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PUTTING LOCAL KNOWLEDGE TO GOOD USE

Indigenous knowledge in Third World agriculture is considerable and too often overlooked, say D Michael Warren and B Rajasekaran

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The overwhelming majority of the population in most developing countries are small-scale farmers, each working less than two hectares of land. These farmers represent hundreds of distinct languages and ethnic groups. In most instances, the knowledge systems of these farmers have never been recorded systematically in written form, hence they are not easily accessible to agricultural researchers, extension workers, and development practitioners. While they remain invisible to the development community, many indigenous organizations are operating in rural communities to search for and identify solutions to community problems.

Recent studies about indigenous knowledge in agriculture is having some effect; indeed it has changed the attitudes of policy makers and agricultural development planners in recent years, and this has led to renewed interest in this type of knowledge.

Policy makers and agricultural development planners are beginning to recognize the need to understand existing knowledge systems and decision-making processes. Agricultural innovations based on indigenous knowledge have been tested through time. Indigenous knowledge is a science that is user derived and scientist-derived, and its utilization in development efforts provides long-term advantages that complement the contributions of conventional top-down agricultural technologies.

Indigenous knowledge (IK) is local knowledge that is unique to a given culture or society. It is the information base for a society which facilitates communication and decision making. IK is the systematic body of knowledge acquired by local people through the accumulation of experiences informal experiments, and intimate understanding of the environment in a given culture.

Indigenous knowledge systems form the basis for decision-making, which is operationalized through indigenous organizations, and they provide the foundation for local innovations and experimentation. According to Lori Ann Thrupp, IK systems are adaptive skills of local people, usually derived from many years of experience, that have often been communicated through "oral traditions" and learned through family members and generations. Local people, including farmers, landless labourers, women, rural artisans, and cattle rearers are the custodians of indigenous knowledge systems.

Valuable Resource

IK is a valuable national resource: its systems are dynamic, never static, and are continually influenced by internal creativity and experimentation as well as by contact with external systems. IK includes practical concepts that can be used to facilitate communication among people coming from different backgrounds such as agricultural researchers and extension workers. IK helps to assure that the end users of specific agricultural development projects are involved in developing technologies appropriate to their needs.

By working with and through existing systems, change agents can facilitate the transfer of technology generated through the international research network in order to improve local systems. IK is cost-effective since it builds on local development efforts, enhancing sustainability and capacity-building.

A growing number of case studies conducted in recent years have shown that IK systems can play an important facilitating role in establishing a dialogue between rural populations and development workers. Some of the best recent studies have been provided by scientists working in the CGIAR systems. The studies recognize the active roles of rural people in problem definition and in the search for their solution through local-level experimentation and innovation. They also explore the variability in a given knowledge system, particularly as this reflects gender-based occupational roles related to agricultural and natural resources management.

The Iowa, US-based Center for Indigenous Knowledge for Agriculture and Rural Development (CIKARD) has also conducted a number of case studies on IK systems during the past few years. In one study, indigenous soil taxonomies recorded in four ecozones of Nigeria have clearly provided the basis for basic communication with the farmers and a beginning point for understanding how their knowledge systems influence their agricultural decision making.

In another study, CIKARD demonstrated that harvesting crabs from the bunds of rice fields, an indigenous food production technique in a south Indian village, contributed significantly to the protein intake of marginal farming households.

Studies of IK have succinctly illustrated the need for understanding and working with IK systems. It is imperative that these systems should form the foundations for agricultural and food policy initiatives and technological interventions. Policy actions in the years to come should give priorities for recording, documenting, and incorporating these threatened knowledge systems.

Such policy actions would certainly pave the way for comparing and contrasting IK systems with the global knowledge systems used by international, regional, and national agricultural research and development centres with an objective to see where technologies can be used to improve upon local systems.

Establishing centres

Regional and national IK resource knowledge resource centers have embarked on systematic recording of IK systems for use in development. Three global centers CIKARD (USA), LEAD (The Netherlands), and CIRAN (The Netherlands) facilitate the establishment of these centers.

The two regional centers are located in Nigeria and the Philippines, while national centers now exist in Mexico, the Philippines, Indonesia, Ghana, Kenya, Sri Lanka, Brazil, Venezuela, South Africa, Burkina Faso, and Germany. The three global centers provide a partnership relationship with the national IK resource centers by: (1) developing guidelines to establish national IK resource centers; (2) coordinating the activities of regional and national centers; (3) compiling a list of documents held at CIKARD and making it available to the centers; and (4) developing human resources for the regional/national IK resource centers.

The functions of national IK systems resource centers include:

- providing a national data management function where published and unpublished information on IK are systematically documented for use by development practitioners;
- designing training materials on the methodologies for recording IK systems for use in national training institutes and universities;
- establishing a link between the citizens of a country who are the originators of IK and the development community.

Methods to record the indigenous knowledge systems of farmers are imperative if interactive agricultural technologies are to be developed with IK as a base. These methods help outsiders to make use of the available IK resources efficiently. CIKARD is currently in the process of compiling the methods for recording IK systems into a training manual.

Once IK systems are systematically recorded, the next step is to compare and contrast them with comparable global knowledge systems. Such a process strengthens the capacities of regional and national agricultural research and extension organizations by generating sustainable agricultural technological options rather than standard technical packages of practices.

The incorporation of IK systems into agricultural development consists of three essential components---conducting participatory on-station agricultural research (research scientists and farmers); secondly, conducting on-farm farmer-oriented research (research scientists, extensionists, and farmers); and, thirdly, validating farmer experiments (farmers and extensionists). The first two components are successive stages of the interactive technology development process, whereas component three is a separate entity.

1. Conducting participatory agricultural on-station research: Involving "research minded" farmers while conducting on-station research is essential and at the same time challenging. Since farmers and scientists each know and understand many things, but have little overlap between their domains of knowledge, farmer-scientist interaction should help both groups learn.

During the process of interactive technology development, scientists at the research station should conduct research by building on recorded IK systems. For instance, farmers of casuarina, a multipurpose tree, in Pillayarkuppam village, Pondicherry Region, India, grow leguminous crops such as blackgram or cowpea as intercrops in casuarina groves. Many farmers faced problems such as the shattering of legume pods and the spreading of legume vines between the casuarina trees.

The research station scientists could conduct on-station research experiments with an objective to evaluate the performance of various legume varieties in casuarina fields, selecting legume varieties which are suitable for intercropping in casuarina fields. The successful combinations of casuarina and legume varieties could provide the basis for farmer oriented on-farm research for its validation under farmers' field conditions.

2. Conducting on-farm farmer-oriented research: Participatory agricultural on-station research forms the base-line for conducting on-farm farmer-oriented research (OFFOR). The purpose of OFFOR is to validate the findings of the participatory on-station research. Research scientists should present the interactive technological options developed during participatory on-station research stage for consideration of selected formers.

The selected farmers are encouraged to identify technological options that would fit into their individual problems and resource constraints. For example, farmers with soil alkalinity problems might select a soil reclamation trial. Instead of selecting experimental plots, the OFFOR utilizes the entire farm for OFFOR research.

By selecting experimental plots, the focus is narrowed to a particular crop (mainly cereals and millets) on the farm, while neglecting the value of associated crops, trees, and livestock. For instance, farmers in south Indian villages grow legumes such as black gram and green gram in rice bunds. Hence, selecting the entire farm for OFFOR is important. Such an effort would facilitate not only an in-depth understanding of the interactions among crops-trees-livestock but also their role in sustainable food production and resource conservation.

3. Validating farmer experiments: Inspite of their significant contributions to the development of farmer-oriented interactive technological options, the above discussed components have two potential limitations---bringing the researcher-extensionist-farmer community together at all times is practically difficult considering the existing bureaucracies and spatial as well as academic distances among the personnel belonging to these groups; and, secondly, depending entirely on research stations for innovations is too impractical considering the inadequate human resource capacity of regional research systems.

Hence, using academically well-trained and "research minded" extension personnel to validate farmer experiments is imperative. Agricultural extension programs should be targeted towards strengthening farmers experiments. The various steps involved during the process of validating farmer experiments are:

- Understanding the rationale behind farmer experimentation. Examples are testing varieties for yield increase, blending local and external inputs, avoiding risks by adjusting sowing and harvesting periods, and testing new varieties for local adaptation.
- Recording the mode of conducting experiments. For instance, some farmers conduct varietal trials by raising local and high yielding varieties in two different plots.

- Identifying farmers' evaluation criteria. The criteria used by farmers to evaluate their own experiments may differ from farmer to farmer and also for the same farmer, from crop to crop.

Conclusion

There is much to be learned from the IK systems of local people. If we are to move towards interactive technology development from the conventional transfer of technology approach, it is feasible, efficient, and cost-effective to learn from the village-level experts.

Establishing national IK resource centers is important for strengthening the capacities of agricultural research and extension systems. Keeping IK as a basis during the process of developing technologies results in a basket of sustainable technological options rather than fixed packages.

Validating farmers' experiments creates an environment of respect for local people and village-level extension workers thus leading to their increased participation and empowerment.

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Groundnuts, line planting, vines and sticks

While teaching on Casava Mosaic Virus in southern sudan it was pointed out that sweet potatoes were on the decrease in favour of cassava, writes Roger Sharland. When asked the reason for this a group of Moru farmers complained that in recent years they were having more problems with 'worms' eating the tubers. This turned out to be a commonly recognised problem affecting what is otherwise a relatively easy crop.

On further investigation the unspecific term 'worms' was found to be Sweet Potato Weevils, so text books were consulted as to what cultural methods might reduce infestation. Since indigenous knowledge is limited to what can be directly observed, pests and diseases are a good starting point for integrating formal knowledge with the indigenous. Relevant control methods, confirmed through formal science, include rotation, field hygiene, early planting, selection of cuttings and deep planting.

Moru farming, being based on the bush fallow, does not traditionally practice either rotation or field hygiene, so both these concepts are basically new. The other factors however had traditional knowledge that could be used in directed change.

Although Moru farmers do not normally select cuttings for sweet potatoes or cassava---both being relatively recent introductions with new methods of planting---they do have a clear concept of selecting seeds. The Moru have two words which differentiate between grain in general and seeds. All the grain, some of which is potentially seed, is called keci. Those that are kept specifically for use as seed are differentiated as kwaari. Kwaari are selected at the time of threshing and kept specifically for seed next year.

For crops like groundnuts and beans the seeds are stored in the pods, so at the time of planting they have to be further sorted. The small shrivelled seeds that are malformed are called kyere and rejected for planting. The concepts of kwaari and kyere were expanded for use with cuttings to explain the need for selecting good cuttings, without visible signs of weevils, in the same way that good seeds are selected.

When selecting cuttings is suggested the Moru farmers complain that there are not enough cuttings. They also recognise that early planting is better, but since cuttings need to grow at the beginning of the rains before they can be cut, there are not enough cuttings for early planting. This problem was addressed by actually observing how cuttings are planted. Moru plant sweet potatoes in mounds or ridges, the vines being collected from the old fields and planted as long straggling cuttings in these mounds. The length of these cuttings is vastly in excess of what is necessary and the density of the planting is likewise excessive.

By cutting the vines into shorter lengths, ensuring that they are planted the right way up, and reducing the number of cuttings at each site the requirement for cuttings for a given area is considerably reduced. This enables both early planting and selection of the cuttings. It also has a further advantage, which has made this an attractive practice, that not only are sweet potato weevil infestations reduced, but with the lower density of planting the individual tubers develop to a larger size, making the surplus more saleable.

While teaching a group of farmers about the advantages of the new planting method, using fewer and shorter cuttings, a discussion arose as to whether it was better to plant using a stick or by hand. At first this seemed a mere superstitious irrelevance, but on further consideration it was realised that when cuttings are planted with a stick the cuttings can be planted considerably deeper than when pushed in by hand. This linked up closely with the prophylactic measure against the 'worms' that had been bothering them.

Further consideration and comparison of the methods of planting made it possible to come down on one side of the controversy, and include the less common stick planting in the recommendation for planting, combining it with the shorter cuttings and lower density of selected cuttings.

In seeking to relate to a problem that was identified through discussion with farmers, while working on another crop, it was possible to combine the indigenous and formal scientific knowledge to develop locally relevant recommendations that pointed to local practices that needed to be adapted and encouraged.

This is an adapted version of an article in "Bulletin", issue No 31, published by the Agricultural Extension and Rural Development Department (AERDD) of the University of Reading, Whiteknights Road, Reading RG6 2AL, UK; it is reprinted with permission. Copies of Bulletin No 31---a special on indigenous technical knowledge---are available from AERDD.

Raised fields raise yields

Archeologists have discovered simple, effective agricultural techniques used in large areas of Peru three thousand years ago, that "can outperform modern agricultural technologies under circumstances found throughout much of the Third World today," says Vol 7 No 3 of *World Development Forum*.

The old-new techniques, known as "raised-field agriculture", are simple, cheap, require little more than human labour, and no chemical fertiliser or modern machinery.

According to *The New York Times*, "they have out-yielded conventional, capital-intensive fields as producers of potatoes, one of the region's main crops both in Pre-Colombian days and now. When conventional fields die in a drought or flood, these mostly survive."

Raised-field agriculture was discovered in the 1960s, but "it fell to Dr.Clark Erickson, an archeologist at the University of Pennsylvania's Museum of Archaeology/Anthropology, to find out how (they) worked in practice, how they were farmed, what made them so successful and therefore so widespread."

How does the system work? The raised platforms of earth that are central to the technology generally range from 13-33 feet wide, 33 to 330 feet long, are about 3 feet high are made from excavated soil that leaves a depression resulting in canals of like size and depth . The crops are planted on the raised platforms.

"Sediment in the canals, nitrogen-rich algae and plant and animal remains, provides fertilizer for crops...water in the canals absorbs the sun's heat by day and radiates it back by night, helping protect crops against frost. The more fields cultivated this way, the bigger the effect on the micro-environment, " says *The New York Times*.

Dr.Erickson recreated the archeological findings in experimental plots--"not only the fields but the way in which the ancients had organised and cultivated them"---and when the results were in, "realised it was such a fantastic system that maybe it could be re-introduced to the region as a replacement for some of the capital-intensive systems of farming that depend on machinery, fertilizer and lots of money."

Experimentation proved that the system worked: large strands of grain were able to survive a 1983 drought, and the fields' elevation enabled crops to survive a bad flood in 1968 while other crops perished.

More food from stone lines

The Mossi people of Burkina Faso developed stone bunding early this century. The bunds (lines of stones) built up over the years and reached a metre high, effectively terracing the slopes for relatively little labour input, most of it during the dry season). In later periods of political turmoil and land alienation, the bunds were abandoned.

However, after a series of droughts in the 1970s, the stone bunds were spontaneously revived and combined with "zay" or pits which conserve water and in which organic material is placed to increase soil fertility. At the same time, introduced systems were shunned.

Although annual rainfall in the area is low, when it does fall the rain is intense; it "runs off" sloping land and is frequently lost to crops. The intensity of the rain also causes soil erosion and long term damage to the land.

The bunds are semi-permeable, allowing some water to get through. The water that would have otherwise "runoff" the fields and caused erosion, is able to slowly sink into the ground and benefit the crops. Erosion is avoided, and the gradual seeping in of the water to the soil helps to build up soil fertility.

In the disastrous drought years of 1983 and 1984, crops grew on land with bunds, while adjoining fields grew nothing.

The British-based aid agency Oxfam provided funds to help to spread the technique; it ran short training courses for farmers in contouring and in the use of the hosepipe level. Burkina Faso's largest NGO, the Naam movement, spread the idea among 1500 groups.

Some four years ago, the UN's International Fund for Agricultural Development (IFAD) gave Burkina Faso funds to help the idea to spread throughout the country's densely populated central plateau; it later produced a video explaining the benefits of the system. Many fields in the central plateau have been abandoned over the last 30 years because of land degradation, and migration into the towns had become common.

About 150 villages on the plateau now have stone lines and again results are coming through. *Sorghum yields on the plateau have risen by about 40 percent in fields with bunds*. "Where there are bunds the sorghum harvest is noticably better", said one farmer.