

WORKSHOP ON MANAGEMENT OF
NATURAL RESOURCES HELD IN COMMON

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CASE STUDY OF MAJJIA VALLEY WINDBREAKS

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Introduction

This case study provides the kind of background information needed to illustrate the use of Dr. Ronald Oakerson's framework for the analysis of common property problems. It concerns the management of recently established windbreaks, a renewable resource. These particular windbreaks were planted to stabilize soils in a rich agricultural valley in the arid West African Sahel.*

The present case is interesting for two reasons. First, the windbreak project in the Majjia Valley is widely considered to be a technical success—the trees are flourishing and have stabilized the valley soil. In fact, the windbreaks have grown so much that they must now be harvested to reduce their excess protection capacity, which threatens to shade arable land unnecessarily. Second, because this is a new resource, the management institutions represent a new departure from (rather than reinforcement or extension of) an existing set of local, indigenous resource management institutions. Since the issue of management approach has not yet been resolved, this case is fairly typical of development projects where new institutions have to be designed.

The remainder of this paper provides the facts necessary to assess this resource management problem using Dr. Oakerson's framework. However, it does not specify the correct solution. During the workshop, participants will analyze the facts and then propose management institutions or approaches to their development for this situation.

Physical Setting

The Majjia Valley lies in south central Niger. Rainfall in the region varies considerably, but generally runoff from the watershed's upland slopes is sufficient to permit good harvests of sorghum and millet. The valley is irrigated from a seasonal watercourse. Flood-recession agriculture accounts for much of the production in the flat lower portion of the valley, where summer runoff from the valley's sides inundates the areas that are closest

* While any in-depth assessment of Dr. Oakerson's framework must focus on a specific resource in a particular context, other examples would have served equally well to illustrate the strengths and weaknesses of this analytic framework.

to the stream channel. Many valley residents also take advantage of the area's shallow water table to pursue truck gardening (primarily onions and tobacco) during the dry season. Fields on the valley floor are typically irregular in shape, relatively small and have comparatively rich soil.

The valley residents practice a local variant of Maliki Islam and generally observe the basic tenets of this faith. In accord with the principles of the Islamic Maliki shari'a school, land is owned by household heads or in some cases, by individual men and women within a family. Most people live in nuclear families, although richer men frequently have more than one wife.

The northern third of the valley (450 square kilometers), where the windbreaks have been planted, is inhabited by about 30,000 people. Population densities exceed 70 per square kilometer for the whole area, but residents are concentrated on the valley floor, where the soil and water supply are most favorable for agriculture. They live in 27 villages and several hamlets, all located in Bouza County and ranging in size from 100 to 4,000 people.

Most of the northern valley has been inhabited only since the late 19th century. Tuareg pastoralists dominated the valley and surrounding plateaus until the French colonized the area at the turn of the century. At present, the relationships among the Tuareg, their Bouzou ex-serfs and the Hausa farmers, who make up 90 percent of the permanent population, are amicable. These three ethnic groups all raise livestock to some extent, in addition to cultivating field crops and gardening.

A fourth ethnic group, the Fulbe, are primarily pastoralists—many do not farm at all. They have long used the valley for pasture during the dry season. However, over the last decade many have moved elsewhere. It has become increasingly difficult to find forage for their animals in the valley because of new restrictions on access to these areas, imposed by the Nigerien Forest Service to protect the windbreaks. As a result, grazing pressure on adjacent slopes has also intensified. The relationships among the Fulbe and sedentary farmers are often tense, partly because the herders sometimes turn their animals into the latter's dry-season gardens.

Thus, the valley supports two primary production systems, mixed farming and transhumant herding. The former system can survive for years on its agricultural component, although many people keep livestock if they can, both to reinforce agricultural productivity and as an investment. Still, the introduction of the windbreaks precipitated a crisis of sorts for the valley's mixed farming system. Women had particular difficulty with the adjustment, and many liquidated their goat herds. In contrast, the

transhumant herders require forage to sustain their stock. They could not survive as the windbreak area expanded and more fields (and their crop residues) on the valley floor were placed off-limits to livestock.

Project Genesis and Organization

The Majjia Valley windbreaks were originally conceived as a technical solution to a new agricultural problem. The wind has always swept through the valley during the eight-month dry season, but almost the entire area was formerly protected by thick brush, if not dense forest. It was only in the early 1970s, when (according to local reports) most of the valley's floor and sides were finally cleared to permit the cultivation of field crops and gardening, that wind erosion began to pose a serious threat to the long-term viability of the Majjia's considerable agricultural potential. When harmattan winds swept down the valley, little woody vegetation remained to protect the soil. What did remain was constantly picked over and cut by women, who collect most of the firewood used for domestic energy. Thus, the area's richest topsoil was rapidly disappearing.

To combat this new problem, two foresters (one a Nigerien and the other a Peace Corps volunteer) obtained support from CARE, starting in 1974, to implement the windbreak project in an effort to stabilize the valley's resource base. In the first few villages at the head of the valley where the project began, farmers whose land was taken for windbreaks were told that they would own the trees. Subsequently, landowners were simply informed that windbreak trees would be planted on their land, thus excluding any implied or explicit property rights.

Over the next decade, with financial support and technical advice from CARE, the Nigerien Forest Service produced thousands of neem seedlings annually. Foresters laid out the windbreak lines, generally perpendicular to both the prevailing winds and channel of the seasonal watercourse running down the valley. From the air, the 300 kilometers of windbreaks that had been established by 1984 look like the ribs of a snake's skeleton.

The windbreak lines did not take land tenure patterns into account. Instead, they were drawn up purely on the basis of technical criteria. Once the surveying was completed, foresters directed valley residents to prepare the ground for planting. They supervised the villagers, who planted seedlings in double-row lines, extending out for about a kilometer on each side of the main channel of the watercourse. The seedling survival rates were impressive, partly because the valley has a shallow water table which tree roots can reach very easily.

After the trees were planted, the foresters used CARE funds to hire local guards to protect the seedlings for several years from browsing livestock. Relying on provisions in the forestry code which give them general responsibility for environmental protection, the foresters in charge of the project declared that all newly planted windbreak areas were off-limits to animals. To enforce this ruling, they authorized the guards to keep livestock out of the windbreaks. Only when the trees were about eight meters high were cattle, goats and sheep allowed to once again graze on both the stubble left after the harvest and natural vegetation in the valley. In recent years, a decision was made to exclude camels from the windbreak areas permanently, because they browse so high that they destroy the trees' windscreen effect and instead create wind tunnels under the branches.

During the intervening years, the guards impounded animals found in the windbreak areas. Their owners could only reclaim them by paying a fine. At first, the fines were too small to deter people from letting their animals into the valley's fields as usual. So, the foresters raised them until, by 1979, they were so high that violations became prohibitively expensive for owners of goats and sheep. It is highly probable that fines were "negotiated" on occasion--thus, the fines were viewed by both violators and the paid guards as bribes to the latter to ignore infractions.

Over 10 years, the neem trees (Azadirachta indica), as well as a native Acacia species (A. nilotica), developed into an effective system of windbreaks, sheltering large areas of Majjia Valley bottomland. For those living within the shelterbelt, the windbreaks produce a public good, but one user's enjoyment of their environmental protection does not detract from others' enjoyment--those demands can be jointly satisfied. The trees break up wind currents to create small micro-climates that are favorable for crop production. While the windbreaks occupy some 15 percent of the arable land in protected areas, crop yields in these locations seem to have risen by about 20 percent above pre-windbreak levels.

The oldest trees have grown so well that they can now provide firewood and building poles on a regular basis. The windbreaks can also produce other forest products, depending on the tree species. Goats and camels will both browse on the foliage of the neem and A. nilotica trees, and seeds from the latter are rich in tannin, which local artisans use to convert hides into leather. A. nilotica also produces thorns that are excellent for fencing. If other species were planted, the windbreaks could also produce fruits and nuts (e.g., mangoes, guavas, palm nuts, cashews, etc.), gum arabic, medicines, and materials for mats and cordage. As other windbreak lines mature, the output of such other products will increase.

Institutional Considerations

The technical feasibility of windbreaks in the Majjia Valley has been demonstrated, but CARE, the Nigerian Forest Service and valley residents now face a dilemma. CARE and the forest service have begun to replicate the windbreak program elsewhere in Niger. Although they have by no means abandoned the Majjia Valley, CARE staff would like to shift the burden of windbreak management to local residents. The position of the forest service on this proposal is uncertain. While forest service personnel would perhaps like to see more popular participation in windbreak management, they worry about destruction of the trees through inadequate management and probably about the loss of fine revenues. The views of valley residents on the management issue are not clear either.

In any case, if CARE shifts its funds to other areas, a management system that is different from the current one must be developed for the new windbreak resource. At this point, a number of management options exist, but in general terms, the windbreaks could be managed as:

- **common property by the forest service, using state funds;**
- **common property by some group of valley residents, who are authorized to do so; or**
- **private property, subject to certain restrictions, by some set of individuals designated as owners.**

Design Considerations

Fields in the Majjia Valley are not fenced. Barbed wire and electric fencing are too expensive, and with deforestation, thorns are no longer abundant locally. Furthermore, the fields are generally so irregular in shape and so small that live hedges would severely curtail agricultural productivity. During the annual summer growing season, this situation poses few problems because livestock owners are required by national law to keep their animals out of planted fields and are liable for any crop damage caused by their herds. However, during the eight-month dry season, animals are allowed to forage freely over village lands, so gardeners must enclose their plots using local materials. This fact bears on the feasibility of enclosing the windbreaks and thus, on the possibility of privatizing them.

Political/administrative institutions in the valley reflect national history and policy decisions. The national administrative hierarchy reaches down to the village through three levels—state, county and canton. Officials at the state and county levels are

appointed by the Minister of the Interior. They have veto power over the selection of canton and village chiefs. The chiefs are chosen by their subordinates (village chiefs and householders, respectively), subject to the vetoes just noted, for life tenure on good behavior. Chiefs' main duties include keeping the peace, collecting county taxes and helping development technicians carry out their operations in the local jurisdiction. This system has been in place in the Majjia Valley since the early part of this century.

Village and canton chiefs, as well as county administrators, also function as arbitrators in an administrative law system. Most frequent case types include land law disputes (boundary determination, inheritance, land loan disagreements, etc.), family law problems (divorce, paternity, non-support, etc.) and application of the national grazing code. By law, animals must be controlled during the growing season; they can roam freely at all other times.

The valley's villages are not unified entities, and collective organization is limited. In all probability, people who live in the same quarter interact with each other more than with other residents of the same village. In addition, they may well have more close relationships with residents of quarters in adjacent villages than with fellow villagers. In some cases, the quarters of one village have split into separate, administrative entities, each with its own chief.

Politics has been banned in Niger since the 1974 military coup d'etat. More recently, the military regime has tried to launch an apolitical hierarchy of corporate associations designed to undertake both the economic and organizational aspects of development. The "development society" hierarchy begins at the village level. Representatives are selected for cantonal assemblies, which in turn name delegates to county councils and then to the state and national councils. In fact, the local units were hastily organized from the top down. Most are moribund, staffed by appointed village officials (including the village chief) who lack any clear idea of their roles and often, show little interest in them. Nonetheless, the Nigerien regime looks upon these local "development society" associations as general-purpose, local action units.

In general, other local voluntary associations (mosque congregations, producer organizations, cooperatives, etc.) can only form legally if they secure official authorization. County administrators channel such demands up the administrative hierarchy to the Council of Ministers. Authorization may be pro forma, but it must be secured.

The information presented in this case study provides the background data needed to assess several possible institutional approaches to managing the Majjia Valley windbreaks. During the workshop on management of natural resources held in common, participants will use Dr. Oakerson's framework to analyze these data and will then propose alternative windbreak management institutions, with considerable attention to detail.

CHECKLIST FOR SMALL GROUP SESSIONS

For each option in institutional design for the management of the windbreaks, address each of the following questions:

	Who gets to?	How much?	Where?
1. Who makes the rules and decisions concerning: Gathering			
 Cutting			
 Replanting			
 Planting new areas			

2. Who enforces the rules for each activity?

Gathering

Cutting

Replanting

Planting new areas

Who gets to?	How much?	Where?

3. Who detects illegitimate use?
4. Who decides on the penalties for infractions?
5. Who settles disputes within the group?
6. Who settles disputes concerning outsiders?
7. Does this user group have other functions?
8. Is this user group a subcommittee of a larger body?
9. Who monitors outcomes?
10. How are outcomes monitored?
11. How are rules revised?
12. what relationship does this group have to higher levels of authority?
13. What are the advantages of this approach to resource management?
14. What are the disadvantages of this approach to resource management?