

It is becoming widely believed that aquaculture will best develop in the context of agriculture, as a new crop in existing farming systems. In this article, the broad issues of farming systems improvement are discussed.

Beyond Romance and Rhetoric: Sustainable Agriculture and Farming Systems Research

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FSR and Research on Sustainable Agriculture

Sustainable agriculture is a fascinating, even compelling subject. Part of its romance lies in its broad appeal to agriculturalists. While recognizing that there are numerous definitions and interpretations of sustainability in agriculture, most agriculturalists nonetheless have their own favored version. Indeed, many claim that they, alone, have "the answer". Practitioners of farming systems research (FSR) must not adopt this habit, which starts with a failure to recognize that the contributions of numerous disciplines are necessary to foster sustainability in agriculture. Everybody must contribute and everybody has a role.

What is the role of FSR? The answer lies in its first principles. These principles affirm that FSR involves farmers, uses systems thinking, brings together social and biological scientific disciplines, complements the work of others, and focuses on farmers' problems.

- Farmer participation incorporates into research the perspective of the ultimate manager of the resources on which sustainable agriculture must be built.
- Systems thinking allows the study of relationships within a hierarchy of systems.
- Multidisciplinary teams enable the understanding of social, economic, biological and physical mechanisms underlying sustainable agriculture.
- Complementary relationships facilitate linkages with other (commodity and

disciplinary) scientists, extension workers, and policymakers.

- A problem-solving focus helps research partners forge a common understanding of important problems, their causes, and possible interventions or solutions. It also enables these partners to set a common agenda in which the actions of each contribute to a common goal.

As sustainability concerns become more important, FSR must progress beyond its initial concentration on improving the productivity of resources devoted to particular crops: *a systems perspective with a predetermined crop focus*, and beyond its current *farmer problem focus*. Progress must include long-term objectives in the rehabilitation and regeneration of natural resource systems: *a natural resource systems focus*. Moreover, attention to ecological sustainability will require a further expansion of the scope of FSR to include the many off-farm and nonfarm activities that make up sustainable liveli-

hoods: *a livelihood focus*. Fig. 1 illustrates this progression.

Regardless of whether the scope of FSR is relatively restricted (*a systems perspective with a predetermined crop focus*) or relatively broad (*a livelihood focus*), the contributions of several disciplines and specialties are almost always needed. In all cases, however, the selection of which disciplines and specialties are relevant depends very much on the nature of the *threats* to system productivity or natural resource quality. Nonetheless, it seems likely that FSR with a natural resource or a livelihood focus will be compelled to call

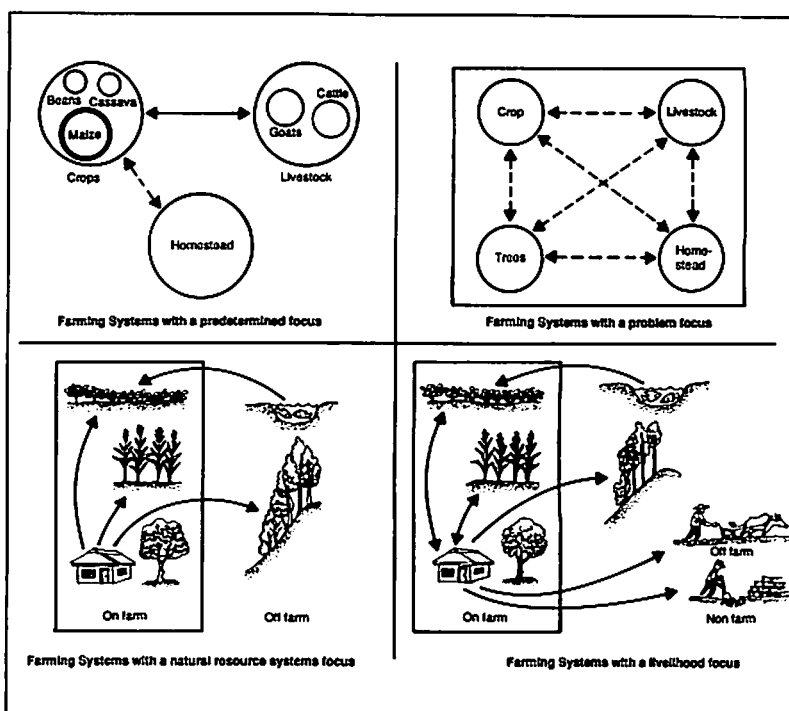


Fig. 1. Progression in farming systems focus.

on the services of a wider array of disciplinary specialists.

Beyond Romance and Rhetoric

The contribution of FSR to sustainability in agriculture is potentially very large. The fulfillment of this potential, however, appears to be hindered by romance and rhetoric. FSR is full of romantic notions about farmers, traditional farming, and where 'the answer' lies.

That farmers know everything

Farmers know a lot, but they do not know everything. There can be no doubt that information from farmers can be exceedingly useful, e.g., on analyzing past trends in resource quality, and some underlying reasons for these trends. However, many processes that threaten the quality of agricultural resources cannot be observed with the naked eye and farmers know little of tomorrow's world and future technologies.

Greater participation will only come through building farmers' skills in experimentation. With greater skills farmers will become more active partners with FSR practitioners as well as disciplinary and commodity scientists in the sharing of ideas and the generation of sustainable farming systems.

That traditional farming systems are more sustainable

Sustainable farms cannot be constructed by going back to traditional farming systems. The success of traditional systems lay in their nonextractive use of natural and human resources. Under intensification and resource extraction the systems collapsed. Because they do not permit intensification it is only in the unrealistic scenario of reduced population pressure that these systems can be made to work.

Similarly, sustainable farms cannot be constructed without the use of some external inputs. These systems can only produce enough nitrogen, even with biological nitrogen fixation, to sustain low outputs. Unrealistically high prices are necessary to turn a profit in systems that couple low outputs with high labor requirements. Unfortunately, "model" sustainable farming

systems flourish in the artificial decisionmaking environment of projects. During the life of the project the model farm remains unchanged, giving the impression that "perfectly integrated, self-sufficient, and stable model farm" is sustainable. When the project goes, however, so does the model farm.

Farmers survive by changing. As with life itself, "evolvability" and flexibility are critical characters for survival. Perhaps all we can seek is dynamism in the farm system directed toward maintaining resource quality as well as productivity.

That the answer lies in any single level of analysis

No single level of analysis can provide a recipe for sustainable farming. Plot-level work on soil fertility or pest management may arrest a yield decline, but adoption only occurs if techniques that are developed fit with the rest of the farming system. Farm level work on enterprise diversification may increase profits, but diversification only occurs if labor, seeds and markets are available. Policy level work can only make its contribution if adequate biological and socioeconomic information at the farm and plot level exists on which to base it.

Thus, we need a balance of study at plot, farm and policy levels using the contributions of farmers, FSR practitioners, and commodity and disciplinary researchers. Similarly required will be a balance in all the levels of farming systems focus illustrated in Fig. 1.

FSR Limitations and Needed Developments

Even with the removal of romance and rhetoric, FSR contributions to the sustainability of agriculture have limitations that should be kept in mind.

- At best, the development of new technologies through FSR will have only a very limited effect on sustainability problems that are global in nature, e.g., climate change, depletion of sources of external inputs, and changes in global biodiversity.
- The impact of any resource-conserving techniques that may emerge through FSR will be limited unless, unlike in

the past, these interventions are rapidly and widely adopted.

In order to contribute more fully to sustainability in agriculture, further developments are needed in FSR methods.

- In studying farming systems, and possible interventions for those systems, FSR has usually restricted itself to a near-term time horizon, usually not more than one calendar year. A stronger sense of dynamics and trends is needed in all stages of FSR, including diagnosis, experimentation and assessment.
- FSR teams need to become more familiar with processes of resources degradation and their underlying causes. Some of these causes may involve externalities, common property resources, property rights and the distribution of assets, public policy, and other issues where the skills and specialties of social scientists can be brought to bear.

By insisting on realism when confronting sustainability questions, however, FSR can still cast itself in a starring role in research on sustainable agriculture.

Acknowledgements

The idea for this article arose from a meeting called by John Dixon and Nimal Ranaweera during the 2nd Asian Farming Systems Association symposium in Colombo, Sri Lanka, on 2 November 1992. We acknowledge their helpful comments given during that meeting, and those of N.S. Jodha, E. Price, M. Quazi, A. Gomez and M. Dalmando. We also thank John Dixon and N.S. Jodha for commenting on the manuscript and David Norman for helping think through Fig. 1.



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ICLARM Contribution No. 912