ILEIA NEWSLETTER

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FOR LOW EXTERNAL INPUT AND SUSTAINABLE AGRICULTURE

LOCAL KNOWLEDGE ENDURES AND GROWS

Peruvian peasants are proud to share their knowledge

Experimentation by Thai farmers raises their self-confidence

Acknowledging the LEISA of Ghanaian farmers

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Dear Readers,

Local knowledge endures and grows

Over the centuries that rural communities have managed to survive from local resources, they have gained increasing knowledge about the possibilities of their changing environment. This local or indigenous knowledge grew through observation, experience and, not least, farmers' own experimentation and innovation.
Nowadays and presumably in the future, the environment – in ecological, socioeconomic and political terms – is changing rapidly. These changes put many constraints on rural people's efforts to maintain or improve their survival systems. But still today – despite or because of agricultural extension messages which did not fit into their way of looking at and working with their environment – most farmers in the tropics continue to base their decision-making primarily on their own knowledge.
An increasing number of persons working with these farmers have begun to recognize the value of their knowledge for developing alternatives to ecologically damaging conventional agriculture. But there is a danger that persons working with farmers misperceive and even misuse local knowledge. Some extract parts of it as mere techniques, detached from their social and cultural setting. Some want to preserve it in the 'musea of the scientific community', possibly for later use. Others are seeking ready-made solutions and instant fame, without giving due respect and acknowledgement to the farmers.
The knowledge of farmers and their capacity to expand it form the prime source for developing site-appropriate, productive and sustainable systems of using natural resources. In this issue we give practical examples of local knowledge and how it continues to grow as it comes into contact with knowledge from elsewhere. Special attention is given by some of our contributors to the roots of agricultural knowledge in its socio-cultural setting, and the rights to use this knowledge.

The Editors

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Cover photo: Local knowledge on the market. These women on Navrongo market, Northern Ghana, are selling more than 50 herbs and parts of shrubs and trees for medicinal and other purposes. Recipe added on request. Thus, markets are splendid places for sharing knowledge. But is local knowledge for sale? Unfortunately, we did not ask for their names to acknowledge them here, but we'll try to send them copies of the picture and Newsletter (Bertus Haverkort/Wim Hiemstra).

'You cannot fix indigenous knowledge'

Thomas Odhiambo speaking with Johan van der Kamp

A leading African scientist who has long been outspoken in urging researchers to look to the knowledge and culture of African farmers for their inspiration is Thomas R. Odhiambo, director of the International Centre of Insect Physiology and Ecology (ICIPE). In February, Johan van der Kamp, staff member of ILEIA, had the opportunity to talk with him about indigenous African farmers and research.

''Let's focus immediately on indigenous knowledge. First of all, how would you define the term ''local'' or ''indigenous'' knowledge?''

''Well, I regard it as knowledge which has been accumulated by the people over generations by observation, by experimentation, and by handing on old people's experience and wisdom in any particular area of human endeavour.''

''Already more than a year ago, your views on research and farmers' knowledge were expressed in various journals. Looking back now, do you see some gains made since then?''

''Yes, undoubtedly, research workers and policy makers are talking more and more about participation by farmers and rural communities in research work. If you look back 10 years ago, it was rare that the rural community was brought in. In fact, it was usually assumed that rural people don't have any knowledge which scientists can use, that everything there is to learn must be learned from scientists.''

''Could you give an example of how rural people are brought into research? Take your own institute: how are the researchers working together with farmers?''

''Our first philosophy is that the knowledge we gather will be used to develop innovative technologies for managing pests and disease-carrying insects. Secondly, our main target group is the resource-poor rural community and so we pay attention to the following:

- the technologies must address the constraints of the resource-poor;
- because we are extremely conscious

The knowledge, skills and survival strategies of farmers operating with low levels of external inputs have often been ignored or even eroded by outsiders promoting ''modern'' agricultural technology. However, with increasing awareness of the limitations and hazards of conventional agriculture, a growing number of scientists have begun to recognize indigenous knowledge as a major untapped resource for developing sustainable agriculture. Local practices offer joining points for developing ways of increasing the productivity and sustainability of local resources. Indigenous knowledge can reveal missing ecological keys which may help scientists develop alternative agricultural technologies less dependent on non-renewable resources (e.g. fossil energy) and environmentally damaging inputs (e.g. chemical pesticides) than conventional technologies.

You cannot fix indigenous knowledge, but you can use nodules to fix nitrogen. A Kenyan researcher and a Kenyan farmer looking at root nodules on a bean plant in a collaborative on-farm trial. In this case, the introduced bean appeared not to be fixing nitrogen, eventhough it had nodules. Photo: Ann Waters-Bayer.

of the ecological impact of conventional methods of pest management, we insist that ecological acceptability be build in from the beginning;

- the options have to be technically effective;
- the pest management technologies must be sustainable.

We believe that one way of ensuring sustainability is to use methodologies and technologies which can easily be accepted by the people expected to use them. Therefore, we must look first at the traditional technology already available or traditional thinking about the particular problem to be solved. About 5 years ago, we started building up a social science interface research group whose main specialty is indigenous knowledge. In any project, they always start by asking: What do people know about this problem and about approaches to solving it?"

"Let us go down to the roots. What methods do you use to identify indigenous knowledge?"

"Let me give you an example in terms of the management of crop borers, moths that attack cereals, legumes, bananas etc., whose main destructive stage lives inside the grain or fruit so that even insecticides can't get at them well. Using our approach, we found very early that the farmers were always intercropping. Yet the Ministry of Agriculture was saying: "No, you must plant your crops individually. Maize in one place, beans in another, and potatoes in another." Then we went into the farming system to find out what is really happening. We found that, in most cases, the level of insect infestation was lower on intercropped plots."

"But how did you find this out? Did you go to the farmers and talk with them, or how?"

"Yes, we did, because we found some very expensive crops being intercropped, for example, pyrethrum. As you know, pyrethrum extract is used for insect control. We found that pyrethrum was grown in bananas, maize, beans, all kinds of crops. Coffee was intercropped, also tea. So we began wondering: if people are doing this despite official instructions to the opposite, there must be something very important in it. So we did a survey and found over 200 crop combinations in Western Kenya alone. This survey was done by an agronomist and an entomologist; it was not something you could easily brush aside. We had to look at reasons why people insist on intercropping. Among other things, we found that – in most cases, not always – this leads to suppression of the insect population. So we took it up and the first element to deal with pest management is intercropping. When we started with intercropping, farmers became part of our research team."

"How did you choose your farmers?"

"Random! Completely at random. We don't look for innovators."

"What about the attitude of the researchers in your institute toward farmers' knowledge?"

"Once we knew the insects and could see where the weak points in their ecology were, then we could move into the field. Not only to our experimental stations but also into farmers' fields, so that we understand what insects are doing under actual farming conditions. We began to learn from the farmers and they began to understand us a bit. Also, ICIPE from the beginning has been multidisciplinary, so we are used to working with different cultures in terms of scientific disciplines. Communication among each other is very easy."

"And so communicating with farmers is also easy?"

"Yes, we are already used to speaking other "languages"."

"What about the farmers? Did their attitude change toward researchers?"

"That's difficult to say. What I can say is: about 5 years ago, the farmers were still suspicious about what the scientists were doing. But now our ICIPE scientists are well accepted by the farmers. The message has got through that we're doing something useful for the community."

"Working with indigenous knowledge, what are the main constraints?"

"I wouldn't put it that way. I would put it that what we establish now as modern knowledge – also in entomology and pest management – will, in 20 years, be indigenous knowledge, for this includes accumulation of past experience. You cannot fix indigenous knowledge; it has to evolve. If you fix knowledge in time, than you are consigning it to a dead civilization. It is there to give you some kind of assurance that there is something behind you, historically and genealogically."

"In the past, you have always put a lot of emphasis on female farmers. What role do they play nowadays in the use of indigenous knowledge?"

"The most important conservators of plant seed and species are women. Every variety that has been recorded, at least in Africa, has been recorded from a store or pot or other storage vessel which the female household members have been keeping. These seeds have been traditionally passed on from

Farmers' knowledge

Albin Korem

More and more agriculturalists are willing to learn about the traditional agricultural wisdom accumulated over the centuries. It is important that this is happening, as many Ghanaian farmers complain to me that traditional knowledge and skills are dying. This was mainly because agricultural education, research, extension and policies for many years emphasized only foreign ideas, skills and technologies, viewing traditional agriculture as backward and primitive.

Since I came to Ghana 18 years ago, I have learned that the farmers are superior to me in many ways. Many of them manifest high social and ecological consciousness without even knowing that such terms exist. I'm not trying to idealize traditional farmers. Many perform very poorly, mainly because they find it difficult to adjust quickly enough to the rapid changes in their environment. However, the African environment will depend first of all on how successful we are in our efforts to uplift the African peasantry. Agricultural development must be based on traditional knowledge and practices as much as on the findings of modern science. I'd like to share with readers a few experiences of Ghanaian farmers' knowledge and practices.

Choosing fields

Near a poor yam trial established by an extension officer at Savelugu in northern Ghana, an official from the Ministry of Agriculture saw a very beautiful yam farm. He went to see the farmer and asked him why his farm was better. Among other things, the farmer said that, when he was choosing the field for his yams, he went early in the morning to find an area rich with dew, in several places he tasted the soil, and he looked for certain plants which indicated that yams will do well on that spot. The extension officer, however, did not possess this traditional knowledge and these skills.

Thomas Odhiambo/photo Frans van den Houdt

"Are you the only one shouting in the desert?"

(Laughing) "I hope not! Otherwise, I would be quite upset. I think that there are many Africans who feel that we really have lost a century. We must now recreate and rehabilitate things which are based in our culture. We must go back to the inspiration of our culture. Now is an exciting time for all of us in Africa, because we are in an age of growth and realization. In each stage of mankind's history, we are going to say: this is now indigenous knowledge. It becomes a new platform from which you can go to the next stage. So I see the future positively."

"But you see the environment degrading. In some parts of the world, it is devastating and still, you are a smiling man."

"It is so, as you say, in some places – but there are also some places which are doing very well! And you know that nature can recover fairly fast. If one real-

mother to daughter to granddaughter. They know their seeds entirely. The same thing with wild plants, forest plants: women know them better than anybody else because they use them regularly as vegetables, as herbal medicines and so forth."

"Getting back to the researchers: You have often spoken of Africanization of research. Does this mean only an increased number of African researchers?"

"No, it's more complex than that. Much more important is: what are the questions we are asking ourselves? A good example: this year we started the international decade for natural disaster reduction, a UN programme. For the international level, discussion was focused on earthquakes, typhoons and other big disasters. For Africa, these are important: they happen in Morocco, in Cameroon. But the major disasters for Africa are different – drought, locusts, epidemics of various sorts. What I mean by Africanization is, when we take the problem of natural disasters, we must be able to address the key questions that concern us. Secondly, we must have the people able to investigate those kinds of questions. Thirdly, we must begin to develop our own criteria for measuring excellence, for giving recognition to good work done."

ly knows the outer limits of nature and knows some of the processes used by nature to recover, then the possibility of rehabilitation is very great. This does not mean we can be complacent, because we should not be complacent about what is happening. On the other hand, I would not cry doomsday, because I read a lot about doomsday. No, I think there are some very good and positive things happening."

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Agroforestry

Practically all traditional farms in Ghana, especially in the north, are based on agroforestry principles. Many traditional farmers are aware that grain crops grow better under Acacia albida trees and do not suffer from the parasitic weed striga. Acacia albida also helps them improve livestock feeding in the dry season. They know that, when crops fail them during drought, their trees can save them. Yet we now hear some people talking about agroforestry as if it were something completely new. Practically no one talks about the need to improve traditional agroforestry systems.

Seed treatment

In the savanna areas of Ghana there grows a tree called Elaeophorbia drupifera. Many years ago, a Bimoba farmer in northern Ghana placed a calabash with grains under this tree and a few drops of white latex from the tree contaminated the grain. A fowl ate this grain and died soon after. In this way, the farmer learnt that he can use the white latex for seed treatment and for poisoning rats and mice. If this traditional knowledge is used widely, Ghana would save a lot of money by not importing rodenticides and chemicals for seed treatment.

Albin Korem,
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In many parts of Africa, beans are traditionally grown by women. This young Kamantan woman in Gidan Maga, Nigeria, has learned about bean-growing from her mother and – hopefully! – will pass on her knowledge and experience to her daughters. Photo: Ann Waters-Bayer.

The Indian science of traditional agriculture

In Asia, Latin America and Africa, there is a growing movement against the replacement of indigenous knowledge and value systems by Western ones and the resulting ecological bankruptcy and socio-cultural disintegration. The PPST (see also Networking, page 33) have been outspoken in this movement in India. Here, T.M. Mukundan gives their views.

T.M. Mukundan

In India, agriculture was not merely an economic activity. It was the basic life-activity of most people in the autonomous Indian village. An early British observer, Col. A. Walker, noted in 1820: ''In Malabar, the beauty of Husbandry (agriculture) seems as ancient as their History. It is the favorite employment of the inhabitants. It is endeared to them by their mode of life, and the property which they possess in the soil. It is a theme for their writers, it is a subject on which they delight to converse and with which all ranks profess to be acquainted'' (quoted in Dharampal, 1971).

World view of Indian science

The world view of the Indian science of agriculture (Krsi sastra) can best be summarised with a quotation from an ancient Ayurvedic text: ''The basic aim of the concepts and fundamental principles of all the sciences is to establish happiness in all living beings. But a correct and thorough knowledge of the basic principles of the universe and the (human) body leads to the correct path to happiness, while deceptive knowledge leads to the wrong path.'' In contrast, the Western view is purely utilitarian, with human beings at the centre of creation.

The ancient scientific texts set out broad principles and their application in a given context, say, a particular region of the country. It is repeatedly emphasised that the particularity of the context is the overriding consideration and the principles are meant as guidelines, not to be applied in a mechanical manner.

Sharing knowledge by all

A very important feature of traditional Indian science is that the knowledge, theories and principles are not meant to rest in a small number of experts, but are created and shared widely, also by the ordinary people who are the daily practitioners of the science. In the Indian tradition, as opposed to the Western view, there is no qualitative difference between scholars and folk practitioners. The scientific texts stress that the truth of the Sastras ultimately lies in the concrete particulars and their use in a real situation.

There was close interaction between scholars and farmers. Text and practice are linked through proverbs in all Indian languages which express the folk wisdom and are as much a collection of scientific information as the texts themselves.

Ancient scientific texts

In the ancient Vedic texts, much attention is paid to agriculture, which was considered a noble occupation. Agricultural implements mentioned include several types of plough. Oxen teams of up to 12 animals provided draught power, and repeated ploughing was done. Cowdung was used as manure,

Not only the "experts" but also the "folk" practitioners are innovators on the frontiers of agricultural science. Theories and technical categories belong to their domain as well. Photo: Sjef Gussenhoven.

and dried cowdung was considered superior. The cow was deeply respected and equated to Mother Earth. The ancient farmers knew how to maintain soil fertility by rotating crops, e.g. rice in summer and pulses in winter in the same field. The Vedic texts also reveal that the farmers knew how to select and treat seeds, and to irrigate by channels and water-wheels (Subbarayappa et al. 1971).

Technology and heavenly bodies

A well-known later text, Krsi Parasara, probably dates from 950-1100 AD (Manjumdar and Banerji, 1960). Written in verse, it opens with a high praise of agriculture and rice. This is followed by verses about meteorology, including a description of four types of clouds and their effects, methods of forecasting annual rainfall, short-term rainfall prediction based on movements of ants, frogs etc., and the relation between planetary movements and drought. Proper care of draught animals and timely ploughing are stressed, and preparation of manure is described. Details are given about seed collection, preservation and sowing, as well as transplanting, thinning plant stands, retaining water in fields, draining fields, planting a kind of seed in one corner of the field to protect the main crop, harvesting and threshing ceremonies, and paddy storage.

Two features are striking: the contents are technical, giving precise details about paddy growing; and all farming activities are coordinated with the movements of planets and stars. This ancient text describes paddy growing in high monsoon rainfall areas as it is practiced in Bengal and some parts of northern India still today.

Plant health

The instruction in the Vedic texts, "Scatter the seeds in the prepared ground", reveals a basic feature of traditional Indian agriculture. The word commonly used for field is Ksetra, which also means the human womb. This indicates the paramount importance of soil preparation and maintaining soil fertility. Healthy crops can be obtained only by taking good care of the soil. Manuring, intercropping and crop rotation are designed to maintain or improve the fertility of Ksetra.

Disease outbreaks or pest attacks are viewed like epidemics in humans. The basic understanding is that outbreaks occur because of imbalances in the ecosystem. A major cause of this is human error, leading to wrong interventions in natural processes. The main protection against disease outbreak is to have a thorough knowledge of nature so as to avoid causing serious imbalances in the ecosystem.

Caring or killing?

Here lies one of the major differences between the Western and the Indian approach to disease and treatment. Indian science understands disease in terms of imbalance in the system and sets about restoring the balance to cure the disease. The effects of worms, insects and other pests on plants are recognised, but getting rid of these pests is not the primary objective of the treatment. In contrast, Western science seems to place the stress on destroying the external agent. The use of chemical pesticides has become the mainstay of the Western approach to plant protection. Such an approach, which ultimately destroys soil fertility by killing also useful organic life, is unthinkable in the Indian science of agriculture. The traditional Indian approach is to grow sturdy plants in healthy soil by selecting soils and crops properly, treating seed before sowing, sowing in proper seasons, using manure, watering properly, and maintaining a fine balance between plants, soils, human beings, animals and insects.

A study of traditional agricultural science is illuminating not only because it shows us ways to devise ecologically safe methods of modern agriculture. Sustainable systems of agriculture can be evolved only if they are firmly based on the traditional agriculture of that particular culture.

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Neem for pest control

Scientific interest in neem is based on its traditional use for pest control. In many Indo-Pakistani urban and rural households, for example, neem leaves are placed between folds of clothing and pages of books to protect against termites, silverfish and other household pests; for the same reason, neem leaves are also mixed with stored wheat, rice, maize, sorghum, and other grains. However, affluent farmers generally do not use neem leaves to protect grains from storage pests because they consider this to be a backward practice. This highlights how well-intentioned government efforts to increase agricultural production by promoting the use of "modern" practices may, unwittingly, backfire.

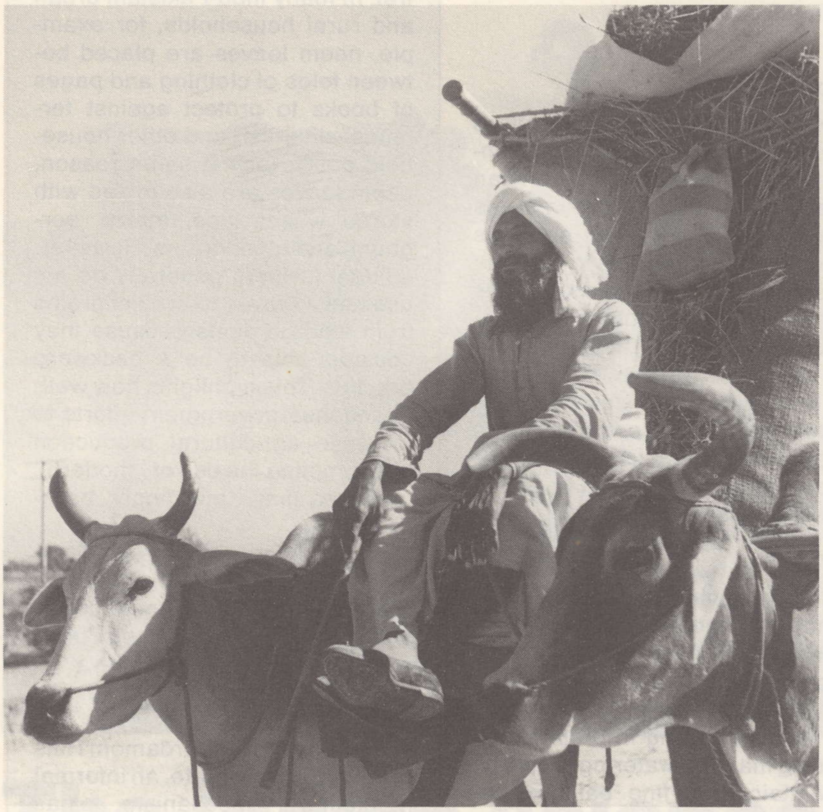
The use of neem cake (residue after oil is extracted from neem seed) for controlling nematodes and other soil-borne pest is, however, increasing even among affluent and sophisticated growers of cardamom, citrus, vegetables and sugarcane. In the Cardamom Hills of India's Kerala State, an informal marketing mechanism has evolved, and 3000 tons of this product is now sold annually – and mostly by pesticide dealers. The product is transported from Karnataka and Andhra Pradesh (250+ km away), and is sold for Rs 1/kg or more. Yet, farmers are willing to invest Rs 100/ha or more, as neem cake appears to be the most effective product for nematode control.

Traditionally, neem is probably best known for its medicinal uses. Its virtues are even described in Ayurveda and Puranas, which are among Hinduism's classic documents. Many Hindus begin their new year by eating a few neem leaves for blood purification.

All temples of the Goddess Mariamman have at least one neem tree in the courtyard. Probably it was because of these numerous therapeutic uses and its hardy nature that neem's admirers from West Asia bestowed upon it the title azad dirakht (independent tree) more than a thousand years back.

Saleem Ahmed, from paper presented in Symposium on Natural Resources Management for Sustainable Agriculture, February 1990, Indian Society of Agronomy (Proceedings to be published). Saleem Ahmed can be contacted at Resource System Institute, East-West Center, 1777 East-West Road, Honolulu, Hawaii 96848, USA.

The past can feed the future



How did Indian peasants 200 years ago manage to produce up to 10 tons/ha without following the ruinous practices of today? Photo: Peter Pennarts, Studio 3.

At the international symposium on Natural Resource Management for a Sustainable Agriculture held this February in New Delhi, the historian Dharampal suggested that keys to solving agricultural problems in India could be found by making a careful study of 18th century Indian peasant technology. Here, we bring parts of his paper.

Dharampal

In the past few years, I and some friends have been looking at the records of a 7-year survey conducted in Chingleput district near Madras by a British engineer, Thomas Barnard. The first analysis shows an average grain yield of 3600 kg/ha of irrigated paddy and 1600 kg/ha on non-irrigated land over a large area covering 800 villages. In the 130 villages with the most productive land, average yield was 8200 kg/ha. Among these were many producing more than 10,000 kg paddy/ha. And this on land which is of no more than moderate fertility in the Indian context.

How does one explain the spectacular yields obtained by the Indian peasant at that time? The details of the technology that made this possible need to be studied carefully. Many 18th century Western observers commented on the variety of seeds used by the Indian peasant, the sophistication and simplicity of his tools, and the extreme care and labour he expended in tending his fields and crops. For example, Alexander Walker, who lived in Malabar and Gujarat from 1780 to 1810, noted that in Malabar alone more than 50 kinds of rice were cultivated. He also noted the variety of implements used by the Indian peasant, e.g. the different ploughs, ''both Drill and common, adapted to different sorts of seed, and soil.'' The observation of a drill plough working in the fields of southern India in 1795 came as a shock to Captain Thomas Halcott, who had imagined this type of plough to be then a recent European invention.

Referring to the careful habits of the Indian peasant, Alexander Walker remarked that he had seen ''details of the most laborious cultivation, of the collection of manure, of grains sown for fodder, of grains sown promiscuously for the same purpose, of an attention to the change of seed, of fallows and rotation of crops.''

Borrowed technologies

Increasing productivity of Indian agriculture is a major problem we have been trying to tackle since 1947. For this purpose, we have extensively borrowed technologies from elsewhere. But it is widely said that these technologies are proving ruinous for our land. It seems that we are actually consuming the fertility of our land in order to obtain productivity of the order of 5-6 tons a year on some of the best lands in India.

How did Indian peasants 200 years ago managed to produce up to 10 tons/ha without following the ruinous practices of today? We have so far introduced modern practices mostly in the irrigated areas of the country. Rainfed agriculture is still relatively untouched. Before we decide to devise new policies for this, it is imperative to understand the Indian ways of practising relatively high-productivity agriculture in rainfed lands.

Far too long, India has been directed and planned by people functioning largely on such residual knowledge and methodology which we inherited from 150 years of British dominance, and what we have since borrowed from Europe and USA. The time should have now arrived when, before we borrow any specific knowledge or technology from other lands, we shall first locate and harness our own intellectual and spiritual resources to provide us the basis for the more desirable future.

Learning from our own people

What I am suggesting is not because of any civilizational revulsion to learning from the rest of the world. All knowledge is, in a way, a mix of the indigenous and the alien. Transfer of technology has been going on in the world, at varied paces, from the beginning of history. But it is only such borrowings which, after the transfer, get transplanted and strike root which have led to growth. In all such cases, the new knowledge was married to the need with discrimination and, if it worked, was allowed to modify itself according to the priorities and preferences of the borrower. In India, most borrowing in the past 200 years has been blind and indiscriminate imitation.

If we are seriously concerned with natural resource management for a sustainable Indian agriculture, we shall have to reverse the ongoing process and begin to learn from our own people and our environment, and take only that from the outside world which we feel we shall be able to digest and internalise.

Dharampal. For further information contact Anil Gupta, IIMA, Vastrapur, AHMEDABAD 380 056, India.

Photo: Hans Carlier.

Andean agriculture – a development path for Peru?

Introduction of Western technology in the Andes is destroying the peasants' basis for survival. Describing contemporary aspects of Andean agriculture, Maria Salas and Hermann Tillmann argue that the indigenous knowledge provides a viable alternative for development in the Peruvian Andes.

Maria Salas
Hermann Tillmann

Latin American countries have a significant peasant population in more than 400 ethnic groups, such as the Aymaras, Quechuas, Mayas, Quichés, Nahuatl and Mixtecos. The history of these people can be traced back more than 20,000 years. In the Peruvian Andes, despite 500 years of Western colonization and recent national modernization efforts, the knowledge, skills and practices of peasant agriculture still exist today. This reflects the strong sense of identity and creativity of these peoples.

Andean tools

The most versatile tool for the Andean slopes is the chaquitaclla or footplough. Created in the 10th century B.C., today it has been transformed by peasants in different parts of Peru. The wooden nib has been replaced by a forged piece of iron. The iron and the handle have taken on many forms and sizes according to soil type and gradient, microclimate and the unique characteristics of each farmer. Among the 15-50 different tools that a peasant family owns, 5-7 models of the chaquitaclla can be found in each family. It is deliberately used to minimize erosion, since it leaves whole lumps in the ground without pulverizing it.

Land-use techniques

The Inca terraces are known as the most spectacular means of using sloped land in the Andes. When investing social efforts in maintaining the terraces, peasants are conscious of their main functions – preventing soil erosion, building up soil fertility and facilitating water management. Terraces cover about 50% of the arable land in the highlands (1 million ha) but only a small part is still in use, since peasant communities have been historically pushed to higher zones. There they practise Wachu (furrow), T'aya (plowing), Ticpa (minimum tillage) and Waru Waru (ridges), among other land-use techniques.

Andean crops and multiple cropping

Andean peasants manage a diversity of crops and crop varieties. ''Native'' crops like potatoes, maize, beans, tubers (mashua, oca, olluco) and grains (quinua, canihua, tarhui, quiwicha) are combined with ''exotic'' crops like wheat, barley, rye and European and Chinese vegetables. These have been adapted to different altitudes and are grown in up to 20 plots in different ecological zones. A plot is seldom dominated by a single crop, and even a potato field has up to 10 different varieties.

Crops are combined for different purposes. As protection against certain diseases, mashua and potato are grown together. To prevent cattle damage, tarhui (lupine) is planted on the edge of maize fields. Maize, beans and pumpkin complement each other in fertility and growing space. The diversity of crops grown in one patch (1.20 m x 10 m) achieves extraordinary ranges among the horticulturists in Pucara (Mantaro Valley), who sow up to 8 different vegetables together, surrounded by 7-10 different classes of herbs.

Classification systems

The peasant system of classifying plants (e.g. over 400 potato varieties) gives evidence of their detailed observation and interpretation of the environment. Peasants order natural phenomena like soil, rain, hail, frost, the position of the moon, the brightness of the pleiades, and animal behaviour into categories which make sense for agricultural use.

Simplifying a complex system of thought, the classification relies on two basic principles: dualism and relativism. Dualism is a way of perceiving opposites that can be divided but, at the same time, remain complementary. For example, all territories in the Andes are divided in high (hanan) and low (hurin), or soils are principally cold (chiri) and warm (qoni), or land use can be pastoralist (astana) or agricultural (layme). Applying the principle of relativism, the opposites lose their absolute delimitation. For example, high terrain becomes low when the point of reference and perception of the peasant is on the former – for an external observer a clear sign of logical inconsistence, but for the peasant a smooth passage to blend opposite values. The point of reference is the middle (chaupi). These taxonomies are expressed in the oral traditions and normal conversations.

Food conservation

Besides several storage methods (Pirhua, Troja, Chalhuanca) due to the erratic harvests, the most salient Andean practice is the processing of tubers like Chuno (dehydrated potato). It is done by carefully selecting bitter potatoes (Shiri, Mauna, Kaullirsh) cultivated at altitudes above 4000 m and on plots known for frost incidence. Directly after harvest, the potatoes are exposed to the alternation of daily sun and night frosts for 5 days. Then they are kept in small rivers to wash out the bitterness. Finally, they are dried and can be stored for years.

Marginal practices?

It has been argued that these practices are marginal and disappearing in the face of Western industrial agriculture. To the contrary, we regard Andean agriculture as a coherent answer of peasant society in dealing with nature and the market. Andean agriculture continues to exist because it represents:

Response to ecological diversity. The Andean mountains, which rise above 6000 m, have the greatest ecological diversity in the world. The peasants translate this into a vertical strategy of land use, maintaining the area as one of the world's major centres for plant domestication. As in the past, peasants are still capable of transforming a "natural disadvantage" into a positive response.

Search for security. Andean peasants optimize the use of their resources relying on their own potentials and applying mechanisms to avoid ecological risks such as drought, frost, hail and diseases. Their main concerns are storing goods, exchanging products from different communities and sowing in various small plots. This logic explains their attitude toward cash crops. They prefer the security of producing food for themselves, more than remuneration.

Appreciation of quality. The peasants also sell part of their harvest to cover expenditures for education, housing, etc. But for their own consumption, they look primarily for quality and prefer a tasty, sandy, small native potato grown in a high plot without chemicals, instead of modern potatoes with high water content due to the use of nitrogen fertilizer.

Community identity. Andean agriculture is a collective achievement of about 5900 peasant communities. This is the basic social unit which structures the life of the majority of rural people. As a democratic institution, it protects

Food conservation The drawings come from Minka, Huancayo, Peru.

The Andean foot plough or chaquitaclla has been transformed by peasant in different parts of Peru. It is deliberately used to minimize erosion. ▼

peasant families against external aggression and regulates internal mutual help in access to pasture, communal farmland and other resources. When an Andean woman (or man) introduces herself, she says "I belong to the community of Sacas, my name is Maria." This shows that the collective identity of the peasant community comes before the individual identity.

A viable alternative for Peru

The value of working with indigenous knowledge is a central debate in political and academic spheres in Peru, as it concerns the future perspective of the nation. During the last decades, Peru faces a general economic crisis, severely affecting 90% of the 22 million people. What can be the role of indigenous knowledge? Two controversial tendencies emerge.

On one hand, the agrarian nature of Peruvian society and the urgency of rural development based on peasant technology and culture are stressed. This is a position with strong national feelings and recognition of the values of precolonial and contemporary Andean knowledge. It focuses on crystallizing an Andean agricultural science, democratizing the society, seeking autonomy in national and peasant community development, and respecting cultural plurality.

Others insist that the agrarian tradition is a relict of the past. This is a position which shows a great esteem for agricultural innovations coming from abroad.

The experience of peasants and Andean agronomists is that indiscriminate introduction of Western technology like pesticides, chemical fertilizers and high-yielding varieties is destroying the natural basis for the survival of peasant society. This relies on a fine technological and cultural response to nature. Development must be based on the aims and daily practices of peasant communities. It requires respect and understanding of Andean culture and knowledge instead of Euro-centric transfer of harmful recipes. Above all, it requires a change of attitude in development workers and politicians. And from external donors, it requires that they support national efforts to realize this alternative Andean paradigm for development. ■

Peasants are proud to share their knowledge

In many Latin American countries, institutions and groups are working with indigenous technical knowledge to promote development. Initially, the external agent (technician, researcher, extensionist) had the central role: interviewing peasants, inventorizing, experimenting and disseminating validated technologies. Although a necessary task, this fell short of the challenge involved in revalorizing peasant knowledge:

- peasants were still treated as individual informants,
- peasant knowledge was extracted out of the social basis of knowledge production,
- findings did not reflect the social interest and symbolic representations of peasant groups.

Aware of this challenge, the attempt is now being made (e.g. by Minka and PRATEC) to apply methods which give more consideration to the actors in knowledge production. Not only tools and skills are looked at, but also the cultural forms of how peasants conceptualize their experience, how knowledge is transmitted from person to person and from generation to generation.

One of these methods is "the workshop", group events with the following characteristics:

- Peasant specialists (women, men, young, old) recognized by their own people get together. It is important that behind each individual stands an organization (community, association, "ronda") endorsing participation in the event.
- The initiative to organize the event is articulated by the group. It can be a request to analyse a production problem or to plan community activities related to a topic or crop.
- The workshop is conceived as a discussion forum where the use of methods familiar to the peasants permits their active participation. Cognition, emotions and actions are stimulated through group discussions, case studies, acting out myths, narrating rites, and making drawings about their knowledge and values.
- The role of the external agent is as facilitator of the discussion process. S/he recognizes that peasant knowledge is culturally signed and specific to the social organization. Scientific knowledge and peasant knowledge are both valid, so the external agent creates a bridge between the two by means of an intercultural communication process: exchange of different ways of perception, common agreements and joint planning of social action.

After a few days of a workshop, peasants express themselves in their own language and with their own categories. They produce detailed technical information verified by the experience of the whole group and identify constraints to their own solutions. Peasants feel proud to present, share and systematize their knowledge in this way. They are stimulated to report to their people of the value of their own knowledge. This strengthens their commitment to build upon their agricultural practices and to mobilize social efforts to do so.

Maria Salas and "Timmi" Tillmann

The peasant journal Minka is edited by Grupo Talpuy, Apto. 222, Huancayo, Peru. PRATEC (Pumacahua 1364, Lima 11, Peru) works with institutions and peasant organizations in Peru, Bolivia and Chile.

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Citrus trees being planted. In the first couple of years the young and vulnerable tree is treated with an anti-termite mixture. Photo: Roger Sharland.

A trap, a fish poison and culturally significant pest control

In Southern Sudan, indigenous techniques used in hunting and fishing have been applied to stop termites from eating young fruit trees. Roger Sharland, who worked for many years with the Moru people, gives an example of how knowledge rooted in local culture can be adapted to solve new problems with new crops.

Roger Sharland

A major part of my work with the Moru and their neighbours, the Morokodo, in Muncri District was encouraging them to plant citrus trees, at first for their own use and later, when the trees yielded more, for income from the surplus. The area is marginal for citrus growing, as it has a long dry season. But the farmers had already seen the value of citrus, so they were willing to look after the trees.

Trees weakened by water stress in the dry season were easily attacked and killed by termites. The first response to this problem was to import Dieldrin, which effectively controlled the termites but raised new problems. As it is not locally available, its use leads to dependency. As the farmers are not accustomed to using chemicals and measuring precisely, there was much misuse of Dieldrin.

Looking at local pest control

As using Dieldrin was obviously not a sustainable solution to the termite problem, started to investigate how the local people traditionally control pests. I found many cultural techniques for preventing pest build-up but, except wood ash, no example of using local preparations on crops. There were, however, several examples of poisons being used for fishing and hunting. Some of these appeared suitable to adapt for use in farming.

One of the most promising of these was actually used by the Morokodo to control termites. The Morokodo make a technically fairly sophisticated type of spring trap to catch game. It is made from a wooden bow sprung with a piece of hide, and has numerous wooden and leather parts which are vulnerable to termite damage. The Morokodo have developed a mixture to repel termites, using a bulb they call boro and the fruit of the tree *Catunaregan spinosa*, called girizo in Morokodo and terinje in Moru. The bulb and fruit are pounded together with water into a concentrated pulp and poured over the traps.

The Moru do not have the same kind of traps as the Morokodo, so they do not know about the use of boro and terinje against termites. But they are familiar with both plants as fish poisons, which are used to stun fish in pools and slow-moving streams. The Moru therefore know where to find these plants, and how to collect and prepare them.

Old solution for new problem

Having 'discovered' this local preparation, we tried it on some trees in our fruit tree nursery to see whether it could be used to control the termites there. The termite species that attack living trees differ from those that attack dead wood, so it was important to find out if the preparation was effective against all types of termites. We also had to investigate whether the preparation had any damaging effect on living trees.

Some of our senior staff, who were familiar with using the preparation for traps, made the same mixture and poured it around the foot of randomly selected trees in the early dry season. Elsewhere in the nursery, other trees showing signs of termite attack were within the local cultural context. The farmers, who are also the hunters and trappers, do not use measurements in any of these practices. They evaluate in ways culturally very different from those of formal science, but equally valid for their purposes. They have finely tuned means of determining whether mixtures are right and which agricultural practices to apply. It was practising farmers, i.e. those working in the nursery, who assessed the preparation as being effective against fruit tree termites. They then passed on this assessment via the extension network (also made up of practising traditional farmers) to other farmers.

One of the problems with using agrochemicals such as Dieldrin was that the measurement and precision needed was not within the farmers' experience. To introduce a locally-made insecticide based on the same premises of careful measurement would probably have made it another foreign concept, only relevant to those who had been to school, and would have raised the barriers to its acceptance.

Culturally appropriate extension

The recommendation to the farmers that resulted was like this: "Make a mixture of boro and terinje as you would prepare it to protect a game trap (for the Morokodo) or to use as a fish poison (for the Moru) and pour it over the base of the fruit trees in the first couple of dry seasons of the tree's life, to protect the tree from termites". This was thus a recommendation firmly rooted in the indigenous knowledge of the people, but adapted for use in a different situation. It could be easily understood by the farmers, who recognised that the trees suffered in the dry season and, on treated later in the dry season. The preparation proved to be very successful in both preventing and curing the termite attacks and, thus, helping the trees survive the dry season.

Since it is when the trees are weakened by water stress that they are most vulnerable to termites, the need for pest control is seasonal. Catunaregan spinosa forms fruit in the dry season, when it is most needed. Also at this time, there are no heavy rains which could wash the mixture away from the tree base. If a young tree is treated for the first couple of years, it is then normally strong enough to resist the termites.

How strong should the dose be?

Having seen that the preparation was effective, we planned to continue experiments with methods more acceptable to formal science. We wanted to determine the optimum dosage so that we could give precise recommendations to farmers. However, as the civil war in Southern Sudan escalated, the experiments in the nursery had to be abandoned before completion. All we can say is that the concentrations used do not seem to make much difference: the local practice for the traps varies considerably with equal effect. Presumably, lower doses than those now being used would also be effective but, since the active ingredients are free and readily available when required, there is no urgent need to use lower doses.

The lack of a precise dosage was, to some degree, fortuitous as it led to further thought about using the mixture closer inspection, could see the termite problem, for which they then had a remedy.

This is one of several examples of how indigenous knowledge can be used in agricultural development (Sharland, 1989). A technology used by the Morokodo for termites and by the Moru themselves for a fish poison was applied to solve a new problem in a new crop. Within their farming culture, farmers throughout the world have ideas and practices which can be expanded and applied to a wider or different use.

My first objective was to find a way of preventing termites from eating fruit trees in the area where I was working. The technique is useful within that context, but is probably not well enough developed to extend to other areas, as our research facilities were limited and our 'scientific' culture requires more measurements. Our method of investigation, which relied heavily on indigenous knowledge, was valuable and quick in determining the local effectiveness of the product, but cannot give the precise information required for wider application. The important lesson is the value of applying local technologies in a way which suits the concepts of the local people, without worrying about Western measurements. These would have greatly slowed down the investigation and, in the midst of civil war, would have meant that an idea useful for the farmers might never have become available.

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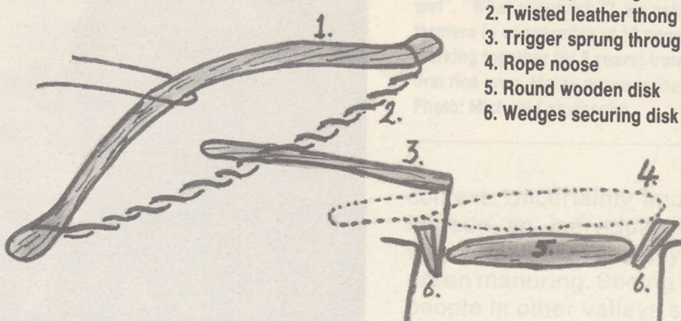

1. Naturally curving bow of hardwood
2. Twisted leather thong
3. Trigger sprung through twisted thong
4. Rope noose
5. Round wooden disk
6. Wedges securing disk and sprung trigger

The Morokodo trap, which is made of locally available but termite-susceptible materials, is set on a game track. A mixture made from the bulb and fruit of the girizo tree is used to protect the trap from termites. A small hole is dug for the trap and camouflaged with soil and leaves. If an animal steps through the noose, it also steps on the wooden disk which sets off the trigger tightening the noose. Drawing: Roger Sharland.

The major factor in the subsistence strategy of the Moru people is reducing risk of total crop failure. It is very effective in reaching its aims and has proved to be adaptable to a changing social and economic environment. Photo: Roger Sharland.

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Johnson Mugarura and a farmer examining Sesbania seedlings intercropped with yam (*Colocassia*). Sweet potato is in the background. Photo: Michael Loevinsohn.

Elements of farming systems developed by Asian farmers are being adopted and adapted by African farmers. Michael Loevinsohn tells how farmers in Rwanda are responding to the new ideas by experimenting and innovating. They have thus found ways of intensifying crop production in a densely populated highland area.

Feeding farmer innovation

Michael Loevinsohn

The Central Plateau of Rwanda is a region of rolling hills and well-watered valleys between 1500 and 1900 m above sea level. It supports a population density among the highest in Africa, reaching more than 700 persons/km2 of arable land. Phaseolus beans, sorghum, sweet potato and banana form the basis of small farmer agriculture that dominates the landscape and that, until relatively recently, was restricted to the tops and flanks of hills. Over the last few decades, however, population pressure and the resolution of a centuries-old conflict between herders and farmers have opened the valley bottoms to cultivation. Over the same period, farmers adopted new crops such as cassava and potato and integrated new practices, including manuring and composting.

For the last one and a half years, I have been working with groups of farmers to find ways of sustainably increasing food crop production in small valley bottoms. Together with colleagues from a Ministry of Agriculture project, I have been exploring a participatory approach to farming system improvement adapted to a situation where, on the one hand, ecological conditions and farmers' concerns vary greatly, even over short distances, and, on the other, formal research faces important human and financial constraints.

We have sought to stimulate innovation by introducing new elements to farmers that have yet to be fully explored by national researchers. We illustrate their use by citing farmers' practices in other countries and continents, and discuss possible modifications. Further stimulation occurs during regular visits to other groups and to the station, where research proceeds in parallel.

Presenting new ideas

After a rapid appraisal of the area, we approached 4 groups of farmers, field neighbours or members of cooperatives, and engaged them in discussion of the problems they faced in the valley bottoms. Many spoke of the extreme shortage of land, to which they saw few solutions other than renting or buying. Could we lend them some money? Well, no, but was the land they had really fully exploited? They grew sweet potatoes and a range of cash and subsistence crops on their raised beds but nothing on the land between. Why? Nothing will grow there, some replied, it's too wet. What about rice, we asked? Farmers in Indonesia do just that, in a system known as sorjan. It had never been tried in Rwanda. Would they like to?

A number of options were debated, of how, when and where to implement the idea. Though rice is appreciated as a food, practically none of the farmers had ever touched a growing rice plant. For our part, we promised to work with them, as groups, to provide seeds and advice; the choice of option, and the risks, would be theirs. We discussed frankly the risks as we saw them. The most important one we foresaw was the adaptability, particularly to low temperatures, of available varieties; the nearest area of rice cultivation is some 200 m lower.

Each of the groups agreed to work with us on these terms and we presented other ideas in a similar manner. The limited availability of fertilizers, organic or mineral, was a major concern to farmers. We suggested making use of ''umunyegenyege'', Sesbania. A fast growing leguminous shrub exploited locally for forage and medicine, in India and Indonesia the plant has long been used as a short-cycle green manure before rice. While only vaguely familiar with the concept of green manuring, farmers were receptive and together we discussed different ways of integrating the practice into their production system.

"Nothing will grow there" some replied, "it's too wet". "What about rice"?, we asked. A group of farmers (a cooperative of 13 people that has been working together for 8 years) transplanting their first rice crop. Maize grows in the background. Photo: Michael Loevinsohn.

Selective adoption

Farmers responded avidly to the invitation to experiment with rice, in a manner that can hardly be described as risk-averse. Many planted rice on the larger part of their land, though only a handful adopted the sorjan concept; most proceeded to level one or several beds to create a paddy. A number of farmers told us that, with only a few beds, the area between them was too small and the work involved in levelling was worth the space created.

Had we pursued the sorjan concept in a more conventional approach, this lesson might only have been learned after several seasons of on-station and researcher-managed trials.

Labour-intensive solutions

Rice yields averaged just over 2 t/ha in the first season; considerable production was lost to blast and sheath rot, diseases often associated with low temperatures. Currently, farmers are managing trials with up to 9 varieties, to identify ones better adapted to local conditions. Yet, on the whole, they declared themselves satisfied with the yields they had obtained; farmers compared them favourably with those of sorghum, seemingly little concerned by the greater effort rice demanded. In the second full season, now beginning, the number of farmers participating has more than doubled in 3 of the 4 groups.

Labour-intensive solutions have also been favoured in integrating rice into the annual rotation. Sweet potato is, for most families, the major caloric staple. The valley bottoms are crucial in ensuring an unbroken supply of planting material for the hillsides, where it yields best. The pattern that is emerging among the groups is to grow rice during the long rains in paddies, then rebuild the beds for sweet potato in the long dry season. For some farmers, this has meant more than a doubling in the area under crops each year.

A range of approaches to exploiting Sesbania are being tried. These include plowing it under before rice (the Asian practice), intercropping it with maize, cabbage or yams, and growing it along the edge of the beds, harvesting it repeatedly down to about 20 cm. No one approach has yet to be widely adopted, and continued local research is needed to overcome problems such as uneven growth.

Farmer groups and innovation

The experience so far with both rice and Sesbania has shown that groups may more easily overcome certain ''thresholds'' that constrain innovation by individuals. Acting together, farmers have realized several economies of scale: canals have been dug that all needed and no one could build alone. Similarly, it has been seen that a child can readily guard several neighbouring fields against birds. The simple measure of planting a larger area in synchrony reduces the number of birds attacking any one field.

But the process of experimentation itself may be strengthened in a group context. Uncertainty and ridicule may impede an individual experimenting with something radically new, such as green manuring. Seeing neighbours or people in other valleys struggling with the same problem appears to provide an important boost. And with regular visits between groups, promising approaches are quickly noted and adapted: peripheral canals, irrigating fields directly, have now been built by each of the 4 groups.

A neglected resource

Today, much of the Central Plateau is suffering famine, the culmination of 3-5 years of poor harvests. Many observers see the hunger and deaths as the inevitable consequence of a rapidly rising population attempting to support itself on a fully exploited land base. A series of famines that ravaged the country from the 1920s to the 1940s was similarly explained by several colonial writers. Rwandan farmers responded to those crises by innovating, adopting new crops and colonizing the valley bottoms.

New solutions are now required to make possible a sustained intensification of production. In areas like the Central Plateau, these must inevitably entail making more effective use of the most abundant resource, labour. Successfully developing and adapting such solutions appears possible only by enlisting what has been until now the most neglected of resources, farmers' innovativeness. ■

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Working with local knowledge in range and livestock development

Some of the range management techniques and systems developed by African pastoralists were described by Maryam Niamir in ILEIA Newsletter 5/2. She now gives some examples of how this indigenous knowledge is being revived or modified, also within development programmes.

Maryam Niamir

Traditional African range management techniques were largely successful in sustaining livestock production in the past. Recent external events, such as droughts, population increase and certain government policies (e.g. land nationalization, replacement of traditional authority with governmental structures) have led to resource shortages and local socio-political confusion. In many cases, the traditional system could no longer cope with this and the old techniques were abandoned. However, in some cases, they have remained alive and viable or have been modified.

Recently, the view has been becoming firmer that the constraints to livestock development in the Third World can be minimized and the potentials maximized, if more time is spent understanding the rationale behind the traditional pastoral systems, and if an ''intermediate technology'' can be designed to bridge the gap between them and modern ranching systems. In many cases, traditional management techniques appear to be a good basis for such intermediate technology.

The following examples are intended as concrete illustrations of the potentials and pitfalls of incorporating traditional techniques into the development process.

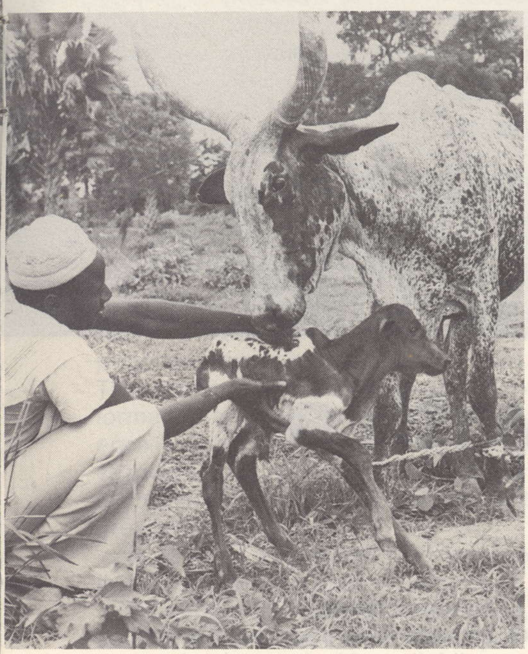
Drought-hit Fulani

The Oxfam-Abala project in 1974 tried to help the Wodaabe Fulani in Niger, who lost considerable numbers of livestock during the drought, to restock their herds. The project based its programme on the traditional ''habanae'' system of lending cows: the borrower of the cow may retain her for three calvings, and then gives her back. The project slightly modified this by allowing women to borrow cows, accepting equivalent cash returns for the loans, and empowering an elder or other community member to record loans and repayments, thus relying on traditional social sanctions against unrepaid loans (Scott and Gormley, 1980). The project is regarded as a success, since most of the loans were repaid. Between 1974 and 1983, about 350 families were given loans. By 1983, 80% of the cows had been given back to the project (IFAD, 1987).

Borehole management

The Tatki borehole in northern Senegal was created and managed by the parastatal Socifété d'Outillage Mécanique et Hydraulique of Louga. Since November 1985 the Government has tried to hand over the borehole to a local management committee chosen from a minority (Wodaabe) rather than a majority (Bisnabe) group. This Government-sanctioned committee has failed to enforce a management plan for the bore-

Control over water resources has traditionally been a means of controlling access to grazing resources in pastoral areas. Efforts to improve water supply are more sustainable if they build upon indigenous social groupings and controls. Photo: Ann Waters-Bayer. ◀



According to the Fulani's "habanae" system, a person in need can borrow a cow, keep it until it gives three calves, and then return the cow. This is a traditional system of social security, upon which post-drought herd-rebuilding programmes can be based. Photo: Ann Waters-Bayer. ▲

hole. At the same time, the Bisnabe created their own committee and are more effective at collecting dues for fuel from individual users. However, the Bisnabe committee lacks the necessary backstopping from the Government for borehole maintenance (Diop, 1987).

Afar grazier association

The Afar of northeast Ethiopia and Djibouti have traditional grazier associations based on clan membership, each with distinct pasture boundaries. The associations have a general assembly, an association committee, elders of each community who mediate between the association and an individual, and a traditional association chief. Recently, the Government of Ethiopia incorporated these associations as local administrative units. The association committee is the main link between the association and the Government. All major decisions, such as range improvement plans, are passed by the Government to the committee who then decide on their merits and pass them on to the general assembly for approval. When a study of these associations was done in 1986, it appeared that the Government had successfully adapted a traditional institution to modern needs (A. Gebre Mariam, 1986, cited in Swift, 1988).

Reviving grazing reserves

Following a failed attempt by the British Administration in Somalia to revive traditional grazing controls, some projects in the late 1960s were more successful at creating grazing associations. However, after a good start, the associations were overtaken by the 1974 drought, which completely disrupted all forms of grazing control (Swift, 1977). Since the herders continue to be willing to abide by grazing rules, there is still potential for reviving grazing controls, but any new attempt should allocate enough time for the associations to "mature" and set up contingency plans in case of droughts and other disasters.

Grazing reserves

The "hema" (plural "ahmia") is probably the world's oldest effective range conservation programme, going back even before the advent of Islam. There are five types of ahmia reserves in the Middle East and North Africa:

- reserves where grazing is prohibited, but hay can be collected at specified times and places and by specified needy people;
- reserves where grazing and/or cutting are allowed, but only in specified seasons, such as the Elazahra and Hameed ahmia near Belgurashi in Saudi Arabia;
- reserves where grazing is allowed year-round, but the number and type of livestock are controlled, such as most of the ahmia around Taif in Saudi Arabia;
- reserves for beekeeping where grazing is allowed only after flowering;
- reserves where certain trees are protected, such as the Oneiza hema in the Najd Plateau where Haloxylon persicum is protected to help stabilize the dunes.

Ahmia can be found in Syria, Saudi Arabia, Kurdistan, the border of Syria and Lebanon, and Tunisia. However, political and legislative changes in this century have contributed to a breakdown of the systems. In Syria, the Government has tried to revive them by creating project-assisted "hema cooperatives". Eight were established in 1968-1972, and 22 were in operation by 1978. The Government has signaled the importance it attaches to the programme by passing supporting land tenure legislation (e.g. to prohibit ploughing and cultivating of rangelands in the Syrian steppe) and setting up research/development centres in each hema for developing appropriate range management techniques (Draz, 1974, 1978, 1985).

Conclusion

Experiences with reviving traditional range and livestock management techniques have been mixed. Some activities were successfully planned and implemented; others started well but were later overtaken by political changes or droughts. The examples show that the chances of success are greater if they are "bottom-up", if they are accompanied by formal recognition and assistance from the Government, if they are provided with appropriate institutional structures, if they take into account local socio-political factors, if they allow for local heterogeneity, and if they are given enough time to become established. ■

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Farmers were having problems with the official wheat-growing technology until some began developing technologies of their own. It now looks as though future wheat production in Thailand will be based on their alternative technologies. John Connell tells how a "minimalist approach to PTD" stimulated their development.

Farmers experiment with a new crop

John Connell

Thailand is a major rice exporter, but has no history of wheat growing. In view of rising consumption, the Government began promoting wheat in 1983, mainly in the irrigated paddy fields of the Upper North after the November/ December rice harvest. The region is mountainous, and the paddy fields in small valleys and on lower hill slopes present a diverse production environment.

The recommended production technology was meant to avoid waterlogging in the paddy soils. It involved full soil preparation, raised seed beds, row seeding and furrow irrigation, but this led to problems. For instance, raised seed beds prompted farmers to irrigate by letting water flow unattended, overnight or longer, through the channels between the beds, leaving the soil completely saturated. The technology itself was viable, but would have required a long and costly training programme before it could be adopted widely by farmers.

Stimulation

Some of the extension agents did not promote wheat aggressively and were satisfied to enlist a few farmers interested simply in trying the new crop. These agents were also aware of alternative technologies, e.g. broadcast sowing or minimum tillage, and suggested that the farmers also try these out on small areas.

In the first village where farmers started doing this, 11 of 23 farmers who tried growing wheat used a total of 12 different component technologies. With 2 varieties sown in 4 distinct soil types, a total of 24 specific interactions of technology/ variety/ soil-type occurred in their fields.

Two factors stimulated farmer experimentation: technical options were presented to them, inviting comparison; and plots were kept small, limiting not only the farmers' risk but also the possible monetary return, so that their initial motivation for looking at the new crop was their interest, not cash.

In the following seasons (1988/89 and 1989/90), this approach was consciously applied in 13 villages through extension workers of various government and NGO programmes, and bilaterally-funded highland development projects.

Farmers' technologies

At all sites, 15-50% of the farmers began investigating alternative technologies in the first year, and more in the second. Most farmers tried only one new component, but each village had at least one experimenter who compared two or more. The components investigated covered the whole range of management practices from soil preparation, through small equipment development, to irrigation. Most importantly, the technologies the farmers tried were not limited to the initial options presented. These were just the starting point.

Three key production technologies have emerged out the farmers' experiments:

- minimum tillage or direct drilling of seed into unprepared paddy soil, applicable where farmers have no access to tractors for tillage, or where weeding would be facilitated by row seeding;
- broadcasting seed onto prepared soil followed by harrowing to cover the seed, applicable where quick seeding is desired and farmers have access to tillage equipment/ labour;
- dibble or hill-seeding, applicable in rainfed production on sloping land, usually by minority hill-tribe farmers.

Farmers in separate areas have converged toward these technologies with little outside influence on their decisions. While the main technologies have crystalized, farmers are still eval-

Akha villagers examine wheat from a farmer's test plot. No progress has been made in this village due to village moving as part of a government relocation programme.

A farmer looks at two methods of seeding rainfed wheat: row seeding and broadcasting. He said that he liked row seeding if he had time, but that broadcasting was quicker.

uating and modifying them. In one village, for example, farmers have used 6 harrowing methods, giving different seed cover and seed depth.

Limits

Some limits to this unguided process of technology development could be seen. The farmers' evaluation of the technologies was hampered by their tendency to use the chosen technology over their whole field, so comparison could be made only with the crop in a previous year or in a neighbour's field. The farmers often attributed crop performance to the most obvious difference in technologies, e.g. broadcasting vs row seeding, when some other factor such as irrigation practice actually had greater effect on yield.

An attempt was made to overcome this analytical weakness of the farmers. In a post-harvest meeting in one village, the farmers counted the number of people whose yields fell into each of four

Two farmers (plots in the foreground and on the hill above) both tried two methods of seeding; row and broadcast seeding.
They realised that they had seeded too late for rainfed production, but they were still interested in the outcome of the experiment. The buffalo as well!

yield levels on a rough bar chart. On this basis, they discussed different management practices in relation to yields achieved. Thus, what had been learnt by individual farmers became common knowledge for the group, and factors which some farmers had not considered important were recognised.

Toward participatory extension

Despite its limitations, this approach in the Thai Wheat Programme helped identify a number of viable production technologies. With these, farmers can expect to achieve grain yields of 2.5-3.5 to/ha in irrigated areas and 0.8-1.5 to/ha under rainfed conditions. These technologies have been applied in only a few villages so far, but all extension workers growing wheat this year were informed of them in a pre-season workshop. It will be interesting to see how this information is used and what technologies now appear in farmers' fields.

This approach allows a step-wise adoption of participatory extension. If participatory strategies are to be widely adopted by government agencies, they must fit into the existing bureaucracies. Much participatory work has been done with special funds and committed workers, which government agencies find difficult to replicate. The Wheat Programme's approach could be adapted and better defined to permit its use for general extension of new crops and component technologies. This approach should appeal to extension departments on purely pragmatic grounds, as a means of delivering appropriate technologies to farmers in diverse environments, and stimulating farmers to generate appropriate technologies.

Adoption of such an extension approach would not require great changes in existing procedures. It would thus give extension departments experience with participatory work, preparing them to adopt more participatory strategies in the future. While the extensionists play a role in developing appropriate technologies, research institutions could then focus their scarce resources on the issues which farmers cannot handle well. The interaction between research and production could be facilitated by organising joint tours by scientists and extension workers to farmers' fields to identify any recurrent problems, and any farmers' innovations that could be added to the extension 'basket of technologies'.

Evaluation of the crop. Getting down to the real reasons for the crop's performance is important, Is it due to the variety, the irrigation procedure used, or some other factor?

Why a "minimalist" approach to PTD?

Many PTD workers might regard this as a superficial attempt at participatory work with farmers. The extension-farmer contact (merely presenting technical options) may be minimal and there is little attempt to form farmers' groups. Extension workers could easily apply this approach mechanically with little of the mutual respect between extension worker and farmers that is implicit in genuine participatory interaction. Even so, the approach does have two effects:

– it stimulates farmers' latent ability to experiment, and
– it tends to modify extension workers' behaviour to be less directive.

During a visit by scientists to the first village where this approach was used, the farmers enthusiastically led them from field to field, explaining the various technologies. The scientists then went on to another village 20 km away, where the extension worker had insisted that the recommended technology be followed exactly. And the crop was indeed excellent. But here the farmers stood by shyly, somewhat concerned that they had done the right thing with the new crop, while the scientists did the talking, making comments and suggestions for further improvements. This approach then, in leaving the final choice of technologies to farmers, injects a minimal but effective participatory content into the extension work. Thus, the farmers experience a sense of accomplishment and self-determination from their investigation and adoption of new technologies. ■

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Traditional farming systems have grown out of generations of farmer experience. A.S. Widanapathirana sought to understand dryland farming strategies in Western Sudan, so as to recognize the strengths of local practices which should be preserved and the problems for which farmers might need outside knowledge.

Learning from traditional dryland farmers

A. S. Widanapathirana

Except along the Nile River and other main water courses, farming in Sudan is essentially rainfed, mainly on sandy soils (Qoz). Here the most popular cereal, millet (Pennisetum americanum), is grown, as well as cash crops such as karkadeh (Hibiscus sabdasifa), sesame, groundnut and watermelon. The grains are mainly consumed by the family. The cash crops generate income to buy other household items. The three major problems faced by the dryland farmers are drought, low soil fertility and pests. Over several generations, the farmers in Western Sudan have adopted certain strategies to get around these problems.

Dealing with drought

Average annual rainfall is 200-400 mm, which falls between July and September. The length of the season and the intervals between consecutive showers are highly variable. The farmers have developed the following techniques to minimize the problems caused by low and erratic rainfall.

Crop choice. The farmers prefer local crop types which are more resistant to drought and pests than introduced ones. First, the long- season crops are sown. Depending on how these perform, the farmers sow various quicker-maturing crops as the season advances. In years with poor rainfall distribution, short-season crops such as watermelon are sown even as late as September.

Sowing methods. Before the rains begin, the farmers sow seeds in small pits spread over a large area to take the fullest possible advantage of the first showers for seed germination. Sowing is repeated several times, depending on the amount and distribution of rain. In poor years, a plot may be sown up to five times. Resowing to fill in empty pits improves crop density. As a result, plants in a crop stand are often of different ages. Several seeds are dropped into each pit and slow-growing seedlings are removed during weeding to permit better growth of the sturdy seedlings.

Size and location of plots. The plots are usually large, often about 5 ha in the case of millet. Farmers sow extensively to increase total yield, since yield per ha is very low. Family members sow many plots in several parts of the village area and in nearby villages, so there is a better chance that a crop will mature in at least one plot. Rainfall is very localized even within a village area. For example, in two villages 5 km apart, the rainfall in one season varied from 47 mm to only a trace. Men and boys work the plots further from home, and women work the plots near home. Large families and polygamy are favourable factors for cropping large areas in several villages.

Strategic weeding. A millet crop is weeded 3-4 times, as the weeds compete with the crop for moisture and nutrients. The first weeding is done only in plots where a crop has germinated. Second and subsequent weedings are done only where crop growth is considered satisfactory, so the area weeded is smaller each time. Ultimately, the area harvested is only a fraction of the land on which the crop was initially sown.

Crop mixtures. Wherever possible, farmers sow mixtures of 2-3 crops which do not compete with each other, e.g. karkadeh, pea and sesame. However, millet and sorghum are usually not mixed with other annual crops, since they do not withstand competition well under these very dry conditions.

Livestock as buffer. Most farmers also keep livestock, which graze the natural vegetation and, in the dry season, also the cultivated land. The animals serve mainly as a buffer for drought years when crops fail to mature.

Dealing with low soil fertility

The Qoz soils are usually low in fertility and are exhausted of nitrogen and phosphate after 3-5 years of continuous cropping. The fertility problem is aggravated by removal of millet residues to thatch houses and to fence the compound. Other crop residues are used as fodder. The main ways in which farmers deal with the fertility problem are:

Use of animal manure. Livestock graze the plots in the dry season. Farmers without large animals encourage stock owners to bring their herds to the farms, sometimes even giving money as incentive. The dung and urine add nutrients to the soil, from which the subsequent crop benefits.

Crop rotation. In the short-term rotation, groundnut or sesame are grown for 2-4 seasons after 1-2 seasons of millet. These leguminous crops increase soil nitrogen. When the soil is so exhausted that fertility can no longer be restored by soil-renovating annuals, a long- term rotation with gum arabic (*Acacia senegal*) trees is adopted. These trees grow throughout the rainfed zone. When annual crops are sown, the trees are cut down but not removed. When the farmers shift to long-term ro-

The Western Sudanese farmers have not yet found effective ways of controlling striga, a parasitic weed which builds on millet plants. Could they get some ideas from farmers in Niger or India? Photo: A.S. Widanapathirana. ◄

tation, the tree stumps can grow again. They form a gum garden after about 7 years and remain for about 20 years. By then, the land has regained enough fertility for annual cropping. The trees are tapped for gum, a very good source of cash income.

The shift to long-term rotation is often based on a group decision made by the rural communities with their traditional leaders. Then the entire area for sowing annual crops is shifted to land which was under gum tree for 20 years or to a new area. This shift is necessary since the gum trees attract birds which feed on grains if the two types of crop are grown close to each other. Moreover, bird control is made easier by locating all gum gardens in one area to form a large plantation.

Dealing with pests

The standing crops are attacked by a wide variety of pests, particularly locusts, grasshoppers, millet headworm, birds, rats and the parasitic weed striga. The farmers have little defence against locusts, hoppers and rats. A traditional method of pest control was charming by a local religious person (Faki). Farmers say this gave satisfactory results in the past but, for unknown reasons, no longer works. In some areas, bigger pests such as locusts are collected as food. Locust meat is a good source of protein. Roasted locusts are sometimes sold at the market.

Birds are controlled fairly successfully by burning nests in the trees, also in gum gardens. The control campaign is well organized by a person called the Agid. Each household is expected to send a male member to join in the work. One small group has the task of supplying drinking water and another supplies food for the workers. A burning piece of rubber is tied to the end of a long wooden stick. This is lifted up to the nest in the tree and kept there until the nest catches fire. The campaign is done during the hot months (September/ October) and continues until all nests have been destroyed within about 5 km from the cultivated plots.

Striga is a parasitic weed which feeds on millet plants. The farmers have not yet found an effective way of controlling it. All they can do is fallow the land heavily infested with striga. However, the parasite reportedly survives in its dormant form in the field even for 20 years. The growing human population and, hence, the shortage of arable land have made long-term fallowing more difficult. The striga problem urgently requires a solution.

Why study traditional farming?

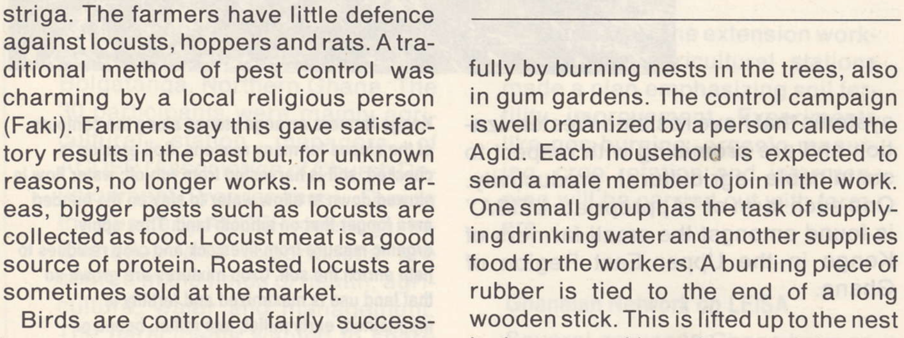
By studying farmers' practices, researchers can see what are the most urgent problems to be tackled. Farmers' strategies to optimize returns from the land can provide useful hints for development workers seeking to improve farming without upsetting the existing mechanisms of adaptation, particularly to drought. Knowledge of local practices is particularly important for doing farmer-oriented research.

The Western Sudanese farmers' technologies have succeeded in providing food for people in a very harsh environment for generations. It is important not to disturb the traditional balance in their land-use systems in the guise of providing farmers with "improved" technologies such as high-yielding seeds designed for more favourable areas. Rather than trying to replace the farmers' highly site-adapted technologies, every effort should be made to preserve them. ■

Because of erratic and localized rainfall, yields in rainfed farming in Western Sudan can be very low. The farm families must therefore sow extensively in large and widely dispersed plots in several villages at a time. Photo: A.S. Widanapathirana. ▲

An effective method of pest control: birds' nests are burned in trees within a radius of about 5 km from the cultivated fields. Photo: A.S. Widanapathirana.▲

Diagram: Pattern of distribution of five showers in a given rainy season in respect of a hypothethical aministrative unit.



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Ed. note: *Constance McCorkle and her colleagues report in their 'Case study on farmer innovations and communication in Niger' (1988, p. 51) that when Wazeye farmers plant millet, they may also throw sesame seeds into the pocket to protect against striga. They say that striga wraps itself around the root of the sesame and leaves the millet free. Address: Dept. of Rural Sociology, University of Missouri-Columbia, Columbia, Mo 65211, USA. See also the article by Subramanya and Sastry in this Newsletter about using Vetiver grass to fight striga.*

Where would the small African farmer stand in 1990, e.g. in Northern Ghana, if outsiders hadn't interfered with so-called improved technology? David Millar argues that probably the majority of them and the environment would be better off. Does LEISA acknowledge these small farmers?

LEISA! Where does this notion of farming originate?

David Millar

In most developing countries, at least within the farming systems in Northern Ghana, the environment has always been central to agriculture. It is not by chance that people in Northern Ghana have given key positions to Saayir (Rain God) and Tindana (Land Owner).

The small farmer has very limited control over his environment and faces many risks and uncertainties. Hence, he pays much attention to the environment, studies it critically, and uses it as reference for choosing production factors. His choice of varieties to grow, tools to use, what crop-crop or crop-livestock combinations to adopt, where to grow what, and the timing of farm operations have all been dictated by his need to work *with* the environment rather than controlling it. This has also meant that, in his traditional form of production, he used primarily the inputs which were locally available. This system sustained itself over generations. Recently introduced Western technology disturbed it and has led to a degree of instability that would not have existed if our "big brothers" had kept off.

The traditional forms of farming in our country, as in most other developing countries, were not well documented in writing. The knowledge was maintained and developed through the oral tradition. For this reason, development workers find it difficult, if not impossible, to assert their authority in recent thinking about the role of the small farmer in experimentation and technology development. Hence, once more, the whole idea of Low-External-Input and Sustainable Agriculture (LEISA) is treated as the brain-child of the Western world, with no or little due reference to the small farmer in, for example, Northern Ghana.

A close look at the developing countries would reveal pockets of traditional systems that have resisted Westernization and are promising with respect to sustainable agricultural productivity. One such form of "Appropriate LEISA" is found amongst the small farmers of Kongo in the Upper East Region of Ghana.

Kongo farmers arrange stones along the contours of the slopes for many reasons. Soil erosion is checked; soil is harvested from run-off; water flow is slowed down to allow water to stay on the bunded area longer that on smooth land. They apply organic manure from livestock and crop residues to help enrich the soil. Crop mixtures are grown so that land use is maximized and fertility is maintained: early millet, late millet, beans or groundnuts, and vegetables are grown together. Photo: David Millar.

Appropriate LEISA in Kongo

Kongo is a small village where mixed farming is practised. Land is in very short supply and is becoming increasingly so. The average holding per family is 5 acres, on very rugged and rocky terrain along a range of hills. At some point in time, the Government feared that the land could not support the people there and tried to re-settle them, but without success. The inhabitants of Kongo stayed and survived. How did they manage this? In Kongo, I was talking with the farmer Azure, who is now in his early fifties and has two wives and eight children.

"How long have you lived here?"

"I was born here and my father told me that his grandfather lived here."

"Has the land always been as rocky as this?"

"Since our ancestors chose this land for us, it has always been the same."

"How do you manage to produce on land like this?"

"When I was a child, my father taught me to farm this land in the way he said his grandfather did. As you can see, it involves arranging the stones in an special way across the slopes. This slows the water running down and holds back the soil that is stolen by the running water. Before we farm at the beginning of the rainy season, we apply animal manure on the soil. We use our hoe to fill the soil and during harvesting we leave the sticks on the soil, as you can see."

"Do you get enough from small parcels like this?"

"We do not get enough, BUT WE HAVE SURVIVED."

Where is the origin of LEISA?

The origin of LEISA is knowledge-rich people like the farmer Azure, like the people of Kongo. If we agree to put our eyes on the ground, we would find many more like the people of Kongo elsewhere, too.

As development workers and researchers, our role should be to help these farmers manage their systems more efficiently, especially in the area of recycling materials. To lay claims to ''New Breakthroughs'' with LEISA is gross academic dishonesty. The farmers did LEISA 50 years ago and would have been doing it more efficiently by now, had we not interfered with so-called improved technology. We thus did a lot of harm to the delicate environment of the farmers, which they know better than we do. ■

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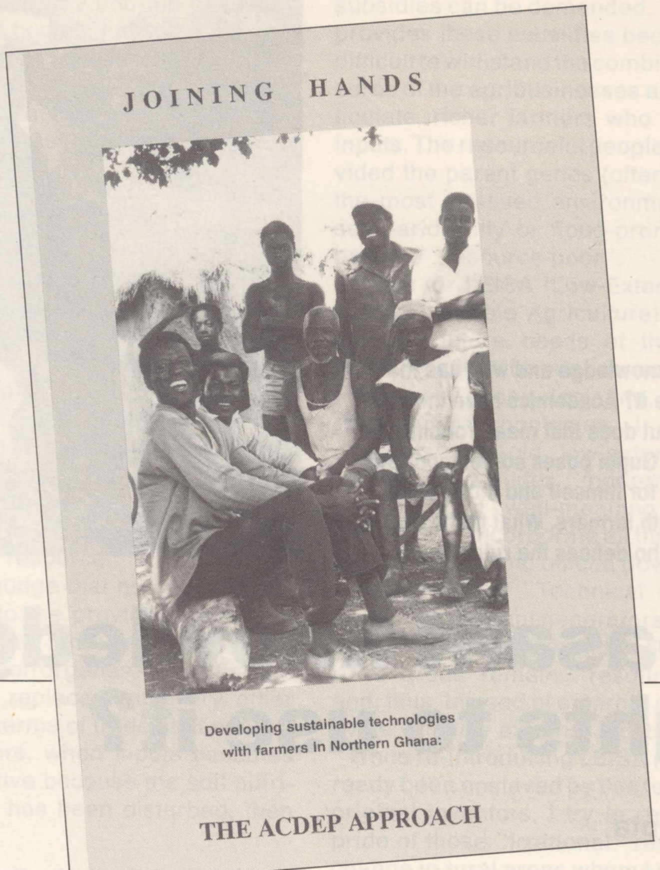
Joining hands: LEISA in Ghana



ACDEP workshop

A workshop on working with farmers was held in December 1989 in Bolgatanga, Northern Ghana. The 30 participants were mainly agricultural station managers of ACDEP (Association of Church Development Programmes). During the quarterly ACDEP meetings, information and experiences are shared in the fields of health, agriculture, water and management. The participants wanted to share their experiences on working with farmers, but also wanted more insights into the international discussion and experiences of other organizations in the field of farmer participation and sustainable agriculture.

A comparison was made between the steps that the participants are following when working with farmers and what practitioners of Participatory Technology Development had identified as steps in the PTD process in the ILEIA workshop in April 1988. The participants made a plan on how to train their field staff to be able to incorporate farmers' knowledge and experimentation aimed at sustainable agriculture. It was agreed to share the field staff training experiences and the possibilities and difficulties of the actual field work.

The first training at station level has already taken place (January 1990 in Garu). The extension workers of four agricultural stations made a plan emphasizing soil fertility improvement. Experiments like non-burning, organic manuring, crop rotation and intercropping will be carried out with farmers.

Ghanaian Network on LEISA

Several groups in Ghana have recently joined in investigating possibilities of establishing a body that could coordinate activities promoting low-external-input and sustainable agriculture (LEISA) and the sharing of experiences in this field. A step-wise approach is being followed.

Formation of an ad-hoc committee that includes both religious and non-religious NGOs. A broader platform is regarded as essential, because then the network cannot be ''monopolized'' by one organization and together the organizations are stronger.

Formulation of a provisional Statement of Intent of the LEISA network, specifying objectives, membership, programme, etc.

Identification of possible partners. Inventory of existing LEISA experiences and expertise in Ghana of the network partners, farmers and institutions/organizations. The outcome of such an inventory would be a register.

Preparation of a national workshop with the following objectives: to get to know each other and the respective programmes;

- to identify areas of common interest;
- to make a joint analysis of environmental problems associated with agriculture in Ghana (possibly differentiated between North and South);
- to identify possible and feasible alternatives which are environmentally sound, economically feasible and socially just (possibly differentiated between North and South); to establish a network of LEISA practitioners;
- to formulate recommendations and proposals for action by the network. ■

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A report has been made which reflects the process that took place during the workshop. A limited number of copies are available at ILEIA to those readers who are interested.

What is knowledge and who has the right to use it? Academics have their reasons, but does that mean robbing the poor? Anil Gupta poses some important reflections for himself and those of us working with farmers. What game do we play and who defines the rules?

Peasant knowledge – who has rights to use it?

Peasant farming in India. Is LEISA merely a modern label for age-old technologies being re-introduced to the "resource-poor" peasants who originally generated them? Photo: Sjef Gussenhoven

Anil Gupta

Whose knowledge? Who defines what is knowledge? Who has rights to knowledge? Who defines these rights? These questions become crucial as the value of peasant knowledge for generating techniques of sustainable agriculture and extending the frontiers of science is increasingly recognised.

There is no term more inappropriate than "resource-poor" when talking about knowledge-rich peasants. Consider the ethical, political and cultural biases underlying the use of this term. Disadvantaged, yes; resource-poor, no. Or only if we don't consider knowledge about micro-environmental relationships as a resource.

If peasant knowledge is a resource and if scientists recognize its usefulness, according to what rules should this resource be defined and used? For example, a multinational (or national) corporation becomes aware of a herb useful for treating a previously incurable disease. It can:

- camouflage the end use to make it difficult for other possible users to enter the resource market
- collect the herb excessively and deplete it in its natural habitat,
- generate other ways/locations for cultivating the herb so that, if people in the original habitat become aware of its value to the corporation, business will not suffer,
- place a very low value on the local people's research (identifying the herb and how to use it) and a very high value on the corporation's research (making it into a commercial drug), rendering the drug out of reach of the people who originally conceptualized its possibilities.

And what is the residue after the resource has been used in the knowledge "industry"? Does the local way of using the herbs lose its validity because it is traditional, superstitious, "unscientific"? Rights to knowledge, extraction by outsiders, and the dominating knowledge systems which give validity to only certain ways of using a resource – all are part of the same problem.

Take us, for example: scientists, academics, people working in voluntary organizations, funding agencies and international consultancy systems, editors of journals, civil servants, whether national or international, i.e. the outsiders. How do we relate to peasant knowledge and the question of rights to this resource? I can deal with peasant knowledge in the following ways.

Academic pursuits

I engage in research, systematic studies and interactions with peasants, to find technologies still in use and ones that were functional but have been discontinued. I document this information and share it with fellow professionals as an academic activity. I may also ask possible users of this knowledge, including large agribusiness companies, to support my research in return for sharing the documented knowledge with them.

I attend international meetings and gain esteem and other career rewards without giving details about the peasants who generated the knowledge. I can thus prevent other outsiders from locating the source, validating the findings or looking into other dimensions of the local knowledge. Otherwise, I would be de-mystifying my role: revealing myself to be a mere chronicler rather than founder of a new school or faith.

Acknowledging knowledge

I don't mention the source of my knowledge because my professional peers ("noblemen") don't consider acknowledgement of the nameless-faceless poor to be a necessary professional act. In this case, I don't even realize that I have done anything inappropriate by not acknowledging the peasants.

I hide behind the argument that the providers of knowledge are so numerous that it is impossible to acknowledge each one of them. I mention the study area, sometimes even the villages, but the particular individuals/groups who gave me the information remain unacknowledged.

I want to give acknowledgement but think that the providers of knowledge don't care whether I do or not. Thus, absence of pressure not only from professional peers and gatekeepers of professional glory but also from the providers themselves makes me indifferent, lax or insensitive.

I extract rent from the knowledge by helping set up a value-adding enterprise aimed at commercial profit. I share the due portion of the profits with my employers, who made my study of peasant knowledge possible. In my contract, they may even have denied me rights to use my findings without their consent. But there is no legal pressure on me to obtain consent from the peasant informants, so I feel no obligation to do so. I hide my rewards from the peasants, so that none of them can ask me to account for the rent I have extracted from their knowledge.

I gain consultancies to identify and extract the conceptual insights of Third World scholars and grass-root workers about peasant knowledge and convert these insights into "new" technologies. I treat these disadvantaged informants like the peasants. I don't acknowledge their contributions, not even how they facilitated my entry into the peasants' villages and homes. I assume it's simply the duty of a Third World public servant. I also assume that the journals in which I publish will never reach those nondescript grass-root workers.

A Hausa man collecting baushe (*Terminalia avicennioides*) leaves, which are pulverized and applied to burns in indigenous medicine. Local people also use parts of the roots to treat internal parasites in humans and animals. Scientists at Ahmadu Bello University in Zaria, Nigeria, have found that the traditional preparation from baushe roots is 90% effective against helminths (worms). Photo: Ann Waters-Bayer.

Robbing the poor

I make it possible, for example, that genes for resistance against a particular disease, genes that peasants preserved in a particular ecological niche, are transferred into a new marketed cultivar. I claim that this gene had no value until it was combined with other genes. It is the instrument of gene transfer which is important, not the resource: the original ideas and skills of the peasants. Rights to the instrument override rights to the resource.

My peers judge that no injustice has been done to the providers. After all, didn't they get a new variety with a better combination of genes? When the cultivar needs replacement every other year, when terms of trade shift against the cultivators, when inputs becomes less productive because the soil nutrient balance has been disturbed, then subsidies can be demanded. The State provides these subsidies because it is difficult to withstand the combined pressures of the agribusinesses and the articulate, richer farmers who use agri-inputs. The resourceful people who provided the parent genes (often found in the most stressed environments, e.g. semi-arid, hilly or flood-prone areas) become "resource-poor".

I plea for LEISA (Low-External-Input and Sustainable Agriculture), arguing that the future needs of the "Third World" cannot be met through input-intensive, soil-depleting, pest-enhancing technologies. I re-import peasants' age-old low-external-input technologies under "modern" labels given by well-meaning "First Worlders". I incorporate all this, including the labels, into official (low-budget) programmes of "Technical Cooperation". The peasant generators and providers of knowledge in disadvantaged rural areas remain "resource-poor" and, thus, in need of external aid to cultivate with low external inputs.

While re-introducing LEISA (I have already been enslaved by this term) to its original inventors, I try to restore the pride of those "irrational" resisters of change in rural areas whom I robbed in collaboration with colonial masters and post-colonial granters of professional esteem in the West. My reference point remains the same: the West.

But who said that poor people lacked pride in what they knew? If it were so, would they have maintained some of their sustainable technologies for so long? If pride has to be restored, it is my own and that of my peers in my own society.

Rules of the game

As peasant expertise is site-specific and therefore limited in its diffusion potential, it does not lend itself to building up socio-cultural institutions of rent extraction through secretiveness, private control and even manipulation, in the way that accumulation-oriented industrialization does. On the other hand, some non-Western knowledge systems (e.g. the Ayurvedic of India) permitted, if not encouraged, local experts to retain control by family/kin over some popular recipes, i.e. over locally valued knowledge of using local resources.

If knowledge were truly a common property, the academic discussion about rights to it would be trivial. But if knowledge can be expropriated by free riders or rent seekers, rules of the game need to be evolved. ■

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For soil conservation in rainfed agriculture, the World Bank is promoting the replacement of traditional earthen bunds by *Vetiveria zizanioides* grass. Some observers in India are sceptical and most are under the impression that it is not known to Indian farmers. Subramanya and Ranganatha Sastry found that this was not the case.

Terracing caused by the Khus planted in 1978. Note the differences in the shoulder level.

Indian peasants have long used Vetiver grass

S. Subramanya and K.N. Ranganatha Sastry

As implementing officers of the khus-based vegetative barrier system for soil conservation, we were also sceptical at first, as the technology has not been tested by researchers. Some questions which arise are: Can the grass adapt to our conditions? What if it spreads like a weed? What if it gets diseased? What if it is browsed? Can it endure for many years?

A glance through the flora of South India (Gamble, 1928; Sambasiva Rao, 1964) revealed that *V. zizanioides* grows wild in many parts of Karnataka State. The only economic uses stated were extraction of perfumery oil from the roots and using the leaves as fodder. The claim has been made that this plant was never used in India for soil conservation (Anon., 1988).

In July 1988, we happened to find farmers in some villages of Gundlupet Taluka of Mysore District using *V. zizanioides* (khus) grass for soil conservation. Inquiries revealed that Vetiver vegetative bunds had already been farmer practice for decades. This evidence erased most of our doubts about the capabilities of the plant and made us think there might be more farmers practising this system independently as part of the natural innovative process. We then toured the State, visiting farmers, and made the following findings.

Independent selection

The local names of the plant differ widely between districts, suggesting its independent adoption. The farmers in Maddur, Channagiri, Halalkere, Tumkur and Kadur appear to have innovated on their own, seeking ways of conserving their soils, and eventually selected *V. zizanioides*.

As one example: the plant is called "ramancha" by farmers using it in villages of Gundlupet Taluka of Mysore District. Even the oldest farmers (over 80 years) say they used it in their fields since they were young, just as their fathers did. Where irrigation and intensive land shaping were adopted, khus appeared less important for soil and water conservation but it is still used in the drylands. It has been planted in all vulnerable areas where rills and gullies would otherwise have formed.

Even on almost flat fields, some farmers plant khus to mark boundary lines, as it is a perennial plant. These lines have remained for several decades. The farmers also use khus to protect waste-weirs and to stabilize drop structures.

The farmers regard the fodder value of khus as an additional merit. They said that 3-4 cuttings can be obtained at an interval of 45 days, mainly during and shortly after the monsoon, yielding enough green fodder for two animals for 6 months in a year.

Farmers' practices

The farmers have developed their own ways of multiplying and propagating khus. On sloped land, they form small section bunds across the slope and plant 2-3 slips per rill 20-30 cm apart on the upstream side. In flat fields, the slips are simply planted in the plough furrow. In either case, they chop off the top of the plant and avoid planting inflorescence axles. Khus establishes well if planted after the first monsoon shower. Even without irrigation, the lines form hedges in about a year. The slips for further planting are taken from 3-year-old bunds. When waste-weirs or drop structures are to be treated, even clumps of khus are taken and placed at appropriate locations.

During field visits, we noticed a sole case of diseased khus. The plants had been affected by *Ustilago raysiae*, a smut disease without serious consequence. None of the farmers regarded khus as a weed or as a host for pests and diseases. A few farmers in Tumkur District said that growing khus prevented the occurrence of striga, a root parasite.

Khus has long been used by Indian farmers, but most scientists are still unaware of this. The indigenous knowledge of Indian farmers has not been appreciated. The knowledge they have gained in dealing with khus-based soil conservation systems needs to be documented and the other uses of khus, e.g. for fodder, should be studied. ■

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KEEP ROLLING

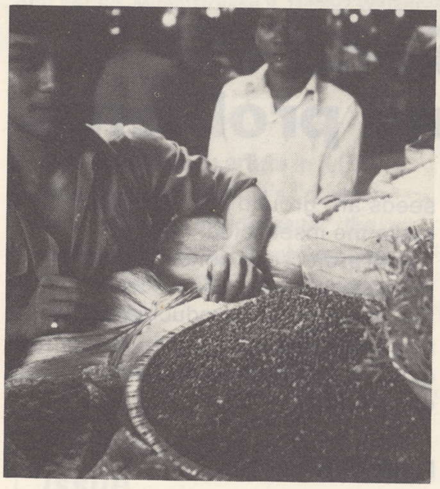
GENETIC RESOURCES

Saving seeds

Conferences and workshops do not in themselves save seeds. Julian Gonsalves observes a lack of effective action to prevent genetic erosion. He gives some practical considerations to increase the quality and impact of seed programmes at the field level.

Julian Gonsalves/*Philippines*

The consciousness today among NGOs about the importance of genetic resources to humankind is at an all-time high. As more meetings are held and papers churned out about genetic erosion, active efforts to save seeds by NGOs and other Save Seeds campaigners are sadly lacking in quality and impact. If one agrees that, historically, the best conservers of seeds have been small farmers and gardeners, then programmes are needed to conserve seeds at this level.



Managing seed-saving programmes

The "amateur" seed conservationist or NGO will find the seed-saving idea much more complicated than it first appeared. Categorization, planting-out, characterization, storage and quality control are all essential, but they are time-consuming and require financial resources.

The NGO must learn to limit the collection based on its priorities, e.g. vegetables, cover crops, fruits, rice etc. It is a common mistake to try to collect everything. This soon becomes overwhelmingly difficult to manage and afford. If NGOs could cooperate, each could specialize on one crop and then exchange the collected and tested materials with partner NGOs.

Seed assessment and storage

Planting out collected seeds is probably the most expensive step. Seeds must be observed for 2-3 seasons so that characteristics such as planting season, flowering habits and pest susceptibility can be recorded. Without these simple but essential data, a farmer receiving the seeds could reach the wrong conclusion, i.e. local varieties are not worth raising. Many local varieties are bound to a certain season and give poor results in other seasons. Others do badly if fertilized and do well only under low fertility conditions! Seed collection, drying and cleaning are also labour-intensive and time-consuming. However, all these activities can be easily learned and require systematic efforts rather than expertise.

Most problems occur in seed storage and maintaining viability. Here, guidance from a seed technologist is important. Seeds can be dried too much or not enough; they can be infested with fungus while in storage, affecting their viability. The seed moisture content is the single most important factor, but the temperature and humidity under which seed is stored are often critical determinants for success.

Labels are important!

The importance of labeling seed packets with place of origin, local name and collection date cannot be overemphasized. Any observations from the farmer will help in future characterization of accessions. For example, some cultivars store better than others, an important characteristic of old bean varieties but lost in the new ones. If this information is not recorded, one might not know it by merely observing plants in the field. Another attribute that farmers know well and may use to describe their "collections" is versatility, e.g. legumes that can be sold as green vegetables but are equally good as dried grains.

Diversity in seed supply

Institutional efforts to collect seeds are justified (as opposed to farmers collecting local seeds for *in situ* conservation) if local seed diversity is lacking. Then, seeds must be brought from other parts of the country and exchanged in order to reinstate the required diversity. But these efforts are useful and relevant only if the seeds collected, tested and multiplied are given to farmers for them to try out and conserve. The sooner the materials are moved out, the better. The ideal approach is to give farmers a diversity from within each crop (e.g. 6 kinds of mung beans instead of just one), so they can choose from a range. Some farmers retain what others will not. ▶

When we publish a Newsletter on a certain theme, we hope that readers will digest it so that new ideas can emerge. In this section "Keep rolling", you have a chance to present further information about themes highlighted in previous issues, thus giving still more food for thought and action.

Farmers conserve varieties for a host of reasons, the least of which may be purely for the sake of conservation. The idea of getting growers to continue raising varieties only in order to save them, as done in some Western countries, is a bit unrealistic. The focus must be on seed accessions whose attributes will, in themselves, result in their being conserved. Genetic conservation becomes a hidden agenda, integrated with other agenda, e.g. family food production through improved agricultural technologies, or health and nutrition improvements.

Getting out into the villages

Our seeds will be conserved only if we actually get out into the villages, seek the diversity, collect the seeds, multiply them and share them widely. Seed conservation is the concern of everyone, not just geneticists and breeders. But time is running out. Our plant genetic heritage is dwindling. We still have time to do something about it ... but only if we start today.

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ALTERNATIVE PESTICIDES

Neem as an exotic – possibilities and problems

The neem *(Azadirachta indica)* is widely promoted as a miracle tree. Continuing the discussion about alternative pesticides, Klaus Reiff describes a project to help campesinos produce their own neem insecticide, and raises some important concerns.

Klaus Reiff/*Nicaragua*

Neem trees were first planted in Nicaragua in 1975 on a trial basis. Since then, neem has become one of the most commonly used trees in reforestation programmes. Because of its drought tolerance, rapid growth and high fuel value, it can make an important contribution to meeting energy needs.

Research in Nicaragua into making neem insecticide was started in 1982 by MIDINRA, the Plant Protection Department of the Ministry of Agriculture. The neem insecticides are ecologically sound and would save foreign exchange for imports. The project consists of two complementary components: on-farm and centralized.

On-farm insecticide production

MIDINRA advises and supports farmers (campesinos) who plant neem on their farms. All the work, also making the simple water-soluble neem seed meal to use as insecticide on their farms, is done by the farmers themselves.

Centralized insecticide production

Two large neem plantations established to supply the processing plant with fruits are operated by the environmental agency DIRENA, a subdivision of the Ministry of Agriculture. The insecticide is made in a coffee processing plant on the edge of Diriamba. The coffee-depulping machine is used to depulp the neem fruits. In a locally-made solar drier, the neem seeds are dried to prevent fungal growth. The seeds are ground in a crushing mill to make the insecticide.

Both project components are complemented by ecological research so that the dangers of introducing an exotic tree into Nicaragua can be recognized quickly and appropriate adjustments can be made.

Problems encountered

Various problems related to labour economics, plant production and health, and ecological factors arose during the first project phase.

Important tasks, such as planting and tending the trees and harvesting and drying the fruits, must be done in the wet season, when there is also a labour peak in cropping. This is why the farmers cannot always give the trees enough attention, and young trees often die as a result. The very time-consuming harvest methods must be improved to make more efficient use of scarce labour.

The high air humidity during neem harvest in the wet season causes fungus growth on the fruits or seeds if they cannot be well dried. This is one reason why, in the 1989 harvest, the farmers growing neem on their farms delivered the harvested fruits to a regional collection point for drying. The fruits were processed in the central plant, from which the farmers obtained the ready-to-use insecticide. However, the long-term aim is to enable the farmers to process the fruits themselves. They will be equipped with simple depulping machines and hand-mills. Appropriate seed drying methods are also being tested. An important task is giving the farmers practical courses in processing neem.

It also became apparent that younger neem trees are prone to wind damage. The trees need 4-5 years before they are strong enough to withstand heavy

The neem seedlings for on-farm planting are raised in a nursery by students of the agricultural technical college in Diriamba. The farmers plant the trees as windbreaks around the fields, as shade for coffee, as living fenceposts for pastures, to hold soil on eroded land, but also to produce fruit for insecticide. Photo: VFLU.

winds. To strengthen the trunk and branches faster, suitable pruning methods must be found. Because heavy winds also cause poor flower formation and fruit setting, the combined use of neem trees as windbreak and fruit producer is not advisable.

Neem not pest-resistant

In the literature, there are often reports about the pest resistance of neem trees, but the trees in Nicaragua suffer pest damage. Leaf-cutting ants defoliated and, in several cases, killed young trees. Older neem trees were also attacked but did not appear to be seriously endangered.

At several locations, beetles bored into the trees and sucked the vascular tissue at the vegetation cone. The shoot tips then die and shoot growth increases, giving the trees a broom-like appearance. The trees were also attacked by citrus mealy bugs *(Planococcus citri, Pseudococcus citri and Knaspis citri)*. This often leads to thickening of the shoot tips and discharge of a sticky substance. The thickening induces uncontrolled growth of new shoots. Cutting out the diseased parts has not helped, as the morbid growth continues afterwards.

In neem trees planted for fuelwood in an irrigated sugarcane plantation (not part of the project) in Timal, locusts *(Schistocera pallensis)* attacked and destroyed the trees. The attack occurred in the dry season, after the sugarcane had been harvested and the residues burned. The vegetation outside the irrigated area had withered, so the evergreen neem trees were the sole source of fresh food for the locusts. Although this was an extreme situation, this gives cause for concern, as it contradicts reports from India that neem trees protect against locusts.

Negative impacts of an exotic

Particularly the sap-sucking insects *(Homoptera)* found in neem trees in Nicaragua must still be more exactly identified and observed. The ecological study includes finding out what pests attack and damage neem and what factors favour them. In addition, it is being investigated whether the evergreen neem serves as an intermediate host in the dry season, thus hindering a natural reduction of pest populations.

The introduction of neem into an ecosystem is not without problems. Neem may have many promising uses, but its possible negative impacts on the ecosystem should not be overlooked. Especially the widespread planting of neem by the DIRENA fuelwood programme could lead to displacement of indigenous species. The effect of neem on plant sociology, a conceivable concentration of active neem substances by leaf fall and root excretions, a possible uncontrolled spread of neem, and its potential to serve as an intermediate host for pests must be carefully researched.

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The Spanish version of the AGRECOL book is ready: **Proteccion Natural de Cultivos en las zonas Tropicales**, written by Gaby Stoll. 1990, Price: DM32.00, 183 pages. Order from: Margraf Verlag, Muehlstrasse 9, D-6992 Weikerheim, F.R. of Germany. ■

In response to an article in ILEIA Newsletter 5/3 on FAO's "double standard on pesticide issue", the Director of the FAO Plant Production and Protection Division has sent us his comments.

FAO and the pesticide issue

The article in the Sri Lankan newspaper "The Sun" is clearly incomplete to the extent that it does not provide a full picture of FAO's involvement in pest management activities. FAO is the leading organization in promoting integrated pest management and has done so since the early 1960s. It is, as stated in many official documents, the FAO official policy that every effort should be made to restrict pesticide use to the minimum.

Over the last 25 years, FAO has gained considerable experience in integrated pest management and the results of our work clearly show that there are a multitude of factors which lead ultimately to the successful application of it. These factors include: excellent knowledge of the pest situation in the crops concerned, in particular the significance of natural enemies; strong political support at all levels in the countries where work has to be undertaken; development of information packages that can be handled directly by farmers; and, most importantly, extensive training of farmers so that they themselves can become the best advisers on the appropriate control actions to be taken.

The above has been clearly demonstrated in our programme for integrated pest management in rice in South and Southeast Asia and so far 400,000 farmers have been trained in a number of countries, but particularly in Indonesia. The experience we have gained allows us to say that we are now confident that the approach can be made available to the 75 million rice farmers in the area. In addition, we will extend this work to other crop situations.

From the above, it can be noted that we consider that a more healthy crop situation can only be achieved if the major technical efforts are directed to the farmers themselves, taking full advantage of their knowledge and capabilities. We are convinced that integrated pest management is not too complex for farmers but it has in the past been presented as such due to the fact that it was often seen more as a challenging research activity and less as a very practical "down to earth" activity.

In view of its organizational set-up, FAO works always through Government agencies but there is now a gradual much closer cooperation with non-governmental groups and, in that respect, we look forward to joining hands with those who want to make a positive contribution to these efforts. ■

Lukas Brader, Rome, 14 February 1990
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New farming systems are emerging in the quest for productivity and sustainability, and global demand is increasingly expressed locally. Gene Wilken, author of *Good Farmers* (see Book Review), sees how aspects of Mayan agriculture are being combined with aspects of modern agriculture in response to international market demand.

Interring leaf mold in commercial horticulture plots, Zunil, Department of Quesaltenango, Guatemala. Photo: Gene Wilken.

The cauliflower connection

Gene Wilken

Critics of traditional agriculture claim that these systems are anachronistic, at best suitable for subsistence production, at worst impediments to progress. Advocates claim that traditional practices have been judged on wrong criteria by biased Westerners, and that their careful husbandry of soil and water, adaptation to local environments and low use of purchased inputs are exactly the model that future agriculture should emulate.

The truth probably lies somewhere in between, in the difficult middle ground of technology assessment and transfer. This is *terra incognita*: there has been little research on transferring traditional methods (Wilken 1989). Exploration of this middle ground now appears more likely as the concept of sustainability gains converts. If agricultural production must share its formerly preeminent position with resource conservation, then some elements of traditional systems, especially those that are ecologically benign or resource enhancing, could prove advantageous.

Vision of the future

But how will traditional methods be integrated into new forms of sustainable agriculture? And what form will they take? We cannot expect that they can be grafted onto modernizing systems without modification. The new farming systems, incorporating aspects of both modern and traditional technology, will be productive, in response to growing world demand. They will be resource conserving, in response to growing concern about environmental deterioration. They will be adapted to particular physical and social environments. They will be shaped by government policies on research, prices and support. And they will respond to powerful market forces. For as populations and incomes grow, and transportation and communication improve, global demand increasingly will be expressed locally.

This vision of the future is illustrated in Guatemala where a well-developed traditional technology that already included modern elements has been expanded by government and foreign-donor projects and now has been incorporated into an international marketing system.

Mayan market gardeners

In the fertile valleys and terraced hillsides of the Western Highlands, Mayan farmers have for years grown produce for market on tiny, hand-cultivated and -irrigated plots (Wilken 1987). Plots were treated with leaf litter and animal manure, but also chemical fertilizers, and planted with locally produced or imported seeds. Farmers took advantage of altitude effects on climate by specializing in mid-latitude vegetables (e.g. beets, cabbage, carrots, celery, lettuce, radishes) for regional and national markets and the lowlands of nearby El Salvador and Mexico.

But the Highlands also have long growing seasons that permit harvests when mid-latitude farms are idle. In the 1970s international produce companies, recognizing the possibilities of the combination of latitudinal advantage and skilled producers, began contracting production of cauliflower, broccoli, snow peas and brussels sprouts from small-scale farmers mainly for North American markets (Von Braun et al. 1989).

Benefits for small farmers

Production of these crops is ideally suited to small-scale operations. Their high value relative to bulk means they can bear substantial shipping costs. There are few economies of scale and even some comparative advantages for small-scale, labour-intensive practices (Von Braun et al. 1989). The produce companies offer credit for seeds, fertilizers and pesticides, technical support, and reduced risk. Spontaneously expanding production areas spread even more rapidly under government and USAID mini-riego programmes that brought small-scale gravity or pump and sprinkler irrigation to new regions (USAID 1977).

Since decisions regarding crop varieties, field schedules and inputs are made by the produce companies, there is concern that the small-scale farmers have become peones (labourers) on their own land, and have traded their flexibility and decision-making prerogatives for the assurances of contract production. It is also not clear whether farmers share equitably in this profitable business. Questions regarding income, equity, social impacts and sustainability need attention since the Guatemalan example may signal future trends.

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TOP 5

To improve low-external-input agriculture, an understanding is needed of existing farming systems and how "modern" science can increase their productivity, i.e., how both sources of knowledge can be used complementarily. The basic premise is that farmers are knowledgeable about their local conditions and that their knowledge is as crucial and indispensable for rural development as the knowledge generated by modern science.

Until recently, issues concerning indigenous knowledge (IK) were treated under categories such as rural development, traditional (local) technologies and rural institutions. Although no journal focuses on IK, articles about it can now be found in the following: **CIKARD News**, 318 Curtiss Hall, Iowa State University, Ames, Iowa 50011, USA; **Gatekeeper Series**, International Institute for Environment and Development, 3 Endsleigh Street, London, WC 1H ODD, UK; **ILEIA Newsletter**, P.O. Box 64, 3830 AB Leusden, Netherlands; **Institute of Development Studies (IDS) Bulletin**, University of Sussex, Brighton BN1 9RE, UK; **Alternative Agriculture News** and **American Journal of Alternative Agriculture**, 9200 Edmonston Road, Greenbelt, MD 20770, USA (focused on American agriculture.)

1 Arthur J. Dommen, **Innovation in African Agriculture** (Westview Press, Boulder, Colorado, 1985). The author asserts that low-resource farming systems operate efficiently through conservation of productive resources. He applies the economic theory of joint production to illustrate that factor productivity in African agriculture is higher than generally believed. His conclusions represent a significant departure from past prescriptions on which agricultural development programmes in Africa have been based.

2 United States Congress, Office of Technology Assessment, **Enhancing Agriculture in Africa: The Role for U.S. Development Assistance** (US Congress, Washington DC, 1988). In addition to recognizing the usefulness of local knowledge, this also envisages American farmers learning important and relevant lessons from African farmers. Based on reviews of past development efforts, it advocates the use of untapped resources such as indigenous plants and animals and people's knowledge of how best to use them. It notes that local knowledge may provide resources for agricultural development beyond those manifested in existing production systems.

3 Robert Chambers, Arnold Pacey and Lori Ann Thrupp (eds.), **Farmer First: Farmer Innovation and Agricultural Research** (IT Publications, 103-105 Southampton Row, London WC1B 4HH, UK, 1989). This book is organized in 4 parts: Farmer Innovation, Farmers' Agendas First, Practical Participation, and Institutions and Practical Change. Although only two chapters specifically refer to IK, others strengthen the concepts of IK, farmer innovation and the complementary methods needed to improve agricultural research. The authors believe that much of the problem of agricultural development lies in the process of generating and transferring technology, and much of the solution lies with the farmers. Hence, Farmer First.

Flyer enclosed with this issue of the ILEIA Newsletter.

4 Johannes Kotschi, Ann Waters-Bayer, Reinhard Adelhelm and Ulrich Hoesle. **Ecofarming in Agricultural Development** (Margraf, P.O. Box 105, D-6992 Weikersheim, FR Germany, 1989). This book describes ecofarming and explains why it is desirable to pursue it in the development of smallholder agriculture in the tropics. In Chapter 3, the authors take a deeper look at IK and ecofarming in the tropics. Possibilities of collaboration between farmers and agricultural scientists are discussed.

5 Warren, D.M., Slikkerveer, L.J. and Titilola, S.O. (eds.), **Indigenous Knowledge Systems: Implications for Agriculture and International Development** (Technology and Social Change Program, Iowa State University, Ames, Iowa 50011, USA, 1989). This collection of papers from two conferences on the role of indigenous knowledge systems (IKS) in agriculture and rural development reflects current thinking and activities, and makes an important contribution to this rapidly evolving field of study. Several subjects of relevance to IKS are covered, including history, economics, natural resource management, gender issues and documentation.

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BOOK REVIEW

GOOD FARMERS: Traditional Agricultural Resource Management in Mexico and Central America. Gene C. Wilken, University of California Press, Berkeley, 1987. 302 pp. ISBN 0-520-05277-3 (hardback). Price: US$58.00

In the late 1960s, when few had recognized the importance of indigenous low-external-input agriculture, Gene Wilken already published on traditional farming in Mexico and Central America. He later compiled his experiences in a book dedicated to those who introduced him "patiently and with comprehension to the relevance and beauty of their work".

In the introductory chapters, Wilken stresses the favorable energy input/output ratios that characterize indigenous agriculture. He structures his book according to management of the resources soil, slope, water, climate and space.

Traditional **soil** classification emerges as a facet of resource management. Characteristics of natural resources such as organic material are related to particular soil and crop conditions. The system reveals a detailed understanding of plant requirements.

With respect to **slope** management, Wilken shows that over the years, despite many constraints and hazards, thousands of hectares of mountainous Central America have been molded into forms that effectively conserve moisture, control erosion and create productive fields in areas otherwise marginal for farming. The farmers developed an enormous variety of mounds, ridges, pits, furrows and beds, each a response to particular crop, climatic, soil and slope conditions. All presumably improve crop plant environments. To substantiate this "presumably" is a task for quantitative research on indigenous knowledge and its principles.

The examples of **water** management show the efficiency of manual scoop irrigation and include several techniques of extracting subsurface water. An almost universal characteristic of small-scale farming is "doing something about the ▶

weather", but few scientific data presently available on **microclimate** management and manipulation can be applied to small plots – yet another gap in our knowledge. **Space**-conserving methods, e.g. intricate forms of multiple cropping, are used where space is physically, ecologically or economically scarce .

Looking to the future of traditional resource management, Wilken concludes that even the ways in which traditional technology could be examined and incorporated into the general body of agricultural knowledge remain vague. Most of this technology is unknown outside local areas and there is much to be learned about how it functions. But, in Wilken's words: "Fortunately, among the millions of traditional fields and farmers, there are many classrooms, many teachers".

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Regional resource centres for indigenous knowledge

In 1989 NISER and the Centre for Indigenous Knowledge for Agriculture and Rural Development (CIKARD) collaborated in establishing two centres in Ibadan, Nigeria: the Africa Resource Centre for Indigenous Knowledge (ARCIK) and the Nigeria Resource Centre for Indigenous Knowledge (NIRCIK).

Objectives of the new centres include promoting incorporation of indigenous knowledge (IK) into the design and implementation of development programmes.

CIKARD is also promoting the establishment of IK resource centres in Asia and Latin America, initially with the International Institute of Rural Reconstruction (IIRR), Silang, The Philippines and the Centro de Ensenanza, Investigacion y Capacitation para el Desarrolla Agricola Regional (CEICADAR) in Mexico.

Similar to CIKARD, the regional centres will record and analyse ethnoscience and indigenous technology, and will promote incorporation of IK into educational and economic development programmes. CIKARD is particularly interested in approaches which encourage self-reliance and local participation in projects, and in experiences in applying modern scientific methods to augment traditional methods and practices.

Contact: CIKARD, Iowa State University, Ames, Iowa 50011, USA.

SOURCES

Basant, R. 1988. Indigenous knowledge and technology diffusion: a case study of agro-mechanical technology in Gujarat, India. Working Paper No. 16. Gujarat Institute of Area Planning, Ahmedabad. 31 pp. Local artisan and farmers in Gujarat have solved the cost problem by modifying existing seed drills and blade hoes to enable them to serve multiple functions.

Biggs, S.D. 1989. **A multiple source of innovation model of agricultural research and technology promotion**. Agricultural Administration (Research and Extension) Network Paper 6. 71 pp. ODI, Regent's College, Inner Circle, Regent's Park, London NW1 4NS, UK.
The dominant image of agricultural research and spread of technologies in the minds of most scientists is the central source of innovation model – new technologies spreading from the formal research stations via the extensionists to the farmers on the edge of the circle. Biggs argues that innovations in agriculture come from multiple sources – from experimenting indigenous farmers, from innovative research practitioners not at the centre of the formal research system, from research-minded administrators, from NGOs and diverse other private and public institutions. He discusses the implications of this multiple source of innovation model for the language and actions of formal research and extension services and the way research funds are allocated.

Mathias-Mundy, E. and McCorkle, C.M. (forthcoming in 1990). **Ethnoveterinary medicine: an annotated bibliography**. This bibliography – compiled by a veterinarian and an anthropologist - encompasses over 250 works that deal in whole or in part with indigenous knowledge, beliefs, skills, management practices, etc. pertaining to animal health. Price and payment instructions can be obtained from: CIKARD, 318 Curtiss Hall, Iowa State University, Ames, Iowa 50011, USA.

Nunez Martinez, O., 1988. **Technologias Campesinas de Chile**. An effort has been made to recover, systematize and develop popular (traditional) knowledge and exchange it among Chilean farmers. In 611 pages, examples are given of machinery and agricultural tools, beekeeping, agricultural infrastructure (mills, pumps, dryers, etc.), means of transport, and small-scale industry.
More information: *Centro Canelo de Nos, Casilla 6257, Santiago 22, Chile.*

Warren, Brokensha, and Slikkeveer, (ed), 1990 (in press): **Indigenous Knowledge Systems: The cultural dimension of development**.
The different chapters will deal with: indigenous knowledge systems, decision-making systems, organizations, experimentation and innovations, international institutions and indigenous knowledge, and bibliographies.
More information: *CIKARD, 318B Curtiss hall, Iowa State University, AMES, Iowa 50011, USA.*

Warren, D.M. 1989. **Linking scientific and indigenous agricultural systems**. In: Compton, J.L. (ed.), The transformation of international research and development. Lynn Rienner Publishers, 1800 30th Street, No. 314, Boulder, Colorado 80301, USA. 248 pp. US$32.00 including postage and handling.

Further References:
Nabhan, G.P. 1989. **Enduring seeds: native American agriculture and wild plant conservation**. North Point Press, 850 Talbot Avenue, Berkeley, California 94706, USA. 225 pp. US$18.95.

Moles, J.A. 1989. **Agricultural sustainability and traditional agriculture: learning from the past and its relevance to Sri Lanka**. Human Organization 48: 70-79.

CESO/CUSRI, 1989. **Indigenous Knowledge and Learning**. Papers presented in the workshop on indigenous knowledge and skills and the ways they are acquired. Cha'am, Thailand, 2-5 March 1988. US$8,75 (incl. postage) (Bank charges: US$10.00!). CESO, P.O. Box 90734, 2509 LS The Hague, The Netherlands.

Davison, J. (ed.), 1988: **Agriculture, women and land, the African experience**. Westview Special Studies on Africa, Westview Press, Boulder.

McCall, M. 1987. **Indigenous knowledge systems as the basis for participation: East African potentials**. Working Paper No. 36. 21 pp. hfl 5.00. Available from: Publications Officer, Technology and Development Group, University of Twente, P.O. Box 217, NL-7500 AE Enschede, The Netherlands.

McCall, M. 1988. **Indigenous technical knowledge in farming systems and rural technology: a bibliography on Eastern Africa**. Working Paper No. 38. 40 pp. hfl 8.50. Available from: Publications Officer, Technology and Development Group, University of Twente, P.O. Box 217, NL-7500 AE Enschede, The Netherlands.

Scoones, I. 1989. **Patch use by cattle in dryland Zimbabwe: farmer knowledge and ecological theory**. Pastoral Development Network Paper 28b. Overseas Development Institute, Regent's College, Regent's Park, London NW1 4NS, England.

Weiskel, T.C. 1989. **The ecological lessons of the past: an anthropology of environmental decline**. The Ecologist, Vol.19, No.3, 1989. pp. 98-103. The Ecologist, Worthyvale Manor Farm, Camelford, Cornwall PL32 9TT, England.

NETWORKING

PRATEC has developed a register of farmers' technologies, called 'Saber Campesino Andino' (Andean farmers' knowledge). More than 70 different indigenous technologies have been described on the basis of a format which contains some 30 questions covering different aspects of the technology in a systematic way. The most important objective is to facilitate the exchange between farmers and farmers' communities. Further it serves as a source of training for technical field staff and it is a way to stop the erosion of indigenous knowledge. PRATEC organizes workshops for field technicians on farmers' knowledge.

More information: Proyecto Andino de Technologias Campesinas, Pumacahua 1364, Lima 11, Peru.

◇

DISCOVERY AND INNOVATION is a multidisciplinary quarterly journal. The topics treated encompass basic sciences, engineering and technology, applied sciences (like agriculture, medicine and climatology), ecology, traditional African science and technology, social and human sciences and anthropology. Contributions should be the results of original research.

More information: Academy Science Publishers, P.O. Box 14798, Nairobi, Kenya.

◇

PPST FOUNDATION a.o. conducts detailed investigations on the traditional Indian sciences and technologies, social structures, legal, political, religious and other systems; investigates the impact of modernization on the traditional political, economic structures, and assesses the potential of the traditional systems vis-a-vis the modern ones; develops and promotes technologies and practices which help Indian people to retain greater control over their lives and resources which are at the same time environmentally sound and resource-conserving and publishes the PPST Bulletin.

More information: Patriotic & People-oriented Science & Technology Foundation, No.6, Second Cross Street, Karpagam Gardens, Adyar, Madras 600 020, India.

◇

DOCUMENTING INDIGENOUS KNOWLEDGE. A checklist to document indigenous knowledge has been made by Anil Gupta.

For further information, contact him at: Indian Institute of Management in Agriculture, Vastrapur, Ahmedabad, 380 056, India.

◇

CLADES: The Latin American Consortium on Agroecology and Development wants to foster rural development based on indigenous knowledge. It coordinates research, training, and information exchange between the member NGOs in Bolivia, Brazil, Chile, Colombia, Ecuador, Paraguay and Peru.

More information: Miguel Altieri, College of Natural Resources, 1050 San Pablo Avenue, Albany, CA 94706, USA.

◇

SURVIVAL INTERNATIONAL. Throughout the world tribal peoples are struggling just to survive. Their lands are being invaded, their homes are being destroyed, their fate is hanging in the balance. Survival International campaigns for their right to live their own lives without exploitation or suffering, their right to speak their own language, to practice their own religion, to bring up their children in their own way, to live on their own land.

More information: International Secretariat, 310 Edgware Road, London W2 1DY, England.

◇

FAO AND INDIGENOUS KNOWLEDGE ON TREES. FAO wants to analyze the role that local knowledge and management systems of natural resources can play in FAO's development projects and programmes. A series of studies are designed to clarify local decision making, priorities, indigenous knowledge, and women's role on the management of tree and forest related resources.

More information: Marilyn Hoskins, Senior Forestry Officer, FAO, Policy and Planning Service, Forestry Department, Via delle Terme di Caracalla, 00100 Rome, Italy.

◇

TRADITIONAL PRACTICES FOR MANAGING PLANT DISEASES. Traditional farmers throughout the world have developed strategies for managing plant diseases. Many of these practices have been adapted over centuries, and have thereby withstood the most stringent tests of sustainability.

David Thurston and Neil Miller of the Department of Plant Pathology, Cornell University, are documenting these practices for dissemination to scientists, development practitioners and others interested in sustainable agriculture.

Since much of the information on traditional agriculture remains undocumented or in reports which are not widely accessible, individuals who are aware of documentation, slides or notable examples of traditional practices for managing plant diseases are encouraged to submit this information for inclusion in the above projects.

For further information, write to: Neil Miller, Department of Plant Pathology, 334 Plant Science Building, Cornell University, Ithaca, NY 14850, USA.

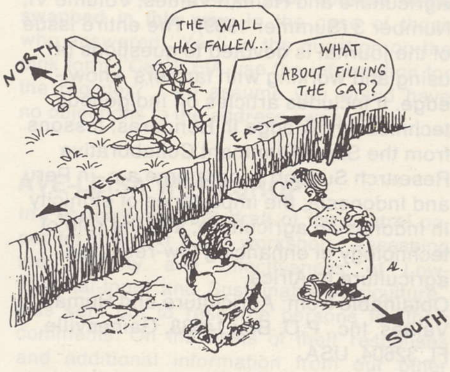
◇

"DEVELOPING A SUSTAINABLE WORLD", Fourth International Permaculture Conference, 10-15 February 1991, Kathmandu, Nepal

Permaculture is a design system for creating productive, diverse agriculture which is essential to support stable human cultures. It is based on observation of nature and traditional farming systems, for use in both urban and rural areas.

The aim of the conference is to provide a forum for discussion on and action by permaculture in cooperation with the policy makers, planners, aid workers, press and members who will be attending. People from all over the world who are engaged in sustainable agricultural systems and research, development organizations and policy, and other related fields are invited as guest speakers.

The conference will be hosted by the Institute for Sustainable Agriculture Nepal (INSAN), GPO Box 3033, Kathmandu, Nepal. Telefax: (977)(01) 524509; Telex: 2439 ICIMOD NP. For details on the costs, contact INSAN in Nepal.



Cartoon by Alain Crepin, first appeared in "TAM-TAM".

ASSOCIATION FOR FARMING SYSTEMS RESEARCH-EXTENSION. At the 9th annual International Farming Systems Symposium held in Arkansas, USA, in October 1989, the new AFSRE was formed. This is an international society organized to promote the development and dissemination of methods and results of participatory on-farm systems research and extension. AFSRE will continue support for the Farming Systems Symposium, publish a farming systems journal and distribute a farming systems newsletter to members throughout the world. First year membership fee is US$40 for citizens of the USA, Canada, Europe, Japan, Australia and New Zealand (US$20 for students). The fee for residents of all other countries in US$10. The 1990 Farming Systems Symposium will be held October 14-17 at Michigan State University and will focus on the role of farmers in farming systems research. Possible topics a.o. could include: farmers as a source of indigenous knowledge, role of farmer organization in FSRE, farmer-based methodologies.

Contact: Tim Finnan, Secretary/Treasurer, AFSRE, Department of Anthropology, University of Arizona, Tucson, Arizona 85721, USA

NETWORKING

SALT NEWSLETTER. In Sri Lanka a newsletter was started in September 1989 about SALT (Sloping Agricultural Land Technology) to allow exchange of information, ideas and experiences between field collaborators. The aim of SALT is achieving sustainability of upland agriculture through conservation and recycling of natural resources, with minimum need for imported inputs. The Institute of Fundamental Sciences (IFS) is serving as the source-base for the newsletter.

Contributions may be addressed to: Ranjit Mulleriyawa, IFS, Hantana, Kandy, Sri Lanka. A SALT video film and slides have also been prepared for showing to SALT field collaborators, farmers and policy makers. It will soon be available in Singhala, Tamil and English.

Building on Local Agricultural Knowledge, Agriculture and Human Values, Volume VI, Number 3 (Summer 1989). The entire issue of the journal is devoted to questions of using and working with farmers' knowledge. It includes articles on indigenous technical knowledge in Honduras; lessons from the Small Ruminant Collaborative Research Support programme a.o. in Peru and Indonesia; the importance of ethnicity in Indonesian agriculture; and the role of technology in enhancing low-resource agriculture in Africa.
Obtainable from: Agriculture and Human Values, Inc., P.O. Box 14938, Gainesville, FL 32604, USA.

AGRINET: The inaugural workshop of AGRINET, an association of European-based networks for Third World agricultural development was held at the Royal Tropical Institute, Amsterdam, in November 1989. ILEIA, RRD (Réseau Recherche Développement, Paris) and ODI ()verseas Development Institute, London) were joined by other networks from Denmark, France, West Germany, Netherlands, Sweden, Switzerland end the United Kingdom. The workshop agreed on AGRINET's mandate, which will initially focus on bibliographic and translation services. A steering committee was formed with John Farrington (ODI) as chairman. A seminar is to be held in the next 12-18 months for network members and representatives of donor agencies, focusing on networking as a means of promoting the exchange of experiences among a wide range of practitioners and across language barriers.
More information: John Farrington, ODI, Regent's College, Inner Circle, Regent's Park, London NW1 4NS, England.

For the second ILEIA Newsletter in 1990 we still lack practical examples of the involvement of small-scale farmers in successfully establishing or improving agroforestry systems on farms and communal land. Brief communications are more than welcome and should reach our office before 20 April 1990. Please send them to ILEIA, Attn.: Henk Kieft.

NEW IN PRINT

Gatekeeper Series. Sustainable Agriculture Programme, IIED, 3 Endsleigh Street, London WC1H 0DD, England (1.50 UK pounds each, incl. p & p).
Recent papers deal with crop-livestock interactions; soil erosion in Africa; participation by farmers, researchers and extension workers in soil conservation; crop variety mixtures in marginal environments.

Kaimowitz, D. 1990. **Making the Link: Agricultural Research and Technology Transfer in Developing Countries.** ISBN 0-8133-7896-6. 278 pp. Westview Press, 5500 Central Avenue, Boulder, Colorado 80301, USA, published in cooperation with the International Service for National Agricultural Research (ISNAR). Building effective links between scientists, technology transfer workers and farmers is one of the most widely debated issues in agriculture today. This book wants to offer a multidisciplinary evaluation, stimulating new insights and new direction to solutions for this complex problem.

Lightfoot, C., et al, 1989. **Training Resource Book for Agro-ecosystem Mapping:** Process Documentation of an Experiential Learning Exercise in Agro-Ecosystem Mapping, held at Rajendra Agricultural University, Pusa, Samastipur, Bihar, India, 7-10 March 1989. International Rice Research Institute, Philippines and Ford Foundation, India. 95 pp.
This training resource book is made for researchers wishing to learn and teach the essentials of Agro-Ecosystem Mapping. Agro-ecosystem maps also facilitate links between research and extension as these maps inform extensionists which farmers are most likely to adopt the technologies developed and where such farmers can be found.

One free copy can be obtained from: Clive Lightfoot, Farming Systems Specialist, ICLARM, P.O. Box 1501, Makati, Metro Manilla, Philippines.

Arntzen, J.W., 1989. **Environmental Pressure and Adaptation in Rural Botswana.** Botswana illustrates that economic development is alone not sufficient for sustainable development. The direction of the economic development is as important. This study describes and analyses land use and human activities in relation to mounting land pressure.
Information: Centre for Development Cooperation Services, Attn. J. Arntzen, P.O. Box 7161, 1007 MC Amsterdam, The Netherlands.

WANTED

Here in French Guyana, we have a problem with root-knot nematodes (*Meloidogyna spp.*). We try to control them with manure, which has some effect, but the heavy rains wash the manure away. We also try marigold, free-ranging chickens and crotolaria, but we still have problems. We are in great need of a good method to control nematodes, and welcome any suggestion.
***Otte Ottema,** c/o Denoit Girard, 47315 Sinnamary, Guyana Francaise, Latin America.*

Kindly send us information on the use of tobacco (*Nicotiana tabacum*) as a possible organic or botanical acaricide against ticks on livestock.
***John Wanjau Njoroge,** Kenyan Institute of Organic Farming, P.O. Box 34972, Nairobi, Kenya.*

Through the exchange arrangement between ILEIA and RODALE's Bulletin AG-Sieve, I learned about the Underground Vegetable Garden Technology. I have made two such structures in farmers' fields here in Nepal, in the Mustang district. Climatic conditions here are extremely adverse from September to February. However, with this structure, farmers are getting green vegetables now during this time and many have extended their happy pleasure towards this technology. Now I need more information regarding this technology.
***K.N. Shrestha,** Agricultural Development Bank, Ramshahpath, Kathmandu, Nepal.*

We are looking for information on leguminous cover crops which could be appropriate for growing under coffee and citrus trees for weed control; also where appropriate species are available. Some information on our region: altitude 700-1000 m, May-Nov: rainy season; Dec-Jan: light rains; Feb-May: dry.
***Kris McCamant,** Apartado 25, Matagalpa, Nicaragua.*

I am working with animal husbandry in the government farms in Bhutan. Many of the government farms depend heavily on concentrate-feeding. I would be interested if there are more ILEIA Newsletter readers working with government farms and what their experiences are with getting these farms "sustainably" run on low inputs.
***Tony Oude Hengel,** c/o ONV-Bhutan, P.O. Box 815, Thimphu, Bhutan.*

ILEIA NEWS

CONTRIBUTIONS

This column presents a selection of the articles received by ILEIA for publication. Because of the space, choice and timing of Newsletter themes and the nature of the contributions, not all of them will (soon) be published. But we list them here so that interested readers can request copies from us. All these articles have been included in the ILEIA library, so the experiences and thoughts won't get lost.

◆

Anderson, S and Pescador, N. **Animal Genetic Resources of Campesino Production System in Mexico**.
Static conservation of animal genetic resources is inappropriate to the needs of campesino farmers. A dynamic form of conservation, evaluation and selection is of more use.

◆

Bebbington, A. **Farmer Knowledge, Agroecology and Institutional Arrangements for Sustainable Development. Comments from a Case Study**.
Remote and disadvantaged Peruvian farmers who produce rocoto (*Capsicum sp.*) are blamed for destroying the region's ecology and the Amazon's and the whole world's climate. Government institutions don't realize that the rocoto farmers have a valuable body of knowledge.

◆

Boeren, F. and Jansen, K. **Minor Crops and Relations of Production in the Peruvian Andes**.
The specific role of the tuber crops oca and olluca in the local production system in the Peruvian Andes is described, as well as reasons for diversity in the cropping systems.

◆

Hoque, M.M. and Adalla, C.B. **Household Participation in Sustainable Vegetable Production: Case Studies Highlighting Women's Involvement**.
After observations on 'vegetable IPM', the activities of several farming households and the women's involvement in the production process are described. Sharing of ideas and experiences has generated trust and confidence.

◆

Mahendrarajah, E.S. **Bampol Poultry Feeders**.
How to make them, their advantages and a technical drawing.

◆

Meliala, G.Y.S. **Mr. Tahan Sembiring's Orange Field**.
The practices of a young (34 years) and successful farmer in North Sumatra, Indonesia are described. Compost is applied and virus diseases are controlled by his way of raising seedlings and bud grafting.

◆

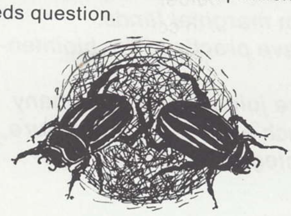
Metha, L.V. **Grandfather's Fruit Bottle Gourds**.
Seaweeds and pyramid water can help increase yields, edibility, nutritional value and quality of crops and vegetables.

◆

Mrinmoy, D. **Apiculture with Sustainable Agriculture**.
Being a beekeeper in India since 12 years, the author pleads that every farmer should adopt beekeeping for his crops and family. Faced with expensive external inputs, agriculture is enriched with honey bee pollination.

OUR EDITORIAL POLICY

To those of you who are wondering how and when your contributions could fit into the ILEIA Newsletter, let us explain our policy of focusing each issue on a special theme. One of ILEIA's aims is to document and disseminate field experiences and research findings about low-external-input and sustainable agriculture (LEISA). In each issue of the Newsletter, we look at LEISA from a different angle, e.g. participatory approaches in rural development, the importance of maintaining genetic diversity and, in this issue, indigenous knowledge. At the same time, we would like to encourage discussion about concerns raised in previous issues. Therefore, in each issue, we will bring feedback and further information about at least two recurring themes, e.g. soil fertility maintenance, women farmers, livestock as part of the agroecosystem, farmer knowledge and experimentation. In this issue, discussion continues about alternatives to chemical pesticides and the seeds question.



KEEP ROLLING!

The dung beetles will be rolling up the themes again. The ancient Egyptians regarded the scarab as a symbol of the sun. Dung beetles (*Scarabaeidae* family) are indeed most active when the sun is hot. These industrious insects roll fresh dung into balls, which they bury a few centimetres under the soil surface. They feed on the plant residues in the dung; burying it keeps the food moist enough to eat. Female beetles also lay eggs in dung balls made especially for this purpose: the larvae live from the food and emerge as beetles. The activity of dung beetles speeds up nutrient recycling and helps plant growth.

Dung beetles make an important contribution to low-external-input and sustainable agroecosystems. The ILEIA Newsletter wishes to do the same, with the aid of more than 3000 readers. When we publish a Newsletter on a certain theme, we hope that you will digest it so that new ideas can emerge. In this section, you have a chance to present further information about themes highlighted in previous issues, thus giving still more food for thought and action.

COMING ISSUES

The third Newsletter in 1990 will take a look at external inputs, for LEISA uses low but not no external inputs. How can resources from outside the farm or region be combined most effectively with local inputs and techniques? Examples might be finding the right mix of organic and chemical fertilizers, or intermediate technology, or strategic use of supplementary feed to bridge a gap in availability of local forages – not to forget century-old use of external inputs in indigenous systems. We welcome reports about field experiences, experimentation by farmers and others, and particularly about women's involvement. Does the introduction of external inputs tend to be male-biased? The deadline for contributions is 1 August 1990.

PINK FORMS CONTINUED

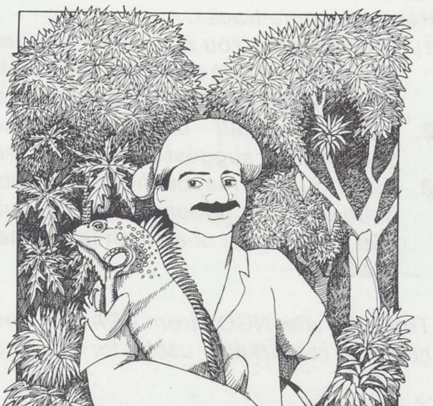
In our last issue, we asked you to send us the filled-in pink forms. Unfortunately, no pink forms were included in that particular issue. We therefore give you a second chance. We still lack information on some 2000 of our readers. If we wish to publish a register of the ILEIA network this autumn, we must have your pink form soon. It only takes a few minutes to fill out and it means a great deal not only to us but also to the other members of our (and your!) network. Thanks in advance!

ADDRESS SWAPPING

A number of networks are interested in swapping addresses with us. For example, when a network brings out a newsletter about a topic which would interest our readers, we would like to send our address list so that the newsletter can be distributed to you. Similarly, when we bring out an issue of particular interest to another network (for example, this issue might interest the CIKARD network), then we would like to send it to – in this case – the CIKARD addresses. **Please inform us if you object to your address being swapped in this way**. In the case of those who answered "Yes" to the question on the pink form "Can ILEIA use the information for the register?", we assume you would have no objections to the address swapping.

AVE-LEISA WORKSHOP

In February, the first draft of the central paper for the next ILEIA workshop "Assessing the Viability and Effectiveness of Low-External-Input and Sustainable Agriculture" was sent out to resource persons for their comments. On the basis of their responses and additional information from our other readers, a first "state-of-the-art" overview will be made and gaps in information will be identified.



The illustrations for Dagmar Werner's article "Fitting iguanas and forests into Central American farms" in ILEIA Newsletter 5/4 were drawn by Deirdre Hyde.

READERS WRITE

Dear Editors,

I have read with great interest your invitation to afford the LEISA extension in every region and thinking what role ILEIA could play.
First of all I would like to say that I do not see significant differences among organic agriculture, permaculture, regenerative agriculture, agroecology and LEISA.
Secondly, I must say that in Mexico we have not a strong movement on this field; you know, we are the cradle of "green revolution" and we had a long period of deeply subsidized external inputs, mainly fertilizers and fossil fuels, but pesticides, too. Besides, we have had an omnipresent government, who permeated the countryside with cheap credits – very often non-refundable – always tied to agrochemicals.
However, the crisis is waking us up; the National Rural Bank has reduced its operations; the fertilizers became less subsidized and we may see a progressive retreat of "modern" agriculture from marginal lands.
Thirdly, here are perhaps some 30 NGOs who have practiced the biointensive horticulture (vegetables gardening).
Fourthly, I am a member of three NGOs who have jointly organized many workshops, courses, meetings, etc. on issues such as organic agriculture, green manures and composting, agroforestry, integrated pest management, etc.

We have dealt with approximately 20 NGOs and even some GOs and technicians. At most recent days, we are beginning to build a relationship with the Instituto Nacional Indigenista. There it could be possible to find good conditions to develop LEISA, based on traditional agriculture, despite the majority of their own technicians, who are "married" to agrochemicals.
Last but not least, there are several Organizaciones Campesinas, who should be the best "target" of LEISA, because although it is true that they intend to build an alternative society, they reproduce the system in a very naive way, as they demand credits mainly on agrochemical inputs.
We are preparing ourselves to develop a communication strategy in order to inform a big number of Campesinos about some ecological alternatives.

Could ILEIA play a role in this context?

Well, I think it is a kind of "experiment", that we could try.
Here are some tracks.
1. *Information – You may share your own publications, bibliography, videos, etc., but I do not know very well how it could work for the wide public (I see the difficulties on languages, distance, etc.).*
2. *If you had a staff – directly or indirectly, it could be useful to answer the questions or suggest how to research the solutions to problems.*
3. *Networking is maybe the most important issue. Of course we should build our own, national network, but it would be encouraging to learn that we are part of a much larger network, of many people with similar goals.*

The links with NGOs from USA and Central America, catalyzed by ILEIA, could be remarkably useful for everybody.

Truly yours,
Angel Roldan Parrodi, Maderas del Pueblo, Tabasco no. 262, desp. 402, col. Roma, C.P. 06700 MEXICO D.F., Mexico.

ILEIA

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NEWSLETTER
march
volume 6 no. 1

ILEIA stands for Information Centre for Low-External-Input and Sustainable Agriculture. ILEIA was established in 1982 by the ETC Foundation and has mainly been funded by the Netherlands Ministry of Development Co-operation. The present programme funds are assured till 1994.

ILEIA's long-term objective is to contribute to a situation in which Low-External-Input and Sustainable Agriculture (LEISA) is:

- widely accepted and adopted as a valid approach to agricultural development, complementary to high-external-input agriculture,
- recognized as a means to balance locally available resources and local knowledge with modern technologies requiring inputs from elsewhere,
- valued as a useful perspective in planning and implementing agricultural research, education and extension,
- developing and consolidating its stock of knowledge and scientific basis.

Low-External-Input and Sustainable Agriculture is agriculture which makes optimal use of locally available natural and human resources (such as climate, landscape, soil, water, vegetation, local crops and animals, labour, local skills and indigenous knowledge) and which is economically feasible, ecologically sound, culturally adapted and socially just. The use of external inputs such as mineral fertilizers, pesticides, hybrid seeds and machinery is not excluded but is seen as complementary to the use of local resources and has to meet the above-mentioned criteria of sustainability.

ILEIA is reaching these objectives by the establishment of a documentation centre, the publication of a quarterly newsletter, publication of bibliographies and a register of organizations, international workshops and support to regional networks in Third World countries.

BACK COPIES
of the ILEIA Newsletter are available:
(US$5.00)

Vol.3/No.1: **Integrated nutrient supply.**
Vol.3/No.2: **Diversity.**
Vol.3/No.3: **Microclimate management.**
Vol.3/No.4: **Livestock as part of the agroecosystem.**
Vol.4/No.1: **Mountain agriculture.**
Vol.4/No.2: **Towards sustainable agriculture.**
Vol.4/No.3: **Participatory technology development.**
Vol.4/No.4: **Enhancing dryland agriculture.**
Vol.5/No.1: **Discussion on sustaining agriculture.**
Vol.5/No.2: **Intensifying agriculture in humid areas.**
Vol.5/No.3: **Farmers' hands on alternatives to chemical pesticides.**
Vol.5/No.4: **Local varieties are our source of health and strength.**

Also available: Proceedings ILEIA Workshop on 'Operational Approaches for Participatory Technology Development in Sustainable Agriculture', April 1989. US$ 7.50 (incl. p&p), Third World readers may request a free copy.

ILEIA,
P.O. Box 64,
3830 AB Leusden,
The Netherlands