	Educational level of respondent	0. No education 1.Primary 2.Secondary 3.Higher 4. Literate	|___|
Q07	Occupation of respondent 1. Housewife 2.Petty trade 3.Gardening 4.Other _____		|___| ☐ |___|
Q08	Parity of respondent		|___|___|
Q09	Total number of living children		|___|___|
Q10	Total number of persons in the household Male | ___ | ___ | Female | ___ | ___ | Total | ___ | ___ |		
Q11	Number of productive people Male | ___ | ___ | Female | ___ | ___ | Total | ___ | ___ |		
2.	**Income and Expenditure**		
Q12	Main source of income 1. Sale of agriculture products 2. Petty trade 3.Paid worker 4.Other specify _____		|___|
Q13	Number of persons contributing to the household expenses Men | ___ | ___ | Women | ___ | ___ |		Total |___|___|
Q14	Main household expenses 1. _____ 2. _____ 3._____ 4. _____		
Q15	Number of persons contributing to expenses over vegetables (crops) Man | ___ | ___ | Women | ___ | ___ |		Total |___|___|
Q16	Number of persons contributing to expenses over vegetables (purchase) Man | ___ | ___ | Women | ___ | ___ |		Total |___|___|

3.	**Dietary diversity at household level**				
Q17	From what you ate and drank yesterday was there...?	YES	NO	NSP* NSP	If doubting, please give details

Q17.1	CEREALS	White sorghum, red sorghum, millet, pearl millet, rice, maize, pasta (macaroni ..), wheat (couscous, bread, cakes ...), fonio ...	1	2	3	
Q17.2	ROOTS AND TUBERS	White sweet potatoes, potatoes, yams, taro, other tubers (fabirama ...), cassava (atieke, gari), plantain (alloco)	1	2	3	
Q17.3	PROTEIN	Beans (cowpea), peas potatoes, peas, chickpeas, lentils and other pulses	1	2	3	
Q17.4	OLEAGINOUS	Groundnuts (or other paste), soya, sesame, cashew nuts, shea nuts, wild nuts, cotton seeds, palm kernels ...	1	2	3	
Q17.5	VEGETABLES RICH IN VITAMIN A	Squash, pumpkin, carrot, red pepper, orange-fleshed sweet potato	1	2	3	
Q17.6	VEGETABLES LEAVES	Sorrel, pigweed, salad, baobab leaves, mallow (bulvaka), spinach, onion, beans, cassava, potatoes, etc. + all wild leaves, kapok, etc.	1	2	3	
Q17.7	VEGETABLES FRUITS	Tomatoes (except concentrated), fresh or dried okra, eggplant, zucchini, cucumbers, cabbage, turnips, onions, green peppers, green beans ...	1	2	3	
Q17.8	FRUITS RICH IN VITAMIN A	Mango, red papaya / orange, orange melon, locust bean (fruit or flour)	1	2	3	
Q17.9	OTHERFRUITS	Pineapple, banana, guava, dates, watermelon, jujube, sugar cane, cinnamon apple, orange, lemon, etc., fresh fruit juice (squeezed fruit juices), fruit, tamarind, monkey bread, etc.	1	2	3	
Q17.10	OIL RICH IN VITAMIN A	Red palm oil	1	2	3	
Q17.11	OTHER OILS AND FATS	Vegetable oil (sauces, seasonings, fried stuff), butter (milk or shea butter), margarine, mayonnaise..	1	2	3	
Q17.12	EGGS	Chicken, guinea fowl, duck, turkey eggs...	1	2	3	
Q17.13	DAIRY PRODUCTS	Fresh milk, milk powder, condensed milk (sweetened or not), yogurt, cheese, cream ...	1	2	3	
Q17.14	LIVER / FULL OFFALS	Liver (veal, mutton, poultry,,,) full offal (heart, kidneys, spleen, lung) and black pudding	1	2	3	
Q17.15	OTHER OFFALS / INSECTS	Offal other than full offal (guts, oxtail, etc.) or insects	1	2	3	

Q17.16	MEAT AND POULTRY	Beef, mutton, goat, pork (including deli meats), tongue, rabbit, bush meat, chicken, guinea fowl ...	1	2	3	
Q17.17	FISH AND SEAFOOD	Fresh fish, smoked, salted, dried fish (except pinch of powder), canned (sardines, tuna ..), all seafood	1	2	3	
Q17.18	SIMPLE SUGARS	Powdered sugar or in pieces (in tea, coffee, porridge ...), soft drinks (sweet drinks, zom-kom, hibiscus, ginger juice ...), sweetened condensed milk, honey, candy, sweet cakes ...?	1	2	3	
Q17.19	ALCOHOLIC BEVERAGES	Beer, dolo, chiapalo, bangui, wine, sangria, pastis, whiskey, etc.	1	2	3	
Q17.20	CONDIMENTS	tomato paste, soumbala, chili ...	1	2	3	
Q17.21	OTHER	Other food not mentioned. If yes, specify:				
Q17.22	Total					

*****Do not know = the respondent does not know whether any of the items of a given food group was included in one of the meals eaten.

	4. **Knowledge on nutrition**	
Q18	**Q18.1 Do you know malnutrition** 1. Yes | ____ | 2.No | ____ | If yes Q18.2 What is malnutrition? .... Do not know **Q18.3 What causes malnutrition?** .... Do not know **Q18.4 Give me the signs of malnutrition**..... .... Do not know	
Q19	**What is a balanced diet?** .... Do not know	
Q20	What should the diet of a pregnant / lactating woman include?	1. 2. 3. 4. 5. Others_____

Q21	What should the diet of a child under 5 years include?	1. 2. 3. 4. 5. Others_____	
Q22	What should the diet of a teenager include?	1. 2. 3. 4. 5. Others_____	
Q23	What should the diet of an old person include?	1. 2. 3. 4. 5. Others_____	
Q24	What should the diet of a sick person include?	1. 2. 3. 4. 5. Others_____	
Q25	What are the benefits of vegetables consumption	1. 2. 3. 4. 5. Others_____	
Q26	How do you consume vegetables	1. Raw 2. Boiled 3. In sauce 4. Others_____	|____|
Q27	Before consuming raw vegetables which hygienic precautions are you taking?	1. Washing with plain water 2. Washing with disinfectant	|____|
Q28	If washing with disinfectant how many minutes?	|____|____|	
Q29	Generally on what occasion do you usually wash your hands with soap or other detergent?	1. Before preparing food Before eating 2. Before feeding the child 3. After leaving the toilet 4. After cleaning a child who defecated 5. Other: _____	|____|

Q30	Generally on what occasion do you usually wash the hands of your children under 5 years?	1. before eating 2. After leaving the toilet 3. Do not wash hands 4. Other: _____	|____|
Q31	**REMARK**: The container for storing water in the house	Q301.1 – is it clean? 1. Yes | ____ | 2.No | ____ | Q31.2 – is it covered? 1. Yes | ____ | 2.No | ____ |	

1. Cropping

Q32	Land cultivated by the household 1. Yes 2.No *(if no, go to questionnaire on diversity*)	|___|
Q33	Land cultivated by the woman 1. Yes 2.No (*if no, go to questionnaire on diversity*)	|___|
Q34	Type of crops in the land cultivated by the woman	

Q34.1 Gardening

1.yes **2**.no

|___|

Local name	Scientific name	Group	Specy	Variety

Q34.1.1 Usage

1. Selling | ___ | 2.Self-consumption | ___ | 3. Exchange | ___ | 4.Other _____

Q34.2 Cereals

1.yes 2.no

|___|

Local name	Scientific name	Group	Specy		

Q34.2.1 Usage

1. Selling | ___ | 2.Self consumption | ___ | 3. Exchange | ___ | 4.Other _____

Q34.3 Other, specify

1. yes **2**.no |___|

Local name	Scientific name	Group	Specy		

Q34.3.1 **Usage**

1. Selling | ___ | 2.Self consumption | ___ | 3. Exchange | ___ | 4.Other _____

2. Culinary recipe in households

Q35	How many meals did you have a day?	1.1 Meal 2.2meal 3.3 meal 4.4 meal and more	|___|
Q36	What dishes did you eat yesterday in the household?		

Local name	Composition	Preparation	Cooking (mn)

3. **Child nutrition**			
Q37	How old is your last child, in months?		|___|___|
Q38	Child's date of birth	|___|___|/ |___|___|/|___|___|	
Q39	Checking the date of birth on a document 1. Yes 2. No		|___|
Q40	Has the child ever been breastfed? 1. Yes 2. No (if no, go to Q47)		|___|
Q41	How long after birth did it take you (name) to breastfeed for the first time?	1. Less than one hour 2. 1-24 hours 3. Days (specify) _____ | ____ |	
Q42	Did you give colostrum to that child?	1. Yes 2.No 3.NSP	| ____ |
Q43	Type of breastfeeding practiced?	1. exclusive breastfeeding 2.mix(breast milk + something else)	|____|
Q44	Is the child is still breastfed?	1. Yes 2. No (if yes, go to Q47)	|____|
Q45	Duration of breastfeeding in months		|___|___|
Q46	**Why did you stop breastfeeding?** *Do not read list*	1. too much work to do, too busy or tired 2. the baby was big enough, he no longer needed 3. I was advised to stop breastfeeding because I was pregnant 4. Other, specify:	|____|
Q47	**At what age (months) did your child start having complementary foods** (*food - liquids in addition to breast milk)?*		|___|___|
Q48	**Since yesterday at the same time that now, did he / she (child) have one of the following:**	Simple water 1.yes |____| 2.no |____| How many times? |____|____| Sugar water 1.yes |____| 2.no |____| How many times? |____|____| Herbal tea, tea, infusion 1.yes |____| 2.no |____| How many times? |____|____| Fruit juice 1.yes |____| 2.no |____| How many times? |____|____| Fruits 1.yes |____| 2.no |____| How many times? |____|____| Natural milk 1.yes |____| 2.no |____| How many times? |____|____| Animal protein (meat, eggs, fish) 1.yes |____| 2.no |____| How many	

		times? |____|____| Plant protein (beans, cowpeas, etc.) 1. yes |____| 2.no |____| How many times? |____|____| Vegetables 1.yes |____| 2.no |____| How many times? |____|____| Artificial milk, dairy products 1.yes |____| 2.no |____| How many times? |____|____| Animal fats 1.yes |____| 2.no |____| How many times? |____|____| Cereals (solid food) 1.yes |____| 2.no |____| How many times? |____|____| Family porridge 1.yes |____| 2.no |____| How many times? |____|____| Weaning porridge 1.yes |____| 2.no |____| How many times? |____|____| Other_____ How many times? |____|____|

		Local name	Composition	Preparation	Cooking time	Consistency
Q49	What infant porridge did you give to your child?					

		Local name	Composition	Preparation	Cooking time	Consistency
Q50	What weaning porridge did you give to your child?					

Q51	How often do you give food supplement? 1. 1 times 2. 2 times 3. 3 times 4. 4 times more | ____ |

Characterization of food consumption patterns in southern Mali (Sikasso)
Interview guide of the focus group: women of childbearing age

Specific objectives of the study

1. Assess the basic knowledge on nutrition,
2. Describe the characteristics of households' food consumption
3. Identify the food habits and food preparation mode
4. Monitor food availability and accessibility in households
5. Determine the diversity and food consumption scores in households
6. Describe the existing food diversity and the parts for cereals, vegetables, animal products.

Theme 1: Identification: village, participants
Topic 2: Basic nutrition knowledge on

- Malnutrition (symptoms, causes, prevalence, consequences, treatment, prevention mode)
- Balanced diet, the diet of pregnant women, children under 5 years, adolescents, elderly people, sick people.
- Vegetables consumption,
- Hands and water hygiene

Theme 3: family recipes, recipes of infant and weaning porridge (local name, composition, method of preparation)

Theme 4: **Proposals for enhanced vegetable consumption in households.**

- Highlight the ways and means to improve vegetables consumption
- Source of funding for the proposals
- Natural and legal persons to participate in funding proposals

Thank you for your cooperation

Characterization of food consumption patterns in southern Mali (Sikasso)
Interview guide of the focus group: heads of families

Specific objectives of the study

1. Evaluate the basic knowledge on nutrition,
2. Describe the characteristics of households' food consumption
3. Identify the food habits and food preparation mode
4. Monitor food availability and accessibility in households
5. Determine the diversity and food consumption scores in households
6. Describe the existing food diversity and the parts for cereals, vegetables, animal products

Theme 1: Identification: village, participants

Theme 2: diversity of local products available for food for the study period (local name, characteristics)

Theme 3: accessibility of food in households (local production, purchase, exchange, income source)

Theme 4: work and responsibilities sharing agreement between women and men in relation to the nutrition of the family (decision-making, men spending for nutrition, women spending for nutrition, women vegetables gardens, self-consumption, male involvement in vegetables production)

Theme 5: Proposals for greater vegetable consumption in households.

- Highlight the ways and means to improve vegetables consumption
- Source of funding for the proposals
- Natural and legal persons to participate in funding proposals

Thank you for your cooperation

Characterization of food consumption patterns in southern Mali (Sikasso)

List of participants of women of childbearing age's focus group

Aged..... Village..... Date.....

N°	Names First name	Age	Level of education	Occupation
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
Total				

Characterization of food consumption patterns in southern Mali (Sikasso)

List of participants of women of childbearing age's focus group

Aged..... Village..... Date.....

N°	Names First name	Age	Level of education	Occupation
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
Total				