

Assessment of potential mare stocking impacts on resource access rights and livelihoods in Komio Village, Niger River Delta, Mali

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The Community-based Fish Culture in Seasonal Floodplains and Irrigation Systems (CBFC) project is a five year research project supported by the Challenge Program on Water and Food (CPWF), with the aim of increasing productivity of seasonally occurring water bodies through aquaculture. The project has been implemented in Bangladesh, Cambodia, China, Mali and Vietnam, where technical and institutional options for community based aquaculture have been tested. The project began in 2005 and was completed in March 2010.

This working paper represents work-in-progress. It forms part of a series of documents presenting research findings from the project. The reader is advised that it has not been subjected to academic quality control, nor edited for errors of fact or interpretation.

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Executive summary

In the context of the CP-35 project, this visit follows up on a preliminary assessment of livelihoods and institutions in Komio village conducted by consultants Joffre and Lajaunie. The objective of the visit was to determine how stocking *mares* around Komio village may impact livelihoods and access rights to aquatic resources. Additional insights were gained from the governance experiences and livelihood impacts of village irrigation schemes (PIVs).

An analysis of the village's institutional history reveals that power is centered on a few key leaders, in particular the heads of households descendent from the first Marka settlers. The previous chief abused his position by embezzling the proceeds from the first collective PIV farming scheme. This had disastrous livelihood implications as communities were unable to replace the PIV irrigation pump when it broke and many people were forced to migrate in search of work. This event led other communities within Komio's territory to establish their own PIVs, and forced the abdication of Komio's chief.

All communities currently appear to embrace greater levels of transparency and accountability in their management of the PIVs. PIVs now form the single-most important livelihood activity for farmers and fishers alike as they ensure that households are able to harvest at least one single crop of rice per year, irrespective of the vagaries of the Niger River's flood regime. They also provide financially remunerative work opportunities within the village during the dry season, resulting in a reversal of outward migration.

Mares are owned by the Marka families who own the land, but they do not limit access or tax these fisheries in any way. According to stakeholder interviews, the Bozo fisherfolk appear most dependent on floodplain and *mare* fisheries for their livelihoods. Unfortunately erosion of the channels connecting *mares* to the Niger River has resulted in declining productivity over time, but they still provide important dry season sources of protein and income to residents of Komio and neighboring villages.

Stocking of *mares* may benefit local residents by contributing to the impacts that the PIVs have of providing food and income during the dry season. However, this depends on how benefits are distributed. Poorer populations face particular risks if land owners impose access fees on non-residents who had previously enjoyed free access, as other villages may reciprocate by limiting local villagers' access to fish. These risks suggest the need for extensive engagement with the community to design equitable governance institutions that will help prevent a capture of benefits by the elite of the community.

List of Acronyms and non-English words used

<i>batigi</i>	a fishing territory
<i>Baba Aougal</i>	Bozo water master in charge of organized closed seasons and collective fishing in the <i>mares</i>
CP	Challenge Programme (specifically, for Food and Water)
CFA	<i>Communauté Financière Africaine</i> (West African currency)
<i>décrué</i>	period of declining water levels
<i>Diina</i>	codified system of laws established by the Fulani Cheikh Amadou's empire (1818-1864)
<i>epervier</i>	cast net
<i>fouta toro</i>	local name for the Fulani Tukulor Empire, in reference to their capital city
IER	Institut d'Economie Rurale
<i>Jowro</i>	title of the Fulani leader who governs access to grazing rights.
<i>manga jii</i>	traditional institution by which visiting fishers give one third of their catch to the water master
<i>mares</i>	floodplain depressions which retain water during the dry season
<i>mise en défens</i>	closed season
NARES	National Agricultural Research and Extension Services
<i>Namu-tuu</i>	ceremonial title left to Bozo water masters when Somono took over territorial rights to a water body.
NGO	Non governmental organization
<i>Nyenne/jegui</i>	water genie or spirit
OGS	Organisation pour la Gestion de l'Environnement au Sahel
<i>pinasse</i>	motorized plank boat used
PIV	<i>Périmètres Irrigués Villageois</i> (village irrigation scheme)
PNIR	Programme National d'Infrastructure Rurale
<i>prefect</i>	administrator in charge of the local (<i>cercle</i>) level of government
<i>yaya</i>	collective fishing event in <i>mares</i> or river fishing reserves

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Project Context and Primary Research Questions

This visit to the village of Komio, in Mali's Inner Niger River Delta falls under the scope of the CP-35 project, and is a follow-up on the initial stakeholder assessment carried out by consultant Olivier Joffre in July 2008.

The purpose of this visit was to build on the CP-35 team's understanding of the likely impacts of stocking *mares* in Komio on livelihood strategies and resource access rights. Based on the preliminary assessment, a second research site, Severi has been abandoned. This was due to fractious intra-community rivalries and poor community sensitization to the project, which raised concerns regarding how an aquaculture intervention in the *mares* might impact equity in *mare* resource access rights. In contrast, Komio appeared to have a largely unified leadership that showed interest in collaboration with the project.

Two main research objectives were pursued:

- 1) To verify the nature of access rights regimes to aquatic resources within Komio territory. Additionally, as the *mares* were thought to be important resources for all communities within Komio's territory, it was necessary to visit these other villages and settlements to understand their access rights to *mare* aquatic resources.
- 2) Understand how local irrigation schemes known as *Périmètres Irrigués Villageois* (PIVs) have succeeded or failed in achieving equitable livelihood benefits. From the preliminary assessment, we noted PIVs as potentially pivotal contributors to establishing sustainable livelihoods in this region due to the income and food that they provide these communities during the dry and rainy seasons. Stocking of *mares* has the potential to change resource access rights and livelihood opportunities in a similar manner. Consequently, the team felt that understanding PIV

impacts on livelihoods and access rights would be useful for modeling the potential impacts of *mare* stocking.

This assessment of aquatic resource access rights and the impacts of PIVs should provide for a better understanding of the roles played by different institutions in Komio, thereby supporting CP-35 team partners in planning successful *mare* stocking trials.

DRAFT

Research Setting and Methods

The research team was composed of Aaron Russell (WorldFish) and Seydou Coulibaly (IER), accompanied by a boat conductor and his assistant. Research activities were based out of Komio village, where the team resided within the village chief's compound. As access to *mares* and irrigated land has livelihood implications for all communities within Komio's territory (see Appendix A), we visited all settlements that were accessible: Komio, Kamaka, Kouana and Ninya-daga (a fishing camp), but not Kanguila.

In order to free interviewees from public pressure to portray any specific image of their community, interviews were held in individuals' homes rather than a public forum. While the intention was to conduct interviews individually, in all but two cases community members were uncomfortable being interviewed alone and requested that at least one other community member be present. This was most notable in the case of recognized leaders, who expressed a desire to avoid raising any suspicions among their followers. The leaders of the women's PIV at Komio also preferred to be interviewed in the presence of the chief.

A list of the stakeholders interviewed is provided in Appendix B. Each interview lasted between 1-2 hours. All interviews were conducted in French or Bambara, a national language that is understood by most (although less so by women, requiring translation by other local women). In addition to semi-structured interviews, informal discussions were held with village elders each evening which helped to clarify our understanding of certain points. The conclusions presented are based on a triangulation between data from different sources interviewed, and incorporates observations made by the first CP-35 assessment (Joffre and Lajaunie 2008).

CP-35 - Komio Visit Itinerary:

Sept. 20-22 - Flight from Cairo to Bamako, and travel to Mopti by IER vehicle;

Sept. 23-25 – Work within the region for CP-72;

Sept. 26 – Travel from Mopti to Komio village by IER *pinasse*;

Sept. 27 – Interviews in Komio village;

Sept. 28 – Interviews in Kamaka village and Ninya-daga fishing camp;

Sept. 29 – Interviews in Komio and Kouana villages; return to Mopti by IER *pinasse*;

Sept. 30 – Debriefing and data analysis;

Oct. 1-2 – Travel to Bamako by IER vehicle, and flight to Cairo.

Research observations

Institutional History

Early institutional contexts

The first known users of this landscape were Bozo fisherfolk who migrated and fished throughout this region for centuries prior to the establishment by the Marka of Komio village; however, their presence was probably a transient one. Notwithstanding their growing Islamization, the Bozo maintained their animistic traditions honoring the water spirits or genies (known as *nyenne* or *jegu*) that were known to inhabit the waters, and who were regarded as the true owners of these waters (Moorehead 1997, Fay 1989). Responsibilities for maintenance of this relationship fell to the senior male of the Bozo family (known as the “water master”)¹ who established a pact with the genie of a specific water body.

Although specific regulations varied, they generally included the setting of fishing seasons, and conducting ceremonial sacrifices to the water spirit (COFAD GmbH 2002; Kassibo 2004, Cotula 2007, Moorehead 1997, Kone 1985, Beeler 2006, Fay 1989). Fishing seasons were set in accordance with seasonal changes in river water levels. During the flood season (when fish are dispersed, and territorial limits are hard to define) access to water bodies was granted freely to all in exchange for a symbolic token of respect (known as the “*prix de kola*”). However during low water levels (when fishing territories were easily defined and when fish were forced into the main watercourses and isolated *mares*), visiting fishers were expected to pay a third of their catch to the

¹ Known as “*maitre des eaux*” (water master) or “*chef des eaux*” (water chief).

water master (an institution known as “*manga jii*”) (Moorehead 1987, see also Lavigne Delville 2003, Kone 1985, Fay 1989).

Establishment of Komio village and the Korondaga Fishing Territory

Traditional institutions and livelihoods underwent significant change following the establishment of the Fulani “Fulbe barn” Empire by Cheikh Amadou (1818-1864). Specifically, the stability and security encouraged permanent settlement of the land by displaced peoples, and the new rulers codified all access to natural resources through a system of laws referred to as the *Diina* (Kone 1985, Moorehead 1997, Fay 1989a, Sarch and Allison 2000). The Marka are an ethnic group that traditionally farmed rice, and who are known to have maintained good relations and close economic interdependencies with the Bozo (Fay 1989). According to oral accounts, the Marka were the first to establish a permanent settlement at Komio, and they purchased the territorial rights from the Fulani Tukulor Empire (1864-93)² (referred to locally as “*fouta toro*” in reference to their capital city). The territory was subsequently subdivided between the families of four Timota descendants: Mamadou (the village chief’s family), Manfing, Nafi and Doudou Timota. Following the establishment of Komio, the *fouta toro* granted Bozo³, Somono, and Malenke permission to establish their own villages (Kamaka⁴, Kouana, and Kanguila, respectively) within the territorial domain of Komio.

The only limitation to the Marka ownership of land resources related to the right of passage for transhumant livestock. These rights were central to the livestock rearing livelihoods of the Fulani conquerors. Consequently, the rights

² The Fulani Tukulor Empire overthrew the Fulbe Barn Empire in 1864.

³ Note – these were not local Bozo, rather they had migrated from a village called Kamaka near Maasina (in Togere Fumbe Territoire), and decided to settle here once the Fulani Empire had pacified the area.

⁴ This community is located on the margins of Komio and Sense village territories.

of passage for transhumant cattle through the landscape are maintained by a Fulani leader, called the *jomro*. In the case of Komio village, however, as discussed by Joffre and Lajaunie (2008), the relatively poor quality of pasture land, means that local livelihoods are only impacted by the passage of cattle for a short period of time. This is still the case today.

Interestingly, while many traditional institutional forms regulating access to water bodies remain the same in Komio today, the roles of water master over the Niger River's resources now belong to the first Somono family that settled in Komio. The Somono were a caste of river boatmen and fishers who served as a naval force for the Fulani Empires, and who established settlements along the banks of the Niger River at one day (traveling by boat) intervals (Moorehead 1997).⁵ In some parts of the delta, the Somono took over the temporal Bozo water master roles (including levying *manga jii*), and left the Bozo water masters with a purely spiritual role of maintaining the relations with the water spirits (known by a new title, *namu-tuu*) (Kone 1985, Moorehead 1997). However, in the case of Komio, it appears that the Somono water master (Mr. Mama Kanta) took over both the spiritual and temporal Bozo water master roles for the Niger River fisheries⁶. The territory that Mama Kanta purchased under the Tukulor Empire is known as “*Korondaga batigi*” and covers roughly 25km of the Niger River (see Appendix A). The management of this fishing territory is discussed further below.

The single existing Bozo institution today is that of water priest (known as “*Baba Aougal*”), who is responsible for scheduling (in concert with the village

⁵ This is a caste that was created during the Mali empire (1250-1450), initially primarily made up of Bozo fisherfolk, but later included ethnic Bobo, Bambara, and Dogon captives and developed into a navy (Moorehead 1997).

⁶ However, according to local leaders today, the fishing territories in this area were first established by the Somono water masters themselves.

council) of the fishing seasons in the larger floodplain *mares*. Local leaders claim that they invited the senior Bozo lineage to take up this role due to its extensive animistic knowledge which was believed to protect people from crocodiles, hippopotami, and drowning. While this role appears quite similar to that described above as *namu-tuu*, from this brief visit it was difficult to determine whether this title was a remnant of a past role when Bozo's were the water masters or whether they were actually invited to play this ceremonial role. As mentioned by Joffre and Lajaunie (2008), informants confirm the ongoing animistic ceremonial role played by the *Baba Aougal* (Mr. Isaaca Traore), however as the individual is a member of the Muslim clergy, he is reluctant to talk about the animistic traditions involved in his role as water priest (a local mosque is shown in Figure 1).



Figure 1. Traditional mud brick mosque in Kamaka village

Colonial and post-colonial institutional changes

Neither the period of colonialism (1899-1960), nor post-colonial socialism (1960-68) and military dictatorship (1968-91) appear to have introduced significant changes to village boundaries; however the role of the chieftaincy was significantly undermined by all. With a highly centralized bureaucracy, chiefs were relegated to seeking influence through their support of a highly authoritarian government, and the military dictatorship's governance was described by Kassibo (2004) as,

“...characterized by the absence of freedom, excessive-central administration, centralized control over natural resource management, a paternalistic, directorial approach to development, monopolization of all political life through the PUC⁷, and the centralized control over the economy.”

With the introduction of multi-party democracy in Mali (in 1991), the government embraced the international development drive for decentralized governance. As part of this process, the population of each village was permitted to choose its *commune*, and all the villages within Komio's village's territory chose to join different *communes* from that of Komio itself.⁸ These choices may have been partly due to grievances over poor leadership by Komio's former chief which caused the collapse of a local irrigation scheme, prompting a large-scale exodus of villagers to the cities (discussed below).

By aligning themselves with different *communes*, several villages have also been able to seek NGO-funding for development activities independent from those of Komio itself (such as the second phase of PIV projects discussed below). However, it should be noted, that rather than replacing pre-existing

⁷ “Parti Unique Constitutionnel”, the single constitutional party belonging to President General Moussa Traore's military dictatorship that lasted from 1968 to 1991

⁸ Kanguila and Kamaka chose Kounari *commune*, Kouana chose Konna *commune*, and Komio chose Borondougou *commune*. All fall within Mopti *cercle*. (<http://www.dgemali.net/bureauvote/mopti.html>).

traditional or national centralized institutions, the *communes* and the strengthened regional governments have simply become another layer of institution to be used by particular actors in pursuit of their own goals. Indeed, Komio's village territory remains intact, and all the land that was not previously given for the use of residents in Komio, Kamaga, Kouana and Kanguila remains the property of the four Timota clan heads. Additionally, all *communes* continue to pay deference to (and may continue to delegate some responsibilities entirely to) Komio's chieftaincy when conducting development activities within the village territory.

The development of NGO-sponsored irrigated farming associations has, however, facilitated the emergence of new leadership capacity in each village. Such developments have been described elsewhere in Mali, as potentially contributing to and enabling a broader range of community leaders, providing alternative avenues for poorer community members to gain access to resources (Beauchemin and Schoumaker 2006, Nijenhuis 2003, Lippman and Lewis 1988, Blair 2000). This has certainly been the case with respect to women's PIV associations in Komio and Kamaka, and the men's PIV associations in Kamaka and Kouana.

In the village of Komio, having learned from his predecessor, the current chief (Mr. Mamadou Timota) appears to put great stake on transparency in his dealings with outside organizations, and relies heavily on the advice and support of other senior family representatives. However, his main advisor is Mr. Manfing Timota, head of the largest land-owning family, the chairperson of the men's PIV association, and the village representative to the commune assembly. While their combined leadership appears well-intentioned and equitable, the accumulation of influential roles by this senior advisor facilitated by the decentralization process and the introduction of NGO-funded

activities cannot but be regarded as having reinforced pre-existing power-structures in this village.

Access Rights to Aquatic Resources in Komio

Mare fishery

The main *mares* within the territory of Komio are owned by the four Timota families on whose land the *mares* are found. However, while their ownership is common knowledge, access to these *mares* is open to all members of the surrounding communities at no charge, and neither the Timotas nor *Baba Aougal* limit who may participate in *mare* fishing. *Baba Aougal* is responsible for setting the closed season (the “*mise en défense*”) which occurs once the *mare* becomes separated from the river (usually during February-March). He also sets the dates for collective fishing in the four main *mares*, and at times may be called upon to organize fishing in the river reserves (see below). As discussed by Joffre and Lajaunie (2008), the closed season collective fishing events for the four main *mares* are interspersed by 1-2 weeks over the course of the dry season (April-July), with the deepest *mare* (known as “Mama Pongu”) being fished in May. Also, unlike some *mares* in other communities, land owners do not charge a fee (*manga jii*) in exchange for allowing non-residents to participate in collective fishing events. The primary fish species captured during the collective fishing events include both some that migrate back down to the river (*Citharinus* sp., *Siluranodon* sp., *Auchenoglanis* sp., *Schilbe*, *Tilapia* and *Bagrus bajad*) and others that remain in the deeper *mares* throughout the dry season (*Clarias*, *Hydrocynus brevis*, *Lates*, *Distichodus*, *Hemichromis fasciatus* and *Brienomyrus niger*) (Bénech et al 1994).

In addition to the large mares, there are at least twelve smaller *mares* within Komio's territory, and access to these is not regulated in any way. While *mare* fisheries have declined significantly in terms of their ability to provide for local livelihoods overall, Bozo women in Komio emphasize their continued importance in helping them provide for their children's needs (much as in the case of the PIV discussed below). Lajaunie and Joffre (2008) cite that between 40-75% of the total fish caught in *mares* is caught by Komio's Bozo fisherfolk through their control over the channels connecting *mares* to the river.

Due to diminished productivity in Komio's *mares*, the neighboring villages appear to place limited importance on Komio's *mare* fisheries. This is supported by the fact that the traditionally floodplain fishing Bozo residents from neighboring village of Kamaka, don't even limit access to fishing channels linking their smaller *mares*. Additionally, migrant Bozo residents of Ninya-daga fishing camp indicate their primary *mare* fishery to be that of the neighboring village, Wanyaka. We were unable to visit the village of Kanguila, but its lack of alternative sources of income from irrigation schemes (see discussion below) and fish from the river, might suggest a greater dependence on *mare* fisheries.

Floodplain channel fishery

The only private property rights that are enforced for aquatic resources around Komio relate to the three main channels that connect the large *mares* to each other and to the Niger River itself. *Mare* channels are strategic resources as they are owned by the landowners on whose land the channels lie (i.e. one of the four branches of the Timota family from the Marka ethnic group).

However *mare* channel fishing is primarily practiced by a few Bozo families who have held exclusive fishing rights to the channels for several generations, in exchange for one third of the catch (an arrangement known as *manga jii*).

Ownership of fishing channels is only exercised during the months of November to February, when the declining water levels (a season referred to as the “*décru*”) make the channels strategic fishing locations. The enforcement of private channel fishing rights is a common institution throughout the Inner Niger River Delta, and though it may raise questions regarding equity in ownership of channel fishing rights (Fay 1989), it does not appear to be a source of conflict in Komio. The primary channel fishing method used by the Bozo is based on use fishing traps spanning the entire channel, constructed of fine-meshed gillnet spanned over a wooden frame, with multiple entrances that allow fish to enter but not exit (see Figure 2). Additionally, gillnets may be strung across the channels.



Figure 2. Fishing traps in a *mare* channel

The productivity of the Inner Niger River Delta fishery is directly related to the extent of floodplain inundation, which allows fish to disperse in a nutrient-rich

habitat. During the *décrué*, floodplain waters gradually drain into the *mares* and subsequently into the Niger River and its tributaries. A number of fish species are known to follow annual “lateral” migrations between the floodplain and the Niger River in search of breeding and/or feeding grounds, particularly the genera: *Citharinus sp.*, *Siluranodon sp.*, *Auchenoglanis sp.*, *Schilbe sp.*, *Tilapia sp.* and *Bagrus bajad* (Bénech et al 1994).

Prior to colonialism, the communities excavated channels connecting the rivers to the village *mares*. This had a number of motivations. By facilitating the inundation of the floodplains and *mares*, the communities were able to decrease their vulnerability to seasonal changes in river water levels and ensure that water levels were sufficient for rice farming. Additionally, this increased the amount of fish entering into their local *mares* providing the community with a supply of fish for every-day needs during the dry season, and the channels themselves enabled the communities to more easily harvest the fish as they left the *mares* to return to the river.

The droughts of 1973 and 1978 are particularly noted by villagers as having contributed to the siltation of the primary channel that connects the main *mares* together and to the Niger River. Community leaders reminisce about times in the past when some families were apparently able to sustain viable livelihoods based on *mare* fisheries, and lament that this is no longer the case. They are currently looking for external support to re-excavate this channel.

Niger River Fishery

Throughout the Inner Niger River Delta, ownership of the main river courses falls to the Somono, who claim special relationships with their local river deities. As discussed above, the Somono fisherfolk purchased ownership rights to this portion of the river; however they claim that the water masters’

relationships with the local water deity predate this legal arrangement. Komio lies toward the upstream end of “Korondaga” fishing territory (known as a “*batigi*”) that stretches from Kouana to Koubi⁹, a distance of roughly 25 km (see Appendix A).

This *batigi* was originally granted to a single Somono water master (Mr. Ali Mama Kanta), but when his descendents settled in three different communities (Kouana, Komio and Sensé) they subdivided the ceremonial tasks involved in river management between the three families. According to one story, at a time when there were conflicts between the different fishing communities, the communities wanted to subdivide the *batigi* between the three communities. However, the forefather who made the original pact with the water spirits had warned them that they risked losing rights to the river altogether if they tried to do so. Today, during much of the year, fishers from communities within the *Korondaga batigi*¹⁰ are allowed to fish without charge, but migrant fishers (see Figure 3) must request permission and pay the water masters the symbolic *prix de kola* (between 2500-5000 CFA.¹¹

⁹ The stretch of the Niger River between Mopti and Lac Debo is subdivided into territories (*batigi*) as follows: Namara to Nèmèdè (“Tonkorongon *batigi*”); Nèmèdè to Kouana (“Wagnaka *batigi*”), Kouana to Koubi (“Korondaga *batigi*”), Koubi to Kouansa (“Kona *batigi*”), Kouansa to Gouraou (territory name unknown). Then Lac Debo is divided between: Gouraou *batigi* along the eastern shore, Tioka *batigi* along the western shore.

¹⁰ Specifically, the villages: Kouana, Saya, Komio, Kamaka, Nukura, Sense, Sense Ladji, Batamani, Kwataka, Kubi

¹¹ However, some long-term Bozo residents of Ninya-daga report not needing to pay this fee or request permission to fish due to their prolonged residency.



Figure 3. Bozo fisher in the Niger River

However during the dry season, the Niger River dries up in many areas, leaving behind isolated pools in what were the deepest portions of the river. At the end of the *décru* (the decline of water levels), four of these pools¹², referred to as “fishing reserves” are closed to all fishing by the Somono water masters in Kouana, Komio and Sensé. This period referred to as a “*mise en défens*” (closure) lasts two to three months, usually between February-April, to allow the remaining fish to grow. Subsequently, the water masters organize collective fishing events (known as a “*yaya*”) in the fishing reserves.

While the fishing reserves are guarded by the children belonging to all three water masters, the remaining tasks associated with the *yaya* are divided between the different families. At the end of this period, the water master in Kouana calls a meeting of the water masters in Kouana (plus the water master from

¹² These pools are individually named: Jimu, Somi dobo, Tanako, and Dambo. The fourth reserve (Dambo) has declined in importance due to river siltation.

Wagnakara¹³) to discuss the upcoming fishing activities and Kouana's water master announces the dates for the collective fishing events. At this point invitations are sent to all surrounding villages, and even to as far away as Mopti. At this point, the water master from Komio sacrifices a black goat to the water genie. Then on the first day of each *yaya*, the water master from Sensé recites an incantation and enters the water first with his community members, followed by the other communities. In each of the reserves, the *yaya* may last for up to 15 days.

Local fishing community members may participate freely in these collective fishing events, but non-resident fishers are required to pay *manga jii*. These fishers traditionally used gillnet and beach seines and were expected to give 1/3rd of their catch to the water master¹⁴. However, due to the rising cost of living, Somono water masters recently raised the *manga jii* to 1/2 of the catch. The *manga jii* is paid to the Somono water masters and funds are shared between:

- Individual payments to all Somono families,
- A collective treasury that helps Somono families pay for emergency needs,
- Purchase of the sacrificial goat and other expenses associated with the ceremony.

¹³ Apparently past water masters had noted that people from Wagnakara and Korondaga fishing territories were free from danger in each others' territories, and came to the conclusion that the same genie owned both areas. Since then the Wagnakara water master has met annually with the Korondaga territory water masters to discuss fishing events, however the Wagnakara water master is responsible for organizing his own ceremonies.

¹⁴ Except for cast nets (known as *epernier*), which require a payment between CFA 2500-5000.

At the end of the collective fishing events, if the water levels are low enough, the Bozo water priest, *Baba Aougal* may organize a follow-up *yaya* event in the river reserves for the use of two-handed dip nets that are typically used in *mares*.

Irrigation Scheme Impacts

Phase I PIV.

According to community members, the Sahelian drought of 1973 was devastating to the population of Komio, forcing most to sell off their productive capital, and resulting in large scale migrations by villagers to cities. The government established the first rural irrigation scheme in Komio (known as “*Périmètres Irrigués Villageois*” or PIV) in 1986 on land owned by the village chief of Komio. All families of Komio, Kouana, Kanguila and Kamaka villages were allocated a plot of land within the PIV. This irrigation scheme was initiated by the *prefect* of the *cercle*¹⁵ with support from the Office du Riz – Mopti (ORM) and was excavated using forced community labor as residents were poorly sensitized regarding the benefits that they would gain from the PIV.¹⁶

Community perceptions of the PIV changed rapidly as they were able to harvest two crops of rice each year rather than the unreliable single harvest that depended on sufficient flooding of the delta (see Figure 4). The high and assured productivity of PIV- versus floodplain-riziculture encouraged many

¹⁵ Based on the territorial delineations and administrative system established by the French colonial system, the military dictatorship governed the country through their appointed governors (at the region), *prefects* (at the *cercle*), and *sous-prefects* (at the *arrondissement*). Since 1991, the government abolished the *arrondissement*, and instead established a more decentralized level of government, known as the *commune*.

¹⁶ This took place during the Traore dictatorship, and numerous respondents describe harsh treatment at the hands of the government services for those who resisted contributing their labor.

families to return to their villages.¹⁷ However the chief of Komio and local politicians in charge of the PIV misappropriated the proceeds, causing the neighboring communities to seek establishment of their own PIVs in the early 1990's. For this same reason production in Komio came to an end in 1997 when the pumps broke and were unable to be replaced.



Figure 4. PIV in Komio Village

Phase II PIV – at Komio

When the previous chief was unable to repay the embezzled PIV funds, the community removed him from his position as chief, and in 1996 they asked his brother, living in Bamako, to take up the chieftaincy. However, between 1997 and 2002 Komio residents were unable to cultivate their PIV as they lacked a

¹⁷ Joffre and Lajaunie (2008) report productivity of inundated rice cultivation in the Komio's floodplain to be anywhere between 500-1000kg of rice per hectare depending on the access in each family to labor and the productive capital needed (plows, oxen). In contrast, PIV culture is reported by this community to achieve between 7700-9600 kg/ha for each harvest due to the intensified rice farming practices used, the collective application of fertilizer, and the guaranteed access to water.

pump to irrigate the area, resulting in another exodus from the village to towns and cities. In 2002, the new chief was able to convince ORM to supply them with two more pumps, and ORM again replaced one of these pumps in April 2008, allowing this PIV to produce two rice crops per year. The new PIV leadership also received training on management of resources and introduced an annual membership fee which goes toward pump maintenance, and the purchase of fuel and fertilizer. A PIV committee of 11 people was selected by the village chief and his advisors and approved for a 3-yr mandate by the community. The President of the Phase II PIV committee is the chief's senior advisor, Mr. Manfing Timota.

In this region of Mali, women do not traditionally practice rice farming; however a group of roughly 120 women had organized themselves into an association for the collective cultivation of onions. In 2000, a visitor to the community recommended that they attempt rice farming, and they were able to get the NGO, "Organisation pour la Gestion de l'Environnement au Sahel" (OGS) to donate a pump in 2001. This pump broke in 2002, and another pump that was donated by another project in 2002 broke in 2003. In 2006, the women had one of the pumps repaired and it worked for a year. Now they use one of the repaired pumps belonging to the men's PIV scheme. Each of the women has a small plot, roughly 0.10 ha in size, enabling them to produce between 2-4 bags of rice per year. Having seen the livelihood impacts of this scheme, other women would like to join, however the limited capacity of the pump limits membership to the original group. This Association organizes a loan scheme to which all members contribute CFA 100 each week, and from which members can borrow for up to three months with a charge of CFA 250. Additionally, an annual fee of CFA 7500 goes toward maintenance and fuel for the pump.

Phase II PIV – at Kamaka.

Kamaka village established its own PIV in 1994 with the assistance of a European Union (EU) funded work-for-food program that paid community members for their labor, and provided them with a water pump. This pump has the capacity to irrigate 20 ha of land, however this community is able to supply 86 PIV members with .25 ha plots of land (for a total of 21.5 ha.). In this community, membership was allocated to all physically capable men (rather than on a family basis) including three longer-term Bozo fisher migrants from Ninya-daga fishing camp.

The women of Kamaka were also able to gain the support of OGS for the construction of their own PIV in 1997, in which 41 women share 5 ha of land (0.12 ha each). A third PIV of 24 ha was established in 2005 by the governmental “Programme National d'Infrastructure Rurale” (PNIR), however the pump for this PIV broke, and they now share a single pump with the women’s PIV, providing them a single growing season each.

Phase II PIV – at Kouana

Similarly, Kouana established its own PIV in 1996 through an OGS/European Union funded program, which provided them with two pumps and fertilizer. These pumps broke in 1998, and the community was given another pump in 2005 by the EU-funded “*Projet Valorization des Ressources en Eaux de Surface en 5me Region*” (see Figure 5). During the period when this community didn’t have a pump, high levels of flooding in the natural floodplain enabled a majority of community members to cultivate rice crops that way, and remain in the village.

This village's PIV scheme is limited to one season per year as the arm of the Niger River on which it is located dries up completely during the dry season.



Figure 5. PIV Irrigation pump at Kouana

Livelihood impacts of PIVs

In all communities visited, participation in PIVs appears to be open to all who are willing to contribute their labor at its inception, without regard for ethnicity or residency (migratory Bozo fishers are known to participate in both Kamaka and Komio). All participants speak positively of the livelihood impacts. The famine of 1973 eroded most households productive capital asset base (ploughs, draft animals, fishing nets, canoes, etc.), forcing some families to quit farming or fishing altogether. The establishment of the PIVs has enabled most families to regain this capital, which positively impacts their productivity in the PIVs as well as farming in the floodplain, and has resulted in a visible accumulation of livestock in the community. Indeed, the only conflicts mentioned regarding the

PIVs relates to growing numbers of livestock that attempt to feed in the rice paddies.

Overall, while Somono and Bozo residents still regard themselves firstly as fisherfolk, many acknowledge that PIV rice farming has become the single-most valuable source of capital among farmers and fishers alike (particularly for those in Komio where they harvest two PIV crops per year). The key PIV statistics are presented in Table 1. According to community respondents, the wholesale price of rice sold in this community ranged between CFA 7,500-14,000 per 80 kg bag, which is roughly half the retail price documented by USAID (2008)¹⁸ at the market in Segou. With production levels for most male heads of households in Komio, Kamaka, and Kouana at around 2400 kg (though it should be noted that one PIV in Kamaka reports achieving double this level of production), the local wholesale value of rice produced by men ranges between CFA 225-420,000 (or US\$ 511-955)¹⁹.

Table 1 Komio Village Territory PIV scheme statistics

Village	Gender	Total area (ha)	Members	Plot size (ha)	Growing Seasons	Production/member (Kg) ¹
Komio	Men	40	300	0.13	2	2496
	Women	5	120	0.04	1	384
Kamaka	Men 1	21.5	86	0.25	2	4800
	Men 2	24	?	0.25	1	2400
	Women	5	41	0.12	1	1152
Kouana	Men	12	48	0.25	1	2400

Notes:

¹ Stakeholders estimate production per ha per crop at 120 bags (each 80 kg), or 9600 kg.

According to a recent World Bank study, Malian households on average consumed CFA 153,000 worth of rice this last year (Nouve and Wodon 2008), implying that most households in this territory produced roughly double their

¹⁸ The value of rice grown based on market prices in 2008 is CFA 16,000-27,000 per 80 kg bag (USAID 2008).

¹⁹ Calculated based on an exchange rate of US\$ 1=CFA 440.

household consumptive needs. This conclusion is supported by respondents who highlight the increasing importance of their village as a source for rice for the surrounding villages that do not have their own PIVs. A number of community members also cite their guaranteed income from PIVs as facilitating access to credit from banks in Mopti. One caveat of PIV membership, however, is the requirement that all plots be farmed each year, as they cannot be sold and will be redistributed to other families if unused.

Though their plot sizes are smaller, and they only are able to produce a single crop per year, the impact of the women's PIVs has also been substantial. Given that, women do not traditionally cultivate rice, and the marginal profitability of onion production (which was their main activity before establishment of the PIV) in this region, women's financial dependence on male family members had been high. Since creating their own PIVs, women have become better able to provide for their needs and the needs of their children.²⁰ (see Figure 6).

²⁰ At Komio and Kamaka, women's PIV should have achieved production rates of 384 kg (valued at CFA 36-67,000 or US\$ 80-153), and 1152 kg (valued at CFA 108-202,000 or US\$ 245-258), respectively.



Figure 6. Women collectively transplanting rice in their PIV

PIV impacts on labor migration patterns

In all communities, one of the principal impacts of the PIVs, as described by respondents, has been to reverse or stem the flow of migrants to the cities as the earnings from the PIVs outweigh activities that they would pursue in cities. This does not mean that migration to cities has ended, however, as the “wealthier” households continue to send family members to the cities, thereby enabling them to earn additional income and find sources for cheaper farming inputs. Similarly, as found by Wampfler (2006) and Joffre and Lajaunie (2008), it is primarily those Somono and Bozo fisherfolk who have more productive capital who can send family members on seasonal fishing migrations to Lac Debo in the dry season. In some cases, these fishers return to their villages in time for PIV activities, or they pay others to farm their plot for them while they focus on their fishing activities. Joffre and Lajaunie (2008) found that wealthier

farming households also may simply pay others to farm for them and invest their own labor elsewhere.

This reflects the dichotomy of scenarios presented by many studies on migration in western Africa. During periods of economic or climatic stress, the inability of rural areas and secondary towns to support livelihoods forces rural populations to send their most productive labor resources away as migrant labor as a last resort (Beauchemin and Schoumaker 2006). However, in many cases, poor households are typically less able to invest in seasonal migration due to a lack of social networks and surplus male labor in their households (Azam and Gubert 2006, Hampshire 2006, Harts-Broekhuis 1997). Rather, it is primarily the wealthier households who choose to send some family members to the cities as a strategic investment based upon the relative costs and benefits that these young men represent outside their villages compared with that in the village (Azam and Gubert 2006, de Bruijn and van Dijk 2003, de Haan et al 2002, Gubert 2002, Hampshire 2006, Harts-Broekhuis 1997).

Impact assessment of stocking *mares* on livelihoods and resource access in Komio

Following painful lessons learned through leadership corruption in the past, it appears that local institutions in Komio currently maintain high levels of equity both between the different stakeholder groups in Komio. The establishment of multiple PIVs in three communities has also contributed to the development of leadership capacities and livelihood alternatives in neighboring communities. This is particularly encouraging in respect to the women's PIVs.

Although the leadership of Komio appears to be transparent and accountable to its people, the accumulation of influential roles by the chief's principal advisor, Mr. Manfing Timota, does raise some questions regarding the potential for elite capture of future project benefits. This is of particular concern as he is also head of the family that owns the specific *mare* ("Mama Pongu") under consideration for stocking. Any intervention in this community should first engage with a diverse array of stakeholder groups to ensure that the project isn't misled by a partial contextual understanding provided by the community leadership.

Although there are some questions as to the true history of water master roles in the *Korondaga batigi* and the *mares* of Komio Village, this does not appear to be a point of contestation within the community. Institutions regulating aquatic resources in the Niger River are clearly designed to provide income to the Somono community, but access to these aquatic resources appears to be open to all local stakeholders without discrimination based on ethnicity, gender, or residency. Although the recent increase in taxation (*manga jii*) of outsider fishers by Somono water masters does not impact community members

directly, this might impact poorer fisher livelihoods if the water masters of the nearby *Wagnakara batigi* (and other *batigi*) raise their *manga jii* correspondingly. *Mares* are recognized as belonging to individual branches of the Timota clan; however these families do not impose any fees for participation in collective fishing events. The productivity of the *mares* has declined due to siltation of the channel connecting them to the Niger River, but they remain valuable sources of supplementary food and income during the dry season for Komio village. Of particular note is the value of the *mares* for poorer household subsistence needs, and Bozo women's abilities to feed and clothe their households. On the other hand, fishing rights in the channels draining floodplain *mares* are managed as private property during the season of declining water levels (*décrué*).

While the initial PIV at Komio was established with little capacity-building for stakeholders or sensitization as to its benefits, all residents from all villages (and even some migrant fishers) appear to benefit from the PIVs today without any discrimination due to ethnicity or residency. The only exception is for Kanguila village which is situated too far from the river to have a PIV. Rice farming was not historically an activity practiced by women in this area, but in two of the villages (Komio and Kamaka), women have been supported by NGOs and the men's PIVs in the establishment of their own PIVs. The PIVs appear to have revolutionized local communities in two major ways:

- They guarantee that residents have a rice crop each year (irrespective of flood conditions), reversing the emigration of villagers to cities; and
- Those PIVs that are able to operate during the dry season provide young men with profitable livelihood opportunities when they would otherwise migrate seasonally in search of work.

The PIV livelihood impacts are apparent as many families have been able to recover productive capital that had been lost following the droughts of 1973 and 1978, and a number of households have invested in livestock. In some cases, those households that send youths to work in cities, now do so in order to reap additional benefits rather than out of desperation. Again, women's PIVs are a significant boon providing them with financial independence.

In terms of overall livelihood impacts, unless *mare* productivity is increased through the excavation of channels, even stocked *mares* will probably not rival the importance of PIVs to the community as a whole. However, they would increase local communities' access to protein and income during the dry season, a period when few other economic activities takes place other than farming in the PIV. With careful citing of enclosures (in order to avoid *mare* margins that are of value for livestock forage), stocking of *mares* during this period does not appear to pose significant risks of conflicts with other land- or aquatic-resource user groups. However, while *mare* owners do not currently charge a *manga jii* for participation in collective fishing events, any increase in value of these *mare* fisheries (as anticipated by stocking) may tempt *mare* owners to start charging for the right to participate (as is done to outsiders in the river fishing reserves and in *mares* elsewhere). Any *manga jii* levied on fishing in the *mare* could limit livelihood abilities of poorer households (as described in Joffre and Lajaunie 2008) to sustain themselves. As mentioned in regards to the increased *manga jii* now being charged for outsiders' participation in river reserve fishing, any new taxation of outsiders fishing in *Mama mare* may negatively impact poorer residents by possibly encouraging other communities to charge them for access to their *mares*.

Governance issues in relation to PIVs appear to have been most challenging when communities shared the use of a resource that was central to livelihoods,

and when these institutions lacked in transparency and accountability (as was the case with the first Komio PIV). While Komio's leadership appear to be well aware of these issues, the potential for abuse by a highly centralized core of power brokers in Komio should be taken into consideration in planning any intervention (with specific regard to Mr. Manfing Timota).

A final concern should be raised regarding the sustainability of any *mare* stocking activity and institutions. Based on these communities' experiences with PIVs, they do not yet appear able to sustain activities on their own and although they collect fees for the maintenance of pumps, they have repeatedly been forced to request additional donations of pumps from NGOs and the government.

As it was not possible for the team to visit Kanguila village, we were unable to evaluate whether this community's lack of PIV, and/or declining productivity of *mare* fisheries has resulted in particular livelihood hardships. However, it is likely that (absent other livelihood opportunities not identified) livelihoods in this community are more vulnerable to the vagaries of river flooding and rainfall levels/seasonality. The *mares* may therefore be of particular value to those who remain in this community during the dry season. Any future plans to increase productivity of, and/or alter institutional arrangements in regards to access to *mares* may have a significant impact on this community, a factor which should be taken into account.

***Mare* stocking recommendations**

According to Komio's leadership, IER has not yet detailed any specifics regarding how they plan to stock the *Mama mare*. Consequently expectations have not yet been raised and the recommendations from this analysis (and that

of Joffre and Lajaunie (2008)) may be integrated without endangering our working relationship with this community:

Forums for public input: As the *mare* is located in Komio village, project planning will necessarily be led by the existing leadership of Komio. However prior community sensitization activities need to ensure that the full range of stakeholders in Komio are given the opportunity to voice concerns regarding how *mare* stocking will impact livelihoods and access to resources. We should also provide similar public forums to the members of Kamaka, Kouana, and Kanguila village, and possibly encourage their representation on any governance committee established.

Access to *mares* and distribution of benefits: From the discussions led by Joffre and Lajaunie (2008), a number of options were considered by the community:

- Distribution of the harvest between households;
- Marketing of the harvest to collect funds for the village and to provide a savings fund for use towards village needs;
- 50% of the harvest should be divided between households and 50% should be sold to go towards the village saving fund;
- Sell the harvest to finance the digging of the channel between the *mares* and the river.

In subsequent discussions with the community, in order to decide how benefits should be distributed, we might want to encourage discussion around which subgroups within this community and in neighboring communities: a) have the greatest dependence on *mare* resources throughout the year, and b) are the least able to provide for themselves from existing livelihood activities. As listed above, there is a danger that income raised will go to (mostly male) heads of

households, and will be limited to the village of Komio itself. Some consideration might therefore be given to the following sub-groups:

- Younger households who do not have access to PIV plots (estimated by Joffre and Lajaunie (2008) at 7%);
- Komio's women, who currently only have small PIV plots;
- Bozo who may rely more on *mare* fishing as a livelihood activity than do others;
- Younger people, who are currently largely dependent on the heads of households for income;
- Community members of Kanguila, if their reliance on *mare* fisheries is assessed to be proportionately greater due to absence of alternatives.

Regarding village funds, the setting of village priorities needs to be done in a transparent manner and must actively seek to engage with more than just village leaders or heads of households. In addition to projects that increase incomes, given the poor literacy levels and high disease burdens faced by many Niger River communities, this village may want to consider objectives beyond strictly economic ones, such as improving access to education and health. Based on the community's estimation of how much it would cost to have a new channel dug to connect the *mares* (CFA 100 million), this seems like a doubtful investment of *mare* fish culture proceeds.

Potential conflicts with other fishing activities: As fish pens may act as fish aggregation devices for natural fish stocks, Bozo fishing activities may come into conflict with the management of stocked fish pens. Additionally, the limited water flow into *mares* following the decline of river flood level will limit both the density and quantity of fish that can be stocked, and will impact the

productivity of existing fish stocks. If access to pen-raised fish is limited to specific groups, this may then have a detrimental impact on those who are more dependent on collective fishing events targeting non-stocked fish.

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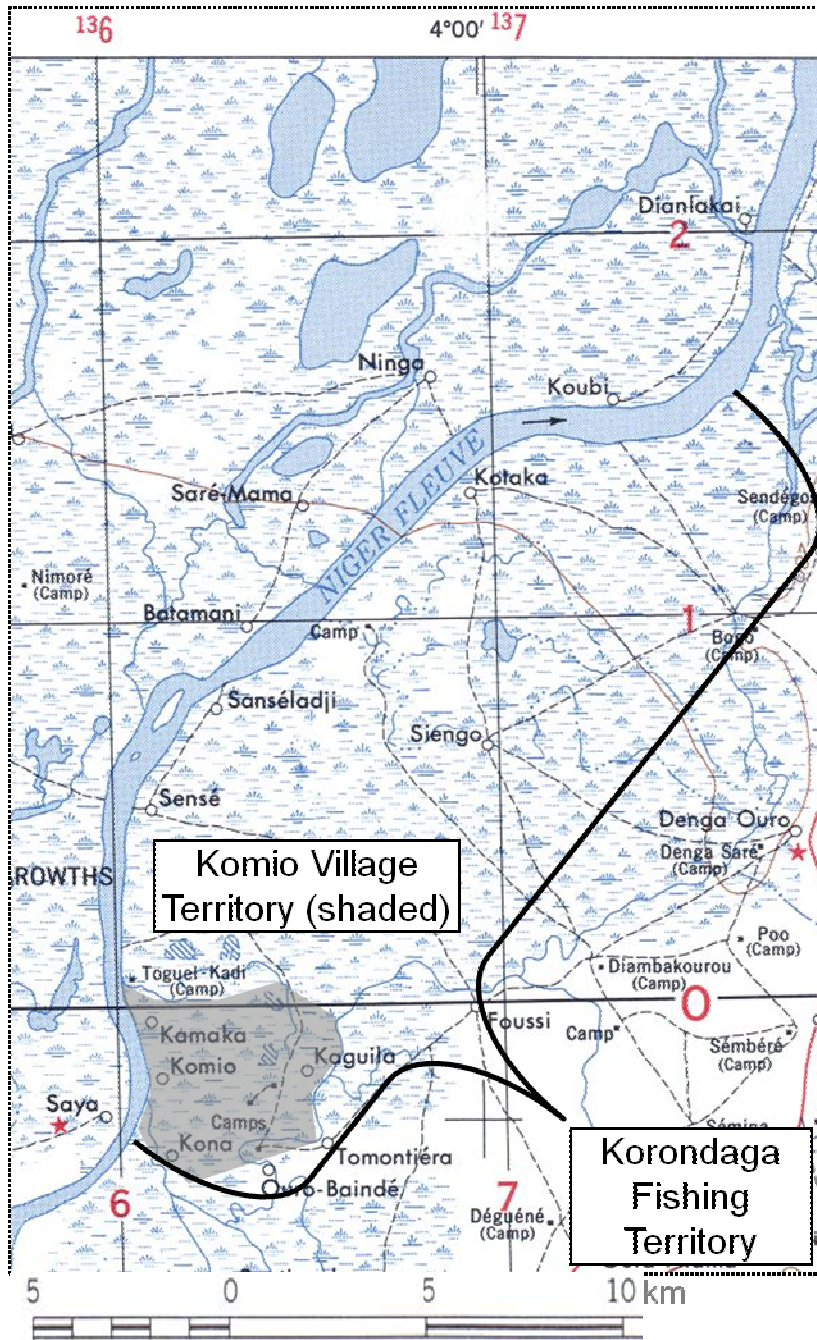
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Appendix A. Map of Komio Village Territory and Korondaga fishing territory



Appendix B. List of Semi-structured Interviews

Interview #	Date	Location	Name	# of Respondents
1	Sept.27	Komio	Village chief and his advisors	7
2	"	Komio	Senior Bozo fisher	4
3	Sept.28	Komio	Komio "Prime minister"	1
4	"	Kamaka	Village chief and his advisors	5
5	"	Ninya-daga	Senior camp resident	5
6	Sept.29	Komio	Somono water master	1
7	"	Komio	Women's group leadership	7
8	"	Kouana	Village chief and his advisor	2
Total respondents =				32

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