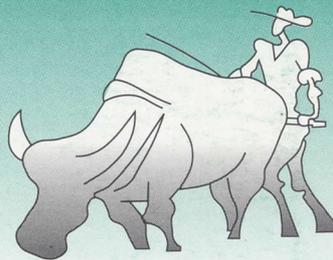


# ILEIA

## NEWSLETTER

FOR LOW EXTERNAL INPUT AND SUSTAINABLE AGRICULTURE



3|92



## LIVESTOCK SUSTAINING LIVELIHOODS

Donkey power to the women

Interviewing cows

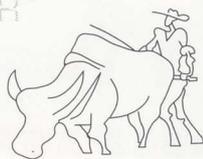
Policies promoting pastoralists



# ILEIA

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Cover photo: In many countries, like here in Afghanistan, donkeys have traditionally been a beast of burden, especially where the roads are poor. Photo: Peter Pennarts

## Dear Readers,

*Especially in the drylands, livestock are vital components of landuse systems. In these semiarid savannas and subhumid regions where lack of water limits plant growth for several months of the year, the amount and timing of rainfall varies greatly. Cropping risks are high, and vegetation yields are low.*

*Up to now, discussions of sustainable agriculture have focused mainly on soil-plant-water relations. If animals are mentioned, then often with reference to negative impacts on vegetation - and with calls for stall-keeping. Keeping animals in one place may be possible in more humid areas, but faces severe limitations in the drylands. Numerous attempts to "modernise" livestock-keeping in these areas have led to misery of many (former) herders and to land degradation.*

*It is gradually dawning on (some) development workers that the livestock-keeping techniques which hold greatest promise of sustainability can be found in traditional practice, characterised by great mobility and flexibility. In this issue of the Newsletter, we therefore emphasise the indigenous knowledge and skills of livestock-keeping peoples.*

*As some articles show, scientific investigation into traditional techniques is confirming their merits in terms of labour efficiency, nutrient cycling, optimal use of grazing resources and effective healthcare with low levels of external inputs. This means that development approaches and policies are needed which allow livestock-keepers to continue practising their time-tested techniques and applying their knowledge and skills in adapting these to changing conditions.*

The editors

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# Herders care for their land

*In Iran as in many other countries, the settling of nomads has greatly contributed to deterioration of pastures around villages and towns. Application of the nomads' traditional skills and knowledge has been inhibited by a range of external factors, particularly the unclear status of land tenure. A. Koocheki points to some practices of pastoralists, which have contributed to resource conservation and sustainable landuse and, if encouraged, could continue to do so.*

## A Koocheki

Iran has a population of nearly 60 million and occupies an area of more than 165 million ha, of which more than 95% is arid and semiarid with rainfall from less than 100 to 500 mm. The main farming activities used to be dryland cereal growing integrated with nomadic herding. Although modern agriculture with monocropping and separation of animals and crops has been introduced, nomadic animal husbandry is still the main occupation of some 15% of the Iranian population, compared with 40% in the 19th century.

In the past many nomads were forced to settle and, in recent years, spontaneous settlement has also occurred. Most have settled in villages and towns where their flocks graze year round nearby, leading to localised desertification. Some have abandoned livestock-keeping altogether and can find no other productive work. In general, lack of secure land tenure, inadequate regulations and inappropriate land-

*Some 15% of the Iranian people move seasonally with their herds, and are able to produce food with little or no inputs of fossil energy.*

use planning are the main causes of range deterioration in Iran.

## Nomadism in dry regions

The pastoralists belong to various ethnic groups - Lur, Kurds, Turk and Bluch - each with a specific territory in different parts of the country.

The full-fledged nomads have no permanent place of residence. In summer they move with their families and herds to the mountains and in winter to the plains, with some intermediate grazing lands. They may cover hundreds of kilometres each year.

The semi-nomads have a permanent place of residence, near to which they also do some farming. They usually also move to mountainous grazing land during spring and summer and return home for winter, but they do not travel so far as the nomads. Although the semi-nomads exploit a smaller and less diverse range of resources, the landuse strategies are similar, the basic principle being to adapt as much as possible to natural conditions through herd composition, stocking rates and grazing time.

As the livestock are kept mainly in areas with little access to a market, the pastoralists aim at diversified production in order to meet family needs as fully as possible. The products include milk, meat, wool and skins for the family and dung as fuel. Some products are also sold to pay for crop foods and other consumer goods.

## Rational landuse

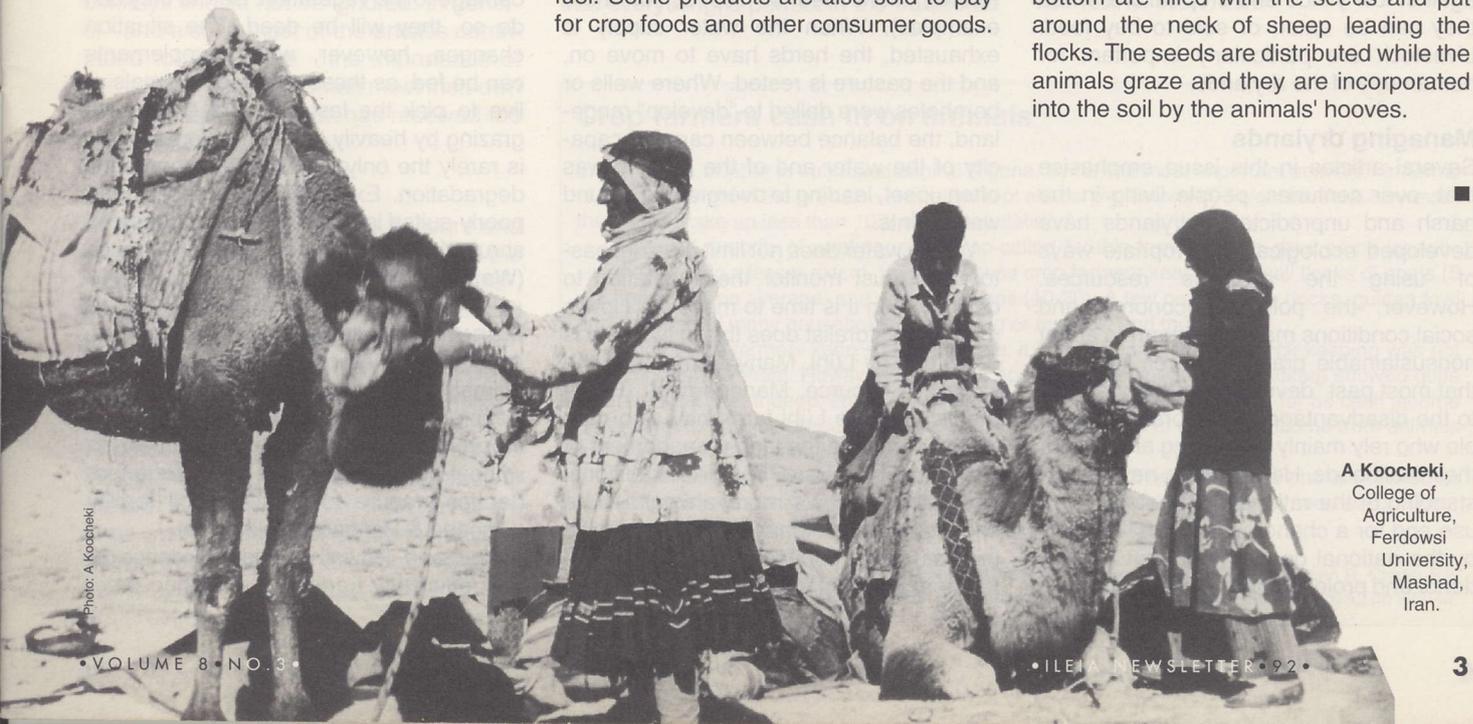
Grazing lands are communal and are not owned by individuals or by government. Certain individuals or groups may habitually use a certain area but they normally do not have exclusive rights. If the main users do not feel that the grazing land is theirs, they have little interest in protecting it. However, where the traditional rights of nomads are recognised, they protect their land.

The nomads are familiar with what are now known as "key species" in modern range management. The beginning of the grazing season depends on the readiness of key range plants, and the end of the season is based on the degree to which these plants have been grazed. The flocks are normally a mixture of sheep and goats and sometimes also camels and cattle, which allows the grazing of different types of herbs and shrubs and thus a more even use of the vegetation.

The semi-nomads cultivate a plot for 1-2 years and then leave it as fallow and pasture for several years. Based on their religious belief, some of them protect certain shrubs and trees such as *Ziziphus spina-christii* and *Juniperus excelsa*.

## Sheep as seeders

For centuries, nomads and their flocks have been an integral part of the local ecology. They play an important role in energy flow and nutrient recycling on range and cropland. Where they have used specific routes for centuries, they enjoy a traditional right of "ownership", try to protect their resources and even practise some range improvement measures. They collect the seeds of the most palatable plants and broadcast them in a very labour-efficient manner. Linen bags with holes in the bottom are filled with the seeds and put around the neck of sheep leading the flocks. The seeds are distributed while the animals graze and they are incorporated into the soil by the animals' hooves.



A Koocheki,  
College of  
Agriculture,  
Ferdowsi  
University,  
Mashad,  
Iran.

*Animal production is in the bad books of many people concerned with global development. Animals compete with humans for food. Roughly 38% of the grain produced in the world is consumed by animals - in the USA as much as 70% and in the former Soviet Union over 50% (Durning & Brough 1991). Producing grain for animals also takes up land. If the land area needed to grow the feed imported for Dutch livestock were counted as part of the agricultural area of the Netherlands, this would be substantially larger than the whole country. So why should livestock-keeping be promoted in the "Two-Thirds World", where grain shortages are common and land is often scarce?*



Photo: Ann Waters-Bayer

## Livestock sustaining livelihoods

**Wolfgang Bayer  
and Ann Waters-Bayer**

In most parts of the Two-Thirds World, domestic animals compete very little with humans for food or for land to grow it. In India and sub-Saharan Africa only 2% of the grain consumed goes to animals. Instead, they complement cropping by using non-arable land to produce food. Animals are also an insurance against low yields and crop failure, when they can be eaten or sold to buy food. Livestock are particularly important for human use of the drylands.

### Managing drylands

Several articles in this issue emphasise that, over centuries, people living in the harsh and unpredictable drylands have developed ecologically appropriate ways of using the available resources. However, the political, economic and social conditions may force them to adopt unsustainable practices. Grell indicates that most past "development" efforts were to the disadvantage of pastoralists - people who rely mainly on grazing animals for their livelihoods. He calls for a new understanding of the rationale of pastoral land-use and for a change in policies, not only by the national governments but also by donor and project-implementing agencies.

Mearns shows how pastoralists in Mongolia are diversifying their livestock holdings again and finding security in ancient landuse institutions, thought to have been eroded by several decades of centralised planning. Koochecki reports on Iranian pastoralists' low-input techniques of caring for their land, not only resting it but even reseeding it, wherever their landuse rights are secure.

In indigenous systems, access to pasture is often regulated by access to water, as reported by Pangare from India (see Niamir, mentioned in Top 5, for more examples). When the water supply is exhausted, the herds have to move on, and the pasture is rested. Where wells or boreholes were drilled to "develop" rangeland, the balance between carrying capacity of the water and of the pasture was often upset, leading to overgrazing around waterpoints.

Where water does not limit grazing, pastoralists must monitor the vegetation to decide when it is time to move on. How a modern pastoralist does this in Namibia is described by Lühl. Many elements of the Holistic Resource Management (HRM) practices of the Lühl farm may also reinforce or improve the land management of traditional herders. HRM, like traditional pastoralism, allows more animals to be kept per unit area than by conforming with the carrying capacity calculations of Western range management.

### How many are too many?

The difficulties in assessing carrying capacity are not discussed in detail in the articles, but are the subject of several publications mentioned as sources. Variation in vegetation yield of the range is influenced much more by variation in rainfall than by intensity of grazing. Behnke & Scoones (1991) summarise recent scientific findings and call for a rethinking of range ecology.

In fact, it is difficult to imagine that purely grazing animals can cause long-term damage to the vegetation. Before they can do so, they will be dead. The situation changes, however, when supplements can be fed, as these can keep animals alive to pick the last blade of grass. But grazing by heavily supplemented animals is rarely the only cause of environmental degradation. Expansion of cropping into poorly-suited land and cutting of trees and shrubs for fuel contribute at least as much (Warren & Khogali 1992).

### Manure for cropping

A second series of articles looks at how animal husbandry can support cropping. People living in the drylands subsist on crop products, but they could not do so without animals. Farmers often trade fodder for manure to maintain soil fertility (Cincotta & Pangare, Mukherjee).

Ikpe and Powell provide evidence of how efficiently traditional manuring prac-

*We should not turn our back to the role of women in animal husbandry. A Nigerian woman taking out her goats to tether them on fallow land for grazing.*

tices recycle the nutrients in crop residues. Here, the strong interdependency of cropping and livestock-keeping becomes apparent. A drop in animal numbers, eg after drought, means less manure and lower crop yields. The seasonal movements of transhumant herders are welcomed by many crop farmers. During the growing season, when risk of crop damage is high, the herds are grazed outside the cropping zone. During the dry season, the herds can move in, feed on stover and produce manure. Thus, wet-season pastures in the arid zone are important not only to produce meat but also as holding grounds for the manure producers.

### Providers of energy

In many countries, draught animals make cropping easier. The major obstacles to their wider use seem to be that farmers need to learn how to handle the animals, and site-appropriate equipment needs to be developed. Makitwange & Beijer describe how these obstacles are being surmounted in Tanzania.

Not only can animals plough the fields; they can also transport water and fuel to the home, goods to and from markets, fertiliser to the fields, and crops to the granary. Fielding & Pearson draw attention to an animal which has received little attention in development work: the donkey. This beast of burden can be used for both transport and draught, is relatively easy to handle and may therefore be particularly suited to reduce women's workload.

Women often keep smaller animals such as poultry, goats and sheep (Zoungrana & Slenders, Perezgrovas et al), but their interest in larger stock such as cattle or donkeys should not be ignored. In general - and also in most of the articles contributed for this issue - the importance of livestock in helping women meet their own and their family's needs has received too little attention.

### Banking on animals

Animals serve as a savings account and ready source of cash. Poultry are often the "coins", sheep and goats the "small bills", and large animals - if available - are sold to meet large expenditures, such as building a house. Where there is no efficient banking system and the rate of inflation is high, this is very rational.

In some countries the "animal bank" is increasingly used by outsiders and, in parts of West Africa, more than half of the large stock is now owned by merchants, public servants and rich farmers. Pastoralists have become contract herders (Toulmin).

How this shift in ownership affects productivity depends on the contract. Payment in milk encourages strong milking to the detriment of calves, and owners may restrict herd movements because they want keep an eye on the herders. New types of herding contracts will have to be evolved to minimise their negative impacts, and alternative investment possibilities will have to be created.

### Combining animals for more

A striking trait of indigenous livestock-keeping is the variety of species kept in combination. This not only facilitates the handling of the "animal bank" but it also spreads risk in case of animal disease. Furthermore, letting goats or camels graze together with sheep or cattle permits a more balanced use of the vegetation.

There are also some less recognised benefits of "mixing" livestock, include small species. Chickens in a cattle kraal can pick up ticks, sometimes even directly off the cattle. A number of poultry species also eat insects. It has been found, for example, that muscovy ducks can control flies more effectively and cheaply than with chemicals (BOSTID 1991).

Moreover, most livestock-keepers in the tropics are not specialised purely in animals. Their livelihoods depend also on cropping, food processing and off-farm activities - all of which may benefit from livestock as manurers, exploiters of wastes, devourers of insect pests, sources of power, forms of investment, risk cushions, transporters and sources of raw materials such as milk, hides and skins, and much more. Furthermore, livestock play an important role in the cultural identity of many peoples (McCorkle 1992) - like in the West. What would the USA be without cowboys?

### Why transfer the troubles?

Only romantic academics would argue that everything is perfect in the traditional

systems. But many of the existing linkages between animal husbandry and other ways of "making a living" already offer keys to sustainable development. There is great danger that supposed "improvements" in livestock-keeping will weaken these links, and simply transfer the troubles of large-scale factory-style systems of animal production.

We hope that this Newsletter will draw greater attention to the strengths of indigenous livestock-keeping systems in the drylands, which are sustaining the livelihoods of a far larger number of people than many modern, specialised systems could.

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## Crop farmers cash in on animals

In the village of Abet in subhumid central Nigeria, by far the most important animals - in terms of total liveweight of the animals - are cattle, kept almost exclusively by Fulani herders. However, the Fulani make up less than 10% of the population.

The vast majority of rural people are so-called "arable farmers" who grow crops for subsistence and, to a lesser extent, for sale. These crop farmers keep only small flocks of goats (5 per household on average) and some chickens (10-20). A few people keep ducks, guinea fowl and sheep, and many households fatten a pig or two now and then.

Since these farmers keep so few animals, it was assumed that livestock-keeping was not very important to them. However, a study of household income and expenditure showed quite a different picture. Indeed, crops provide the basis for subsistence. But as far as cash income is concerned, 56% of this came from livestock sales. And 2/3 of the cash income from animals came from the sale of fattened pigs.

This shows how important the income from livestock can be for farmers who are viewed as "non-livestock-keepers". And this importance is increasing with the growing need of rural people for cash to buy foods and goods they cannot produce themselves.

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# Steppes towards privatisation

*The change from a centrally-planned to a market-oriented economy has caused major upheaval in rural life in Mongolia. Robin Mearns hopes that the revival of traditional pastoral institutions and the change back from specialised to multi-species herds can help secure management of natural resources.*

**Robin Mearns**

**U**lzibayar and his wife live together with their three sons and their families in the Hangai mountain steppe area of central Mongolia. Between them they own a diverse herd of sheep, yak (cattle-like animals), horses and goats, totalling 455 animals or 235 *bod* (Mongolian livestock units). They live in a small camp of felt tents, and move in each of the four seasons of the year to new areas of pasture, up to 10 km apart. The four families work closely together, eg in wool clipping and hay-making. In the short summer growing season, the four men take turns herding the sheep, which they take to distant pastures for a week at a time, where the *otor* (rapid movement to put on weight) takes place.

## Collectives of the recent past

Only two years ago the four families lived separately, as individual production units of a pastoral collective made up of some 1000 families. Ulzibayar had been a specialised yak herder. Almost all of the 100 yak he looked after belonged to the collective. He also kept a few private animals, including horses, sheep and goats, from which the family met most of its needs of dairy products and meat.

The collective produced mainly yak butter oil, which it delivered to the State. The individual herders had to meet an annual milk production target in return for their salary. If they produced more, they could sell the surplus privately, but market opportunities were very limited.

More important, with the large herd of yak allocated to him, Ulzibayar had to herd at least 170 *bod* on his own. This was the maximum number of animals he could possibly handle, let alone produce more than his quota. The same was true for each of his sons, whose families are still young. With little adult labour, they had difficulty in meeting the targets for wool or milk from their specialised herds of sheep or yak. They had to rely on the collective's tractor to move their base camp and on state-subsidised supplementary feed from



Photo: Robin Mearns

the collective to meet the strict production targets.

## Privatisation sweeps Mongolia

What happened in the meantime was the start in 1991 of privatisation of collective animals and other assets. Changes of revolutionary proportions have been sweeping Mongolia as it embarks on the difficult transition from a centrally-planned to a more market-oriented economy.

The changes taking place in Ulzibayar's family are a microcosm of those affecting the rural economy as a whole. Rural life is in a state of upheaval, and it is not yet clear what kinds of institution at the local level will take over the roles previously performed by the pastoral collectives, in such crucial areas as livestock product marketing, input supply and service delivery, and ensuring sustainable grazing management.

## Managing increased risk

In the pastoral collective, each herding family operated as specialised production unit, looking after a single species or even age class of animals. The collectives invested considerably in building shelters and stockyards and in providing supplementary feeds to reduce livestock mortality during the harsh winter-spring period. During the late 1980s, 10% of the overall state subsidies and transfers were accounted for by the long-distance transport of hay and fodder supplements.

Recent reforms have allowed individual herders much greater freedom to decide what to produce and how to organise their production. But the reduction of state sub-

*Mongolian pastoralists own a diverse herd of sheep, yaks, horses and goats. Multi-species herds are a conscious risk management strategy to deal with this biting cold environment. For example, goats survive better during winter if they can huddle together with sheep.*

sidies also shifted the burden of risk onto individual herders.

Most herders, like Ulzibayar, have already returned to the traditional practice of maintaining multi-species herds, and often a smaller number of certain classes of animals. This is a conscious strategy for managing risk. For example, goats survive better during winter if they can huddle together with sheep. A smaller percentage of breeding females means there are fewer vulnerable pregnant females and newborns during the biting cold and windy spring lambing season.

This will result in lower offtake. However, the state has imposed a meat quota even on privately owned animals. The herders responded by underreporting their animal numbers. At the same time, given inflationary pressures, low controlled prices for meat and general uncertainty in the economy, herders tend to hold animals back from the market and expand their herds.

## Return to joint labour

To manage the increased labour demands of a more diverse herd, herders are also returning to the customary practice of living, moving and working with other families as autonomous herding units known as *khot ail* (Szynekiewicz 1982).

Share companies have replaced collectives in providing services and inputs such as assistance with transport for making

# changing pastoral strategies



Photo: Robin Mearns

*Since 1991, privatisation has changed the lives of the pastoralists and they have to adapt their strategies. With appropriate forms of support, the traditional institutions might re-emerge during the transition to a market-oriented, but still pastoral rural economy.*

nomadic moves, or supplementary hay and fodder, but without state subsidies they are expected to collapse. The herders will then have to return to local-level cooperation in hay-making, and to the use of pack and draught animals for moving.

## New policy needed

Important changes in grazing management practices have taken place in Mongolia over the last 4-5 decades since the collectives were established. Pastoral mobility, so essential for ensuring access to forage in all seasons in the dryland areas of Mongolia, became more restricted within new, smaller administrative districts. The provision of services in the district centres gradually led to a reduction in the distances herders moved away from them. When pastures were used by only one animal species, palatable plants were selectively grazed and disappeared.

More recently, as the collective herds are being privatised, an increasing number of private animals are being kept by the sedentary inhabitants of the district and provincial centres. This puts considerable pressure on pastures close to settlements and has led to localised pasture degradation (DANAGRO 1992). On the whole, however, Mongolian rangelands are still in fairly good condition.

## Re-emerging local institutions

Prior to collectivisation, a customary insti-

tution, the *bag*, played an important role in pasture land allocation and settlement of disputes at the local level. Under customary law written down in the Great Yassa of 1229, during the time of Chinggis Khan, individual *khot ail* had use rights over particular areas of pasture. The *bag* territory varied in size depending on ecological conditions: in more productive steppe areas the *bag* operated at the level of a single valley; in the drier, riskier areas of the Gobi desert it covered much larger areas.

With collectivisation, functions of the *bag* were largely taken over by the administration of the collective. However, evidence suggests that the *bags* continued to operate in many areas, albeit on a more limited scale. It is still uncertain whether the customary institution of the *bag* can re-emerge, as the *khot ail* has done, as a pastoral organisation capable of serving the interests of its members under a modern, market-oriented, but still pastoral rural economy (Batsagur et al 1992).

There are several ways in which the cooperative activities of herders like Ulzibayar and his sons may be supported. With appropriate forms of support, both the *bag* and the *khot ail* could replace some of the functions of the collectives or the new public share companies, where these are already disintegrating. They could perform multiple roles, eg as marketing and supply cooperatives.

The possibility of using rural credit funds to support such institutions is being explored by a new Association of Private Herders in Mongolia. Loans could be used, eg, for packaging traditional dairy products to improve their salability in

urban areas, or for buying simple hay-making equipment or seeds of high-quality forage plants. In combination with water-harvesting techniques in drier areas of the Gobi, these could encourage a return to greater local production of supplementary feed.

## Avoiding land privatisation

At present a new land law is being discussed. It is widely acknowledged that privatisation of pasture is inappropriate. Long-term land leases over pastureland hold much greater promise. Leases would have to be issued to groups of herders rather than individuals, to allow for at least the current level of pastoral mobility between different ecological niches in different seasons; and to allow flexibility in use of different areas between years when necessary, to deal with environmental risk (drought, snow, predators, fire).

The *bag* shows promise as an appropriate level of grazing association to complement such new forms of land tenure, building on its customary functions (Mearns 1992). The terms of land leases should be carefully specified to provide for security of tenure at the group level - thereby creating incentives for productive investment in land improvements - and for regulation of pastoral land use to encourage sustainable land management.

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## Robin Mearns

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Photo: Camilla Toulmin

*You have to keep an eye on them. The Fulani herders keep an eye on the Bambara farmers' cattle, and the farmers want to keep an eye on the herders. This may mean that the herds cannot be moved to distant and better pastures.*

## Herding contracts: for better or worse?

*Animals and labour for herding are exchanged between households in a wide variety of circumstances, and under many different terms. Based on research among livestock-owning farmers in the West African Sahel, Camilla Toulmin looks at herding contracts, whereby a herder is paid to care for farmers' animals. She asks how this practice affects the overall productivity of Sahelian rangelands.*

**Camilla Toulmin**

**W**hen you see a large herd of cattle grazing under the watchful eye of a young man, you tend to think "Ah! That man has a fine herd." But often, you may discover that the herder owns few, if any, of the animals in his care. Instead, he is paid for this work by the livestock-owner.

There are several reasons why animals are looked after by people who are not the owners. Some households with livestock may find it difficult to herd the animals themselves, if they have few people of working age, while others may prefer to spend their time doing something else. Sometimes, richer pastoral families will loan animals to poorer relatives and neighbours, to help them survive hard times.

In recent years, a frequently encoun-

tered form of acquiring labour for herding is by means of herding contracts. A herder is engaged to care for a certain number of animals over a given period, in exchange for payment. Rates of pay and other terms associated with the contract vary between different settings, as do the broader consequences of such contracts for herd management, livestock productivity and pasture use.

### Animal wealth from crops

Bambara farmers in central Mali are renowned for their large harvests of millet. Strong cultural value is placed on being a successful, hard-working farmer, producing sufficient grain to feed a large extended family, pay taxes, and invest in cattle.

In the Bambara village of Dalonguebou-gou, lying to the north of the River Niger at Ségou, several families have built up large herds of cattle, while many others have 3-4 animals in addition to their plough oxen. Those with just a few head group their animals together to make up a herding unit.

Livestock plays an important role in the Bambara farming system, being used for ploughing and weeding millet fields. Cattle dung is highly prized for crop production, permitting the regular harvest of crops from fields around the settlement. Here, millet yields averaged 1 t/ha, and twice as much in exceptionally well manured plots. In addition, cattle are a form of wealth; surplus grain or migrants' earnings are invested in animals, which can be sold in times of need.

During the farming season, people are hired for herding, leaving the Bambara free to spend their time weeding their crops. This makes good economic sense, as the cost of hiring herding labour is much less than a man's grain production in an average year. Also, the Bambara say that several seasons spent away in other activities spoils one's ability to farm and gives a taste of a less exhausting way of passing the rains, which might make one reluctant to bend one's back over the weeding hoe again.

### Mixed wages

The cost to the cattle-owner of using hired labour is made up of several components. Each year, for each adult animal, the owner must pay the herder 10 measures of millet (equivalent to about 15 kg). The herder has the right to all milk from the animals on Mondays and Fridays (on other days it is shared with the owner), and is frequently given help with ploughing a millet field. The herder usually also has the right to the manure from the herd for a couple of months, to help boost grain yields.

### Manual on Sahelian pastures

**Manuel sur les pâturages des pays sahé-liens**, by Henk Breman and Nico de Ridder. Karthala, 22-24 bd Arago, F-75013 Paris, France. 1991. 495 pp. FF 160 (people from ACP countries can order via CTA, PO Box 380, NL-6700 AJ Wageningen, Netherlands).

This handbook draws conclusions from a long-term research project of the Netherlands Centre for Agrobiological Research (CABO) on primary production of rangelands in Mali. It gives a detailed description of the nature of pastures and the characteristics of pastoralism in the Sahel, and provides guidelines for evaluating and improving pasture utilisation.

The research results and their potential application are presented in an understandable way, although primarily aimed at researchers and higher-level technicians. It is clearly shown, for example, that vegetation growth is limited by the availability not only of water but also of nutrients, even where annual rainfall is as low as 250 mm.

The length of the book gives some indication of how much knowledge is needed for sound range management based on scientific findings. For those with a good command of French and with scientific interest in rangeland, this book provides a solid basis, is thought-provoking and innovative, and can be highly recommended.

For many herders, this arrangement seems to work fairly well. They gain rights to farm some land while employed as a hired herder. In addition, grain is in good supply within the village, and several herders build up a good and trusting relationship with the cattle-owners for whom they work.

However, there are also significant problems arising, which have adverse consequences for both people and animals.

**Keeping an eye on them**

From the herd-owners' point of view, problems arise because they cannot monitor carefully how their animals are cared for. For example, a major part of the herder's pay comes from the milk of animals in his care. Milk production under Sahelian conditions is highly seasonal, peak quantities being available in July, August and September once the rains have brought a green flush to pastures. But even then, milk offtake for human consumption rarely exceeds a couple of litres a day, and is often less than this. Milk offtake must be limited to ensure that enough is left for the calf.

In the three-cornered struggle between herder, herd-owner and calf, all eager to get a share of the milk, it is usually the calf which suffers. Herders are frequently accused of secretly taking too much milk from the cows in their care. In one case in Dalonguebougou, all 12 of the calves born to a herd-owner wasted away and died during the following months, through inadequate milk supplies. The herder in this case was sacked and was forced to move on to find work elsewhere.

Bambara farming villages in this region are surrounded by extensive areas of pasture. In the dry season, animals are often left free to wander, grazing whatever vegetation they can find. Cattle thieves can pass through the countryside picking up valuable mature beasts, which are then trekked at speed to markets for quick sale. When animals are lost, the herder is often the prime suspect, it being thought likely that he let the thieves take their pick, in exchange for a share of the proceeds.

Herd-owners will rarely be willing to let animals be taken a great distance from the village, as this means they cannot keep such a close eye on them. As a result, pastures around the village tend to get heavily grazed and, by the end of the dry season, there is nothing left to eat for a couple of kilometres. This is particularly damaging for the calves, who are herded apart from the rest of the herd and rely on grazing close to the village.

**Herders have little choice**

In this region, almost all hired herders are Fulani, an agropastoral people found throughout West Africa, well-known for their knowledge of livestock. Traditional

rivalries between the Bambara and the Fulani aggravate the already difficult relations which exist between herd-owners and herders.

From a herder's point of view, herding contracts have become a necessity, given the loss of animals from many pastoral communities, following persistent drought and because farmers have taken over good grazing lands. Herders must find extra income to supplement what they gain from the few animals they own themselves. Many hired herders may hope that over time they can build up a large enough holding to enable them to give up working for someone else.

Access to farmland around the village is an important benefit for hired herders. In villages like Dalonguebougou, with its sandy soils and good supply of manure, harvests of millet have been reasonable even in years of patchy rainfall. Several herders have been able to gain a major part of their food needs from their millet plots, allowing them to set aside much of their earnings for re-investing in buying animals of their own. However, such benefits depend on remaining employed. Given the vagaries of rainfall and animal disease, a herder can easily find himself out of a job, having been falsely accused of negligence regarding the animals in his care.

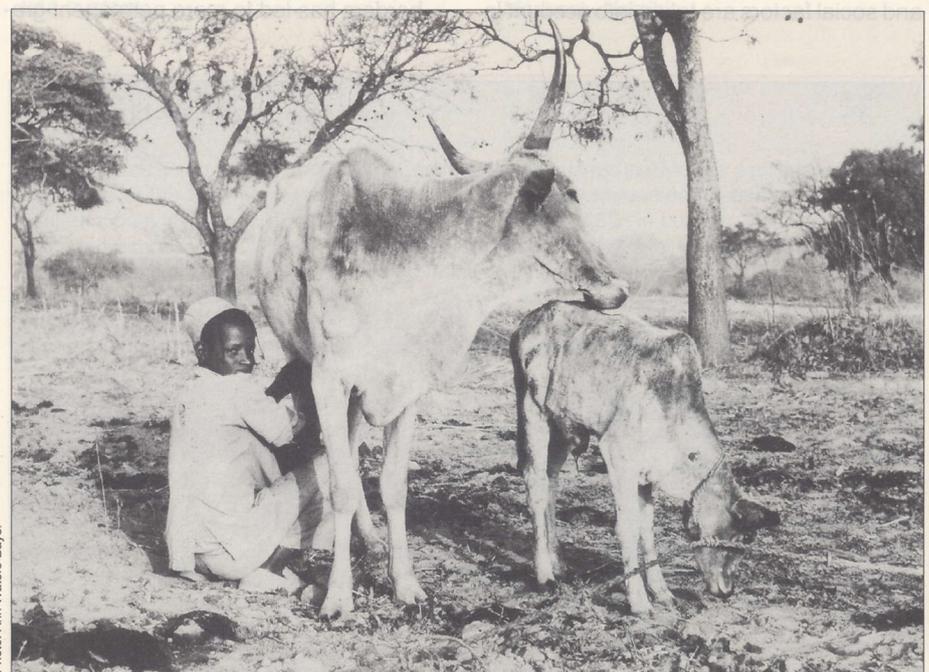
**Settling for the worse**

As elsewhere in the Sahel, herding contracts in Dalonguebougou satisfy a need, based on the increasing livestock holdings of sedentary farmers and the impoverishment of the traditional pastoral sector. However, this continued shift of cattle

ownership from mobile pastoral systems to settled farmers is likely to damage the overall productivity of the Sahelian livestock economy. The decline in the extensive movement of herds between wet- and dry-season pastures increases pressure on locally available grazing and reduces the use made of more distant pastures. The conflicting claims on milk and the division of responsibilities for livestock care between the herd-owner and hired herder create considerable confusion, and do not guarantee that decisions are taken in the best interests of the cattle. Case studies of herding contracts from Niger (White 1984, Thébaud 1988) provide similar evidence for their disadvantages.

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*Hired herders are paid partly in milk. In the 3-cornered struggle between herder, herd-owner and calves for the milk, it is usually the calves which suffer.*

# Holistic Resource Management

*To stop land degradation in southern Africa, a range management system is being applied which imitates elements of traditional herding. Although presently used mainly on large-scale commercial farms, Holistic Resource Management offers promise also for managing communal grazing areas where herding skills still exist.*

**Hans-Peter Lühl**

**V**ast areas of Africa which were used for centuries by nomadic herders are being degraded. For example, the pastures of Namibia supported 3.7 million cattle and 5.7 million small ruminants 40 years ago but now support only 1.8 million cattle and 4.3 million small ruminants. The area has become drier, not because of less rainfall but because grazing led to increased runoff. Grazing by mainly cattle and sheep also led to shrub encroachment.

Can this land degradation be stopped? A growing number of commercial ranches in Mexico, USA, Zimbabwe, Namibia and South Africa which apply Holistic Resource Management (HRM) methods suggest that it can be.

HRM methods were first advocated by Allan Savory in the early 1960s. He states that natural resources can be regenerated only if all interacting ecological, economic and social factors are taken into account in

the management process (Savory 1988). HRM starts with a process of discussion and negotiation during which the resource users set a common goal made up of three interacting parts:

- desired quality of life
- production to attain the desired quality of life
- vision of the landscape and ecosystem that will sustain the necessary production.

## Missing keys

HRM methods are based on a recognition of "missing keys":

- the difference between "brittle" and "non-brittle" environments. "Brittle" means that, if these pastures are closed to grazing, the diversity and stability of the plant cover does not increase. Instead, the plant community simplifies and becomes unstable. Long resting periods lead to degradation. Many drylands are "brittle".
- the importance of animal impact. Trampling, defecating, urinating, rubbing and selective grazing by animals has a decisive and - if properly managed - positive impact on the viability of plant communities. Short intensive grazing and "hoof ploughing" can stimulate plant growth.
- overgrazing is not so much a function of animal numbers but of *time* the pasture is exposed to grazing. Where wildlife could migrate freely and in traditional herding systems, a pasture was intensively used for a short period and then left to rest. Increased sedentarisation of herders has led to more permanent gra-

zing in one location, with little or no time for the plants to rest, resulting in localised desertification.

## Applying HRM on our farm

We have applied these keys on our farm "Garib", which supports about 200 people on 20,000 ha. We produce beef and antelope meat with very low external inputs of fodder, parasiticides etc. Long-term average annual rainfall is 270 mm, but averaged only 176 mm during the 1980s. We keep 1600-2300 cattle and 600-800 large antelopes (oryx, kudu, springbok).

The farm is presently subdivided into 230 paddocks arranged as "cells" around 23 watering points. The process of subdividing the farm started 40 years ago. We try to subdivide so that the vegetation in a particular paddock is uniform.

## Pasture use plan

In the late wet season, we draw up a pasture use plan based on estimates of fodder yield per paddock, measured in cattle-days per hectare. The plan includes a safety margin of about 60 days and takes account of special requirements for lactating cows, breeding period etc. The plan is adapted, when necessary, to condition of the vegetation, which we observe closely.

During the dry season, the cattle are divided into 14 herds, each grazing 16 paddocks in rotation. A paddock is grazed for about 6 days and rested for 90 days. In the wet season, the cattle are divided into 8 herds grazing 28 paddocks each. A paddock is grazed for only 2-3 days and rested for 54-80 days.

The speed of pasture rotation is adjusted to the rate of vegetation growth, which we monitor with small control plots. We use photographs taken at predetermined points before and after the growing period to visualise and document pasture trends.

As we operate in a dry area with uncertain rainfall, we have to adjust the number of animals to the farm's carrying capacity, primarily by selling animals if we have too many and buying animals if we have too few to fully exploit our carrying capacity.

## "Overstocked" but thriving

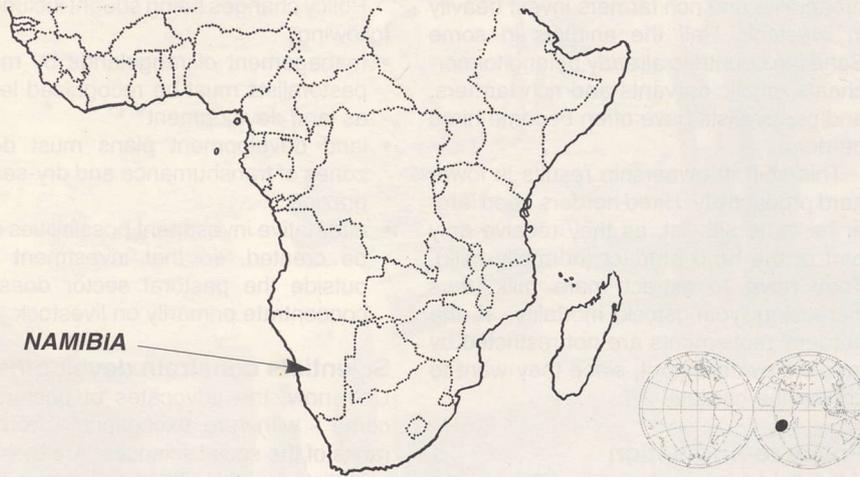
The officially recommended stocking rate for Garib is 22 kg cattle liveweight per hectare. Although rainfall was below average in the 1980s, we stock at a rate of 35 kg/ha or 80% more than recommended - not



Photo: Hans-Peter Lühl

*Cows with their calves on the Garib farm in Namibia, about one month after the rains have ceased and three months before weaning. This is part of the photo records mentioned in the text.*

# nt: can it beat desertification?



counting the wildlife. The average conception rate of the cattle is 83%, well above average for the district.

The trends we observe in vegetation give hope that, within a few years, Garib will be almost completely covered with perennial grasses. We can then increase the stocking rate further.

Although our paddocks are already small by commercial Namibian standards, further subdivision would allow us to keep more animals. In a trial comparing 2 cells with 10 paddocks each, we found that, when we decreased the paddock size from 225 ha to 34 ha, we could almost double the stocking rate: from 38 to 64 kg/ha on average over 7 years.

## Imitating traditional herders

HRM borrows heavily from traditional pastoral practices. However, we may have to be more formal in our approach than experienced herders, whose day-to-day activities make them very familiar with their environment. Our fences partially replace herders, and are intended more to subdivide the grazing *time* than the grazing area. However, fencing requires capital investment, as does the installation of waterpoints. HRM also demands a high degree of personal discipline.

Our biggest problem is adapting management to fluctuating rainfall, such as when we have to dispose of 40% of the herd because the rains failed. If drought is widespread, prices may be so low that selling animals means severe economic loss. In some years, we can lease additional nearby pasture on a short-term basis. During the current drought in southern Africa, we were able to arrange to use an additional property about 200 km from Garib and trekked our cattle to it. Our drought management strategy thus includes a strong element of geographical diversification, which also imitates traditional pastoral practices.

## Application to communal pasture

Traditional grazing areas could be managed according to HRM principles, but we have thus far had limited success in communal areas of Namibia. During the colonial period, many traditional skills of the indigenous pastoralists were lost, and responsible land management was more often discouraged than encouraged.

Other parts of Africa where local people still master the "art of herding" (Müller 1992) may be more fortunate. Still today, some pastoral groups continue to apply sound range management principles: eg using a certain pasture heavily for only a short time and not entering new pasture if signs of trampling or high amounts of cattle faeces indicate recent intensive usage (Niamir 1990). These skills and methods could be incorporated into an HRM land-use system.

However, HRM methods cannot work if pasture is "free for all". If some pastoralists rest a grazing area so that it can recover, others would use it. It is therefore necessary that a clearly delineated group of people controls management of a particular area to which they have secure communal land rights. Also "goal ownership" is vitally important. The group must agree on a common, realistic vision of a landscape suitable to support the necessary production for their desired quality of life.

The area may have to be fenced to ensure proper landuse, but strict and disciplined herding may suffice. The major obstacle is most likely not in the landscape vision and understanding of ecology which is central to HRM, but creating an efficient management structure which can react quickly and flexibly to the observed changes in pasture vegetation.

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## Rethinking range ecology

"Management and Sustainable Use of Communal Rangelands in Africa" is a joint research programme of the Commonwealth Institute, the Overseas Development Institute (ODI) and the International Institute for Environment and Development (IIED) in London. Roy Behnke (ODI) and Ian Scoones (IIED) have produced a clear, concise summary of the presentations and discussions at the Technical Meeting on Savanna Development and Pasture Production, held as part of this programme.

The 39-page paper, entitled **Rethinking range ecology: implications for rangeland management in Africa**, argues that stability of arid range vegetation cannot be achieved since, in these "non-equilibrium" natural pastures, vegetation growth is influenced much more by variation in rainfall than by grazing pressure. As arid areas are characterised by large fluctuations in rainfall, fodder availability varies greatly between years and the number of animals which can be supported in a given area varies accordingly.

Therefore, calculations of a fixed carrying capacity per unit area are of little use, and range resources are more efficiently used by mobile rather than settled forms of livestock-keeping. Arid rangeland can be used most productively yet sustainably by following "opportunistic" strategies, as in traditional pastoralism, rather than the "conservative" strategies of modern ranching.

This paper provides very stimulating reading, and is a must for anyone with an influence on rangeland policies. Further documents coming out of the programme include a report on the 1992 workshop in Zimbabwe "New Directions in African Range Management Policy" (30 pp) and case studies on managing communal rangeland in Botswana and Zimbabwe.

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# Policies promoting pastoralists

*Recurrent failures of range management projects indicate that range scientists are far behind traditional pastoralists in making effective use of tropical rangeland. Hermann Grell makes a plea for policies promoting pastoralists.*

## Hermann Grell

The first generation of range management projects in Africa involved mainly improving the water supply. Instead of increasing animal productivity, this increased overgrazing around the waterpoints. A second generation of projects focused on grazing management, based on Western range management principles such as determining carrying capacity and adjusting stocking rates accordingly. This approach also largely failed.

Both approaches ignored the knowledge and practices of the local pastoralists. There is ample evidence that traditional herders can generally produce more food and support more people per unit area than the "modern" livestock systems (eg Breman & de Wit 1983).

### Mobility needed

In recent years it became increasingly evident that "modern" range management is based on assumptions poorly suited for arid lands. Behnke and Scoones (1991) summarised findings which clearly show that stability of range vegetation cannot be achieved due to the extremely variable rainfall in dry areas. These "non-equilibrium" rangelands are best exploited by adjusting animal numbers to the variations in plant growth by moving the herds.

Our research in semiarid Senegal supports this. Groups of pastoralists were given exclusive rights to fenced grazing areas, if they agreed to limit the stocking rate to 1 tropical livestock unit (250 kg live-weight) per 10 ha. For this rather conservative stocking rate, 600 kg/ha of annual production of plant dry matter is needed. But this yield was reached in only 6 of the last 10 years (Fig 1).

Mobility in pasture use is obviously needed. It is impossible to organise flexible use of pasture from an office in the capital. Instead, the pastoralists themselves need a high degree of autonomy.

### Counterproductive policies

Agricultural policies favouring the urban elite and cash-crop farmers have deprived herders of crucial wet-season pastures. Despite the disrespect for pastoralists, the

urban elite and rich farmers invest heavily in livestock. Half the animals in some Sahelian countries already belong to merchants, public servants and rich farmers, and pastoralists have often become hired herders.

This shift in ownership results in lower herd productivity. Hired herders need larger herds to subsist, as they receive only part of the herd product (normally milk). They have to extract more milk, thus increasing youngstock mortality. If the herders' movements are not restricted by law, the owners do it, since they want to control the herders.

### Policy re-orientation

If the fight against desertification and the aim of cost-efficient production is taken seriously, policies have to be re-oriented. Some important points are:

- the merits of the traditional mobile systems must be recognised and these systems reinforced and, where necessary, rehabilitated
- land tenure systems have to accommodate mobile pastoral production
- pastoral organisations need legal recognition so that they can obtain more secure rights to grazing and water
- pastoral groups have to get a voice in landuse planning
- pastoral people need training to be able to get better employment outside the pastoral sector, where necessary.

GTZ (German Agency for Technical Cooperation) is increasing its support for natural resource management in dryland Africa. Newly launched pastoral development projects are aimed at stimulating the political will to regulate land conflicts, ensure herders' access to key resources, and promote decentralised management of natural resources by users.

Policy changes being sought include the following:

- management of rangelands by mobile pastoralists must be recognised legally as land development
- land development plans must define zones of transhumance and dry-season grazing
- alternative investment possibilities must be created, so that investment from outside the pastoral sector does not concentrate primarily on livestock.

### Scientists constrain development?

Until now, the advocates of pastoralists come - with rare exceptions - from the ranks of the social sciences. Are technical scientists so prejudiced against pastoralism that they are a major constraint to participatory development? We hope to enlist less prejudiced technical scientists for pastoral research and development programmes. In such programmes as well as in policy advice, regional organisations such as CILSS (Comité Inter-Etats de Lutte contre la Sécheresse au Sahel) will play a major role.

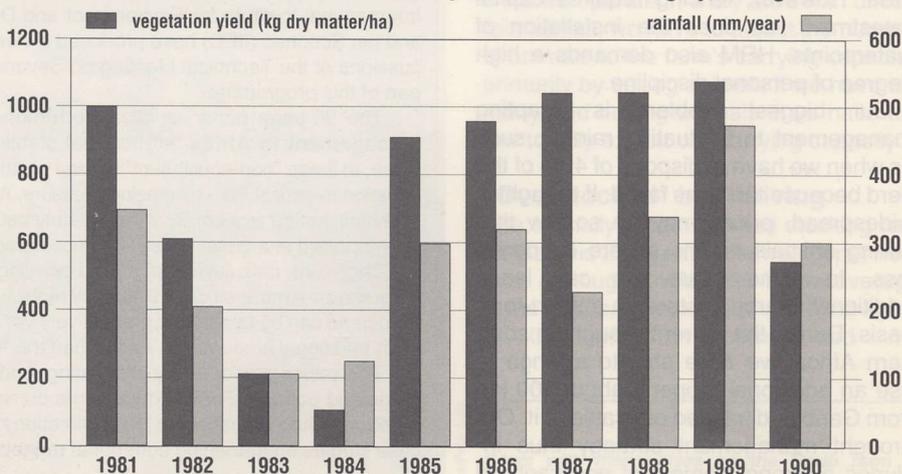
Implementing agencies, such as GTZ, can incorporate the findings into project planning, give the emerging new concepts more momentum, and help arrange financial support. ■

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Figure 1: Vegetation yield and rainfall for 10 years in Widou Thiengoly, Senegal



Source: Grell in Dimanche et al 1991



Most manure is deposited not during daytime grazing but rather when the herds are kept overnight on farmland. The adult animals are moving out to graze and will return in the evening to deposit still more manure and urine, and to give milk to the calves.

tracts with transhumant herders. Since the droughts, patterns of livestock ownership have changed. Less cattle and more small ruminants are kept, and more animals are now kept by sedentary mixed farmers than by transhumant herders. Manure contracts are still important in many areas, eg along livestock trekking routes, but farmers now often combine their own smaller herds to manure cropland.

The 50-80% reduction in livestock numbers during the droughts affected not only livestock but also crop production. Manure availability in the years after the droughts was greatly reduced. This was probably a major reason for the decline in crop yields during this time in many Sahelian countries.

#### Mobile manurers

During the dry season, cattle and small ruminants graze harvested fields of sorghum (*Sorghum bicolor*) and millet (*Pennisetum glaucum*), the most important source of forage at this time of year. Although some manure is dropped during grazing, most of it is deposited during overnight kraaling of animals on the fields. Kraaling requires minimal labour for handling and spreading of the manure.

This traditional method of applying manure allows about half the nutrients excreted by animals to be returned to the soil. Ongoing studies in Niger show that cattle (average liveweight 290 kg) void roughly 1.3 kg of manure dry matter overnight (12 hours kraaling) and sheep (28 kg) 0.4 kg.

The manure output of grazing cattle during the wet season can be twice as high as in the dry season (Omaliko 1980). Since better feed also results in higher nutrient content of the manure, the nutrient output of cattle during the wet season is up to three times higher than in the dry season (Powell 1986). Therefore, early wet season manure is particularly valued by farmers.

#### Manure versus stover mulch

Organic materials are most efficiently recycled when they decompose and release nutrients at the time when the crops need them. Manure from animals fed millet stover decomposes more quickly in the soil than does millet stover applied as mulch. The nutrient release pattern of manure coincides closely with millet growth.

The millet straw initially immobilises soil nitrogen. In our trials, the nitrogen content of the stover increased up to 135% of the

## Nutrient recycling through livestock "Fertiliser factories"

**Increasing population and expansion of cropping, for both food and cash, is reducing soil fertility in many farming areas. The importance of animal manure to sustain crop production is increasingly recognised. Based on their research in Niger, Felix Ikpe and Mark Powell indicate how changes in livestock management affect nutrient cycling in crop-livestock systems in semiarid Africa south of the Sahara.**

### Mark Powell and Felix Ikpe

In the Sahel zone of Africa, most soils are sandy and low in soil nutrients. Plant growth is limited not only by water availability but also by soil fertility. Following as a means to regenerate fertility has already disappeared in many areas. To maintain cropping yields, more judicious management of organic sources of nutrients, such as manure and crop residues, and a wider use of chemical fertilisers are needed (Bremner 1990).

#### Manure and rainfall

Farmers in the Sahel manure 20-50% of their cropland each year. In higher rainfall areas, cultivated plots are smaller and cattle are more important than in lower rainfall areas, where more sheep and

goats are kept. As manure decomposes more rapidly in wetter areas, larger amounts of manure are applied at shorter intervals (2-3 years) than in lower rainfall areas (Table 1).

Annual fluctuations in rainfall also influence crop response to manuring. During a year of low rainfall in Niger, total millet yields (grain plus stover) in manured areas were only 6-19% higher than in adjacent non-manured areas. Manuring even decreased yield significantly in one village. This shows the risk of applying too much manure when rainfall is low. In the next year when rainfall was adequate, manuring increased yields by 71-98%.

#### Drought reduces dung

Prior to the droughts in the early 1970s and mid-80s, most farmers in the Sahel obtained manure through informal con-

Photo: Ann Waters-Bayer

initial value before starting to release it. Thus, stover mulch can cause nitrogen deficiency during the early stages of millet growth, releasing nutrients only when they can no longer be used efficiently by the growing plants.

**Added value of urine**

First results of a long-term trial on a sandy soil at the ICRISAT (International Crops Research Institute for the Semi-Arid Tropics) Sahelian Centre in Niger show that millet yields in kraaled areas (which receive both manure plus urine) were over twice as high as yields where only manure from stall-kept animals was spread by hand. Total millet yields in plots where cattle were kraaled each year were 2.3 times higher than where only manure was applied (Fig. 1). Similar results were obtained with sheep.

There were also residual benefits of urine. Yields in plots where cattle and sheep were kraaled the previous year were about 1.5 times greater than where only manure had been hand-spread.

Urine not only returns nutrients to the soil but also has other beneficial effects on soil properties. Measurements showed that a sheep deposits an equivalent of 202 kg N/ha on a urine patch per voiding. Available nitrogen and potassium at the soil surface (0-15 cm) in urine patches remained elevated throughout the cropping season. The increase in soil surface pH from 5.5 (control plots) to 6.8 (urine

**Table 1: Cultivated and manured areas, manure dry matter (DM), nitrogen (N) and phosphorus (P) on farmers' fields in Niger, 1990**

	Zones		
	Wet	Moderately wet	Dry
Rainfall (mm/year)	600	425	350
No. of households	15	10	15
Cultivated area (ha/household)	3.2	6.3	9.2
% manured/year	29	52	30
Manure DM (kg/ha)	3800	1700	1300
% cattle	52	55	19
% small ruminant	48	45	81
Manure N (kg/ha)	45	23	22
Manure P (kg/ha)	5.7	3.0	2.7

Source: Powell & Williams 1992.

patches), measured 7 weeks after urine was applied, may also have decreased toxic aluminum and increased phosphorus availability to millet.

**Losses through stall-keeping**

The current widespread traditional practice of daytime grazing and overnight kraaling of animals on cropland recycles a relatively high proportion of nutrients, since both urine and manure are returned to the soil.

Where landuse has become more intensive and less area is available for grazing, animals are increasingly being stall-fed. Then, only manure but not urine is available for recycling to crops. Since 40-60% of

the nitrogen excreted by animals is in the urine, stall-feeding has a high potential for nutrient loss, as the nitrogen in urine is easily volatilised.

Urine will not be recycled if measures (eg use of bedding materials) are not taken to catch and store it. Furthermore, stall-keeping demands more labour for transporting manure to the fields and spreading it.

**Room for animals**

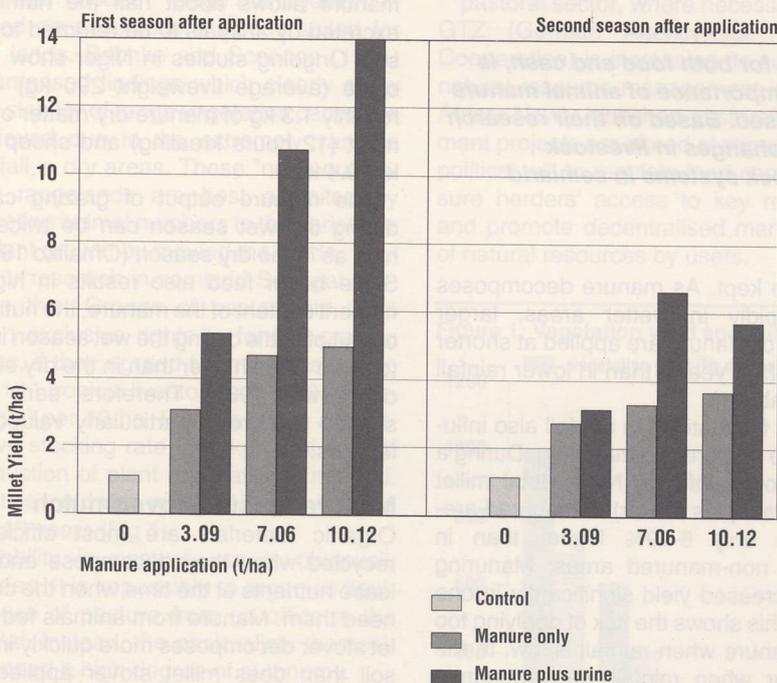
The sustainability of nutrient transfers from range to cropland depends on the amount and quality of grazing land available to animals. Adequate grazing:cropland ratios are required, so that grazing lands are not over-exploited and thus degraded. As cropping expands, wet-season pasture close to cropland is diminishing, and less animals to produce manure can be kept there year-round.

This shows how cropping in semiarid areas is interwoven with the use of rangeland, including the need to move animals to more distant pastures during the wet season. A balance between food and feed supplies and human and animal populations must be sought on a wider regional scale than merely the cropping areas.

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**Figure 1: Effect of cattle manure, manure plus urine and manuring intervals on millet yield. Manure and urine were applied by kraaling cattle for one night (3.09 t/ha), 2 nights (7.06) and 3 nights (10.12) directly on the field. 'Manure only' refers to corresponding amounts of manure collected in cattle enclosures and applied to the fields.**

# Turning the nutrient cycle

*In many parts of the world, the productivity of farming systems pivots on animals' ability to convert fodder into manure. In dry regions, crop residues decompose very slowly. Here, mutually beneficial relationships between herders and farmers revolve around each others' need for fodder and fertiliser, using the livestock digestive system to speed up nutrient cycling. Richard Cincotta and Ganesh Pangara report how the manure trade is organised in part of Gujarat in India.*

**Richard Cincotta  
and Ganesh Pangara**

**T**he Bharavad herders living near Rajkot in Saurashtra Region keep small ruminants, of which about 90% are Maravathi sheep. This native breed produces a coarse wool, best suited for rug weaving. Herd size varies from 40 to 250 head. Income from sheep is generated from sales of animals for meat and from wool, milk and dung. Goats make up the remaining 10% of the herd, and produce mainly milk for household consumption.

Although Bharavad families own houses on the edge of towns and villages, about 10% of them migrate in the dry season to irrigated farming areas in North Gujarat, mostly those families with 200 or more animals. Smaller herds remain in the village, grazing the commons and harvested fields and eating cut fodder.

The farmers in the area cultivate 1-3 ha of rainfed land, which is largely dedicated to cash crops. While tractors operate in almost every village, many farmers prefer animal draught and maintain their own bullock for plowing and sowing. During the initial period of monsoon rains, the "long" rains or *kharif* season, groundnuts are sown. In the shorter *rabi* season, farmers plant cotton, wheat, *bajra* (millet) or groundnuts.

The farmers rely mainly on dung for nitrogen fertilisation and replacement of soil organic matter in their fields. Inorganic phosphate and urea are used sparingly.

## Dung collection

A characteristic of the Saurashtran countryside is the Bharavad corral area: a confused maze of living cactus fencelines and cartpaths at the outskirts of each village. Each corral, 300-600 m<sup>2</sup> in area, is designed for easy dung collection. Dirt floors are levelled, and one or two shallow pits are dug for piling dung.

To minimise dung losses, herders maximise confinement of their animals, which are brought back from grazing before 6 pm and only leave the corrals around 10 am. After the animals have been taken out to graze by the men, the women sweep the

dung into small piles and later into the nearest pit. When farmers are ready to buy dung, the content of these pits is carried in buckets to larger pits outside the corral. With their bullock carts, farmers haul the dung away.

Near the end of the dry season, just before planting, herds occasionally remain overnight in fields to deposit dung directly. This saves farmers the time and labour usually required to transport and apply manure. The animals are then either fed crop residues left at the field, or herders are paid an equivalent amount of cash. Although overnight stays are relatively infrequent in the village, interviewed Bharavads suggested that this farmer-

herder arrangement occurs more regularly on irrigated farmland along migration routes.

## Market for soil fertility

Herders estimate that they can collect a bullock cartload of dung pellets from a herd of 200 sheep and goats in about 3 days. This quantity (around 100 kg) can then be traded for a cartload of baled millet or wheat straw. This is enough to feed 200 small ruminants for about one day. The remainder of their diet is obtained from meagre "wild" forage resources on degraded village commons, from standing stover and fallow weeds, or from fodder traded for farm labour.

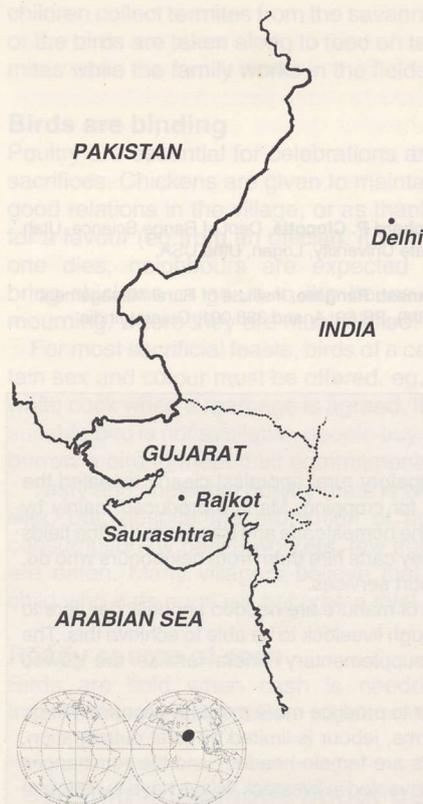
In Saurashtra, most of the common grazing land was distributed among landless villagers during land reforms in the 1950s. All that remains for common grazing is in river floodplains, along roadsides and in hedges. During harvest, Bharavad men and women work in return for cash or fodder. Farmers commonly reserve crop stover and fallow weeds for herders with whom they regularly deal in manure and labour.

Bharavads did not complain about the present terms of trade for either manure or labour. They felt that, if trade became unfair, there were always other farmers with whom they could deal more favourably. Farmers also seemed satisfied with the present exchange arrangements.

Interviewed farmers were nearly equally split in their opinions of sheep and goat dung as fertiliser. About half believed that it was more expensive than chemical fertilisers for the amount of annual return, but thought that it was valuable because of its ability to promote good soil texture in local clays. Other farmers believed dung to be less expensive than chemical fertilisers, especially compared to urea, a quick-releasing nitrogen-rich fertiliser. However, several farmers said that a disadvantage of dung application was its tendency to harbour weed seeds.

## Development considerations

Although improperly managed livestock can cause land degradation, the importance of animals in "turning the crank" on the nutrient cycle should not be overlooked. If a stack of fodder is fed to goats, sheep or cattle, in less than 72 hours it is torn, chewed, soaked, decomposed by fermenting bacteria in the front chambers of the stomach (the rumen and reticulum), chewed again, attacked by acid in the latter part of the stomach, squeezed through the intestinal tract, attacked by bacteria again and deposited on the ground. Left to its own on the soil surface, years can e-



*Figure 1: Map of India and Gujarat State. The Bharavad pastoralists who were studied live in the Saurashtra Region near Rajkot. Around 10% of them regularly migrate to North Gujarat during the dry season, seeking water and forage.*

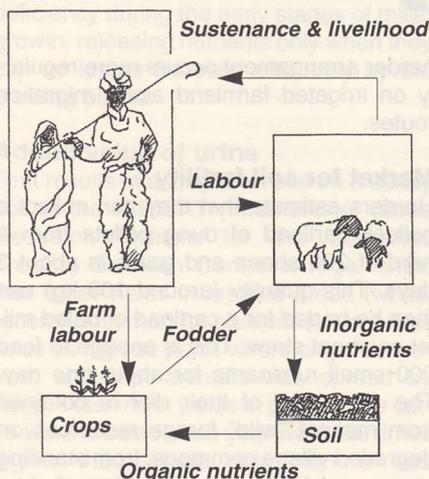


Figure 2: The connections between Bharavad pastoralists, their herds and village cropping. Bharavads trade livestock manure and labour for fodder. Their place at the "hub" of the nutrient cycle makes them important participants in the village agroecosystem.

lapse before crop residue encounters an equivalent amount of physical and chemical decomposition.

While the manure trade is already functioning well, further research may clarify the nutritive benefits and costs that accrue to herder and farmer, and may point to possibilities for improvement. Dung could perhaps be composted to kill weed seeds. The nutritive value and digestibility of straw could be increased by applying ammonia or by supplementary feeding of urea-molasses blocks. However, these technologies require additional inputs of labour and materials which may be infeasible or unprofitable. [Editors' note:

Moreover, increasing the digestibility of a limited quantity of feed would reduce the amount of dung produced.]

At present, Saurashtran herders do a respectable business by trading plant growth for animal productivity. Because fertiliser subsidies are likely to be cut in India, herders may find even greater demands for organic manures in the future. The degree to which local Bharavads have organised the nutrient trade points toward possibilities for pastoralists in other low-external-input farming systems to assume a role as "brokers of soil fertility".

### Water controls grazing

In the **Thar desert of India**, the local people developed a system of harvesting water for livestock and human consumption in *tobas*. To construct a toba, a depression with soil of low porosity is selected. If there is no natural depression but a good catchment, an artificial one is dug.

In Sattasar village in Rajasthan, for example, there are 6 tobas, in addition to the village water supply. The tobas are 8-16 km from the village, and each belongs to a different group. The size of the groups varies from 1 to 20 families.

With the onset of the monsoon, the families and the animals move to the tobas. Each toba group takes pride in being efficient water-users, but the water in most tobas lasts for only 4-5 months. People may get permission to use other tobas but, once their toba water is exhausted, they more commonly depend on the village water supply and have to graze their herds around the village.

The toba system allows dispersal of livestock during the short wet season, and the limited water supply prevents overgrazing in the areas around the tobas.

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### Manure to transport manure

In the North Eastern District of Botswana, a participatory rural appraisal clearly revealed the great importance of livestock in supplying manure for cropping. Manure produced mainly by goats, cattle and donkeys is collected in kraals near the homesteads and transported to the fields with donkey carts. The people who do not own donkey carts hire them from neighbours who do, and give them manure to pay for the manure transport services.

According to local people, about 5 donkey carts of manure are needed annually per acre to maintain soil fertility. However, few people keep enough livestock to be able to achieve this. The insufficient supply of manure and the high costs of supplementary mineral fertiliser are viewed as major problems by the crop farmers.

It is difficult to expand livestock holdings in order to produce more manure, because village areas are restricted by the commercial freehold farms, labour is limited by rural outmigration, particularly of young males (65% of the households are female-headed) and the remittances from these men are so small that little capital can be invested in livestock. Ways have to be found to step up manure production.

**Neela Mukherjee**

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Neela Mukherjee's longer article on "Livestock, livelihood and drought", from which the above was extracted, can be obtained from ILEIA.

In **southern Somalia**, surface water is collected in dug-out depressions called *waros*. The waros are protected by a thorn fence so that animals cannot go directly to the water. The herds of camels, cattle, sheep and goats are watered in troughs, and people have to carry the water from the waro to the trough. This limits the number of animals that can be handled by one family.

The waros have to be cleaned from time to time. For this, the user families have to provide labour. Those families who do not are punished and have to pay a 3-year-old camel to be slaughtered for the people who do the work. After a second refusal to participate, the family may be excluded altogether from using the waro.

Like in India, most waros do not last for the whole year, so that the grazing pressure in a particular area is limited by the availability of water. This system is fairly effective for limiting the number of goats, sheep and cattle in an area, but camels can travel very long distances between water source and pasture.

Nevertheless, the access to water determines the access to pasture, so not all people are happy with government water projects, which effectively open up the pastures for all livestock-keepers - whether they are willing to work or not.

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# Poultry in the backyard

*Backyard poultry-keeping is the most widespread form of animal husbandry, but is little documented. Blanche Zoungrana and Gerard Slenders describe poultry-keeping in Blanche's home village, and ask how this compares with your experiences.*

**Blanche Zoungrana  
and Gerard Slenders**

**D**oulougou village lies 57 km south of the capital Ouagadougou, but can hardly be reached by motor vehicle in the wet season. Average annual rainfall is 700 mm during 5-6 months, peaking in June to August.

The Mossi farmers grow sorghum, millet and cowpeas mainly for food but also for sale, as well as some cash crops such as groundnut and sweet potato. Traditionally the Mossi keep small ruminants and some are now investing in cattle and donkeys, but all villagers - including children - own chickens, and many keep guinea fowls. Each owner marks his or her birds, eg by trimming different toes. Bird numbers fluctuate greatly because of epidemics, such as Newcastle disease.

During the growing season, various measures are taken to avoid crop damage, eg seedbeds for vegetables and spices such as tomatoes, okra, kenaf and chili are covered with low grass roofs to keep out chickens, and are fenced with thorn branches to keep out goats.

Red sorghum is grown next to the homestead, using the fertility from household waste and human excrements. When there is still soil moisture at harvest, only the heads of grain are cut off. The stover continues to grow and is used as dry-season feed for ruminants. Sometimes the plants are cut at ground level and animals graze the stover. But often the stalks are left standing and bent over about 40 cm above the ground to form a shelter under which chicks can move freely, well protected against birds of prey. Later, the stems are used as fuel.

## Breeding chickens

At night the birds are confined in old huts or small shelters built specially for them. These are rarely cleaned but sometimes the floors and inside walls are treated with red-hot cinders and ash to get rid of fleas and ticks.

Hens lay their eggs anywhere. If, for some reason, brooding is interrupted at a late stage, the farmer keeps the eggs embedded in woolly cottonseeds in a clay pot which is turned regularly till the chicks

hatch. They are then reared a few days under a basket, until they foster themselves out to hens with other chicks.

Being grouped in villages rather than dispersed, homesteads are close enough that neighbours' flocks can mix easily. Also the frequent giving and taking of chickens helps prevent inbreeding.

## Feeding and scavenging

In the dry season, the birds are fed with small grains and husks left over from daily threshing of cereals. When the whole crop is threshed communally right after harvest, as happens in a good season, the small grains are stored in clay pots. Each morning the men give some grains to the birds of all family members.

The chickens also eat the grains and particles that fly out of the mortar when the women pound sorghum or millet into flour. Men stop hand-feeding and women pound more carefully as the season progresses and grain becomes more scarce.

Most hens lay eggs in the late wet season, when they are not fed, as grain shortage for humans is most severe then. The birds scavenge for seeds from grasses and weeds as well as for insects, and thus may control pests. Elderly people and children collect termites from the savanna, or the birds are taken along to feed on termites while the family works in the fields.

## Birds are binding

Poultry are essential for celebrations and sacrifices. Chickens are given to maintain good relations in the village, or as thanks for a favour (eg from an official). If someone dies, neighbours are expected to bring chickens or goats to the house of mourning, where they are ritually killed.

For most sacrificial feasts, birds of a certain sex and colour must be offered, eg, a white cock when a marriage is agreed. If a suitable bird is not available, people buy or borrow a bird to meet their commitments.

Tasty and chewable poultry meat is well liked but, despite the promotion of egg consumption by health workers, few eggs are eaten. Many villagers believe that a child who eats eggs will become a thief.

## Ready source of cash

Birds are sold when cash is needed. Income from poultry sales supplements

income from cash crops. The man's crops and animals are sold to pay for medical costs, school fees, staple foods, improved seeds, house repairs and special foods for guests, eg beer and rice instead of sorghum. The wives are expected to buy spices and vegetables, clothing for their children and themselves, and household utensils. Occasionally, they invest in income-generating activities such as brewing sorghum beer or weaving.

Poultry are also sold to meet unforeseen expenses, such as to buy the beer and kolanuts customarily given to gravediggers when a family member dies.

Traders from the capital have begun to buy eggs in the village to sell in the city. Some eggs are bought to be boiled and resold as a snack, particularly popular in connection with the game "Pamb Gella". This is played by two people, each of whom holds an egg in the hand and tries to break the opponent's egg. The winner gains (and eats) the loser's broken egg.

In contrast to chickens, guinea fowls are regarded as a commercial commodity. Farmers collect the eggs, which traders from the capital like to buy because the strong shell makes them easily transportable. Some young farmers buy guinea fowl eggs which they hatch under chickens. Young adult birds are sold, especially in December, which is fortunately just before the high risk period for Newcastle disease.

## Commonly overlooked

It is against this background that any improvement in poultry keeping must be considered. Also changes in other parts of the farming system - eg conserving stover to feed cattle - will affect poultry, in this case, by leaving them less protection. Poultry-keeping is so common that it is easily overlooked by "developers", but if it were to become less common as a result, important economic and social functions of backyard animal husbandry would be lost.

**Blanche Zoungrana and Gerard Slenders**  
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## Seeking knowledge about backyard animals

How are poultry and other small livestock being kept in your village? Blanche and Gerard Slenders have drawn up some guide questions for preparing case descriptions of traditional poultry keeping. The cases are being collected as readings for students and agricultural advisors, to draw attention to the importance and potential of backyard animal husbandry. If you want to describe similar systems and/or would like the complete version of the Mossi case, please contact the Slenders.

**A** woman farmer once said "I can only sell what I can carry on my head". Living several kilometres from a motorable road, her income was limited by transport capacity. Even in the rapidly developing India of today, 50% of the villages lack a good road network (Upadhyay 1991).

In many parts of the tropics, more and more men must leave the rural areas to seek work in towns. The women are left to feed and support the children and the old people who can no longer work. But without the men, there is often not enough power to do critical farming tasks such as timely ploughing and cultivation.

### Where to find power?

One power source that may be particularly appropriate in such situations is the donkey. There are some 40 million donkeys in the world, of which 51% are in Asia, 28% in Africa, and 18% in Central and South America. Donkeys are mainly found in arid and semiarid areas and in mountainous countries such as Ethiopia, which alone has about 10% of the world's donkeys (Fielding 1991).

Particularly in Ethiopia, India and Pakistan, donkeys are immensely important as pack animals, carrying literally anything that can be balanced on their backs. Firewood and water are the classic loads, not only for donkeys, but also for women!

Why are donkeys not used more by women themselves? In most societies, men are traditionally responsible for the draught animals such as oxen and buffalo. Donkeys are commonly regarded as low-status animals by men (Stephens 1985). Back in 1891, Kipling listed many derogatory sayings about the donkey in India, eg, "May your homestead be ploughed by asses", said to be a common Hindu curse. Regardless of any technical advantages of the donkey, women who recognise their own low status in society may be reluctant to be associated with an animal that is also of low status.

But there are also strong technical arguments in favour of donkeys, and support services can play an important role in bringing these to women's attention.

### Donkey power

Donkeys normally weigh about 125-150 kg and frequently carry loads weighing half or more this. The appropriate load will depend greatly on the size and condition of the donkey. A healthy, well-fed donkey can carry more and work longer than a donkey weakened by disease. The distance to be travelled, the hilliness of the terrain, the desired speed, the pack saddle, the bulkiness of the load and the size of the animal also influence how much can be carried.

In addition to pack work, donkeys are used for ploughing, cultivation and carting,



Photo: Hans Carlier

### Power to the women

# Are donkeys an overlooked option?

*The donkey is a source of power which may be particularly appropriate for rural women. Denis Fielding and Anne Pearson review the potential of the donkey to reduce the workload of women in developing countries.*

**Denis Fielding and Anne Pearson**

but their light weight means they can only pull implements which require low draught forces to move them. As a rule of thumb, a healthy donkey can pull with a force equivalent to 16% of its bodyweight throughout a working day. To be sure, donkeys can produce draught forces higher than this, but they are unlikely to be able to sustain them for long periods without frequent rests.

In practice, this means that donkeys are useful for tasks such as weeding, particularly on sandy soils, which tend to be in the areas where donkeys are found, and for carting loads over local roads. However, for ploughing and pulling carts in hilly areas, more than a donkey is needed. In parts of East Africa, 4-6 donkeys can be seen pulling ploughs. In Morocco and Pakistan, a donkey is sometimes paired with a camel. The donkey is easy to guide and turn, and the camel provides most of the power for pulling.

### Additional pluses

Donkeys receive little special feed and are usually left to forage for themselves when they are not working. Despite this, they generally maintain acceptable body condition, because donkeys have a special ability to digest poor-quality fibrous matter (Pearson & Merritt 1991). Therefore, they are cheaper to feed than larger draught animals.

The technical case for offering donkeys

as an option for use by women includes the following points:

- as firewood and possibly water become more and more remote from villages, the women who traditionally carry these key resources need assistance
- to increase or even maintain crop output in the face of male emigration, sustainable sources of power will be needed
- donkeys are appropriate for women because of their size and relative ease of handling
- extension efforts with men to promote draught animals or tractors for ploughing usually lead to large areas being planted that are beyond the woman's capacity to weed without the aid of something like a donkey-powered weeder
- if women farmers are to help themselves, they need to meet other women farmers: donkeys have an important role in human transport
- donkeys do not cost as much as oxen to buy and so are more easily affordable - and less likely to be stolen!

### But also minuses

Donkeys are prone to internal parasites, and in Africa to trypanosomiasis. They are often overused, leading to lameness and skin wounds. Overuse, particularly in towns where there is nothing to eat during periods of standing, reduces their food intake and body condition.

*Without the donkey, I couldn't transport half as much as I do. A woman in Peru fastening the load onto her freight carrier.*

The equipment used with donkeys was often designed for oxen, and is usually too heavy for both the donkey and for any women users. Women are built differently than men, and this has to be taken into account in implement design. Moreover, many women have to carry a child on their back during work. The ease with which they can do this while working with an implement will influence their choice of implement.

### Enabling adoption by women

Before the potential of donkeys can be fully realised, new users will be involved in considerably more work, eg feeding, training and general care - in addition to the initial monetary investment. Kunze and Loos (1991) report a negative circle of labour shortage in Botswana which inhibits women's adoption of donkeys. Without enough labour, production is low, and there is no spare cash to invest in draught power such as donkeys. Without power, incomes decline further and more men must leave to look for work, which in turn leads to an ever greater shortage of labour. In such situations, considerable initial subsidy may be needed to break the negative spiral.

Even with financial subsidies, if women are to adopt donkeys, the benefits need to be appreciated at an early stage. This implies the availability of trained donkeys with suitable support services. This would

require multiplication stations and subsidised distribution schemes. While such financial and organisational demands might appear difficult to meet, this has not prevented a country such as Malawi from launching a donkey importation scheme in order to boost its supply of draught power (Kumwenda & Mateyo 1991).

Forming donkey-user groups and encouraging apprenticeships with experienced users - a widely practised indigenous training method - may also be a possibility of acquainting women with the advantages of using donkeys.

Even if women do begin to use donkeys, there are many additional barriers. Credit to buy implements, for example, is often a problem when women have little or no collateral to offer. Professions associated with donkey use such as disease treatment and harness-making are usually male-dominated, although this need not remain so.

As Jones (1991) reports, adoption of donkey use as a result of demonstration alone may not be successful. The issue of status may be, in some circumstances, insurmountable.

### Day of the Donkey

There are, however, signs that the value of donkeys as draught animals is increasingly appreciated. Contrary to what was previously thought, it has been shown that in Botswana donkeys now provide more traction hours than cattle (Baker 1988). Also in Botswana, Kunze and Loos (1991) report the mounting of training courses for women to encourage them to become conversant with donkeys.

Donkeys are an option for women that has not been fully explored. Uptake may



*Donkeys can carry a load weighing half their weight or more. A drawing from Ethiopia. Artist: Tesfaye Taye.*

be slow and the initial impact small. However, it is likely to be sustainable. Donkeys are indigenous to the tropics and, with the increasing recognition of the value of indigenous systems, it may be that the Day of the Donkey is approaching!

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### Talking about equines

This overview is largely derived from papers and discussions at the First International Colloquium on **Donkeys, Mules and Horses in Tropical Agricultural Development**, held in September 1990 at the University of Edinburgh in Scotland.

The main conclusions and recommendations which came out of the colloquium were the following:

1. In many countries donkeys presently make a substantial contribution to tropical agricultural development, which is not fully recognised by the governments concerned.
2. Most aspects of donkey use have not been investigated or quantified as for other draught animals.
3. Significant opportunities exist for more efficient use of donkeys through improved husbandry and attention to welfare.
4. Technical issues justifying early attention include:
  - parasitic conditions affecting donkeys as well as important disease problems such as trypanosomiasis
  - the design of harnesses and equipment specially for donkeys.
5. Extension issues of importance include:
  - communicating the suitability of donkeys for use by women
  - counteracting the low social status of donkeys, which represents a major barrier to their more widespread use, by education and by devoting greater scientific and project attention to donkeys.

The proceedings of the colloquium can be obtained for £20 (including postage and packing) from the Equine Colloquium Organisers, Centre for Tropical Veterinary Medicine, University of Edinburgh, Easter Bush, Roslin, Midlothian EH25 9RG, Scotland, UK.

Denis Fielding and Anne Pearson would also be pleased to hear from anyone interested in contributing to a Tropical Equine Network as a means of exchanging knowledge and experiences.

*Animals can be important sources of energy for cropping. Godfrey Makitwange and Wim Beijer describe how the animal traction component of an integrated agricultural project in southern Tanzania was developed in collaboration with local services, such as government extension staff and the Mbeya Oxenisation Project.*



Photo: Wim Beijer

## Trying animal traction

**Godfrey Makitwange  
and Wim Beijer**

The Agricultural Development Programme (ADP) in Mbozi District has the aim of increasing food production by smallholders in a sustainable way. The project started in 1986 and now covers some 100 villages. Strong emphasis is given to resource-efficient agricultural methods. Mixed farming is promoted, using the produce of the land to support farm animals (via feeding crop residues and eventually via fodder crops) and the animals' manure and draft power for cropping.

The farmers are encouraged to organise themselves into groups, not only to be better reached by a limited number of extension staff, but also to build up their capacity to 'pull down' services and eventually take over responsibility for their service centres.

The integrated approach involves not only agricultural extension but also supplying inputs and implements at village level. At Divisional level, a Farm Service Centre (FSC) is available, where the extension work is coordinated, training and demonstrations are held, and services (eg building oxcarts, wheelbarrows etc, sale of implements) are provided.

### Two zones of action

Mbozi District lies in Mbeya Region of southern Tanzania on the border to Zambia. It covers 9583 km<sup>2</sup> and has about 330,000 people living in 150 villages. The Great Rift Valley divides the District into three zones with different altitudes. The project is presently working in two of the zones: Mbozi Central Plateau and Ndalambo Plateau.

Mbozi Plateau is an undulating landscape at an altitude of about 1400 m, with some flat, seasonally waterlogged depressions. The growing season is 6-7 months (October to May), with a mean annual rainfall of 1100 mm. Brownish ash soils with moderate fertility dominate, but there are also deep red soils.

The Ndalambo Plateau is drier (950 mm) and has shallow soils overlying ironstone or deep sandy soils. The main foodcrops are maize, beans, finger millet, sweet potato, and coffee as cashcrop. Intercropping used to be practised, but nowadays monocropping predominates.

Average farm size is 4-6 acres per family, farm size being determined by family size, as family labour and the handhoe are the major means of production.

### Cows liked, but not for work

Farming System Research in 1986/87 revealed that the two main problems in agriculture are decreasing soil fertility and a labour shortage at specific times in the year (at planting and the following weeding, January-February, and at harvest, July-August), as most farmers grow maize and (twice a season) beans, as well as some coffee.

More than half the farm households kept cattle, but this seemed to be quite risky, as death rate was high (50% among calves). Common diseases are East Coast Fever, Lumpy Skin Disease and Black Quarter. Veterinary services are poor, and drugs are often not available or too expensive. Witchcraft was frequently mentioned as a cause of death. The use of local medicines appeared to be limited.

Keeping oxen was not very attractive in economic terms, as they were used mainly for ploughing and pulling locally-constructed sledges, and had a very short

productive period of 4-6 weeks per year. But cattle have a high social and cultural value. They provide security, eg, in case of unexpected expenditures (serious illness, funeral etc). Also dowries have to be paid in cattle, preferably cows.

Milk production and reproduction are also reasons why farmers prefer cows. Farmers respect cows more than oxen and would not like to use them for draught purposes, as rough methods are generally used in the training.

### Local ox-trainers

In almost all the surveyed villages there were some local ox-trainers, who trained animals mainly of relatives at a very basic level (getting used to pulling a log and obeying commands) at the farm of the trainer. The actual ploughing was done by the owner after he took his animal back home.

Animals from different families cannot be brought together at one farmer's place for training, as farmers fear that witchcraft may kill their animals. The danger of spreading disease may also be involved here.

The oxen are owned by men, who care for them and work with them. But the culture is changing slowly, and women are not fully excluded from handling oxen.

### Our animal power policy

On the basis of these findings, an ox-mechanisation policy could be worked out. The role of ox-mechanisation is defined in relation to all aspects of soil fertility: transporting organic matter to the fields, incorporating organic matter under ridges, and using improved farmyard manure (stored in pit or heap) and compost.

Its role also needs to be defined in relation to labour constraints, land availability

*Cattle are used for ploughing and pulling locally-constructed sledges. An innovative farmer managed to improve the sledge by adding 3 wooden wheels.*

and crop husbandry practices, with stress on:

- timely soil preparation (ploughing after the harvest or just before the onset of the rains)
- harrowing twice (once to prepare a seedbed for the weeds, and again to kill the germinated seeds and prepare the seedbed for the maize)
- planting on ridges, as the incorporation of organic matter brings higher yields
- the importance of weeding, as poor weeding was found to be the biggest constraint to increased maize yields in the Southern Highlands of Tanzania. This operation must be mechanised on account of the above-mentioned labour shortage.

In all steps the role of women should be taken into account. They should benefit foremost from the eventually realised reduction of workload, as they are the main actors in food production.

### Training link farmers

Ox-mechanisation and animal healthcare are topics in the general agricultural courses for "link farmers" and extension workers at the FSC training centres, where the fully (ox)mechanised trial farms serve as demonstration and training sites. The link farmers are first trained in resource-efficient agricultural techniques during three seminars over one year. The third seminar deals fully with ox-mechanisation.

After this, a village can apply for on-the-spot training of 5 of its ox-users (at least

one should be a woman). The village and the project make an agreement about the rights and obligations of both parties. Then the trainees learn more advanced techniques of steering, weeding, planting, one-ox traction and making different types of yokes. They form an ox-mechanisation committee in their village, to be at the disposal of the farmers' agricultural knowledge groups for further training.

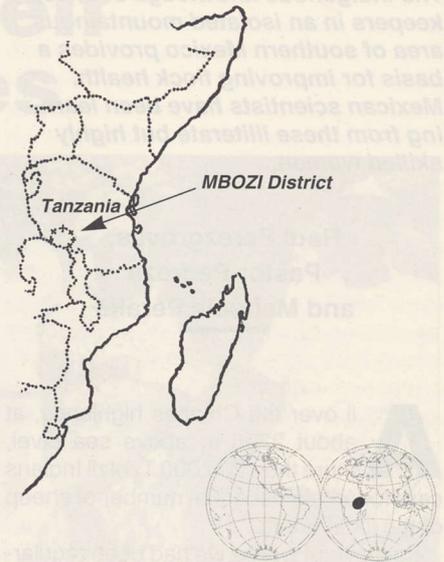
The village provides a demonstration plot, to show people that it is indeed possible to plant and weed with oxen. The village-level training is supported by an upgraded trainer from another village. After mastering all the techniques, the trained committee members function also as trainers in other villages, thereby reducing the role of the project to that of an intermediary, linking the people with the needs with those who have the knowledge.

### Developing suitable equipment

The necessary equipment is distributed via the ADP Mbozi selling points (presently in 48 villages). As the availability of ox-carts has been a problem over the past years, these are now built at an FSC workshop in collaboration with Mbeya Oxenisation Project, which provides the axles. However, availability of equipment such as appropriate cultivators and ridgers still remains a problem.

The presence of the Mbeya Oxenisation Project is a big advantage, as they have developed an axle with adjustable rims, and import second-hand tyres, which are otherwise very scarce. They also developed an over-the-row cultivator, and recently imported interrow cultivators and ridgers from India.

Some local adaptation of equipment



also occurs. One farmer managed to improve the widespread sledge by adding three wooden wheels. A few local blacksmiths produce ploughshares from car springs, and remake the mouldboards in order to improve the soil turning.

### Who benefits?

It appears that mainly medium- and larger-scale farmers benefit from ox-mechanisation, as a farmer needs a minimum of 5 cattle (in order to have 2 bulls, one being the head of the kraal, the other his successor). Moreover, cash is needed to buy the implements.

The reduction of overall workload through ox-mechanisation seems to be questionable. A labour budget survey done by the Mbeya Oxenisation Project revealed that weeding time is reduced from 87 hours with a handhoe to 18 hours by ox-weeding, but the workload for children in a family of ox-owners is considerably higher than in families of non-ox-owners.

Still, in the period 1987-1991, the project sold about 100 ox-carts, 250 ploughs and a few cultivators and ridgers. In the last two years, agreements were made with 11 villages and ox-users were trained in more advanced animal traction skills.

In late 1991, the project started an experiment with a women's group in a very isolated area engaged in maize grinding using an ox-driven maizemill. The mill was installed and two pairs of animals were trained (a pair of oxen and a pair of donkeys). So far, the machine is producing one tin of flour (ca 15 kg) per hour. The project is now working on training the women in management and how to improve the machine efficiency.

Godfrey Makitwange and Wim Beijer  
ADP Mbozi, PO Box 204, Mbozi, Mbeya, Tanzania.

## Networking for animal traction

### Some African networks

**Animal Traction Network for Eastern and Southern Africa (ATNESA)**, c/o Dept of Agricultural Engineering, Attn: Timothy Simalenga, Sokoine University of Agriculture, PO Box 3003, Morogoro, Tanzania.

**Network on Animal Traction in Nigeria (NATN)**, National Animal Production Research Institute, Attn: Jerome Gefu, Ahmadu Bello University, PMB 1096, Zaria, Nigeria.

**Réseau Guinéen sur la Traction Animale (RGTA)**, BP 148, Kindia, Guinea Conakry. Contact: Almamy Sény Soumah.

**West Africa Animal Traction Network (WAATN)**, c/o ISRA (Institut Sénégalais de Recherches Agricoles), Attn: Adama Faye,

For more information, see **Networking for animal traction** by Paul Starkey, ATNESA/ WAATN Network Discussion Paper 92/1 (44pp), which can be obtained from GTZ Dept 421, Postfach 5180, D-6236 Eschborn 1, Germany; or contact Paul Starkey directly at: Animal Traction Development, Oxgate, 64 Northcourt Ave, Reading RG2 7HQ, UK.

Dépt Systèmes, BP 3120, Dakar, Sénégal; or c/o Federal Agricultural Coordinating Unit, Attn: Dayo Phillip, PMB 5517, Ibadan, Nigeria.

### Animal traction newsletters

**Draught Animal Bulletin**, Graduate School of Tropical Veterinary Science, James Cook University, Townsville, Queensland 4811, Australia.

**Draught Animal News**, Centre for Tropical Veterinary Medicine, Easter Bush, Roslin, Midlothian EH25 9RG, Scotland.

**Force Animale**, Projet pour la Promotion de la Traction Animale, BP 37, Atakpamé, Togo.

**Tillers Report**, Tillers International, 5239 S 24th St, Kalamazoo, MI 49002-2019, USA.

**The indigenous knowledge of sheep-keepers in an isolated mountainous area of southern Mexico provides a basis for improving flock health. Mexican scientists have been learning from these illiterate but highly skilled women.**

**Raul Perezgrovas,  
Pastor Pedraza  
and Marisela Peralta**

**A**ll over the Chiapas highlands, at about 2200 m above sea level, more than 200,000 Tzotzil Indians care for an almost equal number of sheep of the local breed.

For several weeks we had been regularly visiting Sabaxan, an Indian shepherdess. We talked about her sheep and the way she keeps them healthy and productive. One day a young ram from a different flock was brought to her home and treated for a testicle inflammation. With great interest we observed how the case was handled: Sabaxan kept the ram isolated from her flock and, for a few days, gave it external and oral doses of an infusion of a plant known in the Tzotzil language as *k'ux peul* (*Solanum lanceifolium*). Either the remedy was strong enough or Sabaxan's prayers were heard by the Holy Shepherd John the Baptist, or both. Within a week, the animal was in good health and back in its flock.

With our veterinarian background, we could have suggested antibiotics and anti-inflammatory drugs for such a case, but we had learnt very important facts from our previous visits to the Indian hamlets: these shepherdesses do not accept commercial veterinary medicine, because it is a practice far away from their culture and traditions (they would not have the money to buy the drugs anyway). They know precisely what kind of plants, combination of herbs and/or rituals to use for a number of common diseases of sheep. They have a comprehensive understanding of how animals get sick and what the chances are for a particular animal to get well again.

Our initial interaction with Sabaxan and other Tzotzil shepherdesses led us to develop a project concerning indigenous knowledge on health practices within Indian-managed flocks. As a result, we have learnt a great deal from these illiterate women with their small flocks (12 sheep).

### From folk to science

Over centuries, Indian shepherdesses have developed an incredibly rich empirical knowledge about sheep, including management aspects such as identification, housing, handling, feeding, health and reproduction. The sheep are

surrounded with magic, and incorporated into the Tzotzil people's cosmic view. As sheep are sacred animals that share their souls with some unidentified human beings, they must never be killed nor eaten, but rather cared for and respected as any other member of the family. They are even given their own names.

To learn about sheep healthcare by the Tzotzil, we first gathered information on herbal treatment of disease, through long and informal interviews and participatory observation with Sabaxan and numerous other shepherdesses. We also followed the flocks and collected those plants which, as we were told, either cured or caused disease.

We obtained the women's descriptions of the most common diseases in sheep, as well as lists of plants and rituals used to treat sick animals. When we "translated" this information into a veterinary format, we realised that Indian shepherdesses can describe the name and causes (natural or supernatural) of several sheep diseases, as well as how they take their course, and specific herbal and/or ritual treatments.

We then tested the effectiveness of some of the herbal treatments scientifically. We evaluated a series of plants prescribed by Indian shepherdesses against "digestive disorders" in their sheep, which we had already determined were associated with parasitic infection, a major problem in Indian-managed herds.

Working closely together with Indian women from different hamlets, we set up an evaluation trial to try to find the best combination of plants and the most effective dose and frequency of treatment. In four flocks representative of Indian management, the most commonly prescribed plants - garlic (*Allium sativum*), Mexican tea epazote (*Teloxys ambrosioides*) and squash (*Cucurbita maxima*) - were tested at three different dose levels and frequencies. Ingredients were collected, prepared by mashing and boiling in water (decoction) and then administered orally to the animals by the shepherdesses themselves.

### Labs prove the women right

Our literature review had already revealed that the plants prescribed by the shepherdesses are well-known for their curative properties. The leaves of *k'ux peul* used by Sabaxan to treat her neighbors' ram have several active ingredients against swelling, surface wounds and ulcers. The plants we included in the clinical trials had also been reported to be effective against gastrointestinal parasites in humans.

The knowledge of Indian shepherdesses, based on close observation of animals and on oral transmission of experience from one generation to the next, proved to be effective. Sprigs of *Teloxys ambrosioides* and mashed garlic cloves given orally to sheep that, according to the Indian classification, are affected by

## Animal healthcare by Indian shepherdesses Plants and prayers



You have to know how to do it. Sabaxan, a Tzotzil shepherdess, preparing her herbal medicine for sheep.

Photo: Raul Perezgrovas

"stomach ache" and diarrhea, significantly reduced the number of eggs of gastrointestinal nematodes and oocysts of *Eimeria* spp within one week after treatment.

Results from the laboratory only confirmed what many Indian women already knew from first-hand experience. What we can technically describe as a clinical reduction in the number of eggs after treatment, shepherdesses simply understand as the improvement of animals affected from "digestive disorders", due to a good choice of a herbal treatment and to the blessing of St John the Baptist, guardian of all woolly souls.

### Extending folk remedies

Not every Indian shepherdess has a comprehensive understanding of herbal medicine for sheep. We obtained a fairly complete picture of herbal and ritual treatment for sick animals only after a large number of informal interviews with Tzotzil women. This gives us a good opportunity to improve the health status in Indian-managed herds by using appropriate extension methods designed to reach as many shepherdesses as possible.

We know that herbal treatments do not totally eliminate the parasite burdens of sheep. However, these remedies cost almost nothing, are culturally accepted by the Tzotzil women and, if properly used, we expect that they can efficiently control gastrointestinal parasites.

Research is underway to test some other Indian remedies for sheep maladies that we can clinically translate as: liver-fluke infection, lung worm, bot fly and a few external parasites such as lice and *Melophagus ovinus*. In the end, we hope to come up with an antiparasite calendar based on regular use of plants and supported by appropriate ritual practices.

The sustainability of a health programme based on herbal remedies and rituals is potentially high in this region, because it fits into the cultural context of the Tzotzil women, is based on their practical knowledge, is very inexpensive and, above all, is culturally sound. And it could be easily applied within traditionally-managed herds by the shepherdesses themselves.

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- Perezgrovas R. 1992. **Animal healthcare by Indian shepherdesses in Southern Mexico**. Paper presented at ITDG workshop, Nairobi. Intermediate Technology Development Group, Myson House, Railway Terrace, Rugby CV21 3HT, UK.

**Raul Perezgrovas, Pastor Pedraza and Marisela Peralta** Centro de Estudios Universitarios, UNACH, Felipe Flores No 14, San Cristobal de Las Casas, Chiapas, Mexico.

# Do-it-yourself vet services



Photo: ITDG

**Animal husbandry systems are changing fast in many countries, and traditional treatments often cannot be adapted fast enough to new circumstances. Modern vets may have effective treatments but transport problems often prevent them from reaching the farmers. John Young shows how community-based veterinary services can bridge the gap.**

### John Young

If asked about their biggest problems with animals, most livestock-keepers will say disease. This does not necessarily mean that diseases cause the biggest losses in productivity, or that coping with disease takes up the most time or money. It simply means that, when an animal is sick, the farmer has to do something, or runs the risk of losing the animal.

In most cultures with a long history of livestock-keeping, there is a wealth of knowledge about herbal medicines and other treatments for common diseases. However, the rush toward modernisation and formal education encourages people to discard their traditional medicines and rely on modern doctors and drugs.

Furthermore, population growth and the need to produce more food from the same land area and sometimes the introduction of new high-producing breeds of livestock are forcing people to change their animal husbandry practices. This may also increase the incidence of unfamiliar diseases.

In this rapidly changing situation, traditional methods of animal healthcare can-

not be adapted fast enough to cope. But, in most developing countries, veterinarians are few and far between, and transport problems limit the area that one vet can cover. The modern sector may have some effective methods, but lacks the infrastructure to "deliver the goods". This situation may be further exacerbated by political instability and, in many countries, by war.

Furthermore, highly qualified vets are expensive and, even in developed countries, it may cost more to bring in a vet than can be earned from the animal - if it gets better. As modern drugs for common diseases are often easy to administer and as many livestock-keepers can recognise symptoms of common diseases, one way of overcoming the infrastructural constraint of veterinary services may be to set up community-based services.

### Village vets

In community-based veterinary care, local livestock-keepers provide their own basic veterinary services. They are trained to recognise and treat common diseases using modern and traditional medicines. They may be called Village Animal Health Workers, Village Vets or Para-Vets. Sometimes, they only treat their own ani-

mals but often they also provide a service for their neighbours - usually for a fee. Most community-based veterinary services also include a local supply of medicines and a referral service - someone or somewhere nearby, where the village vet can refer complicated cases requiring more expert treatment.

The Intermediate Technology Development Group (ITDG) has been helping to set up community-based veterinary services in India and Kenya since 1984. Earlier this year, ITDG organised a workshop in Kenya for people involved in these and similar projects, so that they could meet each other and share their experiences. During the workshop 45 people from 14 countries in Asia, Africa and Latin America visited projects in Kenya and discussed experiences from other countries. By looking at this range of projects, they could identify some key components needed to make community-based veterinary services work.

### Kenyan livestock helpers

The workshop participants visited six projects in Kenya. In farming areas of Meru, Utooni and Ukambi, local farmers were trained to provide a service for their neighbours. They call themselves *Wasaidizi wa Mifugo* (Kiswahili for "helpers of livestock"). Local shops were set up where the wasaidizi could restock their medicines.

In Samburu, a pastoral area, herders and women (the latter being responsible for much of the animal care) were trained to recognise and treat simple diseases affecting their own animals. A shop was set up at a nearby mission, where pastoralists buy medicines for their sick animals.

In both types of project, the training was limited to the most common ailments such as worms, ticks, wounds and mange, which can be treated using medicines unrestricted by drug laws. More serious cases requiring antibiotics or other controlled drugs had to be referred to the nearest government veterinary assistant.

In another pastoral area, Ilikerin Loita in Maasailand, several shops selling animal



Photo: ITDG

Training village vets how to restrain a cow with a simple halter, at Ilamujene Farmers Centre.

medicines had to be set up and store-keepers trained to run them, to treat sick animals and to advise farmers. The shops stock both unrestricted and restricted drugs, and the project employs its own veterinarian to provide a referral service.

In Turkana, in northern Kenya, the government is training village vets called Adakari Vet Scouts to use both simple and controlled drugs to treat other people's animals for a fee, much like the wasaidizi in Meru.

### Similar projects elsewhere

Case study presentations about village vet projects in Nepal, Chad, Afghanistan and the Sudan showed how, also in these areas, different approaches were used to cope with particular circumstances.

In Nepal, where *ayurvedic* (herbal) medicines are widely available, local farmers were trained to treat diseases using both modern and ayurvedic medicines. In Juba in Southern Sudan, a programme began by training local herders to vaccinate cattle against rinderpest, but had to retrain them to treat East Coast Fever when the previously unknown but rapidly fatal disease broke out in the area. In Chad, the Ishtirak project has been encouraging herders to organise into pastoral associations, and two para-vets have been trained in each association to vaccinate and treat sick animals.

### Factors for sustainability

Workshop participants agreed that a key issue in all the projects is how to ensure that the service continues after the project withdraws. This was thought to be relatively easy at village level, by means of appropriate training of the village vets, a reliable drug supply, good follow-up, incentives (which may be in cash or kind) and ensuring that the village vets are answerable to their communities.

However, it is much more difficult to achieve sustainability at national level, so

that such village services can become more widespread. This is especially the case in areas of insecurity, or where medicines are not available, or where there is not a well-established government veterinary service.

If the community services are to be sustained, projects must be based on real local needs and build on existing structures. The community should have control at all stages of the project. Project plans must be logistically feasible and, from the start, build in an adequate administrative structure for local monitoring and evaluation of progress. They should be designed to ensure effective uptake of technologies within the community, and external agencies should withdraw gradually.

Technically, the project should be based on farmers' existing knowledge, but with good veterinary support, either within the project or from local government veterinary staff. The service cannot rely on subsidies and must be affordable, and the community must have financial control.

Workshop participants concluded that successful village vet services combine traditional and modern knowledge at community level and can dramatically improve access to simple veterinary care, especially for resource-poor livestock keepers. To achieve this success, social and institutional work is at least as important as technical work. Veterinarians need to be prepared to learn from the livestock-keepers and to share their knowledge with them.

John Young, ITDG Myson House, Railway Terrace, Rugby CV21 3 HT, UK.

### Village animal healthcare network

Participants in the ITDG workshop on community-based veterinary services were keen to have other opportunities to exchange information on this type of work. ITDG is therefore planning to coordinate an international village animal healthcare network. If you are interested in a full copy of the workshop report or would like to share information on village animal healthcare, please write to John Young at ITDG, Myson House, Railway Terrace, Rugby CV21 3HT, UK.

# Quick ways to assess animal productivity

## Interviewing cows

*Livestock extensionists often have no data to indicate major technical problems. Conventional productivity studies may not be feasible, as they take too long. Much information can be gained through rapid surveys. Those described here are based on the authors' experience in assessing productivity of cattle and small ruminants.*

**Thomas Armbruster  
and Wolfgang Bayer**

**R**apid methods, based on interviews with livestock-owners and herders, cannot reach the depth of long-term studies, but may be enough for practical purposes. Making a "snapshot" of herd structure, or recording animals' life histories, or 12-month recall of herd events can be done in 6-8 weeks, including analysis, whereas conventional productivity surveys take several years and also bother farmers much more.

### Snapshot of herd structure

Animal-keepers can usually give a rough idea of the age of each animal in the herd. The animals are then classified according to sex and age. The result is "herd structure". This can already challenge some frequent assumptions about traditional livestock-keeping, like that of "surplus males". Information on 200-300 animals are needed to get a good idea of herd structure. This may mean interviewing 10 or more cattle herders or 40-60 "shoat"-keepers, depending on herd size.

### Recall

This is an attempt to record entries into and exits from a herd over a year. After recording the present herd structure, the herder is asked about births, purchases, animals received as gifts or for caretaking, sales, deaths etc. It is important to ask why animals are slaughtered or sold, as these

often include sick or weak animals which otherwise may have died.

It is best to refer to local seasons and local events to help make the time period clear. Otherwise, herders may mention sales and deaths of animals which happened for as long back as they can remember.

A disadvantage of this method is that it covers only one year. If it was an unusual good or bad year, the results may not be representative for a longer period.

### Life histories

A longer time can be covered by recording life histories of reproductive females and the fate of their offspring. The life history of a cow might be:

- 8 years old, had 3 calves
- 1st calf male, born 3 years ago in early wet season (April), died 2 months later
- 2nd calf female, born 2 years ago in mid wet season (July), still in herd
- 3rd calf male, born 2 months ago, still in herd.

With this information on many cows, one can calculate fertility, calving interval, calf mortality, sales and other offtake. A list of important local events can be used to get a better idea of exactly when births, deaths etc occurred. For small ruminants the list needs to cover only 5 years, for cattle 10-15 years and for camels even longer (Grandin 1983).

### Analysing and checking results

Data can be analysed by hand or with a pocket calculator, but more complete analysis can be done with a microcomputer using a spreadsheet programme. Definitions and formulae for the different parameters are given in ILCA (1990) and Mack et al (1985).

Data should be checked for plausibility. If intervals between births are shorter than length of pregnancy, then something went wrong. Likewise, if results show that the average cow is 15 years old, the data should be rechecked. Maybe some herders counted seasons instead of years. Age estimates can be checked by count-

ing the animal's teeth (see ILCA 1990). As a guide, Table 1 gives the likely range for some productivity parameters.

These methods should be applied by a person with a good knowledge of likely livestock data, so that misunderstandings can be corrected quickly during interviews and the results can be well interpreted.

### Some tips and warnings

Such rapid methods can give a fair idea of animal productivity in a given area. However, reliability depends greatly on the memory and cooperation of the interviewees.

Someone who has been managing his or her herd for 20 years will know more than a hired herder who started work 6 months ago. It is important to ask the right people, eg, in parts of Kenya where the men have little to do with daily herd management, older women had the most detailed knowledge about the animals (Grandin 1983).

Since productivity surveys basically yield planning data for outsiders, and direct benefits for the herders are not apparent, their willingness to cooperate varies. In remote areas, people may be pleased to discuss animals with somebody. In other cases, owners may be suspicious, thinking that the survey results could be used, eg, for tax collection.

Like all interviews, they should interfere as little as possible with daily routine. This usually means that interviews can be made only when herds and herders are at home (early morning, late evening).

Productivity surveys should not be seen in isolation. It is also important to understand husbandry aims and management practices, including costs for keeping animals. For example, herd structure may indicate that some cows are fairly old. But if costs are low, fodder is sufficient and animals serve as a savings account, it may be quite rational to keep a cow which has not calved for 4 or 5 years, especially if manure is used as fertiliser.

### References

- Grandin BE. 1983. Livestock transaction data collection. In: *Pastoral Systems Research*, pp 277-88.
  - ILCA. 1990. *Livestock Systems Research Manual*. Vol 1. Module 5 "Animal Production".
  - Mack S, Sumberg JE & Okali C. 1985. Small ruminant production under pressure: the example of goats in southeast Nigeria. In: Sumberg JE & Cassaday K (eds), *Sheep and goats in humid West Africa*, pp 47-52.
- All are published by ILCA (International Livestock Centre for Africa), PO Box 5689, Addis Ababa, Ethiopia.

**Editors' note:** These techniques are also explained in the proceedings of the ITDG workshop in Kenya (see article by John Young in this issue).

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**Wolfgang Bayer**, Rohnsweg 56, D-3400 Göttingen, Germany

Table 1: Expected range of productivity results

Parameter	Cattle		Sheep		Goats	
	arid	humid	arid	humid	arid	humid
Offspring/dam/year	0.4	- 0.65	0.8	- 1.8	0.9	- 2.1
Losses:						
0-12 months (%)	15	- 35	25	- 50	25	- 50
adult mortality	3	- 6	13	- 20	13	- 20
Age at 1st birth (months)	36	- 54	22	- 15	20	- 15

Note: the lower values for sheep and goats are generally in the more arid areas, the higher values in the more humid areas.

• NETWORKS • JOURNALS • ORGANISATIONS •

**African Network for Rural Poultry Development.** Contact: EB Sonaiya, Animal Science Dept, Obafemi Awolowo University, Ile/Ife, Nigeria. Publishes Newsletter in both English and French.

**African Small Ruminant Research Network.** PO Box 46847, Nairobi, Kenya. Contact: SHB Lebbie.

**The BAIF Journal.** Bharatiya Agro-Industries Foundation, Senapati Bapat Road, Pune 411 016, India. Quarterly journal with special attention to agroforestry and livestock development.

**Baobab.** Quarterly journal of the Arid Land Information Network (ALIN/RITA), CP 3, Dakar, Senegal. Published in both French and English.

**BERAP** (Bureau d'études et de réalisations agro-pastorales). Sahelian Centre for Livestock and Agropastoral Research, BP 290, Dori, Burkina Faso. Contact: Boubacar Ly. Centre for research in collaboration with herding communities, as well as for training and information exchange.

**Buffalo Bulletin.** International Buffalo Information Center, Kasetsart University, Bangkok, Bangkok 10900, Thailand. Free quarterly journal about buffalo husbandry in Asia.

**Les Cahiers de la Recherche-Développement.** DSA-CIRAD, Ave du Val de Montferrand, BP 5035, F-34032 Montpellier Cedex, France. Quarterly journal (280 F/year) designed to link researchers, trainers, development agents and innovators in farming systems research, with frequent attention to crop-livestock interactions.

**FTTP Newsletter,** from the Forestry, Trees and People Programme, which also publishes reports from field studies such as Jan Lindstrom's and Rose Kingamkono's paper *Food from forests, fields and fallows* (215 pp) on wild foods and livestock-keeping in Tanzania, and Community Forestry Notes such

as the one by Maryam Niamir (see Top 5!). Write for list of publications to: FTTP/IRDC, Swedish University of Agricultural Sciences, Box 7005, S-750 07 Uppsala, Sweden; or FAO Community Forestry Unit, Via delle Terme di Caracalla, Rome, I-00100, Italy.

**Haramata.** Bulletin of the drylands: people, policies, programmes. International Institute for Environment and Development, 3 Endsleigh St, London WC1H 0DD, UK. Quarterly newsletter, sent together with 2 Issues Papers, concerned with sustainable development in dryland Africa. £16 for North, free for South. The Drylands Programme also does action-oriented research together with Southern researchers on topics such as coping with risk and pastoral land tenure, and supports networking and collaboration between local organisations and national research systems.

**Heifer Project Exchange.** Heifer Project International, PO Box 808, Little Rock, AR 72203, USA. Free bimonthly newsletter devoted to small-scale livestock husbandry and low-cost veterinary techniques, targeted at NGOs and community groups.

**Intermediate Technology Development Group (ITDG),** Myson House, Railway Terrace, Rugby CV21 3HT, UK. Good source of information on appropriate technology, also for livestock-keepers; linked with publisher of very readable books. We look forward to more local-language booklets such as Kathy Watson's and Chris Ektan Erukudi's *Ngaberu alo Turkan* (Turkana Women), highly suited for schools and adult education. A recent issue (June 1991, £3.50) of the journal *Appropriate Technology* was devoted to "Pastoralism in crisis". Contact: IT Publications, 103-5 Southampton Row, London WC1B 4HH, UK.

**International Ag-Sieve,** "a sifting of news about regenerative agriculture" has just brought out an issue (Vol. IV. No. 6) focused on

pastoral development. Available from: Rodale Institute, 222 Main St, Emmaus, PA 18098, USA.

**International Livestock Centre for Africa (ILCA),** PO Box 5689, Addis Ababa, Ethiopia. Home of the African Livestock Policy Analysis Network (ALPAN), the Pasture Network for Eastern and Southern Africa (PANESA) and the Small Ruminant Research Network, all of which issue newsletters and/or working papers. ILCA also produces the *ILCA Newsletter* and the quarterly scientific journal *African Livestock Research*.

**Minka.** This Spanish-language journal on peasant science and technology comes out 3 times a year (US\$ 30/year in Latin America, US\$ 35 elsewhere). The January 1991 issue is devoted to "Corral Campesino", livestock as part of the peasant eco-

nomy and culture. Contact: Grupo Talpuy, Apdo 222, Huancayo, Peru.

**NAGA.** Quarterly journal of the International Centre for Living Aquatic Resources Management, MC PO Box 1501, Makati, Metro Manila 1299, Philippines. Focused on integrated crop-tree-livestock-fish systems.

**Newsletter for Beekeepers in Tropical and Subtropical Countries.** International Bee Research Association (IBRA), 18 North Road, Cardiff CF1 3DY, UK. Quarterly journal on low-cost beekeeping.

**Nomadic Pastoralists in Africa Project (NOPA),** c/o United Nations, Gigiri, PO Box 44145, Nairobi, Kenya. Documents and analyses pastoral development activities and seeks to link up persons and organisations seeking sustainable alternatives.

• BIBLIOGRAPHIES •

**Ethnoveterinary medicine: an annotated bibliography** by Evelyn Mathias-Mundy and Constance McCorkle. Technology and Social Change Programme, Iowa State University, Ames, Iowa 50011, USA. 1989. 199 pp. US\$ 18.

**Gender relations of pastoral/agropastoral production: a bibliography with annotations** by Forouz Jowkar and Michael Horowitz. Institute of Development Anthropology, 99 Collier St, Binghamton, NY 13902-2207, USA. 1991. 485 pp. US\$ 12. With over 1000 references to published and unpublished documents about gender relations in pastoral systems, indexed according to key words, ethnic group and geographic area.

**ODI Pastoral Development Network Library Catalogue** by Peter Ferguson. Overseas Development Institute, Regents College, Regents Park, London NW1 4NS, UK. 1991. 279 pp. £10 (free for South). Invaluable overview of writings on pastoral development throughout the world, including much unique "grey literature" (conference papers, reports, theses etc) as well as books and journal articles. Over 2600 well-indexed entries, plus directories of organisations doing pastoral research and relevant journals.

**The one-humped camel: an analytical and annotated bibliography 1980-1989** by Trevor Wilson, Astier Araya and Azeb Melaku. United National Sudano-Sahelian Office, East 45th St, New York, USA. 1990. 301 pp.

**Sustainable pastoralism in Africa: an annotated bibliography** by Ian Scoones. IIED, 3 Endsleigh St, London WC1H 0DD, UK. 1988. 100 pp. £9 (free to South). Divided according to general studies of pastoralism, ecological sustainability, economic sustainability, pastoral systems under change, and research approaches for sustainable development.

**Nomadic Peoples.** Journal published twice a year by the Scandinavian Institute of African Studies (SIAS), PO Box 1703, S-751 47 Uppsala, Sweden. US\$ 45/year for institutions, US\$ 35 for individuals. SIAS also publishes numerous books, mainly based on conferences, about African livestock-keepers, eg: *Adaptive strategies in African arid lands* (eds Mette Bovin & Leif Manger, 1990, 181 pp), *Ecology and politics: environmental stress and security in Africa* (ed Anders Hjort af Ornas & Mohamed Salih, 1989, 255 pp).

**Parcours** is a network which promotes the integrated use of forests for pasture and wood production. Although focused on the Mediterranean area, the experience gained here could be of value for the tropics, since sylvo-pastoralism is a widespread traditional practice which has all too often been discredited by development "experts". Contact: Association Française de Pastoralisme, Groupe de travail "Activités d'élevage dans les espaces boisés", 3191 Route de Mende, BP 5056, F-34033 Montpellier, France.

**Pastoral and Environmental Network in the Horn of Africa (PENHA)**, 19 Springbok Walk, St Pauls Crescent, London NW1 9XX, UK. Contact: Zeremariam Fre. Aimed at mobilising the indigenous research capacity on pastoralism in the Horn and on related problems of environmental degradation and political conflict. Works through networking, workshops, collaborative research and a newsletter.

**Pastoral Development Network,** Overseas Development Institute (ODI), Regents College, Regents Park, London NW1 4NS, UK. Excellent library on livestock and mixed farming systems. Newsletter twice yearly, along with papers exploring important issues and case studies. Also the ODI networks for Social Forestry and Agricultural Research and Extension often address livestock themes.

**Resources.** Quarterly magazine published by KENGO (Kenya

Energy and Environment Organization), PO Box 48197, Nairobi, Kenya. Ksh 20/copy. Deals with sustainable management of natural resources, including pastoralism, collecting wild foods and small-scale irrigation.

**R3S (Réseau de Recherche sur la Résistance à la Sécheresse).** Research network joining African and European institutes concerned with building up resistance to drought by pastoralists and farmers in the Sahel. Contact: M Laomaibo, Institut du Sahel, BP 1530, Bamako, Mali.

**Small Ruminant Production Systems Network for Asia (SRUPNA)**, PO Box 123, Bogor 16001, Indonesia.

**United Nations Sudan-Sahelian Office (UNSO)**, 304E, 45th St, New York, NY 10017, USA; Western and Central Africa Office, Ave Dimdolo, BP 366, Ouagadougou, Burkina Faso; Eastern Africa Office, Gigiri, PO Box 30677, Nairobi, Kenya. Publishes technical papers such as Dan Stiles' *Lakes of grass: regenerating bourgou in the Inner Delta of the Niger River* (1990, 15 pp) and good analytical reports such as Andrew Warren's and Mustapha Khogali's *Assessment of desertification and drought in the Sudano-Sahelian region* (1992, 102 pp), also available in French.

**Winrock International Institute for Agricultural Development**, Route 3, Box 376, Morrilton, AR 72110-9537, USA. Provides technical assistance and training in livestock management and research.

**Editors' note:** See also Top 5 and Book Review and the references listed with each article. Animal traction networks are listed on page 21 of this Newsletter. Our list of sources on livestock in low-external-input and sustainable livelihood systems is by no means comprehensive. We welcome information from readers about other important sources and relevant networks.

• S O U R C E S •

**The cattle of the tropics** by John Maule. Centre for Tropical Veterinary Medicine, Easter Bush, Midlothian EH25 9RG, Scotland. 1990. 225 pp. Somewhat old-fashioned but comprehensive and useful collection of information on over 300 indigenous and new breeds.

**Conducting on-farm animal research: procedures and economic analysis** by Pervaiz Amir and Henk Knipscheer. Winrock International, Route 3, Box 376, Morrilton AR 72110-9537, USA. 1989. 244 pp.

**A development dialogue: rainwater harvesting in Turkana** by Adrian Cullis and Arnold Pacey. IT Publications, 103-5 Southampton Row, London WC1B 4HH, UK. 1991. 182 pp. £10.95. Straightforward account of the trials, tribulations and successes of a water-conservation project in northern Kenya, where local pastoralists identified priorities, adapted the technology and eventually took over full control.

**Environmentally sound small-scale livestock projects: guidelines for planning** edited by Linda Jacobs. CODEL; Heifer Project International; Winrock International. VITA Publication Services, 1815 North Lynn St, # 200, Arlington, Virginia 22209, USA. 1986. 149 pp. US\$ 10.

**The experience of pastoral organisation in African countries** by Djeidi Sylla, Pastoral Unit, Ministry of Livestock, Chad. 1989. 47 pp. £3.50 (free for South). Available in English and French from IIED, 3 Endsleigh St, London WC1H 0DD, UK. Review of pastoral organisation in dryland Africa which draws attention to indigenous structures for managing pastoral resources.

**An introduction to animal husbandry in the tropics** by WJA Payne. Longman Group, Longman House, Burnt Mill, Harlow, Essex CM20 2JE, UK. 4th ed. 1990. 881 pp. £46. Very good standard text, including chapters on underexploited species such as donkeys and the llama, alpaca, guanaco and vicuña of the New World, but still too little emphasis on smallholder animal husbandry.

**Microlivestock: little-known small animals with a promising economic future.** BOSTID, National Research Council, 2101 Constitution Ave NW, Washington DC 20418, USA. 1991. 450 pp. US\$ 29.95. Excellent overview of breeds and species of livestock for Third World villages, including miniature goats, rabbits, guinea pigs, antelopes, iguanas, bees and various types of poultry, with plenty of useful information.

**Pastoral women and change in Africa, the Middle East and Central Asia** by Michael Horowitz and Forouz Jowkar. Institute for Development Anthropology, 99 Collier St, Binghamton, NY 13902-2207, USA. 1992. 79 pp. US\$ 12 (+ postage). Report from a project on gender relations of pastoral production, based on the bibliography mentioned below. Shows how privatisation of pasture and water resources, emigration of men and many other factors are obliging women to take on new responsibilities.

**Taking stock: animal farming and the environment** by Alan Durning and Holly Brough. 1991. 62 pp. US\$ 5. Worldwatch Institute, 1776 Massachusetts Ave NW, Washington DC 20036-1904, USA. Fairly general, but easy to read and thought-provoking.

**Wetlands in drylands: the agroecology of savanna systems in Africa** edited by Ian Scoones. IIED, 3 Endsleigh St, London WC1H 0DD, UK. 1991. Results of review by African and European researchers of how farmers and herders integrate valley bottomlands into their systems of using dryland resources. Overview papers on ecological, economic and social issues (114 pp, £4, all papers free for South) and on soil and water processes (69 pp, £3) are supported by case studies (each 20-35 pp, £1.50) from Nigeria, Burkina Faso, Sudan, Eritrea, Zambia and Zimbabwe.

# BOOKS Top 5

*Many people rely highly on live-stock to sustain not only themselves, but also the productivity of their environment. To appreciate this relationship, we need to understand not only the animal husbandry but also the sociocultural, political, environmental and economic aspects of animal-keeping.*

*The books I picked as the "Top 5" reflect this crucial interdisciplinary view. Many other studies deal with one or two aspects of these complex systems. While they can contribute to the topic, they cannot lead to a full understanding of the interwoven systems which best represent the human need for livestock.*

*These Top 5 readings provide a good background on livelihood systems involving livestock, but for information on basic animal husbandry, it will be necessary to refer to supplementary materials. There appears to be some unwillingness of animal scientists to engage in multidisciplinary research. The social scientists who have mainly been filling the gap have done a commendable job, but a much greater contribution is needed from the animal sciences so as to present a more accurate and balanced view of these life-sustaining systems.*

**1. Community Forestry: Herders' Decision-Making in Natural Resources Management in Arid and Semi-Arid Africa** by Maryam Niamir (FAO Community Forestry Note 4, FAO, Rome), 1990, 126 pp. This study does an excellent job of introducing concepts of indigenous knowledge and explaining issues relevant to decision-making in livestock systems. It provides an in-depth, multidisciplinary view, including the animal husbandry aspect. The author draws on case examples from many different groups, and avoids making broad generalisations that may mislead the reader.

**2. Plants, Animals and People: Agropastoral Systems Research** edited by Constance McCorkle (Westview Press, Boulder, Colorado, USA), 1992, 196 pp, US\$ 36. As this volume draws on the fieldwork of the Small Ruminant Collaborative Research Support Programme (SM-CRSP), it primarily examines the roles of goats and sheep in agropastoral systems. The introduction and 10 cases provide an irrefutable argument for the necessity of social, cultural, economic, political and ecological orientations in order to gain a holistic understanding of agropastoral systems. The message is consistent and hard-hitting, and may be a bitter pill for the more conventional, non-social scientist. For this very reason, I highly recommend this volume particularly to the technical agriculturalists.

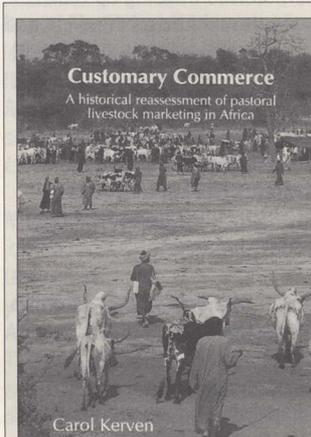
**3. A Partnership for Humans and Animals** by Robert McDowell (Kinnick Publishers, Kinnickinnick Agri-Sultants Inc, Raleigh, North Carolina, USA), 1991, 95 pp. This small paperback is an interesting study for the beginning reader in animal agriculture. The author draws on his great experience in agricultural development to illustrate clearly the partnership between humans and animals. He discusses the many roles of animals as producers of food, services, non-food products etc. The global issues confronting animal agriculture such as methane production and other environmental threats are also addressed, giving the ongoing discussion a scientific basis.

**4. The Advantage of Having Cattle: Distribution of Cattle and Access to Benefits in the Western Province of Zambia** by Marie-Louise Beerling (Republic of Zambia, Dept of Veterinary and Tsetse Control Services & RDP Livestock Services BV), 1991, 178 pp. This is a thorough study of the inner workings of a specific agropastoral system. The author shows the dynamic nature of the system by concentrating on the types of benefits derived from managing and owning cattle. On the basis of a farmer survey, she presents both socio-economic and production data. While the findings may not be generally applicable to other regions, this is an excellent example of multidisciplinary analysis.

**5. The World of Pastoralism: Herding Systems in Comparative Perspective** edited by John Galaty and Douglas Johnson (Guilford Press/Belhaven Press, London), 1990, 436 pp. This collection of case studies and analyses provides a good overview of the full scope of pastoral societies. The book is divided according to geographic regions: semiarid plains and savannas, arid deserts and tundra, and mountainous areas. A wide range of animal species

are covered, including cattle, buffalo, camels, reindeer, goats, sheep, llama and alpaca. The sociology of both subsistence but commercial herding systems from the local to regional level is discussed.

**Tracy Slaybaugh-Mitchell** is a Research Assistant with the Animal Science Department and the Centre for Indigenous Knowledge for Agricultural and Rural Development (CIKARD), Iowa State University, 318 Curtiss Hall, Ames, Iowa 50011, USA. She is currently compiling an annotated bibliography on traditional systems of animal husbandry.



**Customary commerce - a historical reassessment of pastoral livestock marketing in Africa** by Carol Kerven.

Overseas Development Institute, Regents College, Regents Park, London NW1 4NS, UK. 1992. 117 pp. £ 8.95.

This book challenges much of conventional wisdom on pastoralists. It shows, for example, that they are specialised producers who cannot subsist on livestock products alone and have a long history of trading livestock and their products for grain and other commodities. On the basis of historical evidence, Carol Kerven discusses how livestock policies affected pastoralists' livestock trade.

In the case of Kenya, the overgrazing argument was used to reduce competition from traditional livestock-keepers for European ranchers and farmers.

Disease quarantine measures were likewise introduced to fend off competition. Nevertheless, the Maasai and Samburu pastoralists have long been part of a wider economy, and have produced and sold animals despite the many government measures which discouraged them from doing so.

From West Africa, two case studies indicate how pastoralists include marketing in their production strategy. The Fulani in Nigeria, being closer to large population centres, could take advantage of seasonal price fluctuations, but poor market infrastructure and seasonal use of remote, dry areas made this more difficult for the Fulani in Niger. As the major livestock markets in Niger shifted north, the market opportunities for these transhumant herders were improved. Given attractive prices for their animals, they were in no case reluctant to sell. Distress sales due to drought and disease are also discussed as normal features of any pastoral system in a dry, adverse environment.

The conclusion is drawn that indirect support to improve market infrastructure is much more likely to improve livestock marketing than direct interventions such as price controls or taxes, which can greatly hamper the pastoralists' own efforts to market their animals.

The book is an account of how well indigenous pastoralists can adapt to changing economic circumstances. It reveals that they understand the modern economy much better than many older and newer consultants and government reports would make us believe.

Wolfgang Bayer, Rohnsweg 56, D-3400 Göttingen, Germany

## BOOK Review

# KEEP ROLLING



## Farmers teach farmers: training cattle promoters in cooperatives

*In agricultural cooperatives with cattle as their main source of income, the National Union of Farmers and Cattle-raisers (UNAG) in Nicaragua has gained positive results with an extension approach of farmers teaching each other on-farm.*

**Roberto Laguna, Vivienne Lewis and Katrien van 't Hooft**

During the agrarian reform by the Sandinista government (1980-91) large areas of Nicaragua were redistributed to cooperatives. The peasant organisation UNAG emerged during this period. In Estelí in northern Nicaragua, UNAG organises and trains groups of private smallholders and coop members.

The Estelí zone contains both lowland range and mountain areas dominated by extensive cattle farming. Vegetables and cereals are grown in the flat, fertile valleys, alongside semi-intensive dairying, while coffee and vegetables are grown in higher areas (up to 1500 m). Annual rainfall ranges from 900 mm in the lowlands to 1500 mm in the mountains, with a dry season of 7 and 5 months, respectively.

### Agricultural coops

In the 1980s around 80 agricultural cooperatives were set up in Estelí, with an average of 25 families each. Men make up 95% of the membership. All were formerly labourers or landless peasants with no experience in managing large farms or working collectively. Their new status meant they could fulfil their aspirations of human dignity, but also brought numerous organisational problems. These included difficulties in decision-making, instability in membership and lack of investment. As a result, production levels in many farms dropped to half those achieved by the previous private owner.

Each coop has 700-1200 *manzanas* (500-850 ha) of land and, in addition to growing cereals for subsistence, keeps 100-400 head of cattle to produce milk, calves for restocking and sale, and beef cattle for sale. The coops are run by a Management Committee and various commissions, including one concerned with cattle.

Extensive cattle farming (1 animal per 1.7-2.5 ha) has long been a major activity for both large and small farmers in the mountain areas with low population density. All are

anxious to solve the most keenly felt problem: high mortality, due to poor dry-season forage and disease.

### Training workshops

Since the start of UNAG's cattle-related training in 1988, the methods have constantly been evaluated, together with members of the participating coops.

In the first year, training was given to members of the cattle commission in each

### Training of promoters

At first the workshop approach gave good results in most coops, but this did not last long, as the changes in cattle management were not sufficiently supported by other coop members.

After discussion with coop representatives, UNAG started to work with "cattle promoters", using their farms as the site and source of study material. The aim was to train people who could play both technical and



*Good it doesn't turn blue! A milk sample is tested for mastitis.*  
Photo: Katrien van 't Hooft

coop - all men, since cattle work is traditionally a male activity on large farms. During 4-day workshops the organisational and technical problems in each farm were analysed. On this basis, the cattle commission of each coop planned how they would work in the four months until the next workshop. In each subsequent workshop, the commission evaluated progress with respect to basic management factors like water, pasture, salt, supplementary feed, vaccinations, dipping, deparasitisation and general care.

organisational roles related to cattle in their coop and could also support neighbouring farmers.

Training of 16 promoters selected by their coop's assembly evolved between 1989 and 1991. Groups of five promoters took part in two 3-week workshops per year, which were spent working on each other's farm.

The group examined all cattle and learnt to diagnose diseases and detect pregnancy. Other tasks included treating sick animals, enumerating female stock, setting up basic registers, and examining the general organisation and the situation of pasture and water.

### Learning from each other

This method of integral analysis by the promoters of weak and strong points of each coop's work, followed by discussion among cattle commission members and promotor group, has proved fruitful.

On the last workday in each coop, an assembly is held to talk about the analysis and put it into context with the aims and ideas of all coop members. This leads to joint conclusions and concrete plans which emerge

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

according to each coop's own way of decision-making. By exchanging ideas with other cattle farmers and coop members, the promoters learn not only cattle management techniques but also how to analyse a farm's problems and the change-making process.

The promoters have thus gained enough confidence to help nearby farmers and coops with their cattle-related problems. They also teach in other workshops organised for farmers by UNAG.

Within the coops, this process has led to changes in cattle management and general organisation. Mortality has been reduced, and production and coop income increased. The promoters and their coops can plan, implement and evaluate their activities more critically and are thus better equipped to face the difficult economic and political situation in the country.

### Contributors to success

Major factors contributing to this success are:

- The coop members identify with UNAG as their organisation and thus had confidence in the programme from the start.
- The members decide how, when and about what the training will be; the programme thus develops from their rather than technicians' point of view.
- As training is done on-farm, it is rooted in daily reality.
- The aim is to produce not just para-vets but promoters of good cattle management to increase production, reduce costs and make coops as independent of technicians and medicines as possible.
- The training simultaneously promotes confidence in ability to solve problems.

This type of training in cattle management and coop organisation is a long and intensive process, but vital to achieve positive results in coop farms in the long term.



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**Vivienne Lewis & Katrien van't Hooft**, Ooftstraat 32, NL-3572 HS Utrecht, Netherlands

## Hearing the mucuna story

**Researchers in Mexico and Honduras are working together to unlock the secret to a successful green-manuring technology developed by small-scale hillside farmers. Daniel Buckles shows how exchanges between farmers and researchers are being accelerated through effective networking.**

### Daniel Buckles

For more than 40 years, farmers in the humid tropics of Mexico and Central America have been quietly developing and refining a low-input technology based on the use of the leafy legume mucuna (velvetbean). Agricultural research centres and non-governmental organisations (NGOs) gradually became aware of this, shared early experiences and are now developing a collaborative research and extension effort to speed up farmer-to-farmer diffusion and improve the capacity of farmers and researchers to further develop the technology.

The results are feeding into a growing body of experience with green manures in the humid tropics, and inspiring further communication between farmers and researchers in very different types of organisations. Thanks to these exchanges, the mucuna story is being heard by many.

### Indigenous farmers' research

*Mucuna pruriens* (*Stizolobium pruriens*) is a legume from Indonesia, introduced to the Americas in the late 19th century. Mexican and Guatemalan farmers first experimented with it as a natural fertiliser several decades ago, noting its ability to smother weeds and improve maize yields on degraded fields. The notion of "improving the fallow" was a small step for farmers keenly aware of natural processes of soil fertility decline and recovery through shifting cultivation. By broadcasting mucuna seed into abandoned fields, farmers can reduce fallow periods from five years to two.

Further steps in using mucuna to manage fertility, weeds and water were taken by farmers in various parts of Mexico and Central America, often independently and through a steady but slow process of farmer experimentation and diffusion.

Scientists' research into mucuna's properties and adoption did not keep pace with its widespread acceptance by farmers. However, knowledge about its potentials and limitations is growing as widely separated farmers and researchers share and adapt mucuna management strategies, such as mulching and intercropping, in different climatic and social environments.

### Scientists catching up

Formal research experience has been slowly developing on the Atlantic coast of Honduras since the early 1980s, when the Honduran Secretaria de Recursos Naturales (SRN) and CIMMYT (International Maize and Wheat Improvement Center) noted the use of mucuna by smallholders. Experiments with mucuna and other legumes (*Canavalia ensiformis*, *Vigna unguiculata*) were later initiated in all Central American countries by the Regional Maize Program for Central America, Panama and the Caribbean, a network of national researchers and CIMMYT, funded by the Swiss Government. Intercropping trials have been undertaken for several years in a wide range of agroclimatic conditions, and various promising legumes identified (PRM-CIMMYT 1990).

More recently, collaboration expanded to include personnel from the Honduran Forestry Institute (COHDEFOR), a Canadian-funded agroforestry project and the Regional University Centre of the Atlantic Coast (CUR-LA) in an adoption study in Atlantida Department in northern Honduras. Here, an estimated 66% of hillside farmers rotate mucuna and dry-season maize.

### Making cowardly land brave

The northern coast of Honduras has relatively thin soils, an altitude range from sea level to 1000 m, and a bimodal rainfall pattern permitting two maize harvests per year. The use of green manures dates back some 20 years, when migrants from the lowlands of Guatemala introduced both the seed and an effective management strategy: summer green manure. The technology was diffused throughout the region from farmer to farmer, without help from extension services.

The system works like this: mucuna is interplanted in dry-season maize at flowering time and left to grow as a sole crop during the wet season (late May to November). Wet-season maize is sown on separate plots in shifting cultivation, while the green-manure crop or *abonera* prepares the land for planting dry-season maize in December. As this aggressive weed smothers out virtually all



competing weeds and is easy to cut, it reduces labour inputs for land clearing by up to two thirds.

Dry-season maize is stick-planted into the mucuna bed, where it grows well because the mulch supplies nitrogen from decaying leaves and conserves soil moisture. Maize yields in the mucuna mulch are 35% higher than yields in conventional fields, 1.5 t/ha compared to 0.9 t/ha, using local varieties. As one Honduran farmer put it, "cowardly land becomes brave" when managed with the "fertiliser bean".

### Finding farmers' criteria

An exciting component of the Honduran adoption study was the use of visual aids to help farmers answer the sometimes complex questions. To find out farmers' criteria for using mucuna in maize fields, they were asked to rank six factors such as weed suppression and moisture conservation. Four factors, including increased incidence of rats, were ranked in discussing mucuna's disadvantages. In both cases, the farmers arranged cards with drawings of the factors. In this way a large number of farmers could be surveyed, providing insight into why some adopted the technology while others did not.

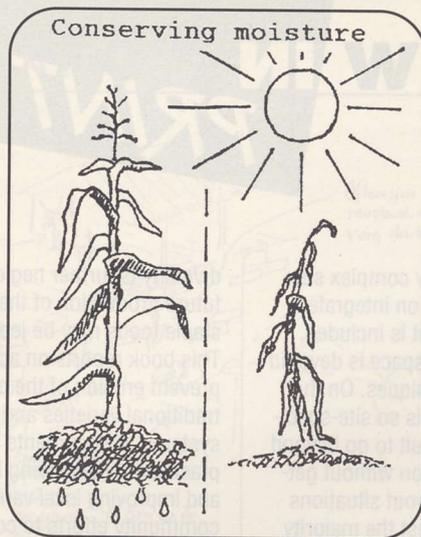
Ease of land preparation and the fertiliser effects of the slash-mulch system are the most important advantages cited by farmers, while the main social limitation on diffusion of the technology is the intensity of land use in the farming system (Buckles et al 1992b).

### Farmer-driven experiments

Crop rotations with mucuna were also developed independently over 40 years ago by Nahuatl-speaking farmers in southern Veracruz, where a Mexican NGO and CIMMYT are studying green manuring and farmers' perceptions of it in a series of farmer-driven experiments (Buckles & Perales 1992). Researchers noted that farmers in neighbouring villages use mucuna and other legumes (eg *Vigna umbellata*) in quite different ways: some as a component in an improved bush fallow, others as a wet-season rotation for dry-season maize, and still others as an intercrop in wet-season maize. Many farmers harvest the seeds of "nescafe" (mucuna again!) as a coffee substitute.

Researchers have given local experimentation with green manures a boost by making farmers aware of diverse management options already tried in the area, a simple example of the synergistic potential of networking. Farmer experimentation is accelerating and even jumping state boundaries, as various groups are now promoting slash-mulch systems with legumes and examining other farmer-generated solutions to problems of resource degradation.

Technical and farmer evaluation in Mexico indicate that green manuring is a multi-purpose technology. In on-farm trials, farmers used mucuna as a sole crop in one corner of their fields to eradicate persistent



**Use of visual aids helped in answering complex questions. Farmers arranged the cards according to their criteria for use of mucuna.**

weeds and in another corner as an intercrop to restore soil fertility. In many ways, the technology is consistent with the traditional model of soil, weed and water management in shifting cultivation. It builds on farmer knowledge of land degradation and restoration processes, an important factor behind rapid and widespread adoption. This suggests that the development and diffusion of technologies would benefit from an understanding of the strengths and weaknesses of farmer knowledge.

### Not without problems

While green manuring with mucuna is an important development for farmers in Veracruz and northern Honduras, the management practices used in these regions require bimodal rainfall and, for crop rotation, relatively extensive landuse systems.

The potential for increased damage to the maize crop by rats is a concern expressed by half the farmers surveyed in Honduras, while many noted that aboneras can provoke small landslides on very steep slopes. Fields with mulch are more susceptible to uncontrolled fires in the dry season.

Early intercropping of mucuna leads to competition with maize, reducing yields by 400 kg/ha in CIMMYT on-farm trials. Preliminary on-station findings suggest that mucuna rotations can provoke stalk rot and excessive lodging.

Thus, while mucuna is well suited to the needs of many hillside farmers in the humid tropics, it has its limitations and is only one of hundreds of legumes worthy of attention.

### New extension methods

While agronomic research with green manures progresses, close collaboration with farmers and networking with NGOs is also

suggesting fruitful ways of modifying extension methods in Mexico (Buckles et al 1992a). In April of this year, three Mexican NGOs - the Sierra Santa Marta Project (PSSM), the Mexican Association for Rural and Urban Transformation (AMEXTRA) and the Centre for Agrarian Studies (CEA) - joined forces with CIMMYT, the national research and extension service (INIFAP-SARH) and an NGO from the USA (Forest Island Project) to launch an extension effort focused on farmer experimentation with green manures.

This lets farmers compare options directly and, by increasing their knowledge of experimental design, strengthens their ability to draw valid conclusions from their own trials. Collaboration of CIMMYT and NGOs is mutually enriching, as the former provides basic concepts of experimental design whereas the latter have developed practical methods for dialogue with farmers.

### Many organisations involved

A deeper understanding of managing green manures in hillside maize and the factors affecting diffusion and local adaptation is being developed in many parts of Mexico and Central America by various other organisations as well.

World Neighbors and CIDICCO have gained a rich experience with green manures in labour-intensive farming systems in central Honduras (ILEIA Newsletter, July 1989). The CIPRES group in Nicaragua are working with mucuna in the tropical lowlands. The International Institute of Tropical Agriculture (IITA) has shown the effectiveness of mucuna in eradicating Imperata, a persistent weed which plagues farming in much of West Africa. These groups are multiplying knowledge of green manuring by exchanging survey instruments, farmer experience in managing legumes, and innovations in extension methods.

Perhaps the biggest lesson to be learned from the mucuna story is that green manures can be effective and adoptable components in hillside farming systems. The principles of green manuring employed by farmers, not the particular legume or management practice, are far-reaching. Innovation by resource-poor farmers is pointing the way to a promising area of research too long neglected by research institutions.

Daniel Buckles, CIMMYT, Apdo Postal 6-641, 06600 Mexico, DF Mexico.



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- Buckles D, Perales H & Arteaga L. 1992a. *Farmer to farmer diffusion of green manures and experimental concepts in the Sierra de Santa Marta, Veracruz*. Manuscript, PSSM-CIMMYT.

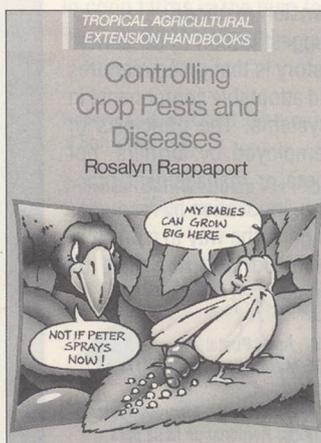
- Buckles D, Ponce J, Sain G & Medina G. 1992b. *Tierra cobarde se vuelve valiente: el uso y difusión de aboneras verdes en el litoral Atlántico de Honduras*. Manuscript, SRN-PDBL-CIMMYT.

# NEW IN PRINT

**Appropriate biotechnology in small-scale agriculture: how to reorient research and development** edited by JFG Bunders and JEW Broerse. Wallingford: CAB International. 1991. 153 pp. ISBN 0 85198 770 2. Dept of Biology and Society, Free University, De Boelelaan, NL-1081 HV Amsterdam, Netherlands.

Agricultural biotechnology is largely oriented toward the economies of the developed world. Only rarely can small-scale farmers in developing countries benefit from it. Thus far, biotechnology research has not taken their situation and resources into account. The authors discuss the problems and potentials of developing and disseminating appropriate biotechnology for small-scale farmers. Criteria for assessing biotechnology research projects are presented and illustrated by a yam tissue culture project in the Caribbean. The appendix gives a classification and description of agricultural biotechnologies. (WB)

**Controlling crop pests and diseases** by R Rappaport and R Edmonds. Tropical agricultural extension handbooks. London: Macmillan. 1992. 106 pp. ISBN 0 333 57216 5. Most people, when they first pick up a book, look at the pictures. This guide deals with a field that is very well-suited to illustration: pest control. It is designed to



give extension staff a basic understanding of pests and how to control them, but the numerous cartoons could also be useful in addressing farmers. Indeed, this book should be understood as an illustrated course which provides extensionists with examples of how they can communicate with

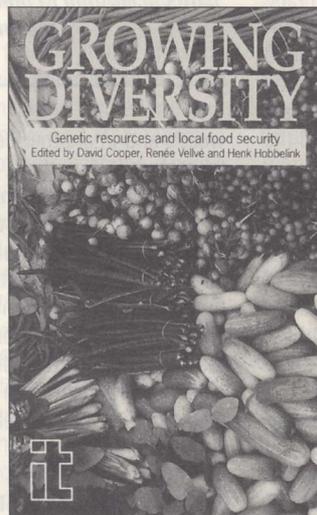
farmers on a very complex subject. Information on integrated pest management is included, but much of the space is devoted to spraying techniques. On the other hand, IPM is so site-specific that it is difficult to go beyond general description without getting into detail about situations that do not interest the majority of readers. (WB)

**Ecological agriculture in South India: an agro-economic comparison and study of transition** by E van der Werf and A de Jager. Leusden: ETC Foundation; The Hague: Landbouw Economisch Instituut (LEI-DLO). 1992. 90 pp. ISBN 90 5242 164 1. DFL 16.75.

This is a report from two research programmes on ecological agriculture in South India. Experiences of 12 farmers in transition to ecological agriculture are described and analysed. A gradual approach is crucial for success. The length of the transition period (3-5 years on average) is directly related to the previous farming system, specifically the amounts of mineral fertilisers used. The agronomic and economic performance of 7 pairs of farms - one ecological and one conventional reference farm - is compared. The gross margins/ha and net farm income per labour day are similar. Labour input per hectare also does not differ significantly. In ecological farms, trees and livestock are far more numerous than in conventional farms. (LEI-DLO)

**Growing diversity: genetic resources and local food security** edited by D Cooper, R Vellvé and H Hobbelink. London: ITP. 1992. 166 pp. ISBN 1 85339 119 0. £9.95. Genetic Resources Action International (GRAIN). The Green Revolution has threaten farmers' traditional role in managing genetic resources. New varieties issued by international research centres have replaced many traditional ones, demand extra inputs and often add to farming risks. If biological

diversity is further neglected, the future production of the world's staple foods may be jeopardised. This book reports on actions to prevent erosion of the pool of traditional varieties and farming systems. It documents farmers' practices in conserving land-races and improving local varieties; community efforts to conserve genetic resources; and how local groups are organising the collection, exchange and multi-



plication of land-races. Organisational and financial support, and cooperation between farmers, scientists and decision-makers are imperative to keep up the momentum of these local-level activities. (WB)

**Sustainable mountain agriculture** edited by NS Jodha, M Banskota and Partap Tej. Vol. 1: Perspectives and issues. Vol. 2: Farmers' strategies and innovative approaches. London: ITP. 1992. Total of 807 pp. ISBN 81 204 0620 6. International Centre for Integrated Mountain Development (ICIMOD), GPO 3226, Kathmandu, Nepal. ICIMOD studies agriculture, environmental management, infrastructure development, and population and employment in mountain areas. This 2-volume work comes out of research by the Centre's Mountain Farming Systems Division. Mountain areas in developing countries face

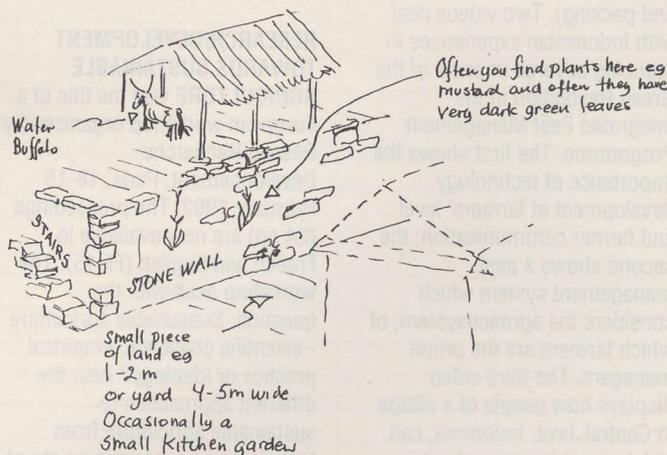
heavy population pressure, leading to environmental degradation. This book looks at how to make mountain agriculture more sustainable. The first volume addresses this in a descriptive, general manner; the second one presents numerous case studies.

**Ways of water: run-off, irrigation and drainage** by H Dupriez and P de Leener. London: Macmillan. 1992. 382 pp. ISBN 0 333 57078 2. £12.99. Terres et Vie, 13 Rue Laurent Delvaux, B-1400 Nivelles, Belgium; CTA, PO Box 380, NL-6700 AJ Wageningen, Netherlands. This is the English translation of the French original published in 1990. It focuses on the paramount importance of water as a production factor in African agriculture. It goes beyond raising an accusing finger at wrong cultivation practices, and teaches better ways of using water. The style is simple, understandable and yet precise, with a large number of useful pictures and drawings. After a general discussion of water in agriculture come specific chapters on the relationship between water and air, soil and plants. Finally, practical aspects are tackled: irrigation, erosion control and water-lifting. A more complete handbook on water management could hardly be imagined. (WB)

**Whose trees: a people's view of forestry aid** by MA Hisham, J Sharma, A Ngaiza and N Atampugre. London: PANOS. 1991. 138 pp. ISBN 1 870670 25 6. £7.95. PANOS, Angel House, 9 White Lion St, London N1 9PD, UK.

These 3 case studies of forest conservation projects in Nepal, Tanzania and Sudan look particularly at how they succeeded in involving local people. Where there is a desperate lack of fuel, fodder and farmland, conservation projects which propose no valid alternatives for local people are doomed to fail. Forestry projects tend to have a Western focus on timber revenues rather than on local use of trees for fuel, food or fodder, or as a means to control erosion. In the projects studied, a great dilemma became apparent: how can rural people consider genetic resource conservation when they need all their resources to survive until the next day? (WB)

## • WANTED •



## Riser Cultivation?

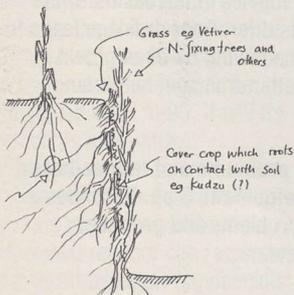
I read the ILEIA Newsletter with great interest. This is a letter asking for advice on how to use the terrace risers in Nepal. Maybe you are not the experts in this field, but hopefully you can put me in touch with the right people.

I am working as a volunteer on a programme called Vocational Training and Community Development Pilot Programme. The aim is to improve the living standards of people in the area, especially the disadvantaged ones, such as women and farm labourers. The catchment area is the northern part of Lamjung District, located in the High Hills of the Western Region of Nepal.

### The riser

The slopes are very steep. A lot of land has been terraced and cultivated. Frequently the slope is over 100%, which means that the terrace riser is bigger than the terrace itself.

These risers seem quite underused to me. There are trees growing on, or rather in, some of them, especially on risers near the village. This is a compromise for the farmer. Near the house he/she needs the firewood and fodder from the trees, but they limit the yield of the food crop. Water buffaloes, cows, sheep and goats are mainly stall-fed.



The distance to the 'Big Forest' is increasing. Often you see small forests near the village which are managed for firewood and fodder. It is a general complaint that it is now much more work to collect firewood and fodder than previously. Some people also collect leaves from the forest for incorporation into the soil together with manure and ashes. There is awareness that the soil is not as 'strong' as it used to be and that yields are dropping. Chemicals are not used.

The trees on the risers are often big - tall or bushy - from being lopped, and they give quite some shade on the terrace. Whether the shade or the competition for water or nutrients is the cause of reduced crop yield, I don't know.

The trees are not planted, but deliberately left in the field. Their trunks are in some cases the starting point for erosion. In others, however, it is clear that they hold the soil. None of the trees are leguminous, and alder (*Alnus nepalensis*) is not found on risers. I am in the process of identifying the trees on the risers, to find out what the pattern is.

The soil on the risers is in a poor state. Often only couch grass is growing, quite thinly, and in many places there is a crust of algae on the exposed soil. In fallow periods livestock graze the terraces and the part of the riser they can reach. When wheat is grown in a field when other fields are fallow, the wheat terraces are fenced off with short bamboo fences across the terrace.

Many risers are scraped down every now and again to prevent rodents living in them, as the tunnels are a starting point for erosion. Some people say it is to prevent weeds from spreading into the terrace. Other reasons could be to harvest a little bit of topsoil, to keep the riser in good shape and/or to make the riser stronger, because it is baked hard by the sun, at least on clay soils.

Rainfall is 2000-2500 mm/year. The average length of the monsoon is 102 days. The lowest part is about 800 m in altitude and the upper limit for cultivation is 2700 m. According to soil maps, the soils are Alfisols at the lower altitudes and Inceptisols higher up. From what I have seen, it varies from very sandy to clay soils.

People live in closely packed villages and are, as a rule, well organised (by strong leaders). Most people are Gurungs and of Tibetan origin. Their houses have stone walls and slate roofs. In between are stone terraces connected with stone stairways. There is little room for kitchen gardens, but there are some. In the stone walls you often find some mustard or a kind of tobacco, but people say they don't plant them. These plants are extremely green, which I guess is due to urine from the neighbour's cowshed, one step up. As villages are almost all south-facing, these stone walls could, in my opinion, be excellent places for growing vegetables.

### Ideas?

I am not an agriculturalist and need some advice. This problem seems to be very specific that probably ordinary agricultural education wouldn't help a lot. I am, however, interested and have included a few ideas.

The main idea is to suggest a kind of alley cropping with the tree component on the risers, especially on bari land. At least

some trees should be nitrogen-fixing and should anchor the terrace. A cover crop of eg kudzu (*Pueraria phaseoloides*) or alfalfa could be grown to reduce surface erosion. Leaves of trees and cover crops would be for fodder and/or mulch. On the very exposed edges, some grass could be grown, eg vetiver or NP-21.

Fast-growing trees could be cut or totally lopped at planting time, or a few weeks before planting, eg maize. The trees should be allowed to grow with the crop so that, by the time we reach fallow, they can survive grazing. They might need to be protected for the first year or two. Closely planted trees could act as a nursing crop for the slower-growing locally valued fodder and firewood species, protecting them from the animals. One farmer has had success in growing alfalfa on risers by plastering it with a mixture of cow dung, clay and alfalfa seed. This is only practical for small areas. I would like to see a cover crop which can maintain itself. I do not know if kudzu would survive year after year, if regularly grazed.

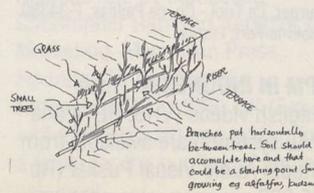
### Request

I am, of course, interested in general comments from other readers, but more specifically: Are there other people who cultivate risers? Is there any research in this field? Which problems do you see in riser cultivation? If it's a good idea, which species, which design, which management practice to choose?

The traditional fire is an open one, and there is a lot of smoke in the kitchen. If you start using wood from N-fixing trees, will the smoke contain bigger amounts of nitrogen oxides and what will that mean health-wise?

Can anyone be of help?

Jakob Jespersen, c/o MS GPO Box 4010, Kathmandu, Nepal.



# NETWORKING

## • NETWORKING •

### BIODIVERSITY TREATY -

National Interests and Global Imperatives is the title of the International Conference organised by the Biopolicy Institute of the African Centre for Technology Studies in Nairobi, 26-29 January 1993. It will bring together scholars, researchers, policy makers and analysts, activists and industrialists to discuss the outcome of the biodiversity negotiations and the future of the convention. Those interested in presenting papers should forward one-page abstracts to the ACTS Secretariat no later than October 15. Limited funding is available from ACTS for developing country speakers.

Please contact Calestous Juma, Conference Secretary, ACTS, PO Box 45917, Nairobi, Kenya (Fax 743995) or John Mugabe, ACTS Biopolicy Institute, Witmakerstraat 10, NL-6211 JB Maastricht, Netherlands (Fax 31.43.258433).

### PASTORALISM IN GUJARAT .

An interdisciplinary two-day workshop on Transhumant Pastoralism in Gujarat was held at the Institute of Rural Management, Anand, India. It dealt with the present status of pastoralism, change in socioeconomic and biotic conditions and institutions, and their response to people's desire for change.

For further information on workshop documents, contact: Ganesh Pangare, IRMA, PO Box 60, Anand 388 001, India.

**AGROECOLOGIE TROPICAL** is the topic of a French-speaking course to be held 1 March - 16 June 1993 (16 weeks) in Montpellier, France. It is meant for development workers, applied researchers, and delegates from farmer organisations or NGOs from ACP and other tropical countries, but also for European organisations involved in tropical agriculture or North-South exchange. Costs: FF 35,000, including board and lodging.

Further information: CIEPAD, Attn: P Burger, Le Triol - Ch. de Pailhas, F-34380 Viols-le-Fort, France.

**IPM IN INDONESIA** Three English videos (VHS, BETA and PAL systems) are available from Studio Audio Visual Puskat (Rp 35,000 per copy, plus postage

and packing). Two videos deal with Indonesian experiences in reducing adverse impacts of the Green Revolution in the Integrated Pest Management Programme. The first shows the importance of technology development at farmers' level and farmer communication; the second shows a pest management system which considers the agroecosystem, of which farmers are the prime managers. The third video displays how people of a village in Central Java, Indonesia, can obtain potable water which is purified by the seeds of a local tree (*Moringa oleifera*).

For information or orders: Studio Audio Visual Puskat, PO Box 75, Yogyakarta 55002, Indonesia.

### FELLOWSHIPS FOR RAINFOREST RESEARCH.

The Rainforest Alliance is now accepting applications for the 3rd Kleinhans Fellowship for Research in Tropical Non-Timber Forest Products. The research should aim at developing an income-producing product, extracting or marketing technique without destroying the integrity of the ecosystem, building on the knowledge of local forest inhabitants. Anyone with a Master's degree in forest, ecology or environmental science may apply; doctoral candidates or post-doctoral researchers are preferred. The fellowship provides a grant of US\$ 15,000/year for 2 years.

Contact: Elizabeth Skinner, Fellowship Coordinator, Rainforest Alliance, 270 Lafayette St, Suite 512, New York, NY 10012, USA.

**GREEN FILM GUIDE** is produced by the Centre for Science and Environment in New Delhi, India, and lists numerous video films on environment from all over the world. The catalogue is published half-yearly and priced at Rs 30 per copy. Various themes are covered, eg, general environment; land, agriculture and animals; forests; water, dams irrigation and fisheries; people; health and family planning; hazardous products and pesticides. All films included are VHS and the Centre loans out video films.

Contact: Audio Visual Unit, Centre for Science and Environment, F-6, Kailash Colony, New Delhi 110 048, India.

### RESEARCH/DEVELOPMENT TOWARDS SUSTAINABLE

**AGRICULTURE** was the title of a European workshop organised by Réseau Recherche Développement, Paris, 18-19 February 1992. The proceedings (24 pp) are now available in French and English (FF 15). The workshop dealt with the question: Sustainable agriculture - scientific challenge, empirical practice or ideology? Also the different approaches to sustainable agriculture from technical and economic points of view were discussed, with respect to Europe and the South. The European participants agreed to continue these exchanges, possibly involving partners from the South. The proposed stages could be: draw up a balance sheet of practices; challenge and discuss in-depth the concepts and methods; make proposals for policy makers and set up related programmes.

Proceedings can be ordered from: GRET, Attn: Jean Michel Centres, 213 Rue La Fayette, F-75010 Paris, France.

## • WANTED •

### DATABASE ORGANIC

**AGRICULTURE.** During our forestry and agroforestry projects, we have established links with over 200 groups in developing countries. We received numerous requests for information and advice on other aspects of sustainable agriculture covering a great diversity of topics from the production of compost to the control of termites. We are expanding our programme to provide this service, free of charge, to anyone in developing countries. Organic techniques will be explained in a series of leaflets. In addition, we hope to collaborate with a number of organic training programmes in Africa. We are compiling a database covering all

## • CONTRIBUTIONS •

Eelaart A van den & Hove P ten. **The sorjan system in the tidal lands of Indonesia.** Euroconsult, Arnhem, The Netherlands. 5 pp. The sorjan system in Java combines raised beds and basins. Land preparation takes an astonishing 600-1000 mandays/ha. This system improves the water availability for rice in the basins, while leaving the secondary crops in the beds drier. Poor drainage leads to reduction of rice yields, as does overshadowing by trees grown in the beds. Suggested improvements: better drainage, better land preparation.

Gill AS. **Vietnamese farmers' pasture problems and farmer-based research for sustainable pasture development.** 6 pp. Describes a farming system in Vietnam, analyses problems and proposes solutions from a scientist's point of view.

Patewa J. **Farming with the environment: a case study: Sierra Leone - Southern Province.** SLC/CCD Project, Pujehun District, Sierra Leone. 4 pp. Describes cultivation practices in Sierra Leone upland-rice systems, including farming calendar. Some remarks on tree species which are left after clearing the bush and considered beneficial for the rice crop.

Rugalema G. **Reconciling livestock and the ecosystem.** 5 pp. Report on a one-week Rapid Rural Appraisal (RRA) in central Tanzania, where animals had been destocked. Shows that the vegetation recovered, but doubts whether the introduction of stalled dairy-cattle is a viable alternative to indigenous stock.

Singh V. **Work animal power: a prop for agriculture.** 4 pp. Gives an overview on the contribution of draught animals to farmwork in India. Indicates their comparative advantage over "green revolution" machinery, and advocates more research into animal traction.

aspects of tropical organic agriculture, and we would like to hear from anyone who could lead us to good sources of information.

Fiona Marshall, Overseas Projects Coordinator, Henry Doubleday Research Association, Ryton Organic Gardens, Ryton-on-Dunsmore, Coventry CV8 3LG, UK.

#### NETWORK FOR SEED RESOURCES.

I recently saw the May 1987 ILEIA Newsletter issue wherein a seed networking page was printed. I wonder if ILEIA has created a guide for vegetable and fruit seed for tropical plants since that issue (Ed. note: No, sorry). My interest is to network with seed resources that have tropical varieties available, primarily for the Caribbean region (Latin America also). Who can help and wants to join?

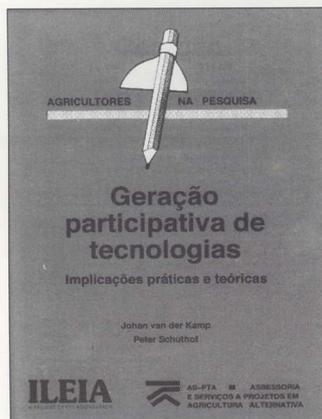
Noel Thomas, 6807 Waverly - Montreal, Quebec H2S 3H8, Canada.

#### SEED SOURCING AND CARE -

Call for experiences. What are the most common sources of seed by small-scale farmers and how do they condition (treat) and store seed? What are commonly perceived advantages and disadvantages of different sources of seed (modern varieties and farmers' varieties)? A review of literature and experiences is presently being made by the Natural Resources Institute and the Overseas Development Institute, to be completed early 1993. It will try to identify alternative technologies that may improve the quality of seed available to farmers at planting time. Interested readers can request further information (eg checklist to fill in) or send their experiences to NRI, Attn: Tim Donaldson, GRAIN Technology Dept, Central Ave, Chatham Maritime, Kent ME4 4TB, UK. Tel. +44-634-883831; Fax +44-634-880066/77. Those readers who contribute will receive a copy when it's finished.

#### GERAÇÃO PARTICIPATIVA DE TECNOLOGIAS

"Methods of Participatory Technology Development" by Johan van der Kamp and Peter Schuthof was translated by AS-PTA in Brazil into Portuguese. The booklet is available for US\$ 2 plus postage and packing from: AS-PTA, Attn: Lourdes Carvalho Grzybowski, Rua Bento Lisboa, 58 - 3e andar, 22221 Rio de Janeiro RJ, Brazil. Fax +55-21-205-3099.



#### EL EXPERIMENTADOR CAMPESINO Y EL TECNICO

'Joining Farmers Experiments', a reader on Experiences in Participatory Technology Development has been translated into Spanish by CETAL Ediciones (Abtao #576, Cerro Concepcion, Casilla 197-V, Valparaiso, Chile). Free copies for Latin American organisations can be requested from GTZ/GATE (who financed the translation), Attn: Annette von Lossau, Postfach 5180, D-6236 Eschborn, Germany. Though not 'adapted' to the Latin American situation, the book remains interesting for its methodological aspects and practical experiences.

#### ILEIA REGISTER REMINDER

In the first half of 1993 we plan to bring out a new version of the register of ILEIA network members. If you do not inform us otherwise, we assume that you have no objections to your name and address being included in the new register.

#### LAYOUT

Annemieke de Haan left the ILEIA team as a layout specialist. We herewith thank Annemieke for the

# ILEIA NEWS

good working relationship, her skills in layout and drawing, and her contribution to making the Newsletter enjoyable. We wish her good luck for the future. Jan Hiensch has taken over the job and this Newsletter shows his first product. Do you like it? Creative criticism is always welcome!

#### DISTRIBUTION OF ILEIADOC

ILEIADOC, ILEIA's bibliographic database on computer, with descriptions of books, papers, articles, series, proceedings, reports, audiovisuals and journals, is growing steadily (now over 5000, of which 10% have an abstract so far). This database (plus one 6-monthly update and the necessary software to read it) is now available on diskette for DFL 75 per year (MS-DOS system). If you have no access to a computer or dislike them, we can also provide, on the same conditions, a printed catalogue. From the database, photocopies of documents can be ordered from ILEIA for DFL 0.60 per copy. As these fees may be prohibitory for many institutions and people in developing countries, ILEIA is trying to interest donors in funding a document delivery service for such beneficiaries. We will keep you informed of the progress. If you're interested, contact Wietse Bruinsma at ILEIA.

#### UPCOMING NEWSLETTERS

The first ILEIA Newsletter of 1993 will be a "Keep Rolling" issue without a central theme. Over the years, many articles have been sent to ILEIA, but they did not always fit into a theme issue. Often they were mentioned in "Contributions". Your response and contributions to this livestock issue and past themes should reach us by 31 January 1993.

The second issue will focus on 'Cutting back on chemicals':

practical experiences in reducing the negative impact of chemical inputs in Green Revolution agriculture and the process of change. We would like to try a new way of preparing an issue. We request readers who are interested in

contributing to this issue to fill out the questionnaire inserted in this Newsletter and return it to ILEIA before 1 December 1992. We can assist you in shaping your articles! Articles should reach ILEIA before 30 April 1993. Draft versions for our comments should obviously reach us earlier.

*NOTE: The issue 'After the harvest' is postponed to autumn 1993!*

#### BIOTECHNOLOGY CONTEST

Some papers have reached us on the contest on rural people's biotechnology (see p 44 of July issue), like 'Combatting pests of vegetables by rural communities in Zimbabwe' by E Manzungu or 'Compost making at Rongai Boys Secondary School in Marsabit, Kenya' by Njeru Dominic. The deadline for sending papers is extended one month to 1 December 1992. If you're interested, there is still some time to write!

## FARMING FOR THE FUTURE

An introduction to Low-External-Input and Sustainable Agriculture



#### FARMING FOR THE FUTURE

If any organisation wants to make large orders for this book, you can try to get them at a reduced rate by contacting Christopher Harrison, Director of Marketing, Macmillan Press, Houndmills, Basingstoke, Hampshire RG21 2XS, UK (Fax +44-256-810526) and asking for a quote for the number of copies you want.

# READERS

## How wealth degrades the Dutch environment

Dear Coen Reijntjes,

I read with interest your write-up on 'A Vision from the South' in ILEIA Newsletter March 1992 (page 25), not because I am one of the authors and responsible for what you call its philosophical content, but because this write-up shows your preferences.

It would be interesting for you, and maybe for many a reader of the ILEIA Newsletter to know that in a couple of reviews, write-ups or discussions on this book here - in India - environmentalists have mainly liked it for its facts about Netherlands' degraded environment: eg. that you cannot drink rain water or that you suffer the stink and pollution caused by cattle dung etc. While those who wish to understand environmental problems politically, philosophically and culturally have rated its strength in its interpretational aspect, as you do. Moreover, speaking personally, with so many interactions with a number of environmentalists, policy makers, peace activists, journalists and academics in Holland in the course of writing this book, I found most of the environmentalists more eager to look into the political and cultural aspect of the problem than mere excavation of facts about environmental degradation which Dutch people know more than we could ever do as outsiders. What new facts could any outsider bring up than what is brought out and published in various of your reports? Maybe because the Dutch problem has crossed the limit where mere facts would hardly break any ice further than broken by information gathering, that the necessity for a deeper analysis has become your intellectual priority.

But on the other hand I must say to the credit of Dutch environmentalists that they seem to be much more intellectually prepared to take intellectual challenges than many. This preparedness to face critical light seems to me the real strength of the Dutch environmental movement. It is much more than passive preparedness, for we did not write this book on our own. We were invited by the Dutch Alliance for Sustainable Development and WISE (World Information Service on Environment and Development). They were actively inspiring us to shed our intellectual 'softness' towards them as Dutch people - if we had any. Whomever we visited, including senior officials in various Ministries, we were told: "Criticise us thoroughly" - they were not selling their ideas to us, which was a remarkable show of humility - and equanimity. This attitude of Dutch friends helped a lot in bringing out in the book what you describe as its main strength.

With my best wishes to the ILEIA group,  
Yours, Rajiv Vora

Ghandi Peace Foundation, 221-223 Deen Dayal Upadhyaya Marg,  
New Delhi 110 002, India

# WRITE



## ILEIA NEWSLETTER

october 1992  
volume 8 no.3



ILEIA (Information Centre for Low-External-Input and Sustainable Agriculture) was established in 1982 by the ETC Foundation and is funded mainly by the Netherlands Ministry of Development Cooperation. Project funds are assured till early 1994.

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

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

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

ILEIA seeks to reach these objectives by operating a documentation centre; publishing a quarterly newsletter, bibliographies, resource guides etc; holding international workshops; and supporting regional networks in the Third World.

BACK COPIES of the ILEIA Newsletter are available: (US\$ 5)

- Vol.3/No.1: Integrated nutrient supply
- Vol.3/No.2: Diversity
- Vol.3/No.3: Microclimate management
- Vol.4/No.1: Mountain agriculture
- Vol.4/No.3: Participatory technology devt
- Vol.4/No.4: Enhancing dryland agriculture
- Vol.5/No.1: Discussion on sustaining agriculture
- Vol.5/No.2: Intensifying agriculture in humid areas
- Vol.5/No.3: Farmers' alternatives to chemical pesticides
- Vol.5/No.4: Local varieties
- Vol.6/No.4: Networking towards LEISA (register of network members)
- Vol.7/No.1/2: Assessing farming techniques
- Vol.7/No.3: Learning for sustainable agriculture
- Vol.7/No.4: Searching for synergy
- Vol.8/No.1: Creating a healthy environment
- Vol.8/No.2: Let's work together (issues not listed are out of print)

Also available: **Participatory Technology Development in sustainable agriculture: an introduction.** 1989. 40 pp. US\$7.50. Third World readers may request a free copy.

The opinions expressed in the articles do not necessarily reflect the views of ILEIA.

Readers are encouraged to reprint or translate articles with acknowledgement. Please send a copy of any reprint or translation to: