

Water Grows Food: Dry Season Farming, Food Sovereignty, and Integrated Water Resource Management in Burkina Faso

Brian Dowd-Uribe, Carla Roncoli, and Ben Orlove

Brian Dowd-Uribe has a PhD in Environmental Studies from the University of California, Santa Cruz. He has served as a Post-Doctoral Research Scientist at Columbia University's Center for Research on Environmental Decisions and is currently transitioning to a position of Assistant Professor at the University of Peace in Costa Rica. His research interests center on political ecology, impacts of neoliberal policies, sustainable food systems, and social movements, especially in West Africa.

Carla Roncoli is an environmental anthropologist (MA, PhD State University of New York, Binghamton) with the Department of Anthropology and the Associate Director of the Master's in Development Practice at Emory University. She works with interdisciplinary research projects focused on the interactions between climate risk, knowledge systems, agricultural decision-making, and livelihood security in Africa as well as in the southeastern United States.

Benjamin Orlove is an anthropologist (BA, Harvard, MA, PhD Berkeley) who teaches in the School of International and Public Affairs at Columbia, where he also directs the Master's Program in Climate and Society and the Center for Research on Environmental Decisions. His major research areas include climate, water and hazards as well as landscape studies in Latin America, South Asia, Africa, and Europe. He has published many books, including the latest *Darkening Peaks: Glacier Retreat, Science, and Society*.

"Now is the time for Food Sovereignty."
--Nyéléni Declaration, 2007, Selingue, Mali

"I wish there was enough [river] water so that I can produce vegetables and sell them."
--Farmer, Jan 2012, Sitiena, Cascades Province, Burkina Faso.

A food production revolution

Karim could be confused with one of millions of African smallholder farmers who tend small plots of land for their subsistence. He grows three hectares of maize and one hectare of vegetables in a small village in southwestern Burkina Faso. He and his family plow their field with a pair of oxen, and weed it with hand-held hoes. When asked where the water comes from for his crops, Karim answers, "God."

But there is a lot more to Karim's story than this succinct anecdote can convey. Karim cultivates the three hectares of maize and one hectare of vegetables during the *dry* season, in addition to the crops he grows during the wet season. These dry season crops are not primarily destined for the household, but are sold in local markets, and some are even exported to Ivory Coast. He uses a diesel powered pump and a series of PVC pipes to direct water from a nearby river to irrigate his fields. He grows two improved varieties of maize and applies herbicides before planting. He purchases improved vegetable seeds from a private distributor who gets them shipped directly from Europe. Pest pressure is high, so he applies multiple applications of different, crop-specific pesticides to his vegetable and maize crops. He also makes multiple applications of mineral fertilizers. Much of these investments are done with very little support from government or non-governmental organizations.

Karim, and many farmers like him, are at the center of shifting agricultural trajectories in sub-Saharan Africa. The adoption of new technologies, including water pumps, tractors, transgenics, improved seeds,

and agro-chemicals is changing the face of agricultural production on the continent. These changes are occurring at a rapid pace and present new challenges for governments, particularly as they relate to extension and natural resource management. This essay uses the case of Karim and other dry season farmers like him along the riverbanks of the Comoé river to explore (1) some of the tensions that arise from this rapid technological change in agricultural production as it relates to the food sovereignty movement and, (2) the role of integrated water resource management (IWRM) in facilitating food sovereignty.

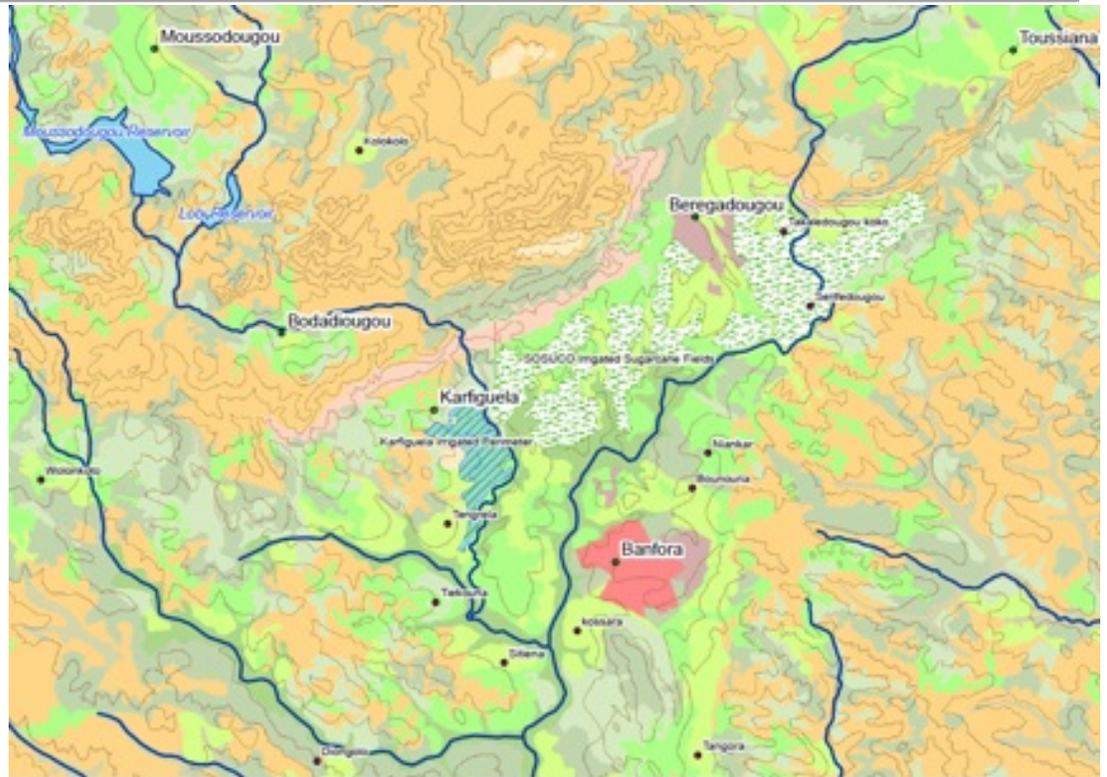


Figure 1: The Comoé River Basin in southwestern Burkina Faso

Setting the scene: The Upper Comoé basin and small-scale motorized irrigation

The Upper Comoé river basin is one of few permanent rivers in Burkina Faso, West Africa. The river originates in southwestern Burkina Faso, crossing the border with Cote d'Ivoire to flow into the Gulf of Guinea. The Burkina Faso portion of the basin includes the Upper Comoé and its main tributary, the Yannon. Water from the two rivers is captured into three reservoirs, the Lobi and Moussoudougou on the Comoé, and the Toussiana on the Yannon (see Figure 1). These reservoirs provide water for (1) a sugar company, *La Nouvelle Société Sucrière de la Comoé*, (SN-SOSUCO); (2) a water company that supplies the urban center of Banfora, *L'Office nationale de l'eau et de l'assainissement* (ONEA), (3) a 350 hectare irrigated perimeter near the village of Karfiguela,

and (4) dry-season riparian farmers like Karim along both the Comoé and the Yannon. Other users include local fishermen, cattle herders, and downstream communities (Roncoli et al. 2009).

As in most of Sudano-Sahelian Africa, food production in the Upper Comoé basin is inextricably linked to water. The Upper Comoé basin is located in one of the more moist areas of the Burkina Faso; the largest town in the region, Banfora, receives an average of 1100mm of rain annually (Roncoli et al. 2009). This relatively abundant rainfall has afforded the southwestern part of the country a status as a breadbasket for the country. Until recently most food production was rainfed – the main exception being the Karfiguela irrigated perimeter mentioned above. But that has changed since the introduction of diesel-powered water pumps.

In the context of the Sudano-Sahelian region, the Upper Comoé basin is a relative latecomer to mechanized water pumps and dry season agriculture. Since the 1970s, the adoption of mechanized water pumps has revolutionized dry season agriculture throughout the region. As early as the late 1980s, World Bank-funded agricultural development projects (ADP) heavily subsidized the purchase of diesel-powered water pumps in Nigeria. Between 1983 and 1989, the Kano State ADP distributed over 40,000 water pumps at subsidized prices to producers (Kimmage 1991). In neighboring Niger, small-scale dry season agriculture with water pumps did not significantly advance until the mid 1990's when the World Bank financed the *Project Pilote de Promotion d'Irrigation Privée* (PIIP). By 2008 the project facilitated the adoption of over 10,000 mechanized water pumps (Ehnrrooth et al. 2011).

In Burkina Faso, significant mechanized water pump adoption did not occur until the mid-2000s. An African Development Bank funded project, *Projet d'Appui au Développement Local dans la Comoé, Léraba, et Kenedougou* (PADL– CLK) began subsidizing the purchase of water pumps in the Upper Comoé basin and neighboring areas in 2004. Pumps were offered to producers for purchase at 10-15% of their total value; their final cost was roughly \$280 USD.¹ This subsidized price made the purchase of these pumps a possibility for many local producers; by 2011, approximately 200 pumps had been sold in the basin. The revenue generated from these subsidized pumps has allowed producers to purchase new water pumps from private sellers from around \$600 USD. These pumps, and their PADL– CLK counterparts, have sufficient capacity to irrigate up to 5 hectares.

According to interviews with over 50 farmers in the Upper Comoé basin, in 2003, total cultivated area for dry season farming along the riverbanks was less than 30 hectares. Producers irrigated almost exclusively with hand-held aluminum watering

cans. In contrast, our survey of dry season riparian agriculture, conducted in July 2012, found that farmers now cultivate over 600 hectares, distributed in individual plots ranging from 0.1 to 5 hectares in size. Almost all of these plots are irrigated with diesel powered water pumps. Dry season farmers primarily grow vegetable crops, including cabbage, eggplant, onions, hot pepper, tomatoes, and okra, which are destined for consumption throughout Burkina Faso and neighboring Cote d'Ivoire. Every morning dozens of bicycles and motorbikes make



Figure 2. A man transports eggplant by motorcycle to a vegetable market in Banfora, Burkina Faso. In the foreground, a woman transports cabbage by bike.

the 10–20km ride from the fields to the regional capital of Banfora, where the produce is sold in a thriving vegetable market (see Figure 2). Residents of local villagers say that dry season farming has become profitable enough for youth to remain in their villages rather than migrating to Cote d'Ivoire or larger towns in Burkina Faso for work.

Another wave of support for dry season farming in the region came in 2011, with Operation Bondofa, a highly publicized campaign to promote dry season maize production in order to supply other areas of

¹ Using an exchange rate on July 1st, 2004 of 539 FCFA = \$1 USD.

the country that were experiencing food insecurity due to drought during the previous rainfall season. Operation Bondofa (which means “filling the granaries” in Dioula, the regional *lingua franca*) provides farmers with subsidies for fertilizer, improved seed, and tractor services, and a guaranteed purchasing price of 150 FCFA/kg. Propelled by significant political backing during an election year, Operation Bondofa established target quotas for planted areas, including 1,500 hectares for the Comoé and neighboring Léraba province. The Minister of Agriculture visited Banfora to encourage farmers to plant Bondofa maize during the dry season. During the event, farmers expressed their concerns about water availability, stressing that there was not enough water in the river to meet targeted quotas. However, many of them did shift from vegetable to maize production to take advantage of the subsidies and price guarantees.

Food production and food sovereignty in the Upper Comoé basin

There is little doubt that the adoption of mechanized water pump technologies has promoted greater food production in the Upper Comoé basin and improved the livelihoods of local residents. But the adoption of these technologies simultaneously draws attention to questions of sustainability. As producers continuously farm the same agricultural fields, will they be viable in the near future? Will water resources be efficiently, equitably and sustainably managed? Does a reliance of technologies and agricultural inputs based on fossil fuels mean that farmers in the Upper Comoé basin are simply replicating the unsustainable agricultural practices that are considered antithetical to a food sovereign future?

This section compares the food production in the Upper Comoé with the vision outlined in the Nyéléni Declaration – a flagship document of the food sovereignty movement. The comparison highlights tensions in the food sovereignty movement regarding the roles of technology,

markets, and the state at facilitating sovereign food production. It also shows how framing the vision outlined in the declaration as a goal to aim at rather than a prescription to abide by can perhaps move the multiple factions of the food sovereignty movement towards improving current food production strategies.

As described elsewhere, food sovereignty signifies many things to many different people – and in this regard resembles a “big tent” where multiple and potentially contradictory trajectories are present (Patel 2009). Nonetheless, it is often conventionally thought of as a rights-based framework. This can be seen in the International Assessment of Agricultural Knowledge, Science, and Technology for Development (IAASTD) report’s definition of food sovereignty simply as, “the rights of people and sovereign states to democratically determine their own agricultural and food policies” (IAASTD 2009, pg. 10).

In 2007, and about 500 kilometers to the west of the Upper Comoé basin, Via Campesina, a worldwide coalition of organizations supporting small sustainable family farmers, gathered 500 activists from over 80 countries to set out a broad vision for the food sovereignty movement. They created what is known as the Nyéléni Declaration outlining their conception of a food sovereign future (Via Campesina 2007). This document goes into greater detail than the rights-based approach referred to in the IAASTD report.

A clear tension in the document is how and whether technologies can contribute to food sovereignty. The only explicit references to technology in the Nyéléni Declaration are negative. The Declaration states that food sovereignty organizations are fighting against “technologies and practices that undercut our future food producing capacities damage the environment and put our health at risk. Those include the so-called ‘old’ and ‘new’ Green Revolutions.” But the Declaration does not explore how the adoption of certain technologies may facilitate some of its livelihood and rights goals. To

use the case of the Upper Comoé basin, the adoption of diesel powered water pumps has increased the ability of local producers to achieve key goals articulated in the Declaration, including to “earn a living wage,” and to remain in their homes.” Moreover, the Declaration states that producers, like those in the Upper Comoé basin, should be able to “determin[e] their own food producing systems.” Comoé producers have exercised this right to determine their food production systems via the adoption and use of water pumps and agricultural inputs.

This ambiguity extends to the role of markets at facilitating sovereign food production. The document uses the term “markets” only twice, and in the same paragraph. But its use bears the tension over whether markets can be viewed as a vehicle for or an impediment to sovereignty. The Declaration states that food sovereignty “puts those who produce, distribute and consume food at the heart of food systems and policies rather than the demands of markets and corporations.” It goes on to state that food sovereignty “priorities local and national economies and markets and empowers peasant and family farmer-driven agriculture and food production, distribution and consumption based on environmental, social and economic sustainability.” The document seems to be prioritizing regional and local food production, but wants to underscore that larger “market demands” should not dictate the direction of food production.

These ambiguous stances, where technologies and markets can both serve as vehicles for and impediments to food sovereignty, reveal the difficulty in outlining the means to move towards food sovereignty. Just as not all food production is “sovereign,” not all technological use or market activities contribute to food sovereignty. For this reason food sovereignty is perhaps best viewed as a continuum, where certain production strategies, technological uses and levels of market integration lead to more or less sovereign food production. These configurations of social, economic and agricultural elements will vary considerably

depending on the particular context of food production and consumption. When viewed as a continuum rather than a dichotomy, greater food sovereignty becomes a goal to strive towards. It turns the discussion to the ways in which each of these elements can improve the sovereignty of food production.

This next section explores whether one intervention in particular, the adoption of integrated water resource management, pushes food production in the Upper Comoé basin towards greater sovereignty. In so doing it exposes the complex ways in which technological adoption and market integration articulate with food production. It also reveals how both technology and markets have the potential to move food production in the Upper Comoé towards principles congruent with the food sovereignty movement.

Dry season farming and water conflict in the Upper Comoé basin

The key to Karim’s success has been his ability to access water. This ability has been made possible by technical and institutional innovations, namely diesel-power pumps and improved water resource governance. But the introduction of diesel-powered motor pumps has also exacerbated tensions over the use of scarce water resources, while the country’s efforts to reform water sector policies and institutions has yet to translate into equitable and sustainable water use in the Upper Comoé basin.

In the last decade, there has been a global shift in water policy towards integrated water resource management, or IWRM. The Global Water Partnership (GWP) defines IWRM as “a process which promotes the coordinated development and management of water, land, and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems” (GWP 2012). The concept of IWRM emerged from a series of international water expert conferences where participants agreed that

integrated approaches were needed to deal with the multiple dimensions of water resource management. In short, IWRM is a vehicle to achieve efficient, equitable and sustainable water use. It is now “the hegemonic paradigm for discussing, legitimizing and implementing policies regarding the management of the world’s water resources” (Orlove and Caton 2010, pg 408).

But, like many overarching narratives, IWRM is thin on specifics of the policies and institutions that can help achieve its goals of more equitable, efficient and environmentally sustainable water use. Moreover, as Orlove and Caton (2010) assert: “IWRM does not venture into...the complex political question over how its principles will be struggled over and fought out in concrete settings” (pg. 410). As IWRM becomes more prominent, it is imperative that researchers analyze how these policies are developed and identify the individuals and groups who win and lose, and assess their contribution towards greater efficiency, equity and sustainability of water use. It is also important to assess their contribution to building systems of food production that are congruent with food sovereignty principles.

Burkina Faso is considered an early global adopter of IWRM and one of only five sub-Saharan African nations judged by the Global Water Partnership to have “strategies in places, or plans well underway, that incorporate the main elements of an IWRM approach” (GWP 2006, pg. 4). The implementation of IWRM hinges on the establishment of decentralized water governance bodies that empower users to manage local water resources. These local water user committees – known by their French acronym CLEs (*Comités Locaux d’Eau*) – are based on the French model for governing water resources. Many observers consider Burkina Faso’s CLEs a model for other nations in the region (Petit and Baron 2009).

Recognizing that full implementation of IWRM in Burkina Faso would take time, policy-makers fast-tracked the creation of pilot CLEs in a few areas in

the country that suffered from a high level of tension and conflict surrounding water resources. The Upper Comoé basin was among the first IWRM implementation sites because of a high level of conflict over water resources. Much of the water conflict in the Upper Comoé revolves around the historic use of water by SOSUCO, the local sugar cane company.

SOSUCO was established before independence by French capital and further developed during the post-colonial era of state-directed development. As a parastatal, it appropriated about 10,000 hectares of land in the Upper Comoé basin, resulting in the dispossession and displacement of local communities. Resulting tensions were further exacerbated in the harnessing of local water resources into the three reservoirs, built by the state between the 1970s and 1980s, a period marked by severe droughts, during which the state invested heavily in reservoir construction as a way of addressing food insecurity and water shortage. Following the government’s embrace of neoliberal policies in the 1990s, SOSUCO was privatized and acquired by an investment firm controlled by the Aga Khan, a Pakistani millionaire, who is also the spiritual leader of the Isma’ili Muslims. Renamed SN-SOSUCO, it retained high level of trade and fiscal protection, with its entire sugar production being destined to the domestic market. Management reforms ushered in by privatization gave rise to periodic waves of labor struggles that further fueled animosity over the past expropriation of local lands and appropriation of water resources. A peak of labor unrest occurred in June 2011, but has since then subsided. At the same time, tensions surrounding water use have continued to surface periodically.

Historically SN-SOSUCO has controlled water in the three reservoirs – whose infrastructure it maintains, by a formal agreement with the state – using it almost exclusively for its own irrigation and sugar processing needs. But the adoption of small-scale irrigation pumps increased tensions around dry-season use of river water. Local water users

have increasingly demanded access to river water as their use of that water has risen. In March-April 2007 the river downstream of the Karfiguela irrigated perimeter ran dry for the first time in local memory, despite above average rainfall during the previous rainy season (1.300mm). Irrate farmers from downstream villages marched on government offices in Banfora in protest, accusing SN-SOSUCO of willfully “starving” (“*affaïmer*”) them. The central government dispatched the Minister of Commerce whose ministry has authority over SN-SOSUCO and who was also originally from one of the protesting villages, to mediate the conflict.

This conflict – covered by national media – led officials to prioritize the Upper Comoé basin as a site for intervention, propelling the formation of the CLE Upper Comoé (CLE-HC) in 2008. The CLE-HC was designed as a mechanism to mitigate water conflicts and improve management of water resources, and is composed of all relevant stakeholders, including user representatives, elected officials, ministries, government officials, customary and religious leaders, and civil society organizations (Sally et al. 2011). The main focus of negotiations that occur within the CLE-HC is the development of a consensual plan for water releases from the reservoirs and water diversions into the network of canals and pipelines that serve different users. This plan, which is developed at the onset of each dry season when users prepare to irrigate their fields, evaluates the water needs of local user groups and allocates a portion of water to be released from the reservoirs to meet those needs.

The adoption of IWRM and the creation of the CLE-HC by the Burkinabè state may be seen as consistent with the goals of greater food sovereignty as outlined in the Nyéléni Declaration. A key theme in the Declaration is greater control of local natural resources by food producers. The Declaration states that, “Food sovereignty...ensures that...the rights to use and manage our...waters...are in the hands of those of us who produce food.” Before the establishment of the CLE-HC, water use was essentially controlled by the sugar cane company.

But the introduction of diesel-powered pumps created a new category of users who were able to appropriate river water for food production. At the same time, the new IWMI policies and creation of the CLE-HC democratized water resource management, broadening decision making concerning water allocation in the Upper Comoé basin. In so doing, Burkina Faso’s movement towards IWRM aids in the pursuit of a future of greater food sovereignty and demonstrates how national policies can contribute to creating a favorable institutional context for smallholder-driven food production.

However, a closer examination of the 2012 conflict surrounding water resources in the Upper Comoé basin shows the persistence of serious challenges to achieving this goal. Years of poor infrastructural maintenance by SN-SOSUCO led to serious problems with the Moussoudougou dam, the largest in the system, which meant that the reservoir could only be partially filled. Lower reservoir capacity coincided with relatively low rainfall during the 2011 season (900 mm) to result in perhaps the largest water shortage in recent history in the basin, and the first such water shortage since the CLE-HC was created in 2008. SN-SOSUCO argued that greater water releases were not possible, as enough water had to be stocked in the reservoirs to ensure that its sugar cane fields could be irrigated for the entire dry season, particularly during the hot period before the new onset of the rains. At the same time, downstream farmers agitated for increased releases of water to service their own parched fields. Attempts by the CLE-HC to produce a consensual plan to distribute the water deficit among users failed.

Hundreds of riparian farmers along the riverbanks between the Karfiguela perimeter and the confluence of the Comoé and Yannon went without water for up to three weeks. The river completely dried up, causing fish to die off and crops to dry out. A month-long conflict ensued. After weeks of failed attempts to secure additional water releases, in March 2012 farmers threatened to march on

government offices in Banfora. This threat made local government officials very nervous, as such public action would inevitably attract national media attention, casting doubts on the Ministry of Agriculture's strategy for relieving famine in the drought-stricken areas through Operation Bondofa. Officials scrambled to address the situation locally by meeting with the farmers to explain that the water scarcity was caused by the infrastructural problems of the Moussoudougou dam as well as by the poor rainfall during the previous rainy season. At the same time, however, the political and humanitarian objectives of Operation Bondofa made it imperative that food production targets for the province be met. The situation eventually became so worrisome that the Minister of Agriculture himself intervened to pressure SN-SOSUCO to release enough water from the reservoirs to enable downstream farmers to irrigate their fields. This contributed to easing tensions as also did an unexpected early rain that replenished the river.

The episode also illustrates the opportunities and challenges that characterize the relationship between water resource management and food production. Established as a way to manage water conflicts in the basin, the CLE-HC can serve as a way to assure and even increase water access to support greater local food production and security. It could help shift water resources away from large-scale and chemical intensive sugar cane production to smallholder-based grain and vegetable production. But key impediments to realizing this potential remain. Even though more inclusive, decentralized forms of water management have been established, and embraced by central government and local stakeholders, SN-SOSUCO retains control over key aspects of the water resource infrastructure and information, including the keys to open the sluice gates and the data on reservoir levels and rates of flow. Furthermore, when tensions heat up, the processes of expressing and negotiating different claims continue to unfold outside the new institutional framework for water governance, in traditional spaces of citizen protest

and state intervention. Established as the primary mechanism for resolving water conflict, the CLE-HC was largely bypassed during the March 2012 events. Instead, it was state officials who intervened, as they had done for years, to serve as the key intermediaries between SN-SOSUCO and the downstream farmers.

Towards embracing technologies and markets for greater food sovereignty

As agricultural production and resource use patterns change across Africa, the Upper Comoé basin illustrates the opportunities and challenges that lie ahead. Technological introductions can, as in the case of diesel powered water pumps, require relatively little involvement of agricultural extension or other time and resource-heavy interventions to improve agricultural productivity. Water pumps dramatically increase the use of water resources expanding food production in an area where water is a limiting factor. The benefits of this production boom are shared relatively equitably as smallholders continue to dominate production. But these advances have come via the use of green revolution technologies with potentially serious environmental and public health implications.

The food sovereignty movement reminds us that not all increases in smallholder food production moves communities toward greater food sovereignty. But the contradictory impulses present in the movement's flagship document – the Nyéléni Declaration – bear the tensions of the movement, unclear in the role that technology and markets can play in food sovereignty. When viewed as a goal to be attained, rather than a prescription to be followed by, the ambiguity in the Nyéléni Declaration can be viewed as an opportunity to clarify how different interventions – be they the adoption of new technologies, or greater integration into local, regional, or national markets – can drive outcomes that look more like the food sovereign vision. This suggests the value of research and analysis that

would assess the ability of different interventions to promote food sovereignty.

The food production revolution in the Upper Comoé basin is not a perfect illustration of food sovereign principles. Green revolution technologies, including herbicides, pesticides, chemical fertilizers and diesel powered pumps promote increases in food production. The majority of food produced goes to local and regional markets, not into the bowls of local residents. In the case of the Operation Bondofa, support for maize production was motivated by political objectives as well as by the government's goal of reducing national dependency on external food aid. At the same time, institutional innovations for water governance have devolved more power to local residents to secure access to water resources. Their increased economic strength has translated to increased political clout, as the resolution of the recent 2012 water shortage demonstrates. Nonetheless these advances in water governance remain marginal at best, and significant room remains to further devolved authority over local water resources to local user groups.

But the Upper Comoé basin shows how technology adoption can drive real gains in food production and significant increases in food production. A food sovereignty movement that embraces these intermediate producers can help move their production systems towards greater sustainability. By intermediate we refer to the adoption of more mechanized and chemical-dependent growing practices with deeper integration to local and regional markets. Interventions to promote greater sustainability could include civil society, donor and state interventions that aid farmer knowledge, such as efforts to promote integrated pest management and farmer field schools. Food production will inevitably evolve as technologies and other interventions changes the production landscape. A vibrant food sovereignty movement can pull these interventions in the direction of greater sustainability, and in so doing, clarify its role in shaping food sovereign futures.

References

- Ehrnrooth, A. L. Dambo, and R. Jaubert 2011. "Projets et programmes de développement de l'irrigation au Niger (1960-2010) : Eléments pour un bilan," Centre d'Etudes et d'Information sur la Petite Irrigation. Available online at: <http://www.reca-niger.org/spip.php?article444>
- Global Water Partnership (GWP) 2006. *Setting the Stage for Growth*. Stockholm: GWP, 84pp.
- International Assessment of Agricultural Knowledge, Science, and Technology for Development (IAASTD) 2009. *Global Report*. Washington DC: Island Press.
- Kimmage K., and W.M. Adams 1990. "Small-scale Farmer managed Irrigation in Northern Nigeria," *Geoforum* 21(4): 435-443.
- Orlove, B. and S.C. Caton 2010. *Water Sustainability: Anthropological Approaches and Prospects. Annual Review of Anthropology* 39:401-15.
- Patel, R. 2009. "Food Sovereignty." *The Journal of Peasant Studies* 36(3): 663-706.
- Petit O. and C. Baron 2009. "Integrated Water Resources Management: From General Principles to its Implementation by the State. The Case of Burkina Faso." *Natural Resources Forum* 33, 49-59
- Roncoli, C., P. Kirshen, D. Etkin, M. Sanon, L. Somé, Y. Dembélé, B.J. Sanfo, J. Zoungrana and G. Hoogenboom 2009. "From Management to Negotiation: Technical and Institutional Innovations for Integrated Water Resource Management in the Upper Comoé River Basin, Burkina Faso." *Environmental Management* 44: 695-711.
- Sally, H. , H. Léville and J. Cour 2011. "Local Water Management of Small Reservoirs: Lessons from two Case Studies in Burkina Faso." *Water Alternatives* 4(3): 365-382.
- Via Campesina 2007. Nyéléni Declaration. Available online at: <http://www.nyeleni.org/spip.php?article290> Accessed on November 12, 2012.