Part I Chapter 2

GENERAL BACKGROUND

2.1 Partial restoration of floodplain functions at local level: the experience of Gounougou, Benue valley, Cameroon

Slootweg, R. & M.L.F. van Schooten (1995). Partial restoration of floodplain functions at the village level: the experience of Gounougou, Benue valley, Cameroon. In: H. Roggeri. *Tropical Freshwater Wetlands: A Guide to Current Knowledge and Sustainable Management*. Development in Hydrobiology 12, Kluwer Academic Publishers (in English and French).

The creation in 1982 of the Lagdo reservoir (700 km2) in the Benue River led to severe ecological and socioeconomic changes, especially downstream of the dam. In the first place, the dam significantly altered the hydrology and the ecology of the downstream floodplain. Priority being given to generation of hydropower, water discharge at the Lagdo dam is kept to a minimum and the river only overflows when heavy rainfall makes water releases from the dam compulsory. Such releases are therefore erratic, and only allow the flooding of a marginal area. In other words, the floodplain of the Benue River no longer exists downstream of the dam.

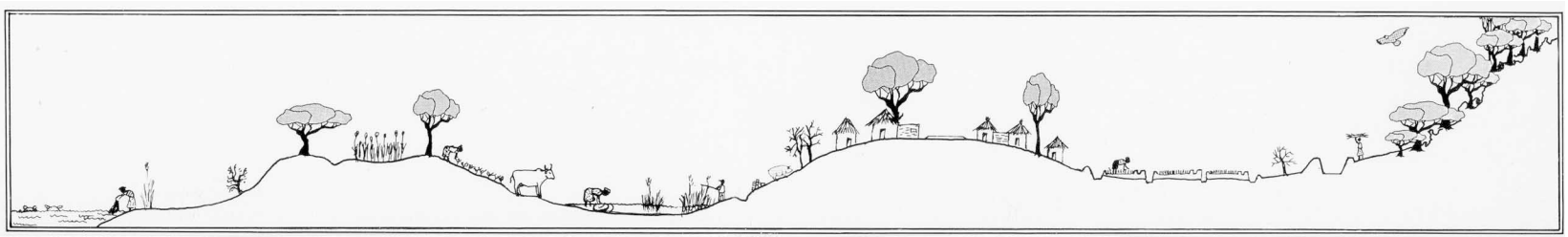
In the second place, subsequent large-scale irrigation schemes have caused environmental damage and massive (partly government-stimulated) immigration in the former floodplain, thereby increasing human pressure on natural resources. Migration from the Sahelian Extreme Northern Province into the project area since 1978 has triggered important social changes. More than 450 families belonging to over 20 ethnic groups now live in Gounougou on the East bank of the Benue River while this village originally consisted of 15 Bata fishermen families. (The floodplain used to be the main source of income for the autochthonous fishermen of the region). Poor management of water supply and faulty drainage resulted in the spread of organisms that transmit malaria (mosquitos) and schistosomiasis (freshwater snails); consequently health risks increase. Finally, local people were excluded from the planning and design of projects (such as irrigation development) that were undertaken after the creation of the reservoir. In summary it can be stated that the situation in the former floodplain is characterized by increasing health risks and threats to natural resources.

A number of activities are being carried out in the region for the purpose of mitigating the adverse effects of the Lagdo Dam and related large-scale construction of irrigation schemes, and for developing sustainable ways to use the new environment. One of these activities is being dealt with in this chapter, i.e. the Lagdo Fishculture Project (LFP).

Project design

The LFP is a pilot project for the East bank of the Benue River between the Lagdo Dam and the confluence of the Benue and Mayo Kebi rivers. Project objectives and actions to be undertaken have been identified on the basis of the actual situation, i.e. the state of the environment and problems resulting from ecological and socioeconomic changes. During the preparation phase of the project (1986), technical and environmental studies have revealed several problems occurring in the six landscape units that can be distinguished in the Gounougou area (Haskoning, 1988; Leeuwerik, 1989). These problems are summarized below (fig. 2).

- **River bed**. Since the closure of the Lagdo Dam, the water level of the river is low in the rainy season. As a result, runoff erodes the (now) steep river bank. Erosion also occurs when water is released from the Lagdo reservoir.
- **Low terrace (river bank).** This area is dominated by rain-fed cultures. In the dry season, herds graze on the remaining millet and maize stems and thus leaving the area barren.
- **Depression (floodplain pools).** During floods these pools are important breeding and spawning grounds for many river fishes; when the water level in the river lowers, fish is plentiful in the remaining shallow water bodies. In years with sufficient flood levels, farmers practise flood-recession agriculture ('mouskouari', a sorghum variety) while cattle graze on the remaining Echinochloa stagnina ('bourgou') fields. The depression of Gounougou is used for the drainage of excess rainwater and waste water from 200 ha of irrigated land, thus minimizing drainage costs (fig. 3). However, by draining the excess water into this area, a permanent swamp is created which favours the reproduction of malaria mosquitos and schistosomiasis snail hosts. The number of malaria cases increased by 400% after the introduction of irrigation (Slootweg & Schooten, 1989) while the prevalence of schistosomiasis has doubled. Land on the pool margins is fertile. However, drainage practices result in unpredictable water levels making the depression unsuitable for agriculture.



	RIVER BED	LOW TERRACE	DEPRESSION	HIGH TERRACE	PLAIN	HILLS
NATURAL DRAINAGE	Infiltration	Infiltration	Stagnation	Infiltration	Stagnation	(Surface) run-off
SOIL	Sand	Sandy	Clayey	Sandy	Clayey	Stony
NATURAL VEGETATI-ON	*Phragmites australis*	*Ziziphus mucronata* *Calotropis procera* *Balanites aegyptiaca*	*Echinochloa stagnina* *Oryza longistaminata*	*Adansonia digitata* *Ficus platyphylla* *Ficus thonningii* *Mangifera indica*	*Anogeissus leiocarpus* *Butyrosperum parkii*	*Pterocarpus erinaceus*
LAND-USE	Fishing Washing Thatching Matting Domain of hippos	Cultivation of ground-nuts, maize, millet. Construction material Grazing Fruits and fodder	Fishing Washing Grazing Brick making Mouskouari culture	Living: . dwellings . main road . water supply . market, school, dispensary	Irrigation canal Cultivation of rice Pharmacy (herbs)	Firewood, timber, fodder Pharmacy Wildlife
PROBLEMS	Erosion of steep river banks	No cultivation in dry season	Decrease in fish pro-duction and mineral deposits Increased health risks	Unreliable supply of safe drinking water	No land rights Bad water management and maintenance	Deforestation Erosion Poaching

Fig. 2: Landscape units on a schematic Wets-East transect of the Gounougou area, prior to the iomplementation of the Lagdo Fishculture Project (after Leeuwerik, 1989)

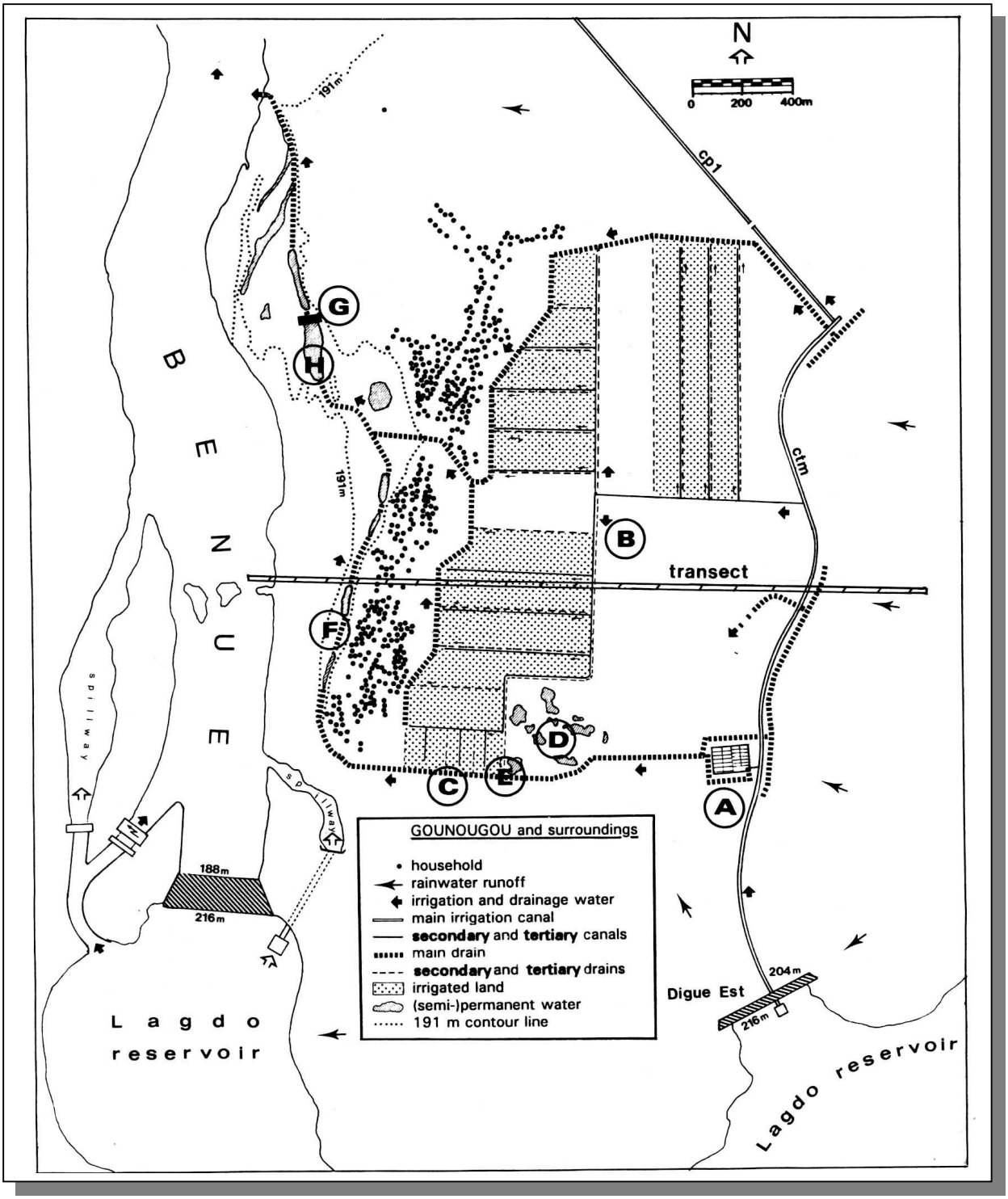


Fig. 3: Changes in the drainage system around the pilot village of Gounougou (circled letter are referred to in the text).

- **High terrace (former river bank).** Most floodplain villages are located on these former river banks as they are well drained and protected against flooding. In the rainy season many crops are grown around the houses. In Gounougou the supply of drinking water is not reliable, and people are forced to use the adjacent pools for washing and bathing; as a result, the risk of infection by schistosomiasis parasites is high.

- **Plain (former floodplain).** Nomadic herds used to graze on the plain during the dry season; yearly floods and clayey soils made the land highly suitable for mouskouari cultivation. The plain will be transformed into a large-scale irrigation development scheme which will eventually extend over thousands of hectares. Mouskouari is no longer cultivated and rice has become the main crop. The land is now state-owned; new irrigated plots are leased to interested farmers.
- **Hills.** Most fuelwood originates from this zone. However, vegetated hill slopes are being threatened by deforestation and erosion as a result of the rapid population growth and increasing demand for firewood. The remaining wildlife of the area (antelopes, porcupine, wart hogs, baboons) is now mainly concentrated in the hills; although this wildlife is legally protected, poaching is widespread.

Socioeconomic studies highlighted the poor social cohesion of a village that hosts more than 20 ethnic groups and where the autochthonous population is outnumbered by immigrants. The need for participation of the local people in the fishculture project is emphasised by these studies and they backed up the participatory approach that had already been adopted. This choice stemmed from two 'principles':

- Once the project is completed, the villagers themselves must be able to carry on with sustainable activities;
- developing sustainable forms of resource use in a new environment may require the introduction of techniques with which villagers are unfamiliar.

The findings of these studies have led to the identification of long-term objectives for LFP:

- to restore and improve the potential of the former floodplain for fisheries through the integration of fish culture into agricultural activities;
- to prevent the spread of schistosomiasis by means of integrated water management.

In accordance with the participatory approach of the project, the long-term objectives have been translated into the following short-term objectives:

- to upgrade fish production in natural and man-made water bodies;
- to integrate water management, fish culture, control of water-related vector organisms and agricultural activities in order to guarantee the optimal and sustainable use of the available natural resources;
- to strengthen the existing village structure and the relationship between the different groups of resource users, especially through the establishment of groups corresponding to specific resource uses ─i.e. the so-called 'functional groups';
- to provide education and training on health aspects, fish culture, agriculture and water management;
- to design and develop a sustainable land-use system in cooperation with the local population.

Emphasis was put on pilot activities to be carried out with the local population (fish culture, water management and cultivation of vegetables). Research experiments focused on techniques for the control of waterborne diseases. Their results were translated into concrete actions that can be undertaken with local people (i.e. action-research). In other words, the project is implementing experimental management, which requires flexibility. For example, the knowledge acquired about the population dynamics of schistosomiasis snails has resulted in a water management plan for the depression. This plan aims at maximizing the production potential of the area through vegetable cultivation and fish culture, while minimizing the risk of proliferation of disease transmitting organisms (to this purpose, the effects of water management are continually monitored).

This small project only deals with water-related activities for which the villagers are directly responsible. Operation and management of state-controlled rice schemes and the Lagdo dam and reservoir are beyond its scope.

Project implementation

In 1987, an experimental aquaculture station was built as part of the LFP (A; letters between brackets refer to the map in figure 3). At the same time operation of the first 50 ha of the state-owned irrigation scheme (rice) started. No provisions were made for the drainage of excess rainwater while waste water from the irrigation scheme was discharged into the Gounougou depression, thereby creating a 2 km long swampy area. During the heavy rains of 1988, accumulated rainwater threatened to destroy newly constructed irrigation canals (B), which clearly demonstrated the need for a better drainage system. A canal was dug (C) to drain runoff into the depression, while the ancient clay quarry (D) was reconstructed as a rainwater-storage basin. A monk (E) reduces the flow to 1 m3/sec and, when closed, allows water storage in the clay quarry for dry-season use (fish culture; cattle watering; Echinochloa pastures for cattle and hippopotamuses).

Another canal (F) was dug through the depression in order to connect the different pools and drain the swamps. The depression was dammed at its downstream end (G), which created a larger pool (H), further away from the village. In the rainy season the dam gate is opened and water flows through the depression, thereby preventing the proliferation of mosquitos and snails. In the dry season the gate is closed and the water level rises by 1,5 m, causing the canal alongside the village (F) to fill up. For irrigation purposes, the villagers dig trenches from the canal to the gardens established on adjacent lands. At the end of the dry season, vegetables are harvested and the clay quarry (C) is emptied in order to catch the fish. Finally, gate E is opened and the whole depression drains (for a detailed description see Chapter 7).

The development of a new, sustainable land-use system requires the participation of the whole population. In the case of Gounougou, where immigrants outnumber autochthonous inhabitants, the cohesion of the population has to be stimulated. Village meetings with the 11 chiefs (one per village neighbourhood) and other interested persons are organized to discuss problems, recent developments and planned activities.

The project also stimulates the constitution of groups that correspond to specific activities in order to favour the exchange of experiences and the cooperation between members of the same functional group. For instance, a group of 17 women from the same neighbourhood constituted such a group. They stocked a small pen with fish and decided to integrate fish culture with onion cultivation. The group was coached by a project team member on a very regular basis. It must be stressed that the motivation of group members to persevere in this kind of new activities highly relies on the presence of a coaching person during the early phases. The Gounougou experience shows that it is better to visit the relevant groups several times a week for only half an hour than to organize semimonthly instruction sessions. In other words, the development worker must live and work in the field (not in town). After one season of successful onion culture, the women decided to continue, but the group split up into smaller groups of women living near each other. Making arrangements within a large group did not work very well (e.g. rotation of garden watering among group members). The establishment of functional groups of men appeared to be difficult. Although many men were interested in having a vegetable garden, most of them preferred to have their own garden, and have it cultivated by their family. In the first season of operation 18 gardens were created along the canal with a total surface of about 2 ha (2 groups of women, 2 of men, 2 of children, 10 individual men, 2 individual women).

Fish culture did not succeed, partly because of land-tenure problems between immigrants and the autochthonous population. The management of the depression at village level posed too many problems. Furthermore, people (from surrounding villages but also from Gounougou) continued to fish in the depression even though they knew that aquaculture activities were being introduced. The experiments with pen-culture were hampered by theft of netting material and destruction of fences by grazing hippopotamuses. Moreover, the success of fish culture depends on regular feeding. Many of the villagers have pigs that compete with the fish for household wastes. As long as fish culture has not been shown to be profitable, people prefer to feed their pigs.

Fisheries, however, were successful. After draining the depression at the end of the vegetable growing season, the area is fished by villagers using all traditional techniques. Women fish in groups and use baskets to trap the fish, a very effective technique in shallow waters. The yearly 'fishing day' is a tradition stemming from the once active floodplain fisheries. In the first year, the catch amounted to about 500 kg of fish (species from over 9 genera; many adult fish). In the second year, the catch dropped to 250 kg and consisted mainly of young fish. Obviously the first catch was exceptionally high because the depression had been entirely drained for the first time. The second catch represented the natural production of the depression (estimated at + 50 kg/ha/year). However, the villagers were pleased with the catch which constituted a very welcomed addition to their diet in the difficult last month of the dry season.

Finally, the canalization of the depression has reduced the numbers of mosquitos and snails by more than 90%. If villagers are capable of managing this area for their own benefit, the depression will no longer constitute a major danger to public health.

Project assessment

So far, the project has had the following positive effects:

- Reduction of schistosomiasis health risk, and reduction of the nuisance caused by mosquitos (the rice fields on the other side of the village still produce millions of malaria mosquitos; therefore the problem is only partially solved).
- Increase in dry-season food production.
- Partial restoration of former floodplain fisheries.
- Higher level of self-sufficiency in food and generation of income.
- More efficient use of drainage water from irrigated fields.
- Higher social interaction between different groups of immigrants and autochthones; recognition of problems by the local population and attempts at solving them.
- Increased awareness with respect to water-related health risks.

However, the following problems remain to be solved:

- **Land-tenure**. The evident success of vegetable gardening and the increase in value of the depression land resulted in many land-tenure problems between autochthones and immigrants. Today, these problems continue to stir up discussions. Women are especially vulnerable if landownership is not clear. After it became clear that plots in the depression had increased in value, the 'land chief' allotted another, less fertile plot of land to the group of women who had successfully started to integrate fish culture and vegetable gardening. Even with the help of a local anthropologist the project team was not able to get a good grip on the situation. The villagers could not, or were very reluctant to, explain these problems to outsiders. Obviously, the village needs time to establish a new land-tenure system. We are confident that they will do so, as the benefits of dry-season vegetable growing are very well recognized.
- **Damage caused by hippopotamuses.** In many instances, hippopotamuses have destroyed fences and gardens. An alternative grazing area for hippopotamuses had already been created at the clay quarry, but the animals were difficult to stop. Planting of thorn shrubs is an efficient way of preventing damage, but farmers tend to refuse to do such long-term investments as long as land-ownership issues are not settled.
- **Water management and maintenance of the irrigation and drainage system**. The management of the depression is closely linked to the management of the irrigated land. Since irrigation is new to the inhabitants of the region, much improvement is needed in the field of water management and maintenance of the irrigation and drainage system. However, this problem goes beyond the scope of LFP.

- **Theft of fish**. More intense social interactions in the village and among neighbouring villages hopefully will help tackle this problem. Intensification of the use of land will reduce thefts as many people will be working around the water body.

Lessons

Learning process

In relation to the activities carried out so far, two important facts should be noted. In the first place, solutions to problems cannot be based on a blueprint; they result from the analysis of problems, and the experience acquired on-site through experimental management of the local environment. In the second place, villagers have the opportunity to experience themselves the effects of an activity and the benefits that can be accrued from it. In other words, both the project staff and the local population learn by doing, while activities of the project should be as much as possible towards stimulating the motivation and initiatives of villagers. This learning process is probably the most valuable achievement of LFP so far, as it creates the basis on which a sustainable land-use system can be developed in cooperation with the local population.

From the point of view of the project staff, this learning process generates information not only on the management of ecosystems but also on non-technical issues that are essential to the sustainable use of resources. An incident that occurred in the Gounougou area shows how knowledge is generated by action. The villagers had constructed a small dam in a creek in order to develop fish culture. Women from other villages used to have access to this area and, therefore, went on fishing in the creek after closure of the small dam. The village meetings that followed provided a good insight on existing resource-use regulations, and possible solutions to problems concerning customary rights.

With respect to the participation of the local people in the learning process, and the involvement of villagers in experiments, the use of a video camera turned out to be quite successful. Project activities were recorded and later shown to the villagers. This led to lively discussions and an increased awareness of activities that were carried out.

Activities by the LFP, and participation of the local people were regularly monitored and discussed with the villagers. Thereby, actions can be adapted in accordance with the experience and knowledge acquired. Monitoring and evaluation are key elements in the learning process.

Flexibility

It is not advisable to carry out activities that do not fit the local situation. The 'beneficiaries' of a project actually determine which activities deserve their support ─i.e. have a chance to be implemented. This means that some of the planned activities may be fully ignored. In such case, their implementation will be impossible or unsuccessful. Therefore, the project staff must be able to adjust its plan of action.

Activities that are supported by local people may also need to be adapted occasionally. For instance, farmers involved in a rice-fish experiment were supposed to first prepare their fields. However, as time passed the project staff could only conclude that no preparation work was being done. The reason for this 'resistance' soon became clear. Farmers refused to clear their land using traditional means while another project active in the area had provided 'modern tools' that could remove tree stumps from neighbouring fields ten times faster. Farmers and LFP staff jointly reconsidered land preparation works and a bulldozer was provided. Such adaptations require flexibility in terms of objectives, plan of actions and allocation of funds.

Flexibility and the capacity to adjustment also allow the development of new activities to solve new problems that inevitably occur during project implementation. For instance, LFP has tried to direct hippopotamuses towards neighbouring non-agricultural areas in order to prevent them from damaging rice fields.

Project duration

Time is an important factor for projects that are initiated in areas where new (environmental and socioeconomic) conditions prevail. In the case of Gounougou, where important immigration have occurred, lack of social cohesion still constitutes a major problem. Efforts made by the LFP (village meetings, functional groups) have helped improve the situation but tensions between immigrants and autochthonous people still are considerable, especially when it comes to issues such as land ownership. Obviously, much more time is needed before substantial progress can be made.

Short-term financing is unsuitable for projects such as LFP. The need to produce results or to achieve objectives within two years is conflicting with the participatory, long-term approach that is needed. Too often the project staff is tempted to intervene (e.g. with large machinery) to accelerate the transformation of depression lands into gardens, whereas villagers need more time to settle their own problems.

Women

Technical and organizational assistance often is not readily available to women. The presence of female project staff who paid special attention to the needs of local women and helped design women-specific activities undoubtedly has been an asset.

Women are very vulnerable with respect to rights on resource use and landownership as shown by the fact that women were deprived of their lands once their successful integration of fish culture and vegetable gardening had made clear that depression land was valuable. So far no solution to this problem could be worked out. However, this experience has not been without effect as other groups of women have started to organize themselves in order to obtain better access to resources such as irrigated rice plots. The insight and experience gained during the project, and women's increased awareness of their possibilities surely point out the need for more efforts on this issue.

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