

## STRUCTURING COLLECTIVE ACTION: AN IRRIGATION FEDERATION IN THE NORTHERN PHILIPPINES

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*The zanjeras or indigenous irrigation societies of Ilocos Norte are well known for their ability to mobilize local resources for irrigation development and water management, and to sustain collective efforts over long periods of time. This paper discusses how these organizations evolved a system for allocating both benefits and costs among water users, based on the concept of atar, and how this concept is used in structuring collective action within a federation of zanjeras.*

### *Introduction*

The mobilization of resources and the allocation of irrigation water are two critical functions of irrigation associations. These functions, however, are difficult to coordinate and effectively accomplish, particularly under conditions of great uncertainty, risk, and variability. Among the irrigation societies of Ilocos Norte, the concept of the membership share or *atar* plays a central role in the internal dynamics of these community organizations. Earlier studies of the irrigation society or *zanjera* (e.g., Christie 1914 and Lewis 1971) had alluded to the concept of shares; more recent publications have described the implications of the *atar* for the distribution of rights and responsibilities in irrigation organizations (Coward 1979 and Siy 1982).

In this paper we draw on a case study to shed more light on the origin of the *atar* concept, to explain its effectivity in mobilizing resources for operation and maintenance, and to speculate on its function in structuring collective action within a larger group — a federation of several *zanjeras* (Siy 1982).

### *The Concept of Atar*

An *atar* is essentially a membership share,

but it holds several interrelated features.<sup>1</sup> Each feature is complex but, at the same time, rational and appropriate. The four basic features represented or symbolized by the *atar* share are (a) land, (b) claimants, (c) water, and (d) members' responsibilities. These features are elaborated in the following sections:

*Atar as a unit of land.* In each *zanjera*, an *atar* has a fixed equivalent in land area which is constant over time and unique to each organization. For example, in a particular *zanjera*, the *atar* is equivalent to one-fourth of a hectare of irrigated land; in another, the *atar* refers to an area of over one hectare.<sup>2</sup> Although *atar* refers to an area of land that is unique to each *zanjera*, this area of land is typically composed of several separate parcels which are noncontiguous.<sup>3</sup> In one *zanjera* studied earlier (Coward 1979), a patterned arrangement was achieved in the following manner. First, the entire area served by the *zanjera* was divided into smaller units called *sitio*. Each *sitio* has a fixed number of *atars* (though not the same number for all *sitios*). Then each *sitio* was divided into two or more blocks laid out perpendicular to the water supply canal. Within each block, each *atar* has one parcel of land — and the order of the parcels is replicated across the several blocks of the *sitio* (see Figure 1). The result is that an *atar* holder

will have the land associated with his *atar* separated into several parcels; in Figure 1, he will have three parcels for his *atar*, one in each block.

To complete the structure of the *sitio* unit (as shown in Figure 1), at the lowest portion of the *sitio* one or more parcels are designated for the use of the unit leader. This irrigation leader is selected by the cultivators in the *sitio* and performs a variety of irrigation-related activities such as supervising needed repairs and overseeing water distribution. Payment for these services is in the form of use rights to these lower parcels.

*Claimants to atars.* Each *atar* share has a claimant or, in some cases, claimants.<sup>4</sup> Alternately, some individuals have control of more than one share.

The reason for this is that the amount of *atar* that a member holds is directly related to the area of land that he cultivates. If the land equivalent of an *atar* in one *zanjera* is one-fourth of a hectare, a member cultivating one-half hectare of land holds two *atar* shares; a member with one-eighth hectare will have one-half of an *atar*. Recent research in one federation composed of nine *zanjeras* indicated that 45 percent of the *atar* claimants or members held less than a full *atar* share (Siy 1982).

Over time, as landholdings are inherited or transferred, the tendency has been for cultivated area per member to shrink as the lands are subdivided and distributed to heirs or buyers. Consequently, *atar* shares become increasingly fragmented as the number of claimants per *atar* increases.

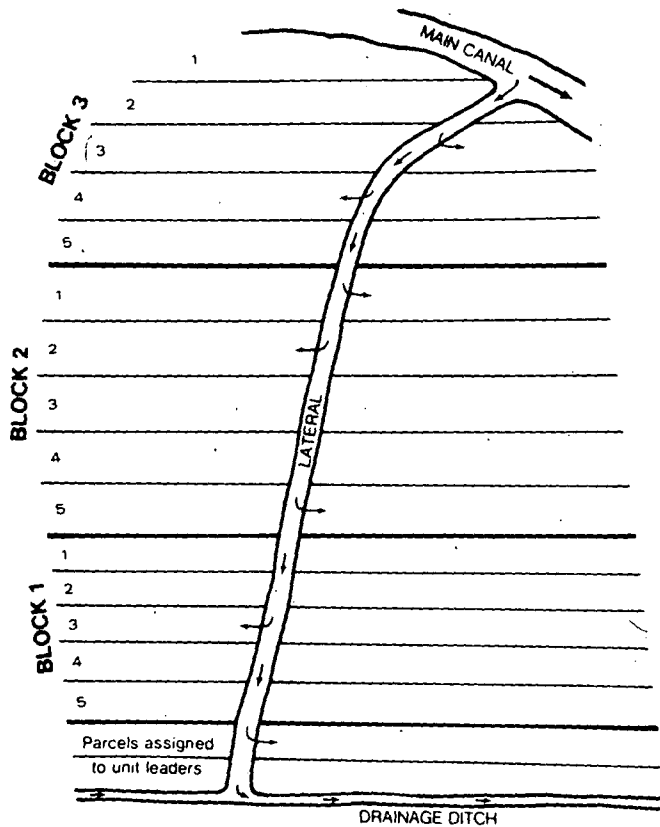


FIGURE 1. ILLUSTRATIVE LAYOUT OF FIELDS IN A SITIO UNIT

*Atar as a right to water.* The unique pattern of land distribution among the *zanjeras* enhances the probability that water supplies are allocated equitably, each shareholder having an equal right to a proportion of the system's water for irrigating their fields. Since each *atar* is represented by several noncontiguous parcels which are scattered in different parts of the system, the result is that variations in water availability and land productivity become more evenly spread or distributed among *atar* shareholders. As such, even during times of scarcity, the land arrangements facilitate the *zanjera's* attempts to ration water in equitable amounts to each parcel.

*Atar as a measure of members' obligations.* Correspondingly, resources are demanded in equal proportion from each *atar* shareholder. These resources, in the form of labor and local materials, are expended in the operation and maintenance of the irrigation system. The basic rule is that each *atar* is obliged to contribute an equal amount of labor as all other *atars* during each work session.

The fractionalization of *atar* among several claimants has complicated this method of assessing resource contributions from members. However, alternative arrangements have been evolved to deal with this situation. The basic pattern is for the cluster of claimants associated with a single *atar* to rotate among themselves the duties and obligations assigned to their "joint" *atar*.

#### *Implications for Membership Involvement*

The equitable sharing of benefits and costs, institutionalized in the *atar*, contributes to the long-term stability of these organizations by effecting a conjunction of interests, promoting consensual decision-making, and limiting the potential for conflict over the assignment of members' obligations. When members are confident and conscious that their co-members share equitably in paying the costs of the organization, the result is a more open and constrained atmosphere for

cooperation.

Second, the *atar* concept has permitted the *zanjeras* to effectively handle two types of uncertainties which small gravity irrigation systems face. The first uncertainty has to do with water availability. The hydraulic works managed by a *zanjera* are such that they lack water storage capacity in the form of a reservoir or tank. By the use of simple diversion structures — often made of bamboo, brush, and stone — water is diverted from a stream or river and conveyed to fields. The amount of water diverted from the stream is highly variable, both between the wet and dry season as well as within a specific season, and thus the supply of irrigation water also is highly variable (Lewis 1971). Under these conditions, the land distribution pattern works to minimize conflict and to facilitate the sensitive task of water allocation.

The second uncertainty concerns the predictability of resource requirements. Gravity systems periodically experience heavy stream flows which cause sufficient damage to weirs and canals to require more inputs than usual for maintenance. In these situations where the requirements for maintenance and repair vary over time and where it is difficult to predict the amounts of labor that each member should provide in a given year, it is important to have an effective means of calling for labor contributions from the membership, which will remain consistently fair over time, and permit the immediate identification of delinquent members. The *atar* system satisfies all these conditions.

#### *Biang ti Daga Agreements*

Earlier, the need for a better understanding of the historical development of the *zanjera* irrigation groups was noted (Coward 1979). Particularly puzzling was the layout of landholding arrangements that were observed to be associated with an *atar*. At that time it was unclear to what extent these patterns represented factors such as topography and

soil types or some historical stages of land development. Recent research has improved our understanding of these matters (Siy 1982).

Based on a review of existing documents and discussions with older informants in the Ilocos Norte region, we suggest it is useful to distinguish the origin of three types of *zanjeras*. First are those that were organized by farmers with the common interest of irrigating those lands which they already cultivated (perhaps under rain-fed conditions). It is this type that Christie seems to have in mind in referring to these groups as "irrigation societies" (Christie 1914): small holders with a common need which could not be met by any of them acting independently.

A second situation is that in which a *zanjera* group is formed to bring irrigation water to territories not previously cultivated. In the research on a *zanjera* federation, it was found that two of the *zanjera* units were created after "new" lands became available as the result of changes in the course of the Laoag River (Siy 1982).

The third circumstance is that in which a *zanjera* group is formed to provide irrigation water to lands already owned and cultivated in exchange for usufruct rights to a portion of the newly irrigated lands being assigned to the *zanjera*. In this third type, the *zanjera* is composed of members who may or may not have been farming in the area prior to the establishment of their group. The exchange between the landowners and the *zanjera* group is formalized in the *biang ti daga* (literally, sharing of riceland) agreements.

In areas where lands were already owned, but still unirrigated, groups would offer to construct an irrigation system on these properties in exchange for the rights to cultivate a portion of the area to be irrigated.<sup>5</sup> The actual division of land between the landowners and the *zanjera* would vary from case to case, but it seems that some arrangements permitted the *zanjeras* to use

from one-third to five-sixths of the total area to be irrigated. The terms of the agreement were that ownership of the land would be retained by the landowners and use-rights would be granted to the *zanjera* as long as the lands of the owners continued to receive adequate irrigation. If the *zanjera* should fail to provide water to these lands, it would forfeit the rights to cultivate the lands specified under the *biang ti daga*.

While contemporary interviews with *zanjera* members and officials attest to the use of this arrangement in *zanjera* development, there are two additional written sources that confirm the matter.

In discussing the topic of cooperative labor in the area of Bacarra, Ilocos Norte, Lazo (1920) notes the following regarding a *zanjera* group:

As to why they organize themselves as an institution, members of this society taking advantage of the water supply of the town have decided to divide the people into two classes:

1. People within the town who have agreed to turn over to the association one half of the land irrigated or receiving support from the society. And this half portion to remain within the disposal of the society so long as the owner receives sufficient supply of water. But in this statement we should avoid the idea that this one half of the land irrigated is given as a property of the association. It has only the rights of usufruct which carries with it the rights of possession but not of property.

2. The other class of people receiving benefit from the association is the one composed of those who agree to work under the guidance and control of the semi-corporate body.

The second piece of evidence is a notarized statement of a *zanjera* president dated January 3, 1950. This item was submitted to the Office of the Register of Deeds of Ilocos

Norte to support the claim of the *zanjera* to parcels of land exchanged for irrigation services.

. . . for over sixty years now, the said (association), even before its incorporation, has been possessing the above-described parcels of land, in concept of owner thereof, continuously, openly, and peacefully, up to the present, enjoying the products thereof, in as much as the said (association) through its collective members, agreed to construct private irrigation ditches that pass through and irrigate the adjoining properties of which the above parcels of land were parts, in consideration of which the above-described parcels of land, together with other parcels, were conveyed and ceded to the (association) by the land owners whose properties were benefitted by the private irrigation of the (association).<sup>6</sup>

The concepts put forward in this statement are quite clear. This *zanjera* is a private irrigation service, separate from the landowners, and which receives payment for its irrigation services in the form of "rights" to selected land parcels. This *zanjera* form is quite different from the small holder cooperative model that Christie presented in his early writings and leads us to disagree with the notion suggested by Lewis (1971:128) that *zanjeras* are all basically of one type. Furthermore, there may be need to alter Lewis' statement that "the manifest function of irrigation societies is simply to procure a stable, reliable supply of water, which can increase crop production in some cases by more than half." The *biang ti daga* agreements suggest that with some *zanjeras* a basic purpose of the group was to use irrigation services as a means of acquiring rights to land.

From the *biang ti daga* agreements we can see the *atar* concept beginning to take shape. Those that provided the original labor to construct the system were rewarded with a share of land acquired in the process. And, since continued use of this share of land is dependent upon the uninterrupted provision

of irrigation water, the labor and other resources required for this service can be directly assigned to the share holders.

The land exchange agreements also provide an explanation for the dispersion of the parcels associated with a particular *atar*. Since each of the landowners benefitting from the irrigation service were required to provide a portion of their land to the *zanjeras*, the acquired parcels would be scattered across the landscape. In each of these acquired blocks, some practical number of parcels would be created and assigned to *atar* holders. Thus, an *atar* holder would be assigned parcels in several, but probably not all, of the units that the *zanjera* acquired from the landowners.<sup>7</sup>

What is not clear is why landowners would have preferred this arrangement for bringing irrigation to their lands, as compared to forming an association among themselves to create and operate irrigation system. Group formation is, of course, not an activity without costs, and landowners may have found these costs exorbitant, for reasons we do not now understand.

We also have no concrete information as to who the people were who formed these *zanjera* groups. In those parts of Ilocos Norte where wealthy families still control large tracts of land, it is quite possible that landowners encouraged their tenants to organize themselves and to construct irrigation systems. Old Spanish documents also make reference to the assistance of the friars in the establishment of Ilocano irrigation systems. However, it is also plausible to expect that such groups were formed using the organizational blueprints available to Ilocanos in the form of the *lakay* institution. As Cruz (1982) has discussed in the case of Ilocano migration to Pangasinan, kinship groups under the direction of a dominant kinsman, the *lakay*, were an important means of collective action for land and water development. Such *lakay* groups may have been the means by which a number of *zanjeras* originated.

Assuming this was the case, we are left with other important questions. Are we to view these incipient *zanjeras* as groups of landless, or near landless, who participated in this collective action so as to gain access to land? Or, alternatively, were these groups of landless organized under the direction of a kinsman who already was an influential landowner and who saw this enterprise as a means to expand his control over land?

While important questions remain unanswered, the *biang ti daga* process does unscramble features of the *atar* concept previously observed. For example, the unchanged number of *atars* associated with particular *zanjeras*, or subunits of the *zanjera*, can be understood in terms of the structure of labor mobilization used in the original creation of the irrigation works. In contemporary *zanjeras*, "members" are defined as those who are claimants to *atars*. Simultaneously, the *zanjera* may be delivering water to a number of cultivators who are not members — that is, those who are cultivating land not associated with any particular *atar*. These individuals typically have a different relationship with the *zanjera*; they pay some type of fee for the water received but are not required to provide labor and materials for the upkeep of the physical facilities. Their conversion to the status of "member" is inhibited by their inability to procure equivalents for the enormous prior investments of labor and materials represented in any single *atar*.

Also, as briefly mentioned above, the *biang ti daga* accord between the *zanjeras* and the landowners provides explanation for the dispersed nature of the land parcels associated with any particular *atar*. Since the general pattern was for the *zanjera* group to receive usufruct rights to some portion of the landholding of each owner served by the irrigation works, the result was that the *zanjera*-acquired lands were scattered across the area served by the system. These acquired blocks were divided into some manageable

number of parcels and the total number of parcels distributed in an equitable manner to *zanjera* members.

#### *The Atar Concept in a Federation Context*

Recently research has been completed on a federation of *zanjera* groups in the province of Ilocos Norte (Siy 1982).<sup>8</sup> One important finding from that research is that the *atar* concept is an organizational principle for structuring action among the several federation entities as well as within each of them, as revealed in earlier research. That is, the rights and responsibilities of each *zanjera* within the federation are calculated in terms of the number of *atars* it has just as the rights and responsibilities of an individual member reflect his *atar* holdings.

This irrigation federation was studied intensively over the period of November 1979 to January 1981. This site was selected for several reasons: the major ones being the federation's age, size, and complexity. Its origin can be traced to the late 19th century. Its irrigated area is approximately 500 hectares cultivated by more than 400 farmers — which is large relative to other community systems in the region. It is organizationally complex, serving several distinct groups of water users, some of which previously existed and operated as separate entities. The federation is located on the north side of the winding Bacarra-Vintar River near the city of Laoag in the province of Ilocos Norte.

The nine *zanjeras* that form the federation did not originate at the same time nor did they always share the same diversion structure and canal network. Accounts of elders in the area indicate that several of the *zanjeras* previously existed as independent entities maintaining their own brush dams and delivery canals. The exact sequence of events in the development of the federation is still unclear but the following broad outline has been reconstructed based on informant interviews and a few historical documents:

- As early as the 19th century, two of the older *zanjeras*, Surgui and Sto. Rosario, were already sharing a common brush dam and main delivery canal;
- Zanjera Nibinib joined these two in 1906 (a copy of the agreement between the parties still exists);
- A fourth unit, San Pedro, joined the others sometime in the 1930s;
- Two additional *zanjeras*, Cabaroan and San Jose, joined the federation in 1946; in 1952 San Juan also merged with the federation;
- In subsequent years, two new units, Sinigpit and Collibeng, were formed on lands not previously used as rice fields. Neither had its own system prior to becoming units of the federation.

While not central to our present concerns, it may be appropriate to mention briefly our understanding of the conditions related to the federation's emergence. Independent *zanjeras* apparently joined the federation only when their continued existence as separate entities was threatened. It does not appear that they joined the federation to achieve marginal benefits from economies of scale. A major threat to a *zanjera's* persistence came from shifts in the Bacarra-Vintar River's course (generally shifting in a southerly direction)

thus leaving them unable to obtain water through their existing irrigation facilities.

Therefore, over the past century, in response to the changing location of the river's flow, and constrained by the existing man-made landscape, seven previously autonomous and self-contained *zanjera* units have joined together to operate and maintain a single dam on the Bacarra-Vintar River and a main canal transporting water from that location to the agricultural lands. In addition, two new units which did not exist prior to the federation have been formed and attached to it.

Finally, it would be useful to provide information on the relative size of the *zanjeras* comprising the federation. Table 1 shows three aspects of size that can be considered with regard to the *zanjera* units: number of *atars*, number of hectares, and number of members. The differences between these units are significant. For example, Zanjera Santo Rosario has nearly ten times as many hectares as does Zanjera San Pedro. San Juan with its 60 *atars* is more than three times the size of Nibinib with its 17 *atars*. Large differences in membership size also exist. As will emerge in the ensuing discussion, while these three measures of size are not completely uncorrelated, it is the traditional concept of

Table 1. *Basic Data on Zanjeras in the Federation*

<i>Zanjera Name</i>	<i>Hectares Served</i>	<i>Number of Atars</i>	<i>Number of Members</i>
San Jose	21.6	26	49
Cabaroan	32.2	36	60
San Juan	70.8	60	73
Sinigpit	30.7	30	30
San Pedro	14.2	25	26
Collibeng	17.5	40	40
Surgui	135.0	50	64
Sto Rosario	140.0	33	69
Nibinib	43.0	17	20

*atar* that operates to organize differential *zanjera* privileges and responsibilities.

In each of the *zanjera* units, as well as the federation level, two fundamental tasks which must be organized are: (1) the allocation of water within and among the *zanjeras*, and (2) the mobilization of labor and other resources to repair and maintain the physical irrigation facilities within each *zanjera*, as well as the facilities for which the federation has combined responsibility — the dam and the main canal.

*Repairing the brush dam.* The brush dam is over 100 meters in length and spans the entire width of the river. It is made of bamboo poles, banana leaves, sand, and rock. The dam is designed to self-destruct when the water level of the river rises above a certain height, thus also preventing damaging and flooding of the canal system. The dam is completely destroyed at least once a year; in some years, this may occur three to four times.

The repair of the brush dam may involve as many as one thousand people. Before the actual start of work, a list of required materials is prepared and circulated among the *zanjeras*. Members of each *zanjera* are required to bring specific quantities of bamboo poles (15-20 feet in length) and banana leaves. In addition, each *zanjera* supplies its own *bilog*, a large canoe-like boat used in the river during the repair activities.

The regularity of the dam repair tasks has encouraged the development of several rules and procedures to facilitate this activity. The entire length of the diversion structure is divided into several segments, and work groups are assigned to construct and complete each of these segments.

Seven work groups are formed. Each of the five largest *zanjeras* (in terms of the number of *atar* shares they have) compose a separate work group. The four remaining *zanjeras* combine to form two additional work groups of two *zanjeras* each. The segments of the

dam assigned for construction or repair are adjusted to allow for the different number of workers available to each work group.

The principle for mobilizing resources for repairing the dam is to allocate responsibility to each *zanjera*, based on its total number of *atars* rather than other possible criteria such as the total number of members or the total number of hectares irrigated. In this manner, each *zanjera* can mobilize labor and materials from each *atar* holder in proportion to the number of *atars*, partial or whole, that each holds.

The *zanjeras*, through their secretaries, maintain detailed records of each member's labor and material contributions. Table 2 is based on such records for 1980.

Several points are of interest:

- The total amount of labor provided is very high, nearly 16,000 man/days. Thus, a little more than 30 days of labor were invested for each hectare of land irrigated.
- There is a close correspondence between the number of days of labor required from each member and the amount of labor actually provided.
- There are large differences in the total labor provided by each *zanjera*. Since total labor includes both inter- and intra-*zanjera* activities, much of this variation is the result of different internal circumstances faced by the several *zanjera* units.

The overall picture is one of success in mobilizing a significant amount of labor to operate and maintain the irrigation system of the federation.

*Allocating water.* An examination of the data for water supplies entering the service area of each *zanjera* indicates a very uneven volume per hectare of land (see Table 3).<sup>9</sup> The data show that those *zanjeras* at the "head" of the system (closest to the brush



Table 2. *Data on Labor Contributions (1980)*

<i>Zanjera</i>	<i>Days Required Per Member</i>	<i>Days Present Per Member</i>	<i>Total Days Provided</i>
San Jose	28	26	1,268
Cabaroan	17	16	975
San Juan	56	56	4,106
Sinigpit	24	23	674
San Pedro	67	64	1,658
Collibeng	32	31	1,247
Surgui	48	42	2,682
Sto. Rosario	40	38	2,618
Nibinib	41	38	749
Total	—	—	15,978

dam) consistently receive large volumes of water relative to their requirements — San Jose, Cabaroan, San Juan, and Sinigpit. The situation of the *zanjeras* at the “tail” of the systems stands in direct contrast. The disadvantages of this allocation pattern are especially acute during the dry season (see Table 3 especially January through April). During this critical period, some *zanjeras* continue to receive water in excess of their requirements, some receive highly variable supplies, and others — at times — are without water.

This uneven allocation of the water supply, when contrasted with the federation’s capacity to mobilize repeatedly the considerable resources required to maintain the system, presents an interesting puzzle. Why do those individuals, and their *zanjera* groups, which appear to be poorly served by the system, continue to support and participate in the federation? Why is it they do not press for a change in the pattern of water allocation or reduce their supply of labor and other resources?

An examination of Table 3 may lead to conclusions of an uneven (perhaps even unfair) pattern of water distribution if we

evaluate the pattern in terms of amounts of water per hectare of land served. However, as discussed above, we know that the concept of *atar* is a powerful organizing idea for the allocation of water within a *zanjera*; is there any evidence that it also is used to organize inter-*zanjera* distributions? Furthermore, earlier work has shown that the *atar* concept is a pivotal concept, at the intra-*zanjera* level, linking rights to water with obligations to provide labor. Thus, we can also ask, is there any evidence that the *atar* idea is used in this dual manner to structure federation actions?

To examine these questions data was organized as presented in Table 4. As shown, in this table we have consolidated data on three critical *zanjera* characteristics: the number of *atars* held, the amount of labor provided, and the amount of water received (at two different times in the cropping year).

These data were created in the following ways. First, the nine *zanjeras* were ranked based on the number of *atars* they hold — San Juan, ranked number one, has the largest number of *atars*. Second, *zanjeras* were ranked based on the total number of labor days provided during 1980.<sup>10</sup> Third, the *zanjeras* were ranked according to the proportion of

Table 3. *Distribution of Hectares, Atars, and Monthly Shares of Water*

<i>Zanjera</i>	<i>Percent of Federation's irrigated area in this zanjera</i>	<i>Percent of Federation's atars in this zanjera</i>	<i>Percent of Total Discharge of Main Canal at the Headworks</i>											
			<i>Jan</i>	<i>Feb</i>	<i>Mar</i>	<i>Apr</i>	<i>May</i>	<i>Jun</i>	<i>Jul</i>	<i>Aug</i>	<i>Sep</i>	<i>Oct</i>	<i>Nov</i>	<i>Dec</i>
San Juan (Head)	14.0	18.0	63	80	79	72	55	45	33	30	29	30	28	22
San Jose	4.3	8.2	9	13	15	18	15	15	12	11	11	11	7	7
Sinigpit	6.0	9.5	22	23	24	24	23	21	10	13	10	12	12	9
Cabaroan	6.4	11.4	15	17	16	9	2	5	15	15	17	13	3	9
San Pedro	2.9	7.9	4	6	10	2	4	4	15	15	20	18	19	3
Collibeng	3.5	12.6	0	0	0	0	2	1	4	7	10	8	8	0
Surgui	26.7	15.8	32	36	22	16	28	30	28	26	34	32	18	30
Nibinib	8.5	5.4	13	6	4	1	1	5	5	4	3	1	2	3
Sto. Rosario (Tail)	27.7	10.4	24	14	5	0	0	8	7	7	8	6	3	11

Table 4. *Relationship of Atar Ranking, Labor Contributions and Water Allocation*

<i>Zanjera</i>	<i>Atar Ranking</i>	<i>Labor Contributions Ranking</i>	<i>February Water Allocation Ranking</i>	<i>July Water Allocation Ranking</i>
San Jose	7	5	6	5
Cabaroan	4	7	4	3.5
San Juan	1	1	1	1
Sinigpit	6	9	3	6
San Pedro	8	4	7.5	3.5
Collibeng	3	6	9	9
Surgui	2	2	2	2
Sto. Rosario	5	3	5	7
Nibinib	9	8	7.5	8

Spearman rank order correlations:

Atar and labor contributions  $r_s = .68$

Atar and February Water allocation  $r_s = .60$

Atar and July water allocation  $r_s = .45$

Kendall coefficient of concordance:

Atar, labor, and February water allocation  $W = .68$

the federation's total water supply which they received in February (a dry period) and in July (a wet period). If the *atar* concept is used by the federation to allocate water and mobilize labor, we would expect to find relationships among these three variables.

We began by examining the relationship between *atar* and water allocations. Water supplies are, of course, most critical in the dry period so that it is especially informative to examine the allocation ranking for February. Analysis indicates a high correlation between a *zanjera's* *atar* ranking and its water ranking in February ( $r_s = .60$ ). There are two important exceptions to this pattern, Collibeng and Sinigpit, but there are plausible explanations for this.<sup>11</sup> First, recall that in the process of federation formation, Collibeng and Sinigpit were the last units to join and that these two units had not existed as independent *zanjeras* prior to that time. Moreover, the land which they brought under cultivation previously had

been the bed of a branch of the Bacarra-Vintar River before its southerly shift. Related to these origins, both of these units have an unusual manner of obtaining water from the system. Collibeng is the only *zanjera* that does not receive water directly from the main canal of the federation. Rather, its source of water is a small pond that collects drainage water from several upstream *zanjeras*. Obviously, when these upstream units are receiving low water supplies, the drainage available to Collibeng may be particularly inadequate.

This combination of facts probably explains the lack of correlation between Collibeng's *atar* and water supply rankings. Collibeng receives relatively less water than its *atar* rank would predict.

Sinigpit is able to receive its water by linking its supply canal with the canal serving San Juan which receives the largest proportion

of the federation's water supply. It seems that Sinigpit directly benefits from the large volume of water available in San Juan's supply canal. The result is that Sinigpit's relative ranking in water received is higher than its *atar* ranking would predict.

Attention now turns to the possible relationship between *atar* and labor mobilization. Utilizing the same procedure as above, the correlation between *atar* and labor was also found to be high ( $r_s = .68$ ). That is, the general pattern is that *zanjeras* holding a larger number of *atars* supply more labor than do the others.

Finally, it is of interest to look at the relationship between all three variables simultaneously. The Kendall coefficient of concordance was calculated to measure this degree of correspondence and also was found to be high ( $W = .68$ ). In a statistical sense, this indicates that knowing a *zanjera's atar* ranking will be highly predictive of its ranking with regard to labor supplied and water received. This pattern is especially noteworthy in the case of *Zanjera San Juan* which has the largest number of *atars*, provides the largest number of man days of labor, and receives the largest share of water during the dry season.

But the case of San Juan illustrates another important point — the striking incongruity between number of hectares and supply of water. For example, while both Surgui and Santo Rosario have nearly twice as many hectares under command as does San Juan, they each receive a lesser proportion of the federation's water supply than does San Juan. Again, the distribution of both labor provided and water received can be shown to correlate with shares (*atars*), not space (hectares).

We suggest that the allocative principle that was reported previously to link benefits and costs for individual *zanjera* members also structures collective action and the distribution of the collective good created by this action across the *zanjeras* that constitute

the federation studied. In that federation, *zanjeras* with larger numbers of *atars* can expect to be required to provide more labor for reproducing the hydraulic system but also can expect to receive a larger proportion of the water supply available to the union. In our judgment, this conjuncture between rewards and requirements is a fundamental mechanism for the federation's endurance.

Before leaving this point, it should be noted that our evidence for the organizing function of the *atar* concept in the federation is based on the structural data just discussed. At this time, we have only partial corroboration of these conclusions from the *zanjera* officers or members. In the case of decisions and actions taken to allocate labor requirements, we have discovered that the concept of *atar* is fundamental — the work load is distributed across *zanjeras* in accordance with the number of *atars* they hold. However, we have not yet uncovered particular instances of decisions or actions taken in allocating water that are explicitly based on an *atar* rule.<sup>12</sup>

#### *Persistence of the Atar Concept*

The *atar* institution, while central to *zanjera* functioning, is not immutable. Three large circumstances in the region continue to stress elements on which this core principle is founded.

First is the continuing reduction of the man/land ratio brought about by population increases, a relatively fixed land base, and limited opportunities for employment outside of agriculture. One result is that the parcels of land associated with an *atar* becomes further fractionalized. This can erode the link between rights and responsibilities when the labor requirements of a particular *atar*, for example, become dispersed across a number of claimants. This dispersion also complicates the work of the *zanjera* and federation officials attempting to supervise these matters. Over time the *atar* holders may be seen as changing

from a dedicated few to a larger number, each with reduced commitment.

A second stress may arise from land reform programs. In systems where some cultivators acquired land rights historically through *biang ti daga* agreements, there can be apprehension that these rights will not be positively interpreted under contemporary land reform procedures. There also is the danger that land reform will attempt to consolidate the separated parcels which now typically are associated with the *atar* principle. Earlier, we explored how this pattern may be related to this historical processes by which many *zanjeras* were formed, here we note the value these scattered parcels can have relative to water distribution and irrigation performance.

Perhaps the most ubiquitous problem in the operation of an irrigation system is obtaining some degree of spatial equity — often characterized as the “head” and “tail” problem. Fields proximate to the source of water usually are better served than those located more distant. However, with the *atar* pattern of landholding, the scattered parcels often produce the result that cultivators have some of their land in “head” zones and some portion in “tail” zones, thus ameliorating the impact of water shortages or poor management. With the *atar* system, all (or most) cultivators will be affected if “tail” zones are poorly served, rather than this burden falling upon a limited part of the community. Consolidation of parcels could adversely affect the *atar* principle by

eliminating one feature that now promotes equity in water distribution and, in turn, reinforces the participation of cultivators in the basic maintenance tasks.

A third stress arises from the processes of irrigation development being implemented by the state. Commonly, these projects anticipate a heavy agency role in irrigation operation and management in the post-project period. That is, in exchange for government providing assistance to the *zanjera*, the irrigation agency then assumes the rights of governance. In the case of *zanjeras* that originated from *biang ti daga* agreements, there has been some concern among *zanjera* members that if government assumes responsibility for providing the irrigation services, the *zanjera* might then lose the long-standing rights to lands based on the agreement that the usufruct rights were in exchange for rendering irrigation services.

The more general irrigation development stress arises because in assuming responsibility for selected irrigation tasks, government inevitably modifies the delicate ensemble of rights and responsibilities that are combined in the *atar* principle. Responsibilities, for example, may be shifted from labor to cash payments, and the calculus of *atars* replaced with that of hectares, and in this process the special place of the member, or *atar* holder, as a symbolic (in some cases, actual) descendant of an original founder may be cancelled. Under these conditions, the fundamental tasks of labor mobilization and water distribution which are mediated by the *atar* principle can be expected to be altered.

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### Notes

<sup>1</sup>Wilkinson (1977) in discussing the social organization of irrigation in Oman refers to a concept of water sharing with an unexpectedly similar name: *athar*. Wilkinson (1977: 108) notes that an *athar* is a time unit (the 48th part of a 24 hour day) used to refer to a share of water from the irrigation system allocated to a shareholder to receive water during a specified period of time. One might speculate on a common Arabic origin for the two

words, transported to the Philippines by the Spaniards. This does not assume that the Spaniards actually introduced the share concept in Ilocos — they may merely have given their term to an institutional arrangement already in place.

<sup>2</sup>A similar notion of common water share with variable land space attached to it is reported by Geertz (1967) in discussing the concept of *tenah* used in the subaks of Bali. One might think of it as a more sophisticated concept than the usual land

unit used in the West since the areal variation allows for consideration of more subtle quality differences in the soil and topographical characteristics of the land.

<sup>3</sup>The pattern of noncontiguous landholdings as an integral feature of the social organization of an irrigation system was earlier reported by Leach in his well-known study of Pul Eliyah in Sri Lanka (1961).

<sup>4</sup>*Atar* rights are directly associated with land ownership — owning a particular parcel of land carries with it some amount of an *atar* share. Tenancy continues to be very high in this region of the Philippines. A sample of cultivators in the federation studied by Siy (1982) indicated that 53 percent of the respondents were full tenants (they owned no land of their own in the federation) and 74.4 percent rented at least a portion of the land they were operating in the federation's service area. Renting-in land provides the renter the associated *atar* rights and responsibilities — that is, he becomes the "temporary" *atar* claimant. It is reported that some owners exploit renters by transferring *atar* obligations to their tenants in disproportion to the *atar* rights which the tenant receives.

<sup>5</sup>A recent report on irrigation organization in the Lake Toba region of North Sumatra (Lando 1979) gives additional insight as to how this process might have operated. Here, groups (often a single patrician) act to construct the basic facilities of an irrigation system — a weir at the water source and a canal(s) to convey water to the potential sawah area. Those who are not members of this "investment" group can use water from the canals to *form* their sawah fields and thereafter to irrigate them. But the cost of doing so is that the user provide one-fourth of the newly created rice-lands to the group that created the irrigation works. This one-fourth is reported to be held in "trust" — which we may presume to mean having usufruct and not ownership rights.

<sup>6</sup>This document was found among the association records which were being kept at the home of one of the *zanjera* officials in Bacarra, Ilocos Norte. There is no doubt that similar documents which in one way or another make reference to the *biang ti daga* are available and are in the possession of the heads of other *zanjeras*.

<sup>7</sup>For a visual display of these arrangements, see the map in Siy (1982:30).

<sup>8</sup>The field data were obtained through several means and from diverse sources including: participant observation, a survey questionnaire, interviews with key informants, review of historical

records and contemporary group records, soil sampling, and regular water flow measurements.

<sup>9</sup>The delivery and allocation of water to each of the nine *zanjeras* was monitored over a period of 50 weeks, from January 12 to December 26, 1980. To measure water volumes, a total of eleven staff gauges were set in place at the turnouts to major laterals which served individual *zanjeras*. Over the 50-week period, every morning between 6:00 and 8:00 AM and each afternoon between 4:00 and 6:00 PM the depth of water in each of the eleven measurement sites was recorded.

<sup>10</sup>The data that we have on total days of labor contributed is not entirely satisfactory because it confounds labor used for activities within a particular *zanjera* along with labor use for federation activities. To use the data as we do, we are assuming that the need for internal labor is approximately the same per *atar* share for all *zanjeras*.

<sup>11</sup>If these two *zanjeras* are removed from the calculation, the Spearman rank correlation for the remaining units is  $r_s = .94$ .

<sup>12</sup>At this point it should be clear that we are suggesting an etic explanation. At the time of field work in the federation, none of the key informants interviewed nor the various federation documents reviewed suggested this allocative principle. However, in a recent brief visit to this same region (November, 1982), we tried to explore this idea more explicitly. Informal conversations with officers of the Ragas Federated *Zanjera* in the town of Marcos suggested that distribution among the units (here called *gunglos*) of that federation is done with regard to the number of *atars* held by each of the *gunglo*.

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# 1984 ISA CONFERENCE ON THE CULTURAL BASIS OF EDUCATION

The Research Committee of the *International Sociological Association* concerned with sociology of education announces a conference on the CULTURAL BASIS OF EDUCATION: The Inter-relationship Between Values, Knowledge and Education as an Institution. The Conference will take place at UNESCO, 7 Place de Fontenoy, Paris, France from August 14 to 17, 1984.

Colleagues are requested to submit an abstract of no more than 500 words by March 15, 1984 directly to the session organizers listed below. Please send at the same time the registration fee of \$30.00 (U.S. currency, International Bank Draft) to the Treasurer, Willem Van Groenou, California State University, Hayward, California 94542, U.S.A. Membership to the Committee amounts to \$5.00.

Ten participants from the Third World will be awarded \$50.00 each and a waiver of the registration fee. There are no funds to subsidize travel costs.

## Session Themes and Organizers

- I. Historical-Cultural Orientation and Educational Order  
Organizers: Margaret Archer                      Fred Mahler  
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Coventry CV4 7AL                      Bucuresti, Romania  
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- II. Education, Politics and Economy – Cultural Homogamy or Contradiction  
Organizers: L.J. Saha                      Anna Frangoudaki  
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- III. Knowledge for What and Education for Whom? – Education in the Third World Nations  
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Ap. No. 50.061                      Zakir Husain Centre for Educational Studies  
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- IV. Instrumental Learning and the Production of Knowledge – Elementary, Secondary and Post-Secondary Educational Systems  
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- V. Between the Sacred and the Secular Culturological Knowledge and Religion  
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- VI. Life-Long Education  
Organizers: Ettore Gelpi – in cooperation with  
Gloria Ramirez (Mexico)  
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Paris 15, France
  
- VII. Education and Youth – Spontaneity and Planning  
Organizers: Artur Meier  
Academy of Educational Sciences  
Department of Sociology of Education  
Schul Street 29  
110 Berlin, D.D.R./East Germany
  
- VIII. Summary Session – This concluding session will summarize ideas, findings, policy recommendations, and directions for future research relating to the conference theme – “Cultural Basis of Education.” It will be a synoptic overview of the papers.  
Organizers: Patricia Broadfoot                      Mike Presdee  
University of Bristol                      Sociology Department  
Helen Wodehouse Building                      Hartley College of Advanced Education  
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