

Formal and informal decision making on water management at the village level: A case study from the Office du Niger irrigation scheme (Mali)

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[1] Water Users Associations (WUAs) are all too often considered a panacea for improving water management in irrigation schemes. Where grassroots movements are absent, they are usually imposed on farmers by national governments, NGOs, and international donors, without fully considering existing forms of organization. This also happened in the Office du Niger irrigation scheme in Mali, where after a partial irrigation management transfer, WUAs were created to fill the resulting power vacuum. This paper demonstrates that, despite active efforts to organize farmers in WUAs, informal patterns of decision making remain dominant. Given the shortcomings of these informal patterns, WUAs could provide a much-needed platform for institutionalizing collective action, on the condition that farmers accept them. Therefore WUAs should adopt some crucial characteristics of informal patterns of decision making while avoiding their weaknesses. First, making use of the existing authority of village leadership and the central management can improve the credibility of WUAs. Second, allowing flexibility in procedures and rules can make them more appropriate for dealing with collective action problems that are typically temporary and specific. Last, formalizing the current pattern of conflict management and sanctioning might enhance its sphere of action and tackle the current absence of firm engagement with respect to some informal management decisions. In addition, WUAs should represent and be accountable to all farmers, including those residing outside the village community.

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1. Introduction

[2] In the context of irrigation management transfer, Water Users Associations (WUAs) are being promoted as the center of decision making on water management. The configuration of water management can take a wide variety of forms, which can be broadly divided into two categories. In the first category, WUAs are responsible for water management of the whole irrigation scheme. Nevertheless, they can delegate operation and maintenance of the main system to professional staff. In the second category, a central agency (private or government) is responsible for main-system operation and maintenance, whereas WUAs are responsible for water management at subsystems, typically at the tertiary level [Groenfeldt and Svendsen, 2000; Hearne, 2004; Johnson *et al.*, 2004]. WUAs do not arise spontaneously in most cases but are imposed on farmers in a top-down way by national governments, NGOs, and international donors [Abdelhadi *et al.*, 2004; N'Khoma and

Mulwafu, 2004; Jamin *et al.*, 2005]. In the process, existing forms of organization are frequently neglected despite the fact that the importance of involving local decision makers in setting up WUAs and building upon existing organizational capacity has been repeatedly pointed out [Meinzen-Dick and Reidinger, 1995; Vermillion and Sagardoy, 1999; Mosse, 1999; Sokile and van Koppen, 2004; Maganga *et al.*, 2004]. The result is that many WUAs remain merely legal constructs without the intended impact on water management [Cleaver, 1999; Mosse, 1999; Sokile and van Koppen, 2004; Theesfeld and Boevsky, 2005].

[3] Existing forms of organization are strongest in indigenous irrigation schemes, where water management is shaped by customary law and is embedded in the social and economic structure of society [Diemer, 1990; Watson *et al.*, 1998]. One of their prominent features is the strong involvement of village leadership in water management. Even in larger indigenous irrigation schemes, leaders of subunits ultimately give account to the village leadership [Adams *et al.*, 1994; Norman, 1997].

[4] In government-run irrigation schemes, decades of farmers' dependency on the central agency has crippled their organizational capacity [Shah *et al.*, 2002]. Nevertheless, some informal patterns of decision making on water management at farmers' level might have emerged.

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[5] The Office du Niger irrigation scheme is a classic example of the above-described evolution. As Mali's largest irrigation scheme (80,000 ha), it provides about 40% of the national rice production, a major staple, and is thus of vital importance for food self-sufficiency of the country. Created in the 1920s by the French colonial power, the central management tightly ran the irrigation scheme until it was pressed into reforms. By the end of the 1970s, the unsustainably low agronomic and financial performance of the irrigation scheme made the Malian government seek the support of the World Bank and several other international donors in order to finance rehabilitation. The latter were prepared to get involved on the condition of economic and institutional reforms. As such, the government reduced the competencies of the Office du Niger to its core business of operation and maintenance and carried out a partial irrigation management transfer to farmers [Aw and Diemer, 2005]. Next, WUAs were created on the initiative of international donors to fill the power vacuum left by the irrigation management transfer. This paper demonstrates that despite active efforts to formally organize farmers in WUAs, informal patterns of water management remain dominant. Given the flaws of these informal patterns, this represents a missed opportunity.

[6] The argument is built through an institutional analysis of both formal and informal centers of decision making on water management. Institutions in this paper are understood as "humanly devised constraints that shape human interaction" [North, 1990]. The difference between formal and informal institutions is not clear-cut. "Formal" is defined as following fixed procedures (mostly written down in statutes) and is molded in an organization backed by the legal system (in this context, a WUA), while "informal" means following customary norms and habits and based on conventions [Onibon et al., 1999]. In principle, both formal and informal institutions can effectively solve collective action problems even though establishing formal organizations might give the necessary impetus in groups already willing to cooperate [Meinzen-Dick et al., 2002]. Moreover, formal institutions are generally complemented with informal ones. As such, the same formal institutions applied by groups with different informal ones might produce different outcomes [North, 1990]. Finally, water management is defined quite broadly and encompasses (1) decision making on the cropping calendar, water allocation, and maintenance of the hydraulic network, (2) conflict management, and (3) information transfer.

[7] The analytical framework used in this paper draws in part from the framework proposed by Ostrom [1990, 1993]. In summary, it states that users do or do not support institutional change, depending on the trade-off of expected costs and benefits. These in turn depend on social norms, users' internal discount rate, and situational variables, such as characteristics of the user group and resource and the socioeconomic environment. From that, design principles can be deduced for successful institutions. While these design principles might be a necessary condition for institutions to work, they are certainly not a sufficient condition. Institutions must therefore be understood in their historical and sociocultural context [Cleaver, 1999; Mosse, 1999; Steins and Edwards, 1999; Sokile and van Koppen, 2004; Narain, 2004]. In particular, this context has shaped social

relations among users, their attitude toward the resource, and the legitimacy of formal and informal leaders. Understanding informal institutions can contribute to designing better ways for implementing institutional change, for example, by including representation of informal and accountable leaders [Ribot, 1996; Wester et al., 2003; Thakadu, 2005].

[8] After explaining the methodology, the paper describes the various centers of decision making in the irrigation scheme. Next, it contrasts the role of WUAs with informal patterns of water management in section 4. A final section concludes and states some policy implications.

2. Methodology

2.1. Description of the Study Area

[9] The Office du Niger irrigation scheme (14°18'N, 5°59'W) comprises 80,000 ha, destined chiefly for small-holder irrigation and cultivation of flooded rice. Irrigation water is drawn from the Niger River and is conveyed by gravity to a hierarchic irrigation network composed of primary, secondary, and tertiary canals. From the tertiary canals, field canals convey water to the rice basins and evacuate it to a drainage network. On average, each farmer cultivates a 2-ha plot divided over different contiguous basins. A village accommodates the farmers of the downstream plots of one to three nearby secondary canals. A growing number of plot holders are however outsiders to the village. In the rehabilitated parts of the irrigation scheme, outsiders comprise some 10 to 40% of plot holders [Jamin and Doucet, 1994]. In addition, even though illegal, leasing out plots for just one growing season has become quite common. Coulibaly and Bélières [2004] report that about 20% of farmers lease out (a part of) their plot, and in total, leaseholders cultivate 7% of the irrigated surface. Most leaseholders also live outside the village.

2.2. Fieldwork Methodology and Data Collection

[10] Fieldwork on farmers' water management and performance was conducted in 2004 and 2005 in nine villages from two administrative zones (Niono and N'Debougou). Data for this study result essentially from qualitative research methods. At the village level, two series of focused interviews [Flick, 1998] with village leaders took place. In the first series, the village history and social composition were discussed. The second series assessed the functioning of WUAs and informal patterns of water management at the village level. Table 1 presents key statistics on the sample villages. Next, a sample of 36 tertiary blocks was constructed for an in-depth study by picking out four tertiary blocks within each village. Group interviews for each of the tertiary blocks were conducted, in which decision making, communication, and coordination on water management were addressed using a structured, open question interview guide. Information obtained through the interviews was then complemented by frequent observations of water management activities on the field and informal discussions with farmers of the studied tertiary blocks (22 in total) on their principles of conduct regarding water management. Table 2 gives key characteristics of the sample of tertiary canals. A frequent presence in the villages, together with the researchers' attachment to a popular local research center that provided highly valued technical assistance, allowed

Table 1. Key Statistics on the Sample Villages

Village	Population	Number of Tertiary Canals	Location in the Irrigation Scheme	Zone
Médina-Coura	2821	34	Top-end position	N'Debougou
Tiemedely-Coura	2811	34	Middle position	N'Debougou
Kanassako	2471	29	Middle position	N'Debougou
Médina	3473	40	Middle position	Niono
Moussa-Wèrè	1123	18	Tail-end position	Niono
Peguenta	1005	10	Top-end position	Niono
Coloni	3150	33	Top-end position	Niono
Suigui-Vocè	1403	25	Tail-end position	N'Debougou
Fassun	2189	17	Tail-end position	N'Debougou

the development of a relationship of trust. Such a relationship is essential for obtaining information on taboo issues such as conflicts and illegal practices. Village interviews were made enjoyable for all participants by offering tea, which created a relaxed atmosphere and allowed to extend considerably the interview without loss of concentration of both interviewers and respondents. Content analysis was used to analyze empirical data [Miles and Huberman, 1994]. In order to further scrutinize empirical data, triangulation methods were used [Baxter and Eyles, 1997]. First, data were discussed in expert interviews with key informants in the study area, such as local researchers, Office du Niger officials, and leaders from the farmers' syndicate. Next, the researchers participated in various project evaluation meetings and information sessions on WUAs organized by the central management. A last source of information consisted in official and informal reports on water management and WUAs developed by researchers and national and international experts solicited to design, implement, and evaluate WUAs in the irrigation scheme.

3. Centers of Decision Making in the Office du Niger Irrigation Scheme

[11] Before reforms, the Office du Niger had a monopoly on virtually every sphere of decision making. Downsizing the Office du Niger led to its responsibility being reduced to water and land management. The other competences were transferred to existing and newly created centers of decision making. The judiciary responsibilities were transferred to the Malian national level, and the registry office, public security, education, and health were handed over to the prefectures and communes. Communes are the lowest formal level of government and are generally compiled of several villages [Hellevik, 2004]. Most villages, being scarcely populated, of the irrigation scheme were newly created starting from the 1920s, and they were populated through various waves of forced and voluntary immigration from different regions in Mali and Burkina Faso [van Beusekom, 2000; Philipovich, 2001; Seebörger, 2003]. Table 3 shows the dates of creation of the sample villages and describes the origin of the population. In the newly created villages, the central management controlled every aspect of daily life, thereby erasing most traditional forms of organization [Magasa, 1978; Schreyger, 1984]. One of the very few surviving customary institutions is the village chieftainship. All villages are headed by a village chief, often the male family head of one of the first settled

families. Since before reforms the traditional duties of the village chief, such as management of the village territory, housing, and administration, were in the hands of the central management, their sphere of action was severely reduced. Nevertheless, they managed to take the lead role in conflict management at the village level through informal jurisdiction and are generally recognized and respected by the villagers. This role is now administratively formalized. Indeed, even though villages are not a separate administrative level, they are an important entity for consultancy and conflict resolution within the commune [Hellevik, 2004].

[12] With the liberalization of crop production and marketing, village cooperatives have been created in the 1980s to manage agricultural input supply and processing and marketing of production, which before were also in the hands of the Office du Niger. The cooperatives were meant to be economically profitable, with earnings invested in social infrastructure such as schools and health centers. Consequently, successful cooperatives were able to play an important role in decision making at the village level. Generally, the village chief or one of his counselors took a lead role in the cooperative as its president or secretary, so that strong ties between the two have developed [Traoré and Spinat, 2002]. The success of the village cooperatives is variable. Already in the 1990s, the majority of cooperatives faced financial problems often caused by mismanagement and corruption [Traoré and Spinat, 2002]. Moreover, the cooperative leaders are often accused of favoritism, which prejudiced their legitimacy in the view of villagers [Yung and Tilly-Sada, 1992]. In response, groups of farmers created independent cooperatives. Ensuing competition often led to tensions at the village level and to the development of opposing factions although in the course of years, the opposing groups came to terms in most of the villages. On the other side, successful cooperatives often strengthened the social cohesion of the village. Table 3 gives an overview of the functioning of the village cooperatives for the sample villages. According to a study by PCPS [2002] that analyzed the functioning of village

Table 2. Key Characteristics of the Sample of Tertiary Canals

	Surface, ha	Number of Farmers	Proportion of Outsiders, %	Number of Leaseholders
Mean	18.4	7.9	14	1
Minimum	6.6	2	0	0
Maximum	48.3	19	56	6

Table 3. Origin of the Population and Functioning of the Village Cooperative for the Sample Villages

Village	Date of Creation	Origin of the Population	Functioning of the Village Cooperative
Médina-Coura	1955	Dominant group (Minianka) originating from the same region and installed by force, complemented by a group of mixed ethnicity	In difficulty, involved in a village dispute
Tiemedely-Coura	1965	Mixed population originating from different regions in Mali and installed both voluntarily and by force	Functional, good relation with competing cooperative
Kanassako	() ^a	Dominant group of original inhabitants, complemented by relatively recent newcomers	Successful
Médina	1940	Mixed population originating from different regions in Mali and installed voluntarily	In difficulty, involved in a dispute with the village chief
Moussa-Wèrè	1959	Mixed population of inhabitants of existing nearby villages and immigrants from other regions in Mali, installed both voluntarily and by force	Bankrupt, competing cooperative also bankrupt
Peguenta	1937	Dominant group of mixed ethnicity but originating from the same region, complemented by a group originating from different regions, relatively few recent newcomers	In difficulty, good relation with competing cooperatives
Coloni	1937	Mixed population of inhabitants of existing nearby villages and immigrants from other regions in Mali, installed both voluntarily and by force	In difficulty, bad relation with competing cooperatives
Suigui-Vocè	1940	Nearly homogeneous population originating from the same village in Burkina Faso, relatively few recent newcomers	Bankrupt, replaced by functional cooperative
Fassun	1962	Dominant group (Bambara) originating from the same region and installed voluntarily, complemented by a group of mixed ethnicity	Functional, good relation with competing cooperative

^aThe village existed before the irrigation scheme was constructed.

cooperatives, this figure is quite representative for the irrigation scheme.

[13] Even though water management is still the competence of the central management, a partial transfer to farmers has taken place. This transfer has been more complete toward the lower levels of the hierarchic canal network. The central management of the Office du Niger bears the sole responsibility for water management at the primary canal level. At the secondary level, farmers participate in decision making in joint committees. At the tertiary level, water management is entirely left to farmers [Touré *et al.*, 1997]. Certain regulations, elaborated in a three-yearly contract negotiated between the Malian state, the central management, and the farmers' representatives, limit farmers' liberty of action [Couture *et al.*, 2002]. The regulations prescribe the maintenance of the tertiary infrastructure, the cropping calendar, and the cultural practices to intensify rice production. They further stipulate farmers' obligation to limit water use and to practice double cropping on designated plots. There were however no structures to monitor compliance with these regulations, so that a certain anarchy and inability to solve collective action problems quickly became apparent. As a response, WUAs were created by donor-funded projects, designed to form the center of decision making on water management at tertiary level.

4. Decision-Making on Water Management

4.1. Water Users Associations at the Village Level

[14] In 1996, a first project, financed and designed by the French cooperation, established WUAs at the village level, the so-called "Comités Paritaires de Partiteur" (CPP). Institutionally inserted in the village cooperative, they are actually not composed of farmers but of tertiary canal chiefs. At every tertiary block, one of the farmers is elected as chief and acts as the representative for the tertiary block

while implementing decisions taken by the CPP. The CPP contains two or more canal chiefs, elected by the general assembly of the village cooperative, in addition to the water bailiff and an official of the Office du Niger. One of the tertiary canal chiefs is appointed as head of the CPP. The duties assigned to the CPP are to assure water delivery to the tertiary blocks through a hierarchical system of communication between farmers, canal chiefs, the head of the CPP, and the water bailiff. Furthermore, it should plan and monitor tertiary infrastructure maintenance [SOGREAH/BCEOM/BETICO, 1999; CEFÉ Consultants, 2000; CDP, 2004]. Next, the CPP backs up the canal chiefs in implementing and monitoring its decisions and regulations on water management. The basis of authority for canal chiefs and the CPP is their power to sanction rule-breaking farmers by proposing their eviction from their plot to the Joint Committee on Land Management [SOGREAH/BCEOM/BETICO, 1999]. Last, the CPP should provide a platform for conflict settlement on water management issues and should be the official point of contact at the village level for the central management.

[15] To date, the CPPs have been seldom effectively established [CDP, 2004]. In most of the villages throughout the irrigation scheme, the posts of canal chief and head of the CPP are filled, but meetings do not take place and none of the CPP-assigned functions is carried out. As to the canal chiefs, group discussions revealed that all but one of the tertiary blocks from the sample have one even though not all farmers are aware of it. This finding is confirmed by a survey of 127 farmers in 11 villages by Bastiaens [2005], where 32% of the interviewed farmers reported that the function of canal chief is not filled in. Since a complete list of the canal chiefs exists at the central management of the irrigation scheme, it can be assumed that the respondents are not aware of the presence of a canal chief. Another 10% of respondents stated that their canal chief does not take on any

of his assigned functions. Furthermore, decisions by the canal chief are often not respected, which makes his function largely meaningless.

[16] The prime reason for the lack of adoption of the CPP is the absence of direct benefits it offers. Indeed, the ample and flexible water supply allows farmers and the water bailiff to circumvent the need for communication by keeping the secondary canal continuously at full capacity [Vandersypen *et al.*, 2006a]. Regarding planning and monitoring tertiary infrastructure maintenance, the procedures, including obligatory meetings of which written records should be kept, are considered too heavy. The proportional equivalence between benefits and costs, one of the design principles for successful institutions, is thus violated [Ostrom, 1993]. Furthermore, patterns of conflict management and information transfer already existed. Embedded in the social structure of the village, they have a natural authority that the artificially created CPPs lack (see further details below). Indeed, where strong informal institutions de facto exercise certain powers, new formal institutions are often unable to take these over and remain ineffective [Onibon *et al.*, 1999]. The second reason is the inherent flaw that a WUA operating at the village level is not fit to deal with specific water management issues that might arise on a particular tertiary block. This lack of fit between the boundaries of the resource and the community to whom powers have been transferred has often thwarted institutional change [Cleaver, 1999].

[17] Nevertheless, some individual CPP heads have assumed a role in water management, if not the intended role. In four out of the nine sample villages, they pass on information between farmers and the water bailiff and are the mouthpiece of farmers vis-à-vis the central management. Apart from that, they are often called upon to substitute for the water bailiff when the latter is absent, a task that is not among their official competences. This CPP heads' authority is based on their good relationship with the village chief and/or president of the cooperative, who in fact delegate water management tasks to them and lend them their authority. For example, as it has been observed in the Peguena village, the head of the CPP can be one of the advisers of the village chief and is thus part of the chieftaincy. As such, the village leadership plays a vital role in the performance of these individual CPP heads. The importance of village leadership for collective action in this region has been pointed out by Vedeld [2000].

[18] The functioning of the village cooperative might be another decisive factor. In four out of five sample villages with the CPP head playing no role at all, the village cooperative is in difficulty or went bankrupt (Table 4). This observation reveals an institutional flaw. It is not clear, with the village cooperative being the anchor for the CPP, what should happen when the cooperative no longer exists. On the other hand, the CPP has never functioned in these villages, regardless of what happened with the village cooperative. Rather than a causal relation between the two, probably a third factor, such as the strength of village leadership, is responsible for both.

[19] Canal chiefs, who operate at tertiary block level, have little substance as well. Several issues are unfavorable to the authority of the canal chiefs. First, the election process of the canal chiefs was often flawed. The survey

Table 4. Association of the Actual Role of the Head of the CPP With the Functioning of the Village Cooperative

Functioning of the Village Cooperative	Actual Role of the CPP			
	The Head of the CPP Exercises (part of) His Assigned Role		The Head of the CPP Plays No Role at All	
Functional or successful	2	Tiemedely-Coura	1	Fassun
In difficulty or bankrupt	2	Kanasakko Médina-Coura Peguena	4	Medina Moussa-Wèrè Coloni Suigui-Vocè
Total	4		5	

by Bastiaens [2005] showed that in only 53% of the cases the farmers of the tertiary block elected the canal chief freely, while in 37% of the cases, Office du Niger agents appointed the chief either directly or indirectly by putting forward stringent selection criteria. Second, the sanctioning system that should back up the canal chief is absent, given that the CPP are not functional, violating another of the design principles for successful institutions [Ostrom, 1993]. A last and more fundamental reason, as revealed by the informal interviews with farmers and village chiefs, is the fact that most farmers find it difficult to accept the authority of a fellow farmer. Indeed, the very idea of electing a canal chief between their peers was imposed on them. The role of culture, in this case posing a constraint on institutional development, has often been underestimated while promoting management transfer [Cleaver, 1999]. Nevertheless, some individual canal chiefs still managed to establish a personal authority concerning water management. This authority is largely based on their conviction of its importance and is facilitated by their strong personality and frequent physical presence on the tertiary block. In the villages of the case studies, on average, one quarter of canal chiefs are reported to possess such qualities.

4.2. Water Users Associations at Tertiary Level

[20] Since 2002, in view of the lack of adoption of CPPs and the inherent flaws of village-level WUAs, new WUAs with competences on tertiary-level water management are being set up at the level of each tertiary block. The Dutch cooperation currently promotes and sponsors this project. The ultimate objectives are ambitious. First, they want to support collective action for water management by offering a formal structure. The WUA will put forward an internal code that institutionalizes water management rules. The code can provide sanctions for rule breaking, which are legally enforceable [BRL Ingénierie, 2004]. Second, the tertiary-level WUA will form the basis for bottom-up representation in federations that will take on water management responsibilities currently assigned to the central management of the irrigation scheme. The ultimate goal is to arrive at an exclusively farmer-managed irrigation scheme [CDP, 2004]. However, in a first step, the competences of these WUAs, called "Organisations d'Entretien du Réseau Tertiaire" (OERT), are restricted to tertiary infrastructure maintenance. The new organizations do not replace existing village-level CPPs, as the latter have much more

complete competences on water management. The articulation between the two remains unclear though. For the time being, both types of WUA will coexist without being linked to one another. As for the time being, none is very active, and there is no competition between them. In addition, most of the time, however, the canal chief is also president of the OERT. It can be expected that when umbrella organizations for OERTs are created, the heads of the CPPs will be incorporated in a similar manner.

[21] The setup of OERTs, intended to promote farmers' participation, paradoxically excludes their involvement. The internal code, designed by the implementing agency (a local NGO), is identical for all OERTs. It states that membership of an OERT is determined through ownership of a plot on the tertiary block and is mandatory. Like the CPPs, OERTs have a rather heavy formal structure. They are chaired by a president and have two divisions for a total of six active members, among which are a treasurer and a secretary. The code provides for at least two meetings a year on maintenance programming, of which written records are to be kept. It stipulates furthermore that members should make financial contributions, which are administered in a deposit and are used for maintenance works.

[22] The success of OERTs cannot be fully assessed yet. From the experience of the first OERTs, some early conclusions can however be drawn. First, most farmers are convinced that OERTs are useful and find that they facilitate collective action for maintenance [Etz, 2005; Bastiaens, 2005]. However, only a handful of OERTs created are actually functional, and even then, most of the formal aspects of the organization are systematically disregarded. The position of the president and active members is mostly filled in, but official meetings do not take place, no written records are kept (80% of farmers in the area are illiterate), and very few OERTs collected financial contributions [CDP, 2004; Etz, 2005]. Its principal merit lies thus in the fact that a formal platform for collective action is created, which is recognized by all farmers of the tertiary block. Three reasons for its relative success can be identified. First, information and sensitization sessions have improved farmers' comprehension of the responsibilities assigned to them during reforms. Second, OERTs explicitly bring together all farmers of a tertiary block, which generates a sense of group membership. Third, farmers appreciate the aspect of self-regulation established through the OERTs, in particular the fact that they can decide themselves when and how to maintain tertiary infrastructure [Etz, 2005]. On the other hand, two important features might jeopardize the future of OERTs. First, the heavy structures and procedures for operating OERTs absorb much energy during their setup and hinder rather than facilitate their functioning. Furthermore, the organizations' basis of authority is very weak since sanctions provided in the internal code do not go beyond blame. Once again, one of the fundamental design principles for successful institutions is being violated [Ostrom, 1993]. Currently, OERTs can only be successful when they are supported by a consensus of all members, and obstinate rule breaking has already led to the collapse of some OERTs. Even with material sanctions, there would have to be an effective mechanism to enforce them. Legal backing by the judicial system, as currently intended, might not be effective since it implies a huge psychological barrier

for most farmers. Indeed, many farmers reported to feel insecure or even humiliated in front of officials, given the knowledge and education gap that usually exists between them.

4.3. Informal Patterns of Water Management

4.3.1. Decision Making on Water Management

[23] Two important and related principles shape decision making. First, it is considered a matter of individual farmers; so collective rules that institutionalize consultation and coordination are rare [Vandersypen *et al.*, 2006b]. The leading perception is indeed that when everyone implements water management correctly, possible collective action problems are avoided [Bastiaens, 2005]. Second, in principle, access to water cannot be denied, and maintenance duties cannot be imposed by fellow farmers. This principle results from the combination of prevalent egalitarian norms and the absence of customary law. Indeed, since the Office du Niger was constructed by the colonial power and during decades, decision making was done exclusively by the central management, and customary law regulating access and use of natural resources does not apply to the irrigation scheme. Irrigation management transfer has thus resulted in an open-access regime, a process comparable to the nationalization of natural resources where the state does not have the capacity to effectively manage the resource in the field [Ostrom, 1990].

[24] In practice, farmers' decision making is motivated by personal principles that are shaped by a trade-off between the common interest and personal costs and the benefits and constraints. Regarding the cropping calendar, coordination of planting dates should avoid conflicts between irrigation and drainage at the end of the cropping season. Its cost, which consists of communication and observation of each others' farming activities, is small, especially for farmers residing in the village, where the start of the cropping season is a topic of casual conversation. However, the main motivation is the economic benefit from anticipating the planting date in order to benefit from the higher price for early harvested rice [Coulbaly *et al.*, 2002]. Second comes the availability of workers and farming equipment, which limits farmers' freedom of choice regarding the start of the growing season [Keita, 2003].

[25] As to the opening and closing of tertiary and field canal intakes, the common interest is not to overuse water or disturb fellow farmers' irrigation activities. The cost consists in information gathering on ongoing irrigation activities. Since most farmers are not present on the field during irrigation, this implies that all field inlets need to be checked, which is considered a time-consuming task. In contrast, when several farmers are present at the same time, informal exchanges on irrigation activities have been witnessed.

[26] Maintenance is motivated above all by the fact that the aquatic weeds growing in the irrigation and drainage canals offer a habitat for the ravagers of the rice crop, such as rats and granivorous birds. In addition, degradation of the canal bed leads to leakages and frequent overflowing resulting in excess flooding of the rice fields. Since canals are overdimensioned, decreasing water flow and storage capacity only becomes critical in case of long-term neglect. In most of the tertiary blocks, the agreement is that every farmer maintains the portions of the irrigation and drainage

canals adjacent to his plot. The cost is in the first place labor input, but maintenance has a direct benefit by reducing the hazard caused by the ravagers of the rice crop.

[27] The trade-off can result in more or less individualistic behavior, depending on how heavy the common interest is weighed. Individualistic behavior has been noted to proliferate easily when farmers acting for the common good feel betrayed by the others. Ensuing collective action problems then remain unresolved and often lead to frictions. On the one hand, the presence of influential and motivated farmers on the tertiary block can promote principles based on the common interest, which was confirmed in about all of the in-depth interviews with village leaders. These farmers are often, but not necessarily, canal chiefs. When they are, farmers of the tertiary block have formalized their *de facto* authority when the function of canal chief was created. On the other hand, when no one already possessed this authority, the appointment as canal chief could not establish it.

[28] Even though individual decision making is the rule, for specific events such as acute water shortage or a large breach in the canal banks, farmers of a tertiary block can engage in temporary coordination of activities. To that end, informal meetings are convened on the spot where rules are agreed upon or activities are organized to cope with the situation. Participation is voluntary in principle but can be pushed through peer pressure. The leading characteristics of ensuing coordination are that it is spontaneous, ad hoc, and specific to the situation. Interviews however revealed that not all farmer groups manage to coordinate activities even for short periods. In about one third of tertiary blocks from the sample, it is every man for himself in all situations. Most of these tertiary blocks have slid toward this chaotic situation because some farmers defected on rules or agreements. Without a functional monitoring and sanctioning system, they could do so unpunished, which eroded trust and incited individualistic reflexes [Vandersypen *et al.*, 2006b]. Once these attitudes prevail, it is difficult to reintroduce coordination [Cleaver, 1999]. Spontaneous collective action is thus not guaranteed to arise when needed.

4.3.2. Conflict Management

[29] In case of conflict on water management issues, a mediator is often called upon to make a decision. Conflict management follows preeminently informal patterns and passes through different steps. In a first step, the mediator is an influential farmer of the tertiary block, who may or may not be the canal chief. For 29 of the 36 tertiary blocks studied, most conflicts are settled at this level. For the other tertiary blocks, or when no agreement could be reached, an influential person at the village level is contacted. In seven of the nine villages of the case study, that person is the village chief. The village chief can either take a decision himself (five villages) or call upon someone he judges to be more competent on the matter, such as the water bailiff, to whom he lends his authority (two villages). Decisions taken at this level are normally followed. The village chief derives his authority from the respect that villagers grant him and from popular consent. Consequently, he has to act in the common interest of the village if he wants to maintain this authority. In general, this authority over farmers residing outside the village is much weaker or even inexistent. In the case the village chief does not interfere with conflicts on

water management, another influential person at the village level is sought, such as the president of the village cooperative or the water bailiff. The following step is the central management of Office du Niger even if it is not formally competent to settle these matters. This step is only taken in the case of serious and persistent conflicts. The Office du Niger is generally seen as a neutral agent and its decisions are respected, but it does not dispose of fixed procedures for conflict settlement, which makes its officials reluctant to get involved. In an ultimate step, which implies an even greater barrier, the conflict might be reported to the police or judicial system where a formal decision is pronounced. Up until today, WUAs do not play a role in conflict management even though their leaders might be involved as private persons because of their personal authority.

4.3.3. Information Transfer

[30] No less than conflict management, information transfer follows informal patterns. Three levels of information transfer on water management are distinguished. The first concerns information on water management decisions at tertiary block level, where information gathering is an individual matter and is done through observations and personal contacts. Centralization of information does not take place. The next level concerns information transfer between farmers and the water bailiff regarding water supply and demand at the tertiary canal intake. Current strategies are to reduce the need for information transfer by maintaining an excess supply in the canals [Vandersypen *et al.*, 2006a]. When information transfer does take place, it relates to specific demands of individual farmers and is done either directly or through the canal chief or head of the CPP. Centralization of information by the canal chief, as was originally intended, seldom occurs. The third level regards information transfer between farmers and the central management, which implies surpassing the village level. In general terms, the village chief is the pivot of information entering or leaving the village, and this is no different for water management. When farmers need to contact the central management, they first pass by the village chief, which then sends an intermediary to the central management. Likewise, when the central management wants to circulate information among farmers, they contact the village chief, who will then convoke a meeting to pass on the information.

[31] Formal pattern of information transfer designed in the scope of WUAs at the village level is thus completely disregarded (Figure 1). Informal patterns in use nevertheless show several flaws. First, at the first and second levels, information transfer is not institutionalized, meaning that (1) there is no rule which says that information should be shared and that (2) there are no predetermined routes to circulate information which increases the probability that someone is not reached. Consequently, information transfer is incomplete at these levels. Next, at the third level of information transfer, farmers residing outside the village form a missing link since they are out of touch with village-level events. Their not being informed often creates frustration for both the outsiders themselves, for example, when they are not informed on a temporary cut in water supply, and for others, when outsiders do not follow certain instructions they are not aware of. Finally, in villages where the village chief is involved in a dispute between different

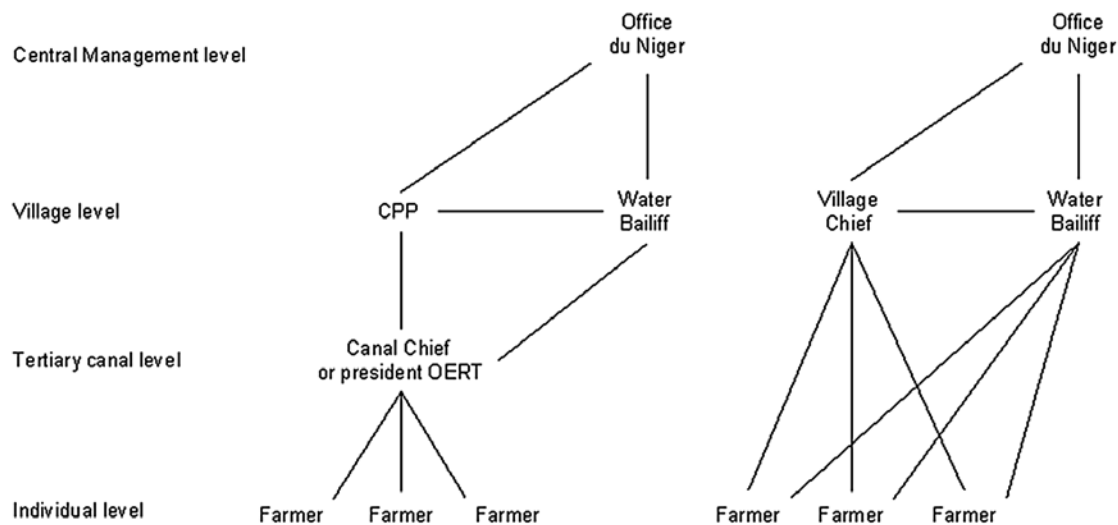


Figure 1. Formal (left) and informal (right) patterns of information transfer.

factions, he can no longer be the pivot of information transfer, as is the case in Médina and Medina-Coura. When the central management is aware of the situation, they often try to contact various leaders within the village, which in itself is a time-consuming task. Even then, the information might not reach some farmers, creating frustration as described above. Informal patterns of information transfer are thus incomplete and vulnerable to disruption. As such, they are an excellent example of how informal institutions are not necessarily better than the proposed formal ones [Cleaver, 1999]. It rather illustrates that a power transfer from local informal but strong institutions to a new legality is hard to achieve when the informal institutions are completely sidetracked [Onibon *et al.*, 1999; Ribot, 1996].

5. Recommendations to Improve the Success of WUAs in the Office du Niger

[32] In the Office du Niger, WUAs were set up to fill the power vacuum left by irrigation management transfer but did not live up to expectations. First, they lack sanctioning mechanisms to make them credible. Second, by providing heavy procedures, costs of the WUAs are disproportionately high with respect to benefits. Third, the sociocultural reality, in itself the result of the irrigation scheme's historical track, has been disregarded. In particular, the fact that farmers do not accept the authority of fellow farmers for water management underlines the need of external sources of authority. Meanwhile, decision making on water management continues to follow existing informal patterns. These are rather successful concerning conflict management but show considerable deficiencies in coordinating decision making and information transfer. In this context, WUAs could give the necessary impetus for strengthening water management, given that farmers effectively adopt them. Indeed, when all farmers of a tertiary block are involved in the WUA, it offers a much-needed platform for institutionalizing collective action.

[33] In view of the analysis of the role of WUAs and informal patterns of decision making in water management, several recommendations can be formulated to improve the success of WUAs.

[34] Structures and procedures of WUAs should be kept as simple as possible. In addition, their objectives should respond to actual needs. These lie essentially in institutionalizing and facilitating information transfer reaching all farmers and enhancing collective action when problems occur. Activities of WUAs should thus be allowed to be spontaneous and specific to the situation, and formal structures should merely facilitate these activities. This implies that the internal code is drawn up by the members of the WUA and provides necessary flexibility and legitimacy for ad hoc agreements.

[35] In order to enhance their legitimacy, support of village leadership, in particular the village chief, should be considered. In this way, WUAs will be able to take advantage of existing patterns of conflict management, which are mostly effective. This support can be obtained by convincing village leadership of the importance of WUAs and the importance of their involvement. Separate meetings with village authorities are thus needed before establishing the WUAs. Next, village authorities should be involved during the setup of WUAs, for example, by asking them to preside at the setup meeting, together with the extension agent in charge.

[36] A water tight sanctioning system is needed, considering the growing presence of farmers and leaseholders who are outsiders to the village and fall outside the sphere of influence of the village chief. Farmers should thus be incited to provide financial or other sanctions when infractions are observed. When disputes over sanctions arise that cannot be solved within the WUA or at the village level, the WUA should be able to appeal to the central management for final settlement. The latter should then be able to appeal to fixed procedures for conflict settlement.

[37] The mechanism currently promoted, which involves the judicial system, is considered to imply too large a barrier for ordinary farmers to be effective. The central management however is closer to farmers while possessing the necessary authority. Given the current trend toward devolution of water management, this might seem as a step backward. However, considering that on the moment of irrigation management transfer no customary or other forms

of organization at farmers level were in place, it might be premature to completely discard it.

6. Conclusions and Policy Implications

[38] In irrigation schemes around the globe, WUAs are being created to replace the central management as the center of decision making on water management. The importance of user participation and the involvement of informal institutions are recognized in theory. In practice, WUAs are however often imposed on farmers in a top-down way, bypassing existing informal patterns of decision making. Consequently, many WUAs do not fulfill their intended role. From the Office du Niger case study, several lessons can be learned.

[39] First, the involvement of existing sources of authority is indeed crucial for new legalities to work, especially in situations where authority is hard to establish. In the Office du Niger, and more generally in an African context, the village level provides such a source of authority. In this study, it was observed that performance of WUAs is strongly linked with the support of the village chieftaincy. Another important source of authority is the central management, which WUAs are nevertheless meant to replace. Indeed, in irrigation schemes where customary leadership has been stunted for decades, the central management might still be considered the only legitimate leader even after management transfer. In that case, collaboration between the central management and WUAs might be more useful than a model of antagonism. This implies that national governments, NGOs, and international donors that usually promote WUAs should be prepared to give priority to existing informal principals of governance and centers of authority even when they contradict their own principles of democratic representation.

[40] Second, informal decision making on water management is not always fully understood, which makes it impossible to take it into account. Active farmer participation in the design of WUAs provides part of the answer. However, there is also a role for researchers to accompany the creation of WUAs to make local realities explicit. As such, they can facilitate the dialogue between farmers and the policy level.

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