

The Challenge of Water Reform in Peru: Lessons from the 'Moral Economy of Water'

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1. Introduction

For more than a decade now the people of Peru have stood frozen at a major crossroad of development, like their neighbours in the other Andean countries, contemplating the limited options seemingly available for a much-needed change in the policies governing the ownership and use of water, the most unique and vital natural resource. The lack of serious movement toward reform, although reflecting ideological differences among various segments of the population, is mainly attributable to the fact that neither of the two conventional policies for water management is entirely acceptable to the majority of the Peruvian people, especially the urban and rural poor. Ownership and control of the resource by the State, the policy regime that has long been in place, has proven to be far from adequate on its own, especially for a 'structurally-adjusted' and impoverished government like that of Peru. Meanwhile, privatization, the alternative that has lately been promoted by the great global 'adjustor', the World Bank, has been rejected emphatically by the masses in Ecuador, Bolivia and Peru. During the last decade, poor people have repeatedly taken to the streets in all three countries in order to demonstrate, sometimes violently, against water privatization, in the most massive and effective 'anti-globalization' movement the world has ever seen.

The inadequacies of the two conventional policies for water management reflect their common origin in an abstract, and almost purely academic, argument. Both state control of the resource, on the one hand, and the privatization of it, on the other, were the policies put forward by Garrett Hardin in his famous attempt, in "The Tragedy of the Commons" [1], to account for the notable tendency of people to overexploit and abuse any resources that they hold in common. He did this by arguing, in a classic though erroneous application of micro-economic thinking, for the existence of an irresolvable conflict in these situations between the interests of the individual, said to be inherently selfish, and the cooperative needs of the group. Tragic outcomes are, of course, widely evident today in Peru, as in many other countries, in the local use of a wide array of natural resources--irrigation water, forests, fisheries, and pasturelands--a fact that at first glance seems to support Hardin's argument and suggest that community-based management of such resources, a seemingly obvious alternative approach or "third way" which he did not even consider, is doomed to fail.

Yet other kinds of outcomes, indeed much happier ones, are just as evident today in communities in many parts of the world, as numerous authors and researchers have since shown in a strong critique of Hardin's theory, an important development that has yet to catch up with events and to have any real effect on policy. These authors have demonstrated that there is indeed a "third way", based on studies of communities where local people have managed communal resources cooperatively, and done so very effectively, over long periods of time. This rebuttal has turned attention toward the task [2-5] of devising an alternative theory to explain how, in such cases, people have been able to overcome their conflict of interest, escape the 'commons dilemma', and pursue the common good.

Progress toward this goal has been especially noteworthy with regard to water, which is encouraging news, given the impending water crisis that threatens Peru and nearly every other country in the 'developing' world. Recent research on the use of water for irrigation, some of which was carried out in Peru, has made it possible to refute the conventional theory, which is now undergoing a thorough revision, and to begin to devise viable alternatives to the simplistic and obsolete policies of the past. This research shows that local people in a great many communities in many different parts of the world—including the Peruvian Andes--long ago arrived, quite independently, at a sustainable solution to the 'commons dilemma', creating a set of principles for sharing scarce water in an equitable and efficient manner that minimizes social

conflict. Wherever people have managed a scarce resource autonomously, and done so effectively over a long period of time--an achievement of which there are now dozens, even hundreds, of documented examples--the principles of distribution and use appear to be highly similar if not exactly the same.

This finding could have a major impact on the policies of the World Bank and the Inter-American Development Bank, who are now in search of an alternative, as their effort to impose privatization in Ecuador, Peru and Bolivia--by offering loans for refinancing the foreign debt in each case, loans that were tied to the adoption of slightly-modified versions of the 1981 Water Code of Chile--has failed. Despite the public's emphatic rejection of that proposal in all three countries, some Bank personnel continue to be strongly influenced by the 'micro-economic' argument of Hardin and to advocate the creation of water markets on a massive scale [6]. My own comparative research on irrigation shows that water markets do not, and indeed cannot, work in the manner that they are widely thought to work, at least not in the small-scale 'peasant' type of system that typifies most of the 'developing' world. It also reveals heretofore unrecognized commonalities in the dynamics of successful communal and 'market' systems in different parts of the world.

2. Successful communal management: The 'moral economy of water'

Scholars and scientists have made steady progress in critiquing and revising the theory of "the tragedy", most notably Ostrom [5, 7, 8] and Tang [9], who have led the way in identifying, through comparison of a large number of case studies in different countries, basic design principles that all effective locally-run irrigation systems seem to share. Their focus has tended to be on small-scale canal systems of 1000 hectares or less operated by small farmers [10], the type of "indigenous" or peasant-community system that predominates even today throughout much of the 'developing' world. Such limited scale, and the intensive face-to-face interaction among water-users that this makes possible, seems to be a critical factor that all of the systems share [7a, d], although more will be said about this important factor below. Most of the common principles identified thus far, however, remain quite abstract, more suitable for predicting the general conditions under which people will be able to come up with a solution, and be successful at community-based management, than for showing them how to actually manage water effectively in situations where they have failed or lost the ability to do so on their own.

The effort to revise theory and to make new policies based on the recent research has been hindered by the limitations of the primary data, which are typically thoroughly *etic*, that is, objective, scientific, and descriptive at the system level, but without incorporating much of the *emic* point of view, the more subjective and culture-bound perspective of the water-user. Analysts have also tended to emphasize the diversity that exists among local irrigation systems, while not giving enough attention to one important feature that nearly all of them share, at least during certain times of the year, and that is water scarcity. All of this has helped to obscure the fact that the keys to local success in dealing with scarcity--*operating principles* for distributing and using the resource, ones that together create *equity* and thereby instill in people a strong positive incentive to obey the rules and conserve water, rather than a purely negative one that merely rests on punishing infractions--appear to be highly similar if not exactly the same in many parts of the world. Once the principles are identified ethnographically, as I was able to do during several years of fieldwork in the Peruvian Andes, and the way that they work together from the water-users' point of view is understood, the parallels in other countries become evident and a striking pattern is revealed.

The principles for successful management of water by local communities, as identified in studies of several peasant villages in the southern Peruvian Andes [11] are the following:

(1) **autonomy**: each community has and controls its own flows of water, using them according to customary rules and procedures;

- (2) **contiguity**: during each distribution cycle, water is given to sectors of land and to individual fields in a fixed contiguous order based on their location along successive canals, starting at one end of the system and moving systematically across it;
- (3) **uniformity** *among water rights*: for each major water source or canal flow, everyone receives water with the same frequency; *in technique*: everyone irrigates in the same basic way;
- (4) **proportionality** (*equity*) *among rights*: no one can use more water than the proportional amount to which the extent of their land entitles them, nor can they legally get it more often than everyone else; *among duties*: people's contributions to maintenance of the canal system must be proportional to the amount of irrigated land that they have;
- (5) **regularity**: things are always done in the same way under conditions of scarcity; no exceptions are allowed, and any unauthorized expansion of irrigation is prohibited;
- (6) **transparency**: everyone knows the rules and has the capacity to confirm, with their own eyes, whether or not the rules are being obeyed, to detect and denounce any violations that occur.
- (7) **graduated sanctions**: penalties for infractions such as water theft are severe, but vary according to the severity of the offence and the behavioural history of the individual irrigator.

Close examination of the data published in the comparative literature strongly suggests that these principles also exist in successful irrigation communities in many other parts of the world. Indeed, it seems clear that this same solution to the problem of having to share a scarcity of the resource—one that I call the “moral economy of water”—has been worked out by peasants and indigenous people in many parts of Peru, the other Andean countries, Mexico, Spain, India, Nepal, Bali, and the Philippines [5, 7b, d, 12–21]. Although the evidence for this is not entirely conclusive, and requires one to read between the lines of the published descriptions, it is compelling enough to show that many of these local irrigation systems badly need a second look [22].

The studies cited above do reveal the existence of some of the principles, in a manner that logically implies, or at least strongly suggests, the presence of the others, although the principles have not been explicitly recognized and discussed. *Autonomy*, for example, is invariably mentioned, since that is basic to the kind of “indigenous”, community-based system that has been so extensively studied. Another widely-noted principle is *proportionality*, both among people's individual water rights (all of which have the same land-to-water ratio) and between people's rights and their corresponding maintenance duties [5, 7–9, 13]. However, proportionality also necessarily implies *uniformity*, at least in the frequency of irrigation, since without that there can be no real proportionality among people's rights. A significant degree of uniformity in people's techniques of water use must also exist—or at least there must be some limits on the nature and extent of such use—for the same reason. Indeed, proportionality and uniformity together create a perception of *equity* or fairness, which is ultimately the key to success.

It is possible, through this kind of logical inference, to confirm the likelihood that all of the aforementioned principles encountered among peasant communities in Peru are present in many of the systems described in the literature. One of the virtues of the comparative analyses done to date, particularly those of Ostrom [5, 7, 8], and Tang [9], is that they show how widespread the principle of proportionality—and therefore also of uniformity—is, thereby revealing this possibility [15, 17, 20, 21]. The pattern, however, must ultimately be confirmed firsthand through fieldwork if it is to help in the effort to reformulate theory and if it is ever to have an impact on policy, so as to result in the emergence of new and better national water laws. The principles must be shown to be recognized and understood by the farmers themselves, and to be motivating them to cooperate by minimizing their temptation to cheat or “free-ride”.

During the years 2003-2004, I was able to confirm this for three rather famous irrigation systems of Islamic origin in the Costa Blanca region of Spain: Valencia, Murcia and Alicante. During the following year, in 2005, I was able to do the same for a total of twelve indigenous communities in the watershed of San Pedro de Atacama in the northern part of Chile. The same set of principles is indeed operating, or was formerly operating, in all of these systems, some of which are well-known in the literature as examples of local success. The Spanish systems, for example, are

extremely complex, composed of multiple user communities, and of much larger scale. Furthermore, it is quite clear that the two great hydraulic traditions that the systems together seem to represent—the Andean and the Moorish or Islamic, respectively—have evolved independently of each other, constituting a case of parallel or convergent social evolution that is unprecedented in the archaeological and historical records. The “moral economy of water” thus appears to have emerged repeatedly, and often independently, in numerous places all over the world, as local people have responded in the same basic way to the daunting challenge of having to share a water scarcity.

3. Some Implications for Water Reform

The results of my research, both as an ethnographer and formerly as a consultant on water reform for the World Bank, show that a strong motive for conserving water will not emerge among farmers as a result of privatization and the creation of water markets, either in the Andean highlands or in other similar parts of the world. The solution to the current water crisis does not lie in the “invisible hand” of the market, in the profit motive and the law of supply and demand, at least not in the small-farmer or ‘peasant’ type of irrigation system that typifies most of the ‘developing’ world. Rather, as I have argued elsewhere [11], it lies in a direct and obvious link--established by the aforementioned principles and clearly recognized by the irrigators themselves--between the efficiency and orderliness of water use and the duration of the irrigation cycle. The logic and effectiveness of the principles does not, I think, depend in any way on water being worth money, although that can be and probably is a feature of some of the systems where the principles are in place today.

An intriguing example of the latter is the community of Alicante in Spain, formerly one of the oldest water markets in the world and one of the few places where small farmers had privatized much of the resource—approximately half--and adopted a ‘market’ approach to its management [15]. The famous water market of Alicante no longer exists, however, as it went bankrupt and was abolished in the early 1980’s due to extreme inequities in the pattern of ownership of private and communal water, respectively, which the market system had created. My analysis of the earlier published studies, since confirmed through the fieldwork of 2003-2004, showed that the same set of principles formerly operated and governed the distribution of much of Alicante’s water (i.e., the other half, which was fully communal) as in the neighboring districts of Valencia and Murcia, and that these were the same principles that I had encountered earlier in my ethnographic research in Peru. The latter communities are successful systems of communal water management, originally studied by the same authors [15], which also stand out in the literature as examples of success, as indicated primarily by an extremely low incidence of water theft and other forms of “free-riding”. Despite the fact that the market no longer exists, Alicante is widely thought by economists to demonstrate the potential effectiveness of “market forces” and the profit motive for giving farmers an incentive to use the resource efficiently and with minimal waste and conflict.

Close inspection of Alicante’s official archives, as well as other published accounts, revealed that its irrigation system had not been rigorously described by earlier authors and, consequently, that its irrigation system had not been well understood from the water-users’ point of view. Nevertheless, it is clear that in Alicante, any water that was formerly sold and transferred among users was delivered on the same schedule, and in the same contiguous order, as people’s regular allotments of communal water, and that it was only available with the same frequency, as part of the general irrigation cycle. Other basic principles, such as proportionality among rights and between rights and duties, existed as well, at least with regard to half of Alicante’s water, which, again, was fully communal rather than private. Indeed, the major insight of my research was that the famous water market rested on a communal foundation, and that the buying and selling of the private water—again, one half of the total supply, which until the 1980’s remained in the hands of feudal landlords--would not have been possible without it.

Below is a list of the principles that are either explicitly mentioned, or at least well described, in the published accounts of Valencia, Murcia, and Alicante, as well as other principles, shown in parentheses, whose existence can be logically inferred from the available sources.

□ **Valencia** (a *turno* system composed of 8 irrigation communities; formerly covering 12,000 ha. [5,500 ha. today]): proportionality, contiguity, (uniformity, regularity, transparency);

□ **Murcia** (a *tanda* system composed of 42 user communities, formerly covering 13,000 ha. [7,000 ha. today]): proportionality, contiguity (uniformity, regularity, transparency);

□ **Alicante** (a market system based on a *tanda*, composed of 3 user communities and formerly covering 3,700 ha. [3,000 ha. today]): proportionality (contiguity, uniformity, regularity, transparency).

The presence of such similar, even identical principles in both communal and 'market' systems can only indicate that the monetary incentive to conserve water, where it exists, must be of secondary importance. In this general kind of system, people obey the rules and respect tradition mainly because by doing so they are optimizing the frequency of irrigation for themselves and everyone else, responding to a close correspondence between individual self-interest and the common good that cannot be achieved through any other kind of institutional arrangement. The fact that people in a market system of the type that formerly existed in Alicante can sell any surplus water which they choose not to use at a particular time, or can buy more if they wish in order to alleviate a prevailing scarcity, does not mean that gaining such income is their primary motivation, or even a very strong one, and this point has never been understood. People cooperate primarily because, under a "moral economy" type of system, which is both equitable and transparent, it is the right thing to do and is ultimately seen as the only rational way to behave.

4. The 'National' Water Market of Chile

A final case worthy of discussion are the peasant communities in northern Chile, the only country in the world that has attempted to privatize all of its water by granting wholly unconditional rights to water-users, both public and private, and the only one that supposedly has a "national" water market. Again, Chile is widely held up by economists as a confirmation of the efficiency of such markets, which are thought to be capable of functioning effectively even in the small-scale canal systems of the Andes and other parts of the 'Third World'. During work as a World Bank consultant in 1994 through 1995, I was able to find out from Chilean colleagues that, contrary to what Bank publications suggest, there have in fact been no significant sales of water between households within that country's peasant communities since the current water law was implemented in 1981. This indicates that, as other authors have since shown, there is in fact no national water market in Chile, only a set of rather narrow and restricted markets where water sales are relatively few, though those may be quite large in terms of total amount of the resource that is transferred {23}.

Moreover, due to widespread resistance by campesinos and small farmers against being included in the market—a strategy that people have adopted in many areas in order to protect what are in fact their communal water rights—the government was forced, in 1989, to adopt a second water law, one which under certain conditions protects the communal rights of indigenous communities. The indigenous law was adopted in response to enormous political pressure applied by indigenous organizations and their leaders, and done in recognition of the serious problems that the 1981 Water Code has created, the only such law in the world in which a State has granted private and tradable water rights to users without imposing any conditions on those rights whatsoever. The foreseeable problems that such an ultra-'liberal' law created—widespread speculation, monopolization of the resource, and forced sales as large private and corporate owners have been able to buy up the rights of smaller competitors, especially farmers—were difficult if not impossible to solve in any other way, precisely because the state had relinquished

its capacity to regulate the market by creating unconditional rights under the 1981 law. Thus in Chile today, private water, which is widely bought and sold (although rarely between farmers of any type) coexists, sometimes even peacefully, with communal water, which is managed according to traditional principles. The national system of water ownership and use is in fact a dual one governed by two policies and two water laws, which conflict with each other but coexist in a kind of unholy alliance.

Fieldwork carried out in 2005, in a study of indigenous communities in the northern region of San Pedro de Atacama, revealed that water is used quite efficiently within the surrounding watershed, and with minimal conflict. One of the reasons for this efficiency lies in a process called "regularization", during which the national government either implemented, or endorsed, practices that manifested the same set of operating principles previously described [23]. This was seen as a necessary first step in regularizing water use and clarifying individual rights in communities that were being integrated into the market system, so that those rights could then potentially be bought and sold. However, it was soon discovered that such use was quite 'regular' in the local indigenous communities and that individual water rights were already clearly defined, in an equitable way, under customary systems of water use, which, as I have since shown in the fieldwork, conform to the "moral economy" model. It seems likely, from what I have been able to learn, that the aforementioned principles already existed locally and are in fact a survival of the much older Andean tradition of water management that I had encountered earlier during my fieldwork in Peru. Interviews with water distributors and individual irrigators, carried out in 2005, confirmed emphatically that the same set of principles previously described governs management of the resource in the twelve communities that occupy the watershed, as I had inferred from earlier published accounts.

This "moral economy" tradition rests on the principle of *equity*, a concept that is often mentioned in the literature but is notoriously difficult to define, in concrete terms, for most natural resources. In the field of irrigation and water rights, however, the concept seems to be easy to define and appears to have been widely defined by people in the same basic way, wherever they have been allowed to do this on their own. It necessarily encompasses both uniformity and proportionality, which are essential components of equity, as I have already shown. This finding, although controversial, could ultimately prove to be pivotal in the effort to build more powerful theories of collective action, and to devise policies and laws which strongly encourage such action to take place in existing communities of water-users.

5. Conclusion: A New Approach to Reform

This brief overview of research on the successful management of water for irrigation in different parts of the world has revealed the outlines of a superior alternative to the policies that have been tried in the past. A new approach to policy and a resolution of the impending water crisis in Peru and the other Andean countries does not require that we discard those policies, which are not obsolete. Instead, it requires that we supplement them appropriately with insights gained from studies of the successful management of the resource by local water-users themselves--from the "moral economy" model--and combine them in a new way. The outlines of such a synthesis of the three main approaches to management—state control, privatization, and community-based management—are revealed by what we actually see happening today, on the ground, in Chile. That reality seems to show clearly, as others have suggested {24 Ostrom reference}, that none of the three approaches is a panacea capable of solving all problems in all situations, but that each of them has something to offer in formulating a new combined approach.

As I have argued elsewhere {11 –the World Development article}, there is no reason why private water and communal water cannot coexist, even peacefully, under the umbrella of a single new law. Water markets can be created in Peru in regions and areas where those would be appropriate and beneficial—especially in the coastal watersheds containing big corporate users, ones where large-scale agribusiness predominates—but in order to function effectively those markets would have to be well regulated, based on the granting of private rights that are subject

to strict and well-designed conditions. This would correct the serious error that was made in Chile and allow the state to play an appropriate role in ensuring that the potential benefits of water trading in those areas are realized, without allowing speculation and the formation of monopolies. Meanwhile, in other watersheds, or parts thereof, where peasant agriculture predominates—still true in most valleys in the Andean highlands—systems of communal management could be shielded from competition by recognizing and protecting their traditional communal water rights. Local communities could be given ownership and control over their traditional water sources, and the infrastructure for using them, so that they could formally take over full responsibility for operation and maintenance, a duty which the government has in fact already granted them. Many communities in the Andes are well-prepared to do this and are in fact doing it already, whose remoteness has in the past kept them out of the reach of the state and its bureaucratic interference. They can be, and should be, allowed to continue managing the resource in their traditional manner.

Other communities, however, are poorly prepared due to decades of domination by the state and interference in local hydraulic affairs. In parts of the highlands where there the existing water law, the General Water Law of 1969, has actually been implemented, which are relatively few—generally the provincial capitals and major highland towns—water rights are invariably poorly defined and over-prescribed, theft and waste of the resource are rampant, local distribution systems are flexible, opaque and extremely prone to corruption, and water is extremely scarce as a result. Such communities, if they are to take over responsibility for management and have ownership of the resource as well—whether communal or private, a choice they can and should be allowed to make democratically—are greatly in need of help, which the State has thus far been unable to provide.

Fortunately, the government does not have far to look in its search for models which reveal the relatively simple changes that need to be put in place. The institutions that have the potential to help solve these problems and promote effective local management already exist in Peru, being of Andean origin, as I have tried to show here. Although those institutions, which are moral principles, also emerged independently in many other parts of the world, that fact itself would seem to indicate that ultimately they have the same origin. Surely it must lie in human nature which, as a growing body of evidence indicates {24}, including what I have presented here, is not purely selfish, as Hardin thought, but also inherently cooperative.

References

- [1] G. Hardin: "The Tragedy of the Commons", *Science* 162 (1968) 1243–1248.
- [2] National Research Council (NRC): *Proceedings of the Conference on Common Property Management*, National Academy Press, Washington DC (1986).
- [3] B. McCay, J. Acheson (Ed.): *The Question of the Commons: The Culture and Ecology of Communal Resources*, University of Arizona Press, Tucson AZ (1987).
- [4] D. Bromley (Ed.): *Making the Commons Work: Theory, Practice and Policy*, Institute for Contemporary Studies, San Francisco CA (1992).
- [5] E. Ostrom: *Governing the Commons: The Evolution of Institutions for Collective Action*, Cambridge University Press, New York (1990).
- [6] World Bank: *Peru: A User-Based Approach to Water Management and Irrigation Development*, Report No. 13642-PE, World Bank, Washington DC (1995).
- [7] a) E. Ostrom: "Institutional Arrangements for Resolving the Commons Dilemma", in Ref. [3], p. 250–265;
- b) E. Ostrom: *Crafting Institutions for Self-Governing Irrigation Systems*, Institute for Contemporary Studies Press, San Francisco CA (1992);
- c) E. Ostrom, R. Gardner: "Coping with Asymmetries in the Commons: Self-Governing Irrigation Systems Can Work", *Journal of Economic Perspectives* 7/4 (1993) 93–112;
- d) E. Ostrom: "Reformulating the Commons", in J. Burger, R. Norgaard, E. Ostrom, D. Policansky, B. Goldstein (Ed.): *The Commons Revisited: An Americas Perspective*, Island Press, Washington DC (1998), p. 1–26.

- [8] E. Ostrom, J. Burger, C. Field, R. Norgaard, D. Policansky: "Revisiting the Commons: Local Lesson, Global Challenges", *Science* 284 (1999) 1–10.
- [9] S.Y. Tang: *Institutions and Collective Action: Self-governance in Irrigation*, ICS Press, San Francisco CA (1992).
- [10] J. Mabry, D. Cleveland: "The Relevance of Indigenous Irrigation: A Comparative Analysis of Sustainability", in J. Mabry (Ed.): *Canals and Communities: Small-Scale Irrigation Systems*, University of Arizona Press, Tucson AZ (1996), p. 227–260.
- [11] P. Trawick: "Historia de la Irrigación y Conflictos de Clases en la Sierra", *Debate Agrario*, No. 18 (1994), p. 21–44;
The Struggle for Water in the Andes: A Study of Technological Change and Social Decline in the Cotahuasi Valley of Peru, Ph.D. Dissertation, Yale University (1994);
 "Water Reform and Poverty in the Peruvian Highlands", in M. Thobani (Ed.): *Peru: A User-Based Approach to Water Management and Irrigation Development*, World Bank Report No. 13642-PE (1995), Annex B, p. 1–20;
 "La Privatization del Agua: Alternativa Andina para una Nueva Ley de Aguas", *QueHacer*, Vol. 115 (1998), DESCO, Lima (1998), p. 36–41;
 "La Nueva Ley de Aguas: Una Alternativa Indígena a Las Reformas Propuestas", *Debate Agrario: Análisis y Alternativas*, No. 28 (1999), Centro Peruano de Estudios Sociales (CEPES), Lima, p. 85–102;
 "Successfully Governing the Commons: Principles of Social Organization in an Andean Irrigation System", *Human Ecology* 29/1 (2001) 1–25;
 "The Moral Economy of Water: Equity and Antiquity in the Andean Commons", *American Anthropologist* 103/2 (2001) 361–379;
The Struggle for Water in Peru: Comedy and Tragedy in the Andean Commons, Stanford University Press, Palo Alto CA (October 2002);
 "Against the Privatization of Water: An Indigenous Model for Local Success in Governing the Commons", *World Development* 31 (6): 977-996 (2003);
 "Comedy and Tragedy in the Andean Commons", *Journal of Political Ecology*, Vol 9, pp.35-68. (2002).
- "Going with the Flow: The State of Contemporary Studies of Water Management in Latin American", *Latin American Research Review*, Vol 40(3): 443-456 (2005)
- "Scarcity, Equity, and Transparency: General Principles for Successfully Governing the Water Commons", in E. Wiegandt, Ed., *Mountains: Sources of Water, Sources of Knowledge*, Springer series Advances in Global Change Research. Pp 43-61. (2008)
- [12] J. Treacy: *Las Chacras de Corporaque: Andenería y Riego en el Valle del Colca*, Instituto de Estudios Peruanos, Lima (1994).
- [13] D. Guillet: "Canal Irrigation and the State: The 1969 Water Law and Irrigation Systems in the Colca Valley of Southern Peru", in W.P. Mitchell, D. Guillet (Ed.): *Irrigation at High Altitudes: The Social Organization of Water Control Systems in the Andes*, Society for Latin American Anthropology Publication Series, Vol. 12, AAS, Washington DC (1994), p. 167–188.
- [14] R. Hunt, E. Hunt: "Canal Irrigation and Local Social Organization", *Current Anthropology* 17 (1976) 129–157.
- [15] A. Maass, R.L. Anderson: *And the Desert Shall Rejoice: Conflict, Growth and Justice in Arid Environments*, MIT Press, Cambridge MA (1978).
- [16] E. W. Coward: "Principles of Social Organization in an Indigenous Irrigation System", *Human Organization* 38/1 (1979) 28–36.
- [17] R. Wade: "Common Property Resource Management in South Indian Villages", in Ref. [2], p. 231–258; *Village Republics: Economic Conditions for Collective Action in South India*, Cambridge University Press, Cambridge (1988).
- [18] R. de los Reyes: *47 Communal Gravity Systems: Organizational Profiles*, Ateneo de Manila University, Institute of Philippine Culture, Quezon City, Philippines (1982).
- [19] R.Y. Siy: *Community Resource Management: Lessons from the Zanjera*, University of the Philippines Press, Quezon City (1982).
- [20] N. Sengupta: *Managing Common Property: Irrigation in India and the Philippines*, Sage Press, New Delhi (1991).

- [21] W.F. Lam: *Governing Irrigation Systems in Nepal: Institutions, Infrastructure, and Collective Action*, ICS Press, Oakland CA (1998).
- [22] P. Trawick: "A Worldview from the Anti-Global South: On the Relationship between Poverty, Global Warming, and the Illusion of Creating Wealth," working paper, available online in the Digital Library of the Commons, of the International Association for the Study of the Commons (IASC).
- [23] A. Dourojeanni, A. Jouravlev: "El Código de Aguas de Chile: Entre la Ideología y la Realidad", *Debate Agrario*, No. 29–30 (1999), CEPES, Lima, p. 138–185.
- [24] Ostrom, E., M. Janssen, and J. Anderies "Going Beyond Panaceas", *Proceedings of the National Academy of Sciences* 104(39) (2007): 15176-78.
- [25] Gintis, H., S. Bowles, R. Boyd, and E. Fehr, *Moral Sentiments and Material Interests*. Cambridge, MA: MIT Press (2005)