



AGROECOLOGY AS THE FOUNDATION OF RESILIENCE IN THE SAHEL

CASE STUDY



The experience of the Agroecology Plus Six program by Groundswell's West Africa network members





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**The experience of the Agroecology
Plus Six program by Groundswell's West
Africa network members,
a regional initiative undertaken by the
Groundswell West Africa network**

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List of acronyms

AE+6	Agroecology Plus Six program
AEC	Agroecological Committee
APC	Agroecology Promotion Committee
BAU	Business as Usual
CAADP	Comprehensive Africa Agriculture Development Programme
CPA	Committee for the Promotion of Agroecology
CPRC	Chronic Poverty Research Centre
CSO	Civil Society Organization
ECOWAS	Economic Community of West African States
FANTA	Food and Nutrition Technical Assistance Project
FAO	Food and Agriculture Organization of the United Nations
FMNR	Farmer Managed Natural Regeneration
GDP	Gross Development Product
GRP	Global Resilience Partnership
HDDS	Household Dietary Diversity Score
HFIAS	Household Food Insecurity Access Scale
NEPAD	New Partnership for Africa's Development
NGO	Non-Government Organization
NTFP	Non-Timber Forest Products
PCP	Participatory Community Planning
PRA	Participatory Rural Appraisal
SES	Socio-Ecological System
SIDA	Swedish International Development Agency
TFP	Total factor productivity
UNOCHA	United Nations office for the Coordination of Humanitarian Affairs
USAID	United States Agency for International Development
WEAI	Women's Empowerment in Agriculture Index
WFP	World Food programme
WMC	Warrantage Management Committee

Executive Summary

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. Their traditional farming practices can no longer sustain livelihoods. The Green Revolution promise has failed them, as they are becoming more dependent on external inputs, while not managing to overcome the root causes of their vulnerability, including climate change, and to cope with shocks.

Many dry land farm families have thus become caught in a vicious downward spiral of declining productivity and loss of assets. They end up in a “hunger–poverty trap” characterized by a severe “resilience deficit”.

The Agroecology Plus Six (AE+6) program was developed by Groundswell International 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” is the essential foundation on which effective resilience activities in dryland areas must be based. It also assumes that improving local resilience through agroecology is a social process as much as a technical process.

This paper arrives at the following key messages:

1. In an area where an NGO actor has had a long term program presence, strong relationships with communities and local government, and deep contextual knowledge, the transition to a transformative level of resilience can be undertaken quite quickly. Where these enabling conditions do not exist, the process will be much longer. But in either situation, or with a government led intervention, communities themselves need to be deeply engaged in a process of learning and adaptation to undertake a progressive transition for transforming their farming system.
2. In order to be viable and accessible to small scale farmers, the rolling out of “foundational innovations”¹ must happen in a manner that sustains this vital but gradual process of a transition toward agroecological intensification.
3. To ensure ownership of this transition, members of the rural communities in the drylands, need to decide on and take ownership of the resilience building practices they will adopt for strengthening their resilience. If this fails to occur, community engagement will end as soon as external intervention funding dries up.
4. In deciding “what to do”, it is wise to work with communities to identify these “foundational” innovations, based on what they learn about what already seems to be successful within their agroecological zone. The next step is to encourage and support farmers to test out these new practices in their own village.
5. It is vital to ensure that agroecological interventions are implemented in a sequenced and integrated manner through a systems-orientated approach. Smallholder farm families and communities must therefore be empowered to engage in a progressive, phased, step-by-step transition towards resilience, whereby “quick wins” are combined with “slow wins”. In this way, enthusiasm is created (essentially through real on farm successes in each community. Additional credibility is generated by harnessing indigenous knowledge and by mobilizing a network of volunteer farmers to test new practices on their own fields.
6. To be effective in strengthening resilience, agroecological initiatives implemented in the Sahelian drylands must recognize that biophysical resilience (ecological system) cannot be divorced from interventions that address the critical issues in the sociological system (referred to as the “sociological and ecological dimensions of a system – SES).

7. To have a sustained resilience impact, all agroecological interventions need to be timed and sequenced so that the tailored activities, beyond spreading of agroecological innovations, are designed to also: provide specialized support to the poorer, most vulnerable households; genuinely enables women to become empowered and gain access to productive resources; and improves the nutritional status of household members, particularly women and children.
8. Fostering an integrated technical and social approach to resilience requires a rethinking of local development priorities through the lens of resilience within local government.

This paper begins by describing the state of the food and nutrition crisis in the Sahel (section 1), analysing the severity of the situation under the “business as usual” scenario dominated by the Green revolution paradigm (section 2). Next is an explanation of what resilience means in the context of the Sahelian drylands (section 3). The paper then spells out what the foundation of agroecology must address to overcome the root problems (section 4), and proposes a systems oriented agroecological and socio intervention design for resilience (section 5).

The paper thereafter unpacks how the collective action of dryland farming communities seeking to transform their farming system for resilience can promote improved social processes in support of equity, improved nutrition outcomes, women’s empowerment and improved use of local resources and planning (section 6).

The paper ends with a proposed framework for ensuring synergies between interventions in the SES (section 7).

Introduction

Purpose of the case study

This case study, conducted in three regions of Senegal, Burkina Faso and Mali, documents an action-research initiative **on how to strengthen resilience.**

Resilience is commonly defined as the capacity of a social-ecological system (SES) to absorb or withstand shocks and stresses to enable that system to maintain its structure and functions. When resilience is strengthened, a system is less likely to collapse into a qualitatively different state. For this case study, the SES under consideration is the “dryland farming system”² **of rural communities in the Sahel.**

The essence of this resilience strategy was to apply agroecological principles and practices to address the stresses of declining soil fertility, degradation of natural resources, erratic rainfall, high temperatures and the periodic shocks of major droughts.

This strategy assumes that agroecology (AE) is highly suited to strengthening the absorptive and adaptive capacities of agricultural communities as well as their capacity to foster transformative change. Once a foundation of intensified agroecological farming is in place, it serves as the basis on which to integrate complementary resilience activities relating to equity, women’s empowerment, and nutrition, tailored to the needs of the most vulnerable groups.

This case study flows directly from six closely related studies documenting the main findings and lessons of the integrated AE+6 approach for resilience. These address the themes of integrating women’s empowerment, the promotion of equity, improved nutrition, and strengthened local governance into an agroecological way of farming for resilience. It capitalizes on the action research processes that were conducted on these themes and proposes a framework through which actors involved in the promotion of agro-ecology to transform farming systems can better programme, sequence and implement these complementary strategies into their programs to strengthen local resilience.

This case study is meant to be relevant to a range of actors - particularly international development agencies, Civil Society Organizations (CSOs) and Non-Governmental organizations (NGOs) working at national level, local and national governments, as well as technical and financial donors.

The key lessons are about **how agroecology, enriched by targeted developmental interventions, can act as the foundation for strengthening the resilience of rural livelihoods.**

It specifically looks at how to foster this transition to agroecological farming in a manner that takes into account and genuinely empowers the most vulnerable groups within the ecologically fragile, drought prone areas of the Sahel to strengthen their food and nutrition security, and their livelihoods.

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, particularly those caught in the hunger-debt trap.

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

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 is 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, biodiversity), and climate change (erratic rainfall, rising temperatures, and periodic drought). **Agroecology is suited to do this; conventional agriculture is not.**

Box 1

What is agroecology?

Agroecology is a set of farming practices that mimic the functioning of local ecosystems,³ allowing for “food production that makes the best use of nature’s goods and services while not damaging these resources.”⁴ It is also the science that applies ecological principles to agriculture; uses an integrated approach to transforming farming and food systems; and replaces “external inputs by natural processes such as natural soil fertility and biological control”.⁵ Agroecological farming systems are “developed on the basis of farmers’ knowledge and experimentation⁶” 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. Finally, agroecology is also a social movement consisting of many organisations, as well as many loosely networked individuals who are working towards an agro-ecological food and farming future that is more people and environment focused.

Without enabling small-scale farmers to adapt to climate change and transforming their farming system to reverse land degradation, all other initiatives to strengthen resilience cannot succeed over the long term, because the basis of almost all rural livelihoods depends on the natural resource base and adaptation to the climate.

A second assumption of the AE+6 approach was that while agroecological practices are beneficial, such measures would not adequately address resilience. Agroecology, as promoted by AE+6, is therefore not only about substituting unsustainable agricultural practices with ecological ones, but also how to reconfigure the food and farming system, which sits at the crux of rural livelihoods, and to restore a social, nutritional, economic and ecological balance.⁷ This is the “people” dimension in the “social ecological system”.

To achieve this, **complementary measures to the promotion of agroecological practices are required** to meet the specialized needs of the most vulnerable groups (women, children, and poorer households). This entails integrating effective social and governance mechanisms to address gender inequality, poor nutritional practices, and strengthening inadequate community capacities for adaptation to climate change.

A review of the evidence shows that measures focusing on increasing agricultural yields is not an effective pathway to resilience because it often neglects the specific needs of women and resource-poor farm households through non-inclusive, socially non-differentiated and gender-blind activities. It also does not address the critical issues of the root causes of vulnerability to risk, nor to chronic malnutrition, which are at near emergency levels in the drylands.

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

Each of the six dimensions of the AE+6 program, particularly the improved agroecological practices, had been undertaken before. The AE+6 approach was different and innovative because 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

This case study builds on all the precedent case studies and offers a consolidated understanding of how agroecology and supportive social measures constitutes the foundation of resilience in the Sahel.

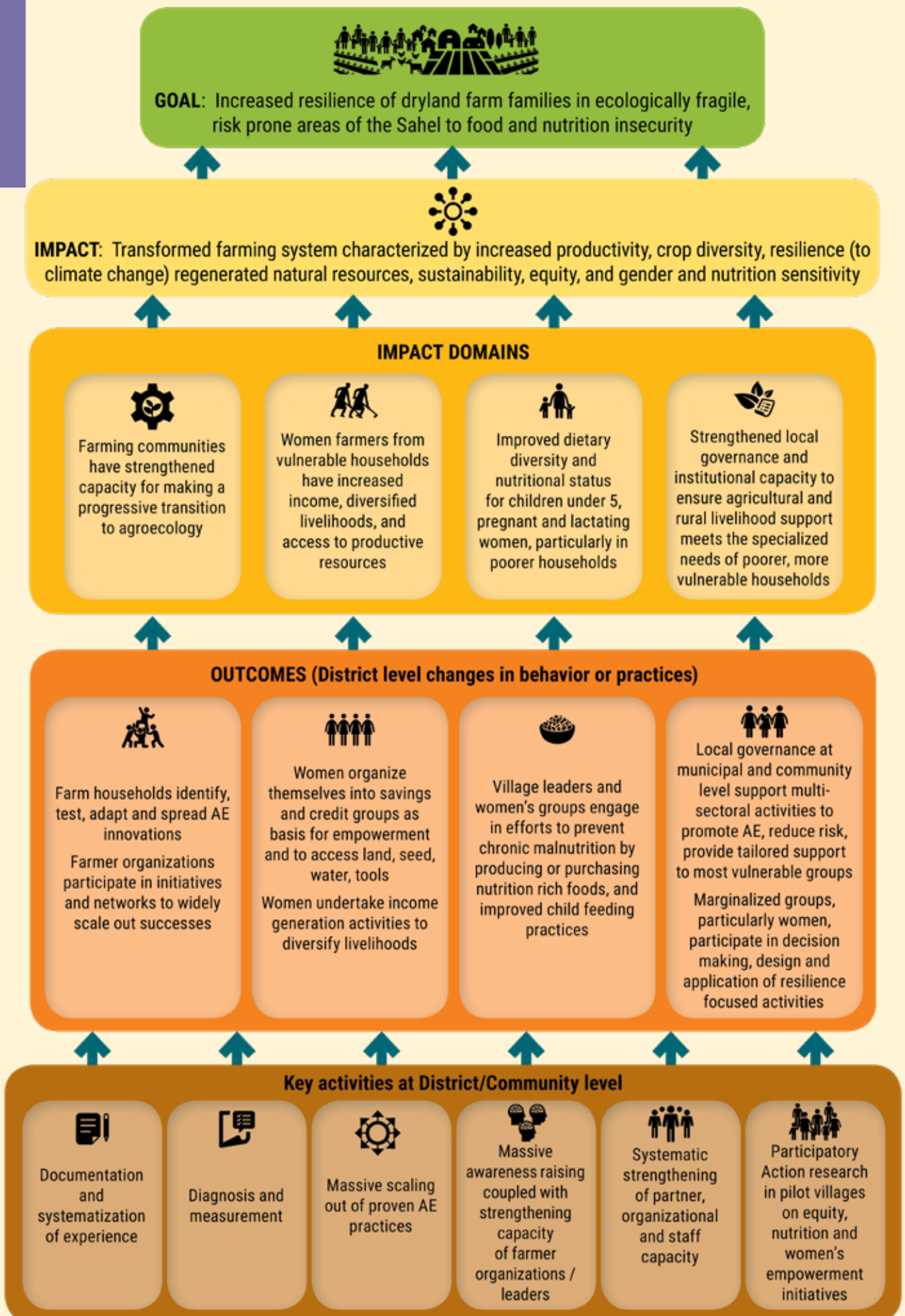
Figure 1 on the next page illustrates how the AE+6 program was conceived and how it addressed the aforementioned issues.

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 each 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 annex for detailed information about these three partner NGOs). Most of the strategies of AE+6 were relatively new to the Groundswell West Africa network members.

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. However, these are sufficient to arrive at conclusions in support of the "proof of concept".

Figure 1: Overall AE+6 program architecture



1. The Sahelian resilience deficit

1.1 The food and nutrition crisis in the Sahel

A growing percentage of the Sahelian population has become chronically vulnerable to food and nutritional insecurity. **In 2018, the UNOCHA warned that the Sahel region was facing its worst food and nutrition crisis in years.** That year, as the lean season, known as the “hungry months”, started unusually early (i.e. in March as opposed to the traditional May to September cycle) in some countries, almost six million people across the most vulnerable Sahelian countries – i.e. Chad, Mali, Mauritania, Burkina Faso, Niger and Senegal - were in urgent need for food and livelihoods assistance to survive the lean season. Up to 1.6 million children under the age of five suffered from severe acute malnutrition and required urgent treatment to survive.⁸

Poor rainfall in 2017 in parts of these countries sparked acute pasture and water shortages, raised food costs and caused livestock prices to plummet. This meant that communities had to find ways of surviving until the end of the lean season (generally to September of the following year).

As a result of this drought, pastoralist communities also have become more vulnerable, with weakened livestock being led to transhumance earlier than usual in search of fodder and water. This contributes to an escalation of tension and conflict between pastoralists and agrarian communities. As much as farmers welcome the manure left by the pastoralist’ camels, cattle and goats, an early “arrival” of the transhumance may lead to this livestock eating crops in the fields before harvest. This, together with the threat this livestock poses to permanent cultivation sites next to water points are some of the reasons why the agro/pastoralist conflict in the Sahel is escalating.

The 2019 prospects were grim. The Food Security Information Network’s acute food insecurity forecast for the 2019 lean season ranked all these countries in phase 3 - that is to say in “crisis”,⁹ essentially because of conflict/insecurity and related displacements (Burkina, Chad, Mali, Niger) or climate shock and dry spells, and related production shortfalls (Mauritania, Senegal).¹⁰ More specifically, 5% of the Burkina population, 4% in Niger and 6% in Senegal were deemed to be in food crisis.¹¹

Map 1 on the next page shows the exposure of Sahelian populations to hunger.

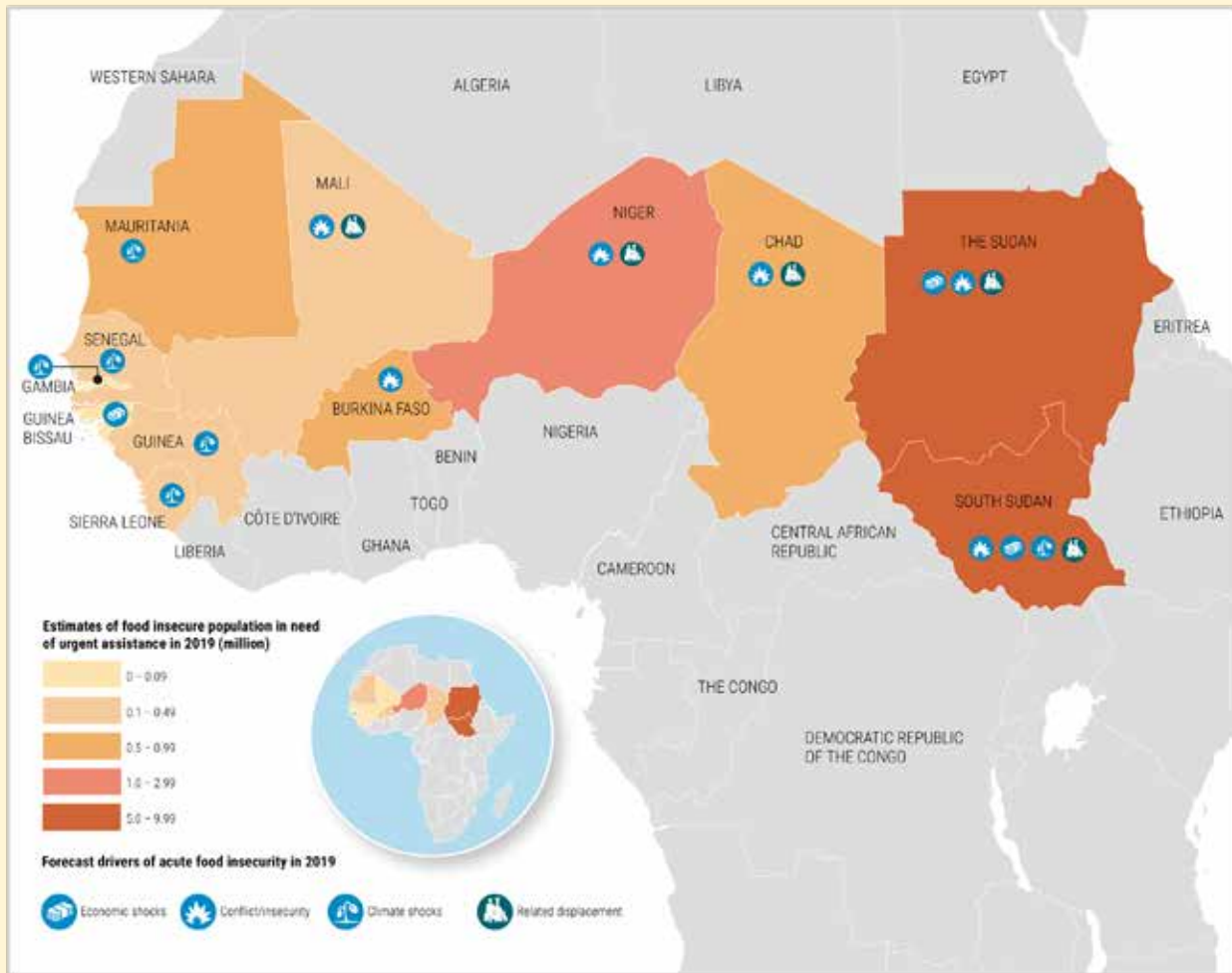
1.2 How is this crisis dealt with?

As a result, a significant percentage of the dryland population survive by depending on humanitarian relief. Not only do government scarce resources get taken up by constantly managing emergencies, but the bulk of the Sahel’s international development assistance¹² is used for short term and costly humanitarian responses. This detracts from resources being allocated to much needed rural infrastructure or the development of social protection systems.¹³

International humanitarian assistance is conceived to deal **with short term emergencies**. Relief can be provided sporadically, by bringing in life-saving support. But, as emphasised by humanitarian practitioners, in the Sahel **“modern-day crises are not short-term”**;¹⁴ **they are due to chronic or “structural” vulnerability**. The recurrence of these “year after year crises”¹⁵ disrupt the functioning of governments in the Sahel who are not able to provide basic service delivery to their citizens.

Because humanitarian assistance is designed for short term responses, the Sahelian populations’ nutrition becomes heavily compromised, despite the provision of this relief.¹⁶ Aid agencies struggle to provide a balanced diet in poor, remote places. The food aid just covers the basics.¹⁷ Aid agencies do not distribute meat, milk or vegetables because of the high costs involved. The long term “relief” diet saves lives but is often short of a healthy diet.

Map 1. The exposure of Sahelian populations to hunger in 2019.



Source: *Global report on food crises 2019* (2019:168)

1.3 What are the underlying causes of this crisis?

The structural reasons underlying this crisis in the Sahel include:

- **the progressive degradation of fragile and drought prone ecosystems;** Historical trends show that the region faces drought approximately every 3 years, and a major drought every 5 to 10 years.¹⁸ The drylands are experiencing a “soil fertility crisis” because years of unsustainable nutrient mining have reduced soils to such an extent that they are deemed to be the poorest in the world.¹⁹
- **high demographic pressure;** the population in the Sahel is on track to double within 30 years.²⁰
- **the low capacity of vulnerable populations to adapt to the stresses of rapid environmental change and climate shocks.**²¹

These structural reasons are further precipitated by **underlying drivers** that include 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.

Another underlying reason is that in a situation of rapid, growing stresses affecting the system, **traditional farming practices can no longer sustain livelihoods**. Farmers' existing capacities for innovation are not quick enough to adapt. Gender inequality, poor nutritional practices, and inadequate technical and social services exacerbate the problem.

The **current rising violence and instability currently** shaking the Sahel is an additional contributing factor to vulnerability. Since the later part of 2018, a rise of communal conflicts—many related to access to food, water or productive land, but also stimulated by violent extremists—contributed to deadly attacks that have killed thousands. From November 2018 to March 2019, nearly 4,800 people died in conflicts across the region. The most problematic rise in violence has occurred in Mali and in northern and eastern Burkina Faso.²²

1.4 More than just a food crisis: a resilience deficit

In order to survive, an ever-increasing percentage of households **engage in negative coping mechanisms**. These include selling much of their harvests to pay back loans, eating their seed stocks, borrowing from money-lenders, cutting down on the number of their daily meals, and selling their physical assets. In the current crisis, livestock herders take similar actions; many have been forced to “decapitalize” their livestock at very low prices. This has an immediate bearing on the nutritional status of pastoral households due to decreased access to animal protein for women and children.²³

These negative coping strategies also lead to an array of **unsustainable natural resource management practices**, resulting in accelerated land degradation, water scarcity, pollution, and biodiversity loss.²⁴ This chronic shortage of pastures leads to overgrazing pasture degradation, and reduced fodder for livestock.

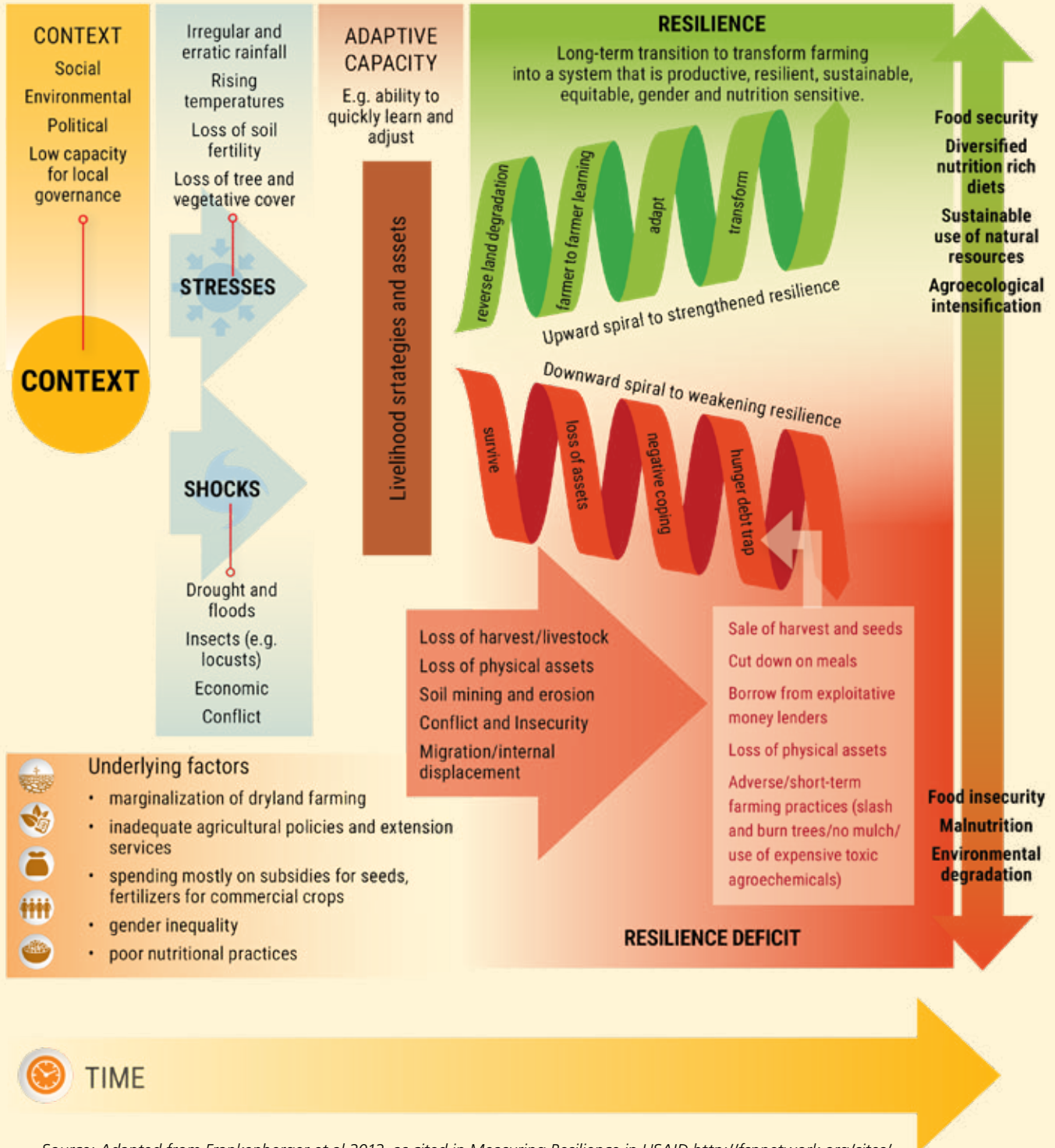
These desperate responses to shocks further increase the vulnerability of these populations. This generates an acute **“resilience deficit”**.²⁵

At the level of the Sahelian household, this resilience deficit often causes more and more households to fall into a debt-hunger trap, characterized by a continuous (or sometime sudden) increase of vulnerability as the resilience of their livelihood systems collapse. They are extremely vulnerable to the slightest shock; like the ancient metaphor of a peasant farmer standing in water that is right up to his or her nose, even small ripples (shocks) can have devastating consequences.²⁶ Adding to this alarming scenario, conflicts and climate shocks have displaced about 3 million people across the Sahel, pushing hundreds of thousands to flee, some migrating as far as Europe.²⁷

Figure 2 illustrates how an increasing number of rural households, already vulnerable, are being caught in a vicious downward spiral because of their reduced capacity to cope with stresses and shocks.

At the level of the Sahelian household, this resilience deficit often causes more and more households to fall into a debt-hunger trap, characterized by a continuous (or sometime sudden) increase of vulnerability as the resilience of their livelihood systems collapse.

Figure 2: 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

2. Grim prospects under the “Business as Usual scenario”

2.1 A worsening crisis

What is critical in the context of the Sahel is to appreciate that helping farmers return to a “post shock normalcy” remains insufficient in an environment that is generally degraded, following a downward spiral of degradation. It is anticipated that unless radical changes are made, this situation can only get worse in the medium-term future.

In ten years time (by 2030), the number of people living in the drylands of West Africa is projected to increase by 65–80 percent (depending on the fertility scenario).²⁸ Despite the much discussed “greening of the Sahel”, the continent’s areas which are currently classified as drylands, and which account for three-quarters of Sub-Saharan Africa’s crop land, are likely to expand by as much as 20 percent under some estimates.²⁹

Despite incremental aid relief allocated to the region, the food and nutrition crisis goes on unabated. This vividly illustrates that – although direly needed – **humanitarian assistance, cannot be expected to address the structural vulnerability prevailing in the Sahel.** Such relief does little to contribute towards strengthening resilience of livelihood systems in the dryland areas.

This raises the issue of whether the current policies in the Sahel and the development pathways being followed are genuinely contributing strengthening community level capacity to self-organize to address longer-term stresses and the structural causes of vulnerability. Below we assess the trends in policies and support for agriculture in the Sahel through this lens.

2.2 Persistence of insufficient support to agriculture

In 2014, the Comprehensive African Agriculture Development Programme (CAADP), through the **Malabo Declaration on Accelerated Agricultural Growth and Transformation for Shared Prosperity and Improved Livelihoods** reaffirmed the Maputo commitment of (2004-2014), to allocate 10% of public resources to agriculture. To date, only a handful of African countries are allocating 10% of their budget to agriculture.³⁰

As of 2017, all three of the focus countries under the AE+6 programme failed to meet this specific target. Burkina Faso’s share of public expenditure to agriculture had reached 7.4%³¹ whilst Mali failed to reach this 10% target with only 4.5% public expenditure to agriculture³² and 9.34 % for Senegal.³³

However, with respective overall scores of 5.6/10 and 4.2/10, Mali and Burkina Faso were considered “on track” in implementing the Malabo Declaration on Agriculture transformation in Africa, as opposed to Senegal, with an overall score of 3.8 considered “not on track”.³⁴

But the volume of funds allocated to the agricultural sector don’t necessarily imply “quality spending”, assuming that food security and resilience are priority goals to address the Sahel crisis. As underlined by the CAADP itself, “there is an argument that the allocation of public resources (10%) to agriculture does not necessarily equate to efficiency in expenditure.” This is why the CAADP tracking database, which shows how countries fare with meeting the targets set for various commitment categories, provides some degree of disaggregated information.³⁵

Other indicators relevant to this issue pertain to women participation in agri-business, where, among AE+6 program’s three countries, only Burkina Faso meets CAADP targets. A 2013 review of agricultural spending in five case study countries in Africa compound this finding, as it shows that in general no specific support was

allocated to women farmers in national budgets.³⁶ When analysing the various criteria relevant to resilience issues, for example in Mali, these seem to indicate underperformance, whereas the CCADP overall scorecard puts Mali well on track to meet the Declaration's objectives.

A review of why Mali scored well indicates that its performance was good on the policy front, and on targets specifically relevant to commercial agriculture (i.e. 7.6% annual growth of the agriculture value added on agri-based GDP, a 18.5% increase of yield for the country's priority agricultural commodities and a 337.6% increase of the size of irrigated areas compared to its value in the year 2000). However, these criteria for being "on track" clearly relate strongly to commercial agricultural commodities and exports, not to food production of dryland farmers. It follows that a favourable score does not mean that a country is improving food and nutrition security. Nor does it indicate that overall sustainability of land use, and resilience to climate change for the agricultural system is improving, particularly for dryland farmers depending on rainfed agriculture, who comprise the bulk of the rural population.

In essence, even a cursory review shows that relatively little in the current agricultural budgets of Sahelian countries supports a transition to AE intensification by small holder farmers in ecologically fragile, risk prone, dryland areas.

2.3 The myths promoted by advocates of the Green revolution

Supporters of the Green Revolution approach often use a narrative that "to feed the world" requires "modern agriculture" based on greatly increased use of external inputs such as chemical fertilizer, hybrid seed, herbicides, pesticides, and large scale mechanization and irrigation. An example is the approach to "agricultural intensification" of the Syngenta Foundation, based in Mali (see Figure 3). This approach anticipates major migration of small-scale farmers to the cities, and a consolidation of land holdings for large-scale commercial agriculture dominated by relatively small number "advanced farmers". One sees how the Green Revolution "graduation model" advanced by the Syngenta foundation relies on incremental dependence towards purchased inputs, with a strong focus put on proprietary seed systems.

In the alternative approach of "agroecological intensification", "subsistence smallholders", featured here at the bottom of the pyramid, reduce their risks, strengthen the resilience of their farming system by relying on ecological principles, crop diversity, soil and water conservation methods, and locally available inputs, such as manure and open pollinated variety seeds. w

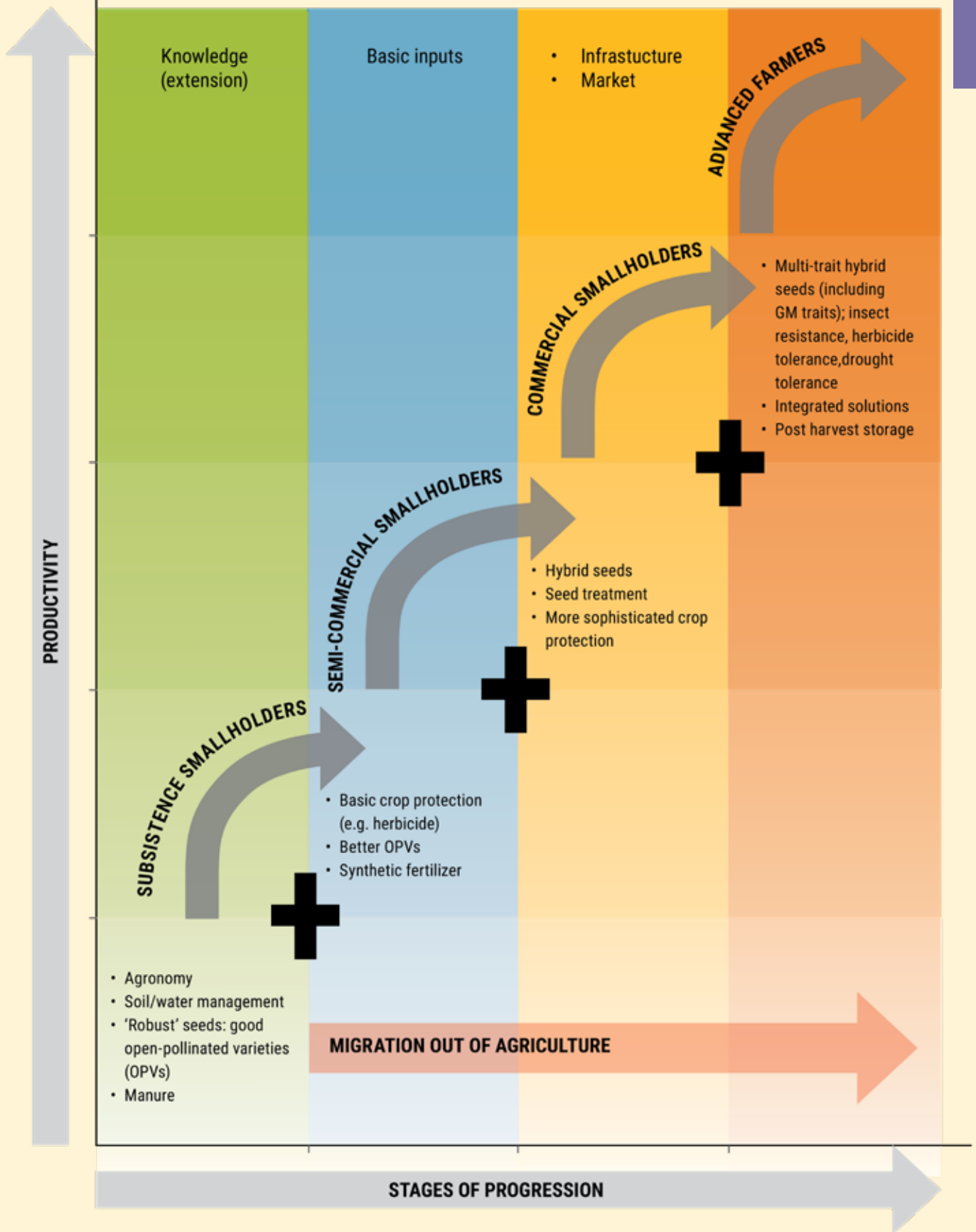
This push has been strongly decried by many actors globally,^{38,39} across Africa,^{40,41} and in the region,⁴² including the Economic Community of West African States (ECOWAS), which in 2008 sounded an alert to how this model, "largely dependent on natural resources and poorly paid labor, (had) become unviable."⁴³ Many actors working in the Sahel emphasized the flaws of the "Green Revolution" paradigm that underpin efforts to modernize agriculture (CARE International 2015).

In essence, the wider benefits of the development benefits advocated by promoters of the Green Revolution, including agricultural growth, are not equitable, nor do current policies lead to redistribution of public revenues. Nor are they adequately focused on the most vulnerable: rural women or small-scale farmers in ecologically fragile zones. **Without the adoption of resolutely pro-poor agendas and rethinking of strategies, "the Sahel food and nutrition crisis will not abate. It will intensify."**⁴⁴

Furthermore, the industrial model, based on Green Revolution technologies, fails to address critical issues of dependence to importation of food to feed the Sahel,⁴⁵ the soil degradation crisis, the climate change crisis, overcoming chronic vulnerability to food and nutrition insecurity of poorer households. Nor does this approach empower women farmers in agriculture or harness agriculture for improved nutrition.

Smallholder farmers and agricultural biodiversity have been hard hit by the changes that occurred on the

Figure 3. "Additive stages of agricultural intensification" according to the Syngenta Foundation



Source: Zhou, Syngenta foundation for sustainable agriculture.³⁷

continent in the wake of Green Revolution thinking. This includes: the skewing of research and development towards a narrow range of export or cash crops (often neglecting the so called “orphan” crops that are key to rural populations’ diets) under the control of multinational seed corporations, and contract farming.⁴⁶

Recent research conducted in the Sub-Saharan African region has extensively documented how the push for high, agrochemical-based input farming methods had disrupted subsistence practices, undermined sustainable land use, exacerbated poverty, corroded local systems of knowledge, trade and labor and curtailed land tenure security and autonomy.⁴⁷

Groundswell’s network partners in the Sahel bear testimony of how an over-reliance on “modern” farming practices has led to the loss of agro-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-chemicals in soils and water bodies).^{48,49}

An example of how the Green Revolution agricultural model has disrupted the resilience of local communities relates to cotton,⁵⁰ one of the major commercial crops in the Sahel region.

Reports indicate that as a result of intensive insecticide usage on industrial cotton, women can no longer plant traditional leafy vegetables that they use to accompany the sauce for meals between cotton rows. Instead, women have to spend their meagre income on buying these ingredients.⁵¹ This is a likely contributing factor to the high levels of chronic malnutrition in Mali’s cotton belt in the Sikasso region. This decline of intercropping shows how the systematic promotion of commercial crops and associated package of the synthetic inputs compromises local food self-reliance and nutrition, and thereby diversity and local resilience.

Government leaders in the Sahel have been strongly influenced by Green Revolution thinking as the way to modernize agriculture. This influence is evident in the pattern of investment supporting industrial agriculture. Farmer Input Subsidy Programmes (FISPs) are the main allocation for public support to agriculture. Subsidies for chemical fertilizers, for example, often take up the lion’s share of the national agricultural budget. This causes small scale farmers to become increasingly dependent on expensive and risky external inputs for short term production gains. Relatively little public support is provided for longer term agroecological practices for strengthening the sustainability and resilience of the farming system.

Research shows that such fertilizer subsidy programmes, in the longer term, accelerate land degradation and undermines the transition to sustainable (agroecological) intensification of agriculture.

In Ghana, for example, a recent study found that six years after its inception in 2008, the FISP programme had achieved very little, with a insignificant statistical relationship between the increase in national crop production and the investment in fertilizer subsidies between 2007 and 2012. Most increased agricultural production was generated by an expansion of land under cultivation instead of increased yields.⁵²

In that country, farmers obtained the subsidy in the form of fertilizer specific and/or region-specific vouchers. This translated in a 488% rise in national budget commitment to the FISP with subsidies of 557.2 tonnes of fertilizer.⁵³ This greatly reduced the resources for other support of agriculture, including rural roads, markets, better post-harvest storage, research and extension for more sustainable farming practices (such as integrated soil fertility management and agroforestry), and support for women farmers. This huge public investment in the FISP program did very little to alleviate farmers’ vulnerability to climate change, or to foster adaptation to reduced, erratic rainfall, and higher temperatures.⁵⁴

2.4 Critical and urgent need of a change of paradigm

The distressing hard truth is that **the overall ecosystem in the Sahel is still on a downward slope**. The underlying causes of chronic vulnerability in the drylands are not being addressed. Some actors may have the perspective that vulnerability is being addressed in a micro context. The reality is that in the macro context, the overall resilience of the drylands is still degrading. **This trend is in urgent need of being reversed to achieve resilience.**⁵⁵

This requires a critical assessment of the extent to which the current paradigm of the Green Revolution that dominates in the Sahel is further entrenching this vulnerability to climate change and land degradation pathway.

Walker et al. (2004) describe how in many adaptive cycles, at some stage in a given social and ecological system

“resources become increasingly locked up and the system becomes progressively less flexible and responsive to external shocks. It is eventually, inevitably, followed by a chaotic collapse and release phase that rapidly gives way to a phase of reorganization”.⁵⁶

Green Revolution practices typically create such “lock ins” for farmers. The 2016 IPES-Food report eloquently described these as obstructions to the transition towards a sustainable food regime and entrenching farmers into a production system that prevents adaptability.⁵⁷

Reversing the resilience deficit trend requires overcoming the major divide between the humanitarian and development action that occurs within the **“continuum” that is supposed to link the functions of relief, rehabilitation, and development** in a linear sequence. This conventional model is not suited to a “Chronic Vulnerability Area” such as the Sahel.

Instead, what is required for strengthening resilience in the Sahel is the **“contiguuum” model**, which recognizes that shocks, stresses, including conflict, and daily life are intermixed and “normal” in this context. “Contiguuum” means that development, change, disaster preparedness, and humanitarian support operate at the same time, in synergy, in overlapping juxtaposition. Within this approach, particular focus must be given to strengthening adaptive capacity and overcoming inequity and marginalization within the social-ecological system.

The pivotal issue of resilience in the drylands is how to enable small holder farmers in their transition to “agroecological intensification” (i.e. enabling them to produce “more with less”), while regenerating the natural resource base, soils and biodiversity. This issue is inherent in the concept of total factor productivity (TFP), a dimension often disregarded in the agricultural research and policies. This is about growing more food by **making land and labor required for farming more efficient, by using ecological processes to reduce external inputs**. This requires reversing the trend of agricultural growth that has largely been due to an expansion of land under production, rather than a sustainable increase in productivity based on more effective use ecological processes.

Agroecology (as a set of practices and as a science) is emerging as an important alternative to the “business-as-usual”, dominant Green Revolution approach to agricultural development. Agroecology can enable smallholder farmers to overcome the ‘lock-ins’ inherent in large-scale, agribusiness-led industrial agriculture, that undermine resilience.⁵⁸ There is a growing base of evidence documented in the literature proving this across many contexts.⁵⁹

The experience of the AE +6 team indicates that agroecological practices, if well adapted to the context of the Sahel, create positive feedback loops on ecosystem resources.

3. What does resilience mean for Sahelian rural populations?

“Resilience”, from the latin “reliere” which means the “act of rebounding”.

3.1 Agriculture at the crux of the social and the ecological system (SES)

Aside the basic explanation of resilience cited above, the Stockholm Resilience Centre describes resilience as “the capacity of a **system**, be it an individual, a forest, a city or an economy, to **deal with change and continue to develop**. It is about how humans and nature can use shocks and disturbances like a financial crisis or climate change to **spur renewal and innovative thinking**.”⁶⁰ This concept of resilience more strongly recognizes the linkages between **social and ecological dimensions of a system (SES)**. This approach is echoed by the work of other organizations, such as the World Food Programme (WFP), who bring support to countries through cross-cutting interventions that give proper recognition to human capital (well-being) on the one hand and social capital (social cohesion) on the other hand, with the physical, financial, natural capital being woven in this construct.⁶¹

The same is conveyed by the FAO, which developed the **Self-evaluation and Holistic Assessment of climate Resilience of farmers and Pastoralists (SHARP) tool**. SHARP defines resilience as “the ability of a system to recover, reorganize and evolve following external stresses and disturbances”.⁶² Importantly, SHARP was conceived to increase climate resilience in a holistic manner over the long-term.

This implies fostering the resilience of these communities to withstand “multiple crises and continual change”.⁶³ **In other words, the onset of a shock or stresses should be overcome in a way that it doesn't leave a deficit in its wake but actually helps the system improve its resilience for the future.** This entails capacities not just to absorb and adapt a system, but also progressively transform it, to overcome the “resilience deficit” and improve the overall viability of the SES.

This wider concept of resilience informed the thinking of the AE+6 programme. Although the core focus of AE+6 is primarily focused on resilience from an agrarian perspective, it explicitly recognizes the **interconnectedness and interdependency within the “social” system** (men, women, the youth, gender dynamics, market dynamics, culinary habits, community dynamics, production practices, natural resource management, etc.) **and the ecological** (soil, water, air, fauna and flora) system.

This means that programmes looking at building resilience of an agroecological farming system cannot be detached not only from the carrying capacity of the ecology, but also considers people, communities and rural livelihoods as an intrinsic part of system.

In this perspective, taking farming by people in a given ecological context as the system to be made more resilient, the reality is that **human action dominates the SES**. Therefore “the adaptability of the system is mainly a function of the social component—the individuals and groups acting to manage the system (...) Their collective capacity to manage resilience, intentionally, determines whether they can successfully avoid crossing into an undesirable system regime, or succeed in crossing back into a desirable one”.⁶⁴

This concept that social systems are the main shapers of a SES very much influenced the approach of AE+6, which **is premised on the principle that Sahelian communities' resilience is largely in their own hands, and that vulnerability is very much function of people's individual and collective access to financial, political, and institutional assets**, rather than solely on exposure to environmental change.⁶⁵

3.2 Key concepts to understand resilience in the Sahelian context

Several concepts informed the AE+6 approach to resilience of dryland farm communities.

The first relates to determining the “boundaries” of the SES. This is best determined by three key questions: *Resilience of what? To what? And for whom?*⁶⁶ For the AE+6 program, the boundaries consisted of the following:

Resilience of what:

the agroecological farming system (in different regions in three countries in the Sahel) within the broader dryland agro-ecosystem (the arid and semi-arid drylands).

Resilience to what:

food and nutrition insecurity, caused by land degradation and climate change.

Resilience for whom:

millions of smallholder farm families in the drylands of the Sahel, but with a specific emphasis on the most vulnerable households and women; also and children); at the meso level, the broader context of communities within an agroecological zone; and a macro level (the scale of district and the region), local government and staff with development planning functions for the SES.

Other characteristics of a resilient farming system that informed the AE+6 team (taken mostly from the SHARP framework of the FAO)⁶⁷ included:

- intrinsic ability to self-organize in an endogenous manner (socially and ecologically)
- capacity to learn and adapt (Carpenter et al 2001).
- reflective and shared learning
- builds human capital
- ecologically self-regulated
- optimally redundant (back-ups)
- reasonably profitable

The AE+6 conception of resilience strongly considered equity, women’s empowerment, good nutrition and strengthened local governance as essential for community well-being and reduction of vulnerability, within the wider social dimension of SES. Finally, due to the highly context specific nature of fostering resilience through agroecology, strengthening local governance was a vital element of the approach.

4. How agroecology can foster the resilience of the the social and agro-ecological (farming) system

4.1 Agroecology as a foundation of resilience in the drylands of the Sahel

A growing archive of case studies from around the world is demonstrating agroecology's capacity to provide immense economic, social, and food security benefits while ensuring climate adaptation and restoring soils and the environment.⁶⁸ The increasing documentation of agroecological transitions is significant in itself, with the latest work by IPES-Food focusing on seven concrete cases of transition from conventional to agroecological farming being a case in point.⁶⁹

Altieri et al. (2015) underline the inherent resilience of traditional farming systems which still often rely on "management options and designs that enhance functional biodiversity in crop fields and, consequently, support the resilience of agroecosystems" (2015:7).⁷⁰ This resourcefulness of local communities applying agroecology also assists them with withstanding the violence of climate shocks; agroecology entails creating temporal as well as spatial diversity, which helps to mitigate risks and brings about functional diversity and resilience to production systems which may be climate sensitive.

4.2 The foundational agroecological innovations introduced by AE+6

There is a tendency among practitioners of AE to seize upon selected innovations or technologies, and scale those out, without seeking to diagnose and address root causes within a holistic "systems" approach.

When trying to select an optimal foundational AE package to be promoted, practitioners should first assess which stresses one should seek to build resilience against. The shock and stresses with a direct incidence on the resilience of the agroecological farming system include climate change impacts (erratic rainfall, drought, increased temperatures); adverse agricultural practices that amplify degradation (burning crop residues, slash and burn land clearing, over grazing).

An essential principle to heed when designing AE interventions, is that the right "foundational innovations" must be in place to start and sustain a gradual process of transition toward agroecological intensification for resilient livelihoods. These must be within the means of farming households and rural communities to quickly adapt (i.e. low cost, able to generate tangible benefits within short time frames).

This section briefly describes each of the "foundational" agroecological practices promoted by AE+6, in different sequences and combinations in the three countries, for resilience.

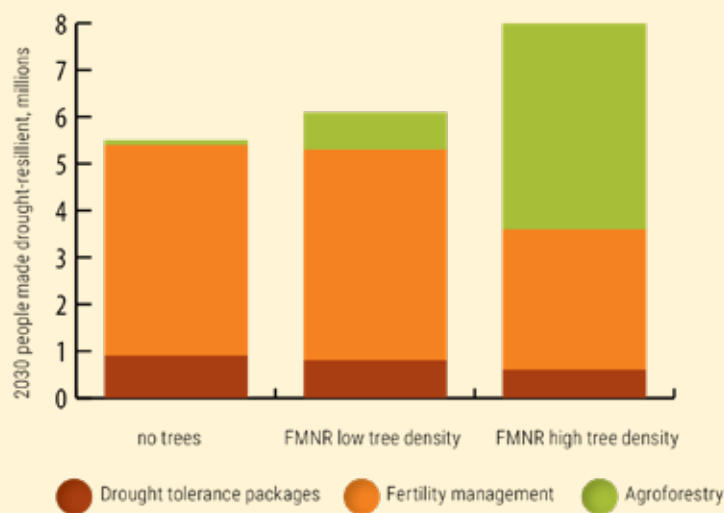
Foundational innovation 1: Farmer managed natural regeneration (FMNR)

Farmer managed natural regeneration (FMNR), which consists of fostering the growth of already established indigenous trees from underground stumps on agricultural land on previously highly degraded land almost cleared from vegetation, is proven to be the most viable method to reintroduce tree cover.⁷¹ Each season bushy growth will sprout from the stumps often appearing like small shrubs. By selecting the strongest and straightest stems and pruning the rest, trees are very quickly re-established. These trees are trimmed and pruned to maximize harvests while promoting optimal growing conditions (access to water and sunlight). The decomposition of tree-contributed organic matter in agricultural fields plays a vital role to maintain the soil fertility of agricultural fields. The pruned branches can be used in the household as fire wood or sold for cash.

Trials, long-running programs and anecdotal data indicate that FMNR can at least double crop yields on low fertility soils.⁷² The World Bank's Africa Drylands Study⁷³ highlighted the impressive benefits in terms of reduction of drought impacts that FMNR can offer. FMNR was shown to actively reduce sensitivity to shocks, as well as enhance households to cope with the effects of shocks after they occur.

This study compared a baseline scenario with no trees being planted, with a low-density tree scenario (whereby 5 trees/ha are planted), and high-density trees (10 trees/ha). The study found that in a group of 10 countries in East and West Africa, the projected number of poor, drought-affected people living in drylands in 2030 fell—compared to the “Business as Usual” (BAU) scenario—by 13 percent with low-density tree systems and by more than 50 percent with high-density tree systems.

Figure 4: Estimated reduction in the average number of drought-affected people through the use of FMNR, improved fertility management and drought tolerance packages



Source: reproduced from World Bank (2018:75)

A study focusing on Tree Based Farming (TBF) in Malawi further elucidates the outstanding contributions FMNR can bring to resilience.⁷⁵ The study found anecdotal evidence that farmers had introduced trees into their agricultural lands, primarily through FMNR. The main driver for this was to increase fuelwood production, followed by soil fertility improvement and the use of trees for constructions purposes.

To demonstrate the potential FMNR presents to help government reduce its spending on the FISP, whilst contributing to building the resilience of rural households, the study assessed the cost benefits of substituting fertilizer trees (*Gliricidia*) for subsidized fertilizer. Looking at about 1,500,000 households then benefiting from FISP for maize, and assuming all these households would adopt *Gliricidia*/maize intercropping systems, the study found that the potential total annual savings amounted to 71 million US\$/per annum, that is to say close to 46 US\$ per household. Assuming a conservative 15 years life span of these trees, the total savings from replacing subsidized fertilizer with *Gliricidia* fertilizer would amount to 551 US\$ per household over 12 years. **This would halve Malawi's FISP annual costs of 141- 151 million US.**⁷⁶

Foundational innovation 2: Improved soil & Water Conservation

In arid and semi-arid ecosystems, the major production challenges pertain to the extreme heat and the lack of water for irrigation purposes, contrasted with episodes of heavy rainfall, which wash off topsoil and create severe erosion. Various innovative approaches can be put in place to prevent or capture run off and protect topsoil.

"Zai" micro-water catchment basins

Zai is a farming technique that consists of digging pits (20-30 cm long and deep and 90 cm apart) in denuded, often abandoned fields during the pre-season to catch water and concentrate compost. The compost attracts termites, whose tunnels help further break up the soil. Zai holes not only rehabilitate degraded land, but reduce risk of drought by catching and retaining water. Evidence shows that Zai can help improving the yields of sorghum, and millet by up to 500 percent.⁷⁷

Permeable Rock Bunds along contour lines to retain rainfall.

Rock bunds, which act as retaining walls, effectively retain runoff during the rainy season. They promote water seepage in the soil and prevent nutrients from being washed away.

They are constructed as lines of stones along the contour, placed at regular intervals across the slope of a field. The lines act as barriers to intercept rainwater run-off. This promotes infiltration, an even spread of rainwater in a field, and prevents erosion. Water is stopped by the stone barrier, and trickles through the gaps between the stones, trapping sediment and organic matter upstream of the bund. Without rock bunds in a field, much the manure or compost applied by farmers, as well as top soil, would wash away in heavy rains. Farmers build up stone lines to 25 cm in height, and often with a base of 35 to 40 cm wide. To increase stability and durability, they are set in very shallow trenches.

Half moons

Half-moons consist of a semi-circular basin dug in barren land to capture water runoff for crops. In the basin, the top soil is mixed with organic manure, which help rehabilitate degraded soil, improve water infiltration, thus improving soil fertility and increasing crop production.



Zai and Half Moons

Credit: ANSD

Foundational Innovation 3: Improved soil fertility

Composting is a decomposition of organic matter through the progressive accumulation of household waste, grass, leaves, straw, crop residues, and animal manure by micro and macro-organisms. This process produces compost which looks like humus rich soil. In the Sahel, there are several methods to create compost. The most common way to compost is to progressively accumulate organic matter by either creating a pile, or by placing materials in a pit.

The compost heap (sometimes turned over once) is left 3 months during the rainy season. Another “rapid method” requires watering during the dry season. Most small scale farmers, using improved methods, and giving more attention particularly to the housing of animals to better collect their manure and urine, can greatly increase the quality and quantity of compost from their farm operations.

Compost is an excellent source of nutrients for the soil. Unlike chemical fertilizer, compost does not acidify the soil, but stimulates good soil structure, increases soil health (microbial activity), releases nutrients more progressively, as and when the plants need. Also, compost greatly increases the soil’s water retention capacity, acting as a sponge to hold moisture.

Foundational innovation 4: Improved crop management

Monocropping cereal crops, particularly maize, millet and sorghum, is increasingly practiced in the Sahel. It depletes the soil, and fosters the concentration of crop specific pests and diseases.

Crop rotation refers to the practice in which different types of crops, particularly cereals and leguminous crops are grown alternately in the same field. Regular rotation, particularly with legume crops (such as peanuts, sesame, bambara beans, cowpeas and pigeon peas) and/or intercropping with these legumes, improves overall production.

Leguminous crops improve the fertility of soil by replenishing it with nitrogen that it fixes from the air with the help of bacteria.

Intercropping is defined simply as growing two or more crop types on one field. It has similar benefits to rotation, depending on the way it is done. It also helps provide soil with cover, which prevents erosion,



Compost making

Credit: ANSD

suppresses weed growth. It reduces risk because if one crop fails, the other is still likely to produce a harvest. Intercropping helps make maximum use of the soil, water and light for overall production, and also reduces pests.

Foundational Innovation 5: Short cycle seed

Many traditional seed varieties developed by farmers tend to require longer growing seasons to mature and produce well. With climate change, rains have become much more irregular and erratic. Shorter cycle seed varieties, both local and new varieties generated by research, that produce a good harvest in much less time, can significantly reduce risk from erratic rainfall and decrease the length of the “lean season”.

4.3 Identifying Synergies

No single one of these 5 agroecological innovations, by itself, would be sufficient to stabilize crop production and food security, and prevent the continued degradation of the farming system because of the twin crises of climate change and soil degradation. Taken together, in locally specific combinations and sequence, the synergies between these innovations have the potential to regenerate the natural resource base, stabilize and sustain production, while significantly reducing vulnerability to climate change. **They provide the “foundation” on which further intensification of agroecology can be based, while also addressing other issues related to resilience,** and which concern the socio-system, in particular equity, gender and local governance.

Short cycle seed and farmer

Credit: ANSD



5. Designing a systems oriented agroecological and socio intervention process for resilience

5.1 Why a sequenced, integrated and systems oriented approach is vital

A challenge with strengthening resilience is that success requires an integrated “systems” approach. Even when the boundaries of an ecological and social system are tightly circumscribed, addressing only one or two elements, through promotion of several improved practices, is often insufficient to ensure that the system has truly become resilient to a range of chronic shocks and interacting stresses.

This is especially relevant in the context of the dryland farming system in the Sahel. Many interventions have promoted 2 or 3 improved practices that have benefited rural livelihoods, and made only a modest or short lived contribution to resilience.

In many cases, these practices, while beneficial, have not stabilized the overall livelihood farming system. Nor have they succeeded in overcoming the root causes linked to land degradation and climate change.

Often, success consists, at best, in slowing down the rate of degradation, particularly of the natural resource base on which rural livelihoods largely depend.

In the context of the Sahel, the resilience of the SES requires not just slowing down the rate of degradation of the farming/ livelihood system, but stabilizing it, and then regenerating it, and even transforming it to a higher, sustainable level.

This requires an integrated, multi-faceted, and systems approach.

5.2 Enabling rural communities themselves to be the key actors

People in rural communities must be the principal actors in strengthening their resilience. Outsiders cannot intervene directly to generate a more resilient system; they can merely be facilitators of this change. The members of the rural communities in the drylands, themselves, need to change, to learn, to adapt, to take collective action.

Other actors, such as the World Food programme (WFP), have also embraced this strategy. For example, the WFP ensures that the choice of interventions is informed by a Participatory Community Planning (PCP) exercise. This is a way of giving a strong voice to the more vulnerable groups, so that their specific needs are taken into account and given priority.⁷⁸

Peter Gubbels, the Team Leader of the AE+6 initiative vividly illustrates this issue:

What can be the longer term impact of an intervention that will improve women’s income, by introducing a new cash crop value chain, or credit for animal fattening, if the soils continue to degrade, firewood becomes very scarce, and erratic rainfall reduces food production of the family? How is the resilience of the agroecological and social system enhanced, if mostly the middle and better off farm families benefit, but the most vulnerable, bottom 20% of families remain mired in an exploitative debt/hunger trap?

5.3 Limits to the ability of rural communities to adopt multiple new practices

No individual, no family, no community can learn and adopt 8 to 10 major new practices all at once to transform their farming system.

Yet, in addition to the foundational agroecological practices, a lasting impact on the resilience of the farming system requires addressing social issues such as equity, women's empowerment, and nutrition, as well as local governance. Moreover, some new technical practices will need to be adapted, before it is feasible to enable communities to engage in testing others, and spreading proven innovations.

What is essential for a systems-oriented resilience initiative in the drylands of the Sahel is to enable small holder farm families and communities, and local governments, to engage in a progressive, phased, step-by-step transition towards resilience.

The experience of the AE+6 teams is that in an area where an NGO actor has had a long term program presence, strong relationships with communities and local government, deep contextual knowledge, the transition to a transformative level of resilience can be undertaken quite quickly. Where these enabling conditions do not exist, the process will be much longer.

5.4 An Overview of Key Lessons and Guiding Principles

What follows are key insights from the AE+6 experience of how to undertake a sequenced, integrated and systems oriented approach to resilience.

Participatory diagnosis of the root problems

To engage the communities in the process and deepen their awareness of the root problems related to vulnerability, the AE+6 teams facilitated a phased participatory diagnosis. This involved customizing several methodological tools to assist with the design phase.

- a) Mini-survey of the percentage of households in each village adopting various agroecological practices related to soil and water conservation practices, use of compost/manure, agroforestry (farmer managed natural regeneration) and others
- b) Participatory Rural Appraisal wealth ranking processes with key informants, including community leaders to determine the socio-economic category of all households in a village, to assess adoption rates for each of these categories
- c) The Household Food Insecurity Access Scale (HFIAS), to help identify those households most vulnerable to hunger⁷⁷
- d) The Household Dietary Diversity Score (HDDS) as a proxy indicator of adequate nutrient intake
- e) The Women's Empowerment in Agriculture Index (WEAI) method to assess gender disparities in terms of access to productive resources, decision making, workloads in the program areas and the potential areas to prioritize⁷⁸
- f) The FAO's methodology to holistically assess resilience of the farming system using the SHARP methodology; to determine in a participatory way the strengths and weaknesses of resilience, and areas of most feasible to address in the short term

The AE+6 teams did not apply all these diagnostic tools at the same time. Instead, they applied these tools in phases, starting first with the mini-surveys to determine existing adoption levels of key agroecological practices, and the wealth ranking of families. This was followed several months later by the assessment of

food insecurity towards the peak of “lean season” before the new harvest. After the first growing season, most of the AE+6 teams engaged the communities in assessing dietary diversity.

Rooting interventions within traditional knowledge and local resources

Resilience implies a high capacity to optimize the local resource usage to limit the degree of dependence on external inputs. This is true at the farm-level, with a strong emphasis laid on circulating and optimizing local resources as part of the fertility circle for instance, but also in terms of the non-farm resources used as a food basis.

Women can be supported with diversifying 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 non-timber forest products (NTFP). Such NTFP products include the flowers and leaves of wild baobab trees, the flowers of the kapokier tree, nuts from shea trees to make butter, and “nééré” tree pods to make powder and “soubala” condiment.

Localising food production also implies capitalizing on local knowledge that may have been lost. A good approach consists of reviving traditional culinary knowledge during community engagement sessions. In this way, an inventory of a wide range of mostly forgotten recipes can be generated and further passed on as part of this effort to diversify diets and improve nutrition.

Shaping action: engaging communities in deciding what to do

In light of the insights gained from participatory diagnosis, the next step is to identify and fully discuss the range of options with communities. The aim is to enable the villagers to decide, based on their intimate knowledge of the specificity of agroecological conditions and community dynamics, what new practices would be most relevant to try.

The best way to identify options is through facilitating visits and learning exchange with farmers in other places where progress is already being made to address similar issues.

In deciding “what to do”, it is wise to work with communities to identifying “foundational” innovations, based on what they have learned about what already seems to be successful within their agroecological zone, and then encouraging them to test out these new practices in their own village.

The value of the SHARP tool in this respect is that it helps the NGO understand the concept of a systems approach, and what it entails, and gives it credibility to explain what guided its orientations in the conception phase, which was worked out with the community.

Creating enthusiasm

Although communities should decide what best to do, in their engagement with local communities, practitioners should encourage testing of a few new practices that are likely to create credibility/enthusiasm about the process, in support of agroecology.

For this to happen, a certain level of tangible benefits would need to be achieved fairly quickly. Such new practices could for instance include:

- Distributing improved seeds – this creates great enthusiasm as yields derived from “new” improved varieties most the time (assuming they are shorter cycle and perform well from an agronomic point of view) may reduce risk, and the length of the lean season.
- Supporting home gardens with basic implements and improved knowledge

- Soil and water conservation methods, even on a limited scale of testing, often produce immediate results in a single season
- Improved methods of making and applying compost almost always has a significant effect on yields, if erosion methods are in place
- Basic bio-control methods are also key to introduce as farmers will need to quickly be given alternatives to any forms of pesticides

However, **organizing farmer-to-farmer visits to show how other farmers are farming successfully is often the most successful way to motivate, and inspire people** in new villages about trying something new.

Combining “quick wins” with “slow wins”

It is important to strike the right balance between “immediate benefits” compared to longer-term benefits in selecting the sequence and combination of innovations.

Certain highly important agroecological innovations, such as agroforestry (FMNR) may not generate significant results in the short term. **The way to address this is generate shorter term “quick wins” while generating interest through visits to where farmers have already invested in longer term agroecological practices, such as agroforestry and have started to reap the benefits.**

In the same strategy, **once initial “technical” new practices have generated interest and enthusiasm of communities, it will become easier to initiate the next major phase of address the more complex and culturally sensitive issues.** These include women’s empowerment, ensuring the special needs of more vulnerable households are addressed, nutrition and local governance.



Yacouba Sawadogo, an illiterate farmer from Burkina Faso has transformed the lives of thousands of people across West Africa, sharing his incredible story and experience

Source: from the film “The Man who Stopped the Desert” by Mark Dodd <https://www.imdb.com/title/tt1694580/>

Box 2

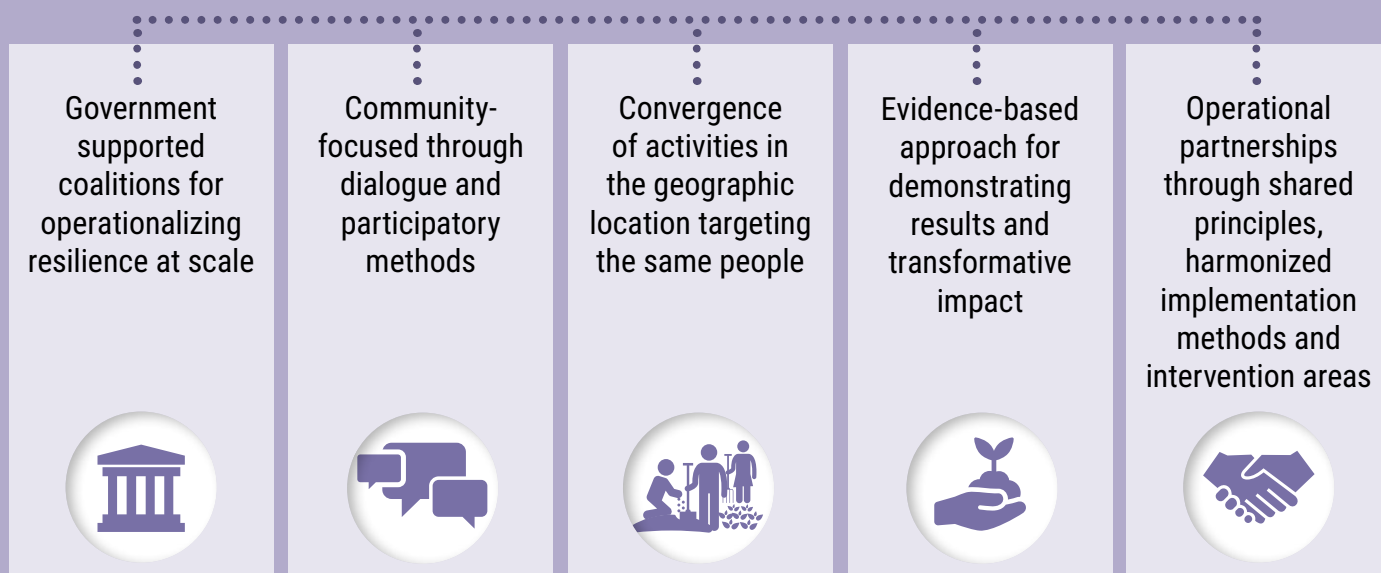
An overview of guiding principles

A key lesson of the AE+6 program was that the sequence and combination of innovations varied significantly across the 3 countries. What was more important than the specific practices was the process and the principles of the resilience approach.

This is because transitions toward agroecological intensification as well as addressing equity, nutrition and gender issues tend to be highly context specific. Resilience requires flexibility and engagement with local actors. No single optimal intervention or outcome can be prescribed to a given context. The agronomic changes that underpin agroecological transitions do not follow a blue-print, and are most effective when designed alongside broader social and economic considerations.⁷⁹

This insight arises also in the experience of other actors in the Sahel. See, for example, the WFP guiding principles for resilience. They emphasize community dialogue and participatory processes, and evidence based approaches for demonstrating results and benefits.

GUIDING PRINCIPLES



Adapted from the World Food Programme (WFP). 2019. Changing lives, scaling up resilience in Mali.

6. Integrating equity, women empowerment, local governance and nutrition into agroecology

As noted above, the focus on identifying agroecological practices to transform the farming system cannot be detached from broader socio-economic considerations, which underlie the resilience of communities as a whole.

For this reason, agroecology, as promoted by AE+6, was not only about promotion of improved agricultural practices but also identifying complementary measures to address the specialized needs of the most vulnerable groups (women, children, and poorer households), wider "livelihood promotion" and "risk reduction" dimensions, as well women's empowerment and nutrition.

In the design of the AE+6 approach, this consisted of:

- exploring how to integrate nutrition, equity, women's empowerment progressively into the overall strategy of agroecology for resilience, so as to optimize potential synergies
- 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
- strengthening community capacity to more quickly and systematically learn and adapt innovations through collective action
- learning how to sustain the AE+6 resilience process by strengthening local governance at community and municipal levels
- integrating effective social and governance mechanisms to enable women's empowerment

Each of the case studies conducted in three regions, Senegal, Burkina Faso and Mali, asked the question: 'what are the combination of tailored activities, beyond spreading of agroecological innovations, to address the specialized needs of the poorest, most vulnerable farm households for resilience, and to sustain the process?'

To address equity, women's empowerment, nutrition issues, and local governance issues, the AE+6 teams in each country had to improve their knowledge of local social and cultural dynamics. The AE+6 case studies on each these 4 topics capture the details of this thematic areas of intervention for resilience. But the key activities and insights are cited below.

6.1 Incorporating equity and solidarity as key principles

Specific interventions conceived to break the poverty trap and embed equity into project interventions included the following activities:

- i) conducting participatory households surveys and household wealth ranking to identify the most vulnerable households
- ii) developing warrantage schemes (collective grain storage)
- iii) establishing seed banks
- iv) providing the most vulnerable households with improved short cycle seeds
- v) promoting the selective and rotation-based donation of pregnant livestock (sheep, goats)
- vi) establishing a dedicated fund to provide regular cash grants for women in the most vulnerable households.



Key tips to get it right

- Specific caution needs to be taken to ensure that, in as far as possible, all women benefit equally from interventions; this can be challenging for instance when women are granted land to farm, which some plots far from water points, which makes their viability questionable, but also make the benefits of collective gardening very inequitable, with some women getting a better harvest compared to others.
- Equity issues can arise when redistributive mechanisms indented though an activity are not clearly enunciated. Such is the case with *habbanaye* for instance (rotation-based distribution of animals); if a clear protocol explaining to the beneficiaries that the donation of the first progeny from the

pregnant mother is required of them, the mechanisms might short fall of benefitting more women and may result in resentment on the part of those who haven't benefitted.

6.2 Women's Empowerment

Key activities and strategies conceived to address the root causes of women's marginalization in the agricultural sector included:

- i) reviving traditional solidarity mechanisms to strengthen the resilience of the most vulnerable households, targeting the women in these households
- ii) supporting women's organization and leadership through the creation of savings and credit groups
- iii) providing specialized material assistance to women from the poorest households including poultry, or rotating animal loans (based on the traditional practice of *habbanaye*); seeds, or monthly stipends of cash
- iv) supporting women to obtain secure access productive assets (land)
- v) providing specialized technical training to women farmers for dry season gardening, or women's crops
- vi) using improved nutrition as a practical enabling entry point for gender-sensitive resilience programming.



Key tips to get it right

- Tackling gender issues doesn't mean that men should be excluded from project activities; on the contrary, men are very much part of the solution when it comes to reversing gender discrimination. Men should as much as possible be included in some of the activities, as observers or as contributors, to make the activity successful (i.e., assisting with transport to communal fields, with scribing in savings groups, etc) and to further change mindsets.
- Be careful when addressing sensitive gender issues head-on because an adverse response could be received from the community. When tackling issues such as secured access to land for women for instance, present the benefits (for the household as a whole) of changing social norms.

6.3 Integrating Nutrition

Specific interventions conceived to improve the nutrition studies of rural households were sequenced as follows:

- i) targeting the most vulnerable households
- ii) raising awareness on the causes of malnutrition and improved nutrition practices at the community level
- iii) using women credit and savings groups as the main means to convey nutrition-related messages and as a source of income generation to allow women to buy nutritious food
- iv) promoting the processing and marketing of non-timber forest products
- v) fostering culinary knowledge among women (new and ancient knowledge) and organizing culinary contests
- vi) training and supporting women with diversifying their production using agroecological principles

- vii) promotion of baobab and *Moringa Olifeira* for women farming as a the key nutrition “game changer”
- viii) training of women to act as volunteer nutrition promoters
- ix) taking women leaders on learning exchange visits and organizing radio games
- x) organizing “caravans” including medical staff (nurses) who can enter into dialogue with community and women leaders



Key tips to get it right

- The most important aspect that agroecology practitioners need to consider is the need to dismantle the idea that nutrition is addressed by the health sector alone. It is seminal that NGOs promoting agroecology very much integrate improved nutrition as part of their mandate. Any production advice should intrinsically take into account the need to ensure diversify and ensure appropriate intakes of food, especially for young children and pregnant and lactating women.

6.4 Local Governance

Specific interventions conceived to make local government an agent of resilience included the following activities:

- i) raising the awareness of local leaders around issues of resilience
- ii) ensuring that the locally elected leadership took ownership of the process
- iii) bringing into being or modify the mandates of local organizational structures
- iv) developing the planning capacity of decentralized local government
- v) formulating revised local development plans to allocate resources equitably
- vi) sharing and disseminating experiences and lessons learnt



Key tips to get it right

- The sequencing of the activities is critical ; leadership makes decisions based on demonstrated success. Once the *in situ* implementation of resilience strategies in villages had started showing striking local results, Groundswell network partners engaged in review and lesson-learning processes. One method was the use of *caravans*⁸⁰, in which locally elected councillors, and technical services staff went by bus to a series of villages over 3 days to talk directly with villagers about their experiences with resilience. As a second phase, once municipal plans had been revised (or the elements to be integrated into the future revision of these plans had been finalized), Groundswell network partners facilitated sessions to disseminate the outcomes at the village level. The village agroecological committees then conducted similar planning exercises at the community level, inspired by these plans. In this manner, projects managed to get a strong level of commitment and enthusiasm from people in the participating communities.

7. A framework for fostering synergies between interventions in the SES

It is essential that the barometer of the four levels of interventions be watched at all times, for fear of building the resilience in one sphere and neglecting other spheres that will keep on being drivers of degradation.

If a project for instance succeeds only one dimension, such as supporting women's savings and credit, without addressing unsustainable farming practices (e.g. lack of adequate composting and integrated land management), land degradation will continue and the overall resilience of the SES will not be sustainably enhanced. Or if a project focuses on increasing agricultural production and women's empowerment, this does not mean that nutrition security/well-being will be achieved. Improved nutritious outcomes will be achieved if the income derived from the selling of commercial crops is in fact spent on nutritious foods, and on whether this food is available locally (i.e. either grow or available in the market).

Design the reverse pyramid approach to ensure synergies between the "eco" and the "socio" dimensions of the farming system

One of the most critical factors of success for gradual intensification of agroecology relates to sequencing and combining mutually enhancing interventions.

The sequencing approach described in section 5 for the ecological system and in section 6 for the sociological system, is adapted from a long standing tested model used by agricultural development pioneer Roland Bunch to assist practitioners with identifying the most suitable agroecology practices and social programmes to phase in, and when. This is the inverted "pyramid" of innovation/technology.⁸¹

The reverse pyramid is useful because most farmers are willing to try out only two or three things (or even less) in a given farming season. It is best to encourage small scale experimentation by a number of volunteer farmers on small plots but in "real conditions" in each village to reduce risk of failure.

Once these initial new practices are mastered and adapted to the local context, the community can engage in spreading them widely, while starting to test a new "wave" of agroecological innovations, which can be rolled out over the subsequent year, but only once the first innovation has reached a critical mass of adoption. In this manner, the farmers who have mastered the level one innovation progress up the pyramid one step each year, and learn another set of one or more innovations, while serving as inspiration and mentors to those just beginning to step into the pyramid.

AE+6's innovation to this pyramid is that it looks beyond the pure technical "farming" practices introduced, and integrates these "technologies" with the social dimensions, designed to support and reinforce the successful implementation of these new farming practices. The AE+6 process, therefore, is to build reverse pyramids from both "agro" and "socio" bricks.



















The relevance of the reverse pyramid applied to the dryland SES can be illustrated with the example of improved compost making, linked with women's empowerment.







As women (who would first be encouraged to farm in their garden but then also on collective plots on secured land) are taught how to make proper compost (first level of the pyramid), they harvest more crops for their fields. This enables them to derive better nutrition and increased income. The women can save part of this income in the Savings and Credit group (set up at the same time as the first practices of the agroecology foundation are taught - first level of the pyramid). Then women take loans to invest in diversifying their production on small garden plots or collective dry season garden plots, or for processing and marketing their produce. Or,

women could buy improved short-cycle seeds for the next season (second level of the pyramid). This can in turn feed into the establishment of seed banks, which could be synchronic with encouraging the digging of zai planting pits or half-moons in which these improved seeds are planted (third level of the pyramid).

Figure 5 below shows a possible reverse pyramid; note how the agroecology foundational practices would be phased in progressively as part of the core foundation, together with social activities. The latter would be integrated more vigorously once the intervention generates enthusiasm and credibility within the community, as well as strengthened leadership, organization and local capacity.

Figure 5: An illustrative SES innovation reverse pyramid

year 4	Seed Banks (SB) 	Caravans for Local Development Planning (CaLDP) 	Caravans for Nutrition (CaN) 	Cash Grants (CR) 	Habbanaye (Ha) 
year 3	Secured Land Access (SLA) 	Improved Soil and Water Conservation (ISWC) 	Promote Non Timber Forest Products (NTFP) 	Improved Crop Management (ICM) 	Promote New Culinary Knowledge (CU) 
year 2	Farmer Managed Natural Regeneration (FMNR) 	Demonstrations Farms (DF) 	Short Cycle Seeds (SCS) 	Awareness Raising on Nutrition (ARN) 	
year 1	Agro-Ecological Training of women (AET) 	Improved Soil Fertility (ISF) 	Women Savings and Credit Groups (WSCG) 		
project design		Participatory Households Surveys (PHS) 			

 SOCIO-INNOVATIONS
  Women empowerment
  Nutrition
  Equity
  Local Governance
 AGRO-INNOVATIONS

The pyramid represented here just serves as an illustration; this model could work in most Sahelian contexts, but communities and NGOs may jointly decide to build their eco and socio innovation pyramids in a different manner. Project time frames may also differ.

8. Challenges

A major challenge is that many organisations may not be able to apply the flexible and interactive approach advocated for and described in this framework. Many organisations have limited scope to adapt their project design. They are often bound by their donors' priorities and specific project activities that are captured in project documents months, sometimes years before the targeted communities are even encountered. If so, this runs the risk of arbitrarily limiting the scope of actions for a given community to address the issue resilience if a more adaptive, learning process had been used for this given community.

Another concern is that **if interventions are rolled out in silos, without considering synergies and multiplier effects, the resilience impact of these will turn out to be much less.**

Finally, there is a risk that projects, if designed with a "top-down" approach, will fail to give sufficient room to adaptive management, notably room to enter into partnerships with other organisations doing similar or complementary work in the area of intervention. The importance of developing and nurturing a long-term trust relationship with the local communities is paramount.

9. Conclusion

The "resilience" of a system is complex and multi-dimensional. This applies to the "eco" dimension of the system complex (topography, soils, localized climate shocks, level of historical degradation, etc.). It also applies to the social system (gender disparities; heterogeneity of villages; complexities of local power structures and marginalization; and the specificity of the agro system i.e. agro-sylvo pastoral versus pure agriculture or pure pastoral, which can often come in conflict over resources in the Sahel).

There are no "single interventions" or silver bullets to increase "resilience" of a complex system.

Interventions will only have an impact on resistance if the low hanging fruit are identified and amplified (i.e. improving what is already working. This assumes trusting that farmers are already getting some things right) and if the community select and adapt the combination and sequence of new practices with which it is willing to experiment.

In the context of the Sahel region, dealing with social change requires tact, caution and strategic diplomacy. When a project seeks to embed agroecological practices concomitantly to changing attitudes, it is vital that traditional mindsets be respected and approached in a way that is non-threatening and that fleshes out how the changes brought about will be beneficial to all.

The principal lessons learnt from the AE+6 experience for fostering resilience relate to the progressive and iterative strengthening of the SES in the Sahelian drylands. This should serve as a basis to projects seeking to scale out agroecology. The reader is referred to the related case study on "[Scaling agroecology for resilience in the Sahel. The experience of rural communities in Mali, Burkina Faso and Senegal.](#)"

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