

NUTRITION CASE STUDY





Integrating nutrition into agroecology for strengthened resilience of rural communities in the Sahel













Integrating nutrition into agroecology for strengthened resilience of rural communities in the Sahel

The experience of the Agroecology Plus Six program

A regional initiative undertaken by the Groundswell West Africa network

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Cover photo

Children eating a nutritious meal made from local produce. Credit: Sahel Eco.

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List of acronyms

AE+6	Agroecology Plus Six program
CLM	Cellule de lutte contre la malnutrition (Senegal) [Unit to fight malnutrition]
COD	Cellule de coordination de la nutrition (Mali) [Nutrition Coordination Unit]
CSO	Civil Society Organization
GRP	Global Resilience Partnership
HDDS	Household Dietary Diversity Score
HHS	Household Hunger Scale
IGAs	Income Generating Activities
NGO	Non Government Organization
PRA	Participatory rural appraisal
SHARP	Self-evaluation and Holistic Assessment of climate Resilience of farmers and Pastoralists
SIDA	Swedish International Development Agency
SUN	Scaling Up Nutrition
USAID	United States Agency for International Development
WHO	World Health Organization

Executive Summary

- This case study reports on the process and findings of the Groundswell West Africa network's Agroecology Plus Six (AE+6) program in the Sahel. Operating in three program areas in Burkina Faso, Mali and Senegal, the AE+6 program aimed to strengthen the resilience of dry land farming systems, primarily enabling farm families to counter land degradation and adapt to the effects of climate change.
- The AE+6 program enabled rural communities in the Sahel to adapt agroecological principles and practices aimed at transforming their farming system to make them not just more productive, but also more sustainable, resilient, equitable and nutrition sensitive.
- Generic indicators in the Sahel region indicate that the prevalence of chronic (and other forms of malnutrition have slowly declined over the past decade. However, the overall rate of chronic malnutrition for children under five years of age remains alarmingly high. The World Health Organization's (WHO) "warning threshold" is 20%. The averages in the AE+6 countries mostly exceed this: 38.5% in Mali, 32.9% in Burkina Faso and 19.4% in Senegal.¹ However, in some rural areas in these countries, the rate is over 40%. The pace of improvement has also been slowing down in many countries.
- Chronic malnutrition and anemia remain a persistent factor negatively affecting resilience in the Sahel by generating irreversible mental and physical impairment of children. This affects their capacities to learn, to adapt to change and innovate, and earn income. Burkina has the highest rate of anemia in the world for children less than five years old, a shocking 90%.²
- Burkina Faso also has the highest rate of anemia for pregnant women in the world, at 72.5%.³
- To overcome this nutrition crisis and enable the most vulnerable rural households to escape the povertyhunger trap, it is essential to better harness agriculture not only to be productive and sustainable, but also to improve nutritional outcomes.
- Agroecological farming is more inherently conducive to improved nutritional outcomes, compared to conventional, high external input agriculture, because it favors crop diversity. However, without effective strategies to integrate nutrition into agroecology, little of this inherent potential can be realized.
- Practitioners of agroecology in the Sahel context still have much to learn about ways to harness agriculture to overcome the near emergency levels of chronic malnutrition.
- The results of the AE+6 initiative showed the impact on resilience to food and nutrition insecurity of a program focusing on large-scale promotion of agro-ecological practices can be significantly augmented when it systematically integrates nutrition and complementary strategies for the empowerment of women in agriculture and strengthened livelihoods particularly for women in the most vulnerable households.
- Despite growing awareness and commitment towards nutrition-sensitive agriculture,⁴ national ministries in the Sahel are largely failing to implement cross-cutting strategies to integrate nutrition into the agricultural sector's priorities.
- Key challenges explaining this disjuncture between nutrition and agriculture in the Sahel include the very limited nutritional knowledge among agricultural extension staff, the narrow perception that nutrition is mostly a health issue, the lack of cross-sectoral cooperation and the general absence of nutrition indicators and targets within agricultural development programs, including for agroecology.
- Support for nutrition-sensitive agricultural practices is not only a matter of policy reform and training; it
 is deeply correlated to dietary consumption and the loss of knowledge about indigenous foods of high

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nutritional value and the related culinary knowledge. It also touches on other systemic problems, related to farmers' tendency not to consume the commercial crops they grow (despite their nutritional value) and also lack of income to access food with high nutrition value.

- This case study documents how AE+6 teams in three Sahelian countries identified concrete entry points, strategies and lessons for transforming the concept of nutrition-sensitive agriculture into practical action, and generating key synergies with simultaneous initiatives addressing women's agricultural production, income generation and empowerment in agriculture and related livelihood activities.
- The AE+6 teams found ways to adapt most of the FAO's 10 recommendations related to the integration of agricultural into nutrition⁵. This experience shows that any organization promoting agroecology and wishing to better incorporate nutrition into its existing activities, could do the same to design locally relevant and measurable interventions to improve nutritional outcomes.
- A key lesson of the AE+6 NGO teams was that it was quite easy to incorporate relatively low cost and simple nutrition-related tools into their methods toolbox to make their programs nutrition sensitive, without requiring too much additional time and work, or additional staff.
- For sustainability and effectiveness, AE+6 teams found that it was critical to implement activities for improved nutrition in close consultation with local government structures, especially at the decentralized level, in order to ensure a multi-actor and multi-sectoral approach.
- Despite a short implementation period (18 months), the impacts AE+6's training and awareness
 interventions were already having an initial effect within the communities reached, in terms of changes
 in diet, diversifying their crops and also retaining a portion of their nutrition rich legume crops for selfconsumption.
- Noticeable organizational changes also took place within Groundswell's network AE+6 partners. They
 revised their mandates and mission to more explicitly include nutrition into their agricultural activities and
 adapted their strategies accordingly.

Introduction

The resilience crisis in the Sahel

An estimated 12 million small-scale farmers living in the ecologically fragile, risk prone drylands of the Sahel are in a crisis. They have become chronically vulnerable to food and nutrition insecurity, because of land degradation, declining soil fertility and climate change. Traditional farming practices can no longer sustain livelihoods. Gender inequality, poor nutritional practices, and inadequate technical and social services exacerbate the problem.

A growing percentage of dryland farm households have become ultra-poor, living on less than 0.50 US Dollars a day. They suffer from hunger, not only in bad but also in good rainfall years. To survive, they are forced to adopt negative coping mechanisms, including taking exploitative loans, selling their animals, eating their seeds stocks, and reducing the number of daily meals. These desperate responses further increase the vulnerability of these populations so that even the mildest shock generates a widespread crisis across the Sahel requiring humanitarian aid.⁶

Weak governance, marginalization, non-inclusive development policies, inappropriate technical advice, and the inability of small-scale farmers to influence policies and government institutions to better address their priority needs are underlying drivers of this growing crisis.

For these reasons many dry land farm families are caught in a vicious downward spiral of declining productivity, and loss of assets. They end up in a hunger–debt trap characterized by a severe "**resilience deficit**". Without external assistance to strengthen the resilience, sustainability and productivity of their farming system, more and more dryland farmers will fall into the hunger-debt trap.

Figure 1 on the next page illustrates how populations, already vulnerable, are being pushed even further into chronic food and nutrition insecurity because of their reduced capacity to cope when the next shock arrives.

The Agroecology7+6 (AE+6) program was developed by Groundswell International's West African network to address this resilience deficit. It was conceived as a "proof of concept" action research initiative undertaken over 18 months in three sites in the Sahel (Burkina Faso, Mali and Senegal). The overarching premise of this initiative was to provide evidence that "agroecology" can, and indeed must be the essential foundation on which effective resilience activities in dryland areas must be based.

This case study documents an action-research initiative in three countries on how to alleviate the hunger/ nutrition crisis by supporting a greater integration of nutrition into agricultural interventions in dryland farming areas of the Sahel.

A critical assumption of the AE+6 approach is that agroecology is essential to transform existing farming practices and to strengthen the capacities of rural communities to absorb or adapt to shocks and stresses to their livelihoods. Once this foundation of intensified agroecological farming is in place, it serves as the basis on which to integrate complementary resilience activities including nutrition, women's empowerment, and equity, tailored to the needs of the most vulnerable groups.

This case study synthesizes the initial results, process, and lessons learned from three program sites in rural Mali, Burkina Faso and Senegal. In each country, the research question was the same: how can nutrition be integrated into existing work to promote agroecological farming, to significantly improve nutritional outcomes, while also enabling rural communities to strengthen the resilience of the farming system and related livelihoods, overcome the hunger-debt trap, and adapt to a changing climate?

A critical assumption of the AE+6 approach is that agroecology is essential to transform existing farming practices and to strengthen the capacities of rural communities to absorb or adapt to shocks and stresses to their livelihoods

Figure 1: Dynamics of Resilience and Vulnerability for dryland farmers in the Sahel



Source: Adapted from Frankenberger et al 2012, as cited in Measuring Resilience in USAID http://fsnnetwork.org/sites/default/files/resilience_measurement_in_usaid.pdf

Nutrition – often neglected in traditional agricultural programs in the Sahel

Millions of households across the Sahel have been struggling rebuild their livelihoods in the aftermath of the acute food and nutrition crises of 2005, 2008, 2010, and 2012. The crises affecting the Sahel have become chronic, described as "every day" and "every year" emergencies.⁸

Every year since 2012, whether rains are good or bad, over 20 million people in the Sahel suffer from chronic hunger and are locked in a debt and hunger trap.⁹ In 2017, 30.1 million people faced food and nutrition insecurity. Of these 16 million required emergency food assistance. (Sahel Report 2017)

Why is the Sahelian population, the vast majority of whom are subsistence farmers and livestock herders, (i.e. living the closest to the food base), so critically at risk of malnutrition?

The reasons are multiple and complex. One of the most immediate answers is that farmers are perhaps not growing a sufficient diversity of crops, and are not eating sufficiently diverse diets. All of the AE+6 partners observed that the nutritional issue was critically missing from agricultural development, and that many farmers grow crops without adequate consideration of their nutritional value for home consumption.

Agroecology, which favors diversified crop production for local markets, has a much stronger inherent potential to be nutrition-sensitive compared to conventional agriculture.

For this reason, many practitioners of agroecology mistakenly assume that applying agroecological practices will significantly improve nutrition. The reality is that the practice of agroecology in the Sahel has not had significant impact in addressing the crisis in nutrition and diversity of diets.

There is **much yet for practitioners of agroecology to learn about how to effectively integrate a nutrition dimension into in their programs, overcome the constraints to healthy, diverse diets** particularly for children and women in the poorer farm households.

Purpose of the case study

This case study documents the action research process used to develop mechanisms through which nutrition can be more efficiently embedded into agriculture and how the socio-economic systems within rural communities can be influenced so that these population's nutritional practices improve.

This case study is meant to be relevant to a range of actors - particularly national governments, technical and financial donors, international development agencies, and Civil Society Organizations (CSOs) working at national level. The key lessons are about how to foster greater inter-sectoral linkages between key institution actors (mainly health, agriculture and rural development) to improve nutrition, but also about how nutrition can play a central role within the transformation of the farming system within the ecologically fragile, drought prone areas of the Sahel, for strengthened resilience of rural livelihoods.

This case study is one of a series of six closely related studies documenting the main finding and lessons of the integrated AE+6 for resilience approach.

The AE+6 program

The AE+6 program was conceived as a "proof of concept" initiative to spread agroecological practices across the Sahelian region. The design assumed that lessons learned could be applied widely to build the resilience of an estimated 12 million small-scale farmers in the drylands who are increasingly vulnerable to food and nutritional insecurity, land degradation, declining soil fertility, erosion, loss of vegetative cover and climate change.

Box 1

What is agroecology?

Agroecology is an approach to farming that mimics the functioning of local ecosystems,²⁰ allowing for "food production that makes the best use of nature's goods and services while not damaging these resources."21 It is a science that applies ecology to the design of farming systems; uses a whole-systems approach to farming and food systems and replaces "external inputs by natural processes such as natural soil fertility and biological control".22 Agroecological farming systems are "developed on the basis of farmers' knowledge and experimentation"²³ and link ecology, culture, economics and society to create healthy environments, food production and communities. It is a multi-functional approach to farming that is productive, economically viable, socially just, resilient to climate change, sustainable and nutrition sensitive.

The impact of conventional high external-input agricultural technologies, based largely on agrochemicals, monoculture of certified seeds, mechanization, growth corridors and large-scale irrigation schemes favored by the Green Revolution approach, has exacerbated these trends.

This productivist approach underlying the push for a "modern agriculture" has been strongly decried by many actors globally¹⁰ ¹¹, across Africa¹² ¹³ and in the Sahel region¹⁴, including by the Economic Community of West African States (ECOWAS), which in 2008 stated how this model, "largely dependent on natural resources and poorly paid labor, (had) become unviable".¹⁵

The industrial model indeed fails to address critical issues of dependence to importation of food to feed the Sahel¹⁶ and the critical need to adapt to a changing climate. Recent research conducted in Sub-Saharan Africa has extensively documented how the push for high, agrochemical-based input farming methods had disrupted subsistence practices, marginalized many local crops, reduced seed diversity, corroded local systems of trade and labor and curtailed land tenure security and autonomy.¹⁷

Groundswell network partners in the region bear testimony of how an over-reliance on "modern" farming practices has led to the loss of agri-biodiversity, loss of agricultural knowledge and the related culinary knowledge, and environmental degradation (notably soil erosion and degradation and pollution through the bio-accumulation of agro-chemical in soils and water bodies).¹⁸

The AE+6 program was officially launched in January 2016. Field operations began in April 2016 and lasted until September 2017. The Global Resilience Partnership (GRP), an initiative conceived by USAID, the Rockefeller Foundation and the Swedish International Development Agency (SIDA) provided financial support. Groundswell International through its West Africa network of Non Governmental Organizations (NGO) partners, assumed the regional coordination of the project.

The underlying premise of AE+6 was that the progressive agroecological intensification of farming systems is the essential foundation of any effective approach to resilience in the drylands. This is because the underlying causes of growing chronic vulnerability include declining soil fertility, degradation of natural resources (trees, water, pasture, vegetative cover), and climate change (erratic rainfall, rising temperatures, and periodic drought).

Without enabling small-scale farmers to adapt to climate change and transforming their farming system to reverse land degradation, other initiatives to strengthen resilience, including improved nutrition, cannot succeed.

A second assumption of AE+6 was that while beneficial, such improved farming practices alone would not adequately address resilience. Agroecology, as it is promoted by AE+6, is therefore not only about transforming the farming system through agroecological practices but also about

reconfiguring the food system, including improved nutrition through local markets, so that these (re)find a social, economic and ecological balance.²⁴

To achieve this, complementary measures would be vital to meet the specialized needs of the most vulnerable groups (women, children, and poorer households) who are most at risk to food and nutrition insecurity. This would require integrating effective social and governance mechanisms to address gender inequality, poor nutritional practices, and inadequate community capacities for adaptation. A review of the evidence shows that measures focusing on increasing agricultural yields often neglect the specific needs of women and resource-poor farm households through non-inclusive, socially non-differentiated and gender and nutrition-blind activities.

Consequently, the AE+6 regional team led by Groundswell developed complementary resilience strategies that built on the foundation of agroecology. These formed the bedrock of the AE+6 resilience framework. It entailed a series of progressive, layered and multi-sectoral interventions that primarily address "livelihood promotion" and "risk reduction" dimensions, as well gender, equity, nutrition.

Each of the six dimensions of the AE+6 program, particularly the promotion of improved agroecological practices, has already been undertaken in the Sahel. What was different and innovative about the AE+6 approach was that it aimed at:

- 1. Exploring how to integrate nutrition, equity, women's empowerment progressively into the overall strategy of agroecology for resilience, so as to optimize potential synergies.
- 2. Learning how rapidly to scale out (spread) the overall process at low cost in order potentially to cover hundreds of villages in a short time.
- 3. Learning how to sustain the AE+6 resilience process by strengthening local governance at community and municipal levels.

The AE+6 resilience team employed a comparative analysis across three Sahelian countries; Burkina Faso (Eastern Region), Mali (Tominian *Cercle* of Ségou) and Senegal (Kaffrine Region) to determine the contextual factors supporting and constraining the results. Groundswell West Africa's network of NGO partners tested this approach in their own countries. These were Association Nourrir sans Détruire ("Association for Feeding without Destroying") in Burkina Faso, Sahel Eco in Mali and Agrecol Afrique in Senegal (see the annexure for detailed information about these three partner NGOs). Most of the strategies of AE+6 were new to the NGO partners.

Because AE+6 for resilience initiative covered a short implementation period (18 months), the research findings documented in this case study captures an initial snapshot of lessons learned and good practices.





1. Rationale for integrating nutrition into agriculture for resilience

1.1 The critical nutrition crisis in the Sahel

What is malnutrition?

The World Health Organization (WHO) defines malnutrition as follows: "Malnutrition refers to deficiencies, excesses or imbalances in a person's intake of energy and/or nutrients. The term malnutrition covers 2 broad groups of conditions. One is **'under-nutrition'**—which includes stunting (low height for age), wasting (low weight for height), underweight (low weight for age) and micronutrient deficiencies or insufficiencies (a lack of important vitamins and minerals). The other is **overweight, obesity** and diet-related non communicable diseases (such as heart disease, stroke, diabetes and cancer)."²⁵

There are two major types of under-nutrition:

- i. protein-energy malnutrition resulting from deficiencies in any or all nutrients and
- ii. micronutrient deficiency diseases resulting from a deficiency of specific micronutrients²⁶

Poor food intake is only one of the underlying causes of malnutrition, although it is a critical one that government authorities have yet to tackle adequately in the Sahel. In 1990, UNICEF developed a model that more comprehensively explains the causes of malnutrition, including the linkages between lack of resources (a resilience issue), community and household structural issues. The framework, adapted in figure 3 on the next page, shows that causes of malnutrition are multi-sectoral, embracing food, health and caring practices.

There are several key indicators used to assess malnutrition. Child growth is internationally recognized as one of the major measures of nutritional status and health. The percentage of children with a **low height for age** (stunting) reflects the cumulative effects of under nutrition and infections since and even before birth. The percentage of children who have **low weight for age** (underweight) can reflect 'wasting' (i.e. low weight for height), indicating acute weight loss, 'stunting', or both.

UNICEF developed a model that more comprehensively explains the causes of malnutrition, including the linkages between lack of resources (a resilience issue), community and household structural issues. Figure 3. The basic and underlying causes of malnutrition



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Source: Redrawn from the UNICEF malnutrition framework (1990)²⁷



Malnutrition indicators at a glance

Chronic malnutrition is inadequate nutrition over long period of time leading to failure of linear growth²⁸. This relates to the age/height ratio of the individual and translates in stunted and short appearances. The WHO warning threshold is 20%.

Acute malnutrition is inadequate nutrition leading to rapid weight loss or failure to gain weight normally.²⁹ This relates to the weight/height ratio of the individual and translates in wasting or thinness in appearance. The WHO has set the 10% threshold as the critical threshold.

Severe acute malnutrition is defined by a very low weight for height, by visible severe wasting, or by the presence of nutritional edema.³⁰ The WHO has set the 2% threshold as the emergency threshold.

Stunting is growth retardation as a result of long-term nutritional deprivation and recurrent infections, and often results in delayed mental development, poor school performance and reduced intellectual capacity. Over 40%, the WHO ranks the prevalence of stunting as very high.³¹

Wasting in children is a symptom of acute under nutrition, usually as a consequence of insufficient food intake or a high incidence of infectious diseases, especially diarrhea. It impairs the functioning of the immune system and can lead to increased severity and duration of and susceptibility to infectious diseases and an increased risk of death. The WHO critical threshold is 15%.³²

Insufficient weight of children aged between 0 and 59 months relates to the weight/ age ratio.³³

Low birth weight: At population level, the proportion of infants with a low birth weight is an indicator of a multifaceted public health problem that includes long-term maternal malnutrition, ill health, hard work and poor health care in pregnancy. The WHO defines low birth weight as weight at birth of < 2500 grams (5.5 pounds).³⁴ Prevalence over 30% is deemed a very high prevalence.

Anemia is defined as a hemoglobin concentration below a specified cut-off point and is easily measured in children under 5 and in women. It can be caused by many things. One of the commonest is iron deficiency, as well as deficiencies of other vitamins and minerals, especially foliate, vitamin B12 and vitamin A. The WHO has set the 40% threshold is a severe public health problem.³⁵ In Burkina Faso, the percentage of children with anemia is close to 90%, the highest in the world.

The impacts of malnutrition

Chronic malnutrition causes irreversible physical and cognitive impairment in children.

Iron-deficiency impairs the cognitive and physical development of children and reduces the work capacity of individuals and entire populations.

Malnutrition can have serious consequences for the economy and national development. The cumulative economic losses of malnutrition on a country have been measured. Senegal for instance estimates that malnutrition caused a loss of 500 millions FCFA (890,000 US dollars) per year.³⁶ Burkina Faso has calculated its national economic losses caused by child malnutrition at 409 billion FCFA (about 802 million US\$) per annum.³⁷

1.2 Zooming in on the malnutrition issues in Burkina Faso, Mali and Senegal

In all the AE+6 countries of Senegal, Mali and Burkina Faso, the three-year average data indicates that undernourishment is following a decreasing trend³⁸. In Mali, the prevalence of under-nourishment (three-year average) has plummeted over the past two decades, dropping from a rate of 15% over the period 1995-1997 to a rate of de 5.3% over the period 2008-2010. In Senegal, it dropped from 21% over the 2003-2007 period to 10% over the 2013-2017 period. In Burkina Faso, this indicator has dropped from 28% over the 2001-2003 period to 20.7% over the 2014-16 period.³⁹

While dropping, these rates remain alarmingly high, especially for Burkina Faso. The pace of decrease in malnutrition indicators has slowed down recently in some countries (since 2011 in the case of Mali).⁴⁰ Critically, this data on child malnutrition rates indicate that, despite good progress in tackling the nutrition issue, much more needs to be done (see table 1).

Indicator	Data for Burkina Faso	Data for Mali	Data for Senegal	Data source
Prevalence of stunting in children < 5 years old	33% (2012 data)	39% (2006 data)	19% (2014 data)	International Food Policy Research Institute (IFPRI). 201541
Prevalence of children < 5 who are underweight	24%	16.9%	15.5%	IFPRI 2015 ; IFPRI 2015 ; SMART 2014
Prevalence of wasting in children < 5 years old	11% (and 2% suffer from acute wasting) (2012 data)	15% (and 6% suffer from acute wasting) (2006 data)	6% (and 1% suffer from acute wasting) (2014 data)	IFPRI 2015
Underweight at birth (<2,5kg)	13.9%	18% (2010 data)	19% (2010-11)	WHO 2015
Vit A deficiency in children from 6-69 months old	52% (2013 data)	66% (2013 data)	40% 92013 data)	Stevens et al 2015 as cited in IFPRI 2015
Anemia in women of reproductive age	49% (2010 data)	46% (2013 data)	58% (2011 data)	IFPRI 2015; Rép. du Mali 2013a ; IFPRI 2015

Table 1. Selected child anthropometry and women malnutrition indictors in Senegal,Mali and Burkina Faso

But such average national data conceal huge regional differences; the rate of malnutrition is higher in some regions, including regions that have high levels of agricultural production.

Regional disparities

Groundswell's project partners have been implementing AE+6 project activities in parts of their countries that experience some of the highest rates of malnutrition and anemia.

- In the Eastern region of Burkina Faso, where ANSD intervenes, the prevalence among children under five years of age of global acute malnutrition was 11.2%; chronic malnutrition was 38.7% and low birth weight was 27.6% (2011 data).⁴² Stunting among children in the region under five years old reaches a staggering 44.8% (2012 data), considered by WHO to be "very high".⁴³
- In the Kaffrine region, where Agrecol Afrique has a program, 10.6% of the children under five years of age suffer from acute malnutrition (the WHO alert threshold is 10% and the national average is 9.1%); 28.7% of children under five years of age are chronically malnourished in contrast to a national average of 16.5%. (2014 data)⁴⁴. The Kaffrine region also records the highest poverty ratio in the country, with an estimated 62.1% of the population ranked as poor.⁴⁵
- The region of Ségou, in the Tominian Cercle (the equivalent of a region or district), where Sahel Eco implements the AE+6 activities, acute malnutrition reached a prevalence of 11.9%, the highest rate in the country, where the national average is 8.6%. In addition, 33.4% of children under the age of five in the region suffer from chronic malnutrition, versus a national average of 27.5% (2013 data).⁴⁶

Economic disparities

Another important disparity masked by these average figures pertains to major differences according to socio-economic levels within the population. The poorest quintile of the population often have much higher malnutrition rates that the wealthier quintiles.⁴⁷

- In Burkina Faso, the significant drop in the prevalence of chronic malnutrition over the past 20 years occurred mostly in the more affluent households. The chronic malnutrition rate in the poorer households remains staggeringly high, and has stagnated. Specifically, 26% of children from affluent households are affected by stunting versus 55% of children from the poorest households (2006 data).
- In Mali, 32% of the children from poorer households were stunted, versus 27% of the children coming from more affluent households (2010 data).
- In Senegal, stunting affects 38% of children from poor households, versus 15% of children from more affluent households (2011 data).⁴⁸

What is appallingly clear is that one cannot consider that rural populations in the drylands have become resilient to food and nutrition insecurity, and have strengthened adaptive capacities to learn and innovate, when 30 to 40 percent of all the children under 5 suffer from diminished mental capacity.

Significantly decreased levels of chronic malnutrition are an essential indicator of strengthened resilience in the Sahel. Agroecology has a significant potential role in bringing about improved nutritional outcomes.

1.3 Why is nutrition so poorly integrated into agricultural programs?

The UNICEF framework (see figure 3) illustrates how important cross-sectoral cooperation between several key sectors, (including water, sanitation, health care, and agriculture) is in addressing the issue of malnutrition.

In the light of this framework, health authorities have a major role to play in addressing "inadequate care of children and women" and "insufficient health services".

But the **agricultural sector also has major responsibility for tackling the other critical underlying cause of malnutrition, described in the framework as "inadequate access to food"**. There are certainly deep and complex economic reasons why people are not able to grow or buy food despite food being locally available.

In the context of the Sahel, where the vast majority of people are smallholder farmers, the transformation of the agricultural sector must play a direct role in the fight against malnutrition. This requires new policies, and institutional capacities for multi-sector collaboration between health and agriculture to ensure that people have access adequate, nutritious, and healthy food.

Groundswell country partners in AE+6 reviewed national policies and programs of key ministries with a potential role for improved nutrition (Agriculture, Livestock Health, Social welfare, Rural extension). They observed that Ministries had started to integrate nutrition into their activities, but that the impact on the ground remained limited.⁴⁹ The main shortcomings and limitations included:

- limited knowledge of agricultural staff with regards to nutrition⁵⁰
- inadequate communication systems to convey nutrition messages
- a lack of nutrition-related indicators and targets within the programs spearheaded by agricultural ministries
- a strong focus on a "productivity approach" (increased yields) assuming, wrongly, that more production and income would help reduce malnutrition
- A lack of cross-sectoral cooperation: AE+6 program partners underlined that within their program areas, there was often little or no cooperation between the agricultural and health sectors at the local government level. Specifically, nutrition was very poorly integrated into the agricultural sector. For instance, in Senegal, the development of nutritional produce is not comprehensively aligned to the farmers' own agricultural production strategies.⁵¹

Finally, in all three countries of Senegal, Mali and Burkina, the data indicated that malnutrition rates were often high even in the areas of the country with the highest level of agricultural production and income. **Clearly, this indicated that increased agricultural production is NOT a sufficient condition for agriculture to reduce chronic malnutrition.**

Lack of cross-sectoral cooperation

Most governments in the Sahel have started to take important steps to overcome this lack of cross-sectoral institutional cooperation. In part, this has been encouraged by the Scaling Up Nutrition (SUN) initiative. Senegal, Mali and Burkina all have establish SUN platforms. The SUN process actively supports each of its member countries to better align interventions across sectors, including agriculture and health, to improve nutritional outcomes.⁵² Senegal, for example, established the *Cellule de Lutte contre la Malnutrition* (CLM) (Unit against malnutrition) in 2001. Similarly, Mali set up a nutrition coordination unit called the *Cellule de coordination de la Nutrition* (COD) in 2015.

Despite this, the reality in the program areas as observed by Groundswell's network partners, is that, at the local level, municipal government institutions still tend to work in silos. Specifically, nutrition remains poorly integrated into the agricultural sector.

"These initiatives will keep on having a limited impact. Food and nutritional security will only be reached when nutrition is genuinely integrated into agricultural planning".

Peter Gubbels, co-founder of Groundswell International and regional coordinator of the AE+6 program.

1.4 Shifting attitudes about the role of nutrition in agroecology

Through the discussions engendered by their involvement with AE+6, Groundswell's network partners' awareness and understanding of malnutrition, and the role of agriculture to address it, increased dramatically. It gradually became more apparent that their work in agriculture should become "nutrition-sensitive", and become part of their core mandate.

"If proper nutrition is indispensable to ensure people's food security, it means that nutrition needs to form part of our work, on the same footing as soil regeneration and improving agricultural production".

Abdoul Wahab Zombra, project manager for ANSD

Similarly, Sahel Eco's team in Mali became aware of the paradox of high malnutrition rates co-existing in the same rich agricultural zones of Mali where agricultural production was high. This stimulated Sahel Eco to give higher priority to integrating nutrition within their agricultural activities. In light of high levels of malnutrition in the villages of their program area, the team underlined how they should take part in the cross-sectoral effort to engage in preventive action, rather than leave it to the health services to provide a curative response to emergency cases of malnutrition.⁵³

The Agrecol Afrique team also stated, after the training provided by Groundswell, that improving nutrition is critical to building the resilience of rural communities, and that agriculture can play a vital role.⁵⁴

"For Agrecol, fighting malnutrition is crucial to strengthen local resilience, because people who are well nourished are healthier and able to work and they also have greater physical reserves. Households who are nutritionally secure are thus better able to withstand and resist shocks for longer periods of time and to recover from them quicker".

> Mouhamadou Moustapha Gning, AE+6 project manager for Agrecol Afrique

2. Strategies of AE+6 teams to integrate nutrition into agriculture

2.1 Theoretical overview of pathways to integrate nutrition into agriculture

An extensive analysis of field experience revealed three major "pathways" to strengthen to improve nutritional outcomes through agriculture. These pathways, reproduced in figure 4, provide a conceptual understanding of what strategies, or combination of activities within agriculture could improve access to food and health care; how they affect and are affected by the wider enabling food environment; and how they ultimately affect the nutrition of women and children.

These three pathways are featured in figure 4 in the context of the four components of what constitutes a "food environment", which can be defined as the availability, affordability, convenience, and desirability of various foods. ^{55 56}





Source: Adapted from the USAID/Strengthening Partnerships, Results, and Innovations in Nutrition Globally (SPRING) Project (2014) and based on Herforth & Ahmed (2015).57

a) The Agricultural Income pathway⁵⁸

By growing cash crops for income, farm families can buy nutritious food in the local market, diversify their diet and improve the nutrition status of their households. However this depends on what is available at the local market and the cost of nutritious food. It also depends on whether farm families have sufficient awareness about good nutrition when deciding how to use their income to buy food. Finally, it also depends who within the household has access to sufficient income to buy food.

Research shows that this is a pathway must be considered with caution. If a farm family decides to concentrate on a monoculture cash crop to maximize farm income, it also exposes them to a greater risk of crop failure (compared to more diversified cropping), particularly in a context of irregular rains. A focus on income generation can adversely affect household wellbeing if the male head of household requires women to spend more of their time on the commercial crop (i.e. cotton, or peanuts), rather than undertaking their own income activities, or giving sufficient time for child care. Finally, invariably, the male head of household controls the income earned from the commercial crop, and may not prioritize its use for improved family nutrition.

Within agriculture, increased farm income can have a positive, negative, or neutral effect on nutrition. Smallholder farmers must decide how much of their land to dedicate to cash crops and how much to set aside to grow nutritious food that is either not available or too expensive on the market, for family consumption.

b) The food production pathway⁵⁹

Depending on the context, concentrating on cash crops may have less effect on nutrition than self production of diversified nutrition rich foods for improved diets among smallholder households.⁶⁰ This pathway often requires changing household farming systems, and the selection of crops. Because farmers are more often net food buyers, it makes sense to encourage farmers to grow more of their own nutritious food, especially if such food is expensive on the local market.

c) The women empowerment pathway⁶¹

This pathway considers women's use of income for food, the ability of women to care for themselves and their families, and how women spend their time and energy. Empirical evidence shows that empowering women in agriculture often contributes to improved nutrition for themselves, their children, and other household members. Many studies have found that an increase in women's discretionary income has greater impact on child nutrition and food security than if men had a similar increase of income.⁶²

Overall, increasing women's active involvement in agriculture is likely to improve nutrition.⁶³ This pathway also has potential downsides. It may lead to increasing women's already heavy work load with farming activities. It can also negatively affect women's ability to provide adequate child care, and to safeguard their health (especially during pregnancy).

This analysis of potential pathways of how to harness agriculture for improved nutritional outcomes shows that there is no one silver bullet. Much depends on the local context and the livelihood strategy and socio-economic status of individual farm families.

AE+6 partners have found that in practice, these pathways are strongly inter-related. In each program area, the approach was to develop a mixed, mutually reinforcing strategy that addressed all three pathways. This mixed approach across all three pathways was best exemplified by the promotion of women's saving and credit groups (see box 7).

2.2 Tools used

Groundswell trained its AE+6 country partners in the use of several tools to help them integrate nutrition into their agroecology work. These included:

- The Household Hunger Scale (HHS): this simple method was developed to measure household hunger in food-insecure areas⁶⁴. The HHS is primarily a tool designed to help identify the households most vulnerable to hunger. Nine questions are asked to determine varying levels of food insecurity, reflecting three domains perceived as central to the experience of food insecurity cross culturally:
 - i. anxiety about household food supply
 - ii. insufficient quality, which includes variety, preferences, and social acceptability
 - iii. insufficient food supply and intake and the physical consequences

Although not directly a nutrition tool, the HHS it proved relevant to help AE+6 partners to assess food security status of households, taking into account that the children of the most food insecure and poorest households often suffered the highest rates of malnutrition.

- The Self-evaluation and Holistic Assessment of climate Resilience of farmers and Pastoralists (SHARP) tool⁶⁵: this tool was designed as an instrument to assess, in a holistic way, the resilience of farmer and pastoralist production systems, particularly in light of climate change. This method generated diagnostic data that facilitated dialogue within the community to identify the aspects of their agro-ecosystem most in need of improvement for resilience. This tool included a series of questions on nutrition as well as on food security. AE+6 teams entered the responses to the SHARP questions making use of a software package and an android tablet, which provided an immediate analysis of the strong and weak points of that household's resilience.
- The Household Dietary Diversity Score (HDDS) for Measurement of Household Food Access tool: this guide provides an approach to collecting and measuring household dietary diversity as a proxy measure of the quality of nutrition. A snapshot of a household dietary diversity (defined as the number of food categories consumed by household members over a given period) is captured to assess which important food categories need to be addressed for a more healthy, nutritionally balanced diet.⁶⁶ Studies groups have shown that an increase in the dietary diversity score is related to increased nutrient adequacy of the diet. Dietary diversity scores have been validated for several age/sex groups as proxy measures for macro and/or micronutrient adequacy of the diet.⁶⁷ Households that improve their HDDS' scores tend to have improved nutritional outcomes.⁶⁸

AE+6 partners used these tools to a different extent. In the short time frame of the AE+6 initiative, the main intention was to help each partner learn about the tools, and use them for diagnostic purposes. Each of the teams have become familiar their use, (and excepting only the SHARP methodology), have started to progressively include these tools in their respective organizations' work protocols. During the 18 months of implementation, the AE+6 partners obtained diagnostic data and a preliminary baseline on dietary diversity for their pilot villages that will be used to track progress over time as funding for continued program work is obtained.

2.3 Activities that contributed to improving the nutrition of households

Targeting the most vulnerable households

When devising strategies to integrate nutrition into their existing agroecology work to improve the nutritional status, Groundswell's network partners decided to give particular attention to the poorest, most food insecure households. This was because the literature clearly indicated that the poorest quintile of households invariably

had significantly higher child chronic and acute malnutrition rates. The rationale and tools to identify and categorize households by wealth category are outlined in the case study focused integrating equity into agroecological interventions.

The literature also indicates that the groups most vulnerable to malnutrition are pregnant and lactating women, and children under two. AE+6 teams also gave priority attention to these population strata in their nutrition-oriented activities.

Raising awareness on the causes of malnutrition and improved nutrition practices at the community level

To begin influencing behavior change by rural households, AE+6 teams began with nutrition education. This consisted of convening general community assemblies to discuss malnutrition in an interactive manner. The teams asked community members their perceptions about how identify malnutrition, its causes and consequences. This participatory approach helped give the communities a sense of ownership in the fight to reduce malnutrition. During these sessions, AE+6 teams explained the nutritional value of different types of local foods. This helped farmers to consider changing the selection and diversity of crops in their production systems.⁶⁹

Promoting the self-consumption of crops

Another key message that the AE+6 teams conveyed was that farmers should set aside a portion of the crops grown commercially so that their households could benefit from nutritional benefits of a more diversified diet. AE+6 field teams helped communities identify the locally grown nutrition rich crops grown commercially. These included peanuts, sesame, cowpeas, beans, roselle (*Hibiscus sabdariffa*, called "*bissap*" in Senegal) and bambara beans (*voandzou*). All these have rich nutritional ingredients that were often lacking in local diets.

In all three countries, the farm households in the pilot villages started to diversify their crops and consume more of the nutritionally rich types of local foods. However, this initial change was feasible mostly because AE+6 teams had also supported income generating activities such as animal farming (thanks to the *habbanaye* system), that helped offset the potential loss of income from retaining nutrition rich crops for home consumption. Another contributing factor was the access to credit, and extra income earned from the warrantage system (see the related case study on equity).

Promoting the processing and marketing of non-timber forest products

Another income generating activity oriented to improving nutrition concerned support for women's groups to learn about how to harvest, process and sell on local markets non-timber forest products. Sahel Eco, in Mali was the lead partner who developed this strategy.

The underlying premise was to help women diversify their local food systems by making more effective use of nutritious fruits from wild trees, and to increase their income by learning how to process these fruits and market value-added products. In Mali, these widely available tree products included the flowers and leaves of wild baobab trees, the flowers of the kapokier tree, nuts from shea trees to make butter, and *néré* pods to make powder and *"soumbala"* condiment.

"Food security starts in one's garden...and in one's forest". Pierre Dembelé, Sahel Eco Executive secretary.

Equipment provided to a women's savings and credit group women to transform shea nuts into shea butter (Mali). Credit: Sahel Eco

Fostering culinary knowledge

AE+6 partners took steps to develop a strong connection between improved nutrition and cooking. This was done to overcome the challenge of introducing relatively new (nutrition rich) crops, when most women were not familiar about how to process them in their kitchens for home consumption. A related step was to teach women how to better preserve nutritious fruits and vegetables.

In their pilot villages, AE+6 teams organized cooking demonstrations. In Mali, Sahel Eco trained two women per village on several cooking recipes using either locally known but under-utilized indigenous crops or newly introduced crops (i.e. orange sweet potatoes). Both of these women had the responsibility to conduct the same cooking demonstrations for other interested women, once they returned back to their home communities.

In Senegal, Agrecol's AE+6 staff systematically obtained culinary knowledge during their many sessions with communities. In this way, they generated an inventory of a wide range of mostly forgotten recipes based on the traditional knowledge of the elderly women. This resulted in Agrecol promoting a number of traditional dishes. One of the most popular was known as "*nyalang*", made from millet, smoked fish and peanuts.

In Burkina Faso, ANSD also organized several culinary lessons on the various uses of orange-fleshed sweet potatoes, which is rich in beta-carotene, an excellent source of Vitamin A. Its flesh can be juiced or made into cake slices. Its leaves can be consumed in couscous or in a sauce.

In this way, women in the pilot villages learned new ways of preparing more diverse and nutrition meals for their households, using locally available foods. AE+6 staff encouraged women to give particular attention to changing their behaviors regarding how to meet the nutritional needs of their children.

In Mali, Sahel Eco explained that women in their program area were excited to learn how to make a highly nutritious porridge for their children, using entirely locally available ingredients⁷⁰ (see box 3).



Box 3

How to make an "enriched porridge" for children

Instructions provided to women nutrition promoters:

- i) measure 3 parts of flour (either millet/peal millet/maize/fonio flour) with 2 parts crush peanuts and add water
- ii) boil for 10 minutes and add "monkey bread" or tamarind fruit or lemon (the vitamin C in the lemon will improve the bioavailability of iron contained in moringa)
- iii) add sugar, salt, millet and moringa powder to taste (it is important to add the moringa powder at the end of the cooking process as the leaves lose 32% of their vitamin C content if boiled over 5 minutes)⁷¹

2.4 Strategies adopted to integrate nutrition into farming systems

To integrate nutrition into their agroecological programs, a key aim of AE+6 partners was to encourage farmers to diversity their food crops, particularly vegetables, and then use this production for home consumption to diversify their diets. Depending on the country, AE+6 partners adapted various types of strategies to achieve this.

Training and supporting women with diversifying their production using agroecological principles

Although applying the same principles, each AE+6 country team adapted these in a different way, because of contextual factors. These varied field experiences across Senegal, Mali and Burkina Faso generated different lessons and strategies.

Some of the AE+6 teams opted to focus almost exclusively on the establishment of home gardens. This was because, in their experience, women often give better care to these gardens next to their homes. Other AE+6 partners had positive results from supporting large collective dry season gardens, near a water source, in addition to home gardens in the rainy season. They key lesson is that practitioners of agroecology must carefully consult with communities, fully discuss the range of options and enable the villagers themselves decide based on their intimate knowledge of the specificity of agro-ecological conditions and community dynamics.

Using one or both of these basic strategies, AE+6 teams systematically introduced new nutrition rich crops in all their pilot communities. Among these previously rarely cultivated vegetable crops were: cabbage, tomatoes, carrots, eggplant, chili and okra. Another new crop that had not been locally available before was the orange-fleshed sweet potato, and lettuce.

The promotion of these vegetable crops, through home gardens or collective dry season gardens, significantly diversified the farming systems based primarily on the staple crops of millet, sorghum, maize, fonio and cowpeas (Mali) or rice, millet, maize and peanuts (Senegal).

"What I found striking when embarking on monitoring visits in the villages was that women were offering us a salad with the meal, with vegetables they had grown in their own gardens. This is really not something we are used to eating locally. It shows how quickly women have taken on diversifying their crops but also that they are really consuming this new production". Pierre Dembelé, Sahel Eco Executive secretary.



A woman form the village of Bilguemtenga (Burkina Faso) showing some freshly harvested sweet potatoes. Credit: ANSD



Women learning how to process orange fleshed sweet potatoes. Credit: ANSD



Promotion of baobab and Moringa Olifeira for women farming

Freshly harvested moringa and baobab leaves are highly nutritious. AE+6 partners developed an innovative technique to plant these trees in home gardens, and manage them as shrubs. This turned out to be a quick win to improve the nutritional status of vulnerable households, especially in Mali and Burkina Faso. If the tops of these trees are cut off when they reach 1.5 meters, these trees start to grow as a leafy bush. If watered regularly, a 20 by 20 meter bed can generate sufficient leaves for a farm throughout the year, for self-consumption as also for sale.

Baobab tree leaves are already well known and used in Mali, but moringa less so. To promote this *moringa olifeira*, a tree with very rich nutritional properties, Sahel Eco developed the "one woman, one moringa" initiative. The intention was to ensure that each woman in the pilot villages would have at least one such tree planted in her garden.

Box 4

The nutritional properties of Moringa Olifeira

The nutritional density of *moringa olifeira* is astonishing. Studies have found that the fresh leaves contain 15 more times potassium than bananas, 10 more times vitamin A than carrots, 17 more times calcium than milk, 25 more times iron than spinach and 0.75 more vitamin C than oranges.⁷² They also have anti-oxidizing and anti-inflammatory properties. Sahel Eco made moringa its champion tree and highly recommended it for infants' porridge, providing them with sound nutrition to build their bone structure and boost their immune systems.

2.5 Strategies to empower women in the agricultural sector

Women's empowerment in agriculture is a key, highly critical pathway for harnessing agriculture to improve nutritional outcomes. AE+6 teams all addressed women's empowerment in agriculture as a significant thematic area of work in support of resilience. This set of initiatives contributed in a major way to the closely related effort to improve nutrition. The overall strategy on women's empowerment in agriculture is documented in detail in a separate case study. What follows here is a brief outline of how activities for supporting women's empowerment worked in synergy with the capital role played by women to ensure sound nutrition for the household.

Women saving and credit groups

Women's saving and credit groups consisted of a group of women,⁷³ (on average between 12 to 20) gathering on a weekly basis to save money. Once the savings fund is large enough, women members can take up loans to start income generating activities. The synergies with nutrition included:

- the regular meetings of the women's savings and credit groups serve as an informal, regular platform for nutrition education, and discussion of progress in diversifying diets
- women often took loans to invest in diversifying their production on small garden plots or collective dry season garden plots
- women gained additional income which they often used to improve their household diets



Supporting women with accessing land

Traditionally, women do not own land in the Sahel. Groundswell's AE+6 partners addressed this helping women farmers groups organize to negotiate secure, long term access to land for farming, particularly for gardening.

Synergies with nutrition:

- women obtaining access to land and water often grow nutrition rich local foods, including baobab, moringa and vegetables that they use, at least partially, for home consumption
- women group members use increased income from their access to land to improve their household diet

Rotation-based gift of livestock (*Habbanaye*) for women from the poorest households

This activity consisted of giving women from the poorest families with pregnant sheep or goats for increasing their asset base, and income generation



ALCO .

Synergies with nutrition:

- women can use the income earned from livestock improving the local diet
- for poultry, women sometimes use the eggs for home consumption

Support with aviculture and fattening of small ruminants

AE+6 supported women with training in how to feed and care for improved poultry and fattening of small ruminants, as part of income generation activities



Synergies with nutrition:

- women can use the income earned from livestock improving the local diet
- for poultry, women sometimes use the eggs for home consumption

Supporting women to process and market tree products (Shea and néré value chains)

Shea nuts and *néré* pods have great nutritional properties. Shea can be processed as butter and *néré pod beans* are used to produce a highly sought after and nutritious condiment called *Sumbala*. ⁷⁴ Sahel Eco in particular supported women groups with small equipment and training in how process these tree products



Synergies with nutrition:

- women can use the income earned to improve their household diets
- women use the shea butter and *sumbala* for home consumption, in addition to sales

Direct support to women to improve farming on plots tended by women

A key part of women's empowerment is to enable women to obtain access to productive resources, including land, water, seeds, animals, credit, training and tools. Groundswell AE+6 partners identified women from poor and vulnerable households and provided them with subsidized inputs (including seeds, tools and training in agroecology) so that they could farm more easily and improve their yields. The farm tools helped women farm on their homestead gardens. The work is more efficient and it frees up time to care for the children.



Synergies with nutrition:

 women use their training and tools to increase household food production, income and use this to improve diets

2.6 Strategies to raise awareness, scale out & spread nutrition knowledge

Training of women to act as volunteer nutrition promoters

AE+6 partners took steps to rapidly scale out the most popular and successful nutrition focused initiatives, especially with regards to women saving and credit groups. One strategy was to recruit and train volunteer women nutrition promoters. ANSD in Burkina, for example, trained 30 volunteer women nutrition promoters in 10 villages to spread nutrition knowledge and practical improved feeding practices to other interested women.

Culinary contests

In Burkina Faso, ANSD organized a contest of the "most nutritious dish cooked form locally available ingredients". A total of 150 women from 3 communes took part in the context. The awards given included cooking appliances, tee-shirts, soaps, etc.

Radio games

ANSD also pioneered the way by organizing games on the local radios to reinforce messages about nutrition. Listeners were asked questions about the causes and consequence of malnutrition, how to identify the right type of food to eat, etc. Rural radio broadcasts were also used to host women giving testimonies of their practical experience in improving the nutrition of their children.

Women's saving and credit groups

These groups usually meet once a week. On these occasions, AE+6 field staff often engaged with women on the issue of nutrition. This reinforced the communication of important nutrition messages, and stimulated dialogue in a trusting environment where women could easily discuss their health and share their experiences.

Immersion visits

An effective way of promoting the adoption of nutrition oriented agro-ecological practices among women (either for home gardens or collective plots) consisted of taking women leaders on learning exchange visits so that the women could see first-hand the benefits of more advanced nutrition related activities and engage in practical discussion.

Caravans

Caravans are a mechanism used by AE+6 partners to spread knowledge, promote improved practices, raise awareness, influence decision makers and local leaders, and also do "on the spot" trouble shooting when necessary. Agrecol Afrique in Senegal organized one such caravan focused on nutrition. Among the "caravaners" were medical staff (nurses) who obtained first hand exposure in the villages, and who entered into dialogue with community and women leaders about the linkages existing between agroecology, savings, food diversification and people's health. These same people contributed to awareness-raising sessions on nutrition, helping to further disseminate and reinforce key nutrition messages. A large group of local officials, nurses, technical staff and other stakeholders travelled across 12 villages, over several days, in May 2017.

3. Challenges

There is a strong tendency for organizations specializing in agricultural development in the Sahel to assume that if farm production and income is significantly increased, this will have significant effects for improving nutritional outcomes.

Unfortunately, this often applies also to practitioners of agroecology, who assume that more diverse, ecologically produced food will, by itself, address the crisis of near emergency levels of malnutrition.

The evidence shows this assumption is not correct.

A major challenge in fostering linkages between nutrition and agriculture is that many agricultural development staff have limited knowledge and understanding for how to achieve synergies and integration.

Beyond that central challenge are additional, related challenges pertaining to operations, attitudes and misconceptions.

3.1 Operational challenges

Lack of sufficient human and financial resources

Groundswell and its AE+6 partners sought to develop a "minimalist" approach to integrate nutrition into existing agroecology work. This meant not recruiting additional staff specialized in nutrition, but rather training existing agricultural technical staff in nutrition and collaborating, when necessary with local health and nutrition agencies. The idea was to develop and test a strategy that could be adapted by many organizations engaged in promoting agroecology to significantly improve nutritional outcomes without entailing major additional costs.

This succeeded to a large measure. However, AE+6 partners, now convinced about the critical importance of integrating nutrition, would have liked to have had more financial and human resources for supporting nutrition, particularly to scale out successful activities to more villages, and to conduct more regular follow-up sessions to reinforce the newly acquired knowledge on nutrition.

Of particular concern to AE+6 partners was that their principal financial partners were not yet fully informed about the critical need for nutrition sensitive agriculture. There seemed to be a reluctance to accept additional costs in new projects to support the nutritional dimension. To address this challenge may require communication of practical results, newly national government policies supporting integration of nutrition into agriculture, and advocacy in order to ensure sufficient long term funding for integrating nutrition into on-going and future agroecological programs.

Lack of knowledge sharing

AE+6 teams cited a lack of sufficient cross-sectoral collaboration and information sharing at the local level as a major impediment to tackle malnutrition. This pertained in particular to the linkage with local health and nutrition staff who were often more involved in health post focused curative work, rather than preventive work in the communities.

Challenges pertaining to the use of tools

Another challenge has pertained to making effective use of the data stemming from the Household Hunger Scale (HHS) and Household Dietary Diversity Score (HDDS) surveys and cross tabulating it with the data related to the socio-economic categorization of households in each of the pilot villages.

Agrecol Afrique's staff in Senegal underlined their difficulties transcribing the data from the paper surveys to a digital format. The team had only a limited number of portable computers. There was too little time, and

inadequate staff capacity to enter the data on computer, fully analyze it, link and triangulate it to other data. Collecting the nutrition and dietary data helped AE+6 teams get a better grasp of the situation, but they often lacked the internal capacity to make optimal use of the data for planning and strategy development.⁷⁵

High illiteracy in the participating communities

The high illiteracy in rural areas slowed implementation of activities and limited the potential impact. The extent of illiteracy⁷⁶ surprised some of the teams. ANSD reported that even community members who said they were literate could hardly read and write. This affected community level management and follow up of activities. One example was that in many communities, there was not a sufficiently literate person to take notes during meetings and training sessions. This required AE+6 teams to develop innovative local communication, recording, and monitoring methods⁷⁷.

Farming-specific challenges

Lack of water was a critical hindrance for the home gardens and dry season gardening plots.

A greater investment in developing cost effective water resources would have been required to more widely extend nutrition-focused agriculture. For example, the moringa and baobab tree seedlings in the home gardens required watering every second day. This proved difficult in some villages with limited water resources.

Other farming-specific difficulties included damage by pests such as insects or rodents, and the need for fencing to protect vegetables and young seedlings in the garden plots.

For animal husbandry, the AE+6 teams found it was necessary to have better linkage with specialists to provide adequate advice about type of animals to be purchased and to address animal health. In Mali, for example, an epizooty epidemic affecting sheep broke out. Sahel Eco advised women to purchase goats, which were not affected.

3.2 Belief systems and pre-conceived ideas on malnutrition

Pre-conceived ideas

The most persistent pre-conceived belief that AE+6 partners encountered among their peers in the agricultural sector was that malnutrition was the sole responsibility of the health sector. Overall, the AE+6 partners realized that agricultural extension officers generally have very limited knowledge of nutrition, the different types of malnutrition, the effects of chronic malnutrition, the main causes, the near crisis levels of malnutrition in the villages, the essential need for pregnant and lactating women to significantly increase their food intake compared to men, and the pathways to enable agriculture to contribute to improved nutrition.

Similar challenges existed at the grassroots level. Villagers (and often agricultural staff) had the idea that if they could eat enough to make their stomachs feels full, they would be well nourished. One of the first myths the nutrition education facilitators had to debunk was that satiety did not mean people were well nourished.

Local belief systems

All AE+6 teams encountered taboos and cultural beliefs that hindered efforts to encourage households to diversity their diets. In Burkina Faso, ANSD learned that villagers (including mothers) believed that if a child fell ill and become malnourished, the main reason was because that child was bewitched.⁷⁸

In Malian villages, cultural norms forbade children to eat eggs, for fear that doing so would turn them into thieves.⁷⁹ The same taboo existed in Burkina Faso, where pregnant women also abstained from eating eggs, for fear of giving birth to a mute and deaf child.⁸⁰ Such food related taboos often negatively affect the nutrition of children and pregnant/lactating women.

AE+6 teams found it was particularly difficult to convince farm households that they should consume a portion of the nutrition rich crops grown for commercial sale. In Mali for instance, Sahel Eco found that cash crops such as peanuts, cowpeas and sesame are rarely consumed. Almost the entire harvest is sold for income. Farm families usually eat sorghum and millet, which are staple crops, and "fill the belly" but do not provide an adequate nutritious diet on their own.

Similarly, it was very challenging to persuade villagers to slaughter and consume their own livestock. One reason is because livestock traditionally represent a local asset that services as a "savings account" to use to buy grain in the case of crop failure.⁸¹ ANSD expects that assisting households to start up small livestock enterprises to raise and fatten up chickens and small ruminants may start to overcome this attitude.

The persistence of the productivist myth

A final misconception within the agricultural sector was that to ensure good nutrition at the household level, the main thing was to help farmers learn to increase their overall production, and this would be sufficient. It required a major effort to shift attitudes and thinking beyond the highly productivist approach, focused on monoculture and high yields, and also consider crop diversification. The many obstacles described in this section above is ample evidence to de-bunk the idea that increasing overall agricultural production will, more or less on its own, be sufficient to significantly improve nutritional outcomes in farm communities of the Sahel.

4. Results and initial effects in integrating nutrition

4.1 Changes in the behavior, knowledge and mandates of AE+6 partners

A key outcome of the AE+6 program experience on embedding nutrition into agriculture was that Groundswell's network members have much strengthened capacity for improving nutrition in their work. They have acquired the knowledge, tools, strategies, and above all the organizational conviction of the need to address nutrition that enabled them to change how they promote agro-ecology in their program areas.

Before AE+6, none of Groundswell's network members had considered including nutrition-specific activities as a strategic dimension of their agricultural development mandates. Even though Groundswell's network members were aware of malnutrition in their areas, they had limited knowledge about the different kinds, signs and causes of malnutrition, and the level of severity. Often, partner staff did not realize how dire the malnutrition situation in their locality, and the irreversible physical and cognitive ill effects of chronic malnutrition.

"I was alarmed at the situation of some people in the Kaffrine region. This was unknown to me. I thought one would only see such alarming malnutrition rates only in countries affected by wars and starvation".

Fatoumata Sall, community outreach officer to Agrecol Afrique.

Moreover, Groundswell's NGO network members were not aware of the important potential linkage between nutrition and agriculture.

All AE+6 team members indicated that they now are fully aware of agriculture's critical role in addressing the near emergency nutrition crisis in the Sahel, particularly in preventing malnutrition. This was an issue they had seen as the primary responsibility of the health sector.

Sahel Eco in Mali, for example, underlined how their work in agro-ecology essentially focused on improving yields. They had not considered crop diversification in any previous program.

Moustapha Gning, Agrecol Afrique's AE+6 project manager, underlined how, based on his experience with this initiative, he now fully understands that nutrition could not remain the unique prerogative of the health sector. He recognizes it is very much a cross-sectoral issue. Beyond that, he now sees that part of his job is to *"make a link between the established farming plots and the recommended food intakes"*. He elaborated on how the insights gained from the training on nutrition made him realize that agriculture *"beyond being the main vehicle for sound nutrition, is also a key guarantee of social welfare."* This is because meeting nutritional needs actually prevents people from falling ill.

Abdoul Wahab Zombra, from ANSD in Burkina commented how he and his fellow team members came to realize that ANSD could significantly improve the nutritional situation of vulnerable households through a diversified production, without having to inject more resources into their existing projects. For him, this constituted a real turning point.

As a result the practical experience in nutrition, gained through AE+6, Groundswell's network partners undertook some substantial, far reaching organizational changes:

- all changed their organizational mandates to more explicitly include nutrition
- some revised their 5 year planning cycle to integrate nutrition-focused activities and to embed this component through the value chain
- all incorporated nutrition related diagnostic and assessment tools for future design, planning and monitoring nutrition outcomes within agro-ecological projects
- all indicate they will integrate nutritional work in future funding proposals, whenever possible

Beyond this, all AE+6 teams self assessed their adoption of nutrition-sensitive agriculture using the Food and Agriculture's 10 Recommendations⁸² for Improving Nutrition through Agriculture and Food Systems (see box 5). They all had improved their scores significantly against the baseline, although for some of these recommendations, only limited progress was made.

Box 5

The FAO 10 Key Recommendations for Improving Nutrition through Agriculture and Food Systems

- 1. Incorporate explicit nutrition objectives and indicators into their design, and track and mitigate potential harms.
- Assess the context at the local level, to design appropriate activities to address the types and causes of malnutrition.
- 3. Target the vulnerable and improve equity through participation, access to resources and decent employment.
- 4. Collaborate with other sectors and programs.
- 5. Maintain or improve the natural resource base.
- 6. Empower women.
- 7. Facilitate production diversification, and increase production of nutrient-dense crops and small-scale livestock.
- 8. Improve processing, storage and preservation to retain nutritional value and food safety, to reduce seasonality and post-harvest losses, and to make healthy foods convenient to prepare.
- 9. Expand market access for vulnerable groups, particularly for marketing nutritious foods.
- 10. Incorporate nutrition promotion and education.

4.2 Changes in the dietary consumption patterns of farm households

It is too soon to quantify the extent to which households in the pilot villages have changed and improved their diets. However, anecdotal evidence strongly indicates initial changes impulsed by the AE+6 program are becoming visible on the ground.

In Mali, Sahel Eco observed that many households in the pilot villages have increased their intake of highly nutritious foods. The main manifestation is the consumption of baobab and moringa leaves as well as other vegetables produced in the home gardens. Households now also tend to consume a portion of the commercial legume crops, unlike before.

In Senegal, Agrecol Afrique similarly observed that people are now eating "monkey bread" and peanuts, which are cash crops, whereas they never used to.

The same applies in Burkina Faso, where ANSD field staff observe that more villagers are willingly consume cowpeas, peanuts, and sesame, which are commercial crops.

4.3 Toward a greater integration of nutrition in local interventions

The advocacy and outreach work done by AE+6 partners to encourage other stakeholders to integrate nutrition into their activities is another effect that is starting to take hold. In Mali, Sahel Eco reports how medical staff in rural health posts have started to change their messaging to encourage villagers to eat a nutritious diet as opposed to only offering them curative measures to manage malnutrition.

4.4 Zooming in on some of the achievement within each country project

Agrécole Afrique – Senegal

- established a total of 14 collective garden plots covering a surface area of 37, 169 m² and enabling the production of 44 tonnes of organic cereals
- fostered the planting of moringa trees and som
 babs in 10 of these large collective plots
- engaged 340 households in food production inclusive of nutrient-rich crops. These households cultivate at least 5 nutrient rich crops, as well as the organic production of organic cereals and leguminous crops
- convinced participating households to directly consume 30% of the harvest of these nutritious crops, with the remainder sold on the local market
- introduced new institutional thinking within overall strategic orientation for nutrition interventions within the "Kaffrine medical region", which in turn has had a direct influence with the national CLM [Unit to fight malnutrition]

Association Nourrir Sans Détruire - Burkina Faso

- established a total of 36 women credit and saving groups across 8 villages, including a total of 760 women, all of whom were engaged in nutrition education
- trained a total of 423 women on improved farming techniques focused on diversified production for better nutrition outcomes
- provided 100 women from vulnerable households with animals for income generation.
- undertook culinary training on the use of sweet potatoes across 8 villages
- engaged 150 women in a locally organized culinary contest

Sahel Eco – Mali

- established 12 collective gardens of a surface of 100m2 across 8 villages in which baobab and moringa olifeira were also planted
- trained 443 women and 103 men on how to prepare food using the new crops
- provided 150 vulnerable households with animal rearing for income generation (poultry and fattening of small ruminants),



5. Lessons learnt

The following factors contributed to the initial results obtained by local municipal councils and traditional leaders and committees in the villages, with the support of AE+6 teams.

5.1 Key success factors for integration of nutrition into agroecology

At the level of the partner NGOs, the integration of nutrition into existing agricultural activities was achieved because of the following "success factors":

Key success factor # 1: NGO staff received in-depth training on nutrition

AE+6 partners applied the strategies to integrate nutrition without any important expenses for additional staff, largely within their own institutional capacities. In some instances, AE+6 partners obtained the support of nutritionists to advise their field staff. However, essentially the agricultural field staff managed, after several training sessions, to get a solid grasp of nutritional issues, how to obtain baseline information on nutritional issues and how to design interventions to improve a given population's nutritional status within the scope of an agricultural program. AE+6 partners also scrutinized national policies to identify implementation gaps at the local level.

Key success factor # 2: NGO staff learned the use of nutrition-focused tools

Tools such as the HHS and the HDDS were valuable tools. AE+6 teams added these to their existing agroecological practitioners' resource kits, as a means to help better diagnose, design, monitor and assess nutrition in their activities. Key observations were as follows:

- The use of such tool is cost and time effective. **Field staff need not be experts** to apply these nutrition-focused tools in the communities.
- Such tools help to capture the baseline information on food and nutrition security in to ensure that
 initiatives are tailored to local needs, but also to measure the long-term impacts. They therefore
 constitute valuable new, nutrition focused monitoring and evaluation tools for organizations engaged
 in agroecology.
- Sahel Eco reports that with this data, their field teams are also equipped with solid data and knowledge for their advocacy work on the topic.

5.2 Key success factors that contributing to improved nutritional outcomes

Key success factor # 1: Target the most vulnerable households

The first step to improve the nutritional situation of the most vulnerable, and especially women and children is to clearly identify the households who are most vulnerable to food and nutrition insecurity through community based participatory rural appraisal (PRA) methods.

Key success factor # 2: Raise community awareness on nutrition

If villagers can be made aware of the causes and consequences of malnutrition from the outset, and how it can be addressed, the community as a whole can become fully supportive in combating malnutrition, of changing dietary consumption patterns and diversifying production.

Key success factor # 3: Promote the self-consumption of crops

Households will often consider consuming a portion of their nutrition rich commercial crops if the associated monetary loss can be offset through the generation of alternative income. This is why persuading farm households to diversify their diets should go hand-in-hand with support for income generating activities.

Key success factor # 4: Support new culinary knowledge

Cooking demonstrations offer an effective means to successfully introduce new crops and ensure these will not only be grown but locally consumed. To persuade women to grow more diverse, nutrition rich foods, they need to learn how to cook them in locally acceptable ways. These demonstrations can be organized with selected women from villages who are then given responsibility for replicating this same training for interested women when they return home.

Key success factor **#** 5: Promote the harvest, processing and marketing of non-timber forest products

Non Timber Forest Products are often a neglected food resource. Educate communities on the nutritional properties of such products. Often this indigenous knowledge is being forgotten. Train women also on how to process these tree products for income generation.

5.3 Key success factors for integrating nutrition into farming systems

Key success factor # 1: Train and support women with diversifying their production using agro-ecological principles

Collective dry season gardens tended by women groups enabled women members to learn from each other and to work together. The groups became "fertile ground" to encourage sharing of experiences and technical knowledge regardless of women's social backgrounds. Through a domino effect, this learning can inspire women in other villages, who are encouraged to adapt the techniques to their own situation. Sahel Eco, for example, has observed women who were trained applied techniques learned in homestead gardens, which were replicated by women neighbors. The Sahel Eco campaign "one woman, one moringa" helped to achieve quick results in scaling out a key innovation that contributed significant nutritional improvements in households.

Finally, dry season gardens also "smooth out" food availability into the dry season, when women's work loads are less than in the rainy season.

5.4 Key success factors contributing to empowering women

The reader is referred to a closely related AE+6 case study on women's empowerment in agriculture. This case study discusses in detail success factors for enabling the empowerment of women. Section 2.5 above indicates the major areas of synergy between women's empowerment in agriculture and improved nutritional outcomes.

For the purpose of this case study on nutrition, the lessons learned from the women's saving and credit groups is highlighted, as it offers great synergies between the three pathways for improved nutritional outcomes.

Box 6

Women saving and credit groups: synergies between the women empowerment pathway, the agricultural income generation pathway and the food production pathway for improved nutritional outcomes

In all three countries, women saving and credit groups have constituted the bedrock for the integration of nutrition into agriculture. First, they respond to an immediate and critical need: traditionally in the Sahel women have limited economic resources and almost no opportunities to access credit. Though this solidarity scheme, women can save and thus start becoming economically empowered. The funds saved are used at the women's own entire discretion. Strengthening decision making by women about how to allocate resources is a core indicator for women empowerment.

In many instances, women decide to undertake agricultural enterprises to generate further revenue. The local income generating activities often established by women can include selling cereal crops, processing and marketing food on the local or neighboring markets (agricultural production pathway), as well as buying and fattening small livestock.

These savings and credit groups also served as ideal platforms for AE+6 network partners to convey critical messages on nutrition. During these weekly meetings, women (especially lactating and pregnant women) are sensitized on the importance of nutrition, to identify the signs of malnutrition, and how to ensure that the households' nutritional needs are met.

This made it easier to generate changes in behavior, persuading women to change their methods of preparing food and household dietary patterns, either by purchasing more diversified food (agricultural income pathway) or through self production.

Through this awareness-raising, women can also be encouraged to invest in agricultural productive assets (renting land, hiring labor, purchasing seed) so that they can produce diversified crops for the benefit of the household.

5.5 Key success factors to scale out knowledge and action on nutrition

Key success factor # 1: Rely on local individuals and structures to disseminate knowledge

- Rely on locally-trained women to spread improved farming techniques, culinary knowledge and nutrition messages. This proved very efficient.
- Invite religious and local leaders (both men and women) to take part in awareness raising and training sessions. They have a strong influence on changing people's behaviors.
- Conduct learning exchange visits to collectively farmed plots where diversified crops are grown for nutritional purposes. This helped spread knowledge and foster ownership of innovations. Women credit and saving groups also offered a valuable platform to covey important knowledge about nutrition.

Key success factor # 2: Organize culinary contests and radio games

Communities highly appreciate such local contests. These offered a great means of triggering new thinking about locally available food and nutrition.

Key success factor # 3: Organizing caravans

- Organize itinerant caravans to influence opinion leaders and to quickly reach rural communities.
 Participants have an opportunity to learn from practical experience of villagers, and directly witness the successes and challenges to strengthening nutrition.
- Use the "cascade" approach to training. This involves initially training a wide network of volunteer promoters, who in turn each train 5 or more other interested neighbors. This has enabled rapid spread and adoption of nutrition oriented farming practices.

5.6 Key success factors for long-term sustainability of nutrition outcomes

Key success factor # 1: Integrate national or regional nutrition networks

Engage agricultural organizations interested in learning how to integrate nutrition activities. Share experience with members of national or regional networks focused on nutrition, so that they can learn about best practices and experiences and integrate this into their future initiatives

Key success factor # 2: Partner with and build the capacity of local institutions

Actively engage decentralized governance structure, both at the municipal elected level and at the village level, into all training and awareness-raising on nutrition. This is critical to secure their long term future support to ensure sustainability, and to reinforce the changes being initiated by the communities reached.

Conclusion

The overall aim of this initiative was to develop a "proof of concept" of how to strengthen the resilience of farming systems and livelihoods of small-scale households located in ecologically fragile, drought prone drylands areas in the Sahel, through a sequential process of integrated activities, some of which specifically focused on improving nutrition outcomes for the groups and households most vulnerable to food and nutrition insecurity.

This particular case study documents how local NGOs who work in the agricultural sector can lead a participatory, multi-stakeholder and cross-sectoral process to integrate nutrition into agricultural activities, based on agroecology, by using simple yet effective tools and strategies, and adapting the 10 key recommendations of the FAO.

This overarching message of this case study is that the near emergency levels of malnutrition in the Sahel will not be significantly reduced unless **nutrition is integrated into agricultural practices at a village level.**

For this to happen, the promotion of agroecology, which emphasizes the diversification of food crops whilst keeping the environment unpolluted and healthy, must be the foundation.

Agroecology is an effective way to transform the farming system to become:

- sustainable (in terms of soils, trees, pasture, water, and biodiversity)
- resilient (to the effects of climate change)
- equitable (addressing the needs of the poorest households who are most at risk of food insecurity, particularly in terms of supporting the empowerment of women in those households) and
- nutrition sensitive

However, the practitioners of agroecology still have much to learn about how to effectively ensure their approach is nutrition sensitive. This case study provides practical, grounded experience, from across three countries in the Sahel, showing the way forward.

The evidence indicates that the approach to agroecology should combine:

- the production of indigenous and locally introduced nutrient-rich crops for self-consumption
- strong awareness raising and communication on important aspect of nutrition and gender issues
- initiatives to empowering women in agriculture (provide access to land, water, seeds, animals, tools, credit and technical advice
- organization of women (into savings and credit groups) to constitute a strong platform through which important messages on nutrition can be conveyed and reinforced
- provide support to enable women to act on the need to improve nutrition through improved farming processes including dry season and home gardens
- enable women to generate income by learning how to process and sell on the local market nutritious, locally produced or harvested wild crops (i.e. the development of new value chain). Without access to increased income, many households will not be able to consume a portion of their nutrition rich cash crops for self-consumption, or buy diversified food they are not able to produce

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Agriculture écologique en Afrique (Agrécole Afrique) - Senegal

Agrecol Afrique is originally an association, founded in Switzerland in 1983. It became a Senegalese NGO in 2002 and has since then continuously been supporting the practice and expansion of organic and ecological agriculture in Senegal and more broadly in West Africa. Its core aim is to help farmers increase agricultural yields in a sustainable manner, so that local populations can overcome the lean season and indebtedness and become actors of environmental conservation, to ensure food security for all. The AE+6 program was implemented in the region of Kaffrine.

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Association Nourrir Sans Détruire (ANSD) - Burkina Faso

ANSD was founded in 2011 – and legally recognized in 2012- with the mandate to support local rural development. ANSD's goal is to strengthen farmers' capacity and the organizations representing them to become contributors of food security and to fight poverty, while protecting natural resources. ANSD currently works with over 100 communities from 3 municipalities in the Easter region of Burkina Faso. Contact: Tsuamba Bourgou, Executive Director btsuamba@yahoo.fr

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Sahel Eco: Mali

The Sahel Eco association was founded in 2004 with the mission to work with the Malian populations and neighboring countries to improve their livelihoods through better environmental management, based on the principles of good governance. The triptych "ecology, economy and listening" guides Sahel Eco's activities. In Mali, AE+6 was implemented in six communes located in the Tominian *Cercle* in the Ségou region. Contact: Pierre Dembele, Executive Secretary

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- 67 Steyn, N.P., Nel, J.H., Nantel, G., Kennedy, G. and Labadarios, D. 2006. Food variety and dietary diversity scores in children: are they good indicators of dietary adequacy? *Public Health Nutrition*, 9(5): 644-650. Also see Hatloy, A., Hallund, J., Diarra, M.M. and Oshaug, A. 2000. Food variety, socioeconomic status and nutritional status in urban and rural areas in Koutiala (Mali). *Public Health Nutrition*, 3: 57-65
- 68 See <u>http://www.fao.org/fileadmin/user_upload/wa_workshop/docs/FAO-guidelines-dietary-diversity2011.pdf</u> [Accessed 8 March 2018].
- 69 To help deepen the awareness-raising on nutrition, Agrecol Afrique in Senegal invented a song that women and girls learnt to use when they were cooking. This song encouraged them to diversify the composition food ingredients of meals being prepared, using the principle of having different colors. It went like this: "Protective food is green, food for energy is yellow, protective food is red".

- 70 Coulibaly, J. M. 2017. Pers. Com. (Facilitator for Sahel Eco)
- 71 Recipe shared by Jean Martin Coulibaly (outreach officer for Sahel Eco) and see <u>https://miracletrees.org/larbremoringa.html</u>
- 72 https://miracletrees.org/larbremoringa.html [Accessed 28 March 2018].
- 73 These take different names in different countries. In Burkina Faso and Mali, they are referred to as *épargne pour le changement* (EPC) (saving for change); in Senegal they are called "solidarity calabashes".
- 74 *Sumbala or soumbala* is a condiment used widely across West Africa. It is usually prepared by women over the course of several days, traditionally from néré seeds.
- 75 Gueye, A. 2018. Pers. Com. (Agrecol Afrique)
- 76 In 2009, the UNDP (United Nations Development Program) reported a 90 percent illiteracy rate among rural officials, which means nearly 16,000 individuals are illiterate. (UNDP. (2009). *Owning the participatory process in Burkina Faso*. [Online] Available at: www.pnud.bf/DOCS/Decentralization_ENG.pdf) [Accessed 28 March 2018].
- 77 Bougou, T. 2018. Pers. Com. (Executive Secretary of ANSD)
- 78 An anecdote shared by Fatoumata Douna, outreach officer for ANSD. (Pers. Com held in 2018)
- 79 An anecdote shared by Drissa Gana (Sahel Eco) (Pers. Com held in 2018) and which is related to the old time French adage « he who steals an egg, steals a cow ».
- 80 An anecdote shared by Fatoumata Douna, outreach officer for ANSD. (Pers. Com held in 2018)
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- 82 Food and Agriculture Organization of the United Nations (FAO). 2013. *Synthesis of Guiding Principles on Agriculture Programming for Nutrition*. Rome: [Online] Available at: <u>http://www.fao.org/docrep/017/aq194e/aq194e.pdf</u> [Accessed 28 March 2018].