

Chapter 3. The Bogo landscape in Cameroon drylands: contribution of local communities to adaptive management

Marie-Laure Mpeck Nyemeck, Aimé Kamga Fogue, Mesmin Tchindjang, Martin Zeh-Nlo

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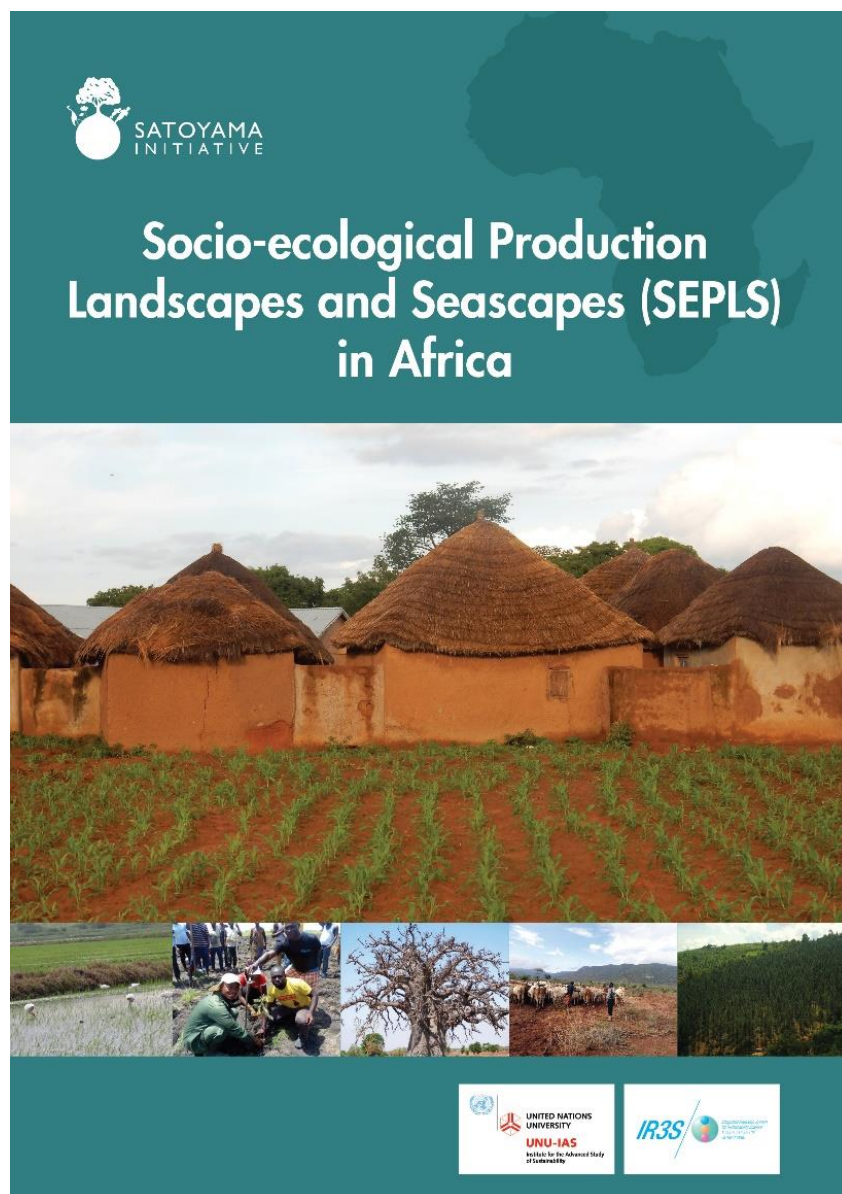
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CHAPTER 3: CAMEROON

The Bogo landscape in Cameroon drylands: contribution of local communities to adaptive management

***¹Marie-Laure Mpeck Nyemeck, ¹Aimé Kamga Fogue, ²Mesmin Tchindjang, ³Martin Zeh-Nlo**

¹GEF SGP/COMDEKS Cameroon, C/o UNDP Cameroon, P.O. Box 836 Yaounde, Cameroon

²University of Yaoundé I, P.O. Box 30464 Yaounde, Cameroon

³United Nations Development Programme (UNDP), P.O. Box 836 Yaounde, Cameroon

*Email address: marie-laure.mpeck@undp.org

Summary

The Bogo landscape is unique in the Cameroon Sahelian region. It is endowed with diverse natural resources with agricultural systems, rich alluvial soils (despite the dry climate), and a diversified pasture and cultural system, which is conducive to tourism and provides a solid foundation for economic activities and sustainable development. The main environmental and social challenges associated with the landscape are linked to food insecurity resulting from climate variability and soil degradation; unsustainable agricultural and forestry practices that lead to soil erosion and crusting; a lack of sustainable livelihood options and women empowerment; recurrent health issues linked to a lack of clean drinking water and occurrence of extreme weather events; widespread poverty; and weak institutional capacity to support conservation and production. To promote healthy socio-ecological production systems for biodiversity conservation while satisfying the socio-economic needs of landscape dwellers, a participatory transformative strategy was developed with the long-term objective of improving the socio-ecological production and resilience of the landscape through community-based activities. With this aim, seven projects have been funded and implemented within the Bogo landscape to increase resilience through raising environmental awareness, improving access to water and alternative sources of energy, promoting sustainable agriculture and agroforestry practices, and improving stakeholder engagement in environmental governance.

Keywords: Bogo landscape, Drylands, SEPLS indicators, Adaptive management, Local communities

3.1 Background to the Bogo landscape

Located in the Sahelian zone of Cameroon, Bogo represents a socio-ecological production landscape (SEPL) for the Community Development and Knowledge Management for the Satoyama Initiative (COMDEKS) program in Cameroon. Administratively belonging to the Diamaré Division in the far northern

region of Cameroon, the Bogo district extends from 10° 35' 05" to 11° 01'30" N and from 14°30' 00" to 14° 49'39" E. It is bordered by the Dargala district to the southwest, by the Maga district in the northeast, by Petté and the Maroua III municipality in the north, and by the Moulvouday district in the southeast (**Figure 1**). The district covers an area of 93,000 ha with a population of 95,230 inhabitants, 48% of which live in rural areas (Bureau Central des Recensements et des Etudes de Population 2010).

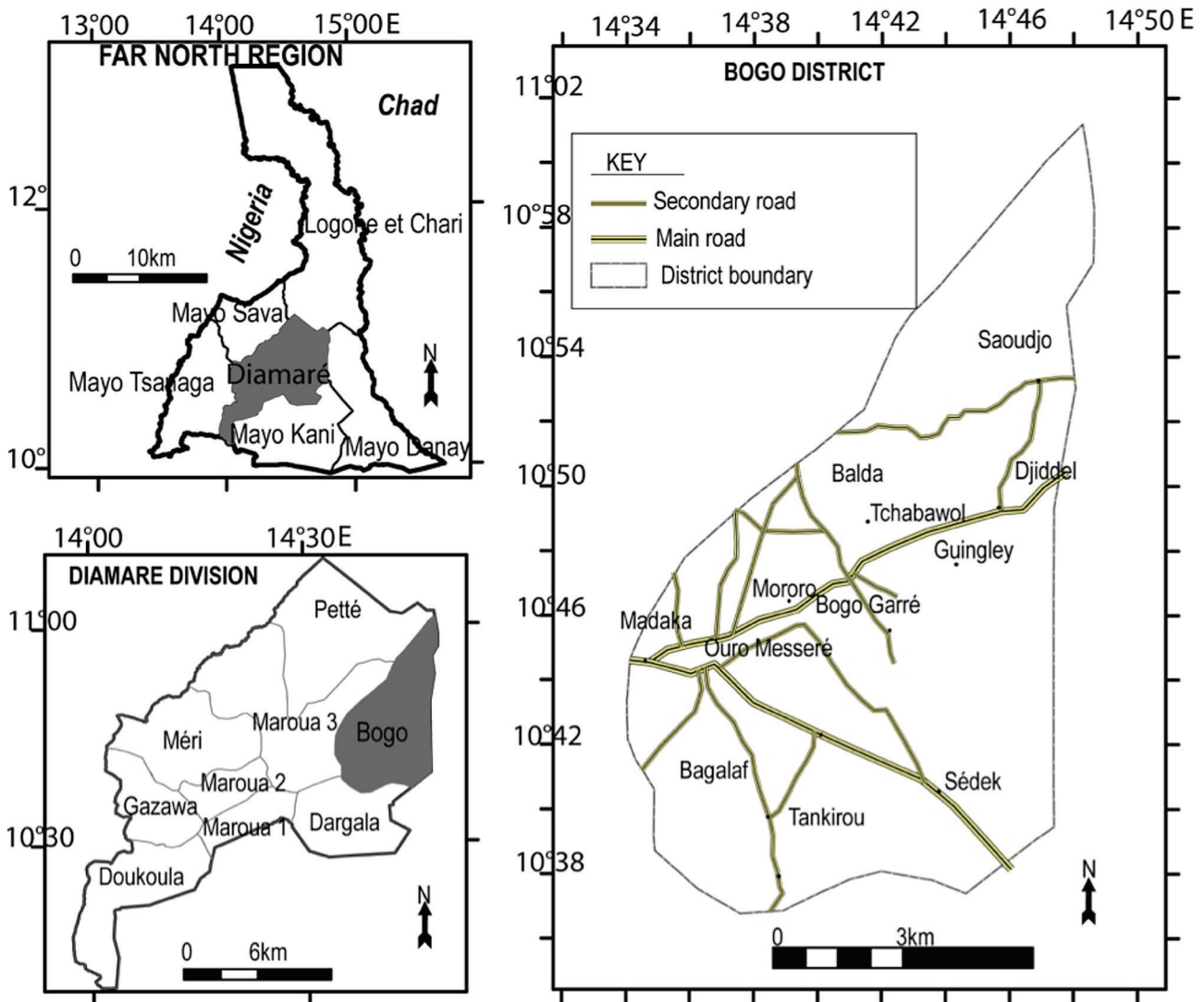


Figure 1: Location map of the Bogo landscape in the Diamaré Division
 Source: SGP/COMDEKS Cameroon Landscape Strategy 2014

The population is composed of 51% men and 49% women, with a density of 102 inhabitants per square kilometer. The district is jointly ruled by an administrative authority (sub-divisional officer) and a traditional authority called the “*Lamido*.” Bogo is made up of twelve cantons, each of which is ruled by a “*Lawan*” and assisted by local neighborhood leaders called “*Djaouros*.”

The Mayo Tsanaga River flows through Bogo and provides freshwater that supports the livelihoods and activities of most of the rural and urban population. The Bogo landscape consists of two major topographic features: 1) a large plain (310–330 m average altitude), which gradually descends towards Lake Chad, and 2) a few hills toward the south western township of Bagalaf (*Hosséré Goboré*, 493 m) and the north western

township of Balda (*Hosséré Balda*, 679 m).

Located within the dry tropics (seven to eight dry months and four to five rainy months/year), Bogo is characterized by a Sahelian climate with a low rainfall regime and one peak (500–700 mm per year), high temperatures (28–35 °C) and low humidity, and swept by hot and dry winds (*Harmattan*). As in the African Sahel, since the early 1970s, this vast plain has faced persistent drought that has resulted in shrinking resources and weakened food security (*Tchindjang et al.* 2015). This Sahelian area hosts two types of landscape plants: 1) thorn-like plants, such *Acacia seyal*, *Acacia nilotica*, *Tamarindus indica*, and *Balanites aegyptiaca*; 2) plants inhabiting periodically flooded prairies called “*Yaérés*.” Some dominant grassland plants such as *Echinochloa stagnina*,

Vetiveria nigritana, *Hyparrhenia rufa*, and *Oryza* spp. (wild rice) are also present.

The Bogo landscape is a unique environment in the Sahelian region as it is endowed with diverse natural resources. The landscape supports agricultural systems due to rich alluvial soils (despite the dry climate), and a diversified pasture and cultural system, which is conducive to tourism and provides a solid foundation for economic activities and sustainable development.

The production system in Bogo, similar to other Sahelian production systems, is heavily dependent on rainfall: food crop production is mostly rainfed, and livestock rearing is through transhumance. Local communities are predominantly composed of farmers and breeders, representing at least 98% of the families. Agriculture, artisanal fishing, hunting, and small businesses constitute the main livelihood activities of these populations, among which more than 50% on average lived below the national poverty threshold during 2011, equating to less than US\$ 1.6/day for an adult (Institut National de la Statistique du Cameroun 2014). Agricultural plots rarely exceed 0.50 ha in size, with land reserved for agroforestry being an exception. Animals are used for farm labor and transportation in this very isolated region. Overall, only 2% of household revenues are generated in the formal sector.

The importance of biodiversity management and building resilient rural communities in socio-ecological production landscapes has increased due to their relevance in supporting key ecosystem functions and the role of biodiversity for the livelihoods of millions of people worldwide. Thus, the conservation of biodiversity involves not only preserving pristine environments but also the natural environments influenced by humans, such as farmland, pastures, and water systems that people have developed and maintained sustainably over centuries.

3.2 Functions and benefits of the Bogo landscape

3.2.1 Biodiversity and ecosystem hotspots

Due to the presence of migratory birds and the “Yaérés” wetlands, Bogo represents a hotspot

of avian biodiversity of national and regional significance, which has received little attention by other parts of Cameroon, and the value of the region through ecotourism remains to be realized. Furthermore, Bogo contains unique natural assets in the Sahel region to facilitate livestock transhumance from Cameroon, Nigeria, Chad, and the Central African Republic. Hence, the important location of Bogo provides ecosystem services, which include:

- i) Integrated agriculture with a mosaic of crops and the use of cattle dung as well as bird droppings as organic fertilizer;
- ii) Transhumance for large herds originating from Chad and transiting to Nigeria (and Niger), which also contributes to milk production potential to sustain local livelihoods;
- iii) Agroforestry through the neem tree (*Azadirachta indica*), *Acacia seyal*, and fruit trees including mango and guava.

At the level of ecosystems services, Bogo forms a mosaic of landscapes combining picturesque hill environments with diverse habitats and high possibilities of intra and inter population gene flows through a diversity of land use patterns, including urban environments (Bogo Garré) and rural (villages and townships) farmlands and rangelands for livestock and transhumance, natural afforested areas, agroforestry plantations of mango and guava trees, periodically flooded meadows, wetlands, and water ponds.

Local agriculture covers a large variety of crop species consumed locally. Included are a variety of cereals, such as sorghum (*Sorghum bicolor*), mouskwari, sesame (*Sesamum indicum*), finger millet (*Eleusine coracana*), millet (*Panicum miliaceum*), corn, rice, groundnuts, cowpea, onions, beans, sweet potato, and tubers such as cassava. Traditional African vegetables are also grown, including okra (*Hibiscus esculentus*), foléré (*Hibiscus sabdariffa*), calabash (*Crescentia cujete*), cucumber (*Cucumis sativus*), melon, squash (*Cucurbita maxima*), eggplant, and tomatoes. Cotton is the only plant farmed on an industrial level, which requires numerous inputs for its cultivation (SGP/COMDEKS Cameroun landscape strategy 2014). Several products, such as cassava, sweet potatoes, and millet are consumed locally as well as sold in rural markets. Seafood and livestock products are also produced, although they are not integrated into urban markets. Agriculture is

generally practiced on clay and alluvial deposits (karal), and sandy or loam soils.

The ability of this landscape to retain water during the dry season explains the abundance and diversity of livestock, including cattle, sheep, goats, donkeys, and horses. Bogo is a popular transhumance zone where animals are used for traction in agricultural work, the practice of night paddock manuring in farming systems, and transportation within the Diamaré plain. Due to the strong local hydrographic network, the Bogo landscape provides a habitat for a diversity of seasonal birds, including cattle egret (*Bubulcus ibis*), intermediate egret (*Egretta intermedia*), African cormorant (*Phalacrocorax africanus*), and egrets (*Egretta ardesiaca*). In addition, guinea fowl (*Numida meleagris*), ducks (*Anas*), and geese (*Anser*) are frequently encountered, and other local wildlife includes wild warthogs (*Phacochoerus africanus*) and hyena (*Crocuta crocuta*). In the Mayo Tsanaga River and floodplain, fishing is promoted, and species such as catfish, *Tilapia sp.*, and carp, are both locally consumed and sold.

3.2.2 Contribution to livelihood sustenance and well-being

The livelihoods and well-being of local communities are predominantly based on agriculture, livestock, and fisheries, and to a lesser extent on small business or small trading activities. Land and property are common household assets in the Bogo landscape. Other current assets include livestock, cash crops such as cotton, food crops, and household appliances such as televisions (mostly in urban areas) or radio sets. Generally, radios are not found in rural communities. The average annual household income lies between US\$ 126 and US\$ 251, indicating that a large number of people live below the poverty line (Institut National de la Statistique du Cameroun 2014).

By virtue of their involvement in the various economic activities, the main actors of the Bogo landscape are farmers, cattle breeders, fishermen, firewood collectors, herbalist healers, traditional authorities (Lamido, Lawanes, and Djaouros), administrative authorities, religious authorities and communities (Muslims and Christians), as well as women, elderly, and youth groups. All these groups are closely dependent on the landscape ecosystem services.

Other elements that contribute to the well-being of communities in the landscape include functional primary schools, health centers, and community drinking water points. Some government infrastructure and services exist, including a sub-divisional office, a city hall, and security and defense forces. The economic sector has been expanding with the presence of the large cattle market at Bogo Garré and microfinance institutions (such as "Express Union," "Credit du Sahel"), which are the only banking services available.

The Bogo SEPL contributes to improve national and local livelihoods through rehabilitation and management of endangered habitats for the conservation and promotion of community development sites. This approach supports the sustainable use of biodiversity through training in the establishment and sustainable management of community development projects. It also contributes to the empowerment of communities in the landscape through the promotion of the micro local economy. The development and promotion of handicrafts, ecotourism, good agricultural and environmental practices, and the promotion of culture and consumption of local medicinal plants are opportunities to improve local livelihoods.

The forest and non-timber products emerging from this landscape result from voluntary reforestation and agroforestry by the communities and serve as the sources for fuel wood and traditional medicines. As an opportunity, it is worth mentioning that very few bush fires (usually intentionally started and controlled as a means for growing fodder) are practiced today, except within the "Yaérés."

Afforestation can be mentioned as another opportunity. Indeed, multidisciplinary studies have attempted to recover the production capacity of "hardés." The latest techniques used appear to have been more successful when implemented through an afforestation program called the "Green Sahel Operation," which was launched by the Ministry of Environment and Nature Protection since 2008. The program consists of removing the first 50 cm of the tatters (which are battleships) and establishing the agroforestry nursery. This afforestation, coupled with the distribution of improved stoves among the local population, has momentarily solved the problem of fuel wood in this area (Tchindjang et al. 2012).

3.2.3 Role of local knowledge practices and systems

Local knowledge is particularly relevant with regard to the management of biodiversity and innovations in agricultural and pastoral areas to improve the resilience of the Bogo landscape and the livelihoods of resident communities. Access and exchange of information and knowledge of local agricultural biodiversity, ancestral customs and ceremonies, and traditional knowledge and practices are passed on by word-of-mouth or learning-by-doing between generations. The documentation and sharing of local knowledge, the use of the native language for knowledge sharing, and the acceptance of the knowledge of women on the use of biodiversity are critical for the sustainability of local ecosystem management approaches.

3.3 Challenges and responses

3.3.1 Challenges and implications for socio-ecological resilience

Five main environmental and social challenges affecting the Bogo landscape that are closely related to the local climatic conditions and the poor resilience of resident communities can be discussed.

(a) Food insecurity linked to climate variability

The already low rainfall distribution is coupled with an intensification and increased unpredictability (with regard to duration and intensity) of droughts and rainfall over the past three decades (1972–1973 and 1983–1985), with a variability of rainfall of up to 40%–80%. These droughts have resulted in the desiccation of crops and reduced yields, as well as superficial crusting leading to decreased soil fertility and more widespread poverty.

(b) The destruction of natural vegetation

This is characterized by the dispersion, loss, and reduction of the spatial density of certain species from most of the Bogo cantons as well as deforestation, causing land degradation, erosion, and loss of biodiversity habitats. The surface crusting due to old fire practices, the extension of grazing, climatic degradation, and erosion are responsible for deteriorated soil quality, reduced agricultural productivity, and the loss of biodiversity. Sediment

loads of rivers during the rainy season undermine the riverbank and gully slopes and negatively impact soil quality and surface waters.

(c) Unsustainable use of landscape resources

Baseline data show that chemical fertilizers provided for cotton production are also being used in subsistence agriculture. In addition, riverbanks, sandbars, and river valleys are cultivated, and artisanal fishing is conducted in streams that dry quickly because the riverbanks are not afforested. A reduction in soil fertility has occurred, as well as a loss of flora and fauna and an increase in erosion and flooding. The root causes of these problems are population growth, lack of hydrological and grassland ecosystem management plans, total consumption of resources by agriculture, insufficient recognition of the importance of local ecosystems, lack of skilled competence and of sustainable livelihoods options, as well as no access to credit.

(d) Health hazards

Health hazards are a challenge that can be linked to the limited availability of drinking water, drought, and the occurrence of extreme weather events. People are exposed to water shortages, particularly during the dry season, and wells and boreholes do not always provide water with adequate drinking quality. Frequent floods during the rainy season increase the spread of waterborne diseases such as cholera and parasitic infections, which cause casualties every year. In addition, increasing average temperatures cause the spread of air-borne diseases such as endemic malaria, meningitis, and measles, as well as the appearance of parasites including hookworms and roundworms.

(e) Insufficient administrative and institutional governance

This challenge arises from shortcomings in the control of access to land and access to basic social services such as health, education, and water, with an overall low institutional capacity to support production and conservation. Ecologically, the production landscape is threatened by the expansion of cultivated areas and pastures, increased erosion, and the increase in wasteland (*hardés*) due to poor agricultural techniques. As agriculture is practiced on clay and alluvial soils (*kara*), sandy or loam soils and sterile soils (*hardés*) are abundant and sometimes left to the pasture. However, competition among farmers and

grazers in the ownership of these unfertile lands has raised conflicts among the landscape stakeholders.

3.3.2 Responses

Between September and October 2013, a landscape-wide baseline assessment was conducted along with the communities of Bogo to assess the resilience of the landscape and to subsequently design a strategy that encourages practices that strengthen resilience. As part of the baseline assessment and consultation process, a set of indicators for resilience in SEPLS collaboratively developed under the leadership of the International Partnership for the Satoyama Initiative were used as a tool to facilitate understanding in the communities and to strengthen resilience of the target landscapes (UNU-IAS et al. 2014). These indicators of resilience were measured in four interrelated dimensions, namely: 1) ecosystem protection and biodiversity conservation; 2) agricultural biodiversity; 3) knowledge, learning, and innovation; and 4) social equity and infrastructure.

Consultation and participatory evaluation were conducted between September and October 2013 by a team of researchers, in compliance with social conventions in the far northern region of Cameroon, namely with men and women consulted in separate groups. Such a process has allowed efficient, effective, and increased participation of women (30%–40%) in the planning process, and

subsequently in the implementation of the landscape strategy. Consequently, focus groups were held with each Lawan and neighborhood leaders (Djaouros) to discuss problems and challenges faced by communities and to address the changes related to SEPLS indicators.

The overall synthesis of the indicators of SEPLS for Bogo (means of measurements collected from eight communities) shows a balance of perception in learning knowledge and innovation, social equity, and infrastructure that have relatively low standard deviations. However, as shown in figure 2 and table 1, there is some divergence between ecosystem protection and agricultural biodiversity: 0.62 & 0.60, (SGP/COMDEKS Cameroun Landscape Strategy 2014).

Following the landscape-wide baseline assessment, a landscape strategy was developed to address the key challenges identified. Based on the priority areas and challenges identified in the landscape strategy, seven community projects were designed by civil society organizations (CSOs) and twelve communities. To address the various challenges and issues raised above, these community projects have provided local solutions to improve ecosystem and community resilience through the implementation of key resilience-strengthening activities as outlined in the landscape strategy.

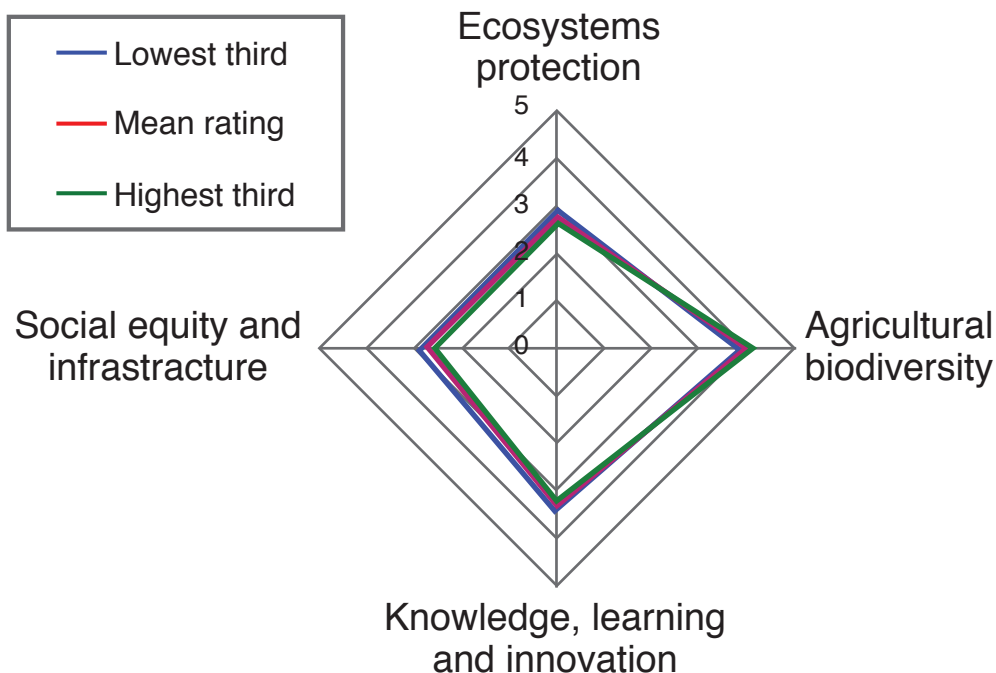


Figure 2: Synthetic radar diagram of SEPL performance indicators at Bogo
Source: SGP/COMDEKS Cameroun landscape Strategy 2014

Table 1: SEPL performance score synthesis for the Bogo landscape

General synthesis of SEPLs at Bogo	Ecosystems protection	Agricultural biodiversity	Knowledge, learning and innovation	Social equity and infrastructure
Lowest third	2,85	3,87	3,41	2,84
Mean rating	2,73	3,98	3,31	2,72
Highest third	2,60	4,11	3,19	2,55
Standard deviation	0,62	0,60	0,45	0,44

Source: SGP/COMDEKS Landscape Strategy 2014

(a) Improving drinking water

Activities to improve access to potable drinking water included the construction of boreholes (**Photos 1a** and **1b**) with solar powered pumps for pumping water to an elevated storage reservoir, providing collection water taps for communities, and establishing drinking water points for livestock. To improve and sustain access to water, more than 300 community members were trained on management and conservation of local water systems.

(b) Cleaning and deepening natural ponds

In addition, natural water ponds previously invaded with mud were cleaned and rehabilitated by communities, and local plant species that had

disappeared decades ago were planted around water ponds in an effort to re-introduce these species into the landscape. Water from these natural ponds is now used for gardening, livestock watering, and also for washing laundry.

(c) Improving food security

In an effort to improve food security and promote agro-biodiversity, high quality seeds of different varieties of onions, maize, and sorghum resistant to climate change were promoted and provided to farmers. The use of drought-resistant onion varieties and training on post-harvest technologies for processing agricultural products such as onions were promoted to sustain crop revenues in this changing climate with more severe and frequent droughts.



Photo 1a: Boreholes with solar powered pumps
Photo credit: Hajara Haman (MBOSCUDA)



Photo 1b: Animal drinking point
Photo credit: Hajara Haman (MBOSCUDA)



Photo 2: Presentation of iron improved stoves
Photo credit: Fadi Kadi (CADEPI)



Photo 3a: Mixing components with the binder to produce biofuel pellets
Photo credit: Fadimatou Hassimi (Association Horizon Info)

(d) *Promotion of biofuel and improved stoves use*

To create an alternative to the use of fuel wood, which has substantially driven deforestation and loss of vegetation in the Bogo landscape and continues to exploit the few remaining trees and woody shrubs of the landscape, a community initiative established a production enterprise for biofuel and improved stoves, which is mostly operated by women (**Photos 2, 3a, and 3b**). Biofuel pellets are produced from various household and agricultural waste such as groundnut, maize, and sorghum waste.

(e) *Reforestation and agroforestry practices*

More than 10,000 seedlings of various tree and shrub species (including *Balanites aegyptiaca*, *Tamarindus indica*, *Diospyros mespiliformis*, *Moringa oleifera*, *Acacia nilotica*, *Acacia Senegal*, and *Acacia albida*) produced in various community nurseries were planted to restore and revitalize the landscape. This afforestation, coupled with the distribution and use of improved cooking stoves among the local population, will certainly reduce deforestation for fuel wood consumption. By promoting water and soil conservation techniques coupled with agroforestry methods, >20 ha of impoverished land has been restored and is now being used for agriculture across several partner communities in the Bogo landscape.

(f) *Funding and literacy*

To promote economic empowerment of women and to diversify income-generating activities, a Women Sustainable Development Fund was established in several communities with the aim of supporting income-generating, women-led activities. More than one hundred income-generating activities undertaken by women benefited from small loans provided through this fund. Families acknowledged the evident benefits of the supported income-generating activities, with more children being sent to schools and women increasingly contributing to family subsistence and health care. Through adult literacy programs, more than 340 people (including women and youth) were trained, further contributing to the development of social capital and economic development of the partner communities. Although the landscape is located in a Muslim area, women and youth voices are now heard, and they are involved in decision-making processes regarding landscape management. These programs have also contributed to the empowerment of communities in the landscape through the promotion of a micro local economy. The development and promotion of handicrafts, ecotourism, good agricultural and environmental practices, and the culture and consumption of local medicinal plants are opportunities to improve local livelihoods.



Photo 3b: Woman displaying produced biofuel pellet at Guinglay
Photo credit: Fadimatou Hassimi (Association Horizon Info)

(g) Knowledge and learning

Training on leadership and conflict management, in response to the mostly agro-pastoral conflicts (between sedentary farmers and nomadic herders), was provided to community leaders and representatives, as well as religious authorities. Moreover, local community institutions were strengthened through the legalization or revamping of community natural resources management and development committees. Platforms for dialog for different communities sharing common ecosystems (water plain or woodland) have been established to promote collaborative natural resource management in the landscape. Local knowledge is particularly relevant with regard to the management of biodiversity and innovations in agricultural and pastoral areas to improve the resilience of the SEPL and resident communities. Access and exchange of information and knowledge of local agricultural biodiversity, ancestral customs and ceremonies, and traditional knowledge and practices are passed on by word-of-mouth or learning-by-doing between generations. The documentation and sharing of local knowledge, the use of the native language for knowledge sharing, and the acceptance of the knowledge of women on the use of biodiversity are critical for the sustainability of local ecosystem management approaches.

3.4 Recommendations

After visiting some project sites in different communities of Bogo, the government of Cameroon and certain international organizations are considering support of pilot activities for replication and up-scaling within the National Adaptation Plan. With support of the Ministry of Forest and Wildlife and as part of an effort to establish resilience-strengthening management practices in the Bogo landscape, a site of almost 3,500 ha shared among three communities will be soon established as a community forest.

As the community-initiated and COMDEKS supported efforts to improve SEPLS management only started two years ago, it is recommended to continue the monitoring of the Bogo SEPL for the next three to five years to ascertain the current impacts and benefits on ecosystems and community resilience and, if necessary, adapt the integrated sustainable management plan as pursued by the landscape strategy.

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