

# Integrated Resources Management, Integrated Agriculture-Aquaculture and the African Farmer

RANDALL E. BRUMMETT  
*ICLARM*

**D**riven by increasing population, environmental degradation and decreasing land availability and fertility, the situation of Africa's rural poor has been steadily worsening over the last decade and appears set to decline even further. Despite the expenditure of huge amounts of money and human effort, the Green Revolution has largely failed to benefit the vast majority of the rural poor in Africa: those smallholding farmers who sell little, if any, of what they grow and rely almost entirely upon natural soil fertility, rainfall and traditional broodstock and seed varieties.

New approaches to food production and income generation in the rural areas must be found if this sector of the agricultural community is to be assisted. Integrated Resources Management (IRM) in general, and integrated agriculture-aquaculture (IAA) in particular, may offer some solutions in cases where the classical methods of improving farm output have failed and/or been unsustainable.

## Reality and Integrated Resource Management

IRM is largely a theoretical construct based on models derived in Asia. While the crops and environments may differ between Africa and Asia, the synergistic recycling of wastes from one farm enterprise to another should

result in greater efficiency, regardless of environment. Environmental evidence from research stations in both Asia and Africa indicates that this is so. In Africa, preliminary findings from on-farm research in Ghana and Malawi also support the theory.

In addition to food production, IRM has the theoretical potential to restore degraded environments and increase human carrying capacity. Observational evidence from densely populated regions of Rwanda and Kenya suggests that increased population densities can be accommodated, and environments rehabilitated, on land managed for long-term stability rather than short-term profit. The degree to which IRM, as currently formulated, has been the mechanism for this is not known and will require further research. Furthermore, whether IAA, as a form of IRM, is actually feasible or economical for a wide range of smallholders, and what the long-term effects of sustained adoptions might

be, are questions for which data are generally lacking.

## Food Security and Household Nutrition

What is the potential for using IAA to produce more food, and food of a higher quality for consumption by under- and malnourished rural populations? Despite anecdotal evidence that fish and the other outputs of IAA are not always consumed by the most needy, we do not yet know to what extent this is so, or even to what extent it is feasible to find out. Evidence indicates that integrated farms are more productive than non-integrated ones operating on the same resource base. Increased food production on smallholdings increases the total amount of food available in a particular area, and gives producers the opportunity to improve their diet both quantitatively and qualitatively. That these increases may not be sufficient to significantly improve the nutritional status of every member of the community may represent an inherent weakness in the IRM approach or might simply be the result of having too few adopters. Clearly, a careful evaluation of what motivates farmers to adopt IAA is needed.

Could integration make large-scale commercial farming more environmentally sustainable and increase food availability at the same time? Maybe, but probably not for the benefit of the rural poor. There



*Rice-fish culture is catching on with farmers in southern Malawi. This woman dug the fish refuge and prepared the paddy field by herself.*

is seldom much money to be made in producing low-cost fish for consumption by poor rural communities. Couple this with the added expense of moving perishable fish long distances over bad roads to remote villages, and the likelihood that large-scale commercial fish farms will feed the poor seems remote.

The only way such farms might help improve rural nutrition is with the support of large government subsidies and investment in infrastructure. While the latter will hopefully be forthcoming, where the money for the former might come from is not clear.

### Income Generation and Capitalization of Rural Economies

The improved productivity and efficiency of integrated farms over non-integrated ones seem to imply that they should also be more profitable. That this is so has been demonstrated on-farm in several test cases, but the degree to which the results of these test-cases can be widely applied is uncertain. While the biotechnical questions about feasibility are probably answerable, the database upon which to

base answers to the socioeconomic questions is almost nonexistent.

That many fish produced by rural smallholders are sold for cash is beyond doubt. Whether that is what happens to most, or only a few, is not known. Also unknown is the degree to which fish transfers fuel the barter economy and assist in the maintenance and/or improvement of social relationships within the community. What becomes of the fish may be a crucial question in designing extension approaches which present IAA in such a way that it satisfies both the immediate food security and cash needs of the farmers, and the longer-term need of the greater society to maintain environmental quality and productivity for future generations.

In the long run, any truly productive and sustainable technology should lead to increasing prosperity among better and/or more aggressive farmers. This should in turn lead to concentration of capital and the adoption of more efficient and productive farming systems. Ideally, a new group of entrepreneurs, who grew up on IRM rather than high-external input agriculture, will lead to a less destructive sort of commercial farming and land stewardship. Just as likely, however, may be the scenario where a few farmers take advantage of improved profits to buy out their less fortunate neighbors and actually increase rural poverty. In such a situation, whether farmers who began with IRM would actually stick with IRM or move to the (in the short term) more profitable extractive agriculture, is not easy to predict.

Furthermore, even if these entrepreneurial farmers come to rely on IRM-based systems, it is not known whether IRM can signifi-



*Small plots of rice-fish culture can be more lucrative than larger plots with cash crops (background).*

cantly improve the social, economic and environmental situation in those regions most in danger of collapse within a time frame which might prevent that collapse. The *rate* at which IRM can improve farm income and rural capitalization requires investigation and testing in a variety of socioeconomic conditions.

Rather than waiting for new farming systems to evolve, could commercialized IRM do the same thing in less time? To answer this question, we must know whether integrated farming is currently feasible and economical on a large scale. The potential for commercial fish farming alone appears to be quite high in certain areas. However, the managerial and logistical problems associated with large-scale IAA (e.g., movement of large quantities of manures, drying and storage of crop residues which are only available once per year, the housing of animals to facilitate introduction of manures into ponds, balancing various farm enterprises to accommodate the needs of others, etc.) tend to drive up labor and overhead costs to the point where the economic viability of the whole operation is reduced. Even if large environmental gains are expected, such operations cannot succeed without subsidies which, as mentioned above, are probably not forthcoming, considering the general poverty of Africa and the prevailing *laissez faire* international economic and political environment.

On the other hand, almost all agriculture (except that practiced by the smallholders) is subsidized, sometimes extravagantly



*The ICLARM/GTZ project has conducted numerous experiments on polyculture of African species at Domasi station.*

so. These "modern" food production systems also exact a terrible toll on the environment. It may be reasonable, from the point of view of policymakers, to provide some sort of support for commercial integrated farming and then reap the benefits in the form of a healthier environment.

### Environmental Preservation and Restoration

What would be the environmental impact of widespread adoption of IRM? In theory, managing agriculture so that it requires fewer external inputs and creates less waste should have a profound impact on the environmental friendliness of the system, both locally and in a wider context. Reusing materials available on the farm to rehabilitate soil fertility and structure, constructing water-holding facilities to improve soil moisture profiles and reduce erosion, and diversifying crops, both temporally and spatially to minimize pests and stabilize output, should be sufficient to significantly improve ecological sustainability.



*Weeding serves not only to maintain pond dikes but also as an added source of nutrients to the ponds.*

The assertion that IRM can reduce, and in some cases reverse, environmental decline is probably less likely to cause debate than whether it can achieve these goals in a realistic amount of time. While relatively short-term gains in yield might be realizable, the theoretically predicted changes in soil fertility and water-holding capacity will require time to be translated into more trees and water. Though more trees are evident in densely populated areas such

as those mentioned above in Rwanda and Kenya, which components of IRM are responsible, and the amount of time required to achieve this outcome, are unknown.

Also unknown is the percentage of land in any given region which must be under IRM to achieve environmental restoration. This will depend upon how resources are shared within a community in addition to the ecological balance between man, land and water.


It should be borne in mind that IRM is not just something which *affects* the environment; it *interacts* with the environment. IAA based on IRM cannot be adopted everywhere. Some places are simply too

dry. The traditional practice of placing ponds near permanent water sources has resulted in restricted access and/or reduced availability of water both locally and downstream. In some cases, outfall from ponds has reduced the value of these supplies for home consumption. Although the data to support the assertion - that pond aquaculture increases the incidence of water-borne or aquatic vector-borne diseases are arguable -

ponds do provide suitable habitats for some diseases and vectors. New models for rainfed aquaculture which would minimize these adverse environmental effects by permitting the removal of fishponds from the immediate vicinity of permanent water sources have been tested and may provide some solutions, but the degree to which the positive benefits would be reduced by having only a temporary pond is not known.

In the short term, however, most fishponds will probably remain close to springs, wells or watercourses. If IAA is shown to be widely applicable and beneficial, what will be the environmental impact if too many people adopt? One can imagine a scenario where all available water is tied up by a few farmers who have staked out land and grown more prosperous through pond construction and fish farming. As with so many other aspects of IRM and its potential role in rural rehabilitation and development, we do not know how much effort should be put into extending IRM or what the longer-term policy implications of widespread adoption might be.

### Conclusion: The Need for New Knowledge

Clearly, there are great gaps in our understanding of how IRM systems might fit and function within rural farming communities. This lack of knowledge about development intervention is not, however, peculiar to IRM. Current efforts to promote economic growth in less developed countries are singular in the history of North-South relations. The vast majority of what the development community proposes and attempts is necessarily experimental. In principle, the basis for these attempts is the desire to improve the lives of poor people while avoiding the painful social cost borne by the working classes in Europe and the USA during the industrial revolution. Whether this is realistic or not is unknown, but the desire mandates that more user and environmentally friendly interventions be promoted over those which might be more profitable on the surface but which are laden with dangers for the very groups which are most in need of help. IRM, while obviously still in its infancy in subSaharan Africa, is clearly one of the approaches which should be more thoroughly investigated and, if found useful, widely applied. 

---

R.E. BRUMMETT is Project Director of the ICLARM-GTZ Aquaculture Project, PO Box 229, Zomba, Malawi.