Wetland management in Malawi

A focal point for ecologically sound agriculture


Photo: Reg Noble

Some farmers in Malawi (Central-Southern Africa) are beginning to manage their wet lands in ways which are improving the ecological sustainability of their farms and ultimately their economic viability. The case studies presented in this article illustrate how farmers have designed their own integrated pond-crop systems for converting marginal wet lands into ecologically sound and highly productive land units.

Reg Noble

Malawian farmers, like many in Africa, appear to be facing a bleak future in terms of ensuring the ecological and economic viability of their farms. Escalating population growth and its attendant land pressure problems are forcing farmers to abandon "traditional" practices of land management which previously helped to maintain their natural resource base. In Malawi, almost 80% of its estimated 9.7 million people are small holder farmers and 78% of this group have land holdings of less than a hectare (NSO 1996). Trying to sustain the food supply from such small farms has resulted in rapid soil degradation and depletion of natural resources. Consequently since 1992, the government has had to supplement farm production by dispersing food staples such as maize to the most needy rural communities. However, food handouts can only ever be a short-term solution. More innovative and longer-term strategies are urgently needed to help farming communities sustain their food security.

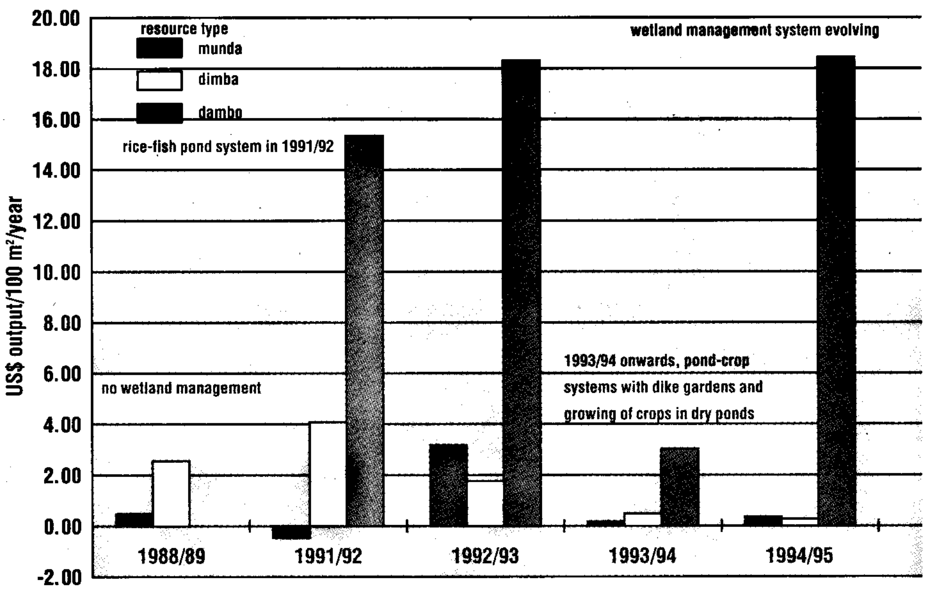
In response to these problems, some Malawian farmers, with the help of government and international agencies, have already started developing new ways of managing their land resources to counteract their ecological degradation. Emphasis has been directed to rehabilitating or bringing into production the marginal wet lands (*dambos*) that occur in low-lying areas of their farms and adjacent to rivers. Certainly, farmers have always attempted to develop a vegetable garden (*dimba*) in such areas to maintain food production through the dry season. However, with growing pressure on land, the dambo and dimba areas are suffering the same problems as the seasonal croplands, overuse, resulting in "mining" of the environmental resources. So, several farming communities have been encouraged to consider developing a more ecological approach to managing these wetland areas which will hopefully renew their natural resource base and ensure its sustainability. The whole process initially focused around small-scale aquaculture and the possibility of ponds acting as a focal point for improving natural resource management.

Introducing ponds

One problem has been that ponds are not a common feature of Malawian farms. External agencies have therefore implemented discussion and farmer participation to enable farmers to see if such ideas are relevant to their agricultural activities. Where farmers have decided to change their wetland management, they are designing their own crop-pond systems suited to their local needs. Initially, fish production to supplement protein supply and cash to the household dominated the integrated system. However, some farmers have moved beyond this to produce their own idiosyncratic and highly effective dimba-pond systems with emphasis on vegetable production. This usually involves improved use of bioresources, water and land.

One major effect of placing a pond in a wetland area is to control water supply and

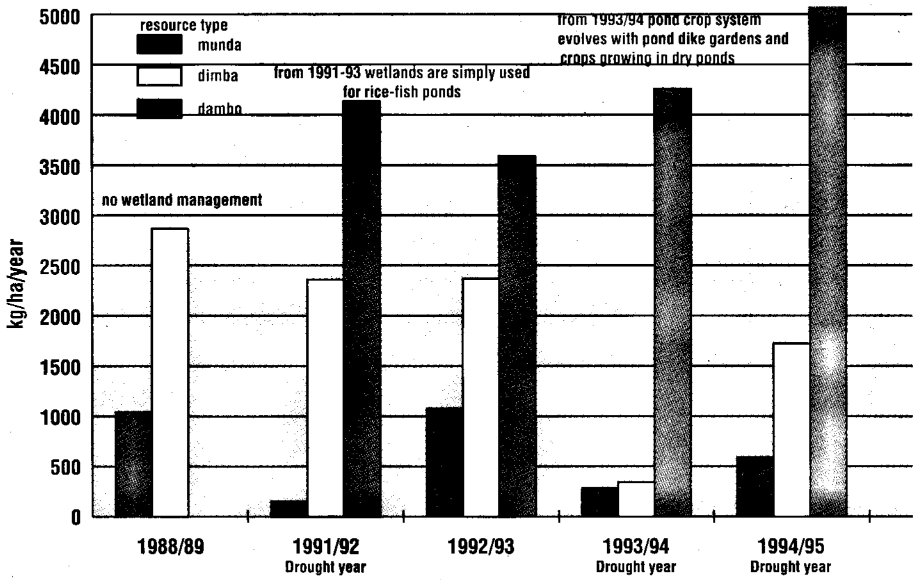
Figure 1. Total net income from each resource type on Salimu farm, Miumbe, Zomba District, Malawi



Note: total net income = balance of cash and non-cash inputs and outputs (e.g. opportunity costs for family labour, use of own seeds for planting, produce eaten or given away, hired labour, purchase of fertiliser etc.). Note that the net income per resource type is expressed in the Y-axis as US$/100 m²/yr. It is far easier for farmers and lay people to understand output per 100 m² than per hectare.

reduce the danger of flooding. So ponds have made areas which were normally impossible to cultivate in the wet season, now available for farming. Presence of ponds trapping water have also maintained soil moisture content of surrounding land well into the dry season, thus extending the growing season for vegetables. Farmers have found that both effects result in increased crop production from dimba gardens adjacent to their ponds. For example, in 1988/89, a farm belonging to the Salimu family had only seasonal crop land (*munda*) and a perennial, lowland vegetable garden (dimba) some distance from the homestead. By 1991/92, an uncultivated wetland area (dambo) adjacent to their house had been rehabilitated and ponds had been built to harness water for fish and rice production. However, as drought set in 1994, the Salimu family decided to develop small dimba gardens on the pond dikes. Water supply was declining so rapidly that they let some of their ponds dry up and stored fish in two remaining ponds. In the dry pond bottoms, they grew maize and pumpkin and hand-watered them from their full ponds. Production was very high because of the fertile pond mud. Likewise, crops on the pond dikes grew well when fertilised with mud from the ponds. Figure 1 illustrates the economic effects of this gradual evolution of a pond-dike system incorporating cycling of fish and crops.

Figure 2. Crop production from each resource type on the Salimu farm, Mlumbe, Zomba District, Malawi



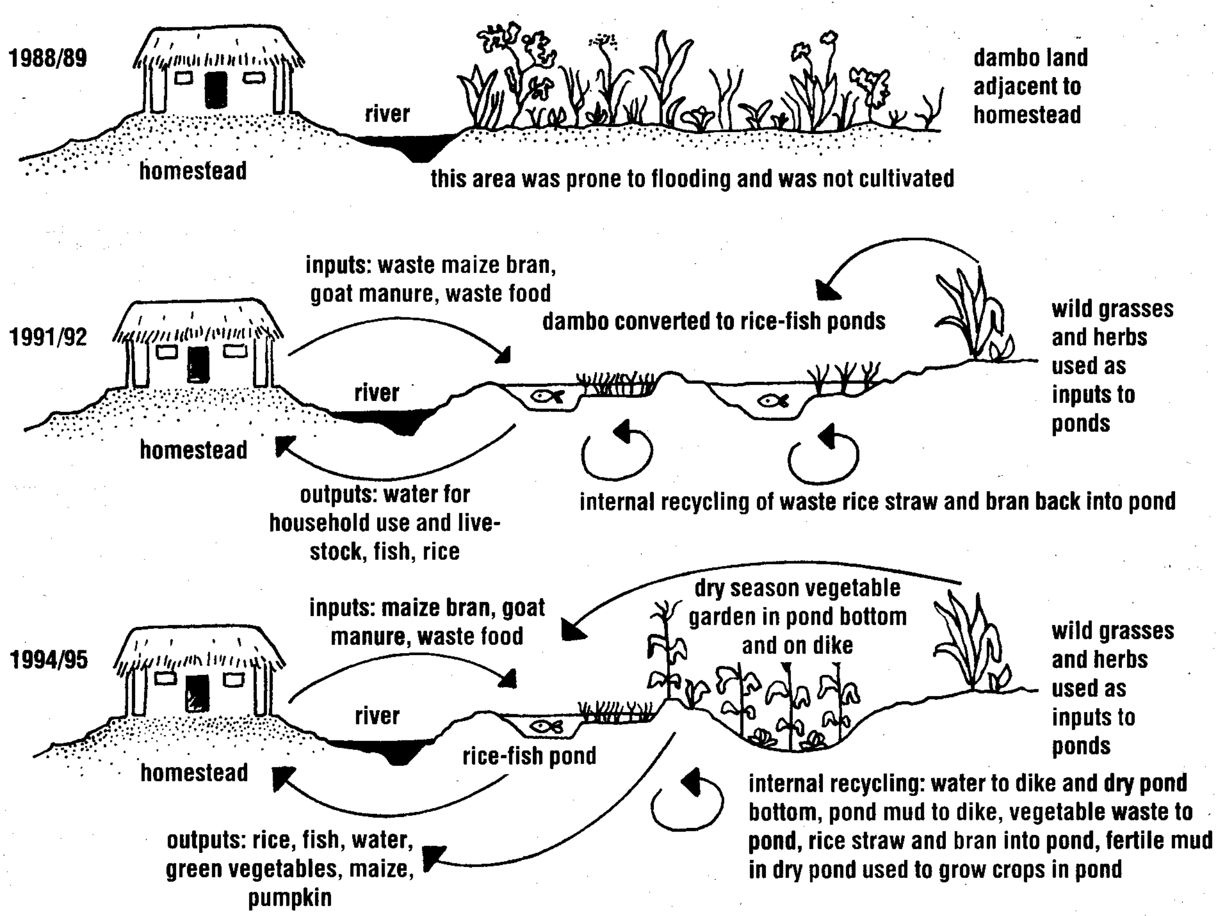
Note: In 1994/95, production from wetland was in excess of 5000 kg/ha/year.

Results

Both the munda and dimba areas of the rest of the farm proved far less resilient to drought compared with the pond-crop systems in the wetland area. Figure 2 demonstrates clearly how crop production on the wetland was maintained and gradually increased over time even with severe droughts between 1992 and 1995. Production from munda and dimba were much more vulnerable to rainfall fluctuations.

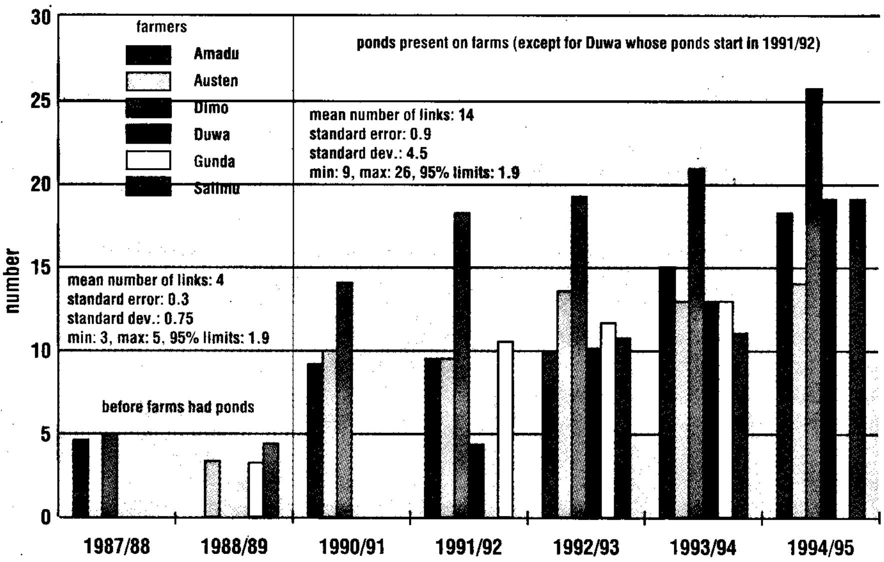
Figure 3 illustrates the evolutionary process which produced the above results depicted in figures 1 and 2. Between 1988 and 1995, a

Figure 3. Evolution of wetland management on Salimu farm in Malawi



Redrawn by Puck Sluijs

Figure 4: Number of internal bioresource flows on six farms in Mlumbe, Zomba District, Malawi



rapid change took place from no management of the wetlands to a very sophisticated arrangement of integrated rice, fish and vegetables which boosted the food and cash production of the household. One of the features of this integrated wetland system is the internal recycling of resources which helps to maintain soil and pond nutrients and thus production from year to year. The pond-rice-vegetable arrangement was designed by the Salimu family and honed and perfected over five years.

However, the Salimu family are not the only farmers who have rehabilitated dambo land or linked some of their dimba gardens with ponds. Table 1 shows annual net cash income in US dollars from munda, dimba, ponds and homestead from six Malawian farms who have redesigned their management of wetlands.

Diverse systems

In all of the cases above, the farmers have at least one dimba garden associated with their ponds and in five out of the six cases, uncultivated dambo land has been converted into an integrated vegetable-fish, and quite often, linked rice system. Each arrangement is different and reflects the local diversity of the land and family's resources. Not all farmers did equally well because some had farms which were particularly sensitive to drought and had major crop failures on the munda. However, even for farmers such as Gunda, Duwa and Dimo their wetland areas maintained production through the drought.

By improving management of the wetlands, integrated dimba gardens and ponds contribute respectively more, 53% and 43% on average to the total family income, than the munda (24%) and homestead (14%). When one goes on to look at the returns on investment, then for every dollar invested in a dimba, $7 are generated, and for every pond $15 compared with $0.5 for a munda (Brummett and Noble, 1995). This is a reflection of improved ecological efficiency and recycling of resources helping to maintain soil fertility without recourse to expensive external inputs such as chemical fertiliser. Linkages are the success of managing these wetlands integrations. Farmers have created nutrient links between dimba and pond, waste vegetable matter going in one direction, water and pond mud in the other. This process has thus helped sustain the nutrient status and production of both systems. Quite often, the development of these bioresource links within the wetland has a synergistic effect on the rest of farm operations so recycling increases over the whole farm. This synergistic effect is illustrated by Figure 4.

A wider sample of 10 farmers, compared with the six above, demonstrated a similar increase in recycling of natural resources over the whole farm from a mean of approximately 5 before wetland management began to an average of 12 to 13 (range 7-17) nutrient linkages.

What has arisen from these farmer experiments in managing wetland is that ecologically and economically pond-dimba systems can profoundly affect the sustainability of small farms. Their success is due to their design being wholly in the hands of the farmers and being based on sound ecological principals of recycling natural resources. The latter process has enabled farming families to bring marginal, unproductive land into production and raise the productivity of land which was degrading through overuse. None of these processes occurred overnight, farmers were given initial stimulation and they took up the ideas, modified them, created new designs and evolved wetland systems which are now the focal dynamo for regeneration of their farms. ■

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Table 1 annual net cash income (US$) for each resource type on six Malawian farms

			Resource type		
Farmer	munda	dimba	ponds	homestead	total
Amadu	87	61	36	28	212
Austen	93	104	68	12	277
Dimo	-8	23	8	13	36
Duwa	-15	31	28	24	68
Gunda	-63	20	32	-8	-20
Salimu	48	78	84	none	210
Mean	*24*	*53*	*43*	*14*	*131*
Std. Dev.	*57*	*31*	*25*	*13*	*108*

Table from Brummett and Noble (1995). Note: mean annual cash incomes for rural families in Malawi is less than $80 per year (United Nations/Malawi Government 1993).