



CULTIVATING CLIMATE RESILIENCE: THE SHEA VALUE CHAIN

Sara Venturini, Anna Haworth, Nadine Coudel, Elisa Jiménez Alonso and Catherine Simonet

Working paper



CONTACT THE AUTHORS



Dr Sara Venturini is a senior policy advisor and development economist at Acclimatise. She specialises in climate adaptation policies and multilateral negotiations. She has over 8 years' professional experience in climate change and environment science – policy interface within European and international frameworks such as UNFCCC, IPCC, UNEP and WMO.



Anna Haworth is a senior specialist in climate change risk assessment and management at Acclimatise. She has a strong scientific knowledge of past climate change and future projections, which she developed through her own academic research. Anna has worked with numerous national and regional governments and companies, seeking to integrate climate change into their decision-making and risk management processes.



Nadine Coudel is a business and environmental lawyer and risk advisor at Acclimatise. She specialises in adaptation planning and policy, climate risk management and climate finance. She plays a key role in developing and delivering participatory learning services.



Elisa Jiménez Alonso is a researcher at Acclimatise. Before joining, she completed a traineeship in Brussels at the European Commission's Earth Observation Programme "Copernicus". Elisa has experience in research and communications, and works across disciplines combining social and natural sciences.



Catherine Simonet is development economics researcher at the Overseas Development Institute. Her focus is climate change adaptation, environmental and economic vulnerability, climate information and food security in sub-Saharan Africa and Least Developed Countries. She holds a PhD from the Centre d'Etudes et de Recherches Internationales.

ACKNOWLEDGEMENTS

The work on this paper involved many people within the Shea value chain. They contributed in different forms and we would like to thank them all for helping us. Special thanks should go to Joseph Funt, Managing Director of the Global Shea Alliance, whose knowledge and access to the value chain in Burkina Faso made a significant difference to the research project.

We would also like to thank Alastair Baglee (Technical Director at Acclimatise) and partners from Laboratoires M&L (L'Occitane en Provence) and the Global Shea Alliance for their support and comments throughout. Emily Wilkinson (Research Fellow, ODI) and Laurie Goering (Climate Editor, Thomson Reuters Foundation) also provided invaluable comments during the writing of this paper.

We would also like to thank interviewees from the following stakeholder organisations:

Institut de l'Environnement et Recherches Agricoles (INERA), Centre National de Semences Forestières (CNSF), Table Filière Karité (TFK), TREE AID Entreprise, Self Help Africa, Welthungerhilfe, Laboratoires M&L (L'Occitane en Provence), Programme de Croissance Economique dans le Secteur Agricole (PCESA) and the Global Shea Alliance.

Contents

Acronyms	4
Executive summary	5
Introduction	7
Methods and outline of the paper	11
1. The Shea butter value chain	13
2. Climate risks to the Shea value chain	23
3. Risk and adaptation responses	32
4. Barriers to effective adaptation	39
5. Resilience opportunities of Shea	43
6. Policy gaps and recommendations	53
References	58
Appendix 1: List of interviewed stakeholders	64

List of tables

Table 1:	Primary stakeholders in the Shea value chain of Burkina Faso	21
Table 2:	Supporting stakeholders in the Shea value chain of Burkina Faso	22
Table 3:	Climate change impacts chain for the Shea value chain, based on literature review, stakeholder comments and expert judgement	30
Table 4:	Actions under Strategic Area 1 of the National Strategy for Sustainable Development of the Shea Sector, with associated types of actions and barriers addressed	50

List of figures

Figure 1:	Burkina Faso Shea value chain	18
Figure 2:	Five Strategic Areas of the National Strategy for Sustainable Development of the Shea Sector	48
Figure 3:	Governance structure for implementation of the National Strategy for Sustainable Development of the Shea Sector	52

Acronyms

AfDB	African Development Bank
BRACED	Building Resilience to and Adaptation to Climate Extremes and Disasters
CILSS	Permanent Interstate Committee on Drought in the Sahel
CIRAD	Agricultural Research for Development
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CNSF	Centre National de Semences Forestières
DFID	Department for International Development
ECOWAS	Economic Community of West African States
EIF	Enhanced Integrated Framework
EU	European Union
FAO	Food and Agricultural Organization
GDP	Gross Domestic Product
GSA	Global Shea Alliance
ICCO	International Cocoa Organization
INEA	Institut de l'Environnement et de Recherches Agricoles
IPCC	Intergovernmental Panel on Climate Change
IPGRI	International Plant Genetic Resources Institute
ITC	International Trade Centre
LGP	Length of the Growing Period
NGO	Non-governmental organisation
OECD	Organisation for Economic Co-operation and Development
REDD	Reducing Emissions from Deforestation and Forest Degradation
SWAC	Sahel and West Africa Club
TFK	Table Filière Karité
UNDP	UN Development Programme
USAID	US Agency for International Development
USDA	US Department of Agriculture
US DOC	US Department of Commerce
WFP	World Food Programme

Executive summary

The economy of Burkina Faso remains relatively undiversified and is strongly driven by the climate-sensitive agriculture sector. Burkinabe agriculture is known to be mostly extensive and not highly productive. Major physical constraints, including climate-induced variations in rainfall distribution, increased severity and frequency of droughts and soil degradation are a threat to agricultural production and exports as they harm production and provoke volatility in commodity prices. Overall, climate change presents a 'threat multiplier' to the Shea value chain, interacting with other non-climate factors characterising the wider Burkinabe environment, economy and society. The Shea tree is considered a vulnerable species that is deemed to be more at risk from human practices than climate change.

Faced by the paradox of high economic growth and difficulties in eradicating poverty, Shea is an important resource in Burkina Faso. Shea production helps reduce poverty through exports and increases food security among the population by providing subsistence. At the same time, although it is affected by climate variability and change, the Shea tree has characteristics that make it a resistant crop, while its genetic diversity gives it high spontaneous adaptive capacity and enables domestication. Shea is beneficial to the overall resilience of the ecosystem, maintaining soil fertility and biodiversity of flora and fauna.

Risk management measures adopted by local stakeholders include those aimed at improving Shea tree conservation and management, as well as soil and water conservation and management. Research and development focused on domestication and isolation of more adaptable varieties of Shea are being turned into on-the-ground applications in Burkina Faso. Organic and fair trade certifications sought by international

brands in the cosmetic industry contribute to establishing appropriate rules for the safeguard of the resource and biodiversity in general, and the minimisation of negative environmental impacts during the production phases. All of this occurs under the framework of national and international laws aimed at protecting Shea trees and in parallel with development initiatives that support local communities through agro-forestry and other projects.

The recently adopted National Strategy for Sustainable Development of the Shea Sector (2015–2019) provides an adequate policy framework in Burkina Faso for building resilience of the Shea value chain. It recognises the environmental co-benefits of Shea trade and the overall contribution to the resilience of rural communities, and, among other objectives, aims to slow down or even reverse the process of degradation of the Shea parklands. Through a combination of value chain development, environmental management and measures targeting social groups, this represents a comprehensive adaptation and resilience strategy for the Shea value chain in Burkina Faso, including those communities engaged in it.

The national strategy does not, however, tackle potential obstacles to effective climate risk management in the agriculture and forestry sector, particularly the lack of reliable meteorological and climatological data and information necessary for planning in advance.

While Shea production has what it takes to improve the resilience of local communities involved in different stages of the value chain, diversification of the crops cultivated by farmers is essential to ensure climate resistance and resilience of the ecologic and socio-economic system as a whole in Burkina Faso. More broadly, efforts that promote economic diversification are imperative in the light of a national agenda for sustainable development.

Introduction

This paper examines the likely impact of climate change on communities engaged in Shea production and trading in Burkina Faso. We present the results of a climate-resilient value chain analysis that looks at the benefits for local communities of increased Shea production, including the resilience of the value chain to climate change impacts.

The economic situation

Burkina Faso's landlocked position, small domestic market and high demographic pressure hamper its economic growth. It is a Sub-Saharan country of 274,000 km² and a population of 17.9 million with projections to reach 30 million by 2030, given the high population growth rate (at 3.1% per year) (AfDB et al., 2015).

Exports are concentrated on a limited number of commodities and influenced by global prices, as the country's main trading partners are Europe and Asia. In 2014, the political crisis, along with lower cotton and gold prices and the Ebola epidemic, had a significant effect on the country's economy (AfDB et al., 2015). The extractive industry, with gold the principal mineral resource, is the fastest-growing economic sector (31% of gross domestic product GDP in 2011). Despite this wealth, Burkina Faso remains a low-income country (45% of the population survives on less than \$1.25 per day) (Lenhardt et al., 2014). GDP per capita has fluctuated and was at \$670 in 2013 (World Bank, 2015).

The country has been regarded as a 'growth-poverty-paradox' as it shows economic growth and good macroeconomic performance alongside limited poverty reduction (Lenhardt et al., 2014). This paradox is explained partly by Burkina Faso's economic reliance on agriculture, forestry and livestock farming, which remain

vulnerable to climatic conditions such as variations in rainfall or droughts, and can in turn lead to higher food prices and to reduced purchasing power of the poor (Lenhardt et al., 2014).

In 2012, agricultural production in Burkina Faso made up 30% of GDP and employed 90% of the workforce (FAO, 2014). Burkina Faso is also one of Africa's leading cotton producers and exporters (USDA, 2015). The Burkinabe government has recognised the need to diversify and transform the economy and aims to develop the value chains of certain promising sectors such as Shea butter in order to reduce the country's dependence on gold, cotton and livestock (FAO, 2014). Besides cotton and Shea as cash crops, Burkina Faso's predominant crops are cereals (such as sorghum, maize and millet), root and tuber crops (such as cassava and sweet potato), vegetables and fruits (such as mango and cashew) (Bila et al., 2010; Hema, 2008; Vyassières et al., 2012).

The Shea sector is benefiting from a global increase of chocolate consumption (The Statistics Portal, 2015) as well as an increase in the demand for cocoa butter equivalents from the natural cosmetics industry (Konaté, 2012). Burkina Faso has about 190 million Shea trees (US DOC, 2014) and is one of the biggest producers, consumers and exporters of Shea kernels and butter in West Africa. Shea butter is now the fourth-largest export product in Burkina Faso and its contributions to the economy are estimated at \$6 million per year (Bup et al., 2014).

As Shea production and processing is a predominantly female industry, it provides an income for about 500,000 women in Burkina Faso (ICCO, 2015). The Shea value chain also plays a crucial role in food security. It is a source of fruit and cooking oil and generates a cash income that is used to purchase basic food supplies (Konaté, 2012).

Overcoming economic vulnerability and achieving political stability are the major challenges ahead. The socioeconomic development of Burkina Faso will depend in part on the success of its export diversification strategy in considering future climate change threats and opportunities, and on the direction of the political transition following the election of its first new president in almost 30 years at the end of 2015 (AfDB et al., 2015).

Environmental and social situation

Burkina Faso's climate is a result in part of its landlocked location in the middle of the West African Sahel region. The climate is dry tropical and alternates between a short rainy season and a long dry season. The country has three climatic zones: the Sahelian zone in the north, which receives an average annual rainfall of less than 600 mm; the north-Sudanian zone in the centre, receiving between 600 and 900 mm of rainfall each year; and the south-Sudanian zone in the south, with an average annual rainfall in excess of 900 mm (World Bank, 2011).

The country is highly vulnerable to climate variability and change, given its geographic location, high levels of poverty and heavy reliance on agriculture for subsistence and income generation. In 2009, 46.7% of the population were estimated to be living below the national poverty line (World Bank, 2009) and over one in three children under five years currently suffer from chronic or acute malnutrition. Burkina Faso's capacity to address poverty, food insecurity and various other socioeconomic problems is highly dependent on the performance of agriculture, as over 80% of the population depends on the sector to make a living (WFP, 2015).

Historically, the country has been prone to extreme weather variability. Burkina Faso's climate sees strong seasonal and annual

variation because of its location in the hinterland and within the confines of the Sahara (World Bank, 2011). This variability, particularly in rainfall, leads to frequent droughts and floods. Between 1991 and 2009, the country experienced three major droughts affecting over 96,000 people, and 11 major floods, which affected over 380,000 people and claimed 93 lives (World Bank, 2011). Over recent decades, severe droughts along with cycles of above average rainfall have greatly affected agricultural production (Sarr, 2012). The country has also experienced several devastating invasions of locusts and many episodes of epidemic diseases (World Bank, 2011).

Climate change is likely to result in increased temperatures and changes in the timing and amount of rainfall. Observations already indicate an increase of the average annual temperature of between 0.2 and 0.8°C since the end of the 1970s (ECOWAS-SWAC et al., 2008). By the 2080s, this is projected to increase further between 3.0 and 4.0°C (Sarr, 2012). Sahelian rainfall has recorded high variability during the past century, with a significant decrease (more than 20%) in the annual amount since the 1970s (Ibrahim et al., 2014). There is uncertainty in climate modelling about whether this overall decrease in rainfall amounts will continue into the future. Of particular concern are the late-onset, early-cessation dates of rainfall and the reduction of length of the growing period (LGP), which are already negatively affecting agriculture in the region. Projections indicate the LGP may reduce by a further 20% by 2050 (Sarr, 2012).

Women are particularly vulnerable to the impacts of climate change because of their dependence on natural resources (water, forests and land) for feeding their families and for income (Oxfam, 2011). Burkinabe women have very limited control over these resources, as they are unable to own land (Allmaier, 2014).

Methods and outline of the paper

Focusing on the situation in Burkina Faso, this research aims to answer the following key questions:

1. What is the likely impact of climate change on communities engaged in Shea production and trading?
2. How can the increasing production of Shea positively affect local community livelihoods and development objectives, including food security?

These questions are considered throughout Sections 4 to 8. Policy recommendations addressing the main gaps identified in the study are presented in Section 9.

Climate change adaptation and resilience are recognised in this study as two integral and intertwined concepts. While **adaptation** aims to offer responses to adverse climate impacts, including accommodating human and natural systems to new climatic conditions through transformation, **resilience** can be understood as a normative criterion to assess the quality of an adaptation strategy to climate change (Adger, 2006; Driessen and van Rijswick, 2001). Resilience has both a positive and negative value as it implies the capacity to resist to or to embrace change.¹ Within the Building Resilience to and Adaptation to Climate Extremes and Disasters (BRACED) initiative, resilience is meant as the 'ability to anticipate, avoid, plan for, cope with, recover from and adapt to (climate related) shocks and stresses' (Bahadur et al., 2015). The longer Department for International Development (DFID) working definition adds the dimension of development; it describes resilience as 'the ability of countries, governments, communities and households to manage change,

¹ www.unisdr.org/2004/wcdr-dialogue/terminology.htm

by maintaining or transforming living standards in the face of shocks or stresses, while continuing to develop and without compromising their long-term prospects' (DFID, 2011).

“Climate change adaptation and resilience are recognised in this study as two integral and intertwined concepts”

The findings in this paper are based on engagement with a range of stakeholders active within the Shea value chain, both in Burkina Faso and internationally. During the course of this study, authors spoke to a range of different stakeholders, covering components of the value chain, together with relevant non-governmental organisations (NGOs). Appendix 1 provides a full list of stakeholders. Authors supplemented these 'on-the-ground' insights with evidence from published scientific and grey literature, to reflect current thinking about the resilience of the Shea value chain to climate change.

This paper does not aim to be exhaustive. It does not cover the full suite of climate and development challenges facing Burkina Faso, nor does it explore the full range of ways in which the Shea value chain could become more climate-resilient. As these stakeholders are based in a wide range of locations within Burkina Faso and internationally, and because of budgetary limitations, we conducted all engagement remotely, albeit supported by on-the-ground Global Shea Alliance (GSA) representatives and partners where necessary.



1. THE SHEA BUTTER VALUE CHAIN

IMAGE:
OLLIVIER GIRARD/
CIFOR

The tree

The Shea or karité tree, meaning 'tree of life', has many unique properties (Goeja, 2004). Shea trees (*Vitellaria paradoxa*) grow in parklands, dry savannahs and forests on a strip of about 5,000 km that crosses West Africa (IPGRI, 2006), more precisely in Benin, Burkina Faso, Cameroon, Congo, Côte d'Ivoire, Democratic Republic of Congo, Ghana, Guinea, Mali, Niger, Nigeria, Senegal, Sudan, Togo and Uganda (Bup et al., 2014). In Burkina Faso, the Shea tree is the most frequent parkland tree species and part of traditional agroforestry systems. It is coveted for its fruit, which contains a nut, an important source of edible oil, commonly known as Shea butter, which is derived from the kernel (Hecht et al., 2014).

The Shea tree is usually not planted but selected, saved and protected by farmers in their fields (Rousseau et al., 2015). *Vitellaria paradoxa* is considered a genetically diverse species, which means it could be domesticated through selection and breeding (Teklehaimanot, 2004). The Shea tree is well adapted to poor shallow soils and dry environments and has a life span of between 200 and 300 years (Boffa, 2015). It produces its first fruit when it is about 20 years old and reaches its full production by its 45th year (Höfer, 2009). Shea fruits are generally collected by women between the months of May and August (Boffa et al., 1998).

Almost all aspects of the Shea tree have tangible and intangible value. The process of purifying Shea butter from the nut kernel is labour-intensive, but results in an oil used locally for frying foods. It also serves increasingly as an ingredient in the manufacture of cosmetic, food and pharmaceutical products (Boffa, 2015). In addition to its fatty kernel, the fruit is coveted for its sweet pulp, which is used to produce jams and alcohol (ITC and EIF, 2015). Moreover, other parts of the tree remain valuable:

- the nut husks are used for mulch and fuel (Orwa et al., 2009);
- the leaves are used in traditional ceremonies to protect newborns and in traditional medicine, e.g. as teas for stomach upset and headaches (ITC and EIF, 2015);
- the edible flowers support honey and essential oil production (ITC and EIF, 2015);
- the thick, fire-resistant bark is also used in traditional medicine, for example to treat leprosy or snake bites (ITC and EIF, 2015);
- the roots serve as teeth-cleaning chewing sticks (ITC and EIF, 2015);

- the tree wood is heavy and resistant to termites; it is valued for woodwork or for making charcoal (ITC and EIF, 2015);
- the Shea tree caterpillar is a favoured protein source used in many traditional dishes (ITC and EIF, 2015).

The commodity

Shea butter is a non-timber forest product and one of the few economic commodities in Burkina Faso that bring women significant income, and for many it is their only source of income (ITC and EIF, 2015). Traditional processing is energy-intensive and involves large quantities of water and wood, which often have to be carried long distances from source to village. It takes approximately 7.9 kg of firewood to produce 1 kg of Shea butter (CIRAD, 2015), and the preparation takes several days, involving the following steps:

- Ripe fruits are collected from the ground and brought back to the village for processing, the green pulp is removed to expose the nut, which is then parboiled and sun-dried (SNV Ghana, 2013).
- When the nuts are completely dry, they are lightly crushed with a stone or wooden paddle to remove the outer shell and expose the oil-bearing kernel (SNV Ghana, 2013).
- After this, the kernels are roasted, pounded into a powder and mixed with water. Women knead and purify the paste by washing it repeatedly with warm water to separate out the butter oils from non-oil partition (ibid.). The fats are collected, heated, filtered and cooled down, so that the oil becomes hard and results in creamy, thick butter, which can vary in colour from beige to green (FAO, 2015).

Shea butter has many uses in the cosmetics, food and chemical industries. It can be found as a cosmetic additive for soaps, shampoos and lotions or in food preparation, where it is used in place of cocoa butter, for example to enhance pastry dough pliability or to enrich chocolate recipes (Konaté, 2012). Shea butter is produced for both the domestic and the export market.

The international Shea market is dominated by the sale of Shea kernels. Shea kernels represent 90–95% of the market, as compared with only 5–10% for Shea butter. There is an increasing demand for Shea products, not only in the traditional markets of Europe and Japan but also through additional markets in West Africa and North America (Konaté, 2012).

Value chain stakeholders

Burkina Faso's Shea value chain is characterised by the presence of various stakeholders and complex dependencies and relationships (see Figure 1). The national association Table Filière Karité (TFK) was established in 2000 to bring key stakeholders in the Shea sector together to facilitate and explore ways of improved communication, cooperation and trade.²

Women play a key role within the primary Shea value chain activities. These activities are at first facilitated by direct input supplies, including parklands and forests, Shea seeds for plant breeding, water and energy in the form of fuel wood (CIRAD, 2015) or electricity. The stakeholders providing these supplies include forest owners (typically the state) and landowners (typically the husbands, as women can not claim property rights on land due to customary law).

² http://tfkburkina.com/TFK/?page_id=5

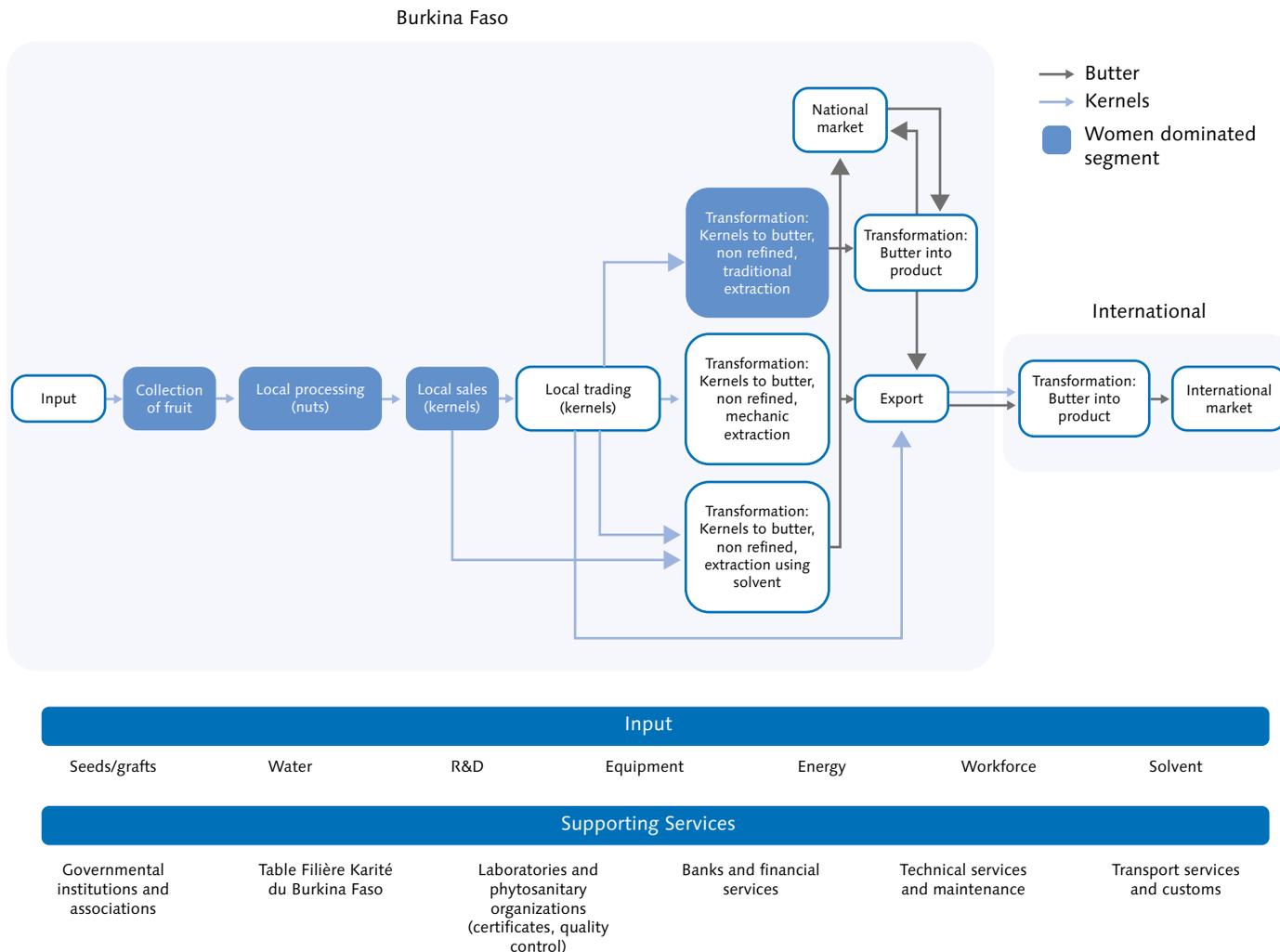
It is predominantly women who ensure fruit collection on private or community land, either individually or as part of women's organisations (village groups, associations, cooperatives, unions or federations). There are over 1,600 such organisations (ITC and EIF, 2015). The collection phase lasts from May to August (Boffa et al., 1998), when other farming activities are at their peak. The local nut processing activities are also assigned to women. Women hold the knowledge on how to store, dry and crush the nuts to remove the kernel. They also sell kernels at markets and on roadsides and engage in local trading. Traders also include individual kernel collectors, wholesalers and exporters (ITC and EIF, 2015). The transformation of the kernels to butter is carried out mostly by women's groups or small enterprises (Boffa et al., 1998), and Shea butter is then sold to the domestic and international market (Chalfin, 2004).

Despite the increased Shea trade and the arrival of foreign businesses in Burkina Faso, the main impact on the value chain has been on prices and volumes and less on the quality standard, structure and governance of the value chain (Rousseau et al., 2015). The country's estimated potential of kernel production amounts 850,000 tonnes per year, which is not yet exhausted (ITC and EIF, 2015). National and international statistics on Shea production and exports are imprecise and not reliable, but it is estimated that West African exports amount to between ca. 240,400 and 403,700 tonnes³ of Shea per year in nut weight equivalent (Rousseau et al., 2015).

Figure 1 provides a visualisation of Burkina Faso's Shea value chain.

3 US tons converted to metric tonnes.

Figure 1: Burkina Faso Shea value chain



Source: Adapted from ITC and EIF (2015).

Given the confidential nature of market-sensitive information and the way it is handled by industries, it is difficult to obtain reliable statistics for the international Shea market, especially for the food industries (Carney and Elias, 2006). Nevertheless, it is estimated that 90% of total Shea exports from West Africa go to cocoa butter equivalent manufacturers, mainly in Western Europe; the cosmetic and pharmaceutical industries absorb the remaining share (Rousseau et al., 2015). European Union (EU) Directive 2000/36/EC, which applies to cocoa and chocolate products and to general provisions related to food labelling, might have had an effect on its sale within the food industry. For certain products, the directive determines the minimum percentage of cocoa butter as well as the possible use of vegetable fat such as palm oil, Shea butter or coconut oil, not exceeding 5% of the finished product (EDES, 2012). New markets such as Eastern Europe, Russia, Brazil and Oceania, and the aforementioned North American market, contribute to the growth of the cocoa butter equivalent industry (Rousseau et al., 2015).

“It is estimated that 90% of total Shea exports from West Africa go to cocoa butter equivalent manufacturers, mainly in Western Europe”

Shea value chain stakeholder map

A stakeholder map for the Burkina Faso Shea value chain was developed using a four-step approach:

1. identification of stakeholders relevant to Burkina Faso's Shea value chain through semi-structured interviews and desk-based research;

2. analysis of the role and type of each stakeholder within the Shea value chain and clustering of findings accordingly;
3. determination of the involvement of each stakeholder in Burkina Faso's Shea value chain and ranking accordingly;
4. classification of the geographical scope of each stakeholder within Burkina Faso's Shea value chain (local/domestic, international).

Tables 1 and 2 below visualise the results of the stakeholder mapping. Four groups of stakeholders were identified and their roles classified along the various steps of the Shea value chain: the private sector (in grey) includes representatives of collectors, processors, traders, transformers, exporters and retailers; the government (in medium blue) includes sector-based ministries; international organisations (in pale blue) include donor agencies, multilateral agencies and certification agencies; and NGOs (in dark blue) include research institutes and associations, such as think-tanks, alliances and community groups.

All stakeholders were divided into categories of: primary stakeholders (Table 1) and supporting stakeholders (Table 2). Primary stakeholders are directly involved in the Shea value chain whereas supporting stakeholders perform an advisory role.

Table 1: Primary stakeholders in the Shea value chain of Burkina Faso

INPUT	COLLECTION (FRUIT)	LOCAL PROCESSING (NUT)	LOCAL SALES (KERNELS)	LOCAL TRADING (KERNELS)	TRANSFORMATION (KERNELS TO BUTTER) IN COUNTRY	DOMESTIC MARKET	EXPORT	TRANSFORMATION (BUTTER INTO PRODUCT) INTERNATIONAL	INTERNATIONAL MARKET
Table Filière Karité (TFK)									
Ministry of Industry, Commerce and Handicrafts									
Forest owners	Cooperative unions/women's groups; e.g. Karikis, Réseau des Productrices du Beurre de Karité du Houet et des Cascades	Cooperative unions/women's groups	Cooperative unions/women's groups	Cooperative unions/women's group	Cooperative unions/women's groups; e.g. Union des Groupements de Productrices de Produits de Karité	Savonnerie Parfumerie du Houet	Kajed Conseils (kernels)	AAK/Aarhus United	International Food Industry, e.g. confectionery producers
Shea plantation owners				Individual Collectors	Kajed Conseils	Karilor	Karitex Inc. (butter)	Olam	Cosmetic Industry
				TATITA S.a.r.l.			Etablissement Mamounata Velegda (kernels)	LodersCroklaan	L'Oreal
							TATITA S.a.r.l. (kernels)	Fuji Oil/International Oils and Fats	Yves Rocher
							Agro B – Burkina (kernels and butter)	3F Afrique	L'Occitane en Provence
							Perseverance (butter)	Ghana Speciality Fats	OLVEA
							Sorliof S.a.r.l. (kernels and butter)	Fludor	Unilever
							SITAB (butter)	Nioto (transformation of kernels)	
							Société ACM (butter)	Intercontinental Specialty Fats	
							Ecobat (butter)	Zor	
							Devour Creation (butter)	SRC	
							DaboTrade	MaasRefinery	
								Walter Rau	

Table 2: Supporting stakeholders in the Shea value chain of Burkina Faso

INPUT	COLLECTION (FRUIT)	LOCAL PROCESSING (NUT)	LOCAL SALES (KERNELS)	LOCAL TRADING (KERNELS)	TRANSFORMATION (KERNELS TO BUTTER) IN COUNTRY	DOMESTIC MARKET	EXPORT	TRANSFORMATION (BUTTER INTO PRODUCT) INTERNATIONAL	INTERNATIONAL MARKET
Ministry of Women and Gender									
Ministry of the Environment and Sustainable Development									
							UN Women		
ITC									
					Fair Trade USA				
Fairtrade International (Partnership for Prosperity in collaboration with SNV)								Fairtrade International (Partnership for Prosperity in collaboration with SNV)	
USAID West Africa Trade & Investment Hub									
SOS Sahel									
INERA									
CECI					CECI			CECI	
Réseau Karité des Femmes du Burkina									
CNSF									
Tree Aid									
Center for International Forestry Research (CIFOR)									
World Agroforestry Centre									
Global Shea Alliance									
Tamneere									
					CIRAD				
				Projet Karité Conseil Environnement et Développement Durable					



2. CLIMATE RISKS TO THE SHEA VALUE CHAIN

IMAGE: CAROL J.
PIERCE/CIFOR

West Africa and the Sahel are considered climate change hotspots. According to the scientific findings of the Intergovernmental Panel on Climate Change (IPCC), temperatures over West Africa are projected to raise by 3°C to 6°C by 2100, with unprecedented climate conditions occurring by the 2040s (Niang et al., 2014). The rainy season may occur later than usual, resulting in a wetter core. In the long term heavy rainfall may become more frequent over West Africa and the Sahel during May and July. As a result, the suitability of certain terrestrial ecosystems and agro-climatic zones is expected to diminish, with significant impacts on vegetation and crops throughout Africa. However, precipitation changes are extremely uncertain (Niang et al., 2014).

Burkina Faso is already experiencing the impacts of recurrent droughts and floods. The country was hit by severe droughts in 2014 and 2011 that are estimated to have affected 4 million and 2.8 million people, respectively (EM-DAT, n.d.). In 2011, the country experienced reduced and delayed harvests (17% drop) owing to delayed rains and prolonged dry spells (FAO, 2011). In November of the same year, millet prices were 14% higher than they were in November 2010, as a consequence of reduced production generated by the precipitation patterns. Fluvial floods in 2009 and 2010 caused damages to the national economy amounting to \$150 million (FAO, 2011).

There is very little evidence in the literature about the impacts of climate variability and change on Shea production and the value chain. Where studies have been undertaken, they typically focus on small-scale trials in restricted geographic locations not necessarily Burkina Faso (Kakai et al., 2011; Okiror et al., 2012; Platts, 2012). The growth, development and yield from Shea trees is highly context-specific, being controlled by a range of factors such as local climate, soil characteristics, geology and management practices (Boffa et al., 1998); this makes it difficult to make wider inferences about the sensitivity of Shea production to climate variables and hazards.

Stakeholders in Burkina Faso indicate that Shea production and the wider value chain have experienced weather and climate-related disruption in the past. The most significant events recalled include the increasingly irregular distribution of precipitation across the country in recent years, with episodes of scarce rainfall and drought alternating with extreme precipitation causing flooding and soil erosion. As a result of droughts and flooding, Shea harvest is heavily reduced, if not completely lost, through direct damage to tree growth and the production cycle. Strong winds are also often cited as a negative factor, with impacts on both the tree and the

flowers. Overall, stakeholders consider rising average temperatures and heat stress a major threat affecting the productivity of the Shea tree, with evident shifts in seasonality.

Climate-induced shocks to the Shea value chain result in lower-quality and more expensive Shea nuts and butter. Climate shocks on non-diversified economies may be particularly large because of the relative weight of the agriculture sector on the national economy. However, the 'multiplier effect' on the whole economy is limited because of weak inter-sectoral relationships, mainly resulting in a decline in consumer expenditure (Benson and Clay, 1994). The effects of adverse hydro-meteorological events are thus likely to hit the agriculture sector the most, besides causing pervasive negative consequences on human health. Droughts and floods may damage both the quantity and the quality of Shea production as they affect the growth of the tree/fruit and the processing of nuts. When local production is weak, domestic markets respond with rising prices of raw Shea nuts, and inflation propagating all along the value chain up to internationally traded Shea-based commodities. According to interviewees, it is not uncommon to witness the fluctuation of local prices of Shea nuts by approximately 20% between bad years and more productive seasons. Lower availability of good-quality Shea products may translate into a decline in export volumes and eventually a GDP loss, in the face of growing global demand of raw Shea goods.

Climate change is seen as an additional stressor to the already fragile condition of the Shea tree in the country. According to some interviewees, the periodic decline of Shea nut supply and quality is the result of multiple, interlinked factors, with climate change being only one. Some of these key environmental, socioeconomic and cultural dynamics affecting the production of Shea are detailed below.

Shea is still perceived as a spontaneous tree and taboos exist within certain communities, with the planting of Shea associated with death and illness (ITC and EIF, 2015). The long juvenile phase and slow growth of the Shea tree is also a disincentive for producers to plant or replant these trees (Sanou et al., 2004). The regeneration of Shea parklands is difficult because of the low level of managed reforestation. These trees are less frequently cultivated compared with other non-autochthonous species.

“The natural Shea heritage is pressured by the growing population and related energy needs of Burkina Faso”

The low survival rate of young plants represents another challenge for Shea production, as does the long growing season, with abundant water, good resource management and protection against herbivores required. This has prevented the establishment of large-scale nurseries of Shea trees (Sanou et al., 2004).

The natural Shea heritage is pressured by the growing population and related energy needs of Burkina Faso. The wood is used for heating and coal production. Deforestation is another major problem, the natural habitat of the Shea tree is under threat as human activity prioritises alternative land use, such as the extension of road transport networks for the mining sector and agriculture. In particular, agricultural activities and the increasing use of chemical fertilisers and pesticides have led to a drastic reduction of the number of pollinators, essential for the wild Shea tree (Sanou et al., 2004). Mammals and birds that have the ability to transport seeds over long distances are also threatened, resulting in the slow natural spread of Shea seeds and hampering the natural regeneration of Shea parklands.

Long-term extreme and incremental climate-related impacts are insufficiently understood at the country level. Climate change projections for Africa are currently available (Niang et al., 2014), but most interviewees recognise that a key problem is the lack of knowledge about impacts on the agro-forestry sector in general and Shea production specifically. Short-term weather forecasts and seasonal predictions are poorly developed at the country level. Low capacity of the national weather service highlights a broader issue of inadequate forecast capability (mainly because of the lack of basic forecasting infrastructure) and low accuracy of the existing short- and medium-term meteorological data (at the regional scale). Moreover, access to weather information appears to be restricted mostly to the population living in urban areas where TV and the internet are available.

Traditional knowledge helps producers overcome this lack of weather information, but only partially. Interviewees report that Shea collectors and producers can usually estimate the level of production a few months ahead of the harvest based on levels of tree blooming, which is directly connected to the amount of rainfall in the maturation phase. However, they cannot predict if strong winds or other extreme weather events will affect the last stages of the production cycle. Extreme events like those recorded over the past five years had not been seen for 30–50 years previously and so there was little collective memory of coping strategies.

Unable to anticipate adverse climate and weather impacts, communities involved in the Shea value chain manage the risk through reactive, coping mechanisms. These strategies include:

- temporary displacement and request for support from relatives;
- selling of property and animals;

- migration towards urban areas and neighbouring countries where paid work is available; and
- reliance on humanitarian aid from the government and international agencies.

To compensate for the loss of trees to drought, Shea producers move to different areas or change and expand the areas of nut collection from wild trees during the following harvest. This does not address the underlying risks, and can cause further bottlenecks in production at a later stage, for example, in delivery because longer transportation times can affect the value chain as a whole.

Rising demand for Shea products, together with climate change, has increased pressure on natural resources and presents new challenges for women farmers. Degradation, desertification and over-exploitation result in women having to invest more time in finding fuel wood and water to be able to process the Shea nuts. Girls are often taken out of school to collect water or take on responsibilities their mothers do not have time for (Oxfam, 2011). When food is scarce women eat less, despite their physical work, which has health consequences for them and their babies.

Shea production is often a secondary activity for women and a drop in production caused by climate change impacts is less of a concern than it is for other crops (e.g. cereal) that are necessary for subsistence. Nonetheless, the Burkina Faso National Strategy for Sustainable Development of the Shea Sector, published in 2015, recognises the gender dimension of Shea production and promotes the socioeconomic development of Burkina Faso through the recognition of women's role in the growth of the sector (Oxfam, 2011).

Table 3 presents a non-exhaustive summary of key direct and indirect climate change impacts affecting Shea production (quantity and quality) and trade (prices) along the value chain. Climate induced-shocks can affect both domestic and international processes, with consequences for global prices. Some of the most severe impacts of climate change are likely to be on communities engaged in Shea production, rather than the tree itself. For instance, warmer temperatures and increasing water stress may directly affect community health or access to potable water, and play a role in the diffusion of pests and diseases in both plants and humans. These will, in turn, affect the yield and the efficiency of collection, processing and trading of Shea. There may also be consequences for the quality of Shea butter produced, whereas the quality of nuts tend to be affected by variations in rainfall patterns during the growth phase. The processing of nuts is, however negatively affected by an overall reduction in water availability (which is necessary to remove impurities from nuts) and excessive rainfall (where longer drying times are required to remove moisture content of nuts).

“Rising demand for Shea products, together with climate change, has increased pressure on natural resources and presents new challenges for women farmers”

Overall, climate change presents a ‘threat multiplier’ to the Shea value chain, interacting with other non-climate factors characterising the wider Burkinabe environment, economy and society. The Shea tree is considered a vulnerable species but is deemed to be more at risk from human practices than climate change.

Table 3: Climate change impacts chain for the Shea value chain, based on literature review, stakeholder comments and expert judgement

CLIMATE DRIVERS	VALUE CHAIN PHASES	INPUT (TREE)	COLLECTION (FRUIT)	LOCAL PROCESSING (NUT)	LOCAL SALES AND TRADING (KERNELS)	LOCAL TRANSFORMATION PROCESSES (KERNELS TO BUTTER)	DOMESTIC MARKET (BUTTER)	EXPORT	INTERNATIONAL TRANSFORMATION PROCESSES (BUTTER INTO PRODUCT)	INTERNATIONAL MARKET
Temperature		Southward shift of vegetation owing to higher T (Niang et al., 2014)		↑ heat stress on workers		↑ heat stress on workers	Minor impacts			
		Shifts in length of growing period ↓ tree and fruit growth ↓ production quantity	↑ heat stress for outdoor workers ↓ production quantity	↓ efficiency of mechanical/electrical processes ↓ production quality	↑ heat stress on workers ↑ commodity prices due to scarce supply	↓ efficiency of mechanical/electrical processes ↓ production quality				
Rainfall		Southward shift of vegetation due to less precipitation (Niang et al., 2014)					Minor impacts [note: flooding addressed separately below]			
		Flowers drop during heavy rain (Carette et al., 2010) ↓ fruit growth ↓ production quantity	↑ logistical difficulties for outdoor workers (Hatskevich and Essilfie, 2013) ↑ ↓ production quantity	↑ drying time owing to elevated moisture content (Hatskevich and Essilfie, 2013) ↓ production quality						
Winds/Storms		Shifts in length of growing period (Hatskevich and Essilfie, 2013) ↑ tree and fruit growth								
		Flowers drop during high winds (Carette et al., 2010) ↓ fruit growth ↓ production quantity	↑ logistical difficulties for outdoor workers ↓ production quantity	Minor impacts	↑ commodity prices owing to scarce supply	Minor impacts		Disruption to transport and logistics ↓ trade	Minor impacts	↑ commodity prices owing to scarce supply

VALUE CHAIN PHASES	INPUT (TREE)	COLLECTION (FRUIT)	LOCAL PROCESSING (NUT)	LOCAL SALES AND TRADING (KERNELS)	LOCAL TRANSFORMATION PROCESSES (KERNELS TO BUTTER)	DOMESTIC MARKET (BUTTER)	EXPORT	INTERNATIONAL TRANSFORMATION PROCESSES (BUTTER INTO PRODUCT)	INTERNATIONAL MARKET
CLIMATE DRIVERS									
Drought	Wrinkling of the seed or even abortion of shea fruit growth (Carette et al., 2010) ↓ tree and fruit growth (ibid.) ↑ tree mortality (ibid.) ↓ tree regeneration (Boffa et al., 1998) ↓ production quantity	Change/expansion of areas of nuts collection ↑ collection and transportation time ↓ production quantity	↓ processing owing to scarce water for washing ↓ production quality	↑ commodity prices owing to scarce supply	Minor impacts	Butter is significant nutritional contribution to local diets during droughts (Boffa et al., 1998) ↑ commodity prices owing to scarce supply	Minor impacts		↑ commodity prices owing to scarce supply
Flooding	Stress on the tree roots and nuts ↑ eventual tree mortality ↓ production quantity	↓ collection as floods impact local communities' ability to work ↓ production quantity	↓ processing as floods impact local communities' ability to work ↓ production quality	Disruption to transport and logistics ↓ sales and revenues ↑ commodity prices owing to scarce supply	↓ processing as floods impact local communities' ability to work ↓ production quality	Disruption to transport and logistics ↓ trade		Disruption to processes ↓ sales and revenues	↑ commodity prices owing to scarce supply
Wildfire	Damage to flowers, fruits and/or the tree ↓ tree and fruit growth ↓ production quantity	↓ collection as fires impact local communities' ability to work ↓ production quantity	↓ processing as fires impact local communities' ability to work ↓ production quality	↑ commodity prices owing to scarce supply	↓ processing as fires impact local communities' ability to work ↓ production quality	Minor impacts			↑ commodity prices owing to scarce supply
Pests and diseases (plant and human)	Damage to tree, withering of tree parts (Boffa et al., 1998) ↓ tree growth ↑ eventual tree mortality ↓ production quantity	↓ collection as epidemic diseases impact local communities' ability to work ↓ production quantity	↓ processing as epidemic diseases impact local communities' ability to work ↓ production quality	↑ commodity prices owing to scarce supply ↓ trade as epidemic diseases impact local communities' ability to work	↓ processing as epidemic diseases impact local communities' ability to work ↓ production quality	↓ trade as epidemic diseases impact local communities' ability to work		Minor impacts	↑ commodity prices owing to scarce supply

Key: ■ Severe negative impacts ■ Moderate negative impacts ■ Minor negative impacts ■ Positive impacts
 ↑ Increase ↓ Decrease



3. RISK AND ADAPTATION RESPONSES

IMAGE:
OLLIVIER GIRARD/
CIFOR

Adaptation measures are of the utmost importance to counteract the negative effects of climate change in the face of increasing temperatures, higher variability of rainfall and recurrent extreme weather events. While some good practice experiences exist, African countries are typically characterised by low adaptive capacity and reactive, short-term responses by households without adequate government support. Practices to improve the resilience of systems and populations to climate change and other shocks and stresses include safeguarding terrestrial ecosystem services, biodiversity protection and management of natural resources. These can also generate income and therefore have benefits for local development (Niang et al., 2014).

Actions currently undertaken to ensure the sustainability of the Shea production in Burkina Faso may also contribute to managing climate risks, although in some cases little evidence is available regarding their effectiveness in doing so. Agro-forestry management practices, technological research and development, institutional and governance actions and financial support all have the potential to reduce the risks associated with climate change and to help adapt to new climatic conditions. In particular, natural regeneration of local trees and water harvesting are key in the fight against desertification (Niang et al., 2014).

“Natural regeneration of local trees and water harvesting are key in the fight against desertification”

The most common measures to protect existing Shea resources and directly or indirectly increase climate resilience include the following:

1. Shea tree conservation and management

The assisted natural regeneration of Shea trees (e.g. through grafting, crown pruning) can reduce the maturation cycle by 10 years and improve overall crop production performance (Teklehaimanot, 2004). Recent efforts undertaken in Burkina Faso have increased tree density and richness in some locations (Niang et al., 2014). However, there seems to be limited knowledge and experience of good agro-forestry practices. When such practices are performed with inadequate techniques,

they may eventually harm the productivity of the tree. Hot and dry weather conditions, as well as the particular soil composition of the Shea zone in Burkina Faso, represent further technical difficulties to practices such as tree transplantation.

2. Soil conservation and management

Soil fertility is essential for Shea crop production.

Rehabilitation of crusted and degraded soils is often done by farmers through the traditional water harvesting technique of *zai*, or planting pits, which consists of manually digging holes in the soil to concentrate runoff water and organic matter increasing infiltration into the ground. *Zai* has numerous advantages: not only does it respond to requirements for soil conservation, but also it contributes to water conservation as it improves groundwater recharge and to the fight against erosion as it limits the volume of runoff. This practice allows the soil to reacquire its porosity and permeability and increase organic matter over time (Lee and Visscher, 1990). Agricultural yields in certain sites in Burkina Faso have increased thanks to water harvesting practices (Niang et al., 2014).

3. Research and development on the Shea tree

Domestication and isolation of cultivated varieties are needed to adequately maintain the genetic heritage of Shea and improve the quality and consistency of production of almonds over time (ITC and EIF, 2015). Applied research is being carried out by national institutions, such as INERA (Institut de l'Environnement et de Recherches Agricoles) and CNSF (Centre National de Semences Forestières) on technologies

to domesticate the Shea tree, including on obtaining improved Shea tree varieties that are fast-growing and more resistant to the impacts of climate change, as well as on innovative natural regeneration techniques.

4. Certification

International companies trading Shea butter for cosmetic use, such as L'Occitane en Provence, have established multiannual contracts with local suppliers guaranteeing a minimum annual order, which also provide for certification of their products (L'Occitane en Provence, 2013). Certification implies a series of prerequisites and procedures that can contribute to the reduction of deforestation and safeguard of biodiversity. The 'organic' certification, for instance, involves the establishment of Shea parklands within protected areas, sustainable management of the nut collection process, environmentally friendly transformation process, the geographical definition of harvest areas, etc. The 'fair trade' certification, besides providing an additional social component through the price premium paid to producers used for development projects, promotes the minimisation of environmental impacts.

5. Laws on Shea tree protection

The Shea tree is considered an endangered species, and is protected by the National Forestry Code of Burkina Faso and the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). However, local populations often disregard these provisions and the tree continues to be overexploited.

6. Support to local communities

Development agencies provide support to local climate resilience projects and international businesses engaged in trading in Shea butter have been financing local projects through foundations and other private initiatives (e.g. L'Occitane Foundation) focused on the environment and women's empowerment. Such initiatives may benefit the Shea value chain, albeit indirectly, but there is little evidence in the literature. More empirical analysis is needed later on in these projects.

Relevant projects include the following:

- *The Decentralized Forest and Woodland Management Project* (2014–2019), World Bank. This adopts a Reducing Emissions from Deforestation and Forest Degradation (REDD+) approach that integrates climate change adaptation and mitigation into sectoral frameworks, policies, activities and investments. In particular, it aims at strengthening national climate governance and resilience. It also focuses on activities that reduce pressures on forests and woodlands in rural and urban communes in areas outside of targeted classified forest.⁴
- *The Local Forest Communities Support Project* (2015–n/a), World Bank. The goal here is to strengthen the capacity of local communities in targeted regions of Burkina Faso to participate in REDD programmes at all levels. The project also includes a component on developing economic and sustainable natural resource management activities.⁵

4 www.worldbank.org/projects/P143993/fip-decentralized-forest-woodland-management-project?lang=en

5 www.worldbank.org/projects/P149434?lang=en

- *The Agricultural Productivity and Food Security Project* (2009–2018), World Bank. The main goal is to improve poor producers' capacity to increase food production and availability of food products in rural markets. This latter component aims to strengthen the capacities of stakeholders to manage the variability of food supplies at local and national levels and also involves matching grants to producer groups for reducing post-harvest losses.⁶
- *The Third Phase of the Community-Based Rural Development Project and Sustainable Land and Forestry Management Project* (2012–2018), World Bank. The objective is to enhance the capacity of rural communities and decentralised institutions in the implementation of local development plans that promote sustainable land and natural resource management and productive investments at the community level.⁷
- *Programme de Croissance Economique dans le Secteur Agricole* (2013–2018), Danish International Development Agency. A financing scheme, the *fond vert*, is in place to stimulate private investments on environmentally friendly activities, including the sustainable use of resources and the fight against climate change, and to promote inclusive social development (e.g. to finance the development of energy systems reducing the use of wood).⁸
- *Implementing the National Forest Resources Management Programme* (2008–2015), Luxembourg Development

6 www.worldbank.org/projects/P114236/agricultural-productivity-food-security-project?lang=en

7 www.worldbank.org/projects/P129688/third-phase-community-based-rural-development-project?lang=en

8 www.me.bf/fr/content/programme-pcesa

Cooperation.⁹ This programme had the objective of promoting sustainable development through the management of forestry resources and creating a link with the *Second National Forest Inventory Project (2009–2015)*.¹⁰ This project, among other things, allowed for sustainable solutions regarding soil erosion by providing seeds for compensation plantations.

- *Consolidation of the Local Environmental Governance Project (2011–2015)*, Austrian Development Agency and UN Development Programme. The objective of this project was to strengthen the capacity of public and private stakeholders, within the local authorities, to effectively manage the risks and opportunities related to climate change, with a view to accelerating growth and reducing poverty.

⁹ www.lux-development.lu/en/activities/project/BKF/019

¹⁰ www.lux-development.lu/en/activities/project/BKF/015



4. BARRIERS TO EFFECTIVE ADAPTATION

IMAGE:
OLLIVIER GIRARD/
CIFOR

The main obstacles to adopting more proactive approaches to climate risk management are informational and knowledge gaps, institutional and organisational issues within the Shea value chain, the scarcity of financial resources available and a number of cultural factors.

The most common barriers include the following:

1. Highly uncertain climate projections for West Africa, especially rainfall projections

Despite recent improvements, climate models have limited capacity to predict West Africa's climate (FAO, 2008), particularly

precipitation patterns, and the latest IPCC projections for West Africa have a high degree of uncertainty (Niang et al., 2014). This is partly because of the limited number of weather and climate observation networks at the local level. In 2008, only 1.5% of West Africa had an adequate number of rainfall stations that could be used to measure precipitation data; agro-pastoral areas were among the worst connected in this regard (FAO, 2008).

2. Lack of agro-meteorology and climate data, poor quality of existing data and scarce access to information

Weather data is needed on a daily/weekly/seasonal basis for the agriculture and forestry sectors to assist the involved communities in monitoring a multiplicity of aspects (e.g. pests, crop infections, fire danger levels and water availability), as well as to provide information for research applications (e.g. to run crops and yield assessment and forecasting models). However, neither the sharing of information nor the quality of the shared material is adequate. The data gap especially affects the implementation of early warning systems based on hydro-meteorological data, as weather forecasting is not adequately developed in Burkina Faso.

3. Lack of technical capacity to implement good practices and existing policy instruments

There is very limited knowledge and training within communities on good forestry practices and nut collection techniques (Sanou et al., 2004). Lack of forest officers to train and educate local farmers has affected the adoption of new grafting techniques and resource management activities. Furthermore,

national and international laws that protect Shea trees are not consistently applied, owing to lack of knowledge of these laws. Technical information is often not adapted to – or shared with – targeted communities (ITC and EIF, 2015).

4. Lack of investment in environmental sustainability and climate resilience of the Shea value chain

Adaptation activities to respond to major changes like soil erosion are underfunded in Burkina Faso. There is also a reported lack of material (e.g. machines) and immaterial investments (e.g. marketing), as well as financing to improve the transformation process and add commercial value to the final product.

5. Lack of awareness on environmental sustainability, climate change impacts and adaptation

Limited understanding of the overall value of Shea tree as a trade and food resource among the population inhibits action to safeguard the resource. Furthermore, producers/collectors are not sufficiently informed and aware of climate change impacts and potential adaptation options.

6. Land property rights hamper the good management of Shea trees

Men own the land on which Shea trees grow, but it is women who are primarily engaged in Shea production. When Shea trees are located in a forest that is state property, women require a permit to access the forest and collect the fruits. It is difficult

for women to engage with other stakeholders in the value chain to take actions that safeguard these resources.

7. Institutional complexity within the value chain

The Shea value chain is not considered to be effectively organised, particularly from the perspective of foreign investors. The traditional organisation of Shea traders based on a complex hierarchical structure of intermediaries has proved particularly impenetrable to change over time (Rousseau et al., 2015). The vertical and horizontal coordination mechanisms in place between wholesalers (including the creation of *interprofessions* such as TFK) are considered part of their strength; these help the regional supply system cope with globalisation. While there are attempts by international brands in the cosmetic sector to restructure the Shea value chain towards direct sourcing to obtain higher quality standards and certification from producers, some argue the role of intermediaries is useful to create value at both local and national level (Rousseau et al., 2015). Direct procurement would also allow for direct support and enhanced economic resilience of women's groups engaged in the production of Shea.¹¹

¹¹ Companies such as L'Occitane en Provence are contributing to a rapid change in the Shea value chain in Burkina Faso, by buying the butter from women's groups or sourcing the nuts from manufacturers whose products come from women's groups. However, this arrangement is limited to the Shea cosmetic industry.



5. RESILIENCE OPPORTUNITIES OF SHEA

IMAGE:
OLLIVIER GIRARD/
CIFOR

Intrinsic resilience of the Shea tree and crop diversification

The Shea tree is largely tolerant to a range of climate variables and, rather than being considered a receptor for climate change risks (as with cocoa (Anim-Kwapong and Frimpong, 2010)), it has the potential to withstand a changing climate. The Shea's genetic diversity (Teklehaimanot, 2004) means it has intrinsic resilience. In fact, high genetic diversity in general corresponds to ecological niche breadth, thus to more resistance to variations in environmental conditions, more rapid adaptation to climate change and increased future options for food security (Biodiversa, 2014; FAO, n.d.). The Shea tree is also important in improving soil fertility, as the husks of the seeds make a good

mulch and fertiliser, and its fruits attract animals and insects (Orwa et al., 2009). It thus contributes to overall biodiversity, providing the optimal habitat conditions for other species to grow and proliferate and fulfil a range of ecosystem functions (Teklehaimanot, 2004). This biodiversity of species permits a broader spectrum of responses to human landscape modification and enhances the resilience of ecosystems (Lin, 2011). Some trees, including Shea, cashew and mango, also have the ability to achieve carbon sequestration and could therefore generate an income through carbon trading under international mechanisms such as REDD+ (Mathur et al., 2012).

“Crop diversification is an important resilience strategy for agro-ecosystems and is needed to maintain ecosystem functioning”

Crop diversification is an important resilience strategy for agro-ecosystems and is needed to maintain ecosystem functioning (Lin, 2011). Some crops have proven less adaptable to new climatic conditions, including modern bred high-yield cultivars such as certain species of sorghum and millet, which are highly vulnerable to climate change. A 2013 study showed negative millet and sorghum yield impacts in the Sudanian region (southern Senegal, Mali, Burkina Faso, northern Togo and Benin) of up to -41% for +6°C/-20% rainfall (Sultan et al., 2013). Cotton is also very sensitive to water availability, even though it has considerable resilience to high temperatures (ITC, 2011). Cashew trees on the other hand are quite strong plants and particularly resistant to drought (Dorthe, 2003); they can contribute to soil conservation, soil fertility and water quality preservation. In fact,

cashew, as a non-autochthonous species, is acknowledged to have been first introduced in Burkina Faso for the purpose of soil conservation, not for the production of cashew nuts itself (AfDB, n.d.).

As biodiversity boosters, Shea in combination with other horticultural plants and crops suitable for the region could hold the key to a sustainable yield of these products. Crop diversification can occur in many forms (genetic variety, species, structural) and over different spatial levels (within crop, within field, landscape level) and temporal scales, and producers can select the options and crop combinations that best fit the economic and social priorities of the Burkinabe people and government (Lin, 2011).

A new policy vision

The National Strategy for Sustainable Development of the Shea Sector provides the policy framework for stakeholders engaged in the Shea value chain to build climate resilience in Burkina Faso. The policy document containing the strategy (ITC and EIF, 2015), adopted in June 2015,¹² sets out clear priorities to respond to the growing international demand for Shea products, while taking into account the socioeconomic and environmental impacts of the value chain at the national level. It was elaborated as a joint ministerial effort, through a comprehensive and participatory process involving all relevant stakeholders in the country for a shared vision on the Shea resource.

The general objective of the strategy is to contribute to increased income and food security of populations through

¹² Although adopted, this policy is not widely available, however Acclimatise was able to secure a copy for this research.

sustainable management of the Shea tree and the valorisation of Shea products. While the main focus is on expanding the commercial value of the Shea sector and exploiting its full potential, the strategy recognises the environmental co-benefits of Shea trade, the overall contribution Shea makes to the resilience of rural communities and new market opportunities.

Among the main challenges to tackle, the strategy includes the **conservation of the Shea resources**. In doing so, it aims to slow down and even reverse the depletion of the existing Shea parklands. In doing so, it identifies a number of key activities that are intended to improve the environmental impact of the Shea value chain, promote environmental protection, and enable rural populations to cope with climate change. These include the following (ITC and EIF, 2015):

- raise awareness among rural people on grafting and other good forestry practices to rejuvenate the Shea population on community and private lands;
- define community management plans of Shea parklands, which allow the implementation of reforestation and conservation projects;
- value the beneficial interdependence with other species of drought-resistant trees such as baobab;
- educate community groups on how to create a 'zero carbon' chain;
- develop technologies and skills to improve stoves that reduce energy demand in the sector;
- develop the technologies and skills concerning the recycling of waste (Shea cakes) from Shea production in order to develop it as an efficient energy source;

- develop and implement the development of agro and eco-tourism around the production of Shea butter, to create additional sources of revenue and new markets for rural producers;
- integrate alternative energy sources (biomass and solar) outside the network to reduce carbon emissions in the processing of Shea; and
- value environmental services such as UN-REDD and compensate farmers for environmental services, such as planting Shea trees.

Furthermore, the strategy acknowledges making **structural and institutional transformations of the Shea value chain** among its crucial challenges, to improve the overall value chain's performance. Here, a number of significant aspects of resilience are also addressed, including economic diversification through the development of the tourism sector in cultural and community areas linked to Shea, as well as diversification within the agriculture and forestry sector involving the expansion of income-generating activities associated with non-timber forest products other than Shea (e.g. trees such as Néré, Baobab, Moringa, Saba, and Balanite, but also honey, mushrooms, edible insects, rattan and ornamental plants). The importance of enhancing the certification system for Shea products and improving the general awareness of the benefits of this commercial practice on gender, health and the environment is recognised. Also, there is merit in strengthening the link between research and development and the management and expansion of Shea parklands.

Another challenge with significant repercussions on the economic and environmental resilience of the Shea value chain is **social development and equity**, in relation to the role of women. While the fundamental institutional structure of the Shea value

chain, based on intermediaries, is not questioned in the strategy, there is a growing focus on the risk of women being marginalised in an evolving and industrialised system dominated by men. In light of their multiple functions, supporting community services, education, health and the environment, there is an emphasis on a strong and equitable participation of women in the sustainable development of the Shea value chain.

The strategy is structured around five main Strategic Areas as shown in Figure 2.

Figure 2: Five Strategic Areas of the National Strategy for Sustainable Development of the Shea Sector

- 1 Increased volumes of almonds produced by sustainable resource management, protection of the environment, and improved accessibility to production areas
- 2 Professionalization of direct and indirect stakeholders in the sector, by strengthening their capacity and ensuring equity between them
- 3 Value creation by improving the quality and product development as well as research and development (R&D)
- 4 Development of the sector in a favourable business environment, benefiting from supportive policies
- 5 Development of an effective presence in target markets through improved promotion of the sector and a better understanding of trends and market demands

Source: ITC and EIF (2015).

Under each Strategic Area, a series of practical actions are envisaged. For example, Table 4 provides an overview of the win-win measures aimed to boost production and safeguard the environment under Strategic Area 1. These include measures to alleviate dependence on firewood and also to promote a new rural economy built on the valorisation of waste, the promotion and exploitation of non-timber forest products and alternative energy sources, as well as the enforcement of existing regulations on Shea tree protection.

In summary, the strategy addresses many of the barriers identified by stakeholders interviewed for this report, including the lack of technical capacity to implement good practices and existing policy instruments, the lack of awareness on environmental sustainability and climate resilience, the poor level of structural and infrastructural investment as well as cultural and institutional challenges within the Shea value chain. With one notable exception: the substantial gap in reliable climatological and hydro-meteorological data and information necessary for planning agricultural and forestry measures in advance, which represents a potential obstacle to effective climate risk management and to the overall sustainability of the strategy, seems to be neglected altogether.

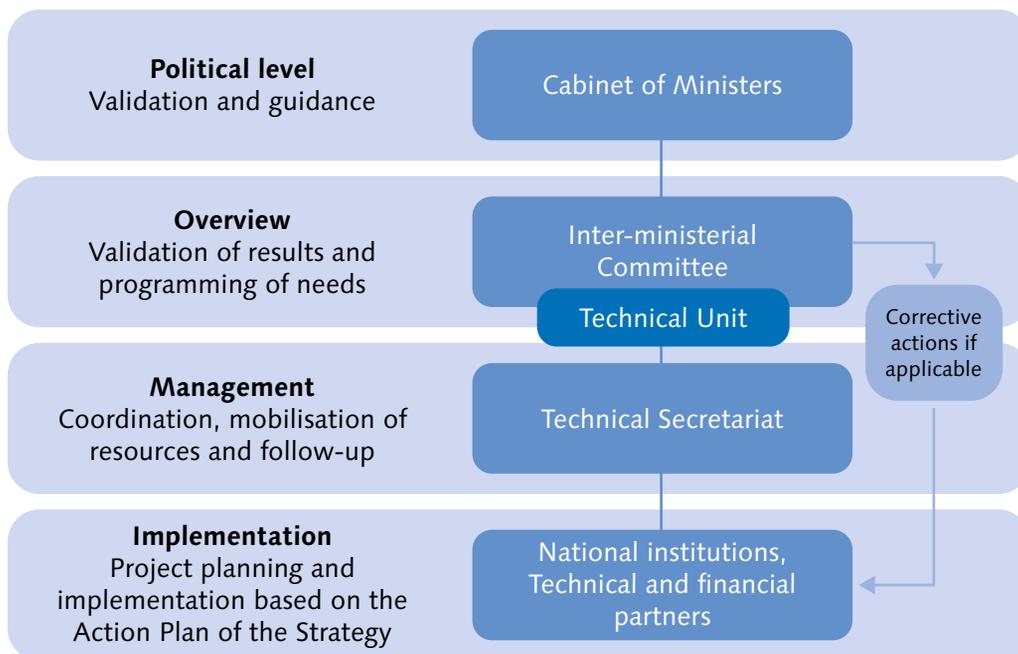
Table 4: Actions under Strategic Area 1 of the National Strategy for Sustainable Development of the Shea Sector, with associated types of actions and barriers addressed

STRATEGIC AREA 1 INCREASED VOLUMES OF ALMONDS PRODUCED THROUGH SUSTAINABLE MANAGEMENT OF THE RESOURCE, PROTECTION OF THE ENVIRONMENT AND AN IMPROVED ACCESSIBILITY TO PRODUCTION AREAS		
Type of actions implied	Proposed measures to slow down or even reverse the process of degradation of the Shea parklands	Main barriers addressed
Informational Technical	Protection and regeneration of the national Shea Parklands	Lack of awareness on environmental sustainability, climate change impacts and adaptation Lack of technical capacity to implement good practices and existing policy instruments
Informational Technical	Promoting good forestry practices in the Shea sector	Lack of technical capacity to implement good practices and existing policy instruments
Technical Informational Institutional	Support to the creation of professional Shea orchards	Lack of technical capacity to implement good practices and existing policy instruments
Informational Technical	Strengthening of applied research for the production of Shea butter	Lack of awareness on environmental sustainability, climate change impacts and adaptation Lack of investments in Shea value chain to improve environmental sustainability and climate resilience
Informational Institutional Governance	Strengthening the enforcement of regulations on the protection of trees	Cultural challenge of land property rights hampering the good management of Shea trees Lack of technical capacity to implement good practices and existing policy instruments
Financial Technical Institutional	Development of income-generating activities in the Shea production areas	Lack of investments in Shea value chain to improve environmental sustainability and climate resilience
Informational Technical Financial	Promotion of energy efficiency in the sector	Lack of investments in Shea value chain to improve environmental sustainability and climate resilience
Technical Financial	Development of rural roads in areas of major production	Lack of investments in Shea value chain to improve environmental sustainability and climate resilience
Informational Technical	Improving pollination of Shea flowers	Lack of technical capacity to implement good practices and existing policy instruments

The strategy's implementation is based on a detailed action plan over the period 2015–2019 (ITC and EIF, 2015 a). In order to provide guidance and management, a governance structure was set up as shown in Figure 3. Under the political guidance of the Cabinet of Ministers, the Inter-ministerial Committee is responsible for coordinating the strategy and facilitating public-private partnership with the support of a Technical Unit. A Technical Secretariat provided by the Directorate General for Trade periodically reports to the Committee, and serves as the link with national institutions and technical and financial partners for the actual implementation.

Public administrations, local authorities, NGOs, research institutions, the private sector, international donors, and all the relevant stakeholders have a general mandate to support the sector, and a specific mandate for implementing the strategy is clearly identified in the action plan. TFK, as primary representative of all the actors operating within the Shea value chain, will be strongly involved in the coordination and implementation of the strategy (ITC and EIF, 2015).

Figure 3: Governance structure for implementation of the National Strategy for Sustainable Development of the Shea Sector



Source: ITC and EIF (2015).



6. POLICY GAPS AND RECOMMENDATIONS

IMAGE:
JONATHAN ERNST/
WORLD BANK

Recommendation 1: Pursue economic diversification in the country by reducing reliance on climate-sensitive sectors such as agriculture

The economy of Burkina Faso remains relatively undiversified and is strongly driven by the climate-sensitive agriculture sector (African Development Fund, 2011). A highly diversified export basket with a more varied mix of agricultural and manufactured products (Kaminski, 2011) and higher productivity are important to enhance Burkina Faso's competitiveness and reduce its vulnerability to external shocks (World Bank, 2010), including those caused by a changing climate. Economic diversification is a core element of sustainable development and could improve

overall long-term economic resilience by reducing poverty and generating employment (UNFCCC, n.d.).

Recommendation 2: Develop income-generating activities associated with Shea and expand existing agriculture and forestry sector by promoting adaptation measures that increase resilience, such as crop diversification

The development of the agro- and eco-tourism industry linked to Shea butter production has the potential to diversify income-generating activities. However, tourism is also a typical climate-sensitive sector and can involve risks. Diversification within the rural sector helps increase adaptive capacity of farmers at the local level. Shea, in combination with other suitable crops, could be central to the sustainability of the agriculture and forestry sector over time.

Recommendation 3: Prioritize the design and implementation of win-win measures such as natural resource management and biodiversity protection

The conservation of the Shea resources is vital to the economic, social and environmental/climate resilience of vulnerable groups such as women and children in rural communities involved in the Shea value chain. Particular efforts should be made to pursue low-regret measures that are beneficial to both economic development and climate change adaptation, such as natural resource management and biodiversity protection.

Recommendation 4: Enhance the role of local NGO in the development of a competitive Shea value chain for a sustainable and equitable economic growth

NGOs are considered primary actors to promote resilience, especially national organisations that are rooted at the community level. According to interviewees, NGOs are key to carrying out education and awareness-raising activities both on the Shea resource and on climate change issues; contributing to reinforcing the commercial capacity of women to get from subsistence farming to entrepreneurship, also using traditional knowledge; and engaging all stakeholders in the sustainable management of Shea, in collaboration with public institutions.

Recommendation 5: Enhance the role of national research centres in the development of a competitive Shea value chain for a sustainable and equitable economic growth

National research centres that are active on applied studies on Shea tree management techniques, are also regarded as essential players in generating adaptive capacity and resilience within the sector. As climate change represents one of the major risks that could hamper the achievement of a sustainable Shea value chain, more efforts are expected to be deployed in research aimed at developing and testing adaptable varieties of Shea tree (ITC and EIF, 2015).

Recommendation 6: Incentivise the involvement of private sector and public-private partnerships in the development of a competitive Shea value chain for a sustainable and equitable economic growth

The private sector has a vital role to play in supporting the creation of enabling environments. International companies are providers of financing for investments aimed at improve productivity and quality of Shea production at all levels of the value chain (e.g. technology for nut transformation, status of roads, planting new Shea orchards). According to interviewees, financing should also be directed to national organisations and research centres to support research and development on the improvement of tree productivity. Adaptation activities to respond to major changes like soil erosion are underfunded in Burkina Faso. There is also a reported lack of material (e.g. machines) and immaterial investments (e.g. marketing), as well as financing to improve the transformation process and add commercial value to the final product.

Recommendation 7: Expand environment-friendly product certification for Shea-related goods

Quality branded manufacturers should also continue to pursue product differentiation through the 'fair trade' and 'bio' certification in order to facilitate the penetration of certain products in niche markets and thus ultimately improve the environmental and social sustainability of the related production.

Recommendation 8: Enable a strong and equitable participation of women in the Shea value chain, including through direct sourcing of Shea products and targeted support

Good governance and enabling environments are fundamental factors that attract private sector investment for market development and technology transfer in developing countries, ultimately contributing to increase economic resilience and adaptive capacity. Restructuring the traditional distribution system towards direct sourcing of Shea products could be a strategic decision to enhance economic resilience of women's groups, in the face of the conservative nature of the Shea value chain itself. Professionalisation and awareness-raising activities aimed at strengthening the participation women in the Shea industry should be given priority.

Recommendation 9: Improve the provision of weather and climate information services and effective early warning systems through the establishment of an adequate observation network

The effective application of climate adaptation and resilience measures needed to make Shea production sustainable requires technical and institutional capacities in addition to high-quality climate data at the appropriate temporal and spatial scale. However, these data are often not available in Burkina Faso, and there is need to strengthen the institutional and technical capacity for economic and climate risk management. International initiatives coordinated by the World Meteorological Organization under the Global Framework on Climate Services, for example, are aimed at improving availability and access to climate-related products and services needed for sustainable agro-forestry measures in developing countries.

References

- Adger, W.N. (2006) 'Vulnerability'. *Global Environmental Change* 16: 268–81.
- AfDB (African Development Bank) (n.d.) 'FIP private sector set-aside: Burkina Faso: climate change mitigation and poverty reduction through the development of the cashew sector'. Project/Programme Concept Note. Tunis: AfDB.
- AfDB (African Development Bank), OECD (Organisation for Economic Co-operation and Development) and UNDP (UN Development Programme) (2015) 'African economic outlook'. Paris: OECD.
- African Development Fund (2011) 'Accelerated growth strategy and business environment support programme: Burkina Faso'. Appraisal Report. Tunis: African Development Fund.
- Allmaier, C. (2014) 'Millennium Challenge Corporation's legacy in Burkina Faso: Secure land rights support Burkinabe agricultural development', CSIS Blog, 14 August (<http://csis.org/blog/mccs-legacy-burkina-faso-secure-land-rights-support-burkinabe-agricultural-development>).
- Anim-Kwapong, G.J. and Frimpong, E.B. (2010) 'Vulnerability of agriculture to climate change: Impact of climate change on cocoa production'. Accra: Cocoa Research Institute of Ghana.
- Bahadur, A., Peters, K., Wilkinson, E., Pichon, F., Gray, K. and Tanner, T. (2015) 'The 3As: Tracking resilience across BRACED'. Working Paper. London: ODI.
- Bila, N.K., Djibo, O., Constant, P. and Sanon, B. (2010) 'Analysis of the cashew value chain in Burkina Faso'. Bonn: African Cashew Initiative.
- Biodiversa (2014) 'Adaptation of trees and forests to climate change: The importance of genetic variability'. Policy Brief.
- Benson, C. and Clay, E. (1994) 'The impact of drought on Sub-Saharan African economies: A preliminary examination'. London: ODI.
- Boffa, J.M. (2015) 'Opportunities and challenges in the improvement of the shea (*Vitellaria paradoxa*) resource and its management'. Occasional Paper 24. Nairobi: World Agroforestry Centre.
- Boffa, J.M., Yaméogo, G., Nikiéma, P. and Knudson, D.M. (1998) 'Shea nut (*Vitellaria paradoxa*) production and collection in agroforestry parklands of Burkina Faso', in FAO (ed.) *Domestication and commercialization of non-timber forest products in agroforestry systems*. Rome: FAO.

- Bup, D.N., Mohagir, A.M., Kapseu, C. and Mouloungui, Z. (2014) 'Oil crops and supply chain in Africa', *OLC Journal* 21(2): D206.
- Carette, C., Malotaux, M., van Leeuwen, M. and Tolkamp, M. (2010) 'Shea nut and butter in Ghana: Opportunities and constraints for local processing', (www.resilience-foundation.nl/docs/shea.pdf).
- Carney, J. and Elias, M. (2006) 'Revealing gendered landscapes: Indigenous female knowledge and agroforestry of African Shea', *Canadian Journal of African Studies* 40(2): 235–67β.
- Chalfin, B. (2004) 'Shea butter republic: State power, global markets, and the making of an indigenous commodity'. Abingdon: Routledge.
- CIRAD (Agricultural Research for Development) (2015) 'Shea butter in Burkina Faso: Less energy for better incomes and a sustainable supply chain'. Paris: CIRAD.
- DFID (Department for International Development) (2011) 'Defining disaster resilience'. DFID Approach Paper. London: DFID.
- Dorthe, J. (2003) 'Information about cashew nut (*anacardium occidentale*)'. Copenhagen: Danida Forest Seed Centre.
- Driessen, P.P.J. and van Rijswijk, H.F.M.W. (2001) 'Normative aspects of climate adaptation policies', *Climate Law* 2(4): 559–81.
- ECOWAS (Economic Community of West African States)-Sahel and West Africa Club (SWAC), OECD (Organisation for Economic Co-operation and Development) and CILSS (Permanent Interstate Committee on Drought in the Sahel) (2008). 'Climate and climate change. The atlas on regional integration in West Africa', (www.atlas-westafrica.org).
- EDES (2012) 'Traceability and labelling – packaging, labelling and marking food products'. Handbook 7.4. Brussels: EDES.
- EM-DAT – The International Disaster Database (n.d.), Country Profile: Burkina Faso – accessed Nov 2015 (www.emdat.be/country_profile/index.html).
- FAO (Food and Agricultural Organization) (n.d.) Harvesting Nature's Diversity – accessed Nov 2015 (www.fao.org/docrep/004/v1430e/V1430E00.htm#TOC).
- FAO (Food and Agricultural Organization) (2008) 'Atlas in regional integration in West Africa'. Rome: FAO.

- FAO (Food and Agricultural Organization) (2011) 'Crop prospects and food situation' 4, December.
- FAO (Food and Agricultural Organization) (2014) 'Burkina Faso: Food and agriculture policy trends'. Country Fact Sheet. Rome: FAO.
- FAO (Food and Agricultural Organization) (2015) 'Introducing a mechanical press for making Shea butter in northern Ghana'. Rome: FAO.
- Goreja, W.G. (2004) 'Shea butter – the nourishing properties of Africa's best-kept natural beauty secret'. New York: Amazing Herbs Press.
- Government of Burkina Faso (2015) 'Burkina Faso national strategy for sustainable development of the Shea sector'. Ouagadougou: Government of Burkina Faso.
- Hatskevich, A. and Essilfie, J.E. (2013) 'Evaluation of the effects of climate changes, GDP growth and cocoa yield and price on Shea nut export in Ghana', *European Scientific Journal* 9(34).
- Hecht, S.B., Morrison, K.D. and Padoch, C. (2014) 'The social lives of forests: Past, present, and future of woodland resurgence'. Chicago, IL: University of Chicago Press.
- Hema, D. (2008) 'Plant breeding and related biotechnology capacity in Burkina Faso'. Rome: Global Partnership Initiative for Plant Breeding Capacity Building, Global Crop Diversity Trust, FAO.
- Höfer, R. (2009) 'Sustainable solutions for modern economies'. Cambridge: Royal Society of Chemistry.
- Ibrahim, B., Karambiri, H., Polcher, J., Yacouba, H. and Ribstein, P. (2014) 'Changes in rainfall regime over Burkina Faso under the climate change conditions simulated by 5 regional climate models', *Climate Dynamics* 42(5): 1363–81.
- ICCO (International Cocoa Organization) (2015) 'Women's voice in shea production Burkina Faso', (www.icco-international.com/int/results/projects/?projectID=1120).
- IPGRI (International Plant Generic Resources Institute (IPGRI) (2006) 'Descriptors for Shea tree (*Vitellaria paradoxa*)'. Rome: IPGRI.
- ITC (International Trade Centre) (2011) 'Cotton and climate change impacts and options to mitigate and adapt'. Technical Paper. Geneva: ITC.

- ITC (International Trade Centre) and EIF (Enhanced Integrated Framework) (2015) 'Stratégie nationale de développement durable de la filière karité, 2015–2019'. Ouagadougou: ITC and EIF.
- ITC (International Trade Centre) and EIF (Enhanced Integrated Framework) (2015 a) 'Plan d'actions de la Stratégie nationale de développement durable de la filière karité 2015 – 2019'. Ouagadougou: ITC and EIF.
- Kakaï, R.G., Akpona, T.J.D., Assogbadjo, A.E., Gaoué, O.G., Chakeredza, S., Gnanglè, P.C., Mensah, G.A. and Sinsin, B. (2011) 'Ecological adaptation of the shea butter tree (*Vitellaria paradoxa* C.F. Gaertn.) along climatic gradient in Bénin (West Africa)', *African Journal of Ecology* 49(4): 440–49.
- Kaminski, J. (2011) 'Cotton dependence in Burkina Faso: Constraints and opportunities for balanced growth', in P. Chuhan-Pole and M. Angwafo (eds.) *Yes, Africa can: Success stories from a dynamic continent*. Washington, DC: World Bank.
- Konaté, L. (2012) 'Creating competitive market models Burkina Faso: The case of Nununa Women's Shea Butter Federation'. Case Study. The Hague: SNV.
- Lee, M.D. and Visscher, J.T. (1990) 'Water harvesting in five African countries'. Occasional Paper 14. Geneva: IRC.
- Lenhardt, A., Glennie, J., Intscher, N. and Ali, A. with Morin, G. (2014) 'A greener Burkina – sustainable farming techniques, land reclamation and improved livelihoods'. Case Study Report. London: ODI.
- Lin, B.B. (2011) 'Resilience in agriculture through crop diversification: Adaptive management for environmental change'. *BioScience* 61(3): 183–93.
- L'Occitane en Provence (2013) 'The fair trade Shea butter supply chain'. 2013 Report.
- Niang, I., Ruppel, O.C., Abdrabo, M.A., Essel, A., Lennard, C., Padgham, J. and Urquhart, P. (2014) 'Africa', in V.R. Barros, C.B. Field, D.J. Dokken, M.D. Mastrandrea, K.J. Mach, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea and L.L. White (eds) 'Climate change 2014: Impacts, adaptation, and vulnerability. Part B: Regional aspects. Contribution of Working Group II to the Fifth Assessment Report of the IPCC'. Cambridge and New York: Cambridge University.

- Mathur, P.N., Ramirez-Villegas, J. and Jarvis, A. (2012) 'The impacts of climate change on tropical and sub-tropical horticultural production', *Tropical Fruit Tree Species and Climate Change* 27.
- Okiror, P., Agea, J.G., Okia, C.A. and Okullo, J.B.L. (2012) 'On-farm management of *Vitellaria paradoxa* C. F. Gaertn. in Amuria district, Eastern Uganda', *International Journal of Forestry Research* ID 768946.
- Orwa, C., Mutua, A., Kindt, R., Jamnadass, R. and Anthony, S. (2009), *Agroforestry Database: A tree reference and selection guide version 4.0*. Nairobi: World Agroforestry Centre.
- Oxfam (2011) 'Climate change and women farmers in Burkina Faso – impact and adaptation policies and practices'. Oxford: Oxfam.
- Platts, P.J., Poudyal, M. and McClean, C.J. (2010) 'Modelling Shea under climate scenarios'. Report for INNOVKAR Work Package 2. York: University of York.
- Rousseau, K., Gautier, D. and Wardell, A.D. (2015) 'Coping with the upheavals of globalization in the Shea value chain: The maintenance and relevance of upstream Shea nut supply chain organization in western Burkina Faso', *World Development* 66: 413–27.
- Sanou, H., Kambou, S., Teklehaimanot, Z., Dembélé, M., Yossi, H., Sina, S., Djingdia, L. and Bouvet, J. (2004) 'Vegetative propagation of *Vitellaria paradoxa* by grafting', *Agroforestry Systems* 60(1): 93–99.
- Sarr, B. (2012) 'Present and future climate change in the semi-arid region of West Africa: A crucial input for practical adaptation in agriculture', *Atmospheric Science Letters* 13: 108–12.
- SNV Ghana (2013) 'Behind the butter: An energy analysis of Shea butter processing', (www.youtube.com/watch?v=cUZK_IJ-Mxl).
- Sultan, B. Roudier, P., Quirion, P., Alhassane, A., Muller, B., Dingkuhn, M., Ciais, P., Guimberteau, M., Traoré, S.B. and Baron, C. (2013) 'Assessing climate change impacts on sorghum and millet yields in the Sudanian and Sahelian savannas of West Africa', *Environmental Research Letters* 8(1): doi:10.1088/17489326/8/1/ 014040.
- Teklehaimanot, Z. (2004) 'Exploiting the potential of indigenous agroforestry trees: *Parkia biglobosa* and *Vitellaria paradoxa* in sub-Saharan Africa', *New Vistas in Agroforestry* 1: 207–20.

- The Statistics Portal (2015) 'Expected growth of chocolate confectionery consumption until 2015, by country', (www.statista.com/statistics/238993/expected-growth-of-chocolate-confectionery-consumption-by-country/).
- UNFCCC (United Nations Framework Convention on Climate Change) (n.d.) 'Risk management approaches to address adverse effects of climate change – Economic diversification' (http://unfccc.int/cooperation_support/response_measures/items/5003.php#ag).
- USDA (US Department of Agriculture) (2015) 'Gain report, 2015 West Africa cotton and products'. Washington, DC: USDA.
- US DOC (US Department of Commerce) (2014) 'Doing business in Burkina Faso: 2014 country commercial guide for U.S. companies'. Washington, DC: US DOC.
- Vayssières, J.F., Coulibaly, O., Sinzogan, A.A.C., Adandonon, A., Dakouo, D., Dabire, R.A. and Ouedraogo, S.N. (2012) 'Mango cultivation in Burkina Faso', in S.G. Valavi, K. Rajmohan, J.N. Govil and G. Thottappilly (eds) Cultivation in different countries. Houston: Studium Press LLC.
- WFP (World Food Programme) (2015) 'Brief. Reporting period: 01 July–30 September 2015'. Ouagadougou: WFP.
- World Bank (2009) 'World development indicators', (<http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators>).
- World Bank (2010) 'Burkina Faso – promoting growth, competitiveness and diversification'. Country Economic Memorandum, Volume 1. Washington, DC: World Bank.
- World Bank (2011) 'Country note on disaster risk management and adaptation to climate change: Burkina Faso'. Washington, DC: World Bank.
- World Bank (2015) 'Country: Burkina Faso – overview', (www.worldbank.org/en/country/burkinafaso/overview).

Appendix 1: List of interviewed stakeholders

ORGANISATION	LOCATION	NAME, SURNAME	POSITION IN THE ORGANISATION
CNSF	Burkina Faso	Sié Kambou	Researcher, R&D
GSA	Ghana	Joseph Funt	Managing Director
INERA	Burkina Faso	Brigitte Bastide	Researcher and National Officer
Laboratoires M&L (L'Occitane en Provence)	France	Justine Humbert	Sustainable Value Chain Services
Programme de Croissance Economique dans le Secteur Agricole	Burkina Faso	Jean Baptiste Zoma	Project Coordinator
Self Help Africa	Burkina Faso	Georges Bazongo	Agricultural Advisor
TFK	Burkina Faso	Dékouwin Magloire Hien	Permanent Secretary
TREE AID Enterprise	Burkina Faso	Yacouba Traoré	Director of Trade
Welthungerhilfe	Burkina Faso	Erik Dirkx	Director Procurement and Logistics

BRACED aims to build the resilience of more than 5 million vulnerable people against climate extremes and disasters. It does so through a three year, UK Government funded programme, which supports 108 organisations, working in 15 consortiums, across 13 countries in East Africa, the Sahel and Southeast Asia. Uniquely, BRACED also has a Knowledge Manager consortium.

The Knowledge Manager consortium is led by the Overseas Development Institute and includes the Red Cross Red Crescent Climate Centre, the Asian Disaster Preparedness Centre, ENDA Energie, ITAD, Thompson Reuters Foundation and the University of Nairobi.

The views presented in this paper are those of the author(s) and do not necessarily represent the views of BRACED, its partners or donor.

Readers are encouraged to reproduce material from BRACED Knowledge Manager Reports for their own publications, as long as they are not being sold commercially. As copyright holder, the BRACED programme requests due acknowledgement and a copy of the publication. For online use, we ask readers to link to the original resource on the BRACED website.

The BRACED Knowledge Manager generates evidence and learning on resilience and adaptation in partnership with the BRACED projects and the wider resilience community. It gathers robust evidence of what works to strengthen resilience to climate extremes and disasters, and initiates and supports processes to ensure that evidence is put into use in policy and programmes. The Knowledge Manager also fosters partnerships to amplify the impact of new evidence and learning, in order to significantly improve levels of resilience in poor and vulnerable countries and communities around the world.

Published May 2016

- Website: www.braced.org
- 🐦 Twitter: [@bebraced](https://twitter.com/bebraced)
- 📘 Facebook: www.facebook.com/bracedforclimatechange

Cover image: Andrew McConnell

Designed and typeset by Soapbox, www.soapbox.co.uk



ACCLIMATISE
building climate resilience