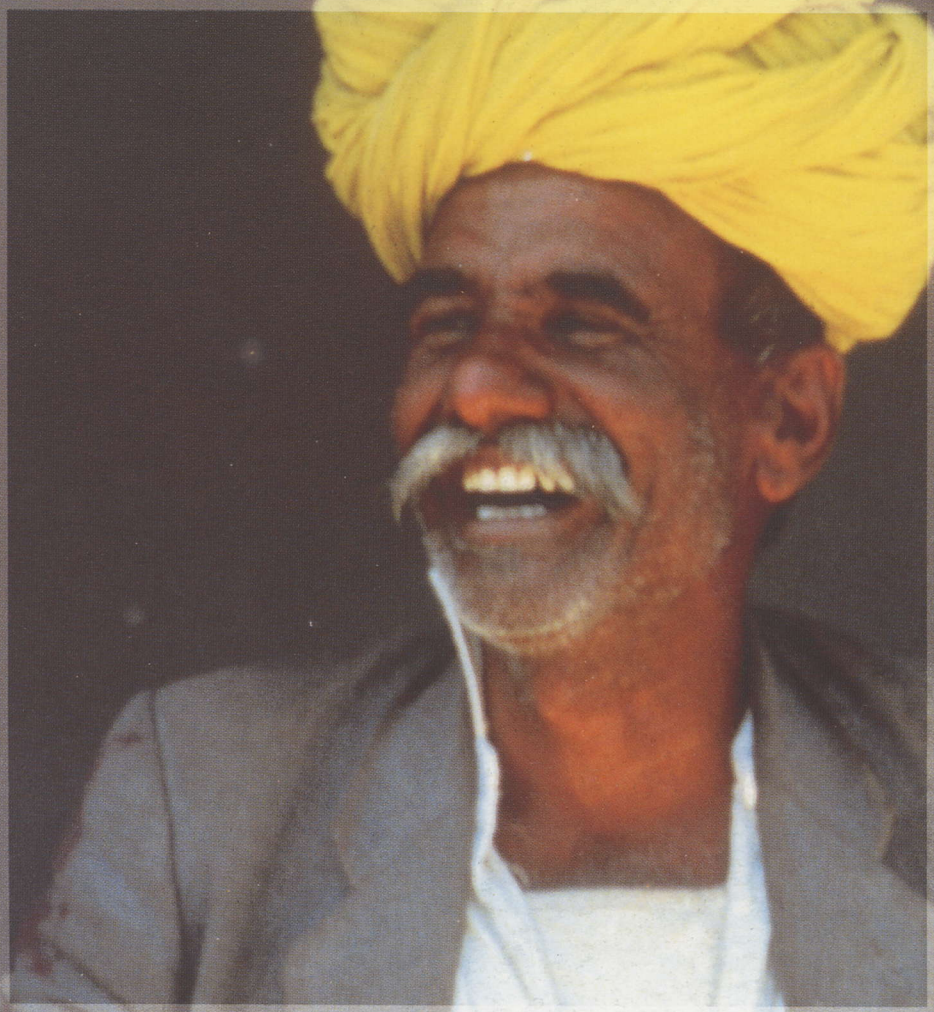
july 1997 volume 13 no.2

# LEISA

ILEIA NEWSLETTER FOR LOW EXTERNAL INPUT AND SUSTAINABLE AGRICULTURE



# Rejuvenate local knowledge

# LEISA

*july 1997 volume 13 no. 2*

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Address: PO Box 64, 3830 AB Leusden
The Netherlands
Visitors' address: Kastanjelaan 5, Leusden
Tel.: +31 (0)33 494 30 86
Fax: + 31 (0)33 495 17 79
e-mail: ileia@ileia.nl



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*EDITORIAL TEAM*

Wietse Bruinsma, Mariëlle Dubbeling, Wim Hiemstra, Ingrid Huibers, Coen Reijntjes. Language editor: Ann Long

*RESEARCH TEAM*

Peter Laban (Team Leader), Bert Lof (Research Co-ordinator). Country Liaison Officers: Mariëlle Dubbeling (Peru), Wim Hiemstra (Ghana), Coen Reijntjes (Philippines). Country Programme Officers: Edith Fernandez-Baca (Peru), Malex Alebikyia (Ghana), Carlos Basilio (Philippines)

*RESPONSIBLE FOR THIS ISSUE*

Coen Reijntjes and Hans Carlier

*TYPING*

Lila Felipie, Carmen Rodriguez

*ADMINISTRATION*

Marika van den Brom, Lila Felipie, Lesley Hadley

*COVER PHOTO*

Ilse Köhler-Rollefson

*DESIGN & LAYOUT*

Jan Hiensch, Leusden

*PRINTING*

BDU, Barneveld

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## How to gain from erosion

***Tells the tale of a visionary member of the Irob tribe in Ethiopia, Ato Ghebray Hawku. Some 50 years ago, against all odds and laughter, he decided to do his own soil and water conservation by building a small dam and irrigation canals. At the age of 78 Ato Zigta, another Irob, is still actively enlarging and improving his soil-harvesting system. He only regrets that the Irob did not think of this idea earlier, as so much soil has already flowed past them.***

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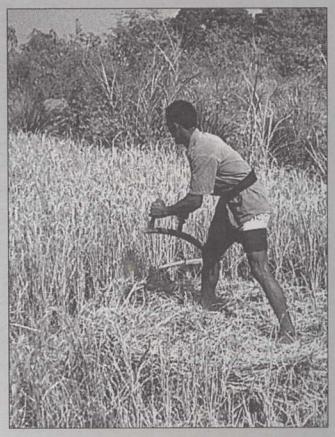
## *Permaculture booming in Nepal*



**Over a period of 6 years of steady work, the Jajarkot Permaculture Programme (JPP) in the mid-western Himalayan Hills of Nepal grew from one acre of land to over fifty villages in four districts, employing some 120 staff and having 12,000 members. Permaculture is more than just edible gardens; it is an innovative approach to participatory community development.**

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## Changing farmers' perceptions of pests

***To most rice farmers in Asia, insects are the main constraints to higher yields. The farmers' tendency to overestimate actual losses caused by insect pests and aggressive marketing campaigns have strongly influenced pesticide misuse. To change farmers' perceptions of leaf-feeding insects, a pilot project was organised in Leyte, Philippines. Farmers were encouraged to experiment with a simple pest management rule: 'in the first 30 days of transplanting, leaffolder control is not necessary.'***

*10*

## *The Herrandina plough*

*8*

***The Herrandina project in Peru shows the potential of a participatory technology development approach (PTD) to improve traditional tools, implements and equipment used by small farmers in the Andes. Designs developed locally in strong interaction with farmers can be 'mass-produced' and benefit farmers beyond the region where the design originally came from.***

# Dear Readers

*Normally, each issue of the ILEIA Newsletter focuses on a specific theme. These themes are mentioned in the ILEIA Newsletter and readers are invited to report on their experiences of these themes (see page 35 for the themes of coming issues). Also, for each issue, a 'call for articles' is mailed to key institutions and individuals. Some of the articles are directly requested from authors with known innovative experiences on the theme of interest. Unfortunately, it is not always possible to include all good articles, limited as we are by the straitjacket of 36 pages. In addition, ILEIA is receiving many articles that have no link with the theme and for which there is not enough space in the 'Keep Rolling' section either. In this issue of the ILEIA Newsletter ample space has been reserved for the best of these articles, carefully saved for the occasion.*

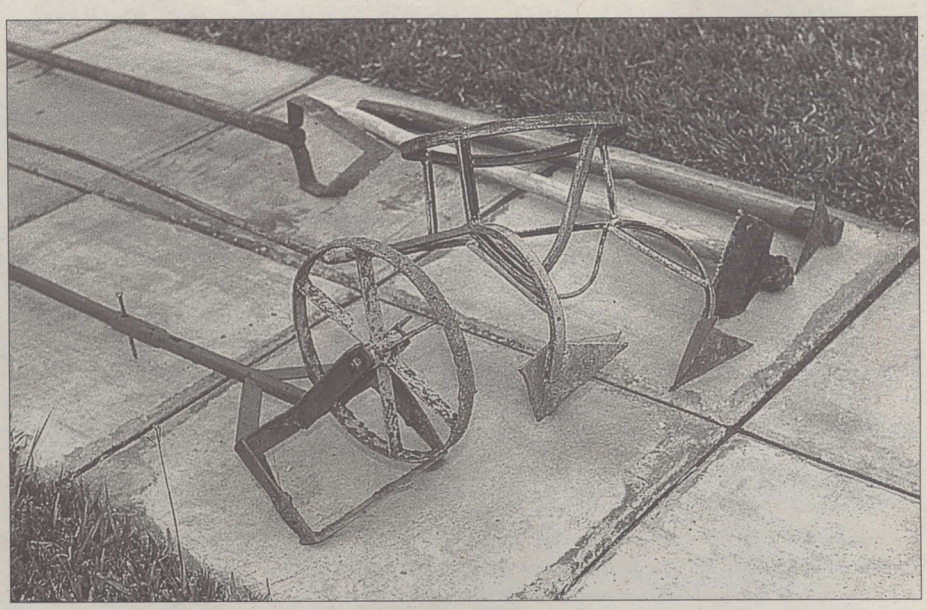
*Although this issue does not have a particular theme, there is, nevertheless, a continuous thread running through most of the articles: 'Rejuvenate local knowledge'. Local knowledge, skills, institutions and even rituals and taboos are taken as starting points to 'rejuvenate' the local technology system. Obviously, the production conditions, needs and values that were important for the older generation of farmers have changed for the younger generations. This adaptation process is described in most articles and ranges from the role of an agroecological school garden programme to documenting existing indigenous knowledge in order to preserve what remains of it. But traditional knowledge, spiritual insights (see Köhler-Rollefson and Tathore) and festivals (see Evans), which have served the local community so well in the past, cannot just be done away with: they are still tremendously valuable today, although they need to be adapted to fit the conditions and needs of the new generation.*

*The editors.*

***ILEIA*** is the "Centre for Research and Information on Low-External-Input and Sustainable Agriculture". It is a project implemented by ETC Netherlands and receives funding from The Netherlands Ministry of Development Cooperation. It was established in 1982. ILEIA's mandate includes collection and exchange of information on development of Low-External-Input and Sustainable Agriculture (LEISA) as well as collaborative research in partnership with Working Groups of farmers, development workers and researchers. ILEIA seeks to exchange information on LEISA by publishing a quarterly magazine, bibliographies, and books. ILEIADOC, the data base of ILEIA's documentation centre, is available on diskette and on ILEIA's Homepage on Internet: **http://www.bib.wau.nl/ILEIA**. ILEIA's Collaborative Research Programme is focused on assessment of the viability of LEISA technology systems. This assessment builds on participatory technology development, scientific studies and capacity building. The research is taking place in three zones of contrasting potential in agro-ecological and socio-economical terms: the dryland savannahs of northern Ghana, the high mountain valleys of Peru, and the humid lowlands of the Philippines.

***LEISA*** is about Low-External-Input and Sustainable Agriculture. It is about the technical and social options open to farmers who seek to improve productivity and income in an ecologically sound way. LEISA is about optimal use of local resources and natural processes and, if necessary, safe and efficient use of external inputs. It is about empowerment of male and female farmers, and communities, who seek to build their future on their own knowledge, skills, values, culture and institutions. LEISA is also about participatory methodologies to strengthen the capacity of farmers and other actors, to improve agriculture and adapt it to changing needs and conditions. LEISA seeks to influence policy formulation to create a conducive environment for its further development. LEISA is a concept, an approach and a political message at the same time.

***Better seeds, low external input and sustainable farming techniques are supported throughout Ghana. However, very little attention is given to the development and introduction of better tools. In the south in particular, where animal traction poses difficulties and is not common, few alternatives exist to traditional farming tools. The Farm Implements and Tools (FIT) Programme (a joint project of the International Labour Organisation, and TOOL, Amsterdam) has acquired some interesting experience working in this field. Together with two networks (ECASARD and ACDEP) of rural NGOs in Ghana, FIT tested ways to involve farmers and metal workers in introducing and adapting new equipment. Initial results are encouraging and merit sharing.***



# User-producer tools development in Ghana

**Martin van Berkel and Willy Laate**

The objectives of the tool development project were threefold:

- to identify and address farmers' tool needs;
- to identify tools that local metal workers can produce;
- to improve communication between farmers and tool producers.

A first step - consultations with farmers to identify priority tool development areas - was easy to organise because strong farmer groups working with NGO network members already existed in the area. They decided to select weeding tools as a first focus of activities. At a later stage, several groups proposed directing activities towards cassava processing equipment.

Weeding is seen as an important constraint, especially first weeding. This has to be undertaken just after planting, in a period of high labour demand. Traditional weeding tools in Ghana are labour intensive, especially the hoe and machete. The high labour demand and inefficient tools tend to make farmers postpone first weeding activities, thus affecting yields.

## Linking farmers and tool producers

A next step was for NGOs to identify among their existing contacts a number of interested farmers and metal workers. For each weeding tool assessment series a preparatory meeting was organised, attended by a metal worker, two to three farmers representing different farmer groups and an extension agent from each participating station of the Association of Church Development Projects (ACDEP) and Ecumenical Association for Sustainable Agriculture and Rural Development (ECASARD) networks. They discussed weeding in general, and the farmers and metal worker discussed a number of improved weeding tools presented by FIT. In addition to the local hoe, the farmers reviewed four new tools originating from Participatory Technology Development (PTD) exercises in Kenya - the 'Kenyan hoe' (a hoe with a triangular blade and a long handle), the 'Dutch hoe' (a push hoe with a long handle), the 'stealth weeder' or 'wheel hoe' (a push hoe with a wheel mechanism), and the 'drag hoe' (which has to be pulled with a stone as extra weight). For each station, the farmers and metal worker discussed possible modifications to these tools. For the Kenyan hoe, for example, a larger hoe plate was proposed, as well as a different hoe angle and an edge with teeth.

The farmers decided how many prototypes of which tool would be produced, using the seed money provided by the project, the management of which was in the hands of the station. In discussions over the production costs of the various prototypes, the farming groups took a strong bargaining position with the metal workers. Purchasing power and the interest of farmers were thus directly linked to the production realities of the metal workers.

## Prototype testing and modifications

Testing the prototypes, the logical next step in the process, was decided by the various farmer groups and their supporting NGO. This mostly boiled down to preparing detailed schedules for allocating the prototypes to interested farmers for particular periods of time, sometimes only a day. This enabled a considerable number of farmers to join in the tests, even though the number of prototypes available was low (production costs!). Factors such as soil conditions and crop type were also taken into account. Most stations opted for monthly monitoring meetings of farmers and metal workers to discuss experiences rather than the daily recording of test results. These meetings also provided the opportunity to suggest and implement minor modifications to the tools in the test programme. Problems relating to existing weeding tools became the criteria for assessing the improved tools. After one farming season, participants met with teams from other farming stations to compare and discuss the tools and test findings.

## Women, weeding, and the tests

In general, the farmers who participated were members of groups organised by the ACDEP and ECASARD stations. Representatives took part in all preparatory and evaluation meetings - mostly male farmers able to travel long distances from home. They and the tool producers made the decisions about what to test and how. Subsequently, the most active members of these groups took part in the testing. Women were better represented in the tests. Some details are available of trials in the ECASARD network in the southern part of Ghana, where 280 farmers actively tested tools (93 men, 167 women and 20 of sex unspecified). This is consistent with the fact that weeding is mostly done by women, and to the fact that both NGO staff and farmer leaders were conscious of the importance of involving women.

In general, results indicated that the new tools (especially the Dutch and Kenyan hoes) were slower, but less backbreaking, and thus enabled the farmer to weed longer. Farmers said the new tools were only useful on fields with young weeds and soil which was not too

stony. No exact pricing and sales information is yet available, but the prototypes for the Kenyan and Dutch hoes were in most cases only slightly more expensive than traditional hoes. Participating tool producers are now also working on orders from non-participating farmers.

### The cassava processing case

Most simple hand weeding tools can be produced by the local (rural) blacksmith. Cassava processing equipment (either manual or machine driven), however, requires the skills and facilities of a more sophisticated metal workshop. Sessions on cassava processing were held to see whether it was possible to establish a dialogue between rural (mostly female) food processors and these metal workers. A number of subsequent PTD steps were then organised. By visiting processing groups using locally-produced cassava graters, the participating women gained an idea of available options. Through discussions with the metal workers, these options were evaluated and modifications suggested. Subsequently, tailor-made prototype machines were developed and purchased by participating food processing groups.

**Table 1. Steps in Participatory Technology Development**

1. **Getting started**
   - searching for partners
   - making contacts
   - reaching women
   - situation assessment and/or village survey
   - agreeing on division of tasks and expectations
2. **Identifying options and making choices**
   - problem analysis and identification of priorities
   - assessing local capacity
   - looking for options, gathering information
   - traditional knowledge
   - ideas from elsewhere
   - screening options and deciding on criteria
3. **Improving and innovating**
   - deciding on design criteria
   - involvement or control of users/producers in design
   - flexibility in design
   - training in experimentation
   - 'laboratory' testing
   - experimentation and testing by the target group
   - diminishing material and social risks for 'test group' during testing
   - evaluating the technology
4. **Spreading out**
   - dissemination of the process
     - exchange visits and study tours
     - training in parts of the process
   - dissemination of the software
     - producer-to-producer or user-to-user training
     - demonstration units
   - production of the hardware
     - production by whom
     - control over production and pricing by users
     - links between users and producers
     - existing capacity of production units
   - supply and marketing of the product
5. **Sustaining the process**
   - establishing or strengthening organizational structures
   - supporting the target group in establishing links

### Lessons learnt

The joint tools development approach is based on the assumption that farmers (including food processors) and metal workers more easily adopt tool innovations if they control the innovation process. Whether they are able to control the process depends on a number of related factors that must be addressed in the preparation stages.

### Commitment

It is important to discuss expectations, strategies and responsibilities with the partners before starting the tool development process. The process will only succeed when all the participants - facilitating partner organisations and target groups - are equally committed. If farmers and tool producers are to be motivated to invest valuable time and resources in the development process, they must be convinced that co-operating can serve both their interests. A considerable amount of unproductive time must be invested in preparations, tests, evaluations and meetings, without receiving direct compensation. More importantly, participants have to play a vital role in disseminating the prototypes that emerge from the process, and promoting the methodology to other groups. All this is only possible if they believe the process will be beneficial and are committed to support it.

### Ownership

Essential to this conviction and commitment is 'ownership'. Participants should select the objectives, determine what will be developed and tested, and when, where and how. They should select the prototypes, criteria, modifications, dissemination methods, etc. If 'experts' or key informants are involved to provide advice (which in many cases can be very useful), they should avoid any temptation to take over.

### Capacity

Farmers and metal workers cannot do everything. A number of inputs provided with the assistance of a partner or specialised organisation can catalyse the development process, such as examples of improved equipment. Also, contacts for exchange visits, a useful way of getting acquainted with improved tools, may need to be established by the partner organisation. But the key elements of the process - prototype design and modification, testing, and dissemination, should be managed and controlled by the participants themselves. Not all rural farmers or food processors can (afford to) manage these elements. Tool users have to be open to innovation and able to evaluate test results. The closer the tool producer, the easier the communication. But the closest tool producers (often the rural blacksmiths) do not always have the capacity to implement innovations. A careful evaluation of the metal worker's skills and capacity in relation to the equipment to be developed is needed for success.

### Remaining questions

Collaboration between tool users and producers, (see table 1), once established, should lead to the development of better equipment. FIT's activities in Ghana have not yet reached this stage, but current experiences provide lessons that are relevant and can help to optimise the tools development approach.

Some issues need further experience and clarification: how can the expertise of key informants be utilised without hijacking the process? Who should be responsible for assessing participants' skills? Where and how can organisers collect samples of already improved equipment? How is the quality of an innovation to be determined? Is it better to assist local tool producers to upgrade their skills or to increase the farmer's mobility? Who should be involved in the commercialisation of useful innovations?

The slow and careful process of developing, testing, modifying, disseminating, and commercialising often does not fit within the scope of traditional development activities. Many projects are short-term and donors require immediate and demonstrable results. A compilation of experiences will help to improve the methodology and should convince important actors, from technicians to policy makers, that collaboration between technology users and producers is essential for sustainable tool development. ■

**Martin van Berkel**, former co-ordinator FIT Ghana, c/o TOOL Amsterdam
**Willy Laate**, ECASARD, PO Box 68, Madina, Accra, Ghana

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*Note: A 25 minutes video has been prepared on the weeding tools development process with ECASARD. By January 1997, a CD-Rom will be published compiling the FIT experience and containing most of the papers and manuals and a lot of other multimedia material. Available from TOOL, Sarphatistraat 650, 1018 AV Amsterdam, The Netherlands*

***Generally we look, in these columns, at tools from the users' perspective. In this article, the process is described of how users and artisans co-operated for the development of tools, through the intermediary of the Farm Implements and Tools (FIT) programme in Kenya. This programme follows basically a four stage approach, known as the user-led innovation approach: raising awareness of the potential for innovation; accessing know-how for innovation; handling risks; and reaching new markets. By bringing producers and consumers together and creating the right setting for a meaningful dialogue between them, the essential precondition for further development has been created. Jim Tanburn and Martin Osumba give detailed information about the process.***

# Development of tools
# *The artisans' perspectives*

**Jim Tanburn and Martin Osumba**

In most participatory approaches of tools and agricultural equipment development, rural artisans or metal workers are called in by extension organisations to interact directly with farmers to develop and produce the needed (improved) artefacts. In making this interaction sustainable, independent from the extension organisation, the artisans have an important role to play. It can be achieved by considering what makes innovative artisans 'tick', and then building on this. What gives artisans the 'technological confidence' to respond creatively to their changing environment, and to meet the needs of their customers more effectively? Experience from the Farm Implements and Tools (FIT) programme in Kenya sheds light on these questions. This programme follows basically a four stage approach, known as the user-led innovation approach: raising awareness of the potential for innovation; accessing know-how for innovation; handling risks; and reaching new markets (Tanburn, 1996).

## Raising awareness of the potential

The networks of artisans are often limited, not extending far enough beyond friends and family to bring them new product ideas, suppliers or customers. Meanwhile, feedback from customers is often negative, partly in the hope of getting a reduction in the price. As a result, artisans compete fiercely with their neighbours in a very limited product range with resulting economic stagnation. Supporting DAREP (Drylands and Applied Research Extension Project) FIT mobilised local blacksmiths and welders to meet with farmers, listen to their need for tools, and review new tools. They discussed the different aspects of tool design, including the quality of components where this was important, and also the prices farmers would be willing to pay. The artisans afterwards described this meeting as 'an eye-opener'. Similar events were organised under the 'umbrella' of the Kisumu Innovation Centre - Kenya (KIC-K).

Another service provided for creating awareness has been that of enterprise visits. The difference with the well know farmer-to-farmer visits is that the artisans (are willing to) pay the costs. Artisans preferred to form their own groups and make group visits, rather than individual visits; men often were not keen for their wives to make visits on their own. The most commonly reported benefit of these visits was increased self-confidence (Hileman, 1995). Those who made visits, or had other opportunities to exchange ideas and information with their peers, made several, substantial innovations in different aspects of their business upon their return (Craig and Cherono, 1994).

## Accessing know-how for innovation

In the above activities artisans obtained specific information which enabled them to design innovative products - an important outcome. But how can artisans gain self-sustaining access to the know-how they need in order to remain innovative?

Enterprise visits are part of the answer - not least because they are a 'service' which workers in 'micro and small-scale enterprises' (MSEs) and metalworkers have been using for years, and are prepared to pay for. In Kenya, FIT is collaborating with a private company offering services to help organise artisans, among others. But a great number of other 'vehicles' can be used to increase access to information: street vendors, local 'information brokers' newspapers, dedicated to MSEs or 'copy packs'. The copy pack idea, involves placing information catalogues in photo-copying shops. Clients choose the information they need from the catalogue, and pay for the photocopy. But there is clearly great scope for the development of other approaches, in particular to reach those MSEs who cannot read and write.

A promising alternative for making sustainable links between artisans and farmers involves the middlemen and women - the traders who market so many artisan products. Their knowledge of local markets is extensive, and it is in their interests to feed back that information to local producers. Their preference for buying good local products rather than travelling to Nairobi, motivated them to order new products from the local MSEs. But again, existing communication is poor. FIT and MATA, a local MSE service company, organised a series of seven monthly meetings between medium- and small-scale metal-workers and local merchants, also in Embu. These meetings clearly 'broke the ice', leading the merchants to place orders with the MSEs for a wide range of products, including hoes, ploughs, forks and wheelbarrows (Mwaniki Ireri, 1996).

While the placing of these orders was an important outcome, the discussions between the merchants and the MSEs, and amongst the MSEs themselves about how products could be made, were equally important. The merchants were purchasing mass-produced goods, often made from materials that the MSEs cannot use so easily

*Second Farmer - MSE meeting in Embu. Artisans present their designs to the farmers. The award winning drag hoe.*

(e.g. cast iron, plastics). Some substitution and even re-design was therefore required. All stood to gain if it could be achieved, so the merchants were happy to 'brainstorm' about solutions to the MSEs production problems.

## Handling risk

Many artisans feel that they cannot afford the risks of making new products without firm indication of a market. Identifying customers willing and able to purchase innovative products helps to address this problem. Clearly, the Embu merchants came into this category. In the case of farmers, even when they are willing to buy, they may need to save for several months before being able to pay for the new tool. If the artisans are already experiencing cash flow problems, it is clear that such a delay may be damaging to their business. SEDECO in Machakos tries to address this by making credit available to the customers (in this case, the food processors). It is too early to say whether this approach has been successful; loans are being made available to groups, using the 'peer-pressure' principle to ensure repayment.

## Reaching new markets

As part of this fourth component in its approach, FIT has initiated a range of services for enterprises to reach into new markets, including, for example, 'How to organise your own enterprise trade show'. 'Rapid Market Appraisal' is the title of a short course which trains artisans in how to identify and interview potential new customers. In addition, FIT has organised a number of small shows where artisans could display their new designs to the farmers. The artisans, however, were somewhat reluctant to take on the initiative themselves, even when they had made sales at previous shows, because of high transport costs.

In Embu, take-up of the new implements has so far been relatively slow, most likely because of the limited purchasing power of local farmers. More encouraging have been the results from Kisumu. One artisan sold new tools designed during the ULI process worth over $1,000 in the 5 months after the process finished. Two others also achieved significant, although more modest sales. The designs sold included chaff cutters, water pumps, weeders and ploughs.

It is apparent, therefore, that the convening of meetings between groups of producers and end-users brings greatest benefits only to certain producers (and their customers). Anecdotal evidence, however, suggests that neighbouring artisans will imitate the innovation process by starting, for example, to listen more carefully to what their customers tell them, or to organise enterprise visits on their own initiative. Evaluations have shown that the benefits for visiting MSEs have been more evenly distributed, with almost every MSE showing innovation as a result of the visits. Furthermore, there is evidence to suggest that they have employed more people and that such workplaces have become more secure and of a higher quality than before the visit.

## Lessons and questions

Mobilisation and reaching farmers was most effective through the large extension programme. However, such farmers often lived in marginal areas at long distances from the artisans, with low purchasing power (Mwaniki, 1995). The smaller number of farmers reached through KIC-K generally lived closer by and provide therefore a more direct market for the artisans.

Special efforts were needed, to ensure the participation of women farmers. Although the majority of smallholder farmers in Kenya are women, it is typically the men who make the purchasing decisions, particularly about tools. Where meetings with artisans were presented as 'Tool Days', most of the participants were men. Even when women farmers had been invited personally, their husbands often came instead. One solution was to advertise the meetings as 'Farmers Days'; in these cases, at least half of the participants were women - who had very clear views about what they looked for in their implements.

Artisans were generally delighted to dialogue with farmers. Initially, however, they showed reluctance, partly because they anticipated (quite correctly) that feedback would be negative. Only after the farmers had been able to express their low opinion of MSEs in general was it possible for them to move on to more constructive dialogue. But how can they be brought to the initial meeting without outside subsidy? Who might have a (commercial) interest in bringing these two groups together and ensure sustainability of the linkage?

Many artisans had difficulty in pricing their new design, and sometimes quoted higher prices than necessary because they did not know how to arrive at a more accurate figure. This deterred some customers who might otherwise have purchased the innovative product.

Generally speaking, it is evident that some artisans can innovate well, responding quickly and appropriately to the needs and preferences expressed by the end-users of their products. It is also clear that the current communication between these two groups is inadequate, and that both are therefore penalised unduly. Interventions can be made, at very low cost, to address this constraint. In some cases, participants are willing to pay all the direct costs involved, thus pointing to a potential for true sustainability. But how can these experiences be 'scaled up'? FIT is keen to exchange experiences with other organisations on all issues raised in this article. ■

**Jim Tanburn**, General co-ordinator of the FIT Programme, c/o ILO, 4 Route des Morillons, CH-1211 Geneve 22, Switzerland.
**Martin Osumba**, PO Box 19456, Kisumu, Kenya.

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*Farmer- judges announce awards for best designs.*

## *The Herrandina Plough*

# Evidence of 10 years of 'PTD' in Peru

***Tells the story of improving a number of traditional tools, particularly ploughs, in Cusco in the Andes in Southern Peru, through close collaboration between farmers, engineers and a few small entrepreneurs in the design and testing of new tools and equipment. For local testing, the improved tools were spread throughout large parts of Peru, at the same time setting up an infrastructure for production and repair. The Herrandina project shows that designs developed locally in strong interaction with farmers can be 'mass-produced' (relatively speaking, then) and benefit farmers beyond the region where the design originally came from.***

**Kor Voorzee**

The Herrandina project in Peru shows both the potential of participatory technology development and the issues related to mass production of results. This project, financed by the bilateral Swiss development co-operation, aims to improve the tools, implements and equipment used by farmers in the Andes. In the period 1985-1995 it expanded its activities from the Cusco area to cover most parts of Peru.

To increase agricultural production based on traditional methods some progress had been achieved through seed improvement, soil conservation, and recovery of local crop varieties, but little attention had been given to agro-mechanical aspects. Project staff thus formulated a project to improve traditionally used tools and implements.

### Joint technology development

The Herrandina project worked in much the same way as the FIT programme in Ghana: Steps were taken to understand the farming process and the daily use of tools and implements, and together with farmers, constraints to increased productivity were discussed. These appeared to consist mainly of labour limits regarding soil preparation and quality, and for weeding and hilling around the plant during the first growth period. The low quality of cereal threshing leading to dirty, broken grains with little market value was also thought to be important.

To address these issues activities were initiated to make reliable tools and equipment that would be practically and

**Table 1: Comparison between traditional and Herrandina plough**

| Items compared | Traditional Wooden Plough | Improved Herrandina Plough |
|---|---|---|
| *Life time* | 2-3 years | 10 years |
| *Adjustments to adjust* | not possible, unless the plough is dismantled | working height and ploughing depth easy |
| *Possible repair* | difficult | easy repair, welding and replacement of parts |
| *Use* | only for ploughing | for ploughing, furrowing, hilling, weeding and the harvest of potatoes |
| *Effect* | ploughs only superficially | can plough deeper with easy adjustments |
| *Efficiency* | 1 ha in 28 hours | 1 ha in 18 hours |
| *Cost* | US$ 15-20 | US$ 60-70 |

culturally appropriate and not too expensive. Farmers, engineers and a few small entrepreneurs worked closely together in the design and testing of new tools and equipment. In a few years they improved the design of eight hand tools, and developed a multi-purpose plough based on the traditional model, and a cereal thresher with additional equipment (a winnower and a bale press). Experiences with the plough in particular show the relevance of the results of such a participatory approach.

## The Herrandina 'ard plough'

Figure 1 shows the traditional symmetrical wooden 'ard plough' that has been used at least since the Spanish conquest, and Figure 2 the new 'Herrandina plough'. At first sight the two ploughs look alike, but let us take a closer look at the Herrandina design: it is completely made of steel. Not from low-carbon mild steel, but from iron bars used to reinforce concrete for housing. These bars are available everywhere and are relatively cheap. Because of a slightly higher carbon content, this kind of steel has a higher tensile strength and is more resistant to wear and tear than mild steel. The design permits the exchange of some parts, making the plough more versatile. While a traditional wooden plough can only be used for ploughing, the Herrandina plough can also be used for crop maintenance and for the harvest of potatoes (see Figure 2). The working principle for the Herrandina plough is the same as its traditional predecessor and no extra skills are needed for its use. Table 1 compares selected features of both ploughs.

## Supporting dissemination

Once the tools and implements were improved in the Cusco region, it was felt that the designs would be useful for all other Andean regions. Herrandina opened offices in Cajamarca in the north and in Lima. To manufacture the equipment for testing, the project selected metal working entrepreneurs in most of the cities of the Andes. This was important strategically, as in this way, a wide dissemination of the tools, implements and equipment could be achieved without losing the dialogue between the manufacturer of the tools and the users. In the years following the extension of the project to the whole country, some changes and refinements were achieved by incorporating farmers' suggestions. The entrepreneurs were very inventive too, improving not only the designs but also the production methods.

The Herrandina project shows that designs, developed locally with the strong involvement of farmers, can be mass-produced and benefit farmers beyond the region where they were originally designed. Table 2 illustrates this with the figures of total sales over a period of five years.

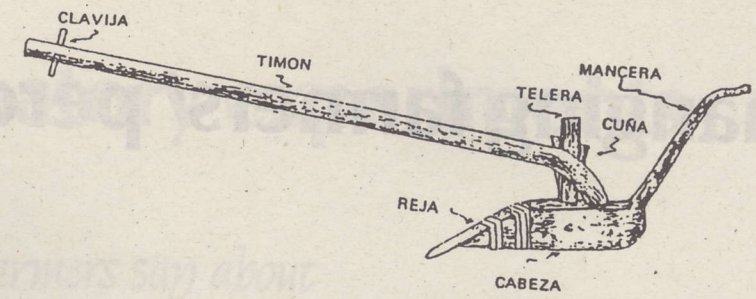


*Figure 1. The traditional 'ard plough'*

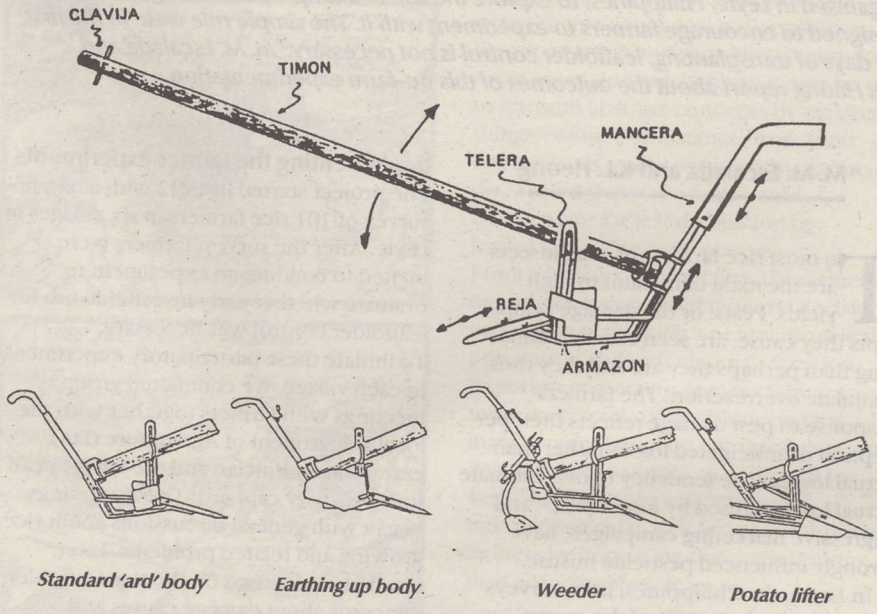


*Figure 2. The new 'Herrandina plough'*

**Table 2: Total sales of tools, implements and equipment**

| | 1989 | 1990 | 1991 | 1992 | 1993 |
|---|---|---|---|---|---|
| *hand tools* | 3535 | 1484 | 2686 | 10156 | 4300 |
| *implements* | 366 | 831 | 674 | 2733 | 1100 |
| *equipment* | 152 | 106 | 185 | 861 | 750 |

Sales in 1992 were high due to an order of $500,000 by Caritas Peru.

To achieve such an impact, contact between users and manufacturers is essential. The metal entrepreneurs became the manufacturers, innovators and ultimately the promoters of the improved tools and implements. Projects or NGOs may serve as intermediaries, or merely as facilitators in the contact between manufacturers and users. On completion of an externally financed project such as this, the results must be commercially feasible for dissemination of their use to take place. A balance must therefore be found between the usefulness of the equipment to the users and the commercial interests of the manufacturers.

■

**Kor Voorzee**, technical adviser of Herrandina between 1990-1995, now at TOOL Consult, Sarphatistraat 650, 1018 AV Amsterdam, Netherlands.

*In Peru more information can be requested from: Herrandina, attn. Raul Hermoza, Jr. Marte 581, Lima 1, Peru.*

# Changing farmers' perceptions of pests

***To most rice farmers in Asia, insects are the main constraints to high yields. Farmers' responses to pest damage thus reflect their perception of the anticipated losses rather than the actual losses. The farmers' tendency to overestimate actual losses caused by insect pests and aggressive marketing campaigns have strongly influenced pesticide misuse. To change farmers' perceptions of leaf-feeding insects, a pilot project was organised in Leyte, Philippines, to explore the use of a simple pest management rule designed to encourage farmers to experiment with it. The simple rule was: 'in the first 30 days of transplanting, leaffolder control is not necessary.' M. M. Escalada and K.L. Heong report about the outcomes of this on-farm experimentation.***

**M. M. Escalada and K.L. Heong**

To most rice farmers in Asia, insects are the main constraint to high yields. Pests, or the damage symptoms they cause, are seen as more damaging than perhaps they are and they thus stimulate overreaction. The farmers' response to pest damage reflects their perception of anticipated losses rather than actual losses. The tendency to overestimate actual losses caused by insect pests, and aggressive marketing campaigns, have strongly influenced pesticide misuse.

In Leyte, the Philippines, farm surveys showed that about 90% of the sprays farmers use in a season are insecticides (Heong et al., 1994). Most farmers apply their first insecticide sprays for 'worms' or lepidopterous larvae during the first 30 days after crop establishment. Farmers strongly believe that these larvae, particularly those of rice leaffolders, cause significant crop losses. Research has shown, however, that rice crops with high degrees of damaged leaves have no yield loss (Miyashita, 1985; Heong, 1993). Consequently, a lot of the insecticides farmers are using for leaffolder control are unnecessary.

To change farmers' perceptions of leaf-feeding insects, we organised a pilot project in Leyte to explore the use of a simple pest management rule designed to encourage farmers to experiment with it. The simple rule was: 'in the first 30 days of transplanting, leaffolder control is not necessary.' This rule is based on years of biological and ecological research such as pest-yield relationships, but also on farmers' decision making processes.

Farmers were invited to participate in testing this rule. We monitored their insecticide inputs and yields in both the experimental and the main plots. We also monitored changes in perceptions and attitudes toward pests and whether these changes were sustained over 6 seasons.

## Implementing the farmer experiments

The project started in 1992 with a baseline survey of 101 rice farmers in six villages in Leyte. After the survey, farmers were invited to conduct an experiment to evaluate whether early insecticide use for leaffolder control was necessary.

To initiate these participatory experiments in each village, we conducted group meetings with farmers together with the local Department of Agriculture (DA) extension technician and the village head (or *barangay* captain). These meetings began with general discussions about rice growing and related problems. Later, discussions focused on the rice leaffolder: concerns about damage causes and methods of control. Eventually, the discussions would concentrate on the issue of whether leaffolder needed control and whether anyone would volunteer to participate in evaluating the simple control rule.

Each participating farmer marked out an area of about 100 m2 in his or her field that would not receive any insecticide treatment in the first 30 days after transplanting. The rest of the field would receive normal treatments. All other agronomic practices in both the experimental and main plots would be carried out according to each farmer's normal practice.

We also provided farmers with support materials, such as a sign board for display in each participant's field, a booklet on friendly insects and field problems of tropical rice, comic strips depicting a discussion of a farmer who had done the experiment (see Fig. 1), a cardboard file with weekly activity sheets for recording farming activities and input costs, and finally, a set of instructions on how to conduct the experiment.

During the cropping season, we made at least two follow-up visits to each participant. At the end of the season, a workshop was held at which farmers reported the results of their experiments and discussed possible reasons for yield differences. Extension technicians and neighbouring farmers were also invited.

## Monitoring surveys

To assess the effectiveness of farmer experimentation, we conducted two monitoring surveys in 1993 and 1994. The 1993 survey was carried out primarily to compare the yields and costs of insecticide application from their experimental and main plots. We also wanted to find out about insecticide use patterns, knowledge and attitudes toward leaf-feeding insects. The 1994 survey focused on farmers' pest management practices, cost of insecticide application, perception of yield differences and benefits derived from the absence of early insecticide spray for leaffolder control.

## What we learned

***Yield comparisons:*** The average rice yields of participating farmers were slightly higher in the experimental plots (5.3 t/ha) than in the main plots (4.7 t/ha). The main purpose of the farmer experiments was to point out that eliminating the early sprays for leaffolder control would result in no difference in yields. Close to three quarters (71.3%) of the farmers had either the same or higher yields in their experimental plots. Those who had lower yields in their experimental plots did not attribute the difference to the rice leaffolder. Instead, they gave reasons such as soil fertility, shading, and incidence of other pests, such as rice bugs.

Since the intent of the farmers' experiments was to encourage farmers to avoid the early spraying, the timing of their first insecticide application was considered to be the key indicator of impact. The percentage of farmers who applied insecticides early in the season dropped from 68.4% in 1992 to 11.3% in 1994. In terms of insecticide use, the average number of sprays per season dropped from 3.2 sprays per season in 1992 to 2.0 in 1994. The experimental plots also registered lower insecticide input costs per season per hectare (USD 7.6) as compared to the main plots (USD 17.1).

***Attitude changes:*** To determine whether the farmer experiments succeeded in changing farmers' perceptions, we compared their responses to statements on leaf-feeding insects from the 1992 and 1993

# through participatory experiments


surveys. In the 1992 survey, we found that more than three quarters of the farmers believed that leaf feeders would cause yield loss if not controlled in the early season. In 1993, the response pattern shifted by as much as 66.3%. The proportion of farmers who, incorrectly, thought that leaf feeders caused severe damage to rice in the early season also dropped from 77.2% in 1992 to 27.7% in 1993. Likewise, the number of farmers who were convinced that chemical control for leaf feeder had to be done early fell from 62.4% to 9.9%.

***Farmers' response to the experiments:*** More than 87% of participating farmers reported that they derived benefits from eliminating the early season insecticide application. Among these, the economic benefit turned out to be the most popular selling point for the big majority of farmers. Other benefits mentioned were reduction in labour input for spraying, reduction of health hazards resulting from less exposure to sprays, and less insecticide residue in rice grains which could affect eating quality.

## Conclusions

Farmer experimentation on a simple pest management rule appears to be an effective approach for changing farmers' perceptions. As a bridge between researchers and farmers, these simple experiments could deal with problem-driven research and simplified technology. As an extension mechanism, it may be used to transmit abstract concepts by making things visible. For instance, from their experiments, many participating farmers discovered that rice plants could compensate for leaf defoliation by leaffolders in the early season.

From a broader perspective, the farmer experiments enhanced farmers' decision making by promoting a pragmatic scientific orientation and reducing risk aversion. Experimentation encourages farmers to make more rational decisions on pest management based on empirical data, and enables them to apply an approach to verify new ideas by collecting and interpreting data. This serves to empower farmers by improving their perceptions, thus reducing their fears. ■

M. M. Escalada, Visayas State College of Agriculture
Baybay, Leyte 6521-A, Philippines

K. L. Heong, International Rice Research Institute
PO Box 933, Manila 1099, Philippines

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# Permaculture booming in Nepal

***After 6 years of steady work, the Jajarkot Permaculture Programme (JPP), in the mid-western Himalayan Hills of Nepal, grew from one acre of land to over fifty villages in four districts, employing some 120 staff and having 12,000 members. Chris Evans, designer, advisor and teacher to this programme, shows us that, in Nepal, permaculture has become a mature innovative approach to participatory community-based development of sustainable land use.***

**Chris Evans**

The idea of permaculture was first introduced to Nepal in 1986 when its co-founder, Bill Mollison, was invited by local development organisations to run a design course. Since than many permaculture workshops have been held and permaculture is a common term for all kinds of activities in the development of sustainable farming in Nepal.

In Nepal, 91-93% of the working population is dependent on agriculture for their basic livelihood. Agricultural practices around Jajarkot have become finely in tune with local mountain climates, landscape and people's needs. Such practices are intimately interwoven with the forest and other natural resources to maintain the balance of nutrients necessary to support agriculture and thus provide food, fuel, leave fodder, timber, medicines and other basic needs. Nationalisation of the forest, population growth and inappropriate programmes have combined to undermine the sustainability of traditional agriculture in a number of ways. Clearing forest land for farming, in an attempt to increase crop yields, has led to degradation of the very resources needed to support agriculture, and thus culture itself. The people of Nepal are now faced with the need to integrate forestry into agriculture in order to supply the resources they need for farming and other basic needs.

In Nepal, and Jajarkot is no exception, political and social effects of the move towards a market-oriented economy are combined with corruption from both the oppressive regimes of past decades and from the present inappropriate and unethical aid policies which promote high external input activities. The result is a disempowered people with inequitable access not only to basic needs but also to the products of the market economy - consumer and luxury goods - of which people assume that to be without is a sign of poverty.

## The Jajarkot Permaculture Programme

The Jajarkot Permaculture Programme (JPP), a relatively small local organisation in mid-west Nepal, has developed demonstration sites to show how sustainable agriculture can be practised by implementing good farm design and social programmes. Integration of trees, use of all farm land, improvement and utilisation of common property resources, and using techniques of low external input, provide the resources needed to increase crop yields without clearing new land.

The JPP is involved in training programmes for fruit and vegetable production, beekeeping, weaving, low-external-input techniques and drinking water systems. This is producing a diverse skills base, and the JPP is further identifying and utilising traditional farming, labour and product exchange systems to apply its work. Further, in order to strengthen the local economy, marketing of farm produce is recycling wealth back into the villages.

The JPP's results to date are so encouraging that part of its aim is now to apply and teach models of permaculture on a national and even international scale. The technologies it has introduced and taught

*By using green manure Damar Bahadur increased his rice production from 1000 to 1600 kg/hectare in 1995 and to 2350 kg/hectare in 1996.*

to farmers were taken up where useful and were adapted and improved by farmers themselves. The programme, in turn, took up these improvements in an information cycle that continuously feeds back and strives to improve itself, providing a better service to user groups. After seven years struggling with a more of less top-down approach, in 1995 the first real farmers' design course was organised, where farmers worked with farmers on permaculture design.

### Farmer to farmer

Farmers who had already established and maintained new technologies could explain their experiences to the course participants visiting their farms. In one household, eight new technologies were found in its traditional farming system: fuel-efficient stove; compost making; collection of daily house sweepings into a trench for nutrient recycling; liquid manure production; vegetable production in a kitchen garden; a home nursery; agroforestry planting of multi-purpose trees on field and terrace edges, and green manures used in rice cultivation. This farmer stated:
*"I use less fuel, have better meals, few pests in the garden, visit the forest less because there is more fodder and fuel coming from my land and, best of all, my rice production has increased from ten to twelve hundred KGs without any extra costs."*

### Agroforestry good for lazy farmers

The JPP's Gumi Resource Centre records show that about 75% of the fodder needs for three bulls, a cow with calf and two goats are met by the Agroforestry (AF) system on the farm and 100% of the firewood needs are now being met. Fuel from Sesbania seed plants alone gave 500 KGs. A farmer in Gumi has introduced sorghum as a green manure, ploughed in after a month's growth, prior to planting potatoes. He claimed a 300% increase in potato yield compared to the non-use of sorghum. A surprise quality evaluation came not from a farmer but from a rice mill owner, who claimed that rice grown with green manure's gave a 10% higher portion of grain to husk *"a fat juicy grain which de-husks easily compared to rice grown with urea which is all husk"* was his remark.

### Rolling permaculture

The above examples of increased production were all attained without a drop in yield, which would be unacceptable in this community where agriculture is the primary source of livelihood. New systems are introduced alongside traditional ones, and are designed to enhance and diversify production rather than replace it.

The second way of rolling permaculture is to use traditional methods of extension and outreach to disseminate an understanding and acceptance of improved techniques to as many people as possible.

# Twenty years of permaculture

Australian Bill Mollison coined the word 'permaculture' in the late 1970s. He defines permaculture (*perma*nent agri*culture*) as 'the conscious design and maintenance of agriculturally productive ecosystems, which have the diversity, stability and resilience of natural ecosystems'. Since then permacultural design is used for all parts of a sustainable society; housing as well as community development. There is no central co-ordinating body for permaculture, but it seems there are almost a hundred permaculture institutions world-wide. A global directory of these institutions can be obtained from *Permaculture International Ltd.*
The Permaculture International Network has a data bank on international trainers, designers, students, institutions and projects in developing countries and publishes the quarterly magazine Permaculture International Journal. P.O. Box 6039 South Lismore, NSW 2480 Australia Fax: 0061 66 220579 E-mail: pcjournal@peg.apc.org

### The ethics of permaculture

Care for the earth; Care for people; Distribute surplus; Reduce consumption

| Some principles | Some examples |
|---|---|
| • Everything works at least two ways<br>Give every element in your design at least two functions | • Chicken clean up pests and weeds, give eggs and young. |
| • See solutions, not problems | • A famous Mollison saying is: *'You don't have a snail problem, you have a duck deficiency.* |
| • Co-operation, not competition in work, communications and economics.<br>Improve the relation between different elements in your design. | • Share information and ideas so all people can learn to live sustainably. |
| • Make things pay | • Recycle grey washing water and compost organic waste. |
| • Work where it counts | • Only weed if you plan to replant immediately. Otherwise you will be weeding again within a month. |
| • Use everything to its highest capacity | • Use sunlight to grow your plants, warm your house, heat your water and cook your food. |
| • Get a grip on your own healthy food and medicine production.<br>• Help make people self-reliant<br>'Let people feel proud'<br>• Minimise maintenance and energy inputs achieve maximum yields<br>Avoid work that nature can do for you. | • Grow vegetables, fruits and herbs and raise chickens or bees in your backyard<br>• Explore local (rain)water sources, indigenous knowledge, appropriate technology, tools etc.<br>• Plant living fences of leguminous trees to build terraces on sloping land to stop erosion and produce fodder and fuelwood. |

In permaculture, ecologists, agronomists and farmers are working on systems similar to what happens in nature. Stimulating a living soil to avoid ploughing and manuring, a permanent organic soil cover to avoid weeding and loss of water, an agroforestry system making optimal use of space over, on top and under the land, mixing multi-purpose trees, shrubs and herbs. Revitalising knowledge about wild edible plants and species of food crops ecologically appropriate to local conditions. Permaculture does not exclude but includes anybody and any idea that makes a more sustainable way of living possible.

**References**
- **Permaculture Magazine**, edited by Permanent Publications, Hyden House, Little Hyden Lane, Clanfield, Hants, UK, PO8 ORU. Fax: +44 1705 595834. E-mail: permaculture@gn.apc.org.

**Further information**
- Permacultura America Latina (PAL), Maria Victoria Arboleda (PAL project Director) San Ignacio 1188 y Gonzalez Suarex, Quito, Ecuador, Tel/fax +59 32506891, Email:maviar@pi.pro.ec
- Permaculture Training Centre of Uganda, Africa, PO Box 8643, Kampala, Uganda.
E-mail: ptcu@starcom.co.ug. Internet: http://www.wolfnet.com/ptcu/
- Fambidzanai Permaculture Centre, Box CY 301, Causaway, Harare, Zimbabwe, Tel/fax: +263 4 726911.

An example is a sharecropping type of system of labour and product exchange called *'adhiya'* (*adha* means half). This involves a landless tenant farming the land of an absentee landlord and then receiving half the crop plus the following year's seed requirement. JPP has made adhiya contracts with local farmers and so has access to land in order to demonstrate rolling permaculture. In the same way, a fruit plantation was established into which fodder trees and grasses were integrated. JPP used its resources of seed, seedlings and information to contract the species selection, establishment and management of the orchard. Fruit is valuable for nutrition, income generation and as a low maintenance value production system. Permaculture emphasise perennial forms of agriculture, ideally from trees, hence the promotion of fruit trees in combination with other crops.

*The scythe, a traditional European implement, is used to cut winter wheat and barley.*

## JPP's technical approach

Since highly appropriate traditional cropping systems (TCS) exist in Jajarkot, research concentrates on finding niches in time and space in which enhancing systems, such as green manures, can be added without affecting TCS yield. An example is planting mustard (a phosphate accumulator) or fenugreek (*Trigonella*, a nitrogen accumulator) into winter wheat shortly before harvesting the wheat in spring. When the next crop (usually maize or rice) is about to be planted, the green manure is mulched or incorporated into the soil, and the nutrients it has accumulated will be available to the next crop. In a different approach alfalfa (lucerne) is introduced in the fallow period after millet. The adhiya approach has greatly facilitated these improvements.

*Maya Gaha in her kitchen garden in 'Gumi' demonstrating the use of liquid manure (in barrel), polyculture and companion planting of marigold.*

## Revitalising traditions

The JPP's philosophy is that culture, farming, economy and environment are inexorably interconnected, and losing the balance in one, means weakening the others. It thus strives to demonstrate that all three can be mutually strengthened with a mix of local resources, new appropriate technologies and an emphasis on traditional wisdom, the best available local resource. The latter of course has to include the skills of dance, song and story telling. In this way, local traditions can be given new vitality.

## Conclusions

The process of development is a long one, where one hopes that constant evaluation of progress will lead to adaptation of techniques and approaches to optimise efficiency. This does not mean maximising the 'speed' of development. There are too many examples of projects that have left more harm than good in the wake of high input technology and short term benefits, which largely ignore traditional practices, are of too large a scale, and often only pursue monoculture goals. The 'sharp end' of development activities should be to leave behind an infrastructure of improved local resources, skills, environment and economy, which the local people can build upon in a self determined way. In the JPP's case the 'sharp end' activities are training and skill development, social work and motivation through participation. An appropriate 'tool box' of technology based on local needs is then implemented by working within local traditions and cultural activities and beliefs, such as festivals, labour exchange practices, and a language based (in Nepal) on the vedic script (a Hindi/Sanskrit translation of permaculture is *Grihasthashram*). The results of developing such an approach is evident, with high participation in the programme by villagers across a range of ethnic and social groups. ■

**Chris Evans**, Technical Advisor JPP, PO Box 10908, Kathmandu, Nepal.

**Reference**

- **Grihasthashram Newsletter**, Jajarkot Permaculture Programme, PO Box 10908, Kathmandu, Nepal. Fax: +977 1225277.

# Values-based rural development

***"Which components are important for farm families to seek self-reliance in food production and income generation on a sustainable basis?" Heifer Project International (HPI), an NGO with many years of field experience with rural development using livestock, has produced a manual for answering this question: 'The Cornerstones Model'. The book is about the process and planning of rural development, in which visioning and goal setting are central elements.***

**Jerry Aaker**

Suddenly, it seems, everyone is talking about values and visioning. A cursory review of books and literature coming out in a variety of fields reveals an astonishing convergence of thinking about the importance for both individuals and organizations of having a vision and establishing goals. We see this across the spectrum of business, natural resource management, spiritual and personal development, government, NGOs, and on down to planning for individual farms or community groups. Vision, it is said, stimulates energy and leads to more effective action and fuller living. A model for rural development that includes visioning has been articulated in a new book entitled, The Cornerstones Model: Values-based Planning and Management.

## Cornerstones

In trying to identify important components of sustainable rural development programmes, HPI staff came up with a list which we call our programme's 'cornerstones': time-tested principles, values and strategies. From the beginning we have not concerned ourselves with hair-splitting definitions or whether these are values, principles, outputs or methods. The most important consideration was to think about 'foundations'. These 'cornerstones', then, are points to be considered when carrying out participatory appraisal, planning, implementation and monitoring of projects.

The cornerstones are mostly based on observation and experience, not theory. However, we realized that theory is also needed, and so began to dialogue and share among ourselves and other NGO colleagues, and to look at writings and research from other fields of endeavor. HPI staff worked on defining and re-defining this set of cornerstones over a period of five years, based on decades of experience in many countries. However, these cornerstones are not to be set in concrete. The cornerstones approach requires an attitude of flexibility and a spirit of openness to new findings and experience.

## Community Story Framework

As an example of combining 'Define the Situation' and 'Envision the Future' a community assessment methodology developed by Michael Bopp with several native communities in Saskatchewan, Canada, can be cited. It suggests several groups of 'starter questions' which ask participants to describe *'what is happening now'*, *'what happened in the past that contributed to the present'*, and *'what would it be like if it was good'*. The realities of children, youth, women, men and elders are explored together with a facilitator.

During the first stage, representatives of each group produced a rough draft to describe the past, the present and the future. After the draft had been intensively discussed in the communities for a defined period of time (thirty to sixty days) through public meetings, radio, and kitchen table discussions, a large community meeting was called. Its purpose was to review and adjust the document and arrive at consensus over the contents. In addition, a description of where things needed to go (vision) was added; a listing of the important problems and challenges for the community, and a selection of five key issues and development priorities. During stage three, the results of the meeting were written up in a 'proposed final draft'. The document summarizing findings and recommendations was circulated to all involved. A period of sixty days was allowed for consideration and proposing last minute changes. During the fourth stage, the evaluation team met, finalised the report and made sure that all stakeholders received copies.

## Local definitions

Eventually the cornerstones were integrated into the forms and guidelines HPI uses in its project system for information collection, project planning and reporting. This gives field personnel who work with farmer groups a consistent set of criteria for use in all parts of the process outlined in the model, especially for defining the situation, planning the project and monitoring progress. When evaluating, we ask all stakeholders to put forward a few indicators that can be used to evaluate each cornerstone in their projects. To do this, simple tools such as ranking scales can be used. The complexity of such assessment tools will depend on factors such as literacy, gender, and prior training and experience with planning, self-evaluation and critical analysis.

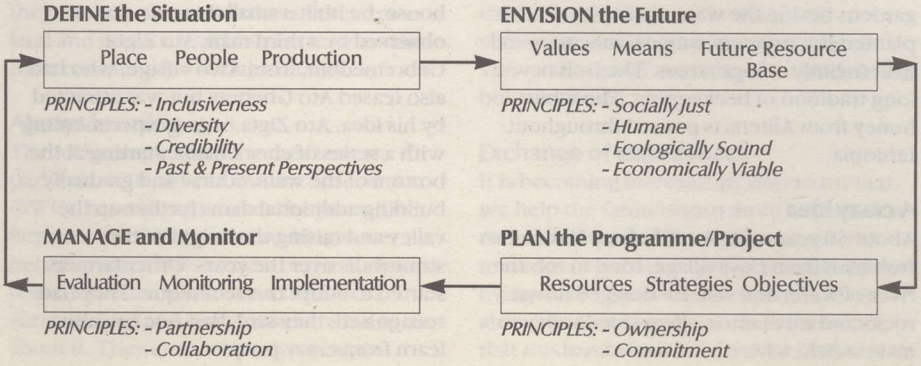
The cornerstones model has been found to be an effective way of setting standards and raising consciousness about key values, principles and goals, while allowing for local definitions of indicators, priorities, and technologies. This has been well tested in the planning and monitoring stages of the process, but thus far we have less experience of the visioning part of the model. As we gain more experience in encouraging farmer groups and communities to 'dream' and think more broadly about what they want to accomplish, and to write down their 'vision of the future', we expect to see more self-sustaining organizations and farms.

Our hope is to see individual farmers, groups and organizations develop their own set of cornerstones and visions that are compatible with their own particular personalities, preferences and values. We are very interested in having ongoing dialogues and sharing experiences with others who are interested in visioning and goal setting with communities and groups in various settings around the world. ■

**Jerry Aaker**, Heifer Project International, 1015 Louisiana Street, Little Rock, AR 72202, USA.

**Reference:**
- Aaker J. & Shumaker J, 1996. **The Cornerstones Model, Values-based Planning and Management.** US$10.00, including shipping and handling. The Exchange, c/o HPI, P.O. Box 808, Little Rock, Arkansas 72203, USA. 155 pp.

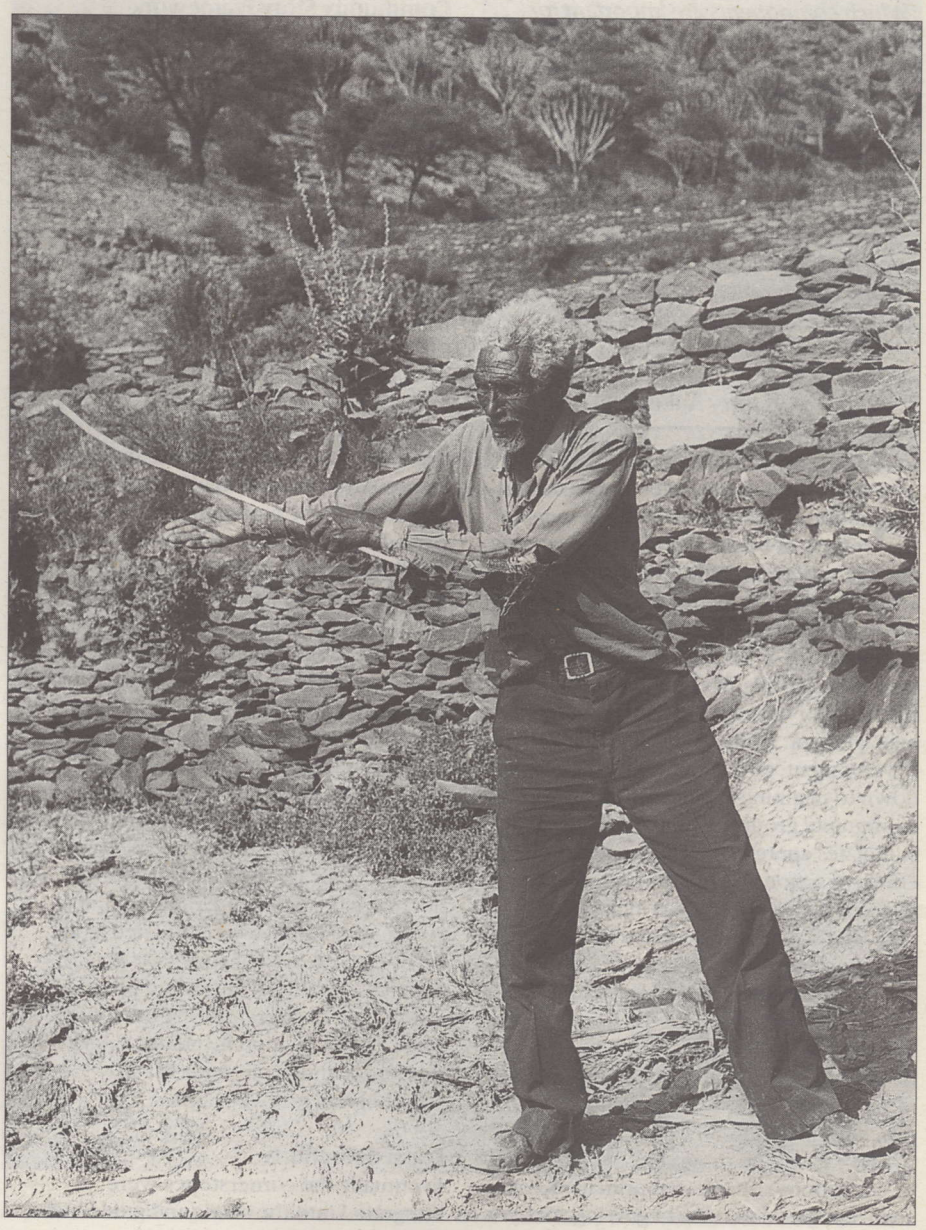
**Table 1: Cornerstones-Based Planning and Management**



# How to gain from erosion: catch the soil

***This is the story about how the Irob people picked up 'a crazy idea' and are constructing check dams to create fertile farmland in the stony valley's of Eastern Tigray, Ethiopia. It shows that a long-term 'cash for work' programme can be successful if it leads to for farmers tangible results and strengthens local institutions, local control and the traditional ethic for mutual help.***

**Hagos Woldu and Asfaha Zigta**



*Ato Zigta showing the story of his learning.*

The Irob people, now about 20,000 in number, live in the far north of Eastern Tigray, on the escarpment which goes down from the high plateau to the Red Sea. The Irob area covers 340 square kilometres. Rainfall is less than 400 mm per year, mainly in one short wet season, sometimes in two seasons. Most people live between 1500 and 2500 m above sea level. The mountain tops are much higher than this, the river bottoms much lower. The terrain is very rugged and stony, with steep slopes and deep canyons carved out by flash floods. Natural patches of level land are rare.

The Irob used to be pastoralists, trying to survive from their herds of goats and cattle, but they often suffered hunger. The prickly-pear cactus (*Opuntia ficus indica)*, locally called balasa, was introduced around 1900 by French Catholic priests, who had come to Irob in 1846 and set up a church and school in Alitena, near to what is now the border between Ethiopia and Eritrea. The Irob began to plant balasa gardens close to their houses. They fed the balasa 'paddles' to livestock during the dry season; the people ate the fruits in the wet season. For both humans and animals, balasa became the key to survival and still plays this role today.

Now the Irob also grow cereals, mainly maize, sorghum and barley. They have been doing rainfed cropping for only the last 2-3 generations, and are still experimenting with different techniques and crops. In recent years some people have made gardens beside the watercourses and have planted hot peppers, onions, tomatoes and fruit (mainly orange) trees. The Irob have a long tradition of beekeeping. The white honey from Alitena is praised throughout Ethiopia.

## A crazy idea

About 50 years ago, Ato Ghebray Hawku, an Irob man from Dayavillage, tried to rob the river of water and soil. He dragged down rocks and earth into a steep-sided valley to make a field where he sowed cereal. Everyone smiled with pity at his hand work and thought he was crazy. But he told them: "Tomorrow you will all be as crazy as I am." All laughed, but an idea was planted in their minds. A short time later, Ato Kahsay Woldu returned home from being a soldier. He had seen traditional soil harvesting by farmers near Tripoli, Libya. In a valley beside his house, he built a small dam. He was observed by a third man, Ato Zigta Gebremedhin, from Awo village, who had also teased Ato Ghebray but was attracted by his idea. Ato Zigta began experimenting with a series of check dams, starting at the bottom of the watercourse and gradually building additional dams further up the valley and raising the height of the stonewalls over the years. Other farmers started to adopt this technique. They had recognised, they said, that one can also learn from crazy people.

In the past 40 years, the Irob have indeed 'gone crazy' about dam building. In numerous watercourses, they have built check dams to catch the soil flowing down from the eroding highlands before it disappears into the Red Sea. They have created stretches of level land to use as crop fields and pastures. Some of the dams are now over 10 m high, filled to the top with soil and growing in width over the years. Ato Zigta, who at the age of 78 is still actively enlarging and improving his soil-harvesting system, regrets only that the Irob did not think of this idea earlier, before so much soil had already flowed past them.

In addition to the check dams in the tributary valleys, Irob farmers began to divert water from the main riverbed to fields built behind walls along the edge. They developed a technique of placing stones vertically in what they call the 'devil's tie', to resist the force of the floodwater. They also dug channels to lead run-off water from the rocky slopes into the fields behind the check dams and beside the river courses.

A Swiss geographer, Bruno Strebel, came to Alitena in the mid-1970s. He saw how the Irob were drawing benefit from erosion by creating farmland, without any manufactured tools, using stone to break stone. He recognised the skills and innovativeness of the Irob and sought ways of supporting their efforts and building on their expertise. That was the beginning of what is now called Adigrat Diocese Development Action (ADDA), with funds from CARITAS (Switzerland) and MISEREOR (Germany).

## Projects of the community

ADDA and the villagers in the Diocese agreed that the funds would be used for public works such as check dams, footpaths, wells, spring protection, gravity-irrigation works and community tree nurseries. Everything is done by hand, often in a step-wise manner over several dry seasons, such as extending or improving the footpaths, or gradually raising the height of dams to catch still more water and soil, just as Ato Zigta had first done. The difference is that the structures and newly-created resources belong to the community rather than private individuals. The external support provided by the ADDA project consists of:

- tools to work stone (crowbars, hammers, chisels) and other equipment and materials not available locally, such as wheelbarrows, buckets and wire
- technical advice and training of peasant technicians
- cash-for-work.

At community meetings in each hamlet, the people decide what construction activities are most needed. The meetings are open for all adults, but always more men than women come. Community members bring their project proposals to ADDA technicians, who are local people with primary or secondary school education and some on-the-job training. They assess the feasibility of the projects, draw up technical plans and calculate the materials and payment needed. The local council (baito) assigns people to supervise work at each site. ADDA trains selected farmers as 'peasant technicians'. The baito decides who will work on the sites. All households are given a chance in turn, one person per family. In the case of male-headed households, it is usually the husband or grown son; in the case of a female-headed household, it is usually the woman, unless she has a son or daughter who is old and strong enough to do the heavy work.

The community decides how the newly-created land behind ADDA-supported dams will be used. In some areas, every household has the right to cultivate part of it in rotation with other households; the land behind some dams is used as pasture, with grazing rights regulated in different ways in different communities. During the 15-year civil war up to 1991, the communities created their own forms of organisation not only to survive but also to continue the development work. Now villagers appointed by the baito assume responsibilities for the community projects. The distribution of tools, materials and payments was organised at first through the parish priests. The use of tools provided by ADDA for public works is increasingly decided by the baito instead of the project. In some cases, tools are now also used by private individuals to build their own structures. However, the problem of broken tools and responsibility for replacement must still be solved.

## Cash for work

It would have been impossible for ADDA to pay the community food-for-work. ADDA does not have the transport and storage capacities for this. Besides, the hamlets are in remote areas, several hours' or days' walk from a road passable with a vehicle. Families are used to organising transport of food and materials by donkey, mule, camel or people. Cash-for-work gives them the means to buy the food or anything else they need or, in better times, to invest in land improvement, crops or livestock. The choice is theirs. The cash wage (now 6 Birr/day) is much lower than the 40 or more Birr per day that skilled masons (which many Irob now are) can earn in towns in Tigray and Eritrea. For the people who choose to stay in Irob, the cash-for-work programme is a much needed source of off-farm income. Only a very small part of the Irob area (3-4%) can be cultivated; depending on the year, the Irob produce only 10%-30% of the grain they need to eat. The rest has to be bought, with money sent back by family members who have gone elsewhere in Ethiopia or abroad to work or with earnings from selling animals. In times of drought, such as in the mid-1980s, the Irob could survive only with food aid. The cash-for-work available in Irob enables many people to remain in their home area, rather than migrating to beg or work for food. This means that, in addition to making physical structures as community assets, they can pay more attention to their own land and livestock and can better maintain their community's social structure.

## Always learning

The technologies used by the farmers, particularly in soil and water conservation (SWC), have changed over the years. The farmers observe how the rushing water behaves when it faces new barriers, discuss reasons for damage to structures or to surrounding land, and consider what to do about it. They are constantly trying to improve their work: to maintain and improve existing structures and to make new ones that are better designed. In the words of Ato Zigta: "If you look closely at our dams, you can read the story of our learning."

In some areas the farmers scrape and carry down soil from the slopes to fill areas behind the stone walls, in order to concentrate the soil in places where something can actually be grown. Some farmers are experimenting with more effective ways of using animal manure and plant matter to fertilise the small plots of land. Behind the dams, some farmers transplant sods of a wiry local grass that grows through the stones, holding them together and also providing animal feed. Some farmers are planting trees and shrubs (or letting them grow spontaneously and then protecting them) to strengthen the dry-masonry structures, to make use of new niches to produce timber, fodder and fuel, and for beekeeping. To irrigate their gardens, channels have been cut by chisel into rock to guide water into holding reservoirs.

In their efforts to catch soil and water behind dams and to irrigate fields, the farmers are running into problems of salt accumulation and waterlogging which is killing some trees in the river valleys. Large old trees are now almost buried in the captured soil. The farmers are seeking more suitable trees and shrubs to plant behind the dams.

## Building roads to the markets

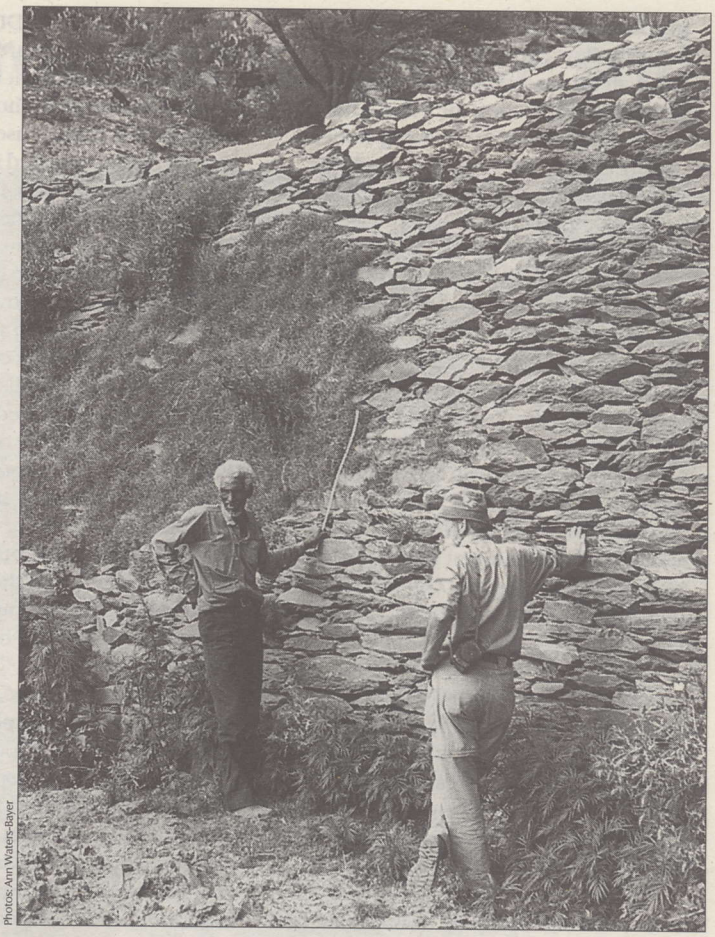
Another problem the farmers face is transport. Parts of Irob land have a good climate for growing oranges, which could be sold at highland markets, but it is difficult to carry the fruits up there. This is one reason why some hamlets give priority to creating or improving paths for transporting loads by pack animals. The Irob even built a stone road from Alitena up to the government road on the plateau at Salembessa, using only handtools and muscle power. This was the first building project supported by ADDA 20 years ago, and the villages along the way have organised themselves to maintain the road ever since. Although the Irob know what they are capable of doing themselves, they also know that the Government has equipment to do this extremely heavy work. They stress that this is one of the main ways that Government could support the farmers' efforts: by building and improving roads for better market links. This year, a government road is finally being built to Alitena.

## Exchange of experiences

It is becoming increasingly important that we help the farmers gain more information and advice from various sources: government agencies, other projects and farmers living under similar conditions. We have already experienced ourselves the value that this can have for both sides. Farmers at

Sero in neighbouring Central Tigray were alarmed at how quickly gully erosion was threatening their irrigation system. The project that supports them sought the advice of our technicians and farmers, who had many years of practical experience in SWC. This was a challenge to our project: an urgent problem to which the skills of our local experts could be applied and from which we could also learn.

But our local experts also have their limitations. ADDA therefore welcomes the support of researchers and formally-trained engineers and agronomists who understand what the farmers are already trying to do in Irob and the other areas into which our project has now expanded, and who can help to speed up the learning process. If these outside experts are willing to treat the local experts as equals and to share the hardships of life and work on the escarpment of Eastern Tigray, the farmers, too, will welcome their contribution.



*Ato Zigta showing one of the first check dams that he started building over 40 years ago to create farmland.*

Photos: Ann Waters-Bayer

## Why is SWC working?

There are many reasons why this community development work has been relatively successful:

- *Productive SWC.* The SWC activities that the farmers choose to do are not only conserving resources. They create farmland and increase crop and animal production, already in the short term. The larger dams built with ADDA support to catch soil and water also provide naturally-filtered water close to the villages, saving women many hours' of walking in the mountainous terrain to fetch water from distant springs.
- *Ethic of mutual help and community service.* People in such remote areas depend greatly on each other for survival in times of emergency. Mutual help is more necessary than in areas where life is easier. The people regard it as their responsibility to serve the community in helping to improve living conditions for all. They invest time and energy not only in construction for low payment, but also in planning, managing, organising and maintenance, for no payment at all. Also many Irob who have migrated to other countries continue to support their home communities. Likewise, the project staff are local people who are prepared to live and work under the difficult conditions, going from hamlet to hamlet by foot to give support. They are motivated by more than just their salaries.
- *Local institutional structure for initial support.* The church network of parish priests living in the hamlets provided a structure for co-ordinating and supervising activities, storing tools and materials, and handling funds, until lay people gained the skills to do this themselves. Also because schooling has been offered by priests since the middle of the last century and continued during the civil war, there were local people with formal education who could take over tasks requiring literary skills.
- *Long-term external support and trust.* For over 20 years, the funders in Switzerland and later also Germany have given support in terms of tools, materials, cash-for-work and advice, and have entrusted the organisation to the parish priests and the local people.
- *Local control.* The baito (councils) guarantee the rights of all inhabitants to use the land resources they create, so the people find it worthwhile to invest in maintaining their resources. The villagers plan and implement the activities themselves: they select what activity has priority, choose the sites, organise how to do the work, monitor the condition of the structures and maintain them. Each hamlet makes its own decisions about these things. They are proud of their independence and their accomplishments. ADDA has heard that there has been criticism of cash-for-work programmes, because the local people reportedly do not regard the results as their own. ADDA's experience with cash-for-work shows that it can support learning, innovation and community-led development, if it is used to accomplish what the community wants to do but cannot manage without outside support. The key question that makes all the difference is: Who decides on the activities, some distant planning agency or the local people who do the work?

## And our own role?

It may seem odd to some people that I (the first author of this article), as co-ordinator of ADDA, have no training in agronomy or SWC. My education is in philosophy. My role is not to be a technical expert, but rather to help organise things so that the farmers get the support they need to do what is important to them.

In the early years of the project, a source of inspiration for farmers and project staff was Father (Abba) Yohannes, who travelled frequently on foot through the mountains and ravines to even the most remote hamlets in the Diocese. He encouraged the people to plan work that would ensure a future for themselves and their children, and he worked together with them. At that time, I was a boy in one of the mountain hamlets, and Abba Yohannes became a role model for me. I am happy that the church has given me the honour to follow in his footsteps, accompanying the farmers in my home area to improve their lives.

My co-author is one of Ato Zigta's sons. He hopes that if the soil- and water-harvesting techniques of the Irob become more widely known, other farmers living under similarly difficult conditions can gain new ideas to try out for themselves. He also hopes that the children of the Irob - many of whom have gained further education in modern technology, as he has himself - can be reminded by this article of the knowledge and achievements of their parents. ■

**Abba Hagos Woldu** and **Asfaha Zigta**, ADDA, PO Box 8, Adigrat, Tigray, Ethiopia

# Palm sugar: the indigenous sweetness

***The Sugar Palm (Borassus flabellifer), is an indigenous plant to the South Asian continent. For generations, on Sathingphra Peninsula, Thailand, farmers have planted palm trees on the dykes of their rice fields for shading the rice, protecting the field from strong winds, and for tapping the sap for cooking. Palm trees start to produce sap when they reach maturity at the age of 15-20 years. Palm trees are also used for many other purposes. For instance, their roots are used for medicine, the trunks for timber, the leaves for script writing, handicrafts and roofing material, and the fruits are eaten. Also, because of their deep root system, palm trees are supposed to recycle nutrients from the deeper soil layers to the top soil and thus play an important role in keeping the land fertile and productive.***

*Sugar palm trees on the dykes of the rice fields, important for the economic and ecological sustainability of the rice-based farm system.*

**Vitoon Panyakul**

Due to increasing competition from the fast growing urban economy, poorly paid activities such as palm sugar collection and processing are under severe economic pressure. In the end this may lead to abandoning palm sugar production and to the elimination of the palm tree from the farm system. The initiatives of NGOs and producer groups to improve palm sugar processing and marketing, presented in this article, could prove to be very important in keeping this farm system economically and ecologically sustainable.

Palm sugar has always been a preferred source of sweetness in local communities despite the difficulties involved in sap collection and sugar production. The sap is collected from the palm flower by cutting the tip and squeezing the flower. The sap collector has to climb trees of 18-25 m high during the dry season, twice a day, 7 days a week. One collector can collect about 400 litres of sap per day. With mounting economic pressure to earn more, there are an increasing number of accidents due to falls from palm trees as collectors work ever harder.

*"Palm climbers like us are not allowed to get sick. No matter how sick we are, we have to climb, because if we don't work just for one day the palm will stop producing sap and the tree will be useless".*

## Sap processing improved

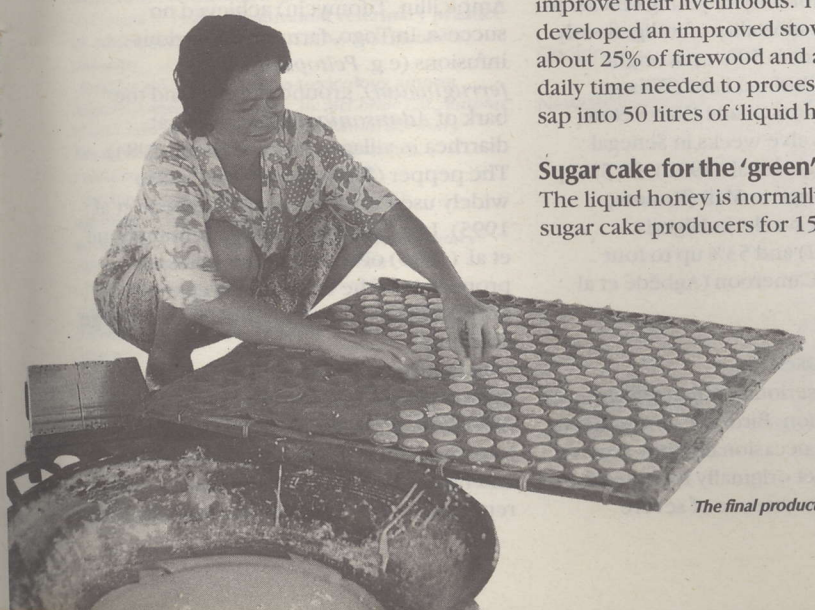
Traditionally, women are responsible for sap processing, which must be done the same day to prevent quality loss. Processing is done by boiling the sap in a large pan on a wood-fired stove. The sap is quickly dehydrated until it turns into a syrup, locally known as 'liquid honey', which can be kept for almost a year.

A local NGO, the Palm Sugar Occupation Development Group, has been working with palm sugar producers since 1987 to improve their livelihoods. They have developed an improved stove which saves about 25% of firewood and about 50% of daily time needed to process 400 litres of sap into 50 litres of 'liquid honey'.

## Sugar cake for the 'green' market

The liquid honey is normally sold to local sugar cake producers for 150-250 baht per 20 litres, depending on the quality and the season. Sugar cake is produced by concentration and crystalization through heating. The honey is stirred in a hot pan till it turns solid. The final product is a small cake of brown sugar.

In 1995, the local NGOs and producer groups decided to go into processing and marketing. As consumers are becoming increasingly health-conscious, the processing has been modified. Less cane sugar (25% instead of 50-80%) is incorporated into the palm sugar cake and no synthetic chemical is added to bleach the colour. To cater for the 'green' market, the producer groups use this as a basic standard for palm sugar production. 'Organic' palm sugar is being promoted by Green Net and other alternative shops. At present, around 150-200 kg of organic palm sugar is produced and sold monthly. This has helped to boost the morale of producer groups, who are keen to invest in the community enterprise. Attempts are being made to penetrate the international market. Quality and packaging have been improved and the product is exported to the fair trade network in Europe. ■



*The final product, 'organic' sugar cakes.*

**Vitoon Panyakul**, Green Net, 1108 Soi Sri-on-rod, Sutheesarn Road, Huay-Kwang, Bangkok 10320, Thailand. Fax: +66 2 276 8023 / 693 6622.

*This article has been shortend by the editors. The complete article can be requested from the author or ILEIA.*

***The high incidence of diseases is one of the principal constraints to African smallholder livestock systems. The generally resource-poor farmers do not have money for or access to chemical medicines or other cost-intensive management systems. In ethno-veterinary medicine, traditional natural products - especially plant products - are used for the treatment of diseases. These locally available products are very suitable for use by small farmers. Both the 'Afro-Asian Network for Rural Poultry Development' (ANRPD) in Senegal and the University of Ibadan, Nigeria, report on many positive experiences with the use of ethnoveterinary medicines for both village chicken and cattle production. However, they also agree on the need for applied research to substantiate these findings.***

# Diseases in village chickens

## Control through ethno-vetinary medicine

**El Hadji Fallou Guèye**

Chickens are of great importance to African village households. They constitute more than 80% of the total poultry population in Africa (Sonaiya, 1995). In general, village producers keep small flocks of between 5 and 20 chickens per household. Women and children play a key role in their management. The chickens are generally raised in a free-range system, scavenging around the compound of households, feeding on the locally available resources e.g. earthworms, household refuse, insects, residues from the harvest etc. In addition, their feed is supplemented with agricultural (by-) products, especially in the period of food scarcity. At night time, the chickens are sheltered in rudimentary coops, often raised from the ground, which provide protection against bad weather and night predators such as reptiles. Thus village chickens in Africa are maintained with very low land, labour and capital inputs and can therefore be kept by even the poorest social strata of the rural population.

However, because of its low productivity, indigenous chicken production in Africa has been neglected, and is frequently considered by farmers as an insignificant occupation compared with other agricultural activities. Nevertheless, outside the urban centers, and especially in non-coastal areas, village chickens provide the population with a vital source of protein and income and play a key role within the context of many social (for special feasts for family or distinguished guests, gifts, etc.) and/or religious ceremonies (e.g. cocks as offerings for the divinities).

### Common diseases and mortality

One of the major constraints to village chicken production is undoubtedly the existence of various diseases. For example, Sa'idu et al (1994), in a 15-year study (October 1976-1991) of indigenous chickens in Nigeria, showed that the commonest and most significant causes of mortality were Newcastle disease (40.9%), infectious bursal diseases (19.3%), fowl pox (19.1%), ectoparasitism e.g. lice and mites (26.9%) and endoparasites, for example, *Tetrameres* sp., *Syngamus* sp. and tapeworms (31.3%). There were also various parasitic associations in village chickens.

The severe rearing losses result partly from the high mortality of young chicks. It is estimated that mortality of indigenously managed chickens is 50% up to eight weeks of age in Burkina Faso (Wilson, 1986) and Northern Ghana (Van Veluw, 1987), 66% at twelve weeks in Senegal (Sall, 1990; Buldgen et al., 1992), 30.5% up to four weeks of age in Mali (Kounta, 1992), 68% at six weeks in Nigeria (Ologhobo, 1992) and 53% up to four weeks of age in Cameroon (Agbédé et al 1995).

### Control of diseases

Poultry diseases seriously affect village chicken production. Birds are almost never vaccinated. Very occasionally they receive an antibiotic tablet originally intended for human use. In the absence of severe droughts like those which occurred in the 1970's and 1980's in Sahelian countries, ethno-veterinary plant products with recognized medicinal properties are far more accessible to villagers than the drugs used in Western veterinary treatments. Moreover, they can be collected at no cost or are cheap to obtain (see Table 1 and box for similar prescriptions for cattle).

In Senegal, farmers have traditionally used such plants to treat their chickens against endoparasites, for example, *Capsicum* sp. extracts and the leaves or barks of *Azadirachta indica A. Juss.* are added to drinking water and given to birds. In Cameroon, Agbédé et al (1995) reported good results from the use of plants such as *Kalanchoe crenata* for coccidiosis, and pawpaw (*Carica papaya*) leaves for diarrhea, while the use of human medicines (especially antibiotics, Ampicillin, Tifomycin) achieved no success. In Togo, farmers use various infusions (e.g. *Peltophorum ferrugineum),* ground pepper, and the bark of *Adansonia digitata* to treat diarrhea in village chickens (Lobi, 1984). The pepper (*Piper guineense*) is also widely used to treat 'cough' (Agbédé et al, 1995). In a Cameroon study, Tchoumboue' et al. (1996) observed nematodicinal properties of the bark of a creeper of *Combretum* sp. in naturally infested village chickens.

In Southern and Eastern Africa, it has been reported that watery extracts of *Nicotiana glauca* can help a chick embryo infected with influenza to survive (Watt and Breyer-Brandwijk, 1962). Lobi (1984) reported on good results obtained after the

use of the *Butyrospermun parkii* (or 'karité') oil to control various ectoparasites such as ticks, lice's and small red ants. According to farmers, this oil obstructs the respiratory system of the parasites. An infusion of the leaves of *Borreria verticilata* are used to treat diseases affecting the birds' locomotion.

In order to prevent snake-bites in village chicken farms, a report from Zimbabwe indicates that the roots of *Annona senegalensis* are soaked and the fluid sprinkled in the hen run to repel snakes (Chavunduka, 1976). In Nigeria, poultry owners grow certain repellent plants or place sliced garlic (*Allium sativum*) around hen houses to keep off snakes (Ibrahim, 1996). According to Ibrahim and Abdu (1996), in Nigeria the spiny fruits of *Cucumis pustulatus* are also placed in the drinking water of chicks to protect them against hawk attacks.

## Conclusions

Ethnoveterinary practices using plant products are effective against some diseases. These plant products are locally available and free or very cheap. Further research in this field is important for understanding whether and when traditional practices are effective and should be used for village chicken production and when modern veterinary medicine offers a better alternative. Moreover, studies are needed under controlled conditions on the efficacy rates and veterinary properties of such plant products and treatments.

The 'Afro-Asian Network for Rural Poultry Development (ANRPD)', which has been set up to coordinate research, training and/or extension on village poultry, is encouraging such investigations. ■

**El Hadji Fallou Gu'eye**, ANRPD Member and Co-Editor of the ANRPD Newsletter, B.P. 5579, Dakar, Senegal

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*The full article and list of references can be requested from the author or ILEIA.*

### Ethnobotany in animal care

The state of Tahara, North-Eastern Nigeria, is inhabited by resident farmers and Fulani herdsmen. The area is covered with Guinea Savannah vegetation and is characterized by an average annual rainfall of 750 mm with a dry season from November to March. Fieldwork of the University of Ibadan, has revealed that the majority of the Fulani herdsmen (Bororo) have the knowledge of traditional plant preparations through which common herd diseases are cured. Seeds, roots, leaves, barks, tubers and fruits are gathered for processing either by grinding, boiling or soaking in water, and used to tackle skin diseases, wounds, cold and reduced appetite.

The Fulani rely on the indigenous knowledge passed on by their forefathers to observe signs and symptoms of sickness in animals and to decide on the type of treatment. Commonly used species include Boabab (*Adansonia digitata*) against diarrhea and skin disorders; Ginger (*Zingiber officinale*) as a laxative, appetizer and antibloate, garlic (*Allium sativum*) as an antidote; African locust beans (*Parkia filicoides*) for skin infections, wounds and worms; Tobacco (*Nicotiana tabacum*) against myasis, hoof infections and ectoparasites; and Neem (*Azadirachta indica*) as an insect repellent. Farmers justify the potency of the remedies in relation to the animal's health and production performance in terms of feed intake, carcass size and quality, body weight and lactation volume. However, scientific testing would remove any doubts as to their efficiency and assure such traditional techniques acceptance in animal care systems.

From: '**The significance of ethnobotany in animal care**'
**Akingboye KA**, Dept. of Veterinary Public Health & Prev. Medicine, University of Ibadan, Ibadan, Nigeria.

*The full article can be requested from the author or ILEIA.*

**Table 1: Plant products used in ethno-veterinary practices to treat village chickens against various diseases in African countries. (Bizimana, 1994)**

| Chicken diseases | Plant products | Application form | Country |
|---|---|---|---|
| Fowl pox | Leaves of *Aloe excelsa* | Added to drinking water | Zimbabwe |
| Diarrhea | Young leaves of *Boswellia dalzelii* | Added to drinking water | Nigeria |
| Enteritis and indigestion | Leaves of *Aloe saponaria Haw.* | Cold infusion | Southern Africa |
| Bloody and watery diarrhea | Bulb of *Adenium multiflorum* | Soaked in water and birds are drenched after 12 hours | Zimbabwe |
| Worms | Fruit of *Cucumis prophetarum* or *Solanum nodiflorum* | Soaked in drinking water | Nigeria |
| Blood in the excreta | Bark of *Cussonia arborea* | Soaked in water and sick birds are drenched in the fluid | Zimbabwe |
| Eye trouble in chicks | Leaves of *Cycnium adonense* | Its decoction is given to newly hatched chicks to open their eyes | Zimbabwe |
| Sore eyes | Bulb of *Adenium multiflorum* | Its juice is used as eye drops | Zimbabwe |
| Fever | Bulb of *Allium sativum and Capsicum annuum* | Added and given orally | Nigeria |
| Cholera | Fruit of *Cyperus articulatus* | Soaked in drinking water | Nigeria |
| Newcastle disease | Fruit of *Adansonia digitata* | Broken and dipped in drinking water | Nigeria |
| | Bark of *Parkia filicoidea* | Put into drinking water | Nigeria |
| | Stem of *Euphorbia candelabrum kotschy (var. candelabrum)* or fruit of *Capsicum annuum* together with leaves of *Iboza multiflora* | Used | Tanzania |
| Poor growth, low production | Fruit of *Cucumis pustulatus* | Mixed with bran and placed in drinking water | Nigeria |
| | Fruit of *Cyperus articulatus* | Soaked in drinking water | Nigeria |

# Rats, bats and traps

## Indigenous methods of vertebrate pest control in the Maldives

*Scarecrow in a taro field against water hens*

***For most Maldivian farmers, animals and agriculture just do not go together. There are three major vertebrate animal pests on these islands and when combined these can cause havoc with most crops. Farmers have devised many ingenious and practical methods to rid themselves of these pests, as will become apparent from this article.***

**Danny Hunter**

For hundreds of years, vertebrates have caused serious loss to agricultural production on the tiny atolls of the Maldives. Today is no different, as Mariyam Mohammed stands in her home garden surveying last night's damage. This morning, Mariyam went into her garden to collect coconuts and curry leaf to prepare the morning breakfast. Instead, she found the leftovers from a night of feasting by the island's rats and fruit bats. Rats had gnawed into many of her valuable coconuts and littered her garden floor with the empty nuts. They had nibbled at the ripening papayas that she had hoped to use for the large meal that she had to prepare for her dead mother's *fatehah*.

To make matters worse, fruit bats had gorged themselves on the tiny *jeymu* (*Munitingia calabura*) berries that her young daughters enjoyed eating so much. Later she would have to go to the village store and buy them some boiled lollies for their school lunch break. On her way back to her cooking house, Mariyam lets out a high piercing cry. Before returning to their daylight roosting site the fruit bats had left their characteristic calling card. Fruit bat faeces is scattered all over the small coral stones that she had spent hours collecting at the beach and had only recently laid down. Now breakfast was going to be an hour late as she would have to spend time cleaning up the mess.

Later that day, Mariyam receives another shock when she travels the long distance to her family's field to harvest the weekly supply of taro. Water hens have eaten their way into the base of a number of her plants and these have started to rot. All this means that she will have to spend more money on rice and flour at the local store, and now that her husband is dead this is something that she can ill-afford to do.

Atoll agriculture is notoriously difficult and is constrained by extremely infertile soils, limited water availability and other environmental factors. Islanders struggle to produce the vitamin-rich fruits and vegetables that are needed to supplement their daily diet of rice and tuna fish. It is a long, hard battle and these problems are further compounded by the daily marauding of rats, fruit bats and water hens. The isolated and scattered nature of the islands has changed these animals into major pests affecting agricultural crops. They have no natural predators and have been causing havoc ever since their arrival.

There seems to be no crop that escapes attack by these pests. Fruit bats mainly cause damage and losses to fruit in the home garden. They like to eat the fruits of guava, mango, stone apple jam trees and papaya. Rats cause serious losses to crops all over the island. They attack the large plantings of coconut that exist on inhabited and uninhabited islands. They also feed on coconuts in home gardens. In the small field plots of cereals that are scattered all over the islands they can cause total loss of the crop overnight.

Water hens are too frightened to come into the villages. Maybe it has something to do with the fact that the villagers are not averse to catching them and cooking them in one of their delicious curries. The water hens prefer to stay well hidden between the aquatic plants of the swamp areas but occasionally venture out to nibble on taro plants or watermelons if there is a field nearby.

In the long battle with vertebrate pests, the islanders have devised many ingenious methods to limit the damage they cause. When rat populations become so high that they cause extensive losses of coconuts, fruits and cereals, the island community organises itself into large-scale hunts. Men would scramble up coconut trees in an attempt to dislodge the rats while others waited below with large sticks to beat them to death. Such activities were common on Fridays, the usual day for community-type work. Well organised hunts can effectively reduce rat numbers and are more reliable than the government-initiated poison/baiting programmes that

never seem to be followed through to the end. At other times, when rat populations are relatively low, a selection of control measures, such as those listed in the box, can be used to minimise damage by rats.

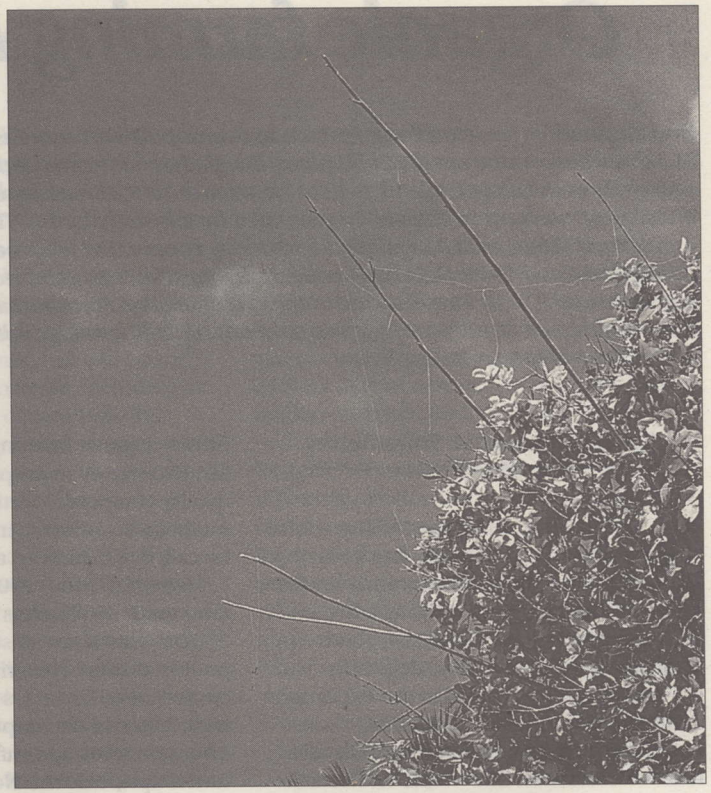
Many barrier, trapping and scaring devices have been invented to minimise the damage caused by fruit bats (see box). Visitors to these islands shouldn't be alarmed if they see someone standing like a sentinel in the top of a tall mango tree. It is most probably a scarecrow. On the other hand, they may think that the many fishing rods, complete with line and hook, protruding from a wax apple tree, are pointing at some strange fishing place. This is, however, just another method that farmers have devised to trap fruit bats and minimise the damage that they cause.

Likewise, one should not be alarmed when one is awoken by the loud banging of tin cans in the middle of the night. It is only one of the villagers who has woken up to pull on the rope that lies beside his bed that is attached to a scaring device in a nearby fruit tree.

Unfortunately, since the death of her husband, Mariyam has not been able to maintain the nets and scaring devices that are needed for minimising vertebrate pest damage in her garden or fields. She does not have the time to climb trees and collect the materials to make traps. She has her work cut out cooking, washing, finding firewood, collecting her children from school and helping them with their homework. Last night, however, a lot of damage was done and she knows that she will have to hire someone to band the trees and put up nets. In earlier times she could have given a few bananas in return for this service, but now the few men left behind on the island who aren't working in the nearby resorts, want money. On her way back from the jungle, after collecting firewood, Mariyam quietly wonders what food items or other little luxuries she can forego in order to afford the cost of protecting her home garden. As night begins to fall she is overtaken by the dusk procession of fruit bats on their way to the village for another night's feasting and she thinks that little bit harder.

The indigenous knowledge of pest control that local communities have accumulated over many years represents a valuable resource. It is important that scientists and governments recognise these innovations and work closely with farmers and communities in devising more appropriate pest management programmes. Such a dialogue would be much supported by an official pest management policy that acknowledges the importance of indigenous knowledge. ■

**Danny Hunter**, Ministry of Fisheries and Agriculture, Republic of Maldives



*Bat fishing from the trees*

## Indigenous methods of invertebrate pest control in the Maldives

**Rats**

- Tree trunks are occasionally banded using pandanus leaves wrapped tightly around the trunk. Coconut palm leaves, split lengthways along the midrib are also employed. One set of split leaflets is wrapped around the trunk below the crown while the other is wrapped in the opposite direction forming an effective barrier to climbing rats. These methods are now largely replaced by tin sheet banding.
- Stone traps consisting of a large flat piece of coral stone are delicately balanced over a bait of coconut or dried fish. The rat is trapped when it triggers a tripwire made from the fibres of sea hibiscus.
- Stick traps, made from locally available timber, are used on islands where large flat coral stones are uncommon.
- Trenches are dug around plots and one side is lined with woven palm leaves. Rats trying to jump the trench hit the woven leaves and fall into the trench.
- To protect ripening ears of maize from rat attack some farmers wrap them in long maize plant leaves. Other farmers take the added precaution of initially covering the ear with breadfruit leaves prior to wrapping in maize leaves. Apparently, rats do not like to nibble through breadfruit leaves.
- People are organised into large community groups for the purpose of hunting and killing rats. Some will climb coconut trees and scare out the rats while people on the ground will kill them with long poles. Rewards in the form of coconuts were given by the island office on presentation of rat tails.
- In the past, when grain was plentiful, it was common to store it in large granaries located in shallow water in the lagoon. This prevented rats and other pests from attacking the stores.

**Fruit bats**

- Ripening fruits are protected by placing them between empty coconut shells.
- Old fishing nets are placed over fruit trees keeping fruit bats from getting access to fruit.
- Fishing nets are strung up between trees to trap bats in flight.
- Fishing lines with numerous dangling hooks are strung up around home gardens in order to snare bats.
- Long poles, with fishing lines and hooks, are hung in fruit trees so that the hooks dangle at the periphery of the tree.
- Human effigies are placed in fruit trees scaring off bats.
- Scaring devices, made from tin cans, are hung in trees and are pulled at regular intervals during the night.
- Oil lamps are sometimes burnt in trees to ward off fruit bats.
- Cloth bags are used to cover and protect ripening fruit.

**Water hens**

- Scarecrows or human effigies are placed in taro fields.
- Snare traps are constructed existing of poles from local trees and fishing line.
- Watermelons are buried in holes and covered with old leaves to hide them from water hens.

# Organic farming in Southern India

***How to promote sustainable agriculture in overpopulated South East Asia was the focus of a three nation study in the Philippines, Bangladesh and India undertaken by the University of Reading, England. In ILEIA Newsletter 13/1, Anna Lawrence reported on the diversity of views on sustainability generated by this study (p. 17). The University of Agricultural Sciences in Bangalore, South India, cooperated with the research project during 1994 and 1995. Data were collected from scientists, extension workers, NGOs, and male and female farmers. One of these farmers, Mr. Purushotham Rao, was discovered to be already a strong supporter of organic farming. This article deals with a few of the techniques he applies.***

**K.S. Krishna and M. Shivamurthy**

Mr. Purushotham Rao, an innovative and creative farmer, has been practising organic farming for ten years at Kuruvalli, Thirtha Hally taluk in Shimoga (district) of Karnataka, South India. He holds a Bachelors degree in chemistry and is involved in the exchange and dissemination of information, extension and training to scientists and fellow farmers. To this end he started a research station under the name of Organic Farming Foundation. Interaction with like-minded scientists and the study of ancient texts encouraged him to develop solutions for all kinds of practical problems.

Mr. Rao has four hectares of farming land, two under plantation crops and two under paddy cultivation. As his farm is located on the bank of the river Thunga in the hilly region of the Western Ghats, he has permanent access to water. Plantation crops grown include coconut, coffee, cocoa, cardamom, pepper, banana, mulberry, arecanut and vanilla. Mr. Rao has planned his four-hectare farm in such a way that he is harvesting one crop each month thus securing him a monthly income. His seven cows supply the manure, milk and other products needed to sustain the farm.

## Becoming an organic farmer

Mr. Rao started farming using external chemical inputs. Over the years, however, he found himself having to use more fertilisers and spraying chemicals to get good yields. He began to feel that investment was increasing simply to assure the same or sometimes even lower yields. The application of chemical fertilisers and pesticides also had to be on time and precise. As a result, Mr. Rao decided to switch over to organic farming.

Initially crop yields were lower due to the sudden reduction in the quantity of inorganic fertilisers. It took 3 to 4 years to achieve the original yield level. Mr. Rao also experienced acute difficulty in choosing appropriate alternatives to various farm practices. Finally, by consulting the literature and discussing with other practising organic farmers, he found the crops and crop combinations he preferred and perfected them through slight adaptations.

## Some organic farming practices

Mr. Rao started to prepare sufficient good quality compost to fertilise his farm. The methods he followed in preparing compost, he called 'Krishinivas' methods I, II, and III.

*Method I*: Dump 250 baskets of forest or farm mud, 250 baskets of cow dung slurry, 250 baskets of raw dust, 250 baskets of poultry manure (external input), and 250 baskets of ash in layers in a pit and mix it well. Allow to decompose for 15 days. After one week add sufficient water and turn it upside down. Now make a heap four feet wide and four feet height. Stir one litre of honey into 100 litres of water. Allow this to stand for eight days and add it to the compost. A rich manure with micro-organisms develops. Add one basket of this compost to the base of each plant.

*Method II:* Dump 250 baskets of forest or farm mud, 250 baskets of poultry manure, and 100 baskets of cow dung slurry mixed with 150 buckets of water in a pit, in layers. Mix well and cover. After one week, mix 100 buckets of cow's urine with 150 buckets of water and stir well. Later make a heap four feet by four. Then mix one litre of bitter milk in 100 litres of water. Leave it for 15 days and mix it with the compost.

*Method III:* Fill one third of a long drum with compost prepared from methods I and II. Add the amniotic liquid from a cow collected at the time of parturition, mix it with one litre of water. Add sufficient water. Collect the mixed water at the top. Repeat, stirring and collecting the water three times. When sprayed on vegetables good yields are obtained. It can also be applied to soil.

## Plant growth promoter

Mr. Rao uses a decoction of four kinds of plant leaves as liquid manure for promoting plant growth, namely, the leaves of the Eupatorium weed, the stinging nettle, Glyricidia and 'Khaki' fruit. About a kilo of leaves are collected in a wooden or plastic bucket and crushed with about ten litres of boiling water. The leaf material is allowed to decay for a day or two and is then decanted and the liquid manure is ready for spraying. Based on the area or number of plants to spray, it can be diluted with water and spread on the crop using a sprayer. In terms of the yields produced, a stinging nettle decoction sprayed on paddy crop has been found to be a better growth promoter.

## Plant protection measures

*Stem Borer in Coconut:* About one kilo of Ekka (*Calotropis gigantea*) leaves are collected in a wooden or plastic bucket (not iron). About 10 litres of boiling water are added and left for 24 hours before decanting. Depending on the incidence of pests, water is mixed in the ratio of 1:10. When plants are drenched with the above decoction mixed with 50 grams of lime, stem borers are controlled.

*'Kole roga' of Arecanut (Phytopthora sp.):* About ten litres of boiling water are added to one kilo of Suvarna gadde (*Elephant foot corn*) cut into small pieces in a wooden or plastic bucket (not iron) and left for 24 hours (if possible in the sun). The tuber pieces must not be boiled, just added to boiling water. The solution is decanted and depending on the incidence of attack, mixed with water in a 1:10 ratio. Drenching Areca plants with this solution has been successful in checking 'kole roga' or fruit rot.

*Viral disease of Banana, wilt of Pepper:* About one kilo of Bougainvillea leaf is collected in a plastic or wooden basket and 10 litres of boiling water is added, left for 24 hours and decanted. Afterwards the solution is mixed with one litre of boiled milk. Sprayed on the infected plants of Banana and pepper, this decoction controls viral diseases.

*Boost, leaf curl, and leaf spot in coffee:* Ten litres of boiling water are added to one kilo of Neem leaves, Seethaphal (Custard Apple), Beetle leaves, and Marigold flowers and left for 24 hours. The decanted decoction is sprayed against boost, leaf curl, and leaf spot of coffee.

## The principles behind the practices

The principles and vision behind Mr. Rao's alternative system of farming are summarised in three basic questions:
Have you touched every plant in your farm?
Have you walked all over the farm barefoot?
Have you written on a white paper what you have not done to a plant in a year?
He has developed his own teaching aids to highlight organic farming practices. He has trained a couple of youths to carry his message of eco-friendly agriculture to the nooks and corners of India.

■

**K.S. Krishna** and **M. Shivamurthy**, Department of Agricultural Extension, UAS, Bangalore 560 024, India.

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# Controlling house flies with manure traps

***How to turn flies into something good? At the Peruvian NGO CEDEPAS a system was devised to rear flies using pig manure. With the resulting pupae, highly nutritious 'fly meal' is being produced. It remains to be seen whether this will really reduce fly nuisance, but the method shows what can be achieved with some creative thinking.***

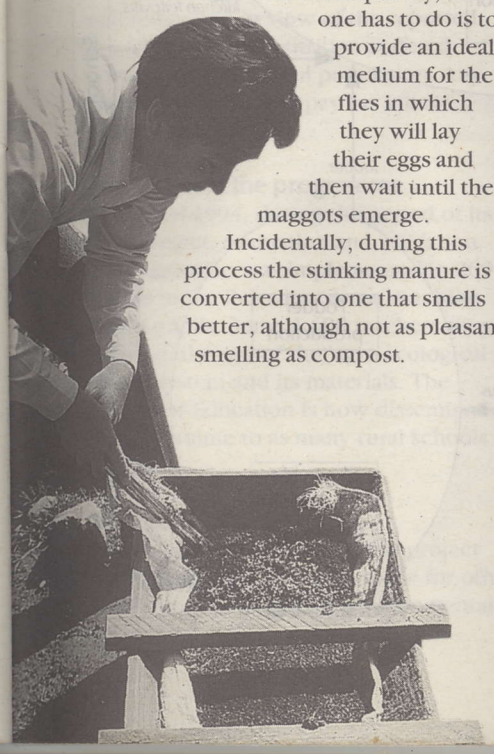
**Johannes Füssel and Ruben Paitan**

Everybody knows how disturbing a house fly can be and many have suffered illness transmitted by this annoying insect. Much money is spent on controlling it using insecticides, parchments, electrical traps and many other methods, but without sustained effect. On livestock farms in particular, fly populations may grow beyond the limit of tolerance, creating sanitary hazards for both animals and people. In a number of countries, this is a reason for prohibiting livestock near or in urban centres.

CEDEPAS (the Ecumenical Centre for Advancement and Social Action, Huancayo, Peru) was confronted with this situation while implementing livestock development programmes in the densely populated Mantaro valley, including the outskirts of Huancayo, the urban centre and commercial capital of Peru's central highlands. In order to cope with the problem, practical experiments were carried.out with fly traps and other ecologically sound methods. But none of these was found to work satisfactorily, until the idea was born to check the fly in its early development stage using the pupae for fodder.

## The manure trap

Flies normally lay their eggs in earth or manure. The house-fly is particularly attracted to pig dung. Consequently, all one has to do is to provide an ideal medium for the flies in which they will lay their eggs and then wait until the maggots emerge. Incidentally, during this process the stinking manure is converted into one that smells better, although not as pleasant smelling as compost.



*Fly-rearing in a simple crate: checking state of the medium and maggot growth*

In Huancayo, we constructed wooden crates of 1.5m x 0.75m x 0.20m, using cheap Eucalyptus planks, but one can of course vary size and material according to needs and availability of materials. The crate is then filled up to a depth of 15 cm with fresh pig manure. Avoid dung with a lot of straw if harvesting of the pupae is planned. If pig manure is in short supply, other types of dung may be used and covered with pig manure, which is the most effective for attracting flies. If pig manure is unavailable, the next best option is guinea-pig dung, followed by horse manure. Fermented plants and cow dung may also be experimented with, to improve the pleasant smell (pleasant for the flies, of course), although we have no experience in this field.

Next, put the crate in a spot where the flies will have easy access, protected from direct sunlight, rain and wind. The smelly manure will immediately attract the flies and encourage them to deposit their eggs. The first maggots emerge after two days. After a week, the crate is covered by a strong plastic foil or something similar, to accelerate the growth of the maggots. Two weeks later the maggots will start to pupate.

## Excellent fodder value

Feeding these pupae to your chickens will show you the unmatched quality of the pupae as a fodder source. If you only have a few chickens, be careful that they do not grow too fat!

Alternatively, you can harvest the pupae, although much more work is then required. Put the manure with the pupae in abundant water and the living pupae will float to the surface. Harvest them and dry them in full sunlight or in a solar drier. This should take some two days. The drying process has to occur rapidly to prevent the flies from emerging. The pupae can then be processed into flour, with a similar smell and texture to fish flour, and the following composition per kilo: humidity 40 g, total proteins 638.4 g, fibre 0.0 g, ash 64.5 g, crude fat 86.0 g and NFE (nitrogen free extract) 171.1 g. With an unbelievably high protein content of 64%, you obtain a high value component for mixing concentrates.

One trap will yield some 150g of dried pupae, equivalent to the control of approximately 95,000 potential flies which are converted into fodder. However, the effect of attracting flies towards these media on fly populations elsewhere should be the object of further study. In Huancayo we plan to produce 3.6 t/a of dry fly flour and to commercialise it as a component in 25.5 t/a of concentrate, destroying 1,235 million potential flies per year.

## Benefits of controlling flies

If poultry or other birds cannot be fed directly on the maggots or pupae, the manpower and other inputs required in production may outweigh the economic value of the fly flour. Even so, there are a number of other factors to be considered when controlling flies using the presented method:

- One single fly may carry up to 6,600,000 bacteria (1,250,000 on average) and other micro-organisms (Hint and Metcalf, 1974). This makes flies ideal vectors for more than 20 human diseases like cholera, typhoid, dysentery, diarrhoea, poliomyelitis and several parasitic worms. Furthermore, they are intermediate hosts of worms harmful to animals (Graham-Smith, 1914). By massive control of flies, an important contribution to a healthy environment would be made, especially in countries with warm climates, preventing tropical diseases in humans and animals. That is why, in the context of public human and veterinary health, it is a very profitable method.
- Destroying the flies in their pupal stage of development is the most appropriate sanitary method, because at the pupal stage they are not infected with any diseases. They are virtually free of micro-organisms.
- The method described promotes creativity, is effective, simple, and does not involve the use of insecticides.
- Untreated manure is converted into compost.
- A word of warning: special care must be taken, when placing the crates, that access by children is avoided due to the danger for hygiene.

■

**Ruben Paitan**, CEDEPAS, AP 430, Huancayo, Peru. Fax: +51-64-222 536
**Johannes Füssel**, APROCACAHO, Casilla 1235, San Pedro Sula, Honduras. Fax: +504-69-3829.

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# Ecology education in primary schools

***The sustainable use of natural resources and environmental education are considered major elements in development. This article describes how a FAO project for primary schools in the Peruvian highlands, called 'Escuela, Ecologia y Comunidad Campesina' (School, Ecology and Rural Community), tries to combine these two elements.***

**Pieter van Lierop**

There exists a great biodiversity in the Peruvian Sierra related to differences of climate, altitude, hydrological characteristics and relief. This is manifested in the wide variety and number of animal and plant species.

Although the region is not the most appropriate for agriculture, its ancient populations created a conducive environment by constructing terraces on the mountain slopes, by building canals to regions with no water, and by domesticating the alpaca (*Lama pacos*), llama (*Lama glama*) and guinea pig (*Cavia tchudii*), and plant species such as the potato (*Solanum tuberosum*), oca (*Oxalis tuberosa*) and quinua. By developing a wide variety of the same crop species that could be used in the different climate and altitude zones, or mixed in order to reduce environmental risks, they contributed to a highly developed agriculture and to providing their subsistence needs. The most appropriate crop or variety was sown in the most appropriate environment and as a consequence local knowledge and technology were as diverse as the mountainous environment itself.

Today there are a number of growing ecological problems: soil erosion, a shortage of fuel, deterioration of terraces, impoverishment of soil fertility as a consequence of chemical fertilisers and pesticides, negligence of traditional crops that were suited to environmental conditions but were also high in nutrient value such as kiwicha (*Amaranthus caudatum*), and an increasing loss of traditional knowledge and techniques.

## Primary education in the Sierra

Until recently, the educational programmes for primary schools were all developed in Lima, the capital. They were not relevant for rural schools in the highlands:

- their examples were largely drawn from the coast and they paid little attention to local cultures, natural environment or economic activities;
- they prepared pupils for secondary education, while the majority of rural pupils in the Sierra only receive primary education and many do not finish it.

While at school most highland children already have their tasks in agriculture, and for the majority of them agriculture and/or animal husbandry will be their main economic activity after leaving school. They do not therefore receive the education that will provide them with a foundation for this future.

## The new school programme

The 'Escuela, Ecologia y Comunidad Campesina' programme is trying to give children a more relevant education. It began with forestry education since deforestation was seen as a major problem in the highlands. Teachers were trained and material developed on the role of trees and vegetation, including practical education on propagation and planting. Tree seeds were given at the beginning but were later collected from trees in the community.

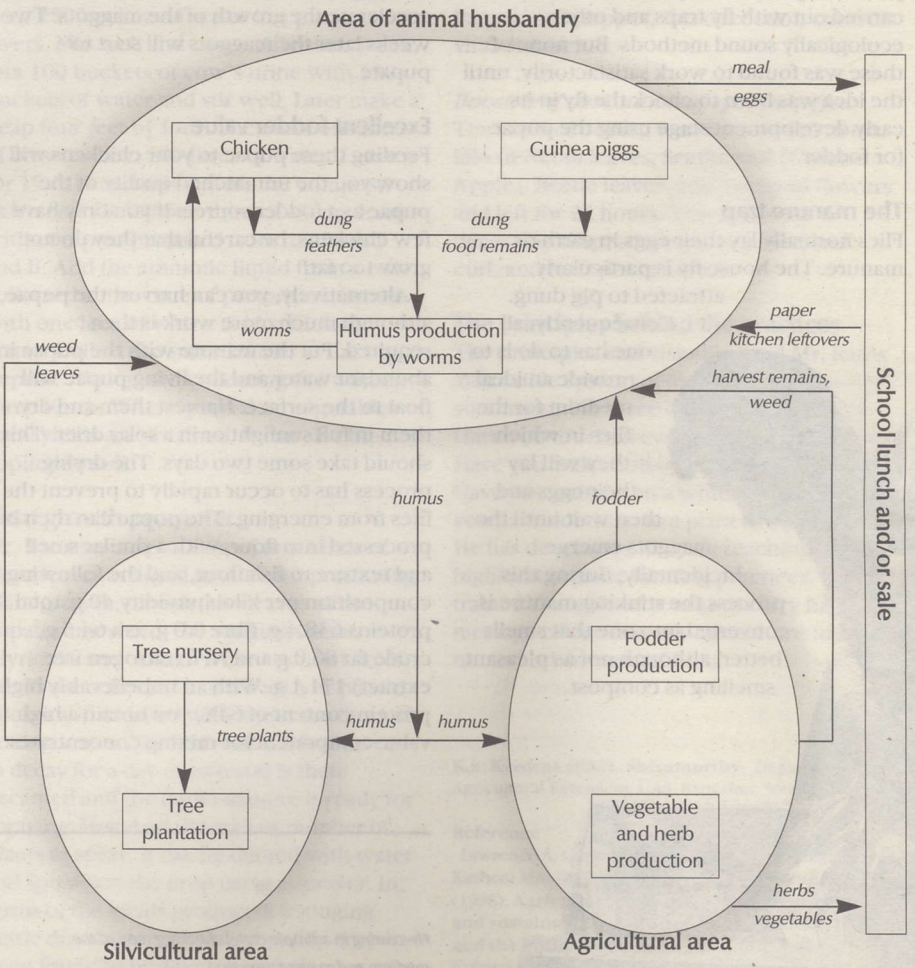
The need for a more integrated education soon became clear and five further thematic units were added to the programme: body, health and nutrition; social life and organisation; geographical environment; life in nature; and agriculture, animal husbandry and agroforestry. The objectives and contents are set out in the educational curriculum, and are developed into six methodological units, one for each of the six primary grades. The guides give theoretical information on each unit and suggestions as to how teachers can develop them with their pupils.

## The agro-ecological school system

Part of the ecology programme is dedicated to developing skills in what is called the agro-ecological school system. It is meant to demonstrate what ecology is about and to create an environment in which children can learn how to use natural resources in a sustainable way.

There are three sectors in the system: agroforestry, with a school nursery and plantations realised each year on school

**Figure 1. The Agorecological School System**



grounds; animal husbandry, consisting of guinea pigs, chickens and earthworms; and an agricultural sector with a vegetable, herb and crop garden.

Some basic agro-ecological principles are taught that relate to the three sectors: use of organic fertilisers - in this case humus produced by earthworms (*Eisenia foetida*); reduction of nutrient loss by relating all the components; conservation and protection of the soil (terracing, planting wind breaks etc.; minimising the use of chemical pesticides, and applying cultural, mechanical and biological control (Integrated Pest Management); and the reproduction of the components.

The production of humus by earthworms relates all the components. The waste from all inputs is used for humus production which is then used in the agricultural and agroforestry sectors. When the earthworm population is high enough, a proportion is used to feed the chickens (Figure 1). Some schools even use earthworms to breed frogs, which are traditionally eaten, though not bred, in parts of the Sierra. Other systems include a fish pond where the earthworms are used to feed the fish.

Some of the techniques are new in the communities, others are aimed at improving existing activities such as keeping guinea pigs in cages instead of them roaming free. However, the programme also includes involving the community so that old techniques appropriate to the environment might be recovered. For this the participation of the parents and general community in creating the 'agro-ecological school' is vital. Teachers are trained and receive a manual with examples, but information and local knowledge and examples are needed from the community.

The products are used for creating plantations on school and community land, and the vegetables, eggs and meat contribute to school lunches, a contribution that should not be underestimated in view of the reported 64% of chronic malnutrition suffered among the rural school population. Any surplus can be sold to pay for school materials.

## The impact of the programme

From 1988-1994, during the period of its development, evaluation and validation, the programme was implemented in 269 schools in the Peruvian Sierra, reaching 45,000 pupils. Some 1,600 teachers were trained in the use of the 'agro-ecological school' system and its materials. The Ministry of Education is now disseminating the programme to as many rural schools as possible.

## Discussion

Based on the experience of this project some general points can be made for other programmes dedicated to environmental education.

*Teaching skills*

During the training of teachers in the programme it became obvious that a substantial number of teachers lacked a good basic teaching skills foundation and knew little about course preparation and planning of content. Training activities were therefore re-written to include and develop these skills. However, this meant that less time was available for training and development in the new ecology teaching programme. Where there is no financial or human support to teach basic skills and environmental education, it would be better to include the latter in existing courses rather than develop a whole new curriculum on the subject.

*Government, community and teachers*

Where a new curriculum is developed, it is essential to work through the Ministry of Education. Teachers are obliged by law to teach the curriculum as developed by the Ministry, and curricula are usually national and controlled by the Ministry's schools' inspectorate.

This does not mean that teachers cannot orient the national curriculum to local conditions. Where the content is intended to cover local conditions, these can vary widely. Teachers therefore need some training in developing their own courses and materials and national curricula must be formulated to make possible a diversification of content to suit local circumstance.

The local community is perhaps best placed to help teachers to develop such courses. Achieving this is not without problems, however. Teachers are often viewed as having more authority and knowledge and a change of attitude on both sides is therefore often necessary.

*School gardens*

The environmental education programme, as outlined above, is built around the school garden. It is a practical way of learning and demonstrating ecological principles. There are some problems attached to the method, however:

- Teachers usually begin with enthusiasm and with the help of community members a lot of work is done. However, school holidays interrupt the maintenance of these gardens. Without the constant involvement of teachers and community, few survive for more than a year, especially where teachers return to the urban areas for the holidays.
- The selling of produce can bring benefits to the school and the aim may become to maximise production rather than promoting the education and learning process for the children.
- There may be two educational goals - to illustrate the nature of sustainable production, and to teach the children some possible agro-ecological techniques. But at what level? What is important is to inculcate a way of thinking rather than giving prototype solutions. Vermiculture (earthworm husbandry) for example, is to teach children that the smallest creature has a part to play in the production of organic fertilisers. But it is only one of the many things needed to reduce soil degradation. The idea in teaching about ecology is to get across its concepts so they might be applied to utilising local natural resources.
- Related to this is that teachers often know less about such natural resources than community members or even the children, who already have responsibilities in agriculture. Teachers may know about integrated pest control but little of local crops and thus risk not being taken seriously. School gardens can only be used as a successful method if community members and teachers complement each others' knowledge.

*Tree nursery*

This activity needs more attention. While tree planting, when properly done, can help resolve erosion and fuel shortages, it may not be a traditional activity. Though country people may have used and maintained the trees in their environment for many years, there is not much evidence in the Peruvian highlands that they know a great deal about how to plant them. Tree nurseries may therefore be an excellent activity to establish in schools.

## Conclusions

- Environmental education must incorporate at the outset training in basic pedagogic techniques as well as environmental matters.
- School gardens and ecological systems appear attractive but bring with them problems. Goals other than education can get the upper hand and there is a specific problem relating to maintenance in school holidays.
- The participation of community members is essential. Their knowledge makes it possible to make the content of courses regionally relevant. Methods for enrolling their support and involvement need to be developed.
- Environmental education must lead to a way of thinking rather than providing ready made prototype solutions.

■

**Pieter van Lierop**, Van Uvenweg 22-1, 6707 BB Wageningen, The Netherlands.

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# *Chintipantipa:* Is planting crops

***Technology transfer is frequently seen as a key to development but the adoption of new technology can have unexpected consequences when it replaces one that has been developed over many generations to suit a complex socio-economic situation. Line sowing is a case in point. This was developed in Europe in the eighteenth century to permit the mechanical weeding of small grains such as wheat and barley. This revolutionised farming systems in Europe making it possible to produce crops with less labour and thereby release vast amounts of rural labour for the growing urban labour markets that stimulated the European industrial revolution. Without mechanical planters and weeders drawn by animal draught power line sown crops may have little advantage over randomly planted crops equidistantly spaced. My experience from Zambia recounted in this article supports this view and shows how dangerous the unthinking transfer of technology from one society to another can be.***

**Tim Russell**

Chintipantipa is a Lamba word used in the rural areas of the Copperbelt in Zambia to describe a traditional method of planting crops in what Government extension staff depreciatory call a random or haphazard manner. To plant crops in rows holes for the seed are dug alongside a planting rope. After each row has been planted the rope must be moved to the next row. This ideally requires two people, one at each end of the rope. Using the Chintipantipa method Zambian women, who are traditionally the planters of subsistence crops such as sorghum and groundnuts, are able to plant these crops in a regular and reasonably equidistant manner, quickly and most importantly alone. To plant crops in this way they do not need help from their husbands or other family members. This gives them independence in food supply and income as they can rightly claim that as they planted the crops they belong to them.

## Hybrid maize and line sowing

Hybrid maize was introduced into Copperbelt province in the early 1980's as a package of technology which included the use of fertiliser, timing and frequency of weeding, plant spacing and line sowing. The Government provided loans at subsidised interest rates to enable farmers to purchase the seeds and fertiliser and guaranteed prices and markets for the farmers maize crops. As this package of technology and inputs produced considerable sellable surpluses it was readily adopted by men who had better, though not exclusive, access to credit and who largely controlled the financial affairs of the family. As a consequence the growing of crops in rows became synonymous with 'modern' technology.

Women have retained their responsibility for growing crops which are principally destined for the family kitchen. These include groundnuts and sorghum which because they were not grown by men and were not grown principally for cash still retained their old fashioned low technology image with local farmers.

## Line sowing should be better!

Extension services looking for simple ways of improving the production of these crops advocated the adoption of line sowing. It was thought that this would increase yield by providing more precise plant spacing and reduce labour costs by making planting, weeding and harvesting easier. To prove the case the Copperbelt Adaptive Research Planning Team, a provincial team of agronomists and economists who are part of a national network of on-farm research teams, embarked upon a series of on-farm trials in which line sowing was compared with Chintipantipa planting.

## Looking for proof

The trials were conducted by members of Farmer Research Groups over two seasons (1991 and 1992) and a total of 67 trial sites. Women conducted 70% of the groundnut trials and 89% of the sorghum trials. Neither the groundnut nor the sorghum trials showed that row planting gave a higher grain yield than the Chintipantipa planting method. Interestingly, despite appearing to be a totally haphazard planting method, the amount of seed used and the final plant population achieved by the Chintipantipa planting method was very similar to that achieved by line sowing.

What was different between the two planting methods was the amount of labour used for planting. For both crops Chintipantipa required 30 to 40% less labour than row planted plots for planting the crop (see Figures 1 and 2). It was not possible, though, to show statistically that there was any difference in the amount of labour required for weeding and harvesting.

## Why line sowing needs more labour

As both methods of planting involve the making of roughly the same number of planting holes the reason for the difference in the extra labour required could be attributed to the need for an extra person to move the planting rope that is used as a guide for preparing rows. Thus, while a woman can plant groundnuts or sorghum alone if she uses the Chintipantipa method, she needs an extra person or child if she is to plant in rows. For women with limited access and control over the family labour pool this dependence on a second person for planting would probably be sufficient to discourage her from adopting line sowing as a planting technology.

## Farmer's evaluation of the trials

An evaluation of the trials conducted by the participating farmers revealed that they

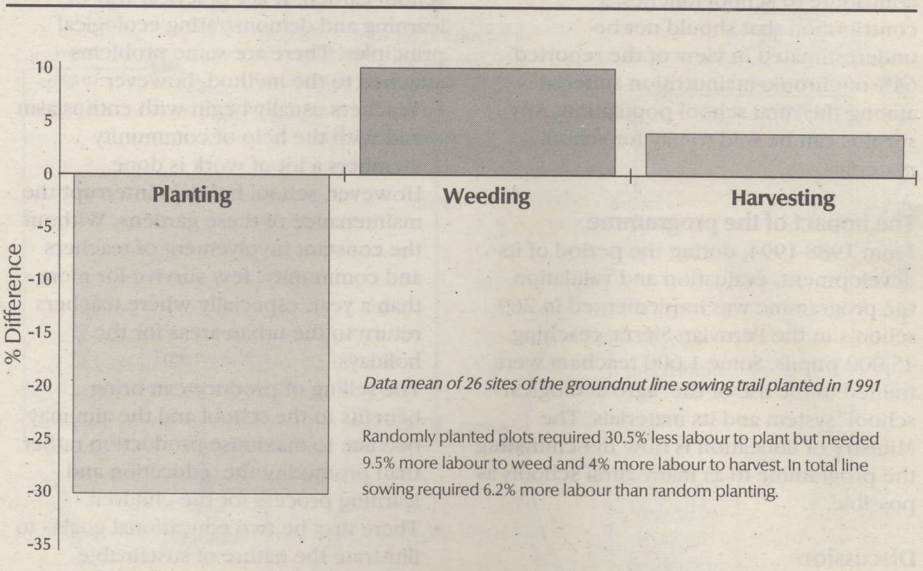



***Figure 1. The percent difference in labour required for planting, weeding and harvesting Chintipantipa planted plots compared with row planted plots - 1991 season groundnut row planting trial.***

# s in lines always the best method?

recognise that row planting requires more labour for planting than Chintipantipa but tend to give the reduction in labour requirement for weeding and harvesting more weight than the labour data in Figures 1 and 2 would suggest is justified. Figure 3 is a typical chart prepared by farmers during the evaluation of the Groundnut Line Sowing Trial conducted in 1992.

Three years after the trials were conducted some of those farmers who had conducted the trials were asked during an evaluation of the research programme if they were now planting groundnuts in rows. All admitted that they were still planting using the Chintipantipa method. This contradiction illustrates the problem researchers have with farmers' evaluations of trial data. The farmers' evaluations represent their views as of the day of the evaluation, views that may be influenced by the occasion of a village meeting, the need to be seen to be modern and to please the visiting researchers. When faced with the task of planting the crop next season if any doubt exists about the worth of new technology farmers in the privacy of their fields will revert to their old systems. The value of scientifically collected data that can be used to verify farmers' opinions should therefore not be underestimated in the rush for farmer empowerment.

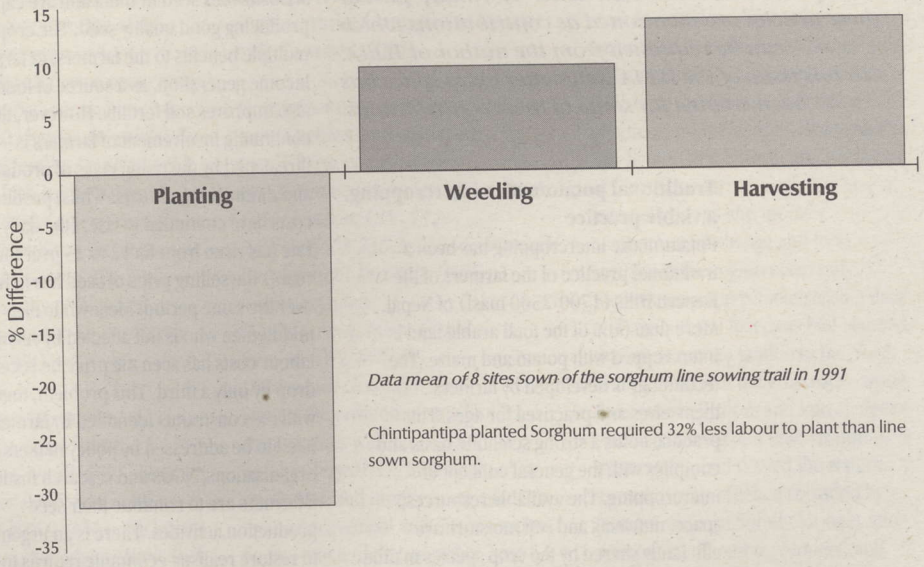



*Figure 2. The percent difference in labour required for planting, weeding and harvesting Chintipantipa planted plots compared with row planted plots - 1991 season sorghum line sowing trial.*

### Is planting maize in rows worth while?

If row planting groundnuts and sorghum shows little advantage in terms of labour saving and yield improvement it could be asked whether line sowing hybrid maize is justified. An on-farm trial comparing hybrid maize planted in 1 meter wide rows with one seed sown every 25 cm with maize sown in holes 1 meter apart with 4 seeds per hole (similar to Chintipantipa method) revealed that there was no difference in grain yield between the two methods. Line sowing, though, took twice as long to accomplish as the Chintipantipa method!

| | *Planting methods (each dot represents a seed)* | | | |
|---|---|---|---|---|
| Charactersitics | Chintipantipa | 50 x 10 | 70 x 10 2 seeds/hole | 70 x 20 1 seed/hole |
| Germinatjon | | | | |
| Pops | | | | |
| Labour of harvesting | | | | |
| Yield | | | | |
| Labour for weeding | | | | |
| Labour for planting | | | | |
| **Total** | **10** | **19** | **19** | **27** |

*Figure 3. Farmer's evaluation of planting methods done by scoring each method out of 5 for each characteristic listed by the farmers as important when assessing planting methods.*

### Conclusion

Studies of family farming systems in the Copperbelt have shown that exchanging labour between families living in the same village and between family members in one household is common. Thus to use the labour of one family member to help with the planting of your crop will result in you having to help plant their crop. If that other family member is your husband then this could mean that you will have to spend more time planting his hybrid maize crop than would have been the case if you had never had to borrow his labour in the first place. Thus it could be argued that introducing a technology such as line sowing that increases women's dependence on family labour makes it more likely that she will have to spend more time working on her husband's crops and less time on her groundnut and sorghum crops. As these are nutritionally important crops and as their cultivation will diversify family food sources making them more secure against the vagaries of climate and National economies it could be argued that the introduction of line sowing would reduce family livelihood security.

■

**Tim Russell**, Lakeland View, Galegreen, Westhouse, Via Carnforth, Lancs, LA6 3NJ UK, Fax +44 15242 42272, E-mail timothyrussell@msn.com

LEISA

*ILEIA is receiving many articles for which there is no space in the ILEIA Newsletter. Normally, part of these articles are mentioned as contributions which can be requested from the author or ILEIA. In this issue of the ILEIA Newsletter extra space has been created for some of these contributions.*

# CONTRIBUTIONS

### Traditional potato/maize intercropping, a viable practice

Potato/maize intercropping has been a traditional practice of the farmers of the Eastern Hills (1700-2500 masl) of Nepal. More than 60% of the total arable land is intercropped with potato and maize. The technology is developed by farmers themselves and practised for ages. This practice holds a strong scientific basis and complies with the general concept of intercropping. The available resources, space, nutrients and soil moisture are efficiently shared by the crop species in time and in space. Throughout the rainy season the potato/maize intercrop canopy provides good ground cover thus minimising loss of top soil. The chance of complete failure of both crops due to hailstones or diseases is minimised.

As under potato/maize earthing up of potato coincides with the first hoeing of maize whilst potato harvesting coincides with earthing up of maize, this practice of combining labour for two crops makes efficient use of the available labour force. Potato/maize intercropping also requires 88% less land than for potato and maize sole. Before introducing any changes in the system, a thorough understanding of present practices is vital.

**S.P. Chand**, Pakhribas Agricultural Centre, c/o BAPSO, PO Box 106, Kathmandu, Nepal.

### Stylosanthes seed production by smallholder farmers in India

Private farmers in Andhra Pradesh are the single most important producers of *Stylosanthes* seed in India and are capable of producing good quality seed. The crop brings multiple benefits to the farmers, in terms of income generation, as a source of fodder and also improves soil fertility. However, the continuing involvement of farmers is threatened by the rising costs of production and diminishing returns. Whilst production costs have continued to rise, (the daily wage rate has risen from Rs 12 to 25 over the last 5 years) the selling price of seed has halved over the same period. Meanwhile the middlemen who is not affected by rising labour costs has seen the price he receives drop by only a third. This problem, together with the constraints identified by farmers need to be addressed by policy makers, state organisations, NGOs and research institutions if farmers are to continue their seed production activities. There is an urgent need to restore realistic economic returns to the farmer. The possibility of the National Seed Corporation taking responsibility for procuring seed from the growers needs to be explored. Other options lie with the formation of a seed growers union, to increase the bargaining power of farmers and enable them to sell directly to the end users. Such developments will only be possible when the problem of access to credit has been solved as until then, farmers will remain dependent on the middlemen and indebted to sell the seed to them. Finally, researchers need to develop closer links with all groups of farmers and can also play a valuable role in quality monitoring.

**C. Turton**, Overseas Development Institute, Portman House, Stag Place, London SW1E 5DP, UK.
**V Ramamurthy** and **C Ramesh**, IGFRI Regional Station, UAS Dharwad, Karnataka, India.

### An indexing approach to quantify sustainability

To develop an indexing approach, the authors defined sustainability of rice farming as the process by which farmers manage soil and water relying mainly on on-farm resources to enhance productivity and maintain it to meet farm and family needs without affecting the production environment. Sustainability of rice farming was quantified through a set of measurable indicators: integrated nutrient management; integrated water management; integrated pest management; land productivity, information self-reliancy; input self sufficiency; input productivity; crop yield security; family food sufficiency. These indicators cover the three dimensions of sustainability, ecological, economical and social. Experts were asked to rate the relevancy of these indicators, these data were converted into relevancy coefficients. Information on these nine indicators was collected from 200 rice growers sampled equally from four rice ecosystems (irrigated, tankfed, rainfed lowland and rainfed upland) spread over three agro-climatic zones of Karnataka in Southern India. On the basis of this information and the relevancy coefficients index values were calculated. The index value of the 200 farmers ranged from 15.63 to 82.34 with a mean of 50.28 out of a positive range of 0 to 100. This made evident that rice farming is only moderately sustainable in this part of the country. Performance on each indicator points to the strengths and weaknesses of any system and improvements can be targeted on weak points so that the overall sustainability status is enhanced.

**M.J. Chandre Gowda** and **K.M. Jayaramaiah**, Division of Extension & TCC, Indian Institute of Horticultural Research, Hessaraghatta, Bangalore - 560 089, India.

### Sunflower virus diseases: the production constraints

This paper describes possible remedies against a number of virus diseases affecting sunflower production in Tanzania. Little is known yet about Sunflower Rugose Mosaic Disease (SRMD), Sunflower Yellow Ringspot Disease (SYRSD) and a complex of both diseases. Most of the sunflower varieties released to farmers, both local and improved ones, open pollinated and hybrids, are susceptible to these diseases.

Disease incidence varies with date of planting but can range from 50-100%. Transmission takes place through aphids, but aetiology, identification of the full range of alternative hosts, vectors and methods of transmission still need further research.

Farmers are advised to grow up to six seeds per station and delay thinning. When thinning, sick plants should be rogued out. If infection continues all sunflower plants should be uprooted. Intercropping sunflower with other crops, such as maize, pigeon pea, sorghum, millet or phaseolus bean is a commendable practice which will protect a smallholder farmer against a total yield loss due to virus diseases.

Planting healthy seed might be an alternative to reduce sunflower virus infestation in the field. At this moment, it is not known, however, whether sunflower virus diseases are seed-borne.

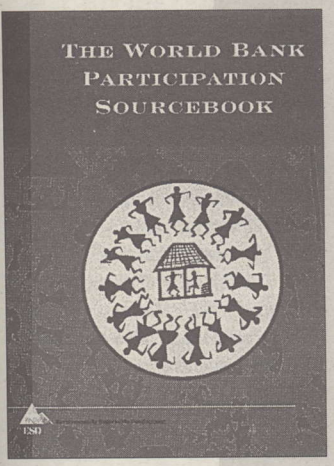
Crop rotation is encouraged in order to maintain sunflower yields and reduce disease incidence. A rotation that includes legumes contributes to improve soil structure and to reduce the amount of inoculum and vectors in the surroundings.

To keep the sunflower field weed-free is also an important option in order to eliminate alternate hosts. Some weed plants harbour viruses in the field and act as a source of inoculum.

Some farmers surround the sunflower crop with maize as a border crop. The maize acts as a fence to keep off vectors which might visit sunflowers. This was observed to reduce disease incidence and severity to some extent, but should be further studied.

**Delphina Mamiro**, National Seed Testing Laboratory, P.O. Box 1056, Morogoro, Tanzania.

# New in print



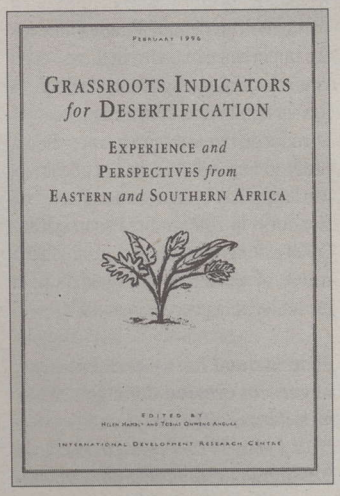

**World Bank participation sourcebook**. *1996. Washington: World Bank, 259 p. ISBN 0 8213 3558 8. Environment Department, World Bank, Room S-5029, 1818 H Street, N.W., Washington, D.C. 20433, USA. (Environment Department papers; 019).*
This publication is written by and is in the first instance meant for World Bank staff. It is mainly written as a reference book, so that it can be consulted on specific participatory approaches to support staff. It begins with reflections on what participation is, presents 16 case studies from all over the world and uses these to elaborate on the various steps of participatory planning and decision making. Special emphasis has been given to approaches to strengthen the financial and organizational capacities of the poor. In an annex, set up as a reference guide, 10 methods are introduced, which have been used in different development situations. (IHG)

**Slash/mulch systems: sustainable agriculture in the tropics** *by HD Thurston. 1997. 196 p. ISBN 1 85339 340 1. £ 14.95. Intermediate Technology Publications (ITP), 103-105 Southampton Row, London WC1B 4HH, UK.*
The follow-up of a previous publication on this highly interesting subject, this book describes agricultural systems based on the practice of slash and mulch. These are characterised by the slashing or cutting of vegetation on the spot in the field to produce a mulch for an agricultural crop rather than discarding it or burning it or taking it elsewhere for composting. The author pleads for slash and mulch systems as a more ecologically sound alternative to slash and burn systems. As proven in the text, fallow periods can be shortened considerably through this system and fertility of degraded soils can be restored. The text contains numerous case studies, arranged according to continent. One of the often-heard reservations about mulches, i.e. the increased occurrence of certain plant pathogens, has given rise to a special chapter, in which it is argued that the inverse seems to hold: maintaining a high level of organic matter on and in the soil is generally associated with reduced incidence and severity of root diseases. The book ends with a very practical list of recommendations and an impressive bibliography. (WB)

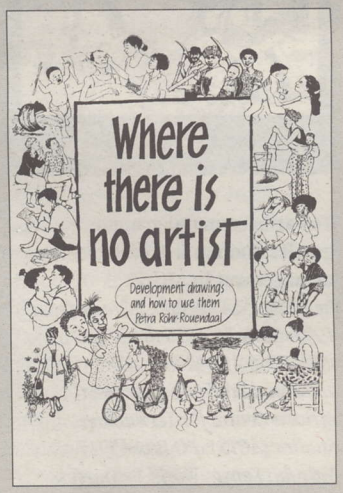
**Farmer's experiments: creating local knowledge** *by J Sumberg, C Okali. 1997. Boulder: Lynne Rienner Publishers. 186 p. ISBN 1 55587 674 9 (hbk): USD45.00. Lynne Rienner Publishers, 1800 30th Street, Suite 314, Boulder, Colorado 80301, USA.*
A critical analysis of Farmer Participatory Research (FPR) based on a review of literature world-wide and a search for experimenting farmers in Ghana, Kenya and Zimbabwe. The rapid fieldwork yielded no evidence of research-minded farmers, informal R&D systems or potential for synergy between formal and informal agricultural research. All farmers try things out as part of their farming practice. Their experimental methods need not be improved; the need is rather to increase the supply of raw material (seed, ideas etc.) with which they can experiment. Development-driven FPR (which we would probably call PTD) is regarded as a particular model of agricultural extension. These results draw our attention to the fact that deeper studies are needed to prove or disprove many popular hypotheses about farmer experimentation if PTD is to be further supported by development agencies. (AWB)

**Paraveterinary medicine: an information kit on low-cost health care practices** *by IIRR. 1996. Silang: IIRR. ISBN 0 942717 63 5: USD10.00. International Institute of Rural Reconstruction (IIRR), Y.C. James Yen Center, Silang, Cavite, Philippines.*
This kit contains information about animal health problems commonly encountered by animal health practitioners working in rural areas. It is intended to help them to identify and remedy common health problems. The manual is composed of four booklets, dealing with restraining animals and simple treatments, basic husbandry practices and veterinary care, disease control and treatment, and herbal medicine for animals. It is written in a simple, practical language and is very well illustrated. (IHG)

**Germplasm for multipurpose trees: access and utility in small-farm communities** *by A Cromwell, A Brodie; A Southern. 1996. London: ODI. 93 p. ISBN 0 85003 236 9: £10.95. Overseas Development Institute (ODI), Regent's College, Regent's Park, Inner Circle, London NW1 4NS, UK. (ODI research study).*
Studies the position of smallholder communities with regard to multipurpose trees, in the light of so much time and money being spent on their improvement and dissemination. So far, much of this work has been done without giving sufficient attention to farmers' objectives in tree breeding, without which any breeding programme will be very hard to introduce into farming communities. Case studies are presented on Honduras, Malawi and Sri Lanka, looking, in particular, into the issue of how improved germplasm is incorporated into existing farming systems and how the existing mechanisms for distribution might be improved. A very clearly organised study, written in easy language. (WB)



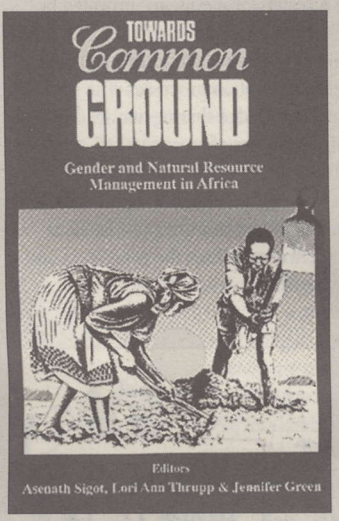

**Grassroots indicators for desertification: experience and perspectives from Eastern and Southern Africa** *by H Hambly, TO Angura (eds.). 1996. Ottawa: IDRC. 168 p. ISBN 0 88936 794 9. International Development Research Centre (IDRC), PO Box 8500, Ottawa, Ontario, Canada K1G 3H9.*
Proceedings of a workshop held in Uganda in 1995 on an important topic for a country that had experienced serious food security problems. Grassroots indicators are defined here as 'measures or signals of environmental quality or change formulated by individuals, households and communities, and derived from their local systems of observation, practice, and indigenous knowledge'. The famine in the North and Northeast of Uganda occurred partly because of failure to assess and monitor environmental change and food security in the region accurately. Reports based on remote sensing data and agricultural forecasts had claimed that there was no famine in the North. But the people at the grassroots, using their own indicators and knowledge of the environment and food resources in their region, had denied the reports. As a result, local evidence provided by farmers was structurally brought into monitoring of famine, drought, and desertification processes. The potential of knowledge sharing may lead to new possibilities of creating more accurate forms of development indicators, planning and monitoring processes. This approach would also facilitate local control over the generation and use of knowledge. (WB)




**Where there is no artist: development drawings and how to use them** *by P Roehr-Rouendaal. 1997. London: ITP. 123 p. ISBN 1 85339 391 6. £12.95 (pbk). Intermediate Technology Publications (ITP), 103-105 Southampton Row, London WC1B 4HH, UK.*
A very original manual explaining how to make drawings for community development purposes. Pictures are all-important in society and, interestingly enough, their importance goes well beyond being a great communication tool for illiterate persons: the power of an appropriate image is just as big in modern,

# New in print

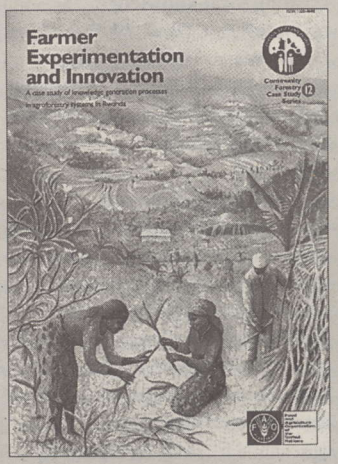
computerised society. This book holds a varied collection of drawing examples covering a wide range of educational and health issues. Apart from selecting the image one looks for and copying, or adapting it, it may also serve as a source of inspiration to develop new images. There are also sections on how to produce flannel board figures, educational games, and puppets. One important remark: educational material, including, of course, drawings, should always be tested in practice in order to check out their effectiveness. Their effect on people should not automatically be taken for granted. There are many instructions for making better drawings (but they did not help a hopeless case like myself). (WB)




**Towards common ground: gender and natural resource management in Africa** *by A Sigot, LA Thrupp, J Green (eds). 1995. Nairobi: ACTS Press. 122 p. ISBN 9966 41 092 9. (ACTS environmental policy series; 6). African Centre for Technology Studies (ACTS), PO Box 45917, Nairobi, Kenya; World Resources Institute (WRI), 1709 New York Avenue, N.W., Washington, D.C., USA.*
Five in-depth case studies are presented, which examine the dynamics of gender in local natural resource management in Ghana, Kenya, Nigeria and Tanzania. They show that women's contributions are critical in managing resources and in shaping environmental and socio-economic conditions, but also how women and men are affected by broader policies and institutions. Policy and programme recommendations are outlined per case. The results from these cases were discussed in a workshop with the authors and policy-makers in 1993, of which an overview is presented in the last chapter. It is clear that women are faced with numerous gender-based constraints and that changes are urgently needed to ensure that women have tenure security, to give opportunities for women's education, and access to appropriate technologies for resource management. (IHG)

**Transgenic Bacillus thuringiensis plants in Mesoamerican agriculture** *by AJ Hruska, ML Pavón (eds). 1997. Tegucigalpa [Honduras]: Zamorano Academic Press. 127 p. ISBN 1 885995 41 5. USD15.00. Escuela Agricola Panamericana, Zamorano, PO Box 93, Tegucigalpa, Honduras. (Publication DVP-EAP; 653).*
Thus far, there has been little attention, in these columns, for transgenic plants, i.e. plants containing genes from other organisms. As the production of such crops, mainly grown for insect resistance, is now a reality, it is important to obtain an overview of this issue, including the great risks associated with this new technology, particularly with regard to the rapid and uncontrolled spread of such genetic material in the wild. The underlying book provides a very useful introduction to the subject, focusing on plants containing a transgene derived from the insecticidal *Bacillus thuringiensis* . Ever since the introduction in maize plants in the USA in 1990, the hectarage under such maize plants has grown considerably. More information about this new technology is urgently needed, particularly in Central America, due to the importance of maize in these countries and given the total lack of formal regulations concerning the introduction of transgenic crops. In order to improve this state of affairs, a workshop has been organised in Honduras in 1996 by the Panamerican College of Agriculture Zamorano, the results of which have been laid down in the underlying proceedings. (WB)

**Field manual for assessment of current erosion damage** *by K Herweg. 1996. 69 p. ISBN 3 906151 07 7. SFR 20.00. Soil Conservation Research Programme, PO Box 2597, Addis Abeba, Ethiopia. Centre for Development and Environment, Institute of Geography, University of Berne, Hallerstrasse 12, CH-3012 Berne, Switzerland.*
Describes a method for monitoring and assessing soil erosion damage of recent origin. The method has been extensively tested in different climatic zones and is, above all, useful in applied research settings, as it is relatively quick to master. The method is based on the estimate of five indicators: soil loss, soil loss per field, soil loss per area of actual damage, area of actual damage as % of the field size, and exact location of the erosion features on the field. The limitations of the approach have been clearly stated, such as limited accuracy with inexperienced observers and difficulty to obtain annual soil losses. The booklet is very condensed and quite suitable for use as a manual; with a careful, clear lay-out and a very good quality of print. Templates of field forms for assessing current erosion damage are joined to the book. There is a detailed description of how to fill these out. (WB)

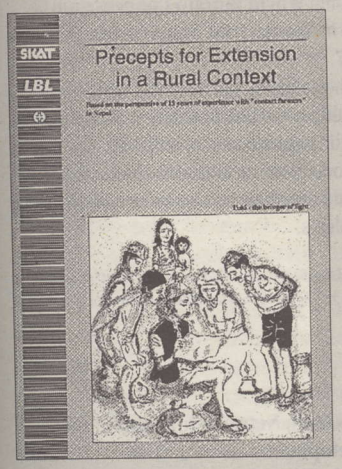



**Farmer experimentation and innovation: a case study of knowledge generation processes in agroforestry systems in Rwanda** *by C den Biggelaar; N Hart. 1996. Rome: FAO. 123 p. Forests, Trees and People Programme (FTPP), Swedish University of Agricultural Sciences (SUAS/IRDC), Box 7005, S-75007 Uppsala, Sweden. (Community forestry case study series, ISSN 1020 4466; 12).*
Active planting and management of woody species by farmers is relatively new in Rwanda. The farmers' processes of generating knowledge about agroforestry, particularly their experimental methods, were studied. Locally identified tree experts had different knowledge about tree cultivation than did normal farmers. The latter had less land and were more likely to experiment with integrating trees in complex systems with field crops. It proved difficult to differentiate experimentation from normal farming practice, as each season is an experiment. Knowledge production by farmers was oriented to use but also to a future beyond the farmers' lifetime. Considerable gender differences in knowledge about trees was found. Communication networks for knowledge sharing were weak; here, more support it needed. Highly recommended reading for PTD practitioners. (AWB)

**A source book on on-farm conservation of seed biodiversity** . *199?. 52 p. Genetic Resource, Ecology, Energy and Nutrition (GREEN) Foundation, 839, 23rd Main, 10th Cross, II Phase, J.P. Nagar, Bangalore 560078, India.*
This fine manual has been compiled by the Green Foundation, with support from the Swiss Agency for Development Cooperation, as part of their mandate to design and develop a biodiversity support and capacity building program. It fits in the approach that dependency on gene banks to stop the problem of genetic erosion is far to narrow, as it leaves no room for evolution of varieties. Another, even more important aspect in favor of on-farm conservation of seed biodiversity is the regained control of farmers over the agricultural system and the possibilities it offers to build in farmer innovations. This publication sketches the need for indigenous seed collection and conservation and to conserve diversity in farmers' fields, but provides mainly practical information on how to organize that. It will help NGOs, extensionists and researchers to systematize on-farm conservation, as in the concept of community owned seed supply many aspects have to be dealt with, e.g. seed collection, cleaning, drying, storage, multiplication and evaluation. The text is written in a simple, clear language, alternated with drawings and record sheets. (IHG)

**Photo-monitoring** *by U Bosshart. 1997. Berne: CDE. 44 p. ISBN 3 906151 17 4. SFR 20.00. Soil Conservation Research Programme, PO Box 2597, Addis Abeba, Ethiopia. Centre for Development and Environment (CDE), Institute of Geography, University of Berne, Hallerstrasse 12, CH 3012 Berne, Switzerland.*
Photo-monitoring can be part of the systematic collection of data, using photographs to detect changes and eventually to identify processes and to assist in the planning, realisation and evaluation of projects. As with all monitoring, photo-monitoring is time-consuming and must be approached systematically. The book provides very condensed information on various aspects of a photograph-based monitoring approach, with emphasis on the so-called baseline approach using pairs of photographs. By observing pairs of photographs under a

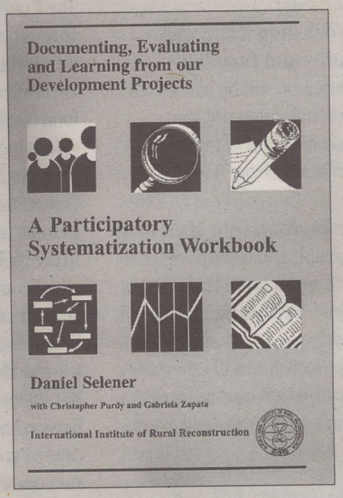
stereoscope, a three-dimensional impression can be provided, allowing an easier interpretation. For a good result neither a professional photographer nor expensive equipment are required. Four case-studies where photo-monitoring was successfully used for different topics (assessment of changes in land use, stability of hydraulic constructions and development of physical soil conservation measures) are presented. A very useful book, comprehensive, very helpful for incorporate photo-monitoring into a wider context. (IHG)




**Precepts for extension in a rural context: based on the perspective of 15 years of experience with 'contact farmers' in Nepal**
*by U. Scheuermeier. 1995. Swiss Centre for Development Cooperation in Technology and Management (SKAT), Vadianstrasse 42, CH-9000 St. Gallen, Switzerland. 92 p. ISBN 3 908001 51 X. SFR 32.00. Landwirtschaftliche Beratungszentrale (LBL), CH-8315 Lindau, Switzerland.*
Tells the story of agricultural extension in the framework of the Integrated Hill Development Project (IHDP), that was implemented in Nepal by the Swiss over the period 1975-1990. The Tuki system was based on the involvement of Tukis ('oil lamps' in Nepali), innovative, open-minded farmers, to bridge the communication gap between the IHDP and the village community. It is interesting to note -and a measure for the success of the project- that the Tukis continued their work even after IHDP were closed. Tukis did not, originally, receive any payment for their services. When it became clear that the initial objective of having at least one Tuki per village could not be reached in this way, their position changed to one of partially-paid project workers at grass roots level, with ensuing increased responsibilities. Efforts to institutionalise the Tuki organisation during the project period failed. Only one year after closing down the project, an independent Tuki organisation was launched, as a result of a political upheaval leading to a political climate that allowed more freedom than before. (WB)

**Soil conservation extension: from concepts to adoption**
*by S Sombatpanit et al. (eds). 1996. Bangkok: SWCST. 488 p. ISBN 974 7721 70 8. Soil and Water Conservation Society of Thailand (SWCST), Dept. of Land Development, Chatuchak, Bangkok 10900, Thailand. For W. Hemisphere: Science Publishers, PO Box 699, Enfield, NH 03748, USA. For other countries: Oxford &IBH Publ. Co., 66 Janpath, New Delhi, India.*
This publication is made up of a number of edited papers selected from those presented at the International Workshop on Soil Conservation Extension: Concepts, Strategies, Implementation and Adoption, held in Chiang Mai, northern Thailand, from 4-11 June 1995, combined with some invited papers. All these papers deal with the present thinking on how extension can best be applied to soil and water conservation projects, as it is generally accepted now that failure of introduction of new technologies in the past are related to a lack of communication between the land users (farmers) and project officials and not that the wrong technologies were introduced. The tendency now is to try to understand the farmers' perceptions of the problems and then help them to identify and solve the problems themselves. The different contributions in the book give an overview of what is tried in different parts of the world and the problems that are still being encountered.The papers are divided into four sections depending on the emphasis given, viz. basic concepts, possible strategies to ensure maximum involvement of farmers, factors important in the implementation phase of a project and a chapter on the process of adoption. Many famous cases on participation in technology development are presented, alternated with lesser known examples from other geographical zones, making it a good reference book on the subject. (IHG)

**Participatory rural appraisal: abstracts of sources: an annotated bibliography** *by S Stewart et al. 1995. 467 p. ISBN 1 85864 009 3. GBP 14.70. Publications Office, Institute of Development Studies (IDS), University of Sussex, Brighton BN1 9RE, UK. (IDS development bibliographies, ISSN 0955 0569 ; 11).*
Contains 823 abstracts. Much more than Participatory Rural Appraisal (PRA) experiences is included here. If one looks under the keywords farming systems research, indigenous technical knowledge, on-farm research and participatory research, one will find some documentation on Participatory Technology Development (PTD). The bibliography is also accessible on the Internet (no site address given, though) and will be regularly updated there. (from PTD Circular 6)




**A participatory systematization workbook: documenting, evaluating and learning from our development projects**
*by D Selener et al. 1996. 103 p. ISBN 9978 04 241 5. USD 20.00. International Institute of Rural Reconstruction (IIRR), Y.C. James Yen Center, Silang, Cavite 4118, Philippines.*
Gives practical guidelines on how to design, follow up, and evaluate development projects and social work programmes or activities in a participatory way, involving all actors. The merit of this manual is in the systematic approach to documenting processes and results of a project, in which mechanisms are put into place that guarantee that findings of the exercise are fed back into the project. Very useful and well illustrated. (WB)

**Conserving indigenous knowledge: integrating two systems of innovation.** *1994. 79 p. Rural Advancement Foundation International (RAFI). United Nations Development Programme (UNDP), Bureau for Policy and Programme Support, One United Nations Plaza, New York, NY 10017, USA.*
As it is stated in the summary of this study: 'Eighty percent of the world's population depends on indigenous knowledge to meet their medicinal needs, and at least half rely on indigenous knowledge and crops for food supplies.' It is not just poor countries and poor people, though, that benefit from indigenous knowledge of the world's biodiversity: indigenous knowledge is vital for innovation and development in a wide range of industries, such as agriculture, chemicals, and pharmaceuticals. Indigenous communities have been the custodians of a, now faster than ever dwindling, biological diversity, but have rarely received any compensation for the commercial value of their varieties. In fact, they have frequently lost ownership rights as developed country-based private countries patented this material.
The underlying study takes basic differences between the traditional 'co-operative innovation system' and the Western 'institutional innovation system' as a starting point. A plea is made for a new 'intellectual integrity framework', in which 'property rights' (for lack of a more appropriate term) of indigenous knowledge about biodiversity would be better protected. A condensed, but very readable study. Many statements and facts are backed up by figures. (WB)

**The human farm: a tale of changing lives and changing lands**
*by K Smith. 1994. 144 p. ISBN 1 56549 039 8. USD 14.95. Kumarian Press, 630 Oakwood Avenue, Suite 119, West Hartford, CT 06110-1529, USA. (Kumarian Press books for a world that works).*
Not exactly 'new in print', but a book that still is very worthwhile to read. It tells the story of a group of Honduran peasants who evolve towards economic and spiritual betterment through encounters that would have a profound influence on their lives: a training farm led by a charismatic farmer-teacher, Elías Sánchez, and an NGO, CIDICCO, for International Cover Crops Clearinghouse, founded by Milton Flores who has managed to develop CIDICCO into an organisation the scope of which spreads well beyond cover crops. The title refers to the notion that people are at the heart of transforming rural communities: people-centred development. Out of so many things tried out in rural development over the last few decades, this concept still firmly holds. Human farming is, in the words of the author, changing the management of our resources by changing our minds, hearts, and souls. (WB)

The **3d International Congress on Allelopathy in Ecological Agriculture and Forestry** organised by the Indian Society of Allelopathy (ISAL) will be held at Dharwad, India, from August 18-21, 1998.

Allelochemicals have shown great potential in increasing agricultural productivity, through stimulation of growth and pesticidal effects. The congress aims at bringing together allelopathy scientists and organic chemists to review progress, identify constraints and establish future goals in research and application.

For detailed instructions to authors and registration contact: Prof. S.S. Narwal, Co-organising Secretary, Dept. of Agronomy, CCS Haryana Agricultural University, Hisar - 125 004, Haryana, India, fax + 91 1662 34952

**International Workshop 'Leucaena - Adaptation, Quality and Farming Systems'**. The workshop will be conducted by the Vietnam National University, the University of Queensland and ACIAR and will be held in Hanoi, Vietnam from 9-14 February 1998.

*Leucaena leucocephala* is one of the most productive and versatile multi-purpose trees available to tropical agriculture. However, its more widespread use has been limited by the narrow germplasm base of the commonly used cultivars. The workshop will especially focus on: germplasm, wood quality, forage quality and on-farm research and extension.

Workshop Secretariat: Department of Agriculture, The University of Queensland, Queensland 4072, Australia. Fax: +617 3365 1188, Email: r.gutteridge@mailbox.uq.edu.au

**PAN International meeting: Feeding the World without Poisons**

From 17-21 May 1997, 95 people from over 40 countries gathered in Cuba to challenge the view that pesticides are essential for agriculture. The Pesticides Action Network (PAN) was founded fifteen years ago as an outcome of a global meeting on pesticide issues in Penang, Malaysia. Cuba was chosen to host the fourth international PAN meeting to mark the great progress made following the country's dramatic conversion to a more ecologically sound agriculture, and to lend support to one of the key actors in this success, the Cuban Association of Organic Agriculture.

In bringing together many different groups, committed to reducing dependence on pesticides on a broad scale, the fourth PAN International Conference brought the network to a new maturity. The organisation locates the problems of pesticides in a broad economic, political and social framework, as reflected in the range of workshops. While the commitment remains as strong as ever to tackle specific pesticide issues -acute and chronic toxicity, environmental persistence, destruction of agrobiodiversity- the context of women's rights, land reform, development policies, corporate strategies and the struggle for control of plant genetic resources and farmers' rights are central to developing future co-ordinated strategies.

A conference report will be available at the end of July 1997 in English, Spanish and French from PAN regional centres.

A short report is published by The Pesticides Trust in Pesticides News 36, June 1997, p.12-13.

Address: The Pesticides Trust, Eurolink Centre, 49 Effra Road, London SW2 1BZ, UK., Tel +44(0)171 274 8895, Fax +44(0)171 274 9084, Email: pesttrust@gn.apc.org

The 17th **ICRA training in interdisciplinary team research for agricultural development** will be held from January 12 to July 23, 1998 (English); and from March 2 to September 10, 1998 (French).

A training programme in which researchers design and implement interdisciplinary team research projects as a service to client agricultural research institutes in developing countries. Preparatory training and team work in the Netherlands or France is followed by fieldwork.

For further details and application contact: Jon Daane, ICRA, PO Box 88, 6700 AB Wageningen, The Netherlands, Fax:+31 317 427046, Email: icra@iac.agro.nl

The **Ecological Action Network on Bio-intensive Mini-Farming** is growing around the world. In Mexico, thousands of people are currently using bio-intensive methods to grow food for their families. Many publications and videos in Spanish have facilitated this process. In Kenya, the Manor House Agricultural Centre has trained 30,000 small holders. In India, a national programme is evolving. In the Philippines, a national bio-intensive education programme has been mandated for all grade and high school students. In the United States, Ohio University has approved a 4-year degree programme in Sustainable Bio-intensive Mini-Farming.

**Ecological Action** began in 1970 as a catalyst group and information resource to encourage a more ecological life-style. The heart of Ecological Action's work is the Research Garden in California. In addition to being a laboratory for soil fertility, open-pollinated crop production and seed-saving, it has been a supportive environment and training center for teachers and practitioners of the Bio-intensive Method.

Ecological Action shares the results of its research through publications, a quarterly newsletter, bio-intensive projects worldwide, training, etc.

If you want to be part of Ecological Actions work, write to Ecological Action, 5798 Ridgewood Road, Willits, CA 95490-9730, USA, Fax: +707 459 5409.

**Sustainable Community Indicators Website**

The Sustainable Community Indicators web site is a place to visit for ideas on sustainable community indicators: what they are, why they are useful, which indicators people are actually using, what makes an indicator a good one. The goal of the site is to educate and to inspire. The original web site was based on the 'Guide to Sustainable Community Indicators', a document about sustainability and the indicators that communities are using to measure their progress towards that goal. The hard copy of this document is available for US$12.50 from the Quebec-Labrador Foundation's Atlantic Center, 55 Main Street, Ipswich, MA, 01935, USA. The site was designed for the volunteers and community members who are working on issues of sustainability and developing indicators for their communities. It is intended to be a source for the general public. The web site now has a searchable database of indicators. Each indicator is 'tagged' with a consistent set of keywords. The web site will be updated regularly.

The address of the web site is: http://www.subjectmatters.com/indicators

The fifth **World Buffalo Congress** will be held in Caserta, Italy, from October 13-16, 1997.

The congress will deal with topics such as buffalo production in different environments; genetic improvement of buffaloes; reproduction, social and economic aspects of buffalo breeding; management and marketing problems.

Organising Secretariat, Via Tanucci 33, 81100 Caserta, Fax: +39 823 444875, Email:luca.orazzo@iol.it

**Afro-Asian Network for Rural Poultry Development** will organise an **International Workshop on Rural Poultry Development Data Bank** in M'Bour, Senegal, on December 9-13, 1997.

Organising Committee: c/o Dr. El Hadji Fallou Gueye, B.P. 5579, Dakar Senegal, Fax: +221 219122, Email:efgueye@syfed.refer.sn

The **International Conference on Ethnoveterinary Medicine: Alternatives for Livestock Development** will be held in Pune, India, November 4-6, 1997.

Farmers and livestock raisers throughout the developing world rely on traditional practices to keep their animals healthy. Such 'ethnoveterinary medicine' includes the use of medicinal plants, surgical techniques and management practices to prevent and treat livestock diseases. This conference seeks to foster an exchange of information and field experience on ethnoveterinary medicine and to identify research priorities and field needs. The conference is open to participants from non-governmental and governmental organisations.

Interested participants are invited to submit papers, organise special workshops of 1.5 hours, and develop exhibits and other contributions for a resource and information sharing event.

For further information, contact: Dr. DV Rangnekar, BAIF, P.B. No.2030, Asarwa Road, Ahmedabad 380 016, Gujarat, India, Fax: +91 79 212 3045.

# ILEIA News

## ILEIA and AME: closer ties

Established in 1986 as a training programme in ecological agriculture funded by the Government of the Netherlands, Agriculture Man Ecology (AME), Bangalore, India, is developing into an innovative training, networking and support/service organisation in the field of sustainable landuse. It mediates between farmers, field-level practitioners, centres of knowledge and policy makers, stimulating multiple flows of information. AME's area of operation is the Deccan Plateau in Karnataka, Andra Pradesh and Tamil Nadu.
In view of the many similarities between the ILEIA and AME programmes, it was felt that a more active collaboration should be established between the two institutions in the field of resource centre functions, research programme and methodology development.

A start has now been made with the exchange of expertise and data in the field of library management and collection development. Also, we are currently looking into the possibility of bringing out ILEIA publications in India and, in the longer run, an ILEIA Newsletter especially for the Indian subcontinent.

AME has, in conjunction with the Indian software firm Aavishkar, developed FARMS. This software application allows for the analysis of the performance of complete individual farms over time. It can also be used to compare farming strategies of different farmers covering production, productive species diversity, nutrient balances, ratio organic/chemical inputs, financial results and labour. This package is now being used by the ILEIA working groups. Support for proper implementation and further development of the package will be given by AME.

**Agriculture Man Ecology**, P.O. Box 7836, 368-4th Cross, J.P. Nagar, 3rd Phase, Bangalore 560 078, India.

## Future issues

The third issue of the ILEIA Newsletter will deal with *'Soil fertility management'*. Articles are especially invited that place soil fertility management in perspective with one or more other aspects of farming. We are especially interested in articles which present options to the questions of the LEISA Working Groups in Peru, Ghana and the Philippines. For example: incorporation of straw in irrigated rice-based farming; green manure in irrigated rice production; (indigenous) cover cropping in rainfed sub-humid savannah agriculture; improved fallowing; (African) experiences in ceasing to burn crop residues; how to deal with shortage of farm yard manure at village level?; how to improve low soil fertility in Inter Andean mountain valleys? Please send your full draft of the article by **15 August 1997**. Also, information on new publications and network news will be very welcome.

The December issue of this year will deal with *'Reducing pesticide dependency to zero?'*. To what extent are radical reductions needed to secure ecosystem balances for sustainable agriculture? How to overcome the yield gap? What are the experiences in e.g. cash crops such as cotton and how realistic is transition to organic cotton cultivation? Is IPM keeping farmers and the ecobalance addicted to pesticides? How successful are IPM programmes? Are local varieties more resistant? Can agro-ecosystem diversity keep pests and insects below threshold levels? What about biotechnological promises for sustainable agriculture (transgenic plants, herbicide resistance)? How widespread is resistance built up against biological insecticides like Bacillus thuringiensis? How safe are botanical pesticides? Please send suggestions for articles before **1 September 1997** to Wietse Bruinsma at ILEIA. Full drafts of articles are requested by **15 October 1997**.

## Sharpening ILEIA's Research Focus

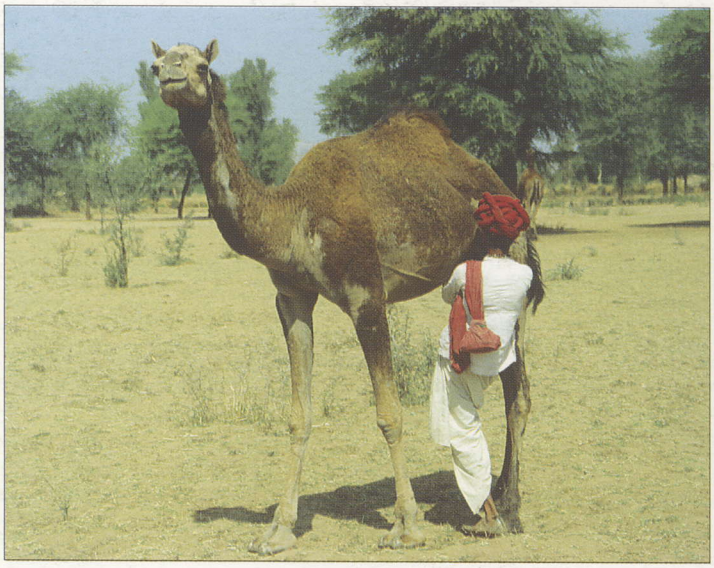
***Early June 1997, representatives from the LEISA working groups in Peru, Ghana and the Philippines, together with staff of the Agriculture, Man Ecology programme in Southern India, discussed ILEIA's Research Framework - as summarised in ILEIA Newsletter 13-1, page 34 - during an intensive workshop in the Netherlands. Four country presentations highlighted the recent activities in the PTD process and proposals for criteria and indicators to validate LEISA as a landuse system. As LEISA is a landuse system, an approach and a political message, it espouses two important needs: the need to limit as much as possible the use of external inputs by emphasising more effective use of locally available resources*** **L-E-I** ***and the need to develop agricultural practices that are sustainable in the long run*** **S.A.**

***A group of external resource persons from various research organisations were invited to critically reflect on the proposals for criteria and indicators. The workshop concluded with presenting criteria and indicators for the economic, ecological and socio-cultural (including gender) dimensions of LEISA. These criteria and indicators will be further detailed to become agro-ecozone specific and measurable during national research workshops in the respective countries. FARMS, a computer model developed in India (see below), will be used for data entry, analysis and quantified monitoring of PTD experiments. In the next ILEIA Newsletter, we will inform you about the progress made.***

**Aprendiendo el desarrollo participativo de tecnologías: una guía de capacitación** ( = Learning for participatory technology development: a training guide) by Laurens van Veldhuizen, Ann Waters-Bayer and Henk de Zeeuw. 1995. 389 p. ETC Foundation, Consultants for Development Programmes, PO Box 64, 3830 AB Leusden, The Netherlands. Also available at: Secretariado Rural Perú - Bolivia, Casilla Postal 13809, La Paz, Bolivia.
Originally published in English in 1992, this is the revised Spanish version of a very successful field-tested learning guide for preparing staff of governmental and nongovernmental organisations to work together with farmers in developing low-external-input technologies for sustainable agriculture. The guide stresses interactive learning for organisational development, both in the development agency and in farmers groups. Included are case studies and learning exercises. Details are added about resource organisations for obtaining further training materials and audiovisuals. (LvV)

## 'Farmers' research in practice' delayed

This book highlighting 17 cases of farmer innovation around the world was announced as being ready by May 1997. However, printing procedures caused a slight delay and the book is now expected to be published by August 1997.



Selling camel milk was taboo, but with the help of the local spirit healer, who sympathised with the idea, a breakthrough was reached.

# Raikas from Rajasthan

**The Raikas in the Pali district of south-central Rajasthan of western India have been known as camel experts for centuries. They belong to a pastoral caste who keep large herds of female camels for supplying work camels to various clienteles. Presently, the Raikas face complex problems which are undermining their subsistence base. At the root of their problems is the lack of grazing opportunities because of an expansion in crop cultivation due to increased irrigation, shortening of fallow, double cropping, etc. But deterioration and alienation of communally owned pastures, and closure of some of their traditional pasture areas for wildlife preserves and reforestation, are also important causes.**

During the rainy season, when crops are grown, the camels have literally no place to go to. The only place left are the Aravalli forests which are also mostly 'protected', i.e. closed for grazing and are infested with flies which transmit diseases. The ensuing malnutrition predisposes camels to diseases, such as trypanosomiasis and mange, resulting in high adult mortality. Herd sizes have thus decreased - and since income is (mostly) a function of herd size, camel breeding is no longer profitable. Another contributing factor, at least in the groups we are working with, is a lack of investment in breeding bulls, so the quality of the camels produced has also deteriorated and this is reflected in the prices obtained.

The applied research project 'Camel Husbandry Improvement Project' aimed at a better understanding of the complex problems faced by the Raikas. To track the reproductive performance of individual animals, ear-tagging was essential, but not popular. Of course the Raikas know their animals individually, but many animals have the same name in a herd and for the researcher this can create confusion. The practice of exchanging animals between herds on a temporary basis also created complications. However, lured by the promise of free prophylactic treatment for 'trypanosomiasis', eventually more families wanted to participate than the project could support.

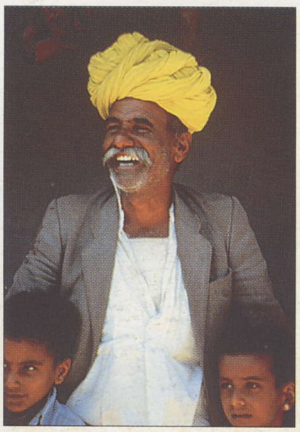
## Problems of empowerment

There are many possible technical remedial measures that can be taken. Our diagnosis is that the traditional extensive management system, with the large herds that the Raikas are used to - and which worked well earlier when there was lots of space - is no longer viable in the current scenario. We are now at a stage where project staff are trusted by the Raikas and are approached by them whenever livestock related problems arise. The major challenge, however, is to 'empower' the Raikas to take on these measures themselves. The community is run by the more conservative old men, and 'committees' that could be responsible for innovations are alien to them. Another problem is that the young and able bodied men are too busy herding to want to attend meetings. This surfaced when the project was to make available a superior breeding bull, and to avoid conflict, agreement was needed on how this benefit should be distributed and who would be responsible for selecting a good animal at the fair.

## Surprising success

At some levels, however, change can happen astoundingly quickly. Only three years ago the idea of selling camel milk was total taboo. It was regarded as equivalent to 'selling one's son', and local lore held that those who tried it met with great misfortune. The majority of Raikas were very reticent about it. We confided the problem to a local spirit healer, or *Bhopa*, who commanded great respect in the community. Sympathetic to the idea, this wise man furnished us with a few handfuls of wheat grains that he had endowed with a 'mantra' and told us to distribute them among the camel breeders as a token of his support for camel milk marketing. This was the breakthrough. Attitudes changed overnight. Within a few months, and assisted in the collection of the milk and arrangement of markets by the project, practically everybody became involved.

Having a daily or weekly cash income, instead of the yearly income from camel sales at the market in Pushkar, was a new experience for the Raikas. Especially the women took this up avidly, exponentially exceeding the indicators for participation and income increase that had been set by the funding agency. The project is now passing from the data collection stage to helping people with social and economic 'empowerment'.



Adoji Ram Dewasi from the village of Jojawar with children of close kinship. Adoji was the first Raika to join the Camel Husbandry Improvement Project which tried to analyse the factors responsible for the decline of camel breeding in Rajasthan's Pali district. The project revealed not only the depth of the Raikas' traditional knowledge system in regards to camel breeding and management, but also the importance of indigenous social institutions in adapting to rapidly changing external conditions such as decreasing grazing resources. Adoji is one of the crucial actors in the project.

The trust between the Raikas and the project is established and the veterinary support and marketing help is appreciated. *But the dilemma of the development worker remains: How to find a balance between research and seeking ways of helping others without being intrusive or interfering in their lives?*

■

**Ilse Köhler-Rollefson**, League for Pastoral Peoples, Pragelatostr. 20, 64372 Ober-Ramstadt, Germany.
**Hanwant Singh Rathore**, Lokhit Pashu-Palak Sansthan, Bhagwan Mahaveer Colony, Mundara Road, Sadri 306702, Pali District, Rajasthan, India.