CHAPTER VII

Toward A More Participatory Framework for Information Systems in Natural Resource Development: Where Do We Go Next ?

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NATURAL RESOURCE DEVELOPMENT: WHERE IS THE ENGINE?

Case 1 A few years ago (about 1983), the author had a chat with a farmer in his irrigated field in the Dumoga valley in North Sulawesi, Indonesia. The farmer told about a recent visit to his farm, and neighboring farms, by a small group of officials from the district agricultural extension office. They told him that he should keep the grass short on the bunds between his rice field basins to eliminate hiding places for rats and to generally enable a more uniform and tidy development of the rice fields. As was socially fitting, the farmer agreed and the officials left, apparently assuming that they had extended information to the farmer. He described however that he had chuckled a little after they left. From his experience the soils on his small farm were too soft and the bunds would collapse without the cohesive effects of deep rooting by grasses on the bunds, which required taller grass. Whether he was technically correct or not, this seemed to be another case where agriculture extension occurred in a top-down manner, not permitting the incorporation of local knowledge into the development process.

Case 2 Some time later in the same area, the author came upon a group of farmers who were altering the levels of different offtake gates in a four-way concrete division box at the head end of a field canal. When asked what they were doing, they explained that they had tried repeatedly to get the government to alter the division box because of the mal-distribution of water which it was producing. When the project irrigation extension officer came to the scene a few days earlier, he told the farmers the hydrologic principles behind why the division box was made as it was, and by implication, why they should be satisfied with it. The farmers said they were not questioning his science and were sure that the theory was correct. The only problem was that after five years of experiencing the distri-

bution of water caused by the division box, they knew that it was sending too much water into a lower lying area and too little water into a higher area. They then asked the officer if the project could alter the box to see if that would improve the situation. He said it could not, since there was no budget for this sort of thing. The farmers had been very reluctant to alter what they saw as government property, but finally resorted to making the change themselves. At the time this seemed to be another case where farmers' knowledge was discredited by development professionals and not incorporated into the development process.

Case 3 More recently (1992), along the White Nile of the Sudan, the author discussed with a group of farmer "tenants" the "privatization" process occurring in the agricultural sector in Sudan. The management tasks of obtaining credit, mobilizing inputs and planning and marketing the crops had all been done previously by the White Nile Agricultural Corporation (WNAC). In 1992, the WNAC was drastically reduced in size and scope and abruptly pulled out of many pump-irrigated schemes along the middle region of the White Nile. Whereas they previously functioned more as tenant laborers, the farmers would now have to take over full management of the production process. We asked the farmers how they would react to this change. Did they know how to obtain inputs for themselves? Did they know how to apply them effectively? How would they market their crops? They answered that they generally had a good knowledge about these things but they knew they needed better information to improve their productivity and to market their crops for maximum profit. We asked how they would get this information. They answered, "We will hire our own extension specialist. He will not only give us the information we need, but he will make the arrangements for us to obtain the inputs on time, arrange bank credit and let us know about marketing arrangements and opportunities." Will you hire one of the displaced staff of the WNAC? "We will hire the most qualified person we can find."

Case 4 During this Workshop (March 1993) one of the field teams visited the Surtana Irrigation System, located in the Chitwan area of Nepal. This system was originally developed and is currently being managed by farmers. It is located along the Dhongre Khola river, which is in the transition area between the lower hills and the flat terai region of Nepal. The system was built many years ago. About eight years ago, as part of a longer process of gradual agricultural intensification, farmers began introducing both winter wheat and a spring rice crop into the irrigation system. With the subsequent higher demand for water also came the desire to convert the water diversion structure at the river from a traditional brush and wood check dam into a stone and wire gabion weir. With some external assistance from a development agency they built the gabion weir. Some forest was cut and the irrigated area was extended.

However, after this was done, farmers from the irrigation system downstream (Badgaon) raised a complaint that the gabion weir, which was only located 200 meters upstream from their own intake, would not leave them with enough water. The dispute was finally resolved with the help of the District Development Committee, which decided that one-eighth of the water crossing the gabion weir should be reserved for Badgaon, the downstream system. Farmers in Dhongre Khola said that until now this has not been implemented because Badgaon System in fact has not yet experienced a water shortage as a result of the new gabion weir. But in the future if they should experience a shortage, farmers from the two systems agreed that they will hire an engineer to build a proportioning weir at the Dhongre Khola diversion to ensure that the agreed 7/8ths and 1/8th division is realized. Meanwhile migrants continue to move into the area and exert pressure on villages to obtain irrigated land. Government engineers believe that the irrigable area of many villages in the region can be extended significantly if the water use

efficiency is improved. The water use efficiency can be improved substantially, they say, by lining the canals. Siltation was a problem, partly as a result of soil erosion in the watersheds. We were struck at how high the canal embankments were (sometimes over 1.5 meters) as a result of years of removing silt from the canal beds and piling it onto the embankments.

Each of the above four incidents with local resource management have helped bring about a gradual shift in my own thinking about community-based resource management and the learning process that goes along with it. By the late 1970s and early 1980s many development professionals concerned with agricultural development and community resource management discovered the richness of indigenous technical knowledge and institutional traditions. (Brokensha, 1980) The Balinese *subak* (water society), Javanese *ani-ani* (finger knife for harvesting rice), villagers' knowledge about crop and tree seed varieties, traditional water proportioning weirs and indigenous institutions which have collectively managed water, lands, forests, fisheries and pasture lands for centuries gained widespread academic if not official recognition. Local knowledge about agriculture and resource management was seen by many researchers, NGOs, and even government officials, as an asset upon which development should be built. However, despite the new appreciation for local knowledge and traditional resource management institutions, development was still predominantly seen by planners and researchers as something which was primarily motivated by the use of capital, extensionists, scientists and enlightened external facilitators. These external resources would be the keys which would enable local resources and skills to become the effective engines of development that they could be.

In the first case above, we were struck by how complex and important local knowledge is for resource-poor farmer families who are struggling but surviving, and sometimes doing quite well, on small pieces of land. Successful farmers must understand and take risks based on what they have experienced and learned about micro-level nuances in a large number of "specialities," such as soils, topography, hydrology, weather, crops, cultivation practices, pests and social relations. It is apparent that this knowledge rarely flows "up" to official or administrative offices, though it is *flowing "sideways"* to other farmers or villages.

The second case above represents, in a small way, a growing appreciation for the difficulties local communities have faced by development project personnel who are not enlightened by local knowledge, and do not incorporate it into their programs through farmer participation. We can remember meeting farmers who felt they were being "chased by development," as one Indonesian farmer put it (while discussing being removed from his land more than once by resettlement projects). Sometimes rural people resist or attempt to correct the effects of well intended but externally-driven (and often locally-insensitive) development programs. Farmers sometimes "take development into their own hands"--by demolishing or modifying government-built structures, refusing rights of way, staking claim to forest lands, or opposing an officially-mandated cropping pattern. (Vermillion, 1990) We have also listened to farmers explain how they knew which sections of a canal needed lining only on one side or the other, on the base of the canal only, or in some places on all three sides of a canal. Typically government-sponsored canal lining programs have a tendency to automatically line all three sides. Over time they could tell whether the seepage loss occurred mostly when the water was deep in the canal or shallow. They also often believed that they could indicate where the lost water was going.

Such experiences serve to reinforce the idea that development professionals needed to tap local knowledge and involve farmers in the development process in order to be effective. During the 1970s and early 1980s, the state was still

generally seen (at least by people not living in villages in developing countries) as the primary engine of development. It was important to demonstrate the value of local knowledge (technical or institutional), extract and incorporate local knowledge into development efforts, and to "catalyze" otherwise unorganized farmers into a state of organized participation in government programs. In order to be empowered, farmers needed to either become organized (primarily at the village level) or have their indigenous institutions recognized by the state.

The third example above was a place where farmers traditionally had even less role and power in irrigated agriculture than is generally the case in Asia. In Sudan, farmers were "tenants" or laborers on state-managed land. When financial crises forced the state to abandon this role, suddenly farmers, who had already begun to organize themselves through tenants' unions, began considering how to chart their own course for development. Here the question was not so much whether they had local control; the state had withdrawn itself from attempting to manage agriculture. Farmers were going to "hire their own extension specialist"; someone who would be accountable to them. These farmers were convinced they could manage their own affairs better than the government or outsiders. They wanted to determine for themselves what support services were available and which ones they would need. They wanted to be represented by someone who was on their payroll. In this setting, what was needed was not so much the extraction of information by well-intending outsiders. What *they* needed was *information about their external environment*. They needed dynamic information about alternative opportunities for obtaining resources by exchange and credit and by more informed and direct modes of marketing their crops.

In the fourth case above, one is impressed by how change was overtaking village life in Nepal--agricultural intensification, expansion of irrigated lands, cutting of forests, soil erosion, the inflow of agricultural settlers, and population increases. Rural development can no longer be seen primarily as a village affair, particularly when there are concerns about the sustainable management of the resource base--the forests, the soils, the water. Village development is becoming increasingly inter-related with larger units. There are increasing hydrologic and legal interactions between irrigation systems along river courses. Villages can now choose among various potential providers of development assistance, both from NGOs and various government programs. In Nepal and elsewhere, irrigation water is increasingly competing with water for other uses. Water increasingly affects, and is affected by human impacts on other resources such as soils, forests and even the air. There is an emerging recognition that the isolated village, the village forest lands, the single tubewell or the village irrigation system is no longer the most vital unit of focus for sustainable development. The *larger resource base (the forest, the river or the aquifer) must be governed and managed at that level* in order to develop and use natural resources sustainably. Village development is increasingly interconnected with regional and international development.

Information brought into the village from the outside is probably more important for village development than is village-level information which is either catalyzed or extracted from the inside by outside development professionals. But it is not the formal, simple technology diffusion and extension model which is the primary source of inflowing information nowadays (if it ever was). The emphasis is now shifting towards more sophisticated approaches of local/non-local resource development partnership, village-initiated information systems and joint ventures with other villages or with external agencies. Farmer-to-farmer training in Nepal and elsewhere has in recent years been promoted by development professionals to extend village-based knowledge and experience (both technical and institutional) to other villages or farmer groups. (Yoder, 1991b)

Another example of this reverse-order information and support service approach is the users-based Federiegos (National Federation of Irrigation Districts) in Colombia. (Betancourt, forthcoming) This is a federation of farmer-managed irrigation systems, federated up to the national level in Colombia. It is financed by water users' fees. Representatives are selected by farmers from individual systems. Through meetings and visits, information about crop production and prices are shared among the schemes, crop plans are coordinated between systems to optimize crop prices at certain times of the year in different parts of the country. The Federiegos provides information to irrigation districts around the country on input provision and marketing opportunities, management problems and approaches used in different systems and legal and environmental matters. This federated user-based organization also arranges training and consultancies for irrigation managers in technical, accounting, managerial and legal aspects of irrigation management.

We cannot deny the important role the state has played in the post-independence period of development in Asia and Latin America, and to a somewhat lesser extent in Africa. One of the most successful rapid improvements in world food supply and human nutrition has occurred through the green revolution of the 60s and 70s. This was largely enabled by international research and government extension programs. But it was primarily implemented by the farmers themselves and most of the information about the new technologies was exchanged directly between farmers. Speaking about the historical process of development in Southeast Asia (where the state has played an especially important role), Bauer weighs the relative importance of the state versus locality in development and concludes:

The historical experience...was not the result of forced modernization of attitudes and behavior [or]...of large-scale state-sponsored industrialization. It was not brought about by...the stirring-up of mass enthusiasm for the abstract notion of economic development, or by any other form of political or cultural revolution. It was not the result of conscious efforts at nation building...or of the adoption by governments of economic development as a formal policy goal or commitment. What happened was in very large measure the result of the individual voluntary responses of millions of people to emerging or expanding opportunities created largely by external contacts and brought to their notice in a variety of ways, primarily through the operation of the market. These developments were made possible by firm but limited government, without large expenditures of public funds and without the receipt of large external subventions. (Bauer 1991:190-91)

The wave of privatization and the attempt t transfer management authority for natural re sources from government agencies to local or ganizations has been driven largely by financial crises in both more and less developed countries. But it has also been supported by recognition of the limitations of the capacity of the state to manage natural resources. Centrally-funded government agencies generally lack the incentives, accountability and capacity to control resource use by local populations. There could never be enough civil servants employed to effectively, by themselves, guard the forests, prevent water theft, or regulate pasture lands. As Bromley puts it:

Post-independence governments in many agrarian countries have indeed declared state ownership of most natural resources. However, because of their failure to implement coherent management and control over those resources, governments have inadvertently fostered the very worst of individualistic struggles for survival against a paternalistic and often corrupt state. Many governments have declared ownership on the misguided belief that this will solve the problems of management. (Bromley, 1993:7)

There are two primary reasons why the village in developing countries is rapidly coming out of

isolation and why this has potential to empower rural peoples. First, the management of natural resources as the basis for sustaining rural livelihoods depends increasingly on sustainable management of the broader resource base beyond the village, as mentioned above. The shift in emphasis from the irrigation system to the river, from village agro-forestry to the watershed or from the tubewell to the aquifer implies the need for community-based federations to regulate resource use at this higher level. Such federations, which are already beginning to emerge in developing countries, have the potential to provide the necessary critical mass of resources needed to support inter-village information and support services networks.

The second reason why empowerment will increasingly depend on the village coming out of isolation is because sustainable development increasingly depends on inter-sector resource management. Increasing population sizes and competition for resources amplifies the urgency of developing federated community-based institutions to participate in regulating or managing the allocation of water between uses such as irrigation, domestic water use, hydro-electric power and manufacturing and industry. The same applies for inter-sector watershed, forestry and pasture lands management. But what is different today about this "coming out of isolation" is that it is not primarily a flow of state-sponsored information and technology into the village. It is becoming increasingly based on the search by villagers for external information and exploitation of external resources (such as credit and marketing) and economic opportunities.

RESEARCH AND INFORMATION METHODS FOR DEVELOPMENT: WHERE IS THE FUEL?

Not surprisingly, participatory rural appraisal, resource inventories and geographic information systems have been developed and used primarily by professionals in development or information systems. They have been designed primarily as tools to extract information from localities, including local knowledge about indigenous resources, technologies and institutions. The change of the term *rapid rural appraisal* (RRA) to *participatory rural appraisal* (PRA) was an attempt to get away from the use of this collection of methods primarily for information extraction by outsiders. (Chambers, 1992) PRA was promoted both as a method for outsiders to learn about local knowledge and conditions and as a method to facilitate local group awareness and problem-solving. It has proven to be highly effective in eliciting local knowledge in areas of relative homogeneity of opinion. (Scoones and Thompson, 1993) The group voting and ranking methods used in PRA appear to be less effective for interpreting sensitive social divisions and disputes than do more traditional methods of ethnography such as key informant and focus-group interviewing. A key strength of such PRA methods as group mapping, ranking and transect analysis is that they are often effective in encouraging villagers to clarify and articulate their own local development priorities. (McCracken, et al, 1988) However, PRA has mainly been sponsored by NGOs or researchers coming from outside of villages. So far there is little indication that villagers are using PRA themselves at their own initiative for their own planning purposes. (Scoones and Thompson, 1993)

In order to obtain more concise information about multiple resource systems and communities, development professionals have developed resource inventories. They are information systems to support programs which allocate resources to community resource management entities such as farmer-managed irrigation systems or community forestry groups. For irrigation, a combination of system "walk-throughs," simple mapping, development of transects and interviewing have been used to provide concise data sets of large numbers of irrigation systems. (Shukla, et al, 1993; Yoder, 1992) The largest known such inventory is one sponsored by the

GTZ (German technical aid agency) in the Dhading District in Nepal, which collected data on approximately 3,000 irrigation systems. (Pradhan, 1989) Besides the positive potential for using resource inventories to better inform development programs, they may also serve to document resource use practices, and to legitimize local water and other resource rights--by the very identification of the existence of irrigation systems or other community resource technologies. As with PRA, some experiments with irrigation resource inventories have attempted to elicit the farmers' perspectives. (Shukla, et al, 1993) However, also like PRA, the initiative for developing, and using the results of, inventories comes from development agencies and researchers.

Development professionals should guard against the assumption that outsiders can effectively extract "users' perspectives," as if it were a uniform body of knowledge capable of direct incorporation into development plans. Exported "users' perspectives" can become reified, stereotyped and misapplied if resource users are not involved in a broader strategic framework of decision-making, agenda-setting and information use. The perspective of resource users not only differs greatly within communities, it also changes over time as the dynamic environment of weather, resource conditions, decision options and so on change. (Scoones and Thompson, 1993) When relating "perspectives" to planning, experimentation and resource allocation decisions, questions of trade-offs and negotiation inevitably emerge which often call for new or modified perspectives. (Vermillion, 1990)

While PRA and resource inventories have been developed primarily by rural development specialists, geographic information systems (GIS), of course, have been developed by a much more eclectic and technical array of specialists and for a great variety of uses. (Maguire, et al., 1991) This Workshop served to introduce some ways in which GIS has been or can be introduced into the field of rural development or natural resource management in developing countries. Similar to PRA and resource inventories, it too has been developed primarily for planners and analysts to better understand local resource conditions.

No doubt these methods have the potential to enhance agency planning processes. But as these processes become relatively less important to rural development, development professionals must, together with resource users, also facilitate development and use of information methods where information needs are defined by communities or federations of communities and where the flow of information is increasingly between communities or resource user groups. This implies such scenarios as community-to-community information networks, making GIS, thematic resource maps or resource inventory information available to communities or resource users organizations for their own planning purposes, and facilitating formation of federated resource users groups which coordinate or provide support services to their community groups.

Certainly PRA, resource inventories, and GIS methods can be adapted for such community-based purposes. In the Workshop, representatives of Action Aid demonstrated the capacity of villagers in India to make effective use of satellite imagery and aerial photographs for spatially-oriented planning purposes. (Joseph, 1993) Farmer-to-farmer training has already been used to provide support services between irrigator groups and it appears that this may develop in Nepal into a financially self-supporting, community-based consulting service in Nepal. (Pradhan, 1993) This has already occurred in Colombia. Resource inventories, if designed, implemented, and analyzed with farmer involvement, may facilitate the formation of community-based watershed or river basin information, management, and support networks. This is in fact what appears to be emerging in the East Chitwan river basin area in Nepal--with the support of the Irrigation Management Systems

Study Group at the Institute of Agriculture and Animal Science, located in Rampur. (IMSSG, 1993)

TOWARD A MORE PARTICIPATORY FRAMEWORK FOR INFORMATION SYSTEMS AND DEVELOPMENT PLANNING

We will not go into details about methodological issues which arise, with regards to using information systems in community-based resource planning. Instead we will summarize seven potential roles which could be played by resource users in a framework of participatory information networks and planning. We can call this Participatory Information and Planning (PIP).

Role 1: Providers of information

The most common (if minimal) role resource users or stakeholders play in PIP is providing information to outsiders. Typically users supply information in response to questions provided by researchers and planners. New techniques of PRA, such as focus group discussions and using farmers as PRA team members, increasingly shift the posing of questions and categories to local rural people. (Cornwall, et al, 1993) Techniques such as resource mapping and modelling, seasonal calendars and transects can convey considerable information and are made by local people often using local materials. Pairwise and matrix scoring and ranking can provide information on local preferences, decision criteria, values, and perceptions of alternative technology or management options. (See IIED, 1988 to present) Enormous potential exists to further develop methods to obtain important information from local people. But in order for this mode of providing information to be locally beneficial, resource stakeholders must play other roles as well.

Role 2: Demanders and receivers of information about the external environment

Since farmers are often unaware of laws, programs, opportunities, and terms and conditions for obtaining support services, the flow of information also needs to be coming into the village in accordance with villagers' needs. Such needs must be partially identified by farmers. This can only occur if information systems are incorporated into participatory planning. In Colombia, after the government exposed information about actual budgets for irrigation agency operations and maintenance at the system level, irrigators' organizations began pressuring the government to take over management of the systems by themselves. Farmers calculated that they could do it themselves more cost-effectively and so negotiated a takeover of management of the system. (Vermillion, 1992)

Role 3: Partners in identifying information and planning priorities

The management of a forest or an irrigation system involves multiple stakeholders including users, consumers, traders, regulatory agencies, etc. Each may have different objectives and performance criteria relative to the development and use of the resource. It is now an axiom that unless the perspectives of the differing stakeholders are understood and incorporated into planning, resource management will be debilitated by contending interests. It follows therefore that management performance should be monitored and evaluated according to multiple objectives of the stakeholders.

Figure 1 illustrates this kind of framework for multiple stakeholders in natural resources management. The users may be primarily interested in income generation; agency personnel in implementing targets; policy officials in broad concerns such as environmental sustainability; and finance ministries in cost-efficiency of government expenditures. They all share an interest in performance outcomes of resource management but their performance criteria emanate from different objectives. Hence resource information systems which aim to be strategic must reflect this differentiation.

Representation of farmers in PIP working groups or workshops is becoming common. This helps facilitate a voice for local people in identifying research and development priorities. We have attended workshops on irrigation management in Nigeria, Sudan, Sri Lanka and Indonesia where farmers gave presentations about their own perceptions of irrigation performance and related issues. This is becoming more and more common for other resource sectors as well.

In a recent national-level policy workshop on "participatory management of irrigation" in Nepal, four written and oral presentations were made by farmers stating their candid viewpoints about irrigation problems and recommendations. Recommendations included 1) how the government should implement assistance programs differently, 2) what training programs they needed, 3) management problems needed to be dealt with in a better way, and 4) a suggestion that the water charge should be raised. (Pant, 1992)

In collaboration with local organizations, IIMI helped conduct an inventory of irrigation systems in the Sindhupalchok District of Nepal aimed at identifying physical, agro-technical, and institutional constraints to effective irrigation management performance. (WECS and IIMI, 1990) Through rapid appraisals involving interviews and inspections, key constraints on performance and priority areas for assistance were identified. Improving on this approach, IIMI expects to soon conduct participatory inventorying in two other districts in western Nepal, involving farmers in the inventory teams. The inventory will help identify which systems may benefit from which types of support services. An outcome of this exercise is expected to be the provision of management training by a farmer-based NGO (referred to above).

Role 4: Partners in designing and developing information systems, management strategies, and technologies

Given the declining role of the state in many aspects of natural resources management, together with the need for more community-initiated information systems and development (referred to above), this role of full partnership in developing and using new information and management systems should become increasingly the dominant mode of participation by communities in natural resource management in the future.

As an example, in Indonesia, IIMI participated in an experiment to improve rotational irrigation in a large-scale irrigation system in West Java. Both agency field operations personnel and representatives of water users associations jointly identified and decided among alternative rotational plans for pilot testing. The discussions served to publicly operationalize the performance criteria of equity, efficiency, and manageability which were the basis for formulating the new rotational plan. Farmers suggested aspects of the plan, how to implement it, and to play a role in its night-time enforcement. Participatory designing of the new plan led to later commitment and better agency/farmer cross-accountability in implementation and enforcement. The activity improved both the equity of water distribution and the management efficiency. (Vermillion and Murray-Rust, 1991)

Role 5: Partners in experimental management of the resource or new technology.

It is well-known that farmers tend to be experimental. They experiment in at least five ways to: 1) test new opportunities (such as trying a different planting date or marketing outlet), 2) test the reactions of others (such as a new form of distributing water), 3) experiment to solve problems (such as alternative pumping methods to alleviate salinity or waterlogging), 4) test new technologies in old environments (such as tubewells in West African *fadama* land), and 5) test old technologies in new environments (such as the adaptation of Balinese proportioning weirs in resettlement areas in Sulawesi).

Such experimentation should be encouraged both by local people, by agencies and together jointly. To encourage innovation, some have suggested developing cooperative insurance schemes to insure against risk of failure while experimenting with new technologies in risk-prone areas (such as insurance against crop failure or irrigation pump installation failures). Many have noted the need for more experimental, phased introduction of innovations. In some states in India, newly-constructed irrigation canals cannot be lined with concrete until they have been tested for at least two seasons. More often than not, even experiments with new resource management approaches (such as management turnover or a new system of fee collection) tend to pilot test only a single approach, rather than comparisons. Two key issues for this role are: 1) How can agencies become flexible enough in timing and procedures, and transparent enough with finances, to encourage a joint experimental approach to natural resource management? and 2) How can agencies reorient themselves more toward providing technical services and encouraging strategies which are participatory, phased and experimental.

For research on experimental innovations, the term "participatory action research" (Whyte, 1991) has been used for an applied research methodology whereby agency personnel and farmers or other stakeholders in a given action research program are involved in both planning and implementing the experiment, and possibly also in evaluating it. Generally researchers specialize in documenting and analyzing the process and results and facilitating a comprehensive dialogue and review process. (For an example of participatory action research in introducing joint farmer/agency management of irrigation in Sri Lanka, see Sakthivadivel, et al, 1992.)

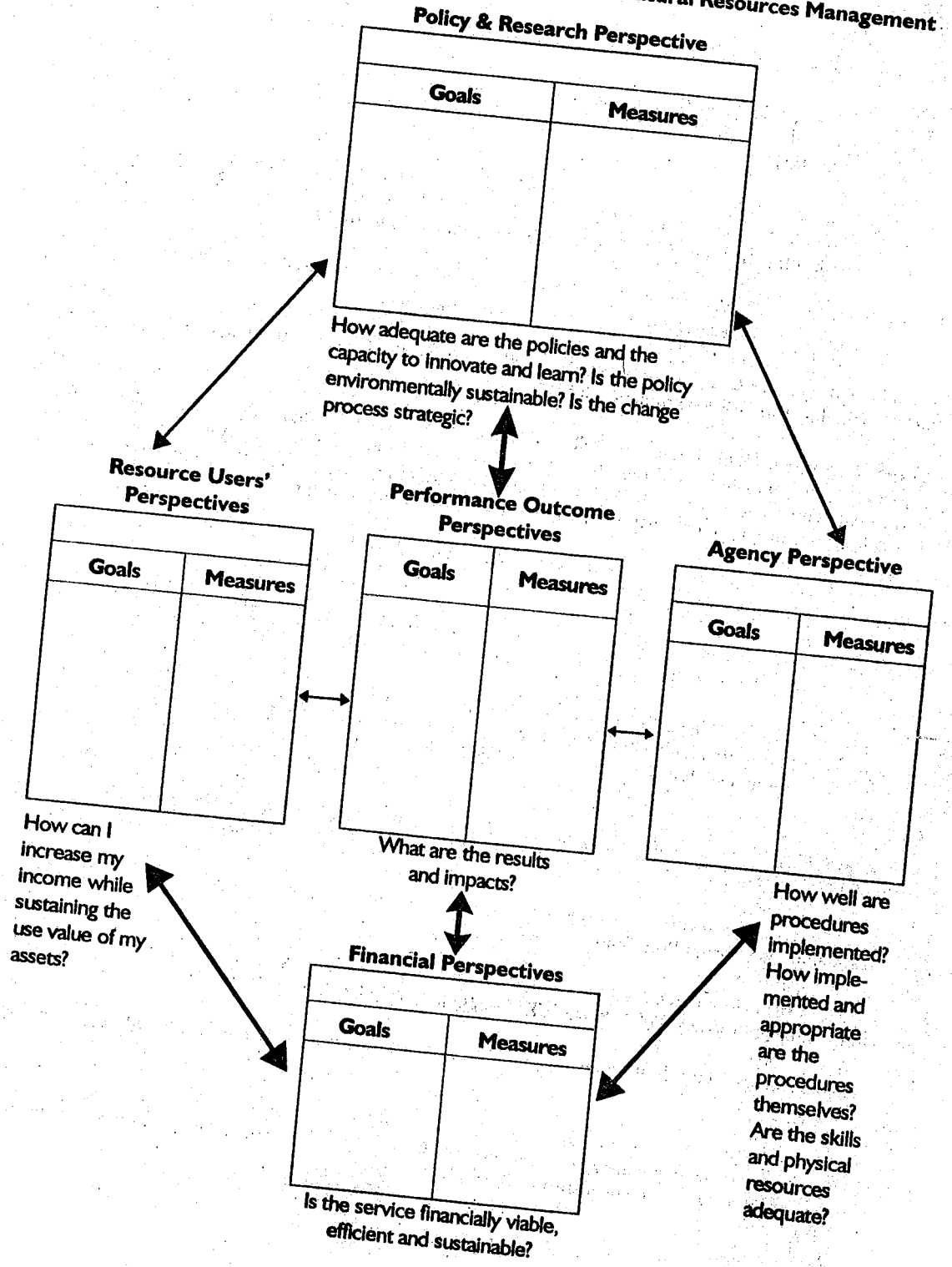
Role 6: Partners in assessing performance of a technology or management strategy

Self-assessment of management performance by irrigators' organizations is a role which has shown promise in both Sri Lanka (Uphoff, 1988) and the Philippines (Lauraya, 1991). Farmers identify their own performance measures and evaluate their organizations over time. Such measures include irrigation operations and maintenance, organization, crop management, and finances. Self-assessment can serve not only to provide insightful information, but also to develop timely action-response arrangements and strengthen local institutions. In the Philippines, "validation workshops" were held with farmer representatives from neighboring irrigation systems to enable greater generalization of findings from the more location-specific self-assessments.

Role 7: Partners in training and institution development

Managers of natural resources can also provide peer training and assistance in institutional development. Peer training has been done by the Grameen Bank in Bangladesh, by World Neighbors in Eastern Indonesia, and by IIMI in Nepal. In Nepal, farmers worked together with researchers and agency staff to help identify the root causes of poor irrigation performance. While engineers tended to focus on the visible symptoms of problems (i.e., damaged physical structures), visiting farmers were often adept at determining less visible causes of these problems (i.e., weak institutions and conflicts). Farmers from successfully-managed irrigation systems proved capable of extending effective management and organizational training to farmers in other systems (Yoder, 1991).

FIGURE 1: **Multiple Actors and Perspectives in Natural Resources Management**



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