



Management and Use of Bourgou (*Echinochloa stagnina*)

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Bourgou is a type of fodder critical to the livestock production system in northern Mali, that thrives in the inundated areas of the Inland Niger Delta. The bourgou growing zones, or bourgoutières, have long played a critical role in the transhumant cycle. Traditionally, bourgou grows during the period when the Delta is flooded and the animals have migrated away to make use of rain fed pastures. The animals return to the delta as pasture and water become scarce in non-flood plain areas, where bourgou serves as a critical fodder through the remainder of the dry season until rain fed pastures become available again. Today, bourgoutières are coming under increasing pressure due to: 1) increased conversion of bourgou growing areas to rice cultivation partially in response to lower flood levels, which have also resulted in reduced productivity among bourgoutier species; 2) tension in the management system of bourgoutières, as the traditional (dioro) management system is now confronted by an alternative caused by the Malian government's decentralization of natural resource management to the local level; and 3) the growing cash value of the bourgou crop, turning what has been a feed consumed-in-place into a possible cash crop for harvest and sale in markets. Despite these pressures, findings from this investigation show evidence that if bourgou growing areas become degraded, they can still be reclaimed, while areas not suffering significant degradation could experience increased production through improved management. However, preserving and improving the productivity of bourgoutières requires the development of management regimes that provides for their rational use and ensures their long-term viability. MLPI is working to identify how best to support communities to improve management and obtain higher benefits from bourgoutières, in recognition that the pressures currently placed on bourgou growing areas threaten the long-term viability of the resource if solutions are not identified. In addition, ongoing MLPI research is investigating how communities are finding solutions to this challenge, and what can be done to support them.

Background

Bourgou (the Fulfulde word for *Echinochloa stagnina*) is a type of fodder that is critical to the livestock production system in northern Mali, thriving in the inundated areas of the Inland Niger Delta (Figure 1). The bourgou growing zones, or *bourgoutières*, have long played a critical role in the transhumant cycle. However today, *bourgoutières* are coming under increasing pressure. This study was initiated to investigate the current knowledge and subsequent knowledge gaps surrounding bourgou, as well as to assess the changes in bourgou and the *bourgoutières* since 1960, in order to identify potential management strategies for the viable preservation of bourgou as an integral natural resource for agriculture and livestock production in the area. Sixty people representing various groups who use *bourgoutières* were interviewed to obtain their views on how the *bourgoutières* had changed from 1960 to now. Information was collected among older residents of four sites in the central Inland Delta (Koubaye, Sévéri, Walado et Yongari). We also contacted professional organizations active in this area to identify what was currently known about bourgou productivity, regeneration techniques, use of bourgou as a feed, and protection of the resource. Finally, a literature review was conducted to investigate current knowledge on bourgou use and management.

Bourgou grows in hydromorphic soils that are inundated for at least three months and at a depth of at least one meter. Production is reduced when flood levels are low. There are two main types of bourgou: red bourgou, which is sweeter and more commonly used in regeneration (Figure 1); and white bourgou, which is of lower value as an animal feed. In Mali, there are approximately 700,000 hectares of bourgou growing areas. In the Niger Delta, it is estimated that *bourgoutières* cover 240,000 hectares, or 8.9% of the land mass (Marie, 2000). These are distributed unevenly across the communities. Four communes, Deboye, Toguéré Coumbe, and Kewa et Youwarou account for a total of 100,000 hectares. In contrast, 14 other communes in the area have less than 8,000 hectares each. *Bourgoutières* are abundant in the north, particularly in the area around lac Debo, but also around Toguéré Coumbé, Tenenkou, Mopti, and in the Yongari basin (Marie, 2000).

In the past few decades, the *bourgoutières* have been suffering significant degradation due to a combination of reduced flood levels and poor management. In spite of these problems, it should be noted that about two thirds of what were historically bourgou growing areas are still productive. The challenge is to keep these

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Box 1. Historical management system and prioritization of the bourgoutieres under the Dina code established in 1818 in Mali.

Livestock production was accorded first priority in the use of <i>bourgoutieres</i> . Within livestock production, village <i>bourgoutieres</i> called ' <i>barimas</i> ' were allocated for the use of the milking herd, calves, and sick animals, while the remainder of the herd was sent to large <i>bourgoutieres</i> away from the village.
After livestock, <i>bourgoutieres</i> were allocated to the Bozo fishing community. The Bozo had temporary camps, " <i>dagas</i> " on dryland areas in the <i>bourgoutieres</i> used as a base for Delta fishing activities.
Finally, subsistence agriculture was practiced in and around the <i>bourgoutieres</i> by " <i>rimaibes</i> ," who were historically slaves to the noble <i>Fulani</i> .

areas productive, learn from the successful management practices there, and try to extend and reclaim areas where bourgou could be grown.

Traditionally, the management of *bourgoutieres* was collective under the authority of a person called the '*dioro*'. This management system originated in the "*Dina*" code established in 1818 by Sekou Ahamdou. According to this system, a distinct order of priority was established (Box 1). The system described in Box 1 served as a management regime for the *bourgoutieres* up until independence, when the state proclaimed itself the ultimate owner of natural resources in Mali. There ensued a period of confusion, as there was a non-concordance between the traditional management system and the laws being promulgated by the state. In addition, there were changes in land use and overall society; *Bozos* increasingly grew rice, *Fulani* began to practice cultivation, and *Dioros* attempted to turn their traditional authority over *bourgoutieres* into

Table 1. Bourgou productivity in Mopti, 2000.

Site	Cercle	Average biomass kg dm / ha
Koubaye	Mopti	5,880
Sévéri	Tenenkou	4,860
Walado	Youwarou	15,030
Yongari	Djenné	5,010

Source: Kodio, 2000.

formal ownership. The decentralization of natural resource management that Mali embarked upon in 1995 has made these tensions particularly acute, but also could offer some opportunities for resolving the management issue. In some areas, there are two different authority structures, *dioro*-based and state-based that claim to manage a given *bourgoutier*.

In this context, it is urgent to establish a new management regime to ensure the future viability of this critical resource. Current research by the Mali Livestock and Pastoralist Initiative (MLPI) is aimed at finding what kinds of local level solutions communities have been able to design in this setting, assess what seems to work, and identify what has not.

Preliminary Findings

As might be expected given such variation in management and production conditions, there is large variation in productivity. Studies indicate the potential of these areas is up to around 35,000 kilograms of dry mass per hectare (kg dm/ha), with a median of around 20,000 kg dm/ha. (Hiernaux et al., 1983) A UNSO project in Tonka in 1989 reported harvests of 15,000 to 32,000 kg dm/ha in



Figure 1. Bourgou (Echinochloa stagnina) growing in an inundated floodplain in the Niger Delta, northern Mali. Bourgou, and its growing areas the 'bourgoutieres', are a critical fodder resource for livestock during the dry season, and have been recently recognized as a cash crop for animal fattening operations. The Mali Livestock and Pastoralist Initiative is working with communities to improve the management of this valuable natural resource, as well as to improve its utilization and marketability. Photo by Lassine Diarra.

regenerated *bourgoutieres* after four to five years. Table 1 reports productivity findings from field sites in Mopti.

A management system for each bourgou growing area needs to establish when herds need to leave, when they are allowed to return, which animals will be allowed and which are restricted when animals are allowed to graze, when people are allowed to harvest the grass, when the seeds can be gathered, and what inputs should be applied to maintain the resource. One modification to the traditional system is that permission to graze in a *bourgoutier* has in some places become conditional upon paying a cash fee. Another challenge is that harvesting has become increasingly important compared to grazing in place. Estimates from studies in the area indicate that annual profits from bourgou fields (if marketed) vary from USD 170 per hectare under rudimentary management, to USD 750 per hectare under intense management. In the region of Tombouctou, a mean price of 40 CFA (USD 1 = approximately 455 CFA at time of publication) was reported for a bundle of bourgou straw weighing between 1.5 and 3 kilograms. A different challenge is that harvesting is also undertaken to allow a household to amass a stockpile of bourgou straw. Motivations for this stocking include: animal fattening, feed for increased milk production, dry season supplemental feeding, and possible later sales when prices are high. As such activities draw on a community resource to generate household income, appropriate management structures are needed to ensure the resource is not degraded.

Two other important changes are notable. One involves changes in the species that grow in the area, the second regards the conversion of pastureland to cultivation, in particular rice cultivation. Concerning the issue of species change, residents of the area reported on the kinds of

Table 2. Changes in pastures in the Inland Niger Delta.

1960 to 1970	Since 1990
Abundant pastures	Undesirable species that have appeared
<i>Echinochloa stagnina</i> (Bourgou) <i>Panicum subalbidum</i> (Pacri) <i>Brachiaria mutica</i> (Bougnari) <i>Vetiveria nigritiana</i> <i>Andropogon gayanus</i> <i>Eragrotis barteri</i>	<i>Mimosa pigra</i> <i>Typha</i> sp. <i>Melochia corchorifolia</i>
	Species that are increasing
	<i>Voscia cuspidata</i> <i>Oryza longistaminata</i> (Baw, diga) <i>Cynodon dactylon</i> (Koyobon = kesu = gazon) <i>Oryza bartii</i> <i>Oryza glaberrima</i>
Present but not abundant pasture	Species that are decreasing
<i>Voscia cuspidata</i> (didèrè) <i>Oryza bartii</i> (séko) <i>Sorghum tricoptus</i> <i>Oryza glaberrima</i> (fara fin malo)	<i>Echinochloa stagnina</i> (Bourgou) <i>Vetiveria nigritiana</i> (Babin) <i>Andropogon gayanus</i> (saran) <i>Sesbania rostrata</i> (Porompoli)
	Species that have disappeared
	(Karso) (Wadio) (Koumba kofol) <i>Andropogon</i> spp (Djiguinèbin)

Source: Kodio, 2000. Words in parentheses represent local names in Fulfulde and/or Bambara.

species change they had noted in earlier work conducted in the area. Table 2 summarizes the findings Kodio reported based on interviews in the Inland Niger Delta.

With regard to conversion of *bourgoutieres* to cultivation, due to a combination of lower flood levels, changes in water management, expansion of irrigation technology, and population growth, there is a significant expansion of rice cultivation onto lands that were formerly *bourgoutieres*.

Zwarts and Diallo (2003) estimate that for the Inland Delta as a whole, almost 1,040 km² of the surface was under rice cultivation, which is about the same as the area under a mix of bourgou and *Voscia cuspidata* (didèrè in Fulfulde), and more than double the area that is exclusively under bourgou cultivation.

Table 3. Area of bourgoutieres occupied by agriculture

Region	Cercle de Djenné	Tenenkou	Mopti
Sites	Pondori, Yongari, Mangari	Kotia, Diondiori, Diafarabé	Kotia, Sendengué, Pondori, Dialloubé, Sébéna
Total area (ha)	58,800	246,400	175,000
Converted to cultivation (ha)	29,400	122,800	50,000

Source: Kodio and Traoré, 2002.

Practical Implications

Findings from this investigation show that there is evidence that if bourgou growing areas become degraded, they can still be reclaimed. Even for those areas not suffering significant degradation, there is evidence that production can be increased through improved management. Preserving and improving the productivity of the extraordinary natural resource of the *bourgoutieres* requires the development of management regimes that provide for a rational use and ensures the long-term viability of these areas. MLPI is working to identify community-based solutions to these problems, along with

how best to support communities to improve management and obtain higher benefits from *bourgoutieres* in recognition that the pressures currently placed on bourgou growing areas threaten the long-term viability of the resource if solutions are not identified. MLPI research in this area has also led to the identification of other issues surrounding the conditioning, storage, marketing, and transformation of bourgou as topics meriting further investigation. It will be our ongoing challenge to identify how to construct or improve the marketing network related to bourgou, and what technologies of preservation or transformation exist for extension to the village level.

Further Reading

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Building on the successes of the GL-CRSP Livestock Early Warning System/Livestock Information Network and Knowledge System (LEWS/LINKS), Improving Pastoral Risk Management on East African Rangelands (PARIMA), and Forage Monitoring Technology to Improve Pastoral Risk Management by Herders in the Gobi Region of Mongolia (GOBI Forage) projects, the Mali Livestock and Pastoralist Initiative (MLPI) was initiated in January 2008, to develop a livestock market information system, and to examine strategies for reducing risk and improving livestock marketing options for the enhancement of pastoral livelihoods in Mali. The project is a collaboration between the Global Livestock CRSP and the USAID Mission to Mali with Texas A&M University, and Syracuse University as the US implementing partners. The project is led by Dr. Jay Angerer, Texas A&M University. Email: jangerer@cnrit.tamu.edu. The MLPI Co-Principal Investigator is John McPeak. Email: jomcpeak@maxwell.syr.edu.



The Global Livestock CRSP is comprised of multidisciplinary, collaborative projects focused on human nutrition, economic growth, environment and policy related to animal agriculture and linked by a global theme of risk in a changing environment. The program is active in East and West Africa, and Central Asia.

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