

**To cooperate or defect?:
The role of Water Users Associations in mitigating the “tragedy of the commons”**

Heather Larue

PhD Candidate, Political Science and Public Policy Program, University of Michigan, USA

*Visiting Research Fellow, Social Research Center (www.src.auca.kg)
American University of Central Asia
Bishkek, Kyrgyzstan*

Introduction:

Following the collapse of the Soviet Union, the newly independent Central Asian states were left with the operation and maintenance responsibilities of a sophisticated irrigation system that had previously been completely fulfilled by Moscow. Kyrgyzstan was unable to provide the necessary service and rehabilitation to the irrigation infrastructure and, in order to reduce the financial burden of irrigation governance on the national budget, Kyrgyzstan embarked on an irrigation sector reform in 1999. This process, known as Irrigation Management Transfer (IMT), entailed the complete devolution and transfer of management, maintenance, and irrigation investment tasks from government institutions to community based farmer’s organizations. IMT has been undertaken in more than 60 countries and currently represents the global paradigm and model for irrigation sector reform. As in the case of Kyrgyzstan, most IMT programs are comprised of the training and capacity building of Water Users Associations, which eventually leads to the transfer of irrigation management to the WUAs.¹

Therefore, Kyrgyz farmers have been placed in the position of needing to coordinate inter-community irrigation systems through the creation of these locally managed “Water Users Associations” (WUA). There is a strong theoretical basis for replacing the central management and decision-making center of irrigation systems with user-based WUAs.² However, empirical results indicate that many WUAs are not fulfilling their intended role.³ The success of the WUA institution relies critically on coordination and cooperation. Operating, maintaining and rehabilitating irrigation canals and enforcing equitable rules for irrigation cycles requires cooperation at multiple levels. This includes between farmers within a WUA, between WUA sharing a water source, and between WUAs and the local water supplier.⁴

In this short overview of WUAs in Kyrgyzstan, I hope to outline the fundamental problems that arise in the management and governance of common pool resources like irrigation systems. I will provide a summary of the justification and theoretical support behind the implementation of Irrigation Management Transfer and devolution of decision-making authority to WUAs. Finally, this paper will include a section delineating some of the constraints and obstacles that hinder the success of WUAs, and in many cases, lead to their failure.

The Collective Action Problem:

¹ Food and Agricultural Organization of the United Nations, “FAO Water,” FAO 2008, http://www.fao.org/nr/water/topics_irrig_reform.html

²World Bank Technical Paper No. 354 “User organizations for sustainable water services”; edited by Ashok Subramanian, N. Vijay Jagannathan, Ruth Meinzen-Dick (World Bank; Washington D.C.; 1997) pp. 3-15

³ Jenniver Sehring, “The Pitfalls of Irrigation Water Pricing in Kyrgyzstan and Tajikistan,” (2008 Society for International Development; Development 2008, 51, (130-134);

⁴ Murab Yakubov and Mehmood Ul Hassan, “Mainstreaming Rural Poor in Water Resources Management: Preliminary Lessons of a Bottom-up WUA development Approach in Central Asia,” Irrigation and Drainage, 56: 261-276 (2007)

The problems that arise from the operation and maintenance (O & M) of an irrigation system provide text-book examples of Mancur Olson's collective action problem and Garret Hardin's "tragedy of the commons." Hardin's "tragedy of the commons" has become a fundamental topic of research and debate across the social science and public policy disciplines and has had a tremendous impact on the development of numerous implemented public policies.

In order to illustrate the "tragedy of the commons," Hardin provides the example of a pasture system that is used by multiple herders for grazing their livestock. Each individual herder has an economic incentive to graze his livestock in a larger area of the pasture and for a longer period of time. Consequently, when all herders pursue their purely rational strategies of maximizing their livestock's access to the pasture, the end result is a depleted pasture that can no longer provide sustenance for any of the livestock. Thus, the individually rational and optimal strategy has yielded results that make the collective much worse off.⁵

Like the pasture system mentioned above, an irrigation system and its water represent common-pool resources. These common pool resources can be defined as public goods that are "nonexcludable" and "rival." First, the incredibly high cost of regulating access to a resource such as water means that you cannot *exclude* individuals within a group from using the resource. Second, the use of one unit of the resource by one member of society reduces its availability for another, thus there is competition among users. These two characteristics lead to the "tragedy of the commons" described above where each individual's rational "over-use" or non-optimal use of a resource eventually decreases the quality and/or quantity of the resource. The final result is that the "collective" becomes much worse due to the degradation of the resource.⁶

In the case of irrigation systems, each farmer's pursuit of strategies to maximize their own water supply leads to social costs which reduce individual incentives to contribute to the upkeep and maintenance of the irrigation system. Since farmers can not be excluded from using the irrigation system, *free-riders* use the source without contributing to the provision of the resource. Thus, the infrastructure eventually disintegrates to the detriment of all of the farmers.

This issue of free-riders leads us into a more specific discussion of the collective action problem that arises during the governance of common-pool resources. We can define collective action as the pursuit of a goal or set of goals by more than one person. A collective action problem is a situation where individuals in a given group have a choice between (a) participating in the provision of a goal or resource or (b) non-participating ("free-riding") and thereby allowing other members of the group to fulfill the goal.⁷

When institutions such as WUAs do not have the capacity to enforce rules that govern a common pool resource, the outcome is inefficient and inequitable because these institutional weaknesses diminish an individual's incentives to cooperate and coordinate in the management of water resources. Consequently, the free-rider problem emerges and upstream farmers may direct extra water resources to their fields, thereby reducing the available irrigation water for downstream farmers. Also, water users may not contribute their share of the necessary irrigation service fees

⁵ Garrett Hardin, "The Tragedy of the Commons," *Science*, 162(1968):1243-1248.

⁶ Ashok Subramanian, N. Vijay Jagannathan, Ruth Meinzen-Dick "User organizations for sustainable water services", p. 16-17

⁷ Olson, Mancur [1965] (1971). *The Logic of Collective Action : Public Goods and the Theory of Groups*, Revised edition, Harvard University Press.

(ISF) which provide for the O & M of the irrigation system. Over time, a lack of resources and rehabilitation will lead to the deterioration of the system.⁸

Finally, as many scholars have noted in the past, the Prisoner’s Dilemma from Game Theory provides a useful though incredibly simplistic conceptual method for understanding the dynamics of the “tragedy of the commons” and collective action problem. The Prisoner’s Dilemma represents a game where in order for both prisoners to achieve the maximum payout, they must trust each other. In particular, the dominant or optimal strategy for each individual player creates the worst possible joint outcome.

	Player 2 Cooperate	Player 2 Defect
Player 1 Cooperate	4,4	6,0
Player 1 Defect	6,0	2,2

The classic story of the prisoner’s dilemma is that two prisoners have a choice after arrest of (1) Cooperation- refusing indict or provide any information about the other player to the prosecutor or (2) Defect- they provide information to the prosecutor about the other player’s involvement in the crime. The most rational choice of action for each player is to maximize their individual gains. Therefore, the “Pareto Optimal Outcome” is for both players to defect which provides both players with a worse outcome than if they had both cooperated and not provided any information to the prosecutor.⁹

Water User’s Associations: A solution to the “tragedy of the commons”?

In order to “solve” or minimize the “tragedy of the commons” and guarantee cooperation in a “prisoner’s dilemma, policy makers must design collective action regimes which promote the cooperation and coordination of individuals who are responsible for the collective management of resource. This regime is generally defined as a set of *institutional arrangements* that govern a shared resource or activity. Institutional economics and game theory stress the importance of individual incentives in creating and sustaining cooperation mechanisms. Thus, in order to “solve” the “collective action problem” or free-rider dilemma, the regime must provide sufficient incentives to motivate individual participation.¹⁰

Water User’s Associations represent a method for institutionalizing collective action for the management of irrigation systems and water. WUAs are formal institutions that are supported by a legal system and legal statues and are designed with a set of rules, concrete organizational structure, and specific procedures that are aimed at constraining and shaping human interactions or behavior. The incentive structure that WUAs create for water users is argued to produce better irrigation management, governance, and maintenance than public agencies and decentralized uncoordinated individual control. For WUAs to truly be effective and provide the solution for the problems discussed in section I, they must change the incentives of water users, and in particular farmers, with regards to cooperating and coordinating on irrigation system management. They must have the capacity, organizational structure, and proper utilization of social norms to restructure individual interactions.¹¹

⁸ J. Stephen Lansing, “Perfect Order: Recognizing Complexity in Bali,” (Princeton University Press; Princeton; 2006)

⁹ Ibid

¹⁰ White, T. and C. Runge. Common property and collective, action: Lessons from cooperative watershed management in Haiti. *Economic Development and Cultural Change*, 1994, 43:1:1-41.

¹¹ Ashok Subramanian, N. Vijay Jagannathan, Ruth Meinzen-Dick “User organizations for sustainable water services”, pp. 21-24

The program theory behind WUAs basically states that WUAs create a sense of ownership among water users for an irrigation system because of the mandatory irrigation service fee requirement and participatory/democratic nature of irrigation management. Since farmers must pay for their supply of water and cover the cost of system repairs, the claim is that they will be more likely to play an active role in the management of the system and monitoring of the condition of irrigation infrastructure. Consequently farmers will be less likely to damage the irrigation structures and will want to acquire more information about water distribution and irrigation management.¹² Some of the important incentives for motivating farmers to participate in localized management projects are as follows:

- physical improvement of the irrigation system
- more efficient and reliable water delivery
- control over water
- Augmented farm productivity and farm income
- empowerment through participation and involvement in key decision-making
- any possible benefits that might accrue to the organization

WUAs are implemented, in part, to decrease the large transaction costs that occur when there is decentralized coordination of an activity among a group of individuals. Without a coordinating mechanism such as a WUA, water users would have to negotiate with each user to try and figure out the best schedule/system for governing and maintaining the irrigation system. Thus, WUAs provide a coordination mechanism or “structured bargaining forum” which decreases the transaction or coordination costs and consequently enables individuals to more efficiently and effectively organize their actions for the successful governance and maintenance of irrigation systems.¹³ It provides the “rules of the game” for interactions among farmers and structures the incentives in exchange.¹⁴ In particular, a WUA will promote diminished transaction costs between individuals once it has acquired a certain degree of stability and legitimacy, thus promoting consistency of water user behavior and reducing the uncertainty of outcomes of exchange.

Moreover, game theorists have shown that within situations that require or enable reciprocity, the mutual defection outcome no longer becomes the guaranteed outcome. Repeated games present players with a situation where cooperation can pay-off in the future. Recurrent acts of cooperation between individuals build a sense of trust which can spill over into other spheres of activity. There is a large amount of literature dedicated to discussions of the benefits that such “social capital” can have on institutional stability. As Ostrom states, “at a more general level, our experiments, along with field research and theoretical efforts, lead us to posit that the crucial variables to enhance cooperation in regard to common-pool resources and other forms of collective action are those that enhance reciprocity, individual reputations, and trust.”¹⁵

Water User’s Associations: Some Problems...

¹² Ruth Meinzen-Dick and Anna Knox, “Collective Action, Property Rights, and Devolution of Natural Resource Management: A Conceptual Framework” Workshop Draft 1999, p. 19-21

¹³ Douglas North, *Institutions, Institutional Change and Economic Performance*, Cambridge University Press, 1990 p. 182

¹⁴ Ashok Subramanian, N. Vijay Jagannathan, Ruth Meinzen-Dick “User organizations for sustainable water services”, p. 19

¹⁵ Elinor Ostrom, Workshop in Political Theory and Policy Analysis, Department of Political Science, Indiana University, 513 North Park, Bloomington, IN 47408-3895, USA

Despite a sound theoretical foundation for the implementation of WUAs, empirical studies from Kyrgyzstan have yet to provide strong and consistent evidence that WUAs are helping to alleviate the “tragedy of the commons” and resolve collective action dilemmas. To understand the obstacles faced by WUAs in post-Soviet Kyrgyzstan, it will be useful to analyze WUAs within an analytical framework developed by the social scientist, Elinor Ostrom, who is well known for her institutional approach to public policy. Ostrom outlines eight design principles which she argues are highly relevant for explaining successful and sustainable institutional systems for the governance of common pool resources. The eight principles are described below along with a general assessment of how well the WUAs in Kyrgyzstan adhere to these important characteristics.¹⁶

1. Clearly defined boundaries- In the case of irrigation systems, this would mean that there is an understanding of the specific land that is under the management of an irrigation system and that water users have a clear understanding of their water and property rights.. Other important elements that should be included within this design principle are clear water and property rights and specific and understood responsibilities and authority among WUA management. Vermillion (1994)
2. Proportional Equivalence between Benefits and Costs- Ostrom argues that the support of institutional change will depend on individuals’ cost-benefit analysis. That is, the benefits of participating in and following the rules of WUAs must outweigh the costs of continuing a decentralized decision-making process for irrigation system management. Ostrom argued that an individual’s cost-benefit analysis is affected by (1) social norms (2) internal discount rates and (3) situation variables. Situational variables include things like user group characteristics, history and informal rule and traditions, the resource in question and the socio-economic environment.
3. Collective Choice Arrangements- This refers to water users’ ability to set and modify rules. Collective choice arrangements should be designed to allow the democratic participation of a majority of water users. Although there will be a limit on the number of individuals who can actually be involved in direct decision-making, each WUA should have election and assembly procedures that enables each member to express their desires.
4. Monitoring-There is a need for effective monitoring and supervision of the irrigation system in order to detect instances of “defection” among the users. It is important that individuals who fulfill this role are *accountable* to the users or are themselves a user.
5. Graduated Sanctions- Punishment must be credible or else individual farmers can gain short-run extra benefits from deviating from the cooperative agreement. In order for the threat of punishment to be credible, there must be a sufficient monitoring system to detect violators along with a legitimates system for enforcing rules through sanctions. Monitoring is impacted by the size of WUAs, distance between irrigators, recurrent interactions between farmers and mirabs and farmers, and the homogeneity of irrigation activities among water users.

The enforcement of a punishment regime is influenced by the perceived gains from the cooperation regime, the role of the leadership, the legal system, and cultural and behavioral norms. Importantly, many scholars and practitioners of organizational

¹⁶ Elinor Ostrom, 1992, *Crafting Institutions for Self-governing Irrigation Systems*, ICS Press, San Francisco, CA (1992).

management argue that in order to make punishment credible it is often necessary to punish any individual who fails to punish violators.

6. Conflict Resolution Mechanisms- There must be conflict-resolution procedures and mechanisms in place that are affordable and accessible. In most cases, legal means of conflict resolution involve very high transaction and social costs for water users in most developing and transition economies.
7. Minimal Recognition of rights to organize- This means that water users do not need to be overly concerned with interference by external governmental authorities.
8. Nested enterprises (federations)- WUAs should be organized into federations where governance and management activities are interdependent and spread across multiple villages and rayons.

On average, impact evaluations and research studies have noted a weak adherence to the rules instituted by WUAs. The present difficulties faced by WUAs in achieving their organizational mandate are related to multiple factors. There are flaws in the institutional design of WUAs and there are a host of situational variables-such as socio-economic standing that are diminishing the success of the IMT project. WUAs have been implemented to change the behavior of farmers by creating a negative or positive set of incentives. WUAs must create an incentive structure for farmers and water users that promotes the collective distribution of water and infrastructure maintenance over the purely rational pursuit of water supply. Nevertheless, the introduction of formal rules is not a guarantee for their implementation in practice. The benefits are conditioned by the values and social norms shared by the actors. Finally, the social-economic context of implementation plays a fundamental role.¹⁷

On the other hand, there are a multitude of factors which can explain the failure and weaknesses of many WUAs to provide the farmers with the above benefits from participation. Naturally, the diminishment of benefits for participation leads to increased costs and therefore raises the prospects for defection. The following list of variables which inhibit the success of WUAs in Kyrgyzstan were compiled from several different research studies undertaken in the country since the implementation of WUAs.¹⁸

- Low salaries for WUA staff lead to less qualified personnel
- Farmers do not have adequate agricultural knowledge with impacts farm profitability
- Lack of short term credits for input supply.
- Small farm units reduce profitability and sustainability of irrigated agriculture
- National debt/financial crisis which impacts the agricultural sector
- Irregular or lack of water delivery service by the WUA which decreases farmer's desires to pay ISF
- High taxes for farmers/WUA and inconsistent tax legislation
- Lack of Past experience of successful cooperation
- Lack of Leadership and education
- Water scarcity

¹⁷ "Privatization/Transfer of Irrigation Management in Central Asia," (Department for International Development Knowledge and Research Services Contract R8025 Final Report; Mott MacDonald Limited; Cambridge 2003); See also Sehring, 2003.

¹⁸ Elke Herrfahrdt, Martin Kipping, Tanja Pickardt, Mathias Polan Caroline Rohrer, and Carl Felix Wolff, *Water Governance in the Kyrgyz Agricultural Sector: On its way to Integrated Water Resource Management?* German Development Studies, Bonn 2006; Ruth Meinzen-Dick and Anna Knox, "Collective Action, Property Rights, and Devolution of Natural Resource Management: A Conceptual Framework" Workshop Draft 1999, p. 9

- Absence Infrastructure for transportation and communication
- Diminished Social cohesion or “social capital”

When WUAs are lacking in the institutional capacity to enforce laws and rules, the outcomes for upstream versus downstream farmers will be inefficient. There will be strong incentives for upstream farmers to take unsanctioned supplies of water and for water users to not contribute to the payment of irrigation service fees for infrastructure maintenance and water supply. Consequently, research reports indicate that the biggest obstacle towards cost recovery in irrigation management is the non-payment of irrigation service fees by farmers and that “water theft is so common that it can be described as a local institution itself as it represents a widely non-confronted rule of behavior.”¹⁹

Indeed, field studies from Kyrgyzstan indicate that the effective sanctioning of offenders seems to be a primary WUA weakness. In many cases, there is an absence of sanctioning mechanisms which are imperative for making WUAs credible to water users. In order to stop “water-theft” and the deliberate destruction of irrigation infrastructure for self-gains, offenders who break such rules must incur sanctions. These sanctions must be differentiated to reflect varying levels of “dis-respect” for collective rules. Without clear rules and clear sanctions for “rule-breakage,” the authority of the WUA will be significantly diminished.²⁰

There are technical, financial, and social limitations for implementing draconian punishment measures such as completely cutting off individuals’ water for non-compliance with WUA rules. Nevertheless, research shows that there are financial and social considerations and incentives for WUA staff to *not* effectively sanction any offenders. For example, with regards to water-theft, kinship ties and intervention by village elders have been shown to limit or stop the application of punishment to violators. There is also the element of corruption which can be especially pernicious during times of water scarcity. In particular, decision making on water allocations can be guided by bribery and personal contacts. This seems to be especially evident in the case of the low-paid mirabs or “water masters” who have a large amount of discretionary power with regards to water distribution.²¹

The other fundamental weakness of WUAs seems to be conflict/dispute resolution mechanisms. Among other factors, conflicts over water can arise from water scarcity, water theft, unequal water distribution, and arbitrary or inequitable conflict resolution. Dispute resolution involves high transaction costs and WUAs are supposed to provide farmers with a platform for resolving tensions and thus cutting down on financial/social costs. The argument is that the initial participation of farmers in decisions that have a large impact on them will diminish the number of potential water disputes. However, formal dispute settlement mechanisms are often absent in WUAs²² and survey research has shown that farmers do not perceive WUAs as legitimate organizations for resolving water conflicts.²³ Even in cases where WUAs reach a formal decision, informal mechanisms such as bribery or water stealing can be employed due to weaknesses in capacity and enforcement.

CONCLUSION:

Approximately 450 Water Users Associations have been set-up across Kyrgyzstan as part of the Irrigation Management Transfer policy. These WUAs have been developed and

¹⁹ Sehring 2003, p. 33

²⁰ *Water Governance in the Kyrgyz Agricultural Sector*, pp. 126-131

²¹ *Ibid*

²² Sehring 2003, 32

²³ Sehring 2003, 128

implemented in an attempt to solve the fundamental problems of coordination and cooperation that have long been associated with public goods management. This paper has aimed at providing the reader with a general understanding of the coordination and cooperation problems that result in the “tragedy of the commons” and “prisoner’s dilemma.” Also, there has been a brief discussion some of the mechanisms inherent in WUAs that are supposed to reduce such problems and how two of these primary institutional characteristics are still quite weak in the case of Kyrgyzstan.

In particular, WUAs have been created to transform the incentives for farmers and thus motivate them to cooperate and coordinate in the provision of public goods, namely the irrigation system and its water. However, the institutional weaknesses of many WUAs, which are a result of poor institutional design and socio-economic factors, do not enable them to fulfill their intended functions.

The social and economic cost of non-compliance with WUA rules must be sufficiently high as to reduce and eventually end opportunistic behaviors among farmers. However, the cost for water-users to derogate from the rules of water distribution and fee payment is dramatically reduced when there is a weak monitoring and enforcement system in place then. Once the benefits of defection outweigh the costs of cooperation, the free-rider problem emerges anew and the sustainability of both the irrigation infrastructure and WUA placed into jeopardy.