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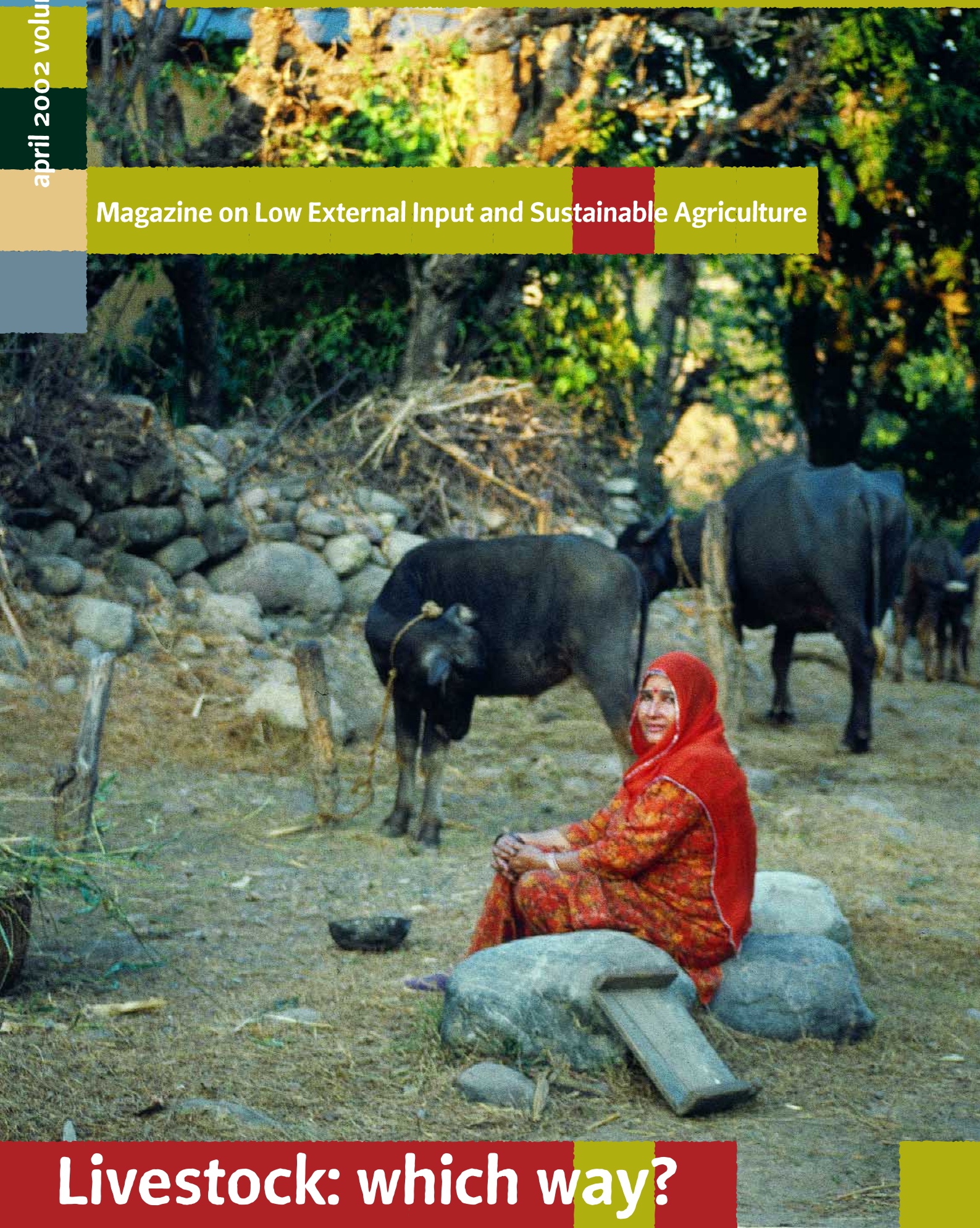
LEISA

Magazine on Low External Input and Sustainable Agriculture



Livestock: which way?

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LEISA
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April 2002 Volume 18 no. 1

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Address: PO Box 64, 3830 AB Leusden, The Netherlands
Visitor's address: Kastanjelaan 5, Leusden
Tel: +31 (0)33 432 60 11, Fax: +31 (0)33 495 17 79
Office e-mail: ileia@ileia.nl
Subscriptions e-mail: subscriptions@ileia.nl
http://www.ileia.org

Editorial Team
This issue has been compiled by: Katrien van 't Hooft (guest editor), Coen Reijntjes, Wilma Roem and Chesha Wettasinha

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Administration
Lila Felipie, Teresa Segura

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A proud milk buffalo owner in Himachal Pradesh, India. Photo: Wolfgang Bayer

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ILEIA is the Centre for Information on Low External Input and Sustainable Agriculture (LEISA) in the tropics. ILEIA seeks to promote the adoption of LEISA through the LEISA Magazine and other publications. It also maintains a specialised information database and an informative and interactive website on LEISA (**http://www.ileia.org**). The website provides access to many other sources of information on the development of sustainable agriculture.

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

24 Dutch dairy farmers find own solutions to their environmental problems

Willem van Weperen en Henk Kieft

Dutch dairy farming in the last fifty years focused on increasing milk production through a variety of interventions that included technology development, effective research-extension-farmer interaction, access to credit, conducive policies etc. However, this development resulted in increased environmental as well as animal health problems. Many animal-related crises in the recent past has raised consumer concern considerably. Ten years ago, two environmental farmer associations in the Friesian province of the Netherlands began experimenting with environmentally-sound farming practices and integrated agriculture. Although these experiments raised suspicion within the authorities, initially, the results are gradually gaining recognition. Now, more than 120 farmers have taken on the initiative and together with researchers they have formed a platform called PMOV to take the initiative further. This experience shows that farmers are able to resolve their own problems and make their farming systems sustainable.

DEAR READERS

The 'Livestock Revolution', intensive industrial livestock production, is spreading fast to the South. In the North, it stands for loss of employment of many small farmers, environmental pollution, epidemic animal diseases (such as BSE and swine-plague), unsafe food and ill-treatment of animals. What alternatives do small farmers have that are competitive enough to keep them in business? In this issue of LEISA Magazine we have brought together a selection of articles which deal with improvement of livestock production by more holistic and ecological management and integration of crops, legumes, grasses, trees and other animal species. These integrated livestock systems seem to be more productive and better for the environment and the animals. But can smallholders and pastoralists really compete within the Livestock Revolution if politics does not make a conscious choice in favour of small farmers, the environment and animal welfare?

This issue has been conceptualised by the ETC livestock working group. Katrien van 't Hooft, a veterinarian with many years of experience with livestock farmers in the Andes (see page 10), who works as editor for the ETC Compas Magazine on endogenous development, was the guest editor for this issue. We are very appreciative of all the work she has put in.

Included with the LEISA Magazine is a special supplement on 'Ecosystem Disruption and Human Health', the result of a collaborative effort between IDRC, UNEP and ILEIA. IDRC holds the main responsibility for the content of this supplement, which is based on a consultation hosted by IDRC and UNEP in November 1999. Human health is an important issue that should become an integrated part of development efforts towards sustainable land use.

For those of you who have access to internet, we would like to mention that ILEIA together with Oxfam and Greenpeace are launching a campaign called *Farmingsolutions* on 8th April. The aim of this campaign is to show how food security can be achieved by innovative, ecologically and socially sound agricultural systems. The campaign is undertaken in preparation for the World Food Summit that is to take place in Rome, Italy, in June this year. The website **www.Farmingsolutions.org** gives easy access to information on world hunger, food production and innovative agro-ecological approaches. More information can be found on page 32.

On the request of many readers we have re-introduced a "letters" section in this issue. So please keep your letters rolling in and we will publish them.

The Editors

LETTERS

Dear Editor,

I agree entirely with your overall theme of issue 17.4 that GE is not the only option, but do also believe that your argument has been weakened in some of the articles which you included in that issue.

My fundamental concern is that in an edition dedicated to GM crops and smallholders there is no mention of China. The country claims that by 2010 up to 80% of the national area of cotton, corn, rice, soyabean and wheat will be planted to transgenic material (Chen Z.L. Transgenic Food: Need and Safety. OECD Edinburgh Conference on the Scientific and Health Aspects of GM Food 28th Feb. to 1st. March,2000).

On page 21 you state that "GM cotton is unlikely to have much appeal to small-scale cotton farmers" without providing evidence for the statement which appears to be contrary to the actual facts. Despite problems with seed supply small-scale cotton growers in China have gone to enormous lengths to obtain GM seed travelling hundreds of km. to buy it. The big attraction has been the reduction in the need for pesticide use with a reduction in average expenditure from RMB 1927 per ha. for pesticides on non Bt. Cotton to just over RMB 300 for the GM crop with no significant reduction in yield.

A striking result of this was that in 1999 only 4% of farmers using GM cotton had experienced any symptoms of pesticide poisoning as compared to 33% using conventional cotton. At the same time survey data revealed 23 beneficial insect species on Bt. cotton as compared to 5 on conventional.

The material on pages 6 and 7 also rings a false note. The great majority of the world's small-scale farmers live in Asia with a minority living in Sub-Saharan Africa. It is difficult to see evidence of "colonial land grabs pushing rural food producing societies off the best lands" in China, India, Bangladesh or Vietnam. It is equally difficult to accept that "healthy domestic markets will never emerge" in these countries. Even more surprising is the statement regarding lagging productivity in third world countries when average grain yields in the third world have risen overall from 1.2 to 2.52 tonnes per ha. over the past 25 years and average per capita food consumption has risen by 28% (FAO 2000).

Yours faithfully, **Stephen Carr**, Private Bag 5, Zomba, Malawi.

We agree that the GE experiences in China should have been covered. Unfortunately we were not successful in our search for a suitable contribution. If any one of you have first-hand information, please send it to us.

There is little doubt that there are farmers who have immediate benefits of switching to GE. However, like in all agricultural technologies and approaches it is important to look beyond the single farm and beyond the next harvest when assessing the value of GE. Our goal was to view GE in this broader perspective. It is also important to realise that GE is different from any previous agricultural innovation in that there is no way back when GE crops have been released: most of them have some biological advantages that will ensure the survival of their genes in nature. If problems show up we cannot get rid of the genes just by stopping the release of GE crops. This is particularly worrying in poor countries who do not have sufficient resources to remedy the situation.

We will take note of your comments on general statements (pag 6.7) in future articles.

Dear Editor,

I have something to say about GM crops, "Will GM crops feed the hungry and reduce poverty"? As these crops are created by private companies they are not introduced for reducing poverty or feeding the hungry. The question therefore must be, "Will GM crops bring profit for the companies"?

The problem of hunger is not productivity only, because in our time there are more than enough productive crops, which can feed the world. A fact is that not everybody can buy enough food. This is because some people are unemployed or do not have enough income to buy what is needed properly. GM crops will not help poor people.

Even in Ethiopia which is known as one of the poorest and the most drought affected countries there are always regions, which produce enough crops to feed the whole country. But there are always people who cannot afford to buy these food crops. For example, in 2001 the price of maize in Ethiopia dropped by 2.5 times and in some places by 5 times from the previous years due to mass increase in production. Until recently the government subsidised the price of fertilisers. But thanks to the World Bank and the IMF, the government eliminated subsidies to farmers. So farmers were obliged to sell their animals to pay their debt resulting from the price increase for inputs, even though they had harvested more than in the previous years. This resulted in even more hungry people who could not afford to pay the price of maize.

The introduction of new GM crops of which we do not know the future consequences is very dangerous. The example of Mad Cow Disease (MCD) may illustrate this. It is said that MDC may result from feeding cows meat and fish products. Cows are herbivores but we are trying to make them carnivores, without thoroughly studying the consequences. We change nature and have to pay for our carelessness.

In my opinion the GM crops and abundant use of fertilisers and pesticides are not necessary to feed the world. What is needed is sincerity in our work and ideas. So we have to think twice before we create new organisms on this small planet.

Yours, **Fekade Fullas**, P.O.Box 36, Bodity, Wolaita, Ethiopia

Dear Editor,

Congratulations on your recent special issue on biotechnology and GM crops. It had many very interesting and worthwhile articles that deserved to be widely read and discussed. However, we would like to correct an important misrepresentation. In the article by Mr. Peter Rossett (p.7) there is a photo with the caption: "Will the "super" rice presently being developed by the International Rice Research Institute (IRRI) meet the needs of small farmers?"

For the record, the "super" rice the article refers to is in no way genetically modified or engineered and so should not be included with the article. Known also as the "New Plant Type", this rice germplasm was developed over a 12-year period via traditional breeding methods. It is also incorrect to say it is "presently being developed" as last year it has been completed officially. Those readers who are interested to get the full story behind "super" rice can go to the following Internet address: http://www.irri.org/vis/prl1001.htm or contact my office directly. It should also be noted that the "New Plant Type" is not really a new rice variety as such. Instead, it is an advanced rice germplasm with better disease resistance and higher yield potential among its many improved features. As of last year, IRRI began sharing this germplasm with anyone (farmers, national systems, NGOs) who would like to use it in their traditional breeding programmes. Already, countries like China and India have started to include some of the NPT's improved qualities in its own new rice varieties for farmers.

Yours Sincerely, **Duncan Macintosh**,
Spokesman, IRRI, Philippines.
Email: d.macintosh@cgiar.org

The photo and caption referred to in this letter was inserted by ILEIA and not by the author, Mr. Peter Rossett. As such ILEIA takes full responsibility for this error.

Please note that all letters have been edited by ILEIA to accommodate them in the space available.

Livestock: industrial or integrated?

Editorial

Livestock production is important for the majority of farmers in developing countries, especially for small farmers in more marginal conditions where land cannot be used for other purposes. Smallholders keep livestock for food, fibre, fertiliser, fuel, draught power, as a buffer in case of crop failure, and also for social and cultural functions. Increasingly, livestock is also produced for cash, which is the main objective of specialised livestock production systems. This type of livestock production strongly depends on the dynamics of the global markets.

A team of researchers of the International Food Policy Research Institute (IFPRI) and the Food and Agricultural Organisation (FAO) produced an extensive report called: 'Livestock to 2020: The next Food Revolution' (see Garcés p.7). 'Livestock Revolution' was the term they used to describe the expected massive increase in livestock production in developing countries due to doubling of the demand for livestock products, especially in the North, over the next 20 years. Like the 'Green Revolution', this 'Livestock Revolution' involves the large-scale transformation and growth of production along the same lines as it has already taken place in many 'developed' countries. What will be the consequences of this development?

Painful experiences in the North teach us that this development towards 'factory farming' will put enormous pressure on natural resources, food safety, animal diversity and welfare, as well as threaten the income generating possibilities of small farmers. In reality these systems are very inefficient and the hidden environmental and social costs of the livestock industry are enormous (Garcés p.7). Also, to meet food needs in 2050 it is necessary to increase human food production considerably. But, the 'Livestock Revolution' will compete strongly with human food production. Presently, livestock already consumes almost 50% of world cereal grain supplies. It is therefore very important to develop livestock production systems, which do not depend on cereal grain (Preston p.26). The Animal Welfare Review in 1998, therefore, raised the all-important question: *"should this type of intensive livestock production continue to be encouraged globally, or should alternatives be sought?"*

Even without the 'Livestock Revolution', livestock keepers already have enough ecological problems, for example, due to overgrazing and burning. Research has developed technologies mainly for intensive and industrialised livestock production systems. But, many modern technologies do not fit the reality of low-input livestock systems (van 't Hooft p.10).

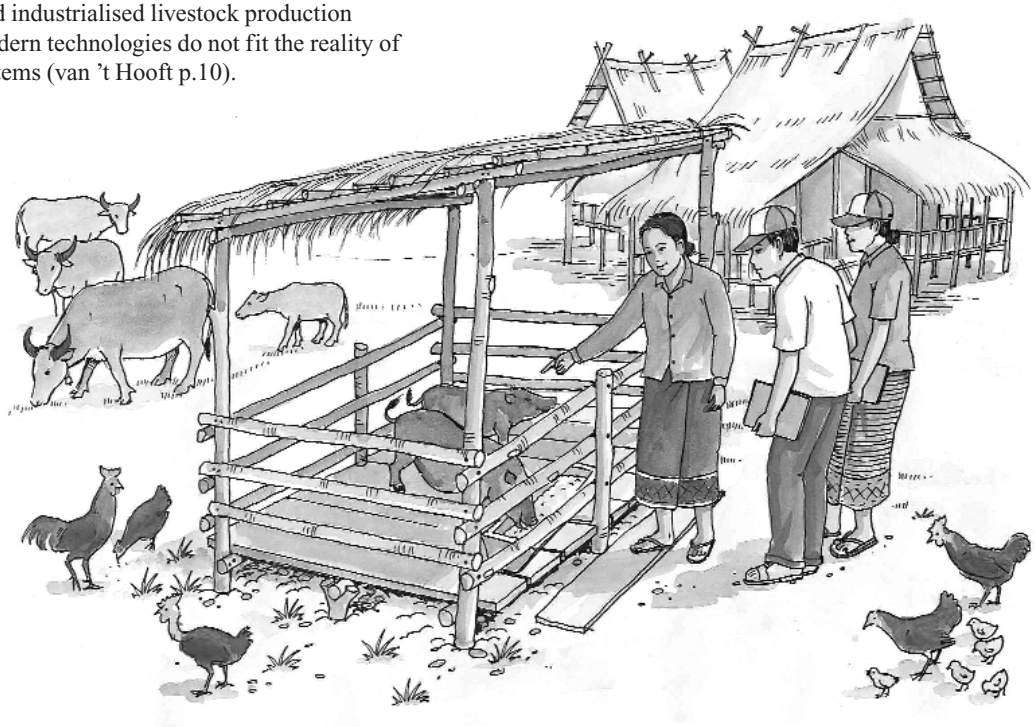
But what alternatives are available to farmers? The articles in this issue present some useful insights, practical suggestions and ways to achieve them.

Enhancing the quality of the whole system

To optimise the performance of farming, it is important that management practices enhance the ecological functioning of the 'web' of all living organisms within the production system by influencing the interactions between climate, soil, vegetation, animals and farmers (Primavesi and Primavesi p.12).

Traditional farmers often have mixed systems in which the production of crops, animals and natural resources are integrated, products are of multiple-use, and waste products of one sub-system are used as inputs in other sub-systems. Within this integrated system, depending on needs, opportunities and risks, farmers may follow different strategies: keep many different animal species under low-input management system, or combine this with the intensive production of one specific species (van 't Hooft p.10). Traditional systems can be relatively productive, while making optimal use of the available natural and human resources. Presently, influenced by modernisation and globalisation, most of these traditional systems are loosing their economic and social coherence.

The awareness that agro-ecological systems are complex and integrated, and that the quality of all parts of the system, including its social and cultural dimensions, is important to optimise the performance of the whole system, has been lost in more modern agriculture. Intensive livestock production in The Netherlands, for example, strongly focused on high input / high output relations and profit making and forgot about the environment. Two environmental associations of dairy farmers, rediscovered the importance of the quality of the whole system. They found that the quality of the cow manure influences the quality of the soil, which, determines the quality and quantity of the pasture and fodder crops, the feed for the animals, which is important for animal health and the quality and quantity of their products (see Figure 1 on p.24). They have developed a new way of feeding their milk cattle with lower protein and higher fibre contents by using less concentrates and fertilisers, which reduces nutrient losses while maintaining milk production at the same level. (van Weperen and Kieft p.24).



Presently, livestock research appears to show heightened interest in mixed or integrated farming systems going by the number of conferences that has dealt with this subject in Latin America, Africa and Southeast Asia (Sources p.30). Agroecological research in Colombia and Cambodia is working successfully on the development of integrated farming systems, with close integration of animals, recycling of all excreta, and the use of highly productive energy and protein crops, to improve productivity and sustainability of smallholder and commercial agriculture in the humid tropics (Preston p.26; Murgueitio p.14).

Integration of crops, grasses, trees and animals

Many of the authors stress the importance of diversification of agriculture. Van 't Hooft (pg.10) explains the importance of animal biodiversity in smallholder agriculture in the Andes. Primavesi and Primavesi (pg.12) report on the benefits of integration of leguminous crops and trees in pastures in Brazil. Funes-Monzote and Monzote (p.20) analyse the effects of integrating crops and trees in dairy farms in Cuba. Viengsavanh et al (p.16) explain how, in Laos, integration of specific grasses, trees and legumes help farmers overcome seasonal feed shortages for their animals, reduce labour requirements, improve animal health and performance in extensive systems. Murgueitio (p.14) points at the complementarity between ruminants, monogastrics like chicken, fish and earthworms, micro-organisms in biogas digesters, crops, grasses and trees to optimise the benefits of intensive integrated systems.

In tropical countries, especially in the humid zone, there are many crops and farming systems that considerably exceed the productive capacity of grain cereals. Key energy plants for intensive integrated systems are: sugar cane, cassava, the palm family (especially the oil and sugar palms). Key protein crops are: N-fixing legumes (trees and shrubs rather than soy beans) and water plants like "duckweed".The feeds derived from these "alternative" crops do not lend themselves to "factory" farming systems which traditionally use dry feeds, easy to store, transport and mix into "least-cost" rations. The "alternative" feeds require relatively small scale, diversified and integrated farming systems. The role of animals in these systems will be synergistic rather than as primary producers (Preston, pg.26).

In more marginal environments it is very important to integrate farm animals adapted to the local climate and forage (Primavesi and Primavesi, Pg.12). Indigenous animal species are often much better adapted to these conditions. Thriving even at low levels of fodder inputs, their maintenance is ecologically more sustainable. While they may not be able to compete with "improved breeds" in regards to milk and meat yields, indigenous animal species fulfil a much wider range of functions and provide a larger range of products. As is becoming increasingly clear, they often have scope for specialty products and can be essential to preserve habitats. Improved feeding can double the performance of local breeds (see box on p.9). But, according to FAO, one third of the world's estimated 4000 livestock and poultry breeds are in danger of extinction! The 'Livestock Revolution' will speed up the loss of indigenous animal biodiversity. Action is therefore urgently needed – an example of this is the LIFE project (Warsi p.27).

In addition, small animals and insects could have considerable potential to improve the integrated farming system. Poultry is an example of a small animal which plays a very important role in smallholder production and poverty alleviation. Earthworms (Murgueitio) and weaver ants (Van Mele and Vo p.28) are examples of very useful insects which could strongly enhance the overall productivity of integrated systems. And, of course, we should not forget the wide diversity of micro-organisms in the soil and the animals without which agriculture would not be possible.

Chain management and weak links

An increasing number of organisations are working on improvement of the whole livestock production chain, including aspects such as input supply, processing, marketing, transport and farmer organisation. Rocha (p.22) presents such an example. In the Andean highlands of Bolivia there is an enormous ecological and economic potential for llama production. However, llama production is strongly marginalised due to, among other factors, a parasite in the meat (Sarcocistiosis), which makes it less attractive for human consumption. Farmers, supported by a local NGO, have succeeded in reducing the prevalence of this parasite, improving market structures for commercialisation of this product, and undertaking other activities to revitalise family-level llama production, with positive economic, ecological and cultural effects.

Often there is a weak link in the production chain, which could strongly inhibit the overall performance of the system. Strengthening of weak links may have unexpected results. Unlike in the intensive systems in The Netherlands, mentioned earlier, in extensive systems, for example, animals often get too little proteins or lack specific minerals (e.g. phosphate, calcium, magnesium or cobalt). Integration of leguminous or other protein-rich crops and trees into the system and feeding of protein-rich concentrates with added minerals could contribute a lot to improve animal health and production (Primavesi and Primavesi; Preston; Viengsavanh et al).

In Kenya, Luo farmers had a lack of manure to fertilise their crops. By adopting 'zero grazing' they succeeded in strengthening the livestock component of their integrated crop-livestock system, which then brought the whole system to a higher level of production. However, intensification of indigenous farming systems, e.g. by introduction of zero grazing, has to fit local perceptions, needs and opportunities (Mango p.18).

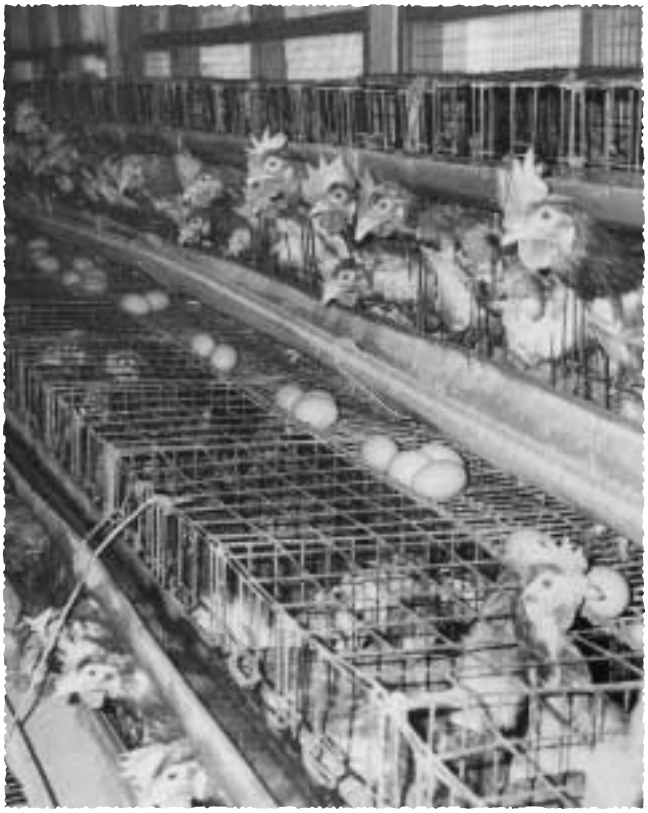
Another example of a weak link is Newcastle disease in poultry production. Poultry networks are now testing new vaccines for control of Newcastle disease which can be produced locally and can be easily administered (van 't Hooft p.36).

Integrating researchers, policy makers and educators

By following a more holistic, ecological approach many farmers seem to come closer to their own 'gut feeling' of how they should manage their farm, which is also more in line with how their parents thought about it (van Weperen and Kieft, p.24). The problem is, however, to get other players such as researchers, policy makers and educators involved in this approach to form (inter)national networks and local platforms for change. Although, increasingly, these players are aware that there is something wrong with the conventional approach to livestock production, they have to make quite a change in attitude and thinking to take a different stand. For example, animal science as taught in Latin American universities and farming schools is focused on reaching the maximum productivity per animal, limited to the animal species used in industrialised livestock keeping, especially cattle, pigs and chicken. The absence of the essential elements of family-level livestock keeping and the basic principles of integrated, ecological livestock production in the curriculum is reflected in the frequent failures of livestock projects and the negative impact of livestock production on the environment.

Although integrated livestock systems have considerable potential to improve livestock production, the chances of small farmers competing with industrial livestock production will remain weak as long as research, policies and education systems do not change.

■



The rise of factory farming in Southern countries, as seen here of laying hens kept in battery cages in Thailand, is proving detrimental to food security, the environment and animal welfare. Photo: CIWF

The 'Livestock Revolution' and its impact on smallholders

Leah Garcés

Two-thirds of the world's livestock are found in 'developing' countries. Most farmers in these countries practise multiple-purpose, non-intensive methods of animal production. Animals are critical for their livelihoods, cultures and social status. Many of these animals graze areas not suitable for crops or scavenge freely, often consuming garbage and harmful insects. Small farms that combine livestock and crops use the land relatively sustainably: crop residues are fed to animals; manure provides good fertiliser and fuel; and animal draught power reduces the need for fossil fuels. Smallholder livestock production makes a substantial contribution to the economy.

In India, for example, livestock contributes about 30% of the total farm output, and 80% of livestock products come from small farmers with 3-5 animals and less than 2 ha of land (Rangnekar 2001). It is estimated that one-quarter of the world's total land area is being used for grazing livestock, including extensive grazing systems. A further one-fifth of the world's arable land is used for growing cereals to feed livestock. This makes livestock production the largest user of land in the world.

The 'Livestock Revolution'

But livestock production systems in these countries are changing fast, due to the so-called 'Livestock Revolution'. The global demand for meat is expected to more than double over the next twenty years, creating an increased demand for cereal feed. Southern countries are expected to become the main producers of meat and animal products for the rest of the world, with increasing dependency on imported grain. It is expected that there will be a shift from livestock being kept for multiple purposes and local food supply to animals being raised under factory farming conditions for export. Many small-scale farms will be out-competed and replaced by large-scale industrial farms (Delgado et al 1999).

This Livestock Revolution will provide new opportunities for agriculture in the South. But, who will benefit from it, what will be the cost to small farmers, food security, the environment, farm animal genetic diversity and farm animal welfare? Compassion in World Farming Trust (CWFT), a research-based farm animal welfare organisation that investigates the development of factory farming at an international level, recently studied the effects of the rise in factory farming on Southern countries, their farmers and farm animals (Gracés 2001; Cox and Varpama 2000). An overview of the results is given below.

Small farmers are loosing

The leading agencies working on hunger alleviation admit that rural small farmers are being pushed out of business by factory farming. Farmers in the UK, US and Europe have already experienced the painful consequences of the so-called 'vertical integration' of livestock production, in which specialised enterprises such as feedlot farms, animal feed traders, and meat packers, all merge under one giant company. This leaves very limited market opportunities for small, independent farmers, many of whom have been forced to leave the business altogether. According to the US Department of Agriculture, there were 5.7 million farms in the USA, in 1950. Today, the number has decreased to about 2 million farms.

This same pattern is quickly taking hold in Southern countries. Brazil's poultry industry is a good example. Between 1970 and 1991, Brazil's poultry industry grew from small backyard farmers to a multi-national mechanised industry, becoming almost entirely vertically integrated. Originally, small family farmers were given day-old chicks by major companies and were paid to raise them. Sadia is an example of a family-owned company, which employed 14,000 smallholder farmers to raise chickens on their mixed farms with a clear benefit to these farming families. The chickens were brought back to Sadia, who processed and distributed them to consumers.

Unfortunately, this system began to change four or five years ago, due to financial troubles of family owned companies, such as Sadia, which were taken over by financial interest groups and foreign companies. Now, Sadia is raising, providing feed for, and processing its own chickens in large production units. Certainly, most of the 14,000 mixed farmers, who once raised chickens for the Sadia industry, do not benefit from this new 'development' initiative.

Harm to import-dependent developing countries

There are many examples that support the view that the introduction of industrial livestock rearing not only harms the individual small-scale farmer but also the developing countries as a whole. As a consequence of industrial livestock rearing, these countries have become more import-dependent. Grains, tractors, fuel, fertilisers and special animal units and processors are required for intensive livestock rearing, none of which a developing country starts out by making itself.

Over the last decade, Asia has begun to import large amounts of grain to feed its industrially-produced farm animals. Likewise, machinery, oil and production units are being imported and subsidised by the government. The Asian

economic crisis of 1999, that raised prices of imported feeds and depressed urban demand, proofed that being an import-laden economy can be disastrous and unsustainable.

Threat to food security

A *World Poultry* study (Gueye 2001) done in sub-Saharan Africa indicates the importance of family-level poultry rearing for food security, poverty alleviation, environmental health and genetic diversity. While the one or two breeds of broiler chicken used for chicken meat in factory farms are generally imported, 85% of rural families keep several species and breeds of poultry of indigenous types. The products of these local breeds are often preferred to those from exotic breeds by local consumers. Furthermore, the local breeds are better adapted to local diseases, pests and climate. Poultry are usually raised in extensive systems, while some families specialise in semi-extensive and small-scale intensive poultry systems.

In extensive production (backyard) systems, birds are reared with little land, labour or capital, can be accessed by even the poorest social communities in rural areas, and are of great importance for women, especially in female-headed households. The study indicated that an average flock of 5 chickens enabled a woman in Central Tanzania to earn an additional US$38 per year or a 9.5% increase in income. Poultry raising has contributed to the 'greater empowerment of women by improving their financial status, if socio-cultural and religious environments allow it'. As such, the loss of family farming to industrial farming could seriously affect women and children.

Effects on the environment

Factory farming was developed in Europe with the aim of ending food shortages after the 2nd World War. Science and technology were promoted, farmers were given subsidies to encourage production increases, and consumers were given cheaper food. But, these policies of production at all costs can no longer be supported. As far back as 1997, the chief of the FAO's Asian Pacific Regional Office declared that it was time to move away from the 'Green Revolution' livestock model, as the environmental problems of this approach were already obvious.

Industrial animal farming has proved to have detrimental effects on the environment both in the short and the long term (Haan et al. 1998). For example, the production of cereals for the livestock industry often takes place far away from where the animals are raised. This is leading to depletion of soil fertility where cereals are produced, and pollution at the other end of the trading spectrum where cereals are used for animal feed. Soya and maize are major products of the US supplied to industrial animal farms around the world. Such monoculture systems, though strongly promoted by governments, have unintended consequences for soil and water quality. Thirty percent of the total cropland in the United States is now eroding at excessive rates, according to the Soil and Water Conservation Society (http://www.swcs.org/).

Globally, farm animals produce 13 billion tonnes of waste per annum (Turner 1999). Animals on industrial farms consume high-protein feeds and produce waste that is extremely environmentally damaging. Industrial animal farming contributes 5-10% of the total of greenhouse gases in the world, accelerating climate change. Moreover, large amounts of water and fossil energy are required to grow, process and transport industrial farm animal feed and treat the animal waste (Pimentel et al.1997).

Loss of genetic diversity

The FAO (2001) reports that the greatest threat to the world's domestic animal diversity is the export of specialised breeds of farm animals from developed to developing countries. Crossbreeding with and eventual replacement of local breeds has resulted in a situation that around 1,350 domestic animal breeds (30% of all domestic breeds) are at risk of extinction. Every week, two breeds of farm animals disappear.

One of the greatest misjudgements of the 'Livestock Revolution' is to deny the importance of genetic diversity for food security. For example, in 1996, some 942,000 inseminations have been carried out in the Netherlands alone, with semen from a single Holstein Friesian bull, named Sunny Boy. In that period the Dutch dairy sector averaged 1.7 million milking cows! (Compas Magazine, Oct.1999, p.26.) Semen of this bull was also used in many other countries.

Nearly 12,000 years of domestication and breeding under different environments have resulted in some 4000 breeds of farm animals. The genetic diversity of these breeds has made it possible for humans to thrive in all corners of the globe, facing a range of environmental challenges including varied climates, diseases, parasites and pests. Unlike imported industrial breeds, local farm animals in given environments have developed resistance or adaptations to these challenges.

For example, in Rajasthan, India, non-industrial breeds of farm animals have benefited human food security even in a harsh desert climate, where temperatures can rise to 50ºC. This region counts 7 local breeds of cattle, 8 breeds of sheep, 4 breeds of goats, as well as camel and horse breeds. Through these local breeds Rajasthan significantly contributes to the national milk and wool output. Marginal lands can contribute to food security only by working with farm animals adapted to the local climatic conditions (Rathore et al. 2001).

Government interventions in Rajasthan have focused on 'improving' local breeds by crossbreeding them with exotic breeds from other climates. Not surprisingly, the crossbreeding of local sheep with exotic sheep has failed to achieve any improved yield, mainly due to high mortality and problems with feed supply. In the case of cattle, the government has realised the detrimental effects of crossbreeding, and in 1998 revised its policy to protect and improve local breeds.

Negative impact on farm animal welfare

Another negative impact of industrial farming is its impact on farm animal welfare. As recognised by the Treaty of Amsterdam,

Measures to benefit the poor to better compete with the livestock industry (LID 1999)

- Access to credit (to allow for the purchase of animals);
- Access to appropriate (community based) animal health services and simple preventive measures such as vaccinations and improved hygiene;
- Secure grazing rights and access to water;
- Access to markets;
- Trade policies and frameworks that allow smallholders and pastoralists to compete with industrial animal production. For example: support to cooperatives, levying taxes from animal producers based on their ecological and social impacts;
- Improve feeding to increase the performance of local breeds (Haan et al 1998);
- Support livestock production based on local resources (feeds, breeds, indigenous knowledge and institutions) and integrated farming systems;
- Stop subsidising intensive animal production in the North and the South;
- Stop export of subsidised products of the livestock industry to developing countries.

German NGO Forum Environment and Development,
Am Michaelshof 8-10, D-53177 Bonn. Fax: +49 (0)228-359096;
E-mail: gura@foromue.de ; http://www.forumue.de

Local breeds of farm animals, such as these cattle in the Gambia, are better adapted to their environment than breeds imported for factory farming. Photo: CIWF

farm animals are living creatures capable of feeling pain and suffering. Industrial animal farming often closely confines the animals indoors, without light and with little or no exercise. This inhibits the natural behaviour of animals, and is known to create aggression, stress and injuries in animals. Industrial animal farming also carries out standard practices of mutilation: the hen is debeaked, so that she can no longer peck her cage mate, and the pig is tail-docked, so that his bored pen mates can no longer bite its tail.

The surroundings of industrial animal farms can be dirty and poorly ventilated, leading to poor animal health. Moreover, selected breeding for large muscles and fast growth, especially in pigs and chickens raised for meat, leads to leg problems, cardiovascular inadequacy, increased risk of mortality and poor welfare.

Learning from the mistakes of the North

In superficial economic calculations, industrial animal farming is considered the cheapest and most productive form of animal production. But, these calculations do not include the 'total costs' of this production system. Industrial animal production looks viable only when selected aspects of the production – consumption system is viewed. In reality, the hidden costs of industrial animal production for future generations are enormous. It is therefore very important that policy decision makers examine questions such as: Is it acceptable to cause job losses by putting small-scale farmers in poverty stricken populations out of business? Is it acceptable to cause ecological degradation, environmental pollution, climate change and increased ozone layer depletion? Is it acceptable to cause unnecessary pain and suffering to farm animals?

The UK, for example, has been struck by diseases such as foot and mouth disease and mad cow disease (BSE) that has brought the industrial animal farming system under serious questioning by the public. Food poisoning connected with eating animal products is also higher than it has ever been in the UK, leaving consumers to doubt the safety of industrial animal products. More and more consumers are turning away from the products of industrial animal farming towards the products of more sustainable systems such as organic and free-range. The governments in Europe are now beginning to recognise this situation and the value of more quality-driven livestock production. The Netherlands government, for example, has recently begun to subsidise organic pig production by 30%. An editorial comment in World Animal Review in 1998 raised an all-important question: "Should this type of livestock production continue to be encouraged globally, or should alternatives be sought?"

Policy makers must now support more sustainable and humane forms of animal farming and realise that industrial animal farming holds no future for Southern and Northern countries alike.

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Leah Garcés, Compassion in World Farming Trust, Charles House, 5A Charles Street, Petersfield, Hampshire, GU32 3EH, UK. Phone: +44 (0)1730 268863; Fax: +44 (0)1730 260791. E-mail: leah@ciwf.co.uk ; Web site: http://www.ciwf.co.uk.

References

- Cox J and Varpama S, 2000. T**he 'Livestock Revolution' development or destruction? A report into factory farming in 'developing countries'**. Compassion in World Farming.
- Delgado C, Rosegrant M, Steinfeld H, Ehui S, and Courbois C, 1999. **Livestock to 2020. The next food revolution**. Food, Agriculture and the Environment Discussion Paper 28. IFPRI, FAO and ILCA.
- FAO In: Reuters,19 Sept. 2001. **Biodiversity shrinks as farm breeds die out**. http://enn.com/news/wire-stories/2001/09/09182001/reu_farm_45000.asp.
- Gueye EF, 2001. **Marketing of family poultry products in Africa to be improved**. World Poultry. Volume 17, No. 5.
- Haan C de, Steinfeld H and Blackburn H, 1998. **Livestock & the environment: Finding a balance**. FAO, World Bank, USAID.
- LID 1999. **Livestock in poverty focused development**. Livestock in development, Crewkerne, UK.
- Pimentel D et al, 1997. **Water resources: agriculture, the environment, and society. An assessment of the status of water resources**. BioScience Vol. 47 No. 2
- Rangnekar DV, 2001. **Livestock production in rural systems and expected impacts of free trade**. In: Vision 2020: Food security from the grassroots perspective. Forum Umwelt und Entwicklung, Bonn, Germany.
- Rathore, Singh H and Kohler-Rollefson I, 2001. **Indigenous institutions for managing livestock genetic diversity in Rajasthan (India)**. In: Experiences in farmer's biodiversity management. Forum Umwelt und Entwicklung, Bonn, Germany.
- Turner J, 1999. **Factory Farming & The Environment**. A Report by Compassion in World Farming Trust.

For a complete version of the report and the references therein, please contact Compassion in World Farming Trust.

Optimising livestock strategies in Bolivian mixed farming systems

Also for pigeons, there is a place on diversified Andean farms. Photo: Katrien van 't Hooft

Katrien van 't Hooft

Most smallholders in rural Bolivian communities have developed mixed systems, in which the production of crops and the rearing of animals are combined with income-generating off-farm activities. The strategies vary a great deal from one family to another, and also within a family, depending on the time of the year, the age of the family members, or external circumstances. It has been calculated that 90% of rural families in central and south Bolivia earn more than 50% of their income through non-agrarian activities. (Jimenez Sardon, 1984)

Principle of diversification

The strategy used by rural families to counteract risks and optimise opportunities under changing and adverse circumstances is to diversify their activities. (Valdivia and Jetté, 1996). This principle of diversification also forms the basis of family-level livestock keeping in Bolivia, as in most parts of Latin America.

Each family has control over a couple of small plots of land, which are often on different ecological floors and from which they produce a variety of crops, thus minimising the considerable weather-related risks, and guaranteeing self-sufficiency for the family. The animals reared are poultry, guinea pigs, sheep, goats, pigs, cows, donkeys, llamas, alpacas and rabbits, and sometimes, depending on ecological circumstances, carp and bees. Women bear most of the responsibilities in animal care. Animals are an important part of the agricultural system and the culture of peasant families. Animal raising is embedded in Andean cultural values, such as solidarity and reciprocity, community organisation, and respect for *Pachamama* – or Mother Earth. Rural families perform, therefore, numerous rituals and festivals related to livestock throughout the agricultural cycle. The subject of livestock rearing by families is also closely connected to those of biodiversity, environment, gender, poverty and migration.

Livestock research and education

Despite massive investment in livestock research, the benefits to marginalised communities, where livestock is especially important to livelihoods has been very poor. In Latin America, as elsewhere, technologies were developed mainly for intensive and industrialised livestock production systems, assuming that the same technologies could be used to improve all livestock systems. This assumption turned out to be invalid. In fact, most modern technologies do not fit the reality of the low-input livestock system, while they have also enabled commercial producers to displace the smaller and less specialised producers.

Animal science as taught in Latin American universities and farming schools does not take into account the complexity of the context in which rural families rear livestock. Rather, attention is focused on reaching the maximum productivity per animal, limited to animal species used in industrialised livestock keeping, especially cattle, pigs and chicken. The absence of essential elements of family-level livestock keeping in the curriculum is reflected in the frequent failures of livestock projects.

Failure of livestock projects

Stimulating livestock keeping at family level is an objective of many livestock projects. It is at this level, though, that failures are most frequent and have harsh consequences. An analysis (Blackburn et al, 1992) of different livestock projects revealed that many were inadequately adapted to the social, economical and cultural reality of the families belonging to the target population. The projects intend to change the people's system of production, usually from a diversified low-input system to a specialised one, directed to a monetary market, without consideration of the social implications and risks that these actions pose to rural families. Many of these projects have not been preceded by a thorough analysis of the reality of the families, like their ways of seeing the world (or cosmovision), their survival strategies, the rationale behind their different productive systems, the role of animals within this reality and the way the families perceive projects. Moreover, a lot of information on the outcome of projects is shelved as work reviews, poorly accessible to students and other interested people. Thus, the same mistakes are repeated.

Two basic strategies

A wide array of livestock keeping strategies can be observed among rural families. Basic elements of these strategies are the use of various animal species, the flexibility to change from one species to the other, and the low-external-input nature of the management system. Most families base their livestock keeping on *diversified* husbandry practices: poultry and pigs scavenge around and do not require major labour or capital input, and *cuy* (guinea pig) are kept in the kitchen, fed on leftovers. Though there is high mortality amongst these animals, their output is produced against very low cost. In addition, one species, like for example milk cattle, may be managed under a more *specialised* system, requiring relatively high levels of capital and labour input, and depending on market sales. The logic behind this more 'specialised' livestock system is quite different to that of the 'diversified' livestock system.

Though all divisions are artificial and never reflect reality in all its complexity, we can use this division in the main strategies of family-level livestock keeping: diversified and more specialised management of animals (Table, next page). They have to be considered as the two extremes of a continuum, with many variations in between. It is helpful, however, to understand the basic idea and logic behind each of these livestock keeping systems, in order to find ways to optimise each of them.

Different ways for optimising

In general terms, under the conditions of diversified livestock keeping, it is not possible to increase profits by reducing the costs of production, because these costs are minimal. It is also not possible to aim for a major increase of productivity per animal, as that would require a large investment of cash and labour, which goes against the basic principle of this strategy. The

Table 1: Characteristics of the two basic livestock keeping strategies

CHARACTERISTICS	DIVERSIFIED LIVESTOCK KEEPING	SPECIALISED LIVESTOCK KEEPING
LABOUR	Mainly women and children - combined with migration	Usually the whole family, including men
RISK FOR FAMILY	Low, because of the different species used	High, dependence on (external) conditions related to one species
FUNCTION OF THE ANIMALS	Multiple: to be consumed by the family, to be sold, as a way of saving and reducing risks, to produce organic fertiliser and medicines, for cultural and spiritual reasons	Mainly for income generation
PRINCIPLES	The number of animals most important. Reduced investment and low output of traditional products (meat, milk, eggs, wool, fur), combined with the use of other products, like manure, bones, horns, blood, bladder.	Main focus on production level per animal. Large investment of money and labour to sell traditional products. Specialised keeping of one species is often combined with diversified keeping of other species.
MANAGEMENT	The animals are kept in many different ways. Temporary food shortages and disease risks are part of the system.	The animals are kept in a relatively uniform way, directed at optimal conditions throughout the year.
TYPE OF HEALTH CARE	Based on local practices and medicine (ethnoveterinary medicine), sometimes complemented with selected 'modern' practices. Veterinary care includes rituals and local practitioners.	Based on 'modern western' practices by field workers and veterinarians, complemented with selected ethnoveterinary practices of the owners. Limited consultation of local practitioners
FLEXIBILITY	High, it is easy so shift from one species to another	Low, due to high individual value of the animal and the specialised knowledge and network required

best way of optimising diversified livestock keeping, without veering away from its principles, is to *reduce the mortality rate* of the animals. Under normal circumstances, the mortality rate in diversified livestock keeping can vary from 40% to 80%. This is due to a variety of reasons, such as infectious diseases; theft, accidents and predators; food and water shortages; lack of shelter; internal and external parasites; lack of care during special moments such as parturition and disease; and inbreeding. The relative importance of each of these variables differs according to the animal species and the circumstances.

In more specialised livestock keeping the mortality rates are generally much lower than in diversified keeping, because of the extra attention given to feeding and care of the animals. The way to optimise specialised livestock keeping is by *reducing the costs of production* and *increasing the profit margin per animal*. This may imply, for example, improving feeding strategies throughout the year, or cross-breeding with exotic breeds. As this is also the basis of industrialised livestock keeping, plenty of documentation about these technologies is available. Stimulating the cooperation and organisation amongst families that produce a specific species can be a major starting point, to improve marketing and infrastructure, for example.

Niche for poverty alleviation

The measures taken to reduce the mortality rate in diversified livestock keeping should be based on the strategies, the practices and the knowledge of rural families, especially of women. These measures should be cheap and require little additional labour; the income earned in the short term as a result of these measures should be greater than the costs necessary to implement the change. Under these conditions, the measures can combine traditional practices with strategies of modern veterinary medicine, and include the training of community-based animal health workers.

Various projects have shown that it is indeed possible to reduce mortality rates under these circumstances, i.e. low-cost vaccinations against specific diseases such as Newcastle disease in chicken or hog cholera in pigs; protection of chicks from predators by confining them during the first 2-3 weeks of their lives; strategic parasite control in llamas and alpacas; selection and exchange of stock of indigenous breeds; and specific actions to counteract the worst effects of food shortages, such as supplying mineral salts and supporting traditional forms of feed supplements during the critical periods. Special attention and simple infrastructure during and after parturition, can drastically reduce the number of piglets crushed to death by the sow.

There is, however, a lack of knowledge generation, extension materials, research and education in this field, as most livestock development initiatives have aimed at changing the diversified systems into more specialised ones. Optimising the diversified system of family level livestock keeping within it's own context, and without changing the logic it is based on, is an under-utilised niche for poverty reduction. It implies a major challenge for projects, as well as for research and education in the livestock field.

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Diversifying their livestock activities, a strategy used by rural families to counteract risks and optimise opportunities under changing and adverse circumstances. Photo: Katrien van 't Hooft

Katrien van 't Hooft, ETC - COMPAS, PO Box 64, 3830 AB Leusden, The Netherlands. Katrien.hooft@etcnl.nl

More information in "*Gracias a los animales: la crianza pecuaria familiar en América latina con estudios de caso de los valles y el Altiplano de Bolivia*". Edited by Agruco, Cochabamba, Bolivia. Forthcoming. Katrien van't Hooft, editor.

References

- Blackburn H., and de Haan. C. (editors), 1992. **Livestock development projects – past present and future**. Proceedings of an informal meeting of donor representatives involved in livestock development, organised by USAID and the World Bank, Paris, France December 1992
- Jimenez Sardon G. 1984. **Gender relationships within the peasant households**. En: Género en instituciones de desarrollo rural andino, Consejo Andino de Manejo Ecológico (CAME)
- Valdavia Score C. and Jetté C., 1996. **Peasant households in semi-arid San José: confronting risk through diversification strategies**. SR-CSRP technical report series, IBTA 181/technical report49/SR-CRSP47

Animals need shade trees to feel comfortable. Photo: Ana Primavesi

Optimising climate-soil-pasture-cattle interactions in Brazil

Ana Primavesi and Odo Primavesi

In nature, nothing functions in isolation; everything depends on the other factors present. In animal production, to optimise the performance of cattle, it is very important that management practices try to enhance the ecological functioning of the web of living organisms within the production system - climate, soil and soil life, vegetation and cattle - by influencing their interactions. In this article we look at some of these interactions and how, in Brazil, they can be optimised in an ecologically sound way.

Adapting pasture to the soil and cattle to the pasture

Cattle breeding is a very expensive activity when the breed is selected first, then the pasture suited to that breed and finally the soil is corrected with lime and fertiliser to make the pasture grow. This order has to be reversed. The pasture has to be adapted to the soil and the cattle to the pasture, and all of it has to fit the climate. In the tropical climatic zone, European breeds should be used only for crossbreeding with zebu cattle. It is not the most productive breed that will give the best performance, but the breed that adapts best to the existing ecological conditions, climate, soil and pasture.

Increasing water availability for plant growth

Forage yields depend strongly on the availability of water. Especially in the dry areas of Brazil, improving permeability and the storage capacity of the soil can increase water availability. Covering soils with vegetation and its residues allows for better infiltration of rain water, improves the soil structure, and thereby increases its air and water circulation and storage capacity necessary for plant metabolism and efficient plant nutrition. In a well-structured soil, roots are able to explore a larger soil volume for more water and nutrients. Plants can, therefore, develop better and faster and will be less affected by drought. Integrating deep-rooting crops and trees into the pasture system will further increase the production of biomass and the overall performance of the system.

Plants absorb water from the soil and transpire it. When the air is saturated with water vapour, plants cannot transpire any more. But when the wind carries it away, they absorb more water from the soil and transpire more water into the air, thus drying up the soil. In Brazil, in one year, wind can carry away an equivalent of 750 mm of the total rainwater. Planting of shrubs and trees as windbreaks can strongly reduce the transpiration of pastures and hence increase the available water for plant growth.

Enhancing micro-climate for comfort

When the surface temperature of tropical soils is higher than 33° C, plants cannot absorb water and nutrients any more. Deep rooting trees can act as air humidity and temperature regulators, pumping water from the subsoil, and releasing it through transpiration. Therefore the shade of trees is cooler than for example, the shade of a dry leaf roof.

An animal is not a machine into which forage is put in and milk and meat comes out. It is a living being that needs to be comfortable to produce well. Shade trees provide comfort to cattle. In the colder season it is 3 to 4° C warmer under the trees and in the hot season it is 3 to 4° C cooler. Pastures with at least 50 shade trees/ha allow a yield increase of 15 to 30% milk and around 20% meat. It is not only the quantity of fodder quantity or the energy consumed or the digestibility of the forage that matters; it is also the comfort that makes cattle produce well.

In Brazil, there is an increasing tendency to establish wind shelters and small shade forests to avoid water losses by wind and to improve animal comfort. In extensive systems with

cerrado (savannah) vegetation, the bushes and trees provide additional advantages, like the supply of forage and increase of biodiversity of forage species. This allows for better animal weight maintenance and even an increase, compared to monoculture grassland, also in the dry season. When new pastures are opened, with maintenance of bush and tree strips of the original "cerrado" vegetation, the grass grows faster and the productivity is higher, due to wind protection. *Embrapa Agrobiology*, the Brazilian research centre on agrobiology, near Rio de Janeiro, has developed an easy way to establish legume trees even on very degraded pastures, by inoculating the seedlings with *Rhizobia* and *Micorhizae* and adding a little phosphorus to the substrate. Organic matter production and accumulation in these soils is surprisingly fast. This works well as a pre-treatment for establishing forage plants

Grazing rotation instead of fire

The division of pastures into smaller sub-units for grazing rotation is fundamental to prevent grassland being destroyed by cattle. In native grassland, cattle always first eat the plants it likes most. The plants that are not eaten get old, hard and are not tasty. The eaten plants sprout again and are grazed on another time. This goes on until these palatable plants disappear. But the less appreciated plants continue to grow and multiply and with time the entire pasture gets hard, rough and has little nutritive value. Then the ranchers set fire to the pasture. Many plants die, and only those that can protect their growing points against fire survive. Thus the pasture becomes worse and the forage volume smaller. Eight consecutive years of burning, with one fire per year, is enough to decrease plant production to 25% of the initial. As only the hard, less palatable plants that cattle eat only when very tender are left, farmers burn the pastures up to five times per year. Thus all organic matter that nourishes soil micro-organisms is burned out, resulting in their death. The soil compacts, water runs off and the vegetation gets scantier.

All perennial plants need a rest period to recover the reserves in their roots, which are needed for re-sprouting. Forage plants and weeds recover their root reserves only when they bloom. Grasses need to bloom and form seeds once a year. This makes pastures more resistant to droughts and low temperatures and warrants vigorous re-sprouting. Ranchers say: "*rest for a pasture is as good as irrigation*". Forages cannot always be grazed when it is best for the cattle. Sometimes they have to rest to recover their forces. In Brazil, rotative grazing is getting more common under better-controlled conditions, using electrified fences, sometimes powered by solar energy.

Integrating leguminous forage plants

In Brazil, 70% of the pastures are of *Brachiaria (decumbens, brizantha* or *ruziziensis),* and 80% of the cattle are improved *Bos indicus,* this is zebu, mainly of the Nelore breed. *Brachiaria* is an African grass with very active *Micorrhizae* fungi on it roots which give it a high degree of adaptation, productivity and efficiency of phosphorus absorption and use. The main problem is that it is planted in monocultures. In more fertile soils, *Cynodon dactylon* cv. Coastcross and Tifton , and different cultivars of *Panicum maximum* (Tanzania, Tobiatan) and *Pennisetum purpureum* (Elephant grass) are used.

Grass-legume mixtures are rare because the tropical grasses are very aggressive when supplied with nitrogen. Pasture with soybean rotation is more common. After 3 to 4 years of *Brachiaria brizantha,* soybean is direct seeded into the desiccated pasture. The nitrogen input by soybean improves the growth of *Brachiaria* grass, allowing an increase of the stocking rate from the national mean of 0.5 Animal Units (AU)/ha up to 3 AU/ha. Nitrogen-fixing legume shrubs and trees like *Cajanus cajan* or *Leucaena leucocephala* and other fast growing species are introduced in semi-intensively managed pastures for protein rich forage.

Eliminate nutrient deficiencies

Tropical grasses have a very high biomass production potential, but need a good water and mineral supply. But cerrado soils, for example are acidic and poor, especially in calcium, magnesium, phosphorus and potassium. The major nitrogen sources are nitrogen-fixing leguminous plants, cattle manure and synthetic nitrogen fertilisers. Small doses of phosphorus (35 to 42 kg/ha P_2O_5) are needed to guarantee the development of forages. Phosphorous-deficient, decumbent grasses like *Brachiaria*, don't form stolons, have a shortened vegetative cycle, bloom early and produce little biomass.

Cattle also need phosphorus. Insufficient phosphorus in the pasture lowers milk and meat production and makes cows sick. It happens specially when pastures have old, dry forage, or when the soil is compacted by overgrazing and forage roots cannot penetrate the surface layer of the soil. It can be completely avoided by applying phosphate fertiliser or giving cattle mineral salts.

There also can be other nutrient deficiencies, which affect animal health, like that of calcium causing a kind of "grassland tetany". This can occur especially in *Brachiaria humidicula* pastures, but also in young, vigorously sprouting grasses or in very compacted soils.

Magnesium-deficient zebu cattle are very nervous and aggressive and the heifers do not develop well. Cobalt, extremely deficient in the Amazon region, is the mineral which is most lacking in Brazilian grassland. Young animals are meagre, gloomy, without appetite but gnawing at tree barks; they loose the hair from their tails and have a scrubby hide. In all cases mineral salts are very important to compensate for the mineral deficiencies and to keep the animals healthy.

Parasites and diseases

One of the biggest problems in tropical cattle breeding is parasites, mainly worms, ticks and bots. The horn fly becomes an increasing problem in flogs treated against parasites with injectable *Ivemectin*. This is because the beetle that eats the larvae of the fly in the cattle excrements is also killed. With rotational grazing and a pasture with 20-25 % legumes, the worm problem can be practically controlled. Tick attacks are mostly seen in European cattle that have a thinner hide. Zebu cattle are rarely affected. The problem of bots can be resolved by selecting the bot-resistant animals and selling the affected ones. Normally, "sweepers" (animals with no respect for fences, grazing anywhere) never have bots.

Towards "green meat" and "green milk"

To prevent 'global climate change' by 'greenhouse gases', it is important to reduce methane emission by cattle. This obliges farmers to speed up animal production per unit area and to reduce the slaughter age to get a lower ratio of kg methane/kg animal protein (meat). The use of grains for animal feed has to be reduced as well, giving priority to human consumption. This then increases the dependence on forage. But, as grass cellulose is the main source of methane emission, management practices that contribute to an increase of forage yield per unit area and maintain stocking rate without weight losses, all year long, are needed. Profitability, competitiveness and sustainability of the production system will be thus increased whilst reducing the negative impact on the environment.

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Ana Primavesi, Fazenda Ecologica, POBox 36, 18730-000 Itaí, SP, Brazil. Email: sindritai@laser.com.br
Odo Primavesi, Embrapa Southeast Cattle, PO Box 339, 13560-970 Sao Carlos, SP, Brazil. Email: odo@cppse.embrapa.br

References
- Primavesi A, 1998. **Manejo ecológico de pastagens**. Nobel, São Paulo, Brazil.
- Primavesi A, 1989. **Manejo ecológico de solo.** Nobel, São Paulo, Brazil. www.livrarianobel@com.br

The drawing provides an overview of the different components of an integrated system as developed by CIPAV.

Integrated systems: the experiences from CIPAV in Colombia

Enrique Murgueitio

In Colombia, inefficient extensive cattle ranching by 10% rich farmers occupies 40 million ha, 90% of agricultural lands. The 90% poor subsistence farmers have access only to about 10% of the land and must produce in an increasingly intensive way. Farming units smaller than 20 ha cover only 13% of the land but comprise 74% of farms. Permanent crops such as coffee, oil palm and sugar cane occupy 3 million ha and short-cycle crops, mainly cereals and tubers, around 2 million ha.

Since 1986, the Centre for Research on Sustainable Farming Systems (CIPAV) has worked in the south-west of Colombia, conducting participatory research studies with peasant farmers and entrepreneurial producers on different aspects of integrated systems. In recognition of the development and implementation of these systems in the humid rural areas of Colombia, CIPAV was awarded the ecological prize "Blue Planet Award" in 1995. Presently, much of the progress made in generating, validating and applying new know-how regarding these systems has been concentrated on issues such as agroforestry and silvopastoral systems, environmental adaptation of livestock, management of micro watersheds, water decontamination and production of healthy food products. In this article the author provides an outline of the basic models.

The basic components of the peasant systems

The small-scale integrated systems that have been developed with peasant farmers use highly productive annual crops, multipurpose trees and water plants as sources of biomass to provide feed for cattle and other animal species, food and fuel. The systems consist of several subsystems that can be introduced separately or as an integrated farm. These subsystems are: biomass production (crops), ruminants, monogastrics (poultry, fish, earthworms), water decontamination and biogas (see Figure p.26). This basic model is developed for small-scale farms but has been adapted to large-scale as well.

The system can be either based on a crop or on residues and by-products of processed tropical crops. Sugar cane planted at high density, oil palm, coconut palm, plantain, banana or cassava are a few examples of crops that can be used. In the case of sugar cane, the juice is fed as a complete replacement of cereals to pigs and ducks and supplemented with fresh water fern *Azolla filiculoides* and whole soybean grain. Local fodder tree species like *Gliricidia sepium, Trichanthera gigantea, Erythrina fusca, Erythrina peoppigiana, Erythrina edulis, Thitonia diversifolia, Morus alba, Leucaena leucocephala, Moringa oleifera, Cnidoscolus aconitifolius* or *Guazuma ulmifolia* are used depending on which adapts better to the local conditions. The tree foliage is harvested and the leaves are used as a source of protein to supplement sugar cane tops for feeding cattle. Trees are also used as sources of fruits, shade and nitrogen. Animals are partially stall-kept, allowing for easy recycling of their excreta by vermicomposting or through a biogas digester to provide fuel. Biodigesters are part of the treatment for decontamination of waste water from washing animal enclosures and coffee beans. The productivity of these intensive integrated farming systems is 3 - 10 times higher than of traditional farming systems. The system can be implemented gradually at a pace convenient for each farmer. Few farmers set up the whole system at once. Resources required are mainly manpower, manure and plants.

The "Productive Decontamination" subsystem

This subsystem consists of a plastic-bag biodigester of *continuous flow* (water and organic residues enter and escape continually at a constant rate), aquatic plant channels, fishponds

and associated crops. Waste water goes into the biodigester to produce biogas from organic waste. The effluent is directed through zigzag channels with aquatic plants where suspended solids, phosphorus, nitrogen and heavy metals are removed by bacteria and the plant root systems. The channels have different species of plants that vary in their degree of efficiency to decontaminate (*Azolla filiculoides, Azolla sp., Lemna minor, Eichornia crassipes, Salvinia natans*). Aquatic plants and sediments from the channels are used to fertilise forage and fruit crops. Finally, the water can also be sent into a fishpond where plankton utilises the remaining minerals in the water to produce biomass to feed fish. Fish are produced in a system of multiple association of species (*Prochidolus reticulatus, Cyprinus carpio* and *Colossoma macropomum*). Pressed stalk and stems are also used as fuel. In this integrated system waste products are minimised and the local resources are efficiently used. Fuel production is an added benefit for the family and the environment. In small farming units biogas is used for cooking while entrepreneurial farms use it for warming piglets or generating electrical power in internal combustion engines.

Components of the commercial systems

In the larger-scale commercial systems, the biomass subsystem is divided into four components (sugar cane, silvopasture, grassland and aquatic plants). The cattle are of a dual-purpose type for both milk and meat production. The silvopastoral subsystem consists of grass (*Cynodon nlemfuensis, Panicum maximum* or any other Gramineae), associated with a legume tree like *Leucaena leucocephala* or *Erythrina fusca* (10,000 or more plants/ha). Grazing on these pastures allows the animals to freely browse on the fodder trees, which regenerate naturally. Grazing is rotational and pastures are fertilised with manure and effluent from the biodigester. Calves are kept under a restricted suckling regime supplemented with sugar cane tops, grass, urea-molasses blocks and a mixture of tree foliage and palm oil. Commercial feed has been completely replaced with excellent biological results. These systems eliminate the costs of nitrogen fertilisation, allow an increase in the number of animals per unit area up to 5 animals/ha (national average: 0.5/ha) and increase milk production above 12,000 l/yr. Given the fact that the system is environmentally friendly and highly productive, some areas of land can be freed for conservation.

Diversification in the use of sugar cane has resulted in the production of certified organic *panela* (dark sugar loafs) for export using animal manure as fertiliser and substituting herbicides with hair sheep and manual weed control. Sugar cane has also been used in steer fattening (stalks and tops) combined with tree forages such as *Gliricidia sepium* planted in densities between 10,000 and 20,000 trees/ha.

In commercial swine production, water is decontaminated using biodigesters that allow 20-25% reduction in the cost of electric power by using a mixture of biogas and fossil fuel (diesel or gasoline) in internal combustion engines.

The use of tractors for low-weight cartage is restricted through the use of animal draught, mainly buffaloes and mules, with a 50% reduction in the cost of these activities and environmental (emission reduction) and social (employment generation) benefits, while maintaining efficiency.

The approach is spreading in the humid tropics

The CIPAV system is ideal for the humid tropics in Central and South America and Southeast Asia, where biomass production is not a limiting factor but conservation of natural resources and the environment is a priority. For the last 10 years these systems have been tested, adapted and adopted (either all or some of the components) by small farmers in different climatic conditions in Colombia. Currently this technology is being transferred and adapted to the Philippines, Cambodia, Vietnam, El Salvador, Barbados, Trinidad and Tobago under FAO assisted projects. ■

Enrique Murgueitio, Executive Director of the Research Centre on Sustainable Farming Systems – CIPAV, Carrera 2 Oeste # 11-54, Cali, Colombia, Phone: +57(2) 8930931; Fax: +57(2) 8935535
Cali, Colombia. Enriquem@cipav.org.co. Web site: http://www.cipav.org.co

References:
- Murgueitio ER, 1998. **Mixed farming production systems: a sustainable solution for livestock production in Latin America.** On: http://www.cipav.org.co
- Murgueitio ER, 2001. **Participatory research on integrated silvopastoral systems: experiences of CIPAV in Colombia.** LEISA Revista de Agroecologia Volume 16, No. 4 (Spanish).

CIPAV has produced many how to do publications, available in Spanish only.

Native tree species for silvopastoral systems

Currently, CIPAV is working with local communities in the central and western Andes of Colombia on the integration of native tree species in silvopastoral systems. Two examples of research on such trees are:

1. Nacedero *Trichanthera gigantea*

This species, native to the northern Andes, is traditionally used by rural indigenous and small farmer communities in Colombia and Venezuela. Its main uses are related to its medicinal properties and to increasing spring water. The water-attracting capacity has been mentioned by different authors but has not yet been proved through formal scientific methods. Researchers from CIPAV learned from the farmers how to use this species as a fodder plant. Since then participatory research has allowed for considerable gain of knowledge related to this species. Some important products and results of this research are:

- Intensive cultivation in protein banks in more than 20 departments in Colombia and 12 countries in Central America, the Caribbean, Venezuela and Southeast Asia
- Fast asexual propagation techniques
- Germoplasm collection in Colombia and Venezuela
- Inclusion in most Andean micro-watershed reforestation projects in Colombia
- Commercial products for natural medicine

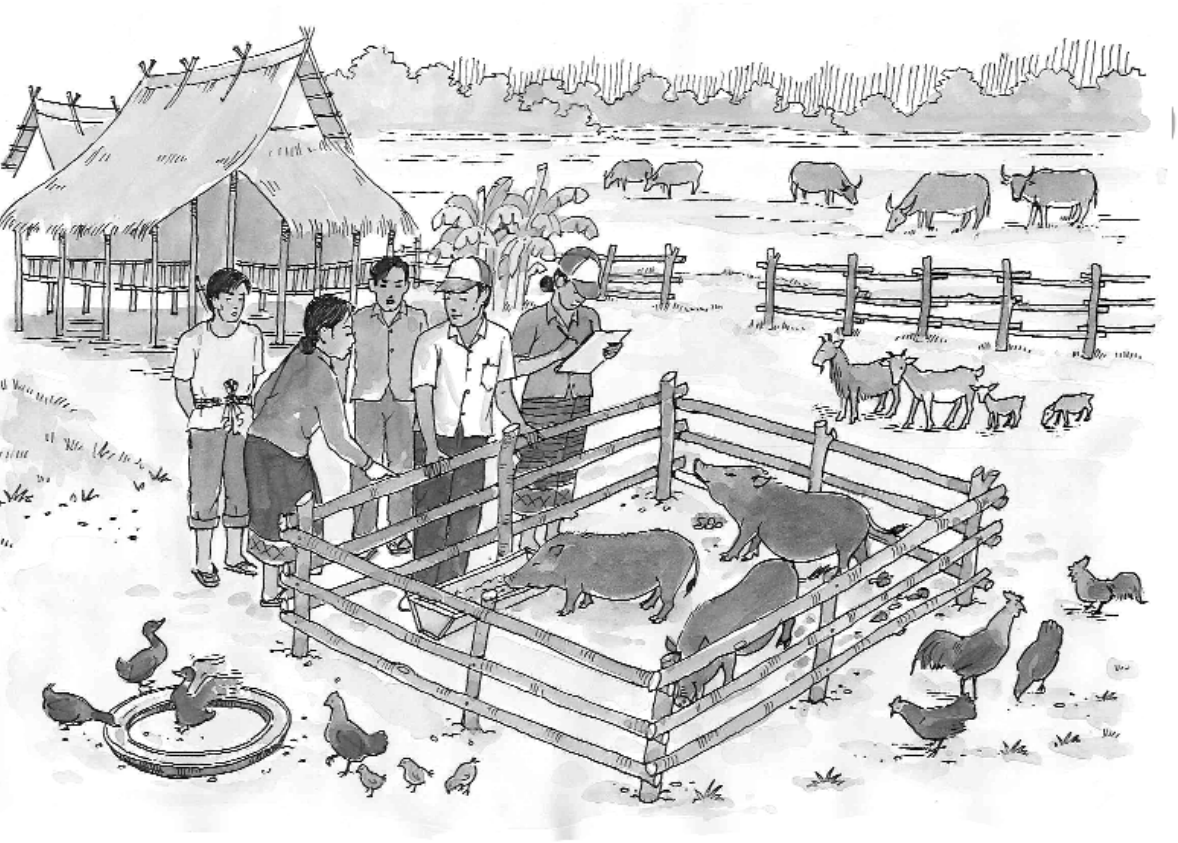
2. Arboloco *Montanoa quadrangularis*

This is a tree species from the Andes of Colombia and Venezuela that grows fast in unforested habitats. For more than a century this species has been used for construction of houses and buildings, animal enclosures, coffee-drying sheds, corrals, furniture, fences etc. Its white pith is used in handcrafts.

Work done by CIPAV with this tree relates mostly to phenology, regeneration, growth, rehabilitation of degraded pastures, plantations and agroforestry systems. Young farmers trained to conduct rigorous periodic observations participate as co-researchers. In less than 5 years and with a limited budget these studies have benefited small farmers and institutions in the form of:

- Guidelines for the restoration of deforested micro-watersheds
- Plantations for the rehabilitation of degraded pastures
- Low-cost technology for establishing habitat corridors, live fences and tree-lines for erosion control.

The results of these research programmes have been presented in the electronic conference on 'Agroforestry for animal production in Latin America' organised and run by FAO and CIPAV (see http://www.cipav.org.co).



What happens when the river runs dry?

Viengsavanh Phimphachanhvongsod, Peter Horne and Werner Stür

Lao people say, "*When the river is in flood, the fish eat the ants. When the river runs dry, the ants eat the fish*". For many of the 80% of the Lao population who are rural, this saying encapsulates their deep connection with seasonal change and cycles of shortage and surplus. Shifting cultivation, the dominant farming system in the northern mountainous regions of Laos, is susceptible to the vagaries of climate, soils and steep slopes. In Xieng Khouang province, for example, where shifting cultivation is widespread, upland rice yields are among the lowest in the country (<1.2 t/ha), the average household size (6.5 – 8.1) is the highest in the country, female literacy rates are among the lowest in the country and 6 of the 7 districts have nett negative food balances (Sisouphanthong and Taillard, 2000).

The most pressing problem facing farmers in these areas is declining rice yields, due largely to declining soil fertility and increasing weed problems. Both of these are the result of shorter fallow periods (which averaged 12 years in 1981-2 but have fallen as low as 3-4 years in the more-intensively farmed areas). In the recent past, farmers were able to overcome occasional disasters in their rice crops by gathering forest products and hunting wild animals for home consumption and sale. These coping mechanisms have, however, rapidly diminished in the last 20 years, resulting in newly emerging poverty.

So, how do farmers cope with this increasingly vulnerable farming system? Many strategies are emerging depending on local and household opportunities. Some are robust strategies and are likely to persist, such as diversifying farm activities to reduce reliance on upland rice and concentrating labour and manure on the smaller areas of more fertile fields. Other strategies are short-term coping mechanisms that have developed in the absence of better alternatives, such as selling labour and growing cash crops in the hope that traders will come to buy them. But, the most widespread strategy, which is becoming increasingly important, is to raise animals. Livestock are the easiest way for most upland farmers to accumulate capital, (delivering a high return per unit of labour input) and they can be sold in a market environment where there is constant demand and stable prices (unlike most crops). Typically, the better-off farmers will have 5-10 cattle and buffalo whereas nearly all farmers raise small animals (chickens, pigs, ducks or goats).

The link between livestock and reducing poverty

A study by the State Planning Committee (SPC) in 2001 asked farmers across Laos to define poverty, identify its causes and prioritise the ways they would like to overcome poverty. Livestock emerged as the primary indicator of wealth, livestock disease ranked second as a cause of poverty, and livestock acquisition ranked second as a solution to poverty. This was particularly so among the ethnic groups which inhabit the remote mountain areas. Among the poor, women were, on average, worse off than men. The raising of small livestock is typically women's work. At certain times of the year (especially at the start of the wet season) they spend 30-50% of their working time collecting feed for pigs. These small animals are particularly susceptible to catastrophic disease epidemics and, when disease strikes, "the loss to the family is every bit as traumatic as the collapse of a bank in which all of one's savings were held".

The need for new options in smallholder livestock production

The strong emphasis placed by smallholder farmers on livestock as a "stepping-stone" out of poverty has encouraged government and non-government organisations throughout the country to work on improving smallholder livestock systems. In an earlier article in LEISA Magazine (Vol.16, No.3, pp.26-27) we described research that is being done with farmers in the northern mountainous regions of Laos to identify forages (both grasses and legumes) that can help minimise some of the livestock feeding problems. In this first year, working with 222 farmers in 18 villages, the most promising forage technologies that have

emerged are those which:

- help farmers overcome seasonal feed shortages (such as the grass *Panicum maximum* "*Simuang*" for cut-and-carry feeding of cattle and buffalo when they are sick, working or penned)
- help reduce labour requirements in looking after animals (such as the legume *Stylosanthes guianensis* CIAT184 which can be grown near pens as a source of high quality feed for pigs) and,
- can provide feed at particular times of year when traditional feed resources are in short supply (such as *Brachiaria brizantha* "*Marandu*" for providing green feed to cattle and buffalo in the dry season)

The most promising varieties for Southeast Asia and their potential impacts on smallholder farmers (based on field experiences of over 5 years) have been described in two books that are available in English and five regional languages (Horne and Stür, 1999, Stür and Horne, in press).

Forages will, however, only ever be one component of livestock feed resources and, especially for small animals, new supplementary feed resources are needed. To provide an energy source for their pigs, for example, Hmong women in the remote district of Nonghet grow maize. They have two traditional varieties but neither satisfies their needs. We are now expanding our work in partnership with such farmers to evaluate and develop other feed resources (especially new legume, maize and sweet potato varieties) to help them diversify their livestock feed resource base.

In the study by SPC about 70% of the villages surveyed identified livestock disease as an urgent and high priority problem. Epidemic diseases (particularly fowl cholera and Newcastle disease in chicken, swine fever in pigs and the parasite *Toxocara vitulorum* in buffalo calves) can cause annual losses of 80% or more. *Haemorrhagic septicaemia* results in occasional major losses of cattle. Two complementary approaches are being developed to deal with these disease problems. The first is to build a national network of Village Veterinary Workers who are linked to district offices, which can supply them with veterinary medicines. This is a strategy that will have longer-term impacts but is dependent on the development of a supply chain that can deliver good-quality vaccines and veterinary chemicals to remote areas. In the shorter term, some organisations are working with farmers to develop livestock management and simple medication strategies that do not eradicate these diseases but limit the impact.

Where is this leading?

Working with upland farmers in Laos to improve livestock health, feeding and management strategies is likely to have major positive impacts on poverty in the short to medium term. Research and development like this is not, however, an "end-game" in which a solution is developed for a problem and that's the end of the story. For every solution there are new opportunities, problems and issues. In 25 years time, many farmers we are working with now may no longer keep livestock, but they have used livestock to build capital to allow them to take the risk of moving into new enterprises. The key to sustainable development in this context is the mentoring of groups of people at community, district and province-level who have the experience, skills, confidence and mandate to work together to resolve new problems (or take advantage of new opportunities) as they arise. In this sense, the **process** of research and development is as important as the technologies that are developed.

It is common for district officers to make trips to villages only when they are asked to collect data or when there is a technology package to be 'extended', often through the development of model farms. These unrelated village visits and the lack of adoption of 'tech-packs' by farmers develops an expectation among district officers that 'we cannot make a difference'. The general trend towards genuine participatory research that is happening throughout the world offers an alternative that empowers district officers to see that they **can** make a difference. We are assisting four districts in Laos to implement a new process in which the district officers, their institutions and farmers work through a series of steps in an annual process to find solutions to their livestock problems and capitalise on emerging opportunities (see Figure 1). Details of each step in the process are described in more detail in a book that will be published later this year (Horne and Stür, in prep). The key to the process is to encourage district officers to experiment and adapt the approaches to suit their needs. Working with farmers as active partners will be a learning experience for all concerned.

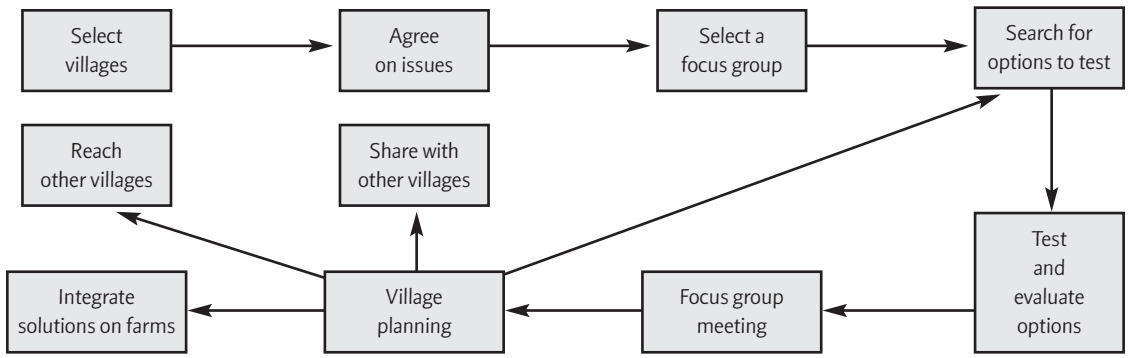
So what happens when "the river runs dry"? Poverty in Laos is not endemic and not generally synonymous with hunger, but farmers are susceptible to an increasingly risky environment. Livestock are an important insurance against calamity when "the river runs dry". Developing new technical options with farmers in a process that builds linkages and confidence between farmers and development workers is helping to build resilience into their farming systems. ■

Viengsavanh Phimphachanhvongsod, National Agriculture and Forestry Research Institute, PO Box 811, Vientiane, Laos. Email: vieng63@laotel.com
Peter Horne, CIAT-Lao Forages and Livestock Systems Project, PO Box 6766, Vientiane, Laos. Email: p.horne@cgiar.org
Werner Stür, 22 Seventh Ave, Windsor, QLD Australia. Email: w.stur@cgiar.org

References

- Horne PM and Stür WW, 1999. **Developing forage technologies with smallholder farmers – how to select the best varieties to offer farmers in SE Asia.** ACIAR Monograph 62 (also available in Lao, Indonesian, Thai, Vietnamese and Chinese). 80pp (ACIAR, Canberra).
- Stür WW and Horne PM (in press). **Developing forage technologies with smallholder farmers – how to grow manage and use forages.** ACIAR monograph series. (also to be published in Lao, Indonesian, Thai, Vietnamese and Chinese). (ACIAR, Canberra, in press).
- Horne PM and Stür WW (in preparation). **Developing agricultural solutions with smallholder farmers – participatory approaches for getting it right the first time.** (ACIAR Monograph Series). (also to be published in Lao, Indonesian, Thai, Vietnamese and Chinese).
- Sisouphanthong B and Taillard C, 2000. **Atlas of Laos: spatial structures of the economic and social development of the Lao People's Democratic Republic**. 160 pp. (Silkworm Books, Chiang Mai, Thailand).
- SPC (2001). **Participatory Poverty Assessment in Laos. A study prepared by the State Planning Committee.** 448 pp. (ADB, Vientiane).

Figure 1: The process of finding solutions to livestock problems



Adaptation of the zero grazing concept by Luo farmers in Kenya

Nelson A.R. Mango

The National Dairy Development Project (NDDP) of Kenya was implemented by the Kenyan and Dutch governments with the main aim of increasing milk production for the market. In 1979, the NDDP introduced a dairy farm concept based on *zero grazing* (ZG) which involves confining of dairy cattle in a stall and the development of a cut and carry fodder system. When the project ended in 1999, it had covered a total of 25 districts throughout the country and over 10,000 farmers were involved in either ZG or semi -ZG dairy farming. Many of the Luo farmers of Siaya district embraced the project as they were attracted to the additional benefit of ZG, namely replenishment of soil fertility for crop production. However, they introduced a number of adaptations to the ZG concept to fit their needs and opportunities. The ZG concept and the adaptations made are discussed below.

The zero grazing concept

The research component of NDDP produced a technology package that aimed at addressing the constraints of smallholder dairy farming in Kenya: lack of grazing land, low productivity of dairy cows, low quality of fodder, prevalence of diseases and lack of financial means (Valk, 1990; Muma 1994). The package consists of several components:

Housing (the zero-grazing unit): Fig.1 shows the floor plan of a ZG unit building as proposed by the NDDP. In the ZG system, the cows are kept inside all year round to prevent tick-borne diseases and other health hazards.

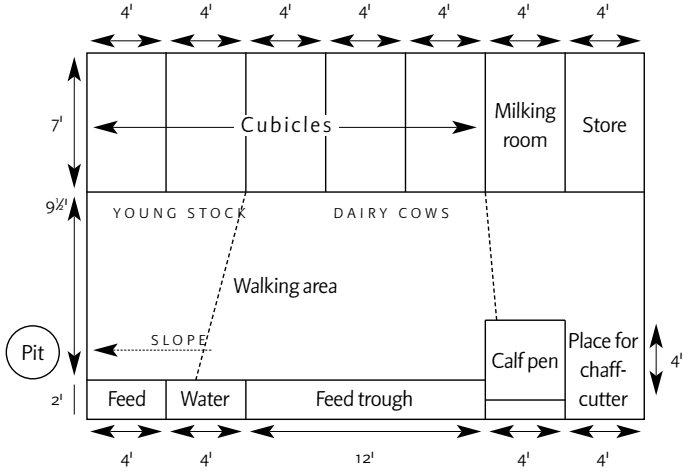


Fig.1 Floor plan of zero grazing unit

The introduction of improved dairy cattle breeds. The NDDP recommended that farmers stock their units with high milk yielding graded dairy cows. Graded cows, in this case, were not pure breeds, but animals with more than 50% 'exotic blood'. Exotics used for obtaining graded cattle were Jersey, Ayrshire, Guernsey, Friesian and Sahiwal.

Breeding and fertility: Farmers were advised to maintain the dairy breeds by upgrading their stock through artificial insemination using semen from a dairy bull.

Farmers saw many possibilities in the "zero grazing" approach. Photo: Willem van Weperen

The production of high-yielding fodder on-farm. In a ZG system all feed is brought to the animals, as they are not allowed to graze outside. Napier grass is the main fodder crop that the project recommended to the farmers. Its re-growth after cutting is rapid and establishment is relatively easy.

Utilisation of farmyard manure and artificial fertilisers to maintain soil fertility. To replenish soil fertility, NDDP recommended that farmers return all manure to the napier plot every 2 to 3 days. Farmers were also advised to apply 4 bags (@ 50 kg) of compound NPK fertiliser (20-10-10) per acre per year.

Feeding: The project advised the farmers to plant 0.75 - 1 acre of napier grass per mature cow and her offspring, and to cut it when approximately 60-90 cm long. Commercial dairy meal was to be given as the main protein concentrate supplement to the cows at milking time, the quantity depending on the production of the cow. Mineral salt lick was to be offered to the animals *ad lib* in the mineral box.

Introduction of the ZG concept to Luo farmers

Initially, dairy production with graded cows was developed in Kenya on large-scale European farms during the colonial period. Since the 1950s, it spread to African smallholdings as well. In Siaya, the first graded cows arrived in the early '50s. But, being settled pastoralists, the Luo people still highly valued its own breed of African Zebu cattle, which played an important cultural role, for example in wedding and funeral ceremonies. Free ranging animals were essential in providing manure for crop production. By bringing in nutrients and organic matter from a wider area to the cropped fields, soil fertility can be replenished. Being more expensive and needing more care, graded dairy cattle could not be used to perform these functions. As such, the Luo people did not accept these animals.

When the NDDP was launched in Siaya in 1987, farmers were actively seeking solutions for the problems they were facing: reduced land sizes, low incomes, loss of soil fertility leading to poor crop yields and market failures of cash crops like coffee, cotton and sugar. Some innovative farmers had already started with ZG, particularly after seeing its benefits in the neighbouring districts where it had been introduced much

earlier. The Luo people were getting more integrated into the money economy and cash crop production. Their ceremonies were changing as well as their opinion about graded cows. Now, most farmers have adopted the ZG concept, because they were able to adapt it to their needs and opportunities.

Production of napier grass

Most ZG dairy farmers have an average of 2 to 3 cows, 1 or 2 heifers and 1 calf. Some have a young or full grown bull. The majority of farmers have only 0.4-0.6 acres of napier per cow and her offspring. Farmers do not find this a problem as they always supplement napier grass with crop residues such as maize stalks, sweet potato vines, banana leaves and stems, and molasses.

During times of scarcity, farmers are forced to feed the African Zebu cattle on the napier grass as well. This lowers the amount of napier grass that is available for the dairy cows. Then they harvest the napier grass even below 60cm in height. During times of plenty (wet seasons), the napier grass is allowed to overgrow as a lot of labour is required in the other areas of the farm. Farmers then cut napier grass only to feed the high-grade dairy cattle and not the African Zebu.

Replacing commercial concentrates

Most farmers use commercial dairy meal. They feed dairy meal to the cows at milking time at a rate of 2 kg per day or depending on productivity. Some farmers reduce this rate of dairy meal provision due to the availability of ample roughage. Several farmers in the district have come up with 'home-mix' dairy meal. Farmers who use this home-mix state that they get twice as much milk for the same amount of commercial dairy meal, which is sometimes adulterated with sawdust. A typical composition of a 100 kg of home-mix dairy meal is 40 kg sunflower cake, 40 kg maize grain, 10 kg sorghum, 5 kg soya beans and 5 kg dried cassava chips. The mixture is dried and milled.

Some farmers have embarked on using brewer's waste (*machicha*) as a protein supplement. Farmers get their brewer's waste from Kenya Brewers Limited some 40 km from Kisumu town. They find brewer's waste cheap to buy even though its transportation is costly. Farmers mention that the use of brewer's waste as a feeding supplement, *ad lib,* increases the milk production by 7 litres per day.

Other additional sources of protein are fodder legumes. Some farmers grow their napier grass mixed with *Desmodium spp.*. Apart from increasing the protein content of the feed, it also fixes nitrogen in the soil. Also, fodder trees like *Leucaena spp., Calliandra spp.,* and *Sesbania spp.*, are used to increase the protein content of the diet.

Use of manure and artificial fertilisers

Most farmers in Siaya do not apply fertiliser to their napier. Those who do, apply an average of 39 kg per acre per growing season instead of the recommended 100 kg. Figures on the amount of manure that is returned to the napier plot in Siaya are also much below the recommended amounts. A bag of fertiliser is quite an investment, which most farmers prefer to use on cash crops, food crops or vegetable crops instead of on the napier grass. Fertilisers are also not readily available everywhere in the district. There is an apparent competition for manure between the napier grass and cash crops, especially vegetables. Farmers with sufficient manure from their ZG units have expanded farming by growing high-value crops like vegetables (kale, cabbage and onions). Some farmers prefer applying the manure to their maize crops.

Farmer innovation in napier production

A group of farmers are now using a new method to grow napier known as *tumbukisa*. This method is a response to the high labour input required by the normal method of growing napier recommended by the NDDP at a spacing of 3 feet by 2 feet. With *tumbukisa*, farmers dig holes of 3 feet by 3 feet and 4 feet deep; they mix the topsoil with three wheelbarrows of compost manure from the dairy unit and use the mixture to fill the hole. About 10 cane sets are planted on top of the filled hole in a concentric manner. Top dressing with slurry is done every six months instead of 2 to 3 days. This method is labour intensive to establish, but requires far less labour to maintain as slurry application in only done twice a year. Since the holes are spaced 2 feet apart, some farmers plant sweet potatoes in between.

As applying slurry to the napier plots manually is labour intensive, some farmers have constructed furrow channels, that take the slurry by gravity from the unit into the napier plots, maize and vegetable fields. Some farmers just remove the dung manually from the unit and heap it somewhere to decompose and form farmyard manure.

Conclusion

Some farmers in Siaya adopted ZG with the aim of commercialising milk production. As a result of the project, they set up the Yala Dairy Co-operative Society for marketing their milk. The society also advances credit to its members to expand dairy farming. These farmers see ZG as an alternative to coffee, sugar and cotton that are now less successful in the area. ZG provides them another way to generate money for household requirements and to pay for their children's education.

Farmers accepted the "zero grazing" approach but only after adapting it to their own situation. Photo: Willem van Weperen

Others adopted ZG in the first place to obtain manure for crop production. By buying nutrients as feed (napier grass, concentrates or other sources of protein) from outside the farm, the losses of nutrients due to soil erosion and export of products to the market, can be compensated. ZG makes it possible to still keep cattle where land is scarce. These farmers see ZG as a way of re-establishing the balance between livestock and crop production, which was largely lost due to reduction in the numbers of African Zebu cattle. ■

Nelson A.R. Mango, Ph.D student, Department of Rural Development Sociology, Wageningen University and Research. E-mail: Nelson.mango@alg.asnw.wau.nl or narmango@hotmail.com

References
- Muma M, 1994. **Farmers' criteria for assessing zero grazing innovation in dairy production. Case studies of NDDP implementation in Kakamega and Vihiga Districts, Kenya**. Unpublished MSc thesis. Wageningen Agricultural University.
- Valk Y van der, 1990. **Review report of the DEAF surveys during 1988, Naivasha, Ministry of Livestock Development.**

The Cuban experience in integrated crop-livestock-tree farming

Fernando Funes-Monzote and Marta Monzote

For nearly 25 years agriculture in Cuba strongly depended on trade with socialist countries in Europe and the Far East. A few export products (sugar cane, citrus, coffee and tobacco) were exchanged for, among others, modern inputs to sustain the farming and ranching activities.

In 1990, this advantageous trading system collapsed. As trade was blocked also with the USA and other Western countries, import of inputs was not possible anymore. The ensuing economic crisis demonstrated the vulnerability of agriculture strongly dependent on imported external inputs. But agriculture in Cuba proved to be unsustainable, also due to the ecological and environmental problems it had created: soil degradation, deforestation, water pollution and loss of biological diversity.

The challenge to transform agriculture

This crisis challenged Cuban farmers and the government to transform their export-oriented, large-scale, specialised production systems into diversified, integrated, self-sufficient, small-scale systems. Agricultural research started to experiment, among others, with local cattle and the development of integrated systems and management practices, and more sustainable feeding methods. Conversion of ranching systems into integrated crop-livestock-tree systems to reverse the economic and environmental crisis and to provide income and food security for producers was the focus, with efficiency as a key factor for success.

In 1994, the Cuban Grass and Forage Research Institute started a project to study, develop and promote integrated small and medium-scale crop-livestock-tree systems. The work included research on 14 experimental farms and a large outreach programme in the provinces of Havana, Sancti Spiritus, Camaguey and Las Tunas based on participatory extension for spreading the lessons (Monzote and Funes-Monzote, 2000).

Six years later, the project has shown that integrated crop-livestock-tree systems can be sustainable, efficient and productive alternatives to specialised, external-input dependent dairy farming. Researchers and farmers show that combining the components into a consistent whole brings better results in terms of total production, energy efficiency, recycling of organic matter and the use of available natural resources.

The experimental farms

The project converted 14 ranches into integrated farms. These farms cover a wide range of soils (alfisoles, mollisoles and inseptisoles) and climates (1000 to 1400 mm rainfall, nearly 80% during the rainy season). These rainfed farms, ranging from 1 to 20 ha. in size, had not used agrochemicals or imported animal feed in the four years before the project began. Eight of them were specialised ranching systems dedicated to pasture and milk production.

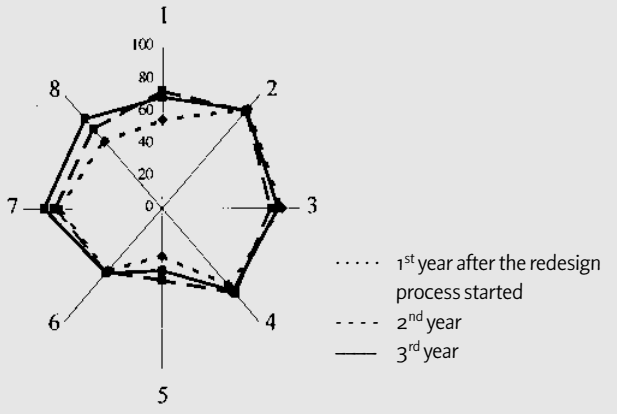


Figure 1. Evaluation of a farm through weighted indicators (% satisfaction) represented in a spider web

Each experimental integrated farm has its own unique combination of crops, livestock and trees (with 25 to 50% of crops integrated in the livestock system) which suits the local conditions: soils, topography, climate, natural vegetation, wildlife and farmer preference. Each farm has a crop production sub-system (areas of arable crops, perennial crops and vegetable garden) and an animal production sub-system (forest ranch land, pastures with a mixture of gramineous and leguminous species, fodder banks with e.g. Pennisetum, sugar cane, protein banks with leguminous fodder crops and trees such as glycine, kudzu, leucaena, and areas for small animals). Medicinal plants and fruit trees are distributed throughout the farms.

Each farm manager defined the process of redesigning the farm. Self-sufficiency in food, fodder and organic fertilisers, high production of biomass, diversification and integration were the leading principles. Strategies like the use of crop residues for animal feeding, functional biodiversity, reforestation of grazing areas, recycling of manure, composting of organic waste, soil regeneration and conservation were followed.

Evaluation of performance

Spider web diagrams (figure 1) were used to show the results of a large number of tests used to interpret the performance of the farms. Eight agroecological indicators were selected to evaluate the performance and sustainability of the integrated crop-livestock-tree systems. In milk specialised systems in Cuba the average yield is about 1 to 1.5 tons of milk per ha. Some of the integrated farms achieved 3 tons of milk and 6.1 tons in terms of total food production from crop and livestock (Tabel 1).

Diversification of production

The biodiversity in the redesigned farms had increased considerably in the three years. The number of trees per hectare had increased by 26 – 50% a year and the average number of food crops had increased from 14 to 17 to 20. The total biodiversity of wildlife had increased from 46 to 78 species per hectare, in addition to the increase in the diversity of soil life.

Table 1. Scores of the sustainability indicators in the experimental farms

Indicator	Range*
1 Milk production (tons/hectare)	1-3
2 Food production (tons/hectare)	1.9-6.1
3 Reforestation level (number of trees/hectare)	53-277
4 Diversity of wildlife (total number of species)	46-78
5 Food products (Number of edible products)	11-20
6 Production of organic fertilisers (tons/hectare)	1-2.8
7 Intensity of work (hours/day/hectare)	0.8-4.5
8 Energy efficiency (calories produced / calories invested)	4.5-10.6

*as a mean result of the 14 farms during six years

Reforestation is an essential activity in the transformation to integrated systems. But securing the survival of planted tress is a complex task on farms with livestock. Therefore, for each sub-system several strategies (see Table 2) were defined:

Table 2. Reforestation strategies

Reforestation

Crop production sub-system	Animal production sub-system
• Around the fields • Within the cropping land (in strips)	• Within the pastureland (with protection) • Forest patches (segregation) • Fences (hedges) • Use of species that are not palatable for cattle

Organic fertilisers

A crucial question is where to obtain the organic matter and nutrients. One option is to import them from another farm, which is usually the case in market-oriented organic production.
The other option is to produce them on-farm. In this respect, Jeavons (1991) dismisses the former and stresses that organic fertilisers must be produced on the farm itself, recycling nutrients and maintaining the fertility of the soil by proper management.
In balancing nutrient flows, long-term, nutrient losses by soil erosion, leaching, etc. have to be minimised and export of nutrients to the market has to be compensated by import of nutrients, e.g. as fertiliser or feed. The advantage of having cattle is that they produce considerable quantities of manure, which makes recycling of nutrients and organic matter easier.

The evaluation showed that it is possible to produce enough good quality organic fertiliser from the by-products available in the farms to fertilise both the ranch and crop areas at a rate of 2 - 6 tons per ha., depending on the design of the farm.
In addition, worm humus is produced in smaller quantities and green manure crops at a large scale. In this way the degraded soils are being regenerated into biologically active and nutrient-rich soils. Nevertheless, there may be a nett outflow of nutrients, which has to be compensated for on the long-term.

Multiple cropping

Designs for multiple cropping systems were made that are well adapted to the local conditions and with crops commonly used in Cuba: cassava, beans, groundnuts, soy beans, sesame, maize, sorghum, squash, melon, tomatoes, cucumbers and *vigna, mucuna* and *canavalia* etc. (as green manure) (see Figure 2). These systems resulted in high land use rates (LUR), proving the vast potential of multiple cropping for intensive land use.

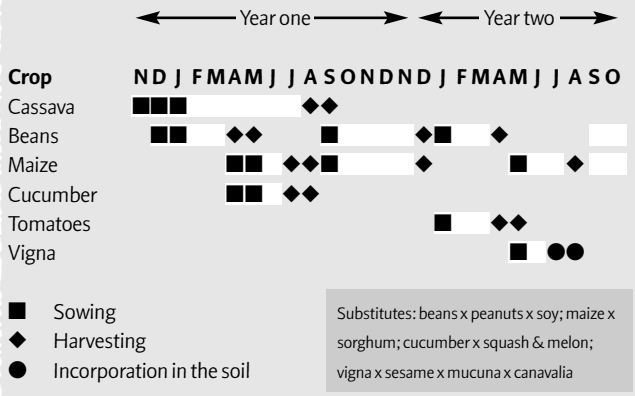


Figure 2. Sequence of rain-fed crops for 2 years

Biomass production and energy efficiency

The evaluation revealed the high productivity of these farms. The total biomass production was 3-9 tons of dry matter/hectare/year, of which 1-3 tons/hectare/year relates to the livestock system and the rest to crops, which corresponds with 3,000 - 10,000 Mcal/hectare of protein. The number of persons that can live from each farm varied from 4 - 10 persons and the sources of protein and energy are diverse (see Table 3). This shows the potential of integrated farms to produce a complete diet, food security for the family and a market surplus.

The energy balance of 4 - 10 calories produced for each calorie invested, shows the biological benefit and efficiency of these systems. In conventional livestock systems applied in Cuba during the '70s and '80s, this is normally in the order of 5 calories invested for 1 calorie produced (Funes-Monzote, 1998).

Table 3. Number of persons sustained on the monitored farms

Indicators	Range*
• People fed per hectare	4-10
• Sources of energy	4-9
• Sources of vegetal protein	3-10
• Sources of animal protein	5-12

* as a mean result of the 14 farms during six years

Final comments

This study showed the high potential in terms of production, sustainability and environmental care of integrated crop-livestock-tree farming built on agroecological principles.
The practical evaluation methodology based on selected sustainability indicators is appropriate for further defining of strategies, planning and research. The redesigned farms attracted a lot of attention from farmers, technicians, researchers and teachers; they provided training opportunities and led to the adoption of the approach by other farmers.

The agroecological concepts stimulate the creativity and enthusiasm of farmers, which leads to better decision making and performance of the farm. By incorporating crops and trees in their farming system, ranchers can become self-sufficient in food products and increase the amount of by-products available for animal feed and income. Recycling of manure, green manure crops and trees help to take care of the environment, whilst adding value to the production unit.

Promotion of crop-livestock-tree integration is important to change the farming mentality and to develop more efficient production practices based on the optimal use of locally-available resources and a fair and sustainable balance between nature and human beings.

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Fernando Funes Monzote and Marta Monzote Fernández, researchers of Integrated Agroecological Systems. Pasture and Forage Research Institute – MINAG, Apartado 4029, C.P. 10400 Havana, CUBA. Fax: +53-7-2099881;
E-mail: mgahona(ip.etecsa.cu

References

- Funes- Monzote, F. (1998). **Sistemas de producción integrados ganadería – agricultura con bases agroecológicas. Análisisy situación perspectiva para la ganadería cubana**. MSc. Thesis, International University of Andalucia, 150 pp.
- Funes Monzote F & Monzote M, 2000. **Results of Integrated Crop-Livestock-Forestry Systems with agroecological bases for the development of Cuban Agriculture**. 13th IFOAM International Scientific Conference. Basel, Switzerland. p. 426.
- Funes Monzote F, 2001. **Integración ganadería – agricultura con bases agroecológicas. Plantas y animales en armonía con la naturaleza y el hombre.** Asociación Nacional de Agricultores Pequeños, La Habana. 2nd Edition. 83 pp.
- Jeavons J, 1991. **Cultivo biointensivo de alimentos** (bio-intensive cultivation of food products). California: Ecology Action.

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Camelids are best suited to the conditions of the Andean highlands. Photo: AIGACAA

Improving llama production in Bolivia

Osman Rocha Ravollo

For over 6000 years the South American camelids have been a distinctive feature of the Andes region, both physically and culturally. Of the four existing camelid species, two have been domesticated: the llama and the alpaca. With the arrival of the Spaniards, these native animals and their breeders were forced to retreat to the highlands of the Altiplano.

Bolivia is the country with the largest number of llamas in the world. Almost all of the two million animals are bred in small family herds, grazing exclusively on wild pastures. The llamas are part of the life strategy of these poor peasant families; they are a means of transport, they provide meat, their manure is used as fertiliser and fuel, and their wool for garments and similar articles.

Llamas are intimately connected to the culture and cosmovision of the Andean indigenous people and play a central role in many of their rites and celebrations. For example, when a couple gets married, they receive several llamas from their parents, depending on the number owned by the parents. This inheritance is then carefully administered by the newlyweds. The common ritual known as *Rhuthucha* - 'first haircut' - takes place around the age of two; on this occasion, too, the child receives a couple of llamas from his or her godfather, as well as parents and other relatives. Although the parents take care of the animals, from that moment onwards the child has his or her initial asset called the *lacama*.

A llama breeding family

Señor Pánfilo Gerónimo is 55 years old and lives with his wife Damascena in the community la Rivera of the Oruro department. The couple has 6 children, some of them are still in school, and the others have migrated temporarily to work in Chile. The mountainous region where the family lives is situated at 3,800 m above sea level; its climate is harsh with frequent frosts. A small part of their land is used for crops, such as potatoes, *quínua* (local grain), barley and oats, while the rest is used for grazing.

Don Pánfilo explains, *"We have 180 llamas and 30 sheep. The whole family takes care of them, taking turns with herding. The sheep graze elsewhere and my wife takes care of them; we also have 5 donkeys. All decisions about the llamas or the sheep are taken together with my wife. We breed llamas to have meat ourselves, and also to sell at the Pisiga fair, some 40 km from here. The male llamas are also used as packers. The sheep are for our own consumption. We use the manure of the llamas and the sheep as fertiliser in the fields and sometimes as fuel for cooking."*

The family has learnt the art of breeding llamas from their parents and grandparents. They keep many traditions, such as the Wilancha ritual, alive. Don Pánfilo explains, *"This ceremony is performed to plead for the well being of the families, when a new task is undertaken, or in the hope of a good year for the animals. During the ritual a llama or a sheep is slaughtered at dawn. Blood is shed for the Pachamama* (Mother Earth) *and for the work that is about to be started. The meat of the animal is then cooked and all present are invited to the meal."*

Limitations

Over the past decades, the tendency has been to reduce the size of the family-owned llama herds in Bolivia. In the areas where camelids were predominant, people started to combine them with, or give priority to other species, particularly sheep. Economically, the main function of the llamas - transportation - was being taken over by engine-driven vehicles, while at the same time the prices of llama meat and wool were particularly low, due to the low quality of these products.

Llama wool is inferior to that of the alpaca as it contains a great deal of low-quality bristles. Therefore, in many areas, only 20% of the animals are sheared each year. Llama meat is consumed either fresh or as *charque* (sun dryed). The sale of fresh meat is limited and the prices are very low due to the presence of grain-like cysts of the parasite *Sarcocystis aucheniae* and *S. lamacanis*. Though this parasite does not pose a danger to human consumers, meat with a high degree of infestation is often confiscated. Therefore, it is usually sold through informal channels. The incidence of the parasite, which is transmitted by dogs, is approximately 90% in animals older than 2 years.

Other factors that limit llama husbandry are the degradation of the pastures, the lack of labour, external parasites, lack of shelter, and the degeneration of the animals due to inbreeding. Mortality rates are high, both in adults and offspring. Another problem is the lingering influence of the traditional authorities, which used to regulate the use of the communal pasture areas. All this, plus the fact that breeding takes place almost exclusively in areas of extreme poverty, has increased the cultural prejudices and lowered the status of breeding llamas.

Economic and ecological potential

Despite these limitations the llama is the species of highest potential in the Bolivian highlands, which explains why families have continued breeding it. On the one hand, the highlands comprise huge areas of natural pastures, especially suited to camelids. They are best adapted to this environment, being highly resistant to the effects of the altitude and climate, and – unlike sheep, goats and cattle – do not disturb the fragile ecosystem of the Andean mountains when they walk and graze. As such, the camelids play a fundamental role in recovering the large areas of degraded pastures.

Furthermore, as long as Sarcocystiosis is kept under control, camelid meat is excellent for consumption, with lower levels of cholesterol and fat than beef, pork or lamb. It is possible to reduce the mortality rate of the animals by controlling external parasites, improving shelter and nutrition; better quality wool – comparable to the alpaca – can be achieved by selective breeding programmes. Other potentials include the families' experience in llama breeding and their knowledge of wool processing – both of the fabric (the women) and of the loom (the men) – and other artisan products.

ASAR

ASAR (Asociación de Servicios Artesanales y Rurales) is an NGO, which has since 1995 been developing programmes for improving llama husbandry in 6 provinces of the Oruro and Cochabamba departments. After analysing the potential and limitations of llama breeding, they have worked towards organising the llama farmers, training them and letting them have a voice in the strategies of the project. In the training of livestock para-technicians, two participants were elected by each community. The methodology was directed at illiterate adults with a great deal of practical knowledge.

After several courses in organisation, llama breeding, transformation and commercialisation of products, the association ARPROCA (Regional Association of Camelid Producers) was established, drawing together the communities from the Litoral, Atahuallpa and Mejillones provinces. It managed to generate funds from UNEPCA (Executive Unit of Camelid Projects) in 1995. These funds were used as credit for the members of the association to buy selected llamas and to establish a special llama-slaughterhouse in Huachacalla to commercialise the venture.

Quality improvement and marketing of meat

In September 1997, this abattoir for camelids was ritually opened by the communities. Subsequently, courses on slaughtering and the preparation of dried meat were given. Several small solar drying units were built in the communities, to produce high quality *charque*. Once the abattoir was opened, it was also possible to collect data on the slaughtered animals, and monitor the effect of the actions taken to reduce the incidence of sarcocistiosis, by controlling the incidence of infestation in the dogs (periodic deworming) and by strategic grazing strategies. Between 1997 and 2000, sarcocystiosis in animals older than 2 years has been reduced from 90% to 54%. Thanks to these efforts, good quality fresh and dried meat is now sold in the established meat stores, and the producers fetch a better price. In the year 2000, ARPROCA was able to sell 35,687 kg of fresh meat and 480 kg of charque in local and regional markets. Likewise, a network of 12 veterinary community animal health workers has been trained to provide basic veterinary help to the families in the ARPROCA area. This has made it possible for families to increase the weight of their animals. The family income for each llama sold has increased by US$ 9.65 per adult animal and US$ 8.76 per young animal, between 1997 and 2000.

Llama wool and its market

Some llamas have high quality wool similar to alpacas. In the area of Calientes, a breeding programme for the genetic improvement of llamas was started in coordination with the Universities of San Simón, Bolivia, and Hohenheim in Germany. Groups of llamas were selected according to their wool or meat producing qualities, and three breeding centres of the ARPROCA now stimulate controlled breeding in the family herds , for either meat or wool production.

In December 1997, 23 people from 14 different communities belonging to ARPOCA were trained in classification, selection and spinning of the wool, and the weaving of carpets and fabrics. Currently, the crafts centre in Huachacalla employs 8 women and one man. The annual production of this centre is eight carpets of 3 x 2 m., 48 rugs, 200 m of woven cloth, 24 sweaters and 12 ponchos. Private companies, such as SARTAWI, COPROCA and LLAMACTIVA, pay the llama breeding families a good price for the wool as they have found international markets for these products.

Not marginal anymore

Thanks to these new possibilities in management and markets, the breeding of llamas in these areas has ceased to be a marginal activity. The families are now trying to increase the size of their llama herds, not only for cultural and ecological reasons, but also for the socio-economic advantages. Don Pánfilo explains: *"Earlier, it was difficult. Each year I could sell some 20 llamas of different ages at the fair. Each llama gave us about 30 kg of meat, 5 bolivianos per kg. Sometimes they didn't want to take it because of the arrocillo* (Sarcocistiosis)*. With the money I would buy groceries and bread to take home. I didn't sell the wool or the leather, because there weren't any buyers. Now, fortunately, the situation has changed. There is less arrocillo, the llamas are heavier and we can sell the meat at a better price. Also LLAMACTIVA buys our wool at a good price to export it to Peru. They also buy our leather as they have also found a market for this product. With all this we are certainly better off now than before!"*

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Women working with llama wool at the crafts centre in Huachacalla. Photo: ARPROCA

Osman Rocha Ravollo, OsmanRocha_Ravollo@hotmail.com

More information in "*Gracias a los animales: la crianza pecuaria familiar en América latina con estudios de caso de los valles y el Altiplano de Bolivia*". Edited by Agruco, Cochabamba, Bolivia. Forthcoming. Katrien van't Hooft, editor.

Dutch dairy farmers find own solutions to their environmental problems

Willem van Weperen en Henk Kieft

Farmer experimentation and innovation and farmer-researcher platforms for the development of low external input and sustainable agriculture are very successful not only in tropical countries. Also in the Netherlands, there are remarkable initiatives of farmers to develop alternatives to the unsustainable conventional dairy production model. Ten years ago, two environmental associations of dairy farmers, VEL and VANLA in the province Friesland, in the north of the Netherlands, started to experiment with nature and landscape management and integrated agriculture. Now, after several years of successful experimentation with environmentally-sound farming practices, this initiative is being taken up by several hundreds of dairy farmers in different parts of the country.

Fifty years of dairy development

In the '60s, the average Dutch dairy cow produced 4000 kg milk per year. In 2001, this was about 8500 kg. The average yearly increase of about 100 kg milk per cow was possible due to very successful technology development, enhanced by effective research-extension-farmer interaction, access to credit, and a conducive policy environment. Artificial Insemination and effective breeding policies increased the potential milk yield of dairy animals to levels that our grandfathers did not even dream of. Other important innovations were: the shift from rope-tied to free-roaming stables with sleeping cubicles and a much better ventilation system; disease control through effective vaccination; very high fertiliser application levels which boosted grass yields; mechanisation of fodder production; improved fodder conservation techniques and the introduction of fodder maize. The availability of ample high quality roughage, supplemented with high levels of protein-rich concentrates, made it possible to fully exploit the improved genetic potential of the dairy cows. But also, the low prices of these high quality fertilisers and concentrates were essential in achieving high milk production.

Increasing environmental problems

The recommended fertiliser application for pastures has gone up to 400 kg nitrogen (N) /ha. Presently, annual grass production on pasture land is 10-12,000 kg dry matter/ha. in 5-6 cuts. The low price and high status of mineral fertilisers made cow manure lose its importance and was used only as an extra, over and above the recommended fertiliser application. Until recently, the nitrogen present in manure was not even considered in calculations.

These high fertiliser applications increasingly led to serious environmental problems: leaching of nitrates from the topsoil to the groundwater negatively affecting the quality of the drinking water and high levels of ammonia emission from the cows negatively affecting the quality of nature in the surroundings of the farm. In the '80s, the Ministry of Agriculture had to introduce a series of 'restrictive' measures for dairy farmers to meet the environmental targets set by the European Union. Broadcasting manure on pasture land was banned and instead it was made compulsory to inject the manure as slurry into the soil during the growing season.

In the early '90s, a mineral bookkeeping system for dairy farmers was introduced and was tested as a voluntary management tool. Through simple accounting of mineral input and output at farm gate level, nutrient losses within the farming system were made evident. Ideally, inputs (concentrates and fertilisers) balance with the outputs (milk and meat) in terms of nutrients. However, losses of nitrogen occur in the cow and in the soil. This bookkeeping revealed that losses of N/ha in the conventional dairy system had become very high and hence N efficiency very low (<18% at cow level and <30% at soil level). See figure 1.

Animal health problems and consumer concern

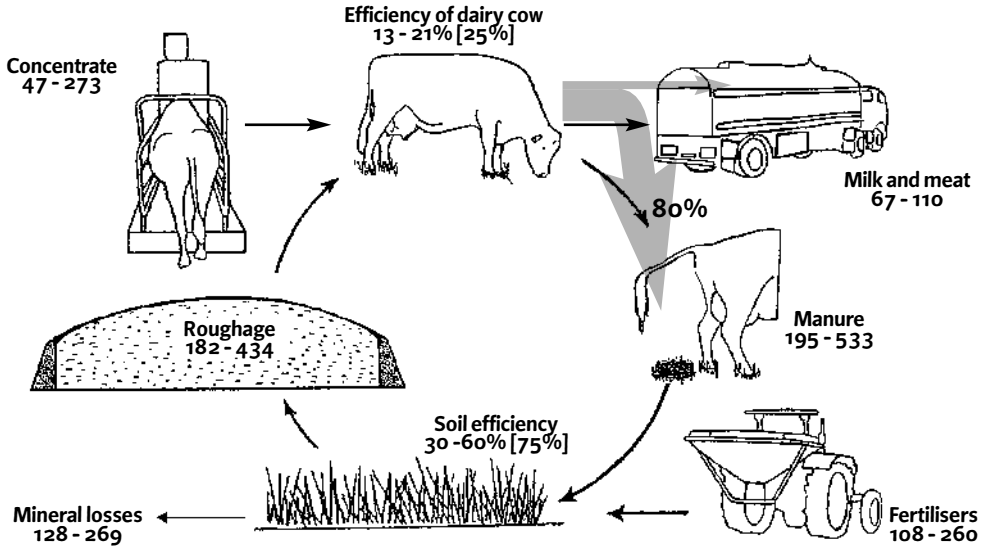
The high-input farming system led not only to environmental pollution but also to animal diseases:

- very high protein levels in the rations causing digestion problems and malfunctioning of the liver;
- high incidence of mastitis;
- animals becoming susceptible to hoof diseases;
- prolonged calving intervals due to fertility problems.

These health problems are increasing veterinary costs and decreasing milk production.

Consumers are showing increased concern with the (perceived) lack of animal welfare related to intensive production, and with human health in relation to cow-diseases like Mad Cow Disease (BSE). They have begun challenging the so-called "license to produce" of farmers. The Foot and Mouth Disease crisis of last year aggravated this feeling and exposed the vulnerability of the modern livestock production systems.

Figure 1: Nitrogen efficiency of Drenthe project farmers expressed in kg N/ha/year [ideal]



Two environmental associations start the process

Ten years ago, the two environmental farmer associations in Friesland were founded by farmers to regain control over their own future. They argued that by development of integrated agriculture, pollution control by conscious use of agrochemicals and plastics, and the management of nature and the many small-scale natural landscape elements (hedges, bunds, pools, etc.) on and between their farms, they could greatly improve the quality of their environment. These measures, they said, should not necessarily decrease their production and income, while certified quality products, landscape management and income from agro-tourism could provide new opportunities.

The philosophy of these dairy farmers, based on their 'gut feeling' and experience with the production system of their fathers, is that many relationships exist between the various components of the farming system, and that these relationships should be considered in all management decisions. For example, the way they feed their cows affects the quality of the manure. The quality of the manure affects the quality of the soil. The quality and fertility of the soil affects the quality of the pasture and fodder crops and hence the feed, which in turn affects the health of the animals and the quality and quantity of the products. All parts of the system as well as the whole are important! The quality and quantity of the dairy products (milk and meat) are improved by optimising the (biological) quality of all the different aspects (manure, soil, pasture, feed, animals, products) and the quality of the whole system. In conventional dairy production, the concept of system quality was lost because of the focus on the development of a high input - high output system. Through refocusing on quality, the system develops in the direction of a low input - high output system.

The farmers found that by reducing the amount of protein and increasing the amount of crude fibre (roughage) in the feed of their animals, the quality of the manure is much better than the slurry produced by conventional dairy farmers. They argue that this type of manure (with higher C/N ratio and relatively rich in organic N) is more beneficial to soil life and therefore more efficient in production of biomass. Consequently, N emission to the environment will be reduced. Broadcasting manure with these qualities is also less detrimental to the environment.

The approach builds, as much as possible, on farmers' knowledge and ecological regulating mechanisms found in nature. The farmers consider their experiences as added value to the conventional scientific knowledge as they also use practices and methodologies not accepted by conventional agricultural science.

Apart from system quality, the farmers also work on adapted animal breeding, new opportunities to diversify the local rural economy such as agro-tourism, and farmer cooperation to enhance processes of change.

The PMOV platform – taking it further

In the last 3 years, this initiative has been taken up other farmers and together with some researchers they have founded the PMOV platform to promote 'eco-technological' farming. Presently, the platform constitutes about 120 experimenting dairy farmers, two formal experimental research farms comparing integrated and organic agriculture and the two environmental associations of Frisian dairy farmers.

The network felt strongly that a link should be built with university research for two major reasons. The farmers, who rely on their own observations and incidental measurements, wished to get more insight into what ecological processes actually take place in their farming systems. Secondly, they wanted policy makers to understand their exploratory efforts and promising results, and adapt legislation towards objective-oriented regulations instead of instrumental ones. "Politicians should tell us what they want, but we will decide ourselves how to do it!" Initially, the Ministry of Agriculture was very reluctant to cooperate. The farmers were perceived as those trying to escape environmental legislation. Only with great difficulty could the farmers negotiate some legal space for their experiments which did not conform to Dutch law for manure application. After several years of good results some recognition for the value of these experiments is emerging, and money from the government has been allocated to facilitate further experimentation by a larger number of farmers also in other parts of the country. Also in 2002, a grant is expected from formal Dairy Research to formulate a joint monitoring project to assess PMOV farm results and compare these with conventional farms. 'Joint' here means that farmers and scientists together design the project. Interest also exists to better understand the dynamics and decision-making logic of experimenting farmers, to make the sharing of their experiences to other interested farmers cost efficient. These farmers do not only perceive themselves as entrepreneurs, but also and often even more so, as 'stewards of complex agroecosystems'. They often feel the need to regain their 'license to produce' within society at large.

Management guidelines for dairy production

Based on the long years of experience of the farmers and the experiments carried out on the experimental research farms, the platform formulated some new management 'guidelines' for keeping dairy cattle in a more sustainable way:

1. Reduce the percentage of crude protein in the diet (from 18% to around 16 or 15%) and increase the crude fibre content;
2. Try to keep the OEB (Rumen Protein Balance) at zero;
3. Try to increase the C/N ratio of manure from 7 to around 10;
4. Feed concentrates to a maximum of 25 kg per 100 kg of milk;
5. Reduce the fertiliser applications on pasture stepwise with about 30 kg N/ha/year. Try to get it down until it is in balance with the permitted yearly losses (180 kg N/ha/year);
6. Distribute larger portions of the manure applications to the 1st and 2nd cut. Stop manure and fertiliser applications entirely after mid July.

Preliminary results

The results of the practical experiences indicate that it is possible to maintain the milk yield with lower costs due to substantial reduction in mineral fertiliser supply and concentrate feeding. The values of nitrate losses into the ground water and ammonia losses into the air were clearly below the set EU-targets. The health status of cattle on many PMOV farms has improved, adding significantly to cost reduction. The biological quality of milk, manure and soils is presently being assessed.

Beside these technical results, the farmers strongly value the benefits from improved social relations and collaboration within the working groups and their communities. As farming now is more in line with their intuition, farmers feel less stressed as well.

The techniques, ideas and experiences of the farmers and the two experimental research farms are shared through farmer-to-farmer meetings, newsletters, seminars and info-markets, lectures and excursions, farmer study-clubs and educational material.

The experiences show that these farmers are well able to resolve their own problems and make their farming systems sustainable to a large extent. Within the norms set by society, farmers should have professional freedom to find their own solutions adapted to local conditions.

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Willem van Weperen en **Henk Kieft**, ETC Ecoculture, PO Box 64, 3830 AB Leusden, The Netherlands. Phone: +31 33 4326000; Fax: +31 33 4940791; Email: willem.van.weperen@etcnl.nl ; Internet: www.etcint.org

Towards local resources-based integrated crop- livestock systems

T.R. Preston

The present livestock production systems in most industrialised countries are in direct competition with human needs. Livestock presently consume almost 50% of world cereal grain supplies. In the "intensive" large-scale production systems (Sansoucy 1998), increasingly promoted by corporate agriculture, livestock wastes contaminate soil and water resources, create less than favourable working conditions for the personnel involved in feeding and cleaning, and decrease employment opportunities. To meet food needs in 2050, it is necessary to develop livestock production systems, which do not depend on cereal grain.

In developing countries in the tropics, instead of grain-based livestock systems, alternative production systems must be developed which make optimal use of locally available resources, solar energy, soils, water and people for multiple end purposes. The challenge is to capture the sun's energy in systems of production and utilisation which at the same time will contribute to alleviation of poverty, creation of jobs, a more equitable life-style, protection of the environment and increased biodiversity. Close integration of livestock in the farming system, with recycling of all excreta, will be the basis of an agriculture which can be highly productive and also sustainable (Figure 1).

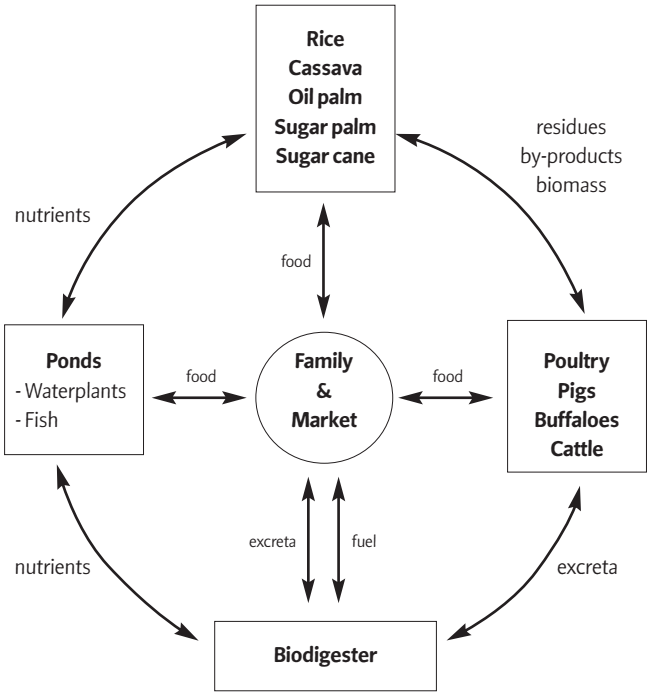

Figure 1: The integrated farming system

Energy crops

In tropical countries, especially in the humid zone, there are many crops and farming systems that considerably exceed the productive capacity of grain cereals. Key plants in this scenario are sugar cane, cassava, and the palm family, especially the oil and sugar palms.

The yield potential of the sugar palm (*Borassus flabellifer*) is extremely impressive. An annual average yield equivalent to 18 tonnes of soluble sugars per hectare has been documented in a study with 12 family farm households in Cambodia (Khieu Borin and Preston 1995). Despite this demonstrated potential almost no research is currently conducted to improve the technology of growing and using this tree, which is found throughout the SE Asian region.

Protein crops

There is an equally great potential to produce high yields of protein in the tropics. But this will be with trees, shrubs and water plants, rather than with soya beans. The *Lemnacaea*, of which "duckweed" is the most widely distributed, have a particularly important role to play in efficient resource utilisation because of their capacity to extract nutrients from water fertilised with wastes (excreta) from livestock and people. A specific feature of this plant is that its protein content can be manipulated according to the nutrient supply in the water. Values in the range of 35-40% protein in the dry matter can be attained when the nitrogen content of the water is in the range of 20 to 30 mg/litre (Leng 1999). Duckweed is easy to harvest and needs no processing prior to being fed to livestock. The protein is highly digestible and the excellent balance of essential amino acids makes it an ideal supplement for chickens, ducks and pigs. Average yields are in the order of 100g fresh biomass/m^2/day equivalent to 8 tonnes of protein/ha/year (Nguyen Kim Khang 2000).

The cassava plant (*Manihot esculenta*) can be managed as a perennial forage crop with repeated harvests of the foliage at 50-70 day intervals. The foliage yield increases over successive harvests (Preston, 2001) as the repeated cutting stimulates new growing points. Yields of 3-4 tonnes of protein/ha/year are possible with this regime. The fresh foliage is an excellent protein source for ruminants, while after ensiling (which converts the toxic cyanide into non-toxic cyanates) it can safely be fed to pigs (Ly and Rodríguez 2001). Cassava is an exploitive crop when grown in monoculture and on sloping land. Managing it as a perennial shrub / tree and associating it with N-fixing legumes, such as *Flemingia macrophylla* or *Desmanthus virgatum*, or fertilising it with heavy dressings of livestock manure or biodigester effluent, are ways in which it can be grown sustainably with enhancement of soil fertility (Preston et al 2000). The presence of cyanide components in the leaves may even serve as an "organic" pesticide, providing protection against a wide range of pests.

Changing the livestock system

The feeds derived from these "alternative" crops (juice from sugar cane and sugar palm, roots of cassava, fruit from oil palm, duckweed biomass and cassava foliage) do not lend themselves to "factory" farming systems which traditionally use dry feeds, easy to store, transport and mix into "least-cost" rations. The "alternative" feeds require "alternative" farming systems such as developed by CIPAV in Colombia (see page 14) which are now widely being adopted and adapted in, among others, Vietnam and Cambodia.

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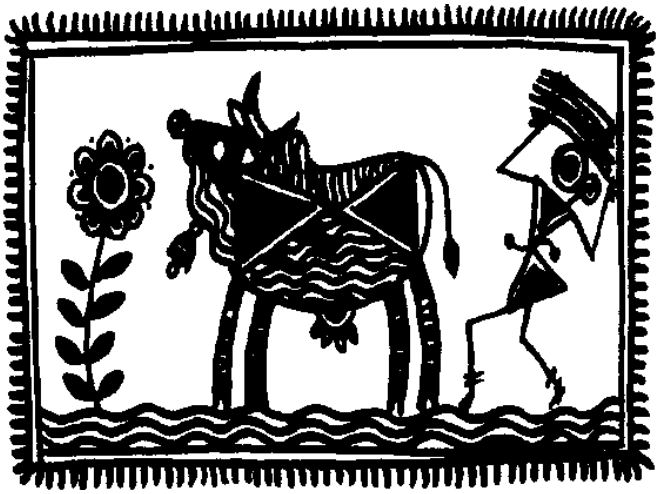
T.R. Preston, University of Tropical Agriculture, Chamcar Daung, Phnom Penh, Cambodia. Email: regpreston@utafoundation.org

Please contact the author for more information on the references.



Local livestock for empowerment of rural people

W.M.K. Warsi

Domestic animal diversity represents one of the most neglected as well as threatened aspects of biodiversity. According to FAO, one third of the world's estimated 4000 livestock and poultry breeds are in danger of extinction. In the South, these breeds are vested with traditional farming and pastoral communities, who manage them according to their indigenous knowledge and in tune with local ecological constraints. Causal factors for their extinction include political backing for cross breeding, loss of grazing land, globalisation of the economy, catastrophes, conflicts, legal restrictions on the marketing of their products etc. Many countries provide direct subsidies on feed and other inputs, which tend to favour exotic breeds and industrial animal farming.

Nevertheless, many local livestock breeds continue to represent the lifeline of rural populations. While they may not be able to compete with "improved breeds" in milk and meat yields, they fulfil a much wider range of functions and provide a larger range of products. Being able to thrive even with low fodder inputs, their maintenance is ecologically more sustainable, especially in marginal environments. Requiring lower levels of health care and management, they commonly entail a lower workload for women in comparison with exotic breeds. As is becoming increasingly clear, they often have scope for speciality products and can be essential to preserve habitats and cultures.

At the local level, the loss of a breed means the loss of a livelihood strategy and loss of indigenous knowledge. At the global level, it means decreased manoeuvring room for adapting to environmental and economic changes. The Convention of Biological Diversity (CBD) mandates maintenance of the remaining livestock genetic diversity. It also emphasises the need for the active involvement of indigenous communities and the role of local knowledge and institutions in conservation.

The LIFE Network

The League for Pastoral Peoples (LPP) and the Indian NGO Lokhit Pashu Palak Sansthan (LPPS) jointly organised an international workshop on "Local Livestock Breeds for Sustainable Rural Livelihoods" at Udaipur and Sadri, Rajasthan, India, in November, 2000. This workshop initiated the process of implementation of the Convention of Biological Diversity in regards to domestic animal diversity. It received an overwhelming response and a large number of participants from scientific institutions, universities, NGOs, governments and international donor agencies from Asia, Africa and Europe attended it. At the end of the workshop a joint declaration, known as the "Sadri Declaration", was signed by all the participants. Inspired by the response from the participants of the workshop and the Sadri Declaration, LPP and LPPS took the initiative to establish a network: LIFE (Local Livestock for Empowerment of Rural People).

LIFE aims at supporting and fostering the following activities:

- Study and document indigenous knowledge relating to livestock breeding and breeds.
- Make case studies of livestock breeds that are threatened and the social, economic and political factors involved.
- Exchange information between NGOs, pastoralists and farmers' associations, scientific institutions, policy makers and others through workshops and a mailing list.
- Build capacity of NGOs in the conservation and development of indigenous livestock breeds.
- Analyse the macro-economic and political factors driving the process of livestock genetic resource erosion.
- Lobby for more participatory orientation of research concepts in formal-sector organisations.
- Establish a network of organisations and individuals for community-based conservation of livestock breeds.

Membership of LIFE is not restricted to a particular geographic location. Any organisation or individual concerned for sustainable livestock development is welcome to join this network.

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For more details, the workshop abstract and copies of the Sadri Declaration please contact:
W.M.K.Warsi, LIFE Coordinator, C/o Lokhit Pashupalak Sansthan, Ambedkar Nagar, Desuri Road, Sadri, District Pali – 306702, Rajasthan, India.
Email: lpps@sify.com

World watch list for domestic animal diversity

The increasingly grim outlook for indigenous livestock breeds – and for the farmers who depend on them – is detailed in the third edition of the 726-page volume of the FAO/UNEP World watch list for domestic animal diversity (WWL-DAD:3), released in December 2000. While local communities generally possess extensive knowledge of the observable characteristics of their breeds, there is negligible documented research data for about 85% of all breeds and even less sound breed comparison information for decision making on breed use. The real value of genetic diversity is not properly reflected in current choices of breeds and associated technologies. Breeds that utilise low-value feeds, or survive in harsh environments, or have tolerance to or resistance against specific diseases could be very beneficial in the future.

Indigenous breeds can be improved to provide better outputs
Opportunities for improvement of indigenous breeds have never been explored systematically. To help countries in improving the performance of indigenous breeds, the FAO's initiative for Domestic Animal Diversity (iDAD) is currently producing guidelines for identifying and achieving particular breeding objectives (more meat, milk, eggs, wool, etc.). In addition, iDAD supports the conservation of pure breeds, which is vital for maintaining genetic diversity and preserving the genetic material on which future agriculture may depend.

For more information visit the web pages of FAO's Domestic Animal Diversity Informati on System. www.dad.fao.org

Observations and farmer experimentation with predatory ants

Paul Van Mele and Vo The Truyen

Mr. Nguyen Van Cung cultivates one hectare of organic citrus in Giong Trom district of Ben Tre province in the Mekong Delta of Vietnam. He has nearly 40 years of experience with biological pest control. Mr. Cung fears that a lot of his experience will be lost because the new generation of farmers spends less time observing and 'experiencing' their crop. Whilst on a visit to his orchard, Mr. Cung shared with us some of his knowledge and experiences in keeping the weaver ant *kien vang (Oecophylla smaragdina)*.

Orchard diversity

Mr. Cung grows mainly lemon trees in his 1 ha. orchard as lemon tolerates the widely-occurring greening disease better than other citrus varieties. But we also came across trees of papaya, mandarin, king orange, pomelo, soursop (*Annona muricata*) and rose apple (*Syzigium* sp.) in his orchard. This he does to spread labour and get an income throughout the year. On an average he makes about 1000 US$ per month.

Moreover, Mr. Cung finds the latter three fruit species particularly useful for the weaver ant, because these trees have big and flexible leaves that are ideal for building nests. The density of the trees is such that the canopies touch one another, enabling the spread of the weaver ant throughout the orchard.

Farmer Nguyen Van Cong (left) and son Phong (second left) in the family orchard. Photo: Vo The Truyen

Benefits from the weaver ant

Protects fruit crops from pests
It is known that the weaver ant is a good predator on citrus and other trees such as mango, longan, lychee, cashew and coconut palm. A fruit crop not mentioned before in publications is soursop, which does not suffer from the fruit borer due to the weaver ant.

Protects annual crops from pests
Before Mr. Cung started cultivating citrus, he helped his father on the farm. With a rope the ants were guided from the trees towards the rice nursery beds and to the fields where pulses were grown. If left undisturbed ants even made nests by stitching the leaves of the leguminous crop together. Through experimentation they had found out that pests in these major annual crops could also be sufficiently controlled by the weaver ant that normally resides in the trees.

Deters rats
Besides insect pests, the weaver ant also attacks or deters a small type of rat that feeds on fruit in and around the orchard.

Increases mango fruit set
A major problem for mango production in the Mekong Delta is low fruit set, which is greatly improved when ants are present. Mr. Cung describes this as an indirect consequence of the ant preying on the mango flower hopper.

Improves citrus fruit quality
Mr. Cung says that mandarins grown without ants would be less sweet and juicy, and more granulous (*suong*). He also has a good citrus yield with the ants.

Provides a means of weather forecasting
The ants' behaviour helps him to predict the weather of the coming days. For instance, weaver ants sense oncoming storms. They become very active and move from the weaker to the stronger branches of the trees. This is a sign for the family to prepare for a storm.

Some observations on ant behaviour

The best time for making new nests is the beginning of the rainy season, as the trees produce new growth flushes. It is also a good time for introducing nests to new orchards as the ants are highly active. In the dry season there are more and smaller nests with a lesser number of ants per nest compared to the beginning of the rainy season when ants seem to join in larger nests.

During the cooler period of the year, from December to February, the nests are high up in the trees. At the hottest time of the year and during the rainy season from May to November, ants move to nests inside the canopy, to protect themselves from the heat and strong rains.

The Vietnamese word Mr. Cung uses to describe a colony or several nests that can live happily together without fighting is literally translated as ants 'from the same place' or settlement (*ổ*). This can vary from nests in one tree at the beginning of colony establishment, to nests in one planting bed, one orchard or in neighbouring orchards. Mr. Cung's interventions to support the ants throughout the years have resulted in his colony covering more than 1 ha at present.

Weaver ant technology

Mr. Cung is often asked by colleague farmers to give advice on matters concerning the weaver ant. He was one of the first farmers who started converting paddy fields into orchards. Now, all citrus farmers of the village practice some level of ant technology. At social gatherings farmers discuss and exchange ideas about many things of their farm, including the ants.

Weaver ant colony establishment
Citrus farmers generally consider the black ant *kien hoi* a pest. Mr. Cung tells us that the black ant causes a lot of the citrus fruit to drop. He attributes this to the presence of sucking insects that are abundant when the black ant is present. As black ants and weaver ants fight each other, one of the first things before establishing a weaver ant colony is to get rid of this black ant.

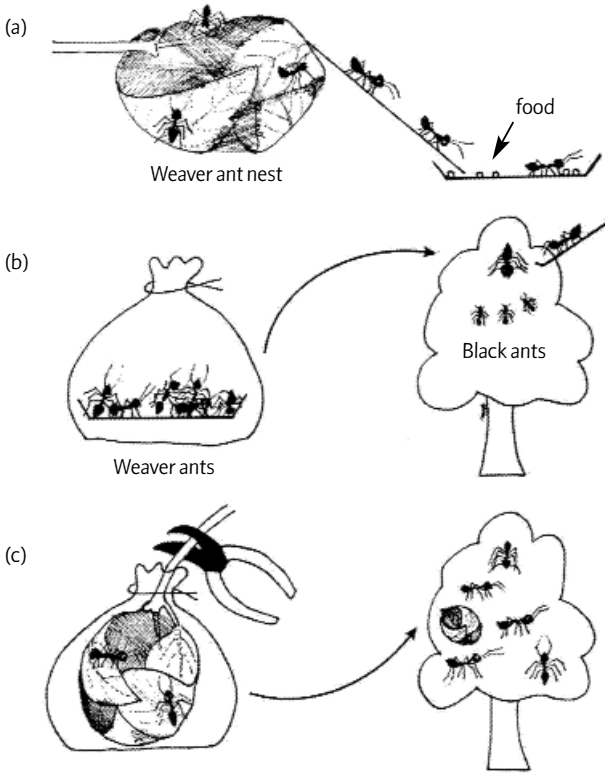

Figure 1: A good way to introduce a new weaver ant colony in case black ants are present as proposed by Mr. Cung. Drawing by Marcella Vrolijks.

Mr. Cung has developed a very successful strategy for this purpose as illustrated in figure 1.

The first step is to lure the strong soldier weaver ants by putting a rope from one of the trees with nests to a container with food such as shrimps (figure 1a). After the container is full of strong soldier ants you put a bag over it and transport it to the place where you want to establish a new colony. Once on the spot, you climb the tree all the way to the top where you then release the soldier ants (figure 1b). This approach guarantees better success than when you just release it at any other place in the tree. Once the black ants are defeated you then introduce a complete nest (figure 1c). The best time to do this is at the beginning of the rainy season (April/May) as ants are then very active.

Helping weaver ants to win from invading black ants

'To fight the black ant, you study its military strategy, and then you know how you can help the weaver ant to win the battle', Mr. Cung continues. One weaver ant can easily win from 5-6 black ants by cutting their bodies in half. However, when black ants become too numerous, the weaver ant gets tied down by the legs and finally killed. But it is not only numbers that matter.

Mr. Cung has observed that black ants sometimes attack established weaver ant colonies from several directions, simultaneously. When the weaver ants start running away, it is time to intervene so that they do not loose the battle. You have to trace down the soldier base of the black ants and cut their support line, for instance by pruning the branches along which they enter the tree. Black ants also have a kind of journalist ants or 'liaison officers' (*giao lien*) that report back to the 'base camp' (*can cu*) for more support. By cutting the line, this flow of information is also cut off.

But if the branches are bearing fruit, they cannot be pruned. Then a different intervention is required. Mr. Cung collects an 'aid force' (*luc luong ho tro*), a nest from the same weaver ant colony, and puts it directly in the base camp of the black ants. The fighting black ants in the tree are soon informed and return to their base camp. The weaver ants, which were disoriented, return and fight side by side with the ants of the aid force.

In the case of black ants attacking a newly introduced weaver ant colony, it is even possible to bring in an aid force from a different colony. This is the only time that weaver ants from different colonies do not fight each other, but join forces against a common enemy.

Mr. Cung has developed two different strategies to keep the black ant population under control. When the black ant becomes too numerous in the dry season, a rotten fish is crushed and spread over a small area of half a square metre in the orchard. This attracts many black ants, which are killed by burning the spot. In the rainy season, the black ants look for a dry place to build their nest. By hanging a bunch of dried leaves or grass in the tree, black ants are lured in and then removed and burnt.

Supplementary feeding

Mr. Cung has observed that weaver ants do not need supplementary feeding in the rainy season due to an abundance of food. He now feeds them moderately in the dry season with mainly fish and small shrimps. Although the ants can transport large pieces of food to their nest, he prefers to provide small pieces that can be carried by a single ant. The amount of food given determines for a great part the number of nests.

Reducing harm to both the weaver ant and farmer during harvest

To avoid the irritation of ant bites during harvest, Mr. Cung has developed a simple ant-friendly technique. When harvesting fruit he takes a bag of wood ash and spreads some ash on the branches he wants to climb. The ants retreat back to their nests. Once the wind or rain removes the ash from the branches, the ants return.

Conclusion

The knowledge and experience of farmers like Mr. Cung will be lost unless more efforts are undertaken to document and spread them to others.

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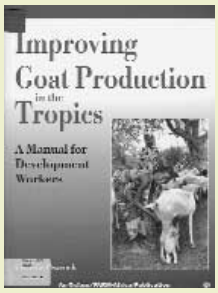
Paul Van Mele, Farmer Participatory Training and Research Specialist, CABI Bioscience, Bakeham Lane, Egham, Surrey, TW20 9T, UK. Fax +44(0)1491 829 100, E-mail: p.vanmele@cabi.org

Vo The Truyen, Pomologist, Southern Fruit Research Institute, Long Dinh, Tien Giang, Vietnam, E-mail: SOFRI@netnam2.org.vn

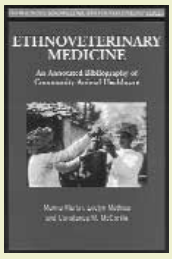
We invite everybody having experience with farmers making use of predatory ants to share information on this topic. Of special interest is also how other farmers have been convinced and trained in using such predators. Please contact Paul Van Mele.

Weaver ant nest in pomelo. Photo: Paul Van Mele



Improving goat production in the tropics a manual for development workers by Peacock C. 1996. 386 p.. ISBN 0 85598 269 1 (pbk) : £ 14.95. FARM-Africa, 9-10 Southampton Place, London WC1A 2DA, UK. Oxfam, 274 Banbury Road, Oxford OX2 7DZ, UK.
This book is written both for livestock specialists and for development workers who do not have formal training in animal production. It explains the theory of goat-keeping, and how it can be used to design simple and cheap improvements in the nutrition, health, and breeding management of small or large flocks.

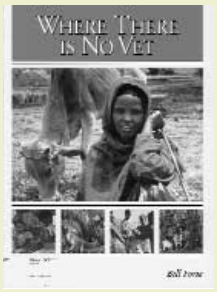
The role of forages in reducing poverty and degradation of natural resources in tropical production systems
by Peters M [et al] 2001 11 p. (Agren Network Paper no. 117) The Overseas Development Institute (ODI), 111 Westminster Bridge Road, London SE1 7JD, UK / agren@odi.org.uk
The paper reviews the role of forage crops in improving the productivity of smallholder farming systems and breaking the cycle of poverty and resource degradation. It reviews the contributions of forage crops to increasing farm incomes, intensifying farm production, and contributing to better human nutrition. Several case studies are presented including mucuna in Central America and West Africa, the forage peanut in Colombia, a forage legume in China, forage crops in Costa Rica and the production of forage crop seed in Bolivia. The paper also describes a strategy for farmer participatory research in identifying suitable forage crops in Southeast Asia.



Ethnoveterinary medicine : an annotated bibliography of community animal healthcare by Martin M, Mathias E, McCorkle CM. 2001. 611 p. ISBN 1 85339 522 6 : USD 45.00. (Indigenous Knowledge and Development Series). ITDG, Publishing, 103-105 Southampton Row, London WC1B 4HL UK, orders@itpubs.org.uk / www.itpubs.org.uk.
This bibliography with 1240 abstracts of documents on ethnoveterinary medicine covers 118 countries over the whole world and 25 livestock species including numerous breeds of cattle and sheep.

Forage husbandry by Bayer W, Waters-Bayer A. 1998. 198 p.. ISBN 0 333 66856 1. (The tropical agriculturalist / Coste R (ed.)). Technical Centre for Agriculture and Rural Cooperation (CTA), PO Box 380, 6700 AJ Wageningen, The Netherlands.
This book gives an overview of different aspects related to forage and livestock keeping, with an emphasis on pastoralists and smallholder farmers. Included are basic aspects of the farming systems, basic biology of livestock and forage resources, management of natural forage, forage as an auxiliary product from cultivated land, cultivated forages, and forage conservation and supplementation. The information explains the way pastoralists and smallholder farmers organise their lives, using livestock as part of their risk reducing and diversification strategies, combining livestock with crops and other - often non-farming - activities. In this sense not only technical and socio-economical aspects are taken into account, but also gender and other characteristics of the cultural dimension of livestock keeping. The last chapter gives an overview of the research and development approaches related to livestock keeping and forage production. This methodological guide includes a combination of traditional practices with outside ideas and technologies, according to the specific characteristics and needs of the farmers. Also available in french (KH)

The long dry season: crop-livestock linkages in Southern Mali by Ramisch J. 1999. 24 p. (IIED Issue paper no 88) International Institute for Environment and Development, Dryland Programme, 3 Endsleigh Street London WC1H 0DD, UK / drylands@iied.org
This paper investigates the interactions brought about by the co-existence of animal herds and agriculture in a village setting. It draws on PhD research that used soil nutrient balances to evaluate exchanges of animal manure and traction between owners and non-owners of livestock in Mali. The examples describe an agricultural sector undergoing an increasing level of intensification together with a growing number of animals. The challenge is to find ways of building on practices to intensify agricultural production further, while keeping at bay the risks of soil mining or widening inequality between different groups.



Where there is no vet by Forse B. 1999. 368 p.. ISBN 0 85598 409 0 : GBP 14.95. Oxfam, 274 Banbury Road, Oxford OX2 7DZ, UK.
Oxfam and CTA supported the preparation of this guide to first aid for animals. The author is a veterinary practitioner and farmer, and does a commendable job of explaining an impressive number of livestock diseases and their causes, symptoms and treatment. The numerous drawings make the text easy to understand. Although some information on care, feeding and handling of animals is given, the recommendations focus on curative measures. Important mechanisms of specific (often local) livestock species or breeds, such as tolerance or resistance to a particular disease, are mentioned only briefly. Although it is clear that a general book on simple veterinary medicine for the tropics cannot cover ethnoveterinary treatment in any detail, it would have been desirable if more emphasis was placed on local medicines which people can prepare themselves and which need not be kept cool. The book will be useful for field-based development workers, to guide them in making routine treatment and in handling emergencies. It frequently points to the limits of what can be done where there is no vet, requiring assistance from more experienced people. (AWB)

Managing mobility in African rangelands : the legitimization of transhumance by Niamir-Fuller M (ed.). 1999. 314 p.. ISBN 1 85339 473 4 GBP 17.95. Food and Agriculture Organization of the United Nations (FAO). IT Publications, 103-105 Southampton Row, London WC1B 4HH, UK / orders@itpubs.org.uk.
This book addresses one of the most important questions in range management in dryland areas of Africa: that of livestock mobility, which is still the most important economic strategy to deal with seasonal and inter-annual variation in forage and water availability in the rangelands. The book is divided into 11 chapters, of which 8 are case studies from countries in northern (Morocco), western (Mauritania, Mali, Niger), eastern (Sudan, Uganda) and southern Africa (Zimbabwe, Namibia). These cases cover the most important ecological zones for range management: arid, semi-arid, seasonally dry subhumid, in both lowlands and highlands. They deal in

some detail with current practices, their ecological foundations and problems, and issues of resource access and tenure. In the final chapter, key concepts related to livestock mobility are discussed: transience and flexibility, priority of use, managing uncertainty and risk, strengthening management regimes, managing key sites, law enforcement and mechanisms for conflict resolution. This book is a must for both policymakers and practitioners in range management and pastoral development. Moreover, in comparison with other technical texts, it is also reasonably priced. (AWB)

Agricultural services and the poor : case of livestock health and breeding services in India - summary by Ahuja V, [et al]. 2000. 148 p + 17 p. Indian Institute of Management, Vastrapur, Ahmedabad 380 015, India / www.iimahd.ernet.in The World Bank, Swiss Agency for Development and Cooperation.

This study on the delivery of livestock health and breeding services in three states of India attempts to develop policy recommendations for a more efficient and balanced system of delivering these services. The report with a seperate summary describes two field surveys. The first covered service provider units operated by various agencies like government, cooperative unions, private entrepreneurs and non-governemental agencies. The second study focused on the demand side of livestock service delivery. Its objective was to evaluate the potential impact of privatization and cost recovery on different categories of farmers. In the light of the findings of these two surveys, the study recommends a redefinition of the role of government in this sector by moving the curative veterinary and AI service into the realm of the private sector. (WR)

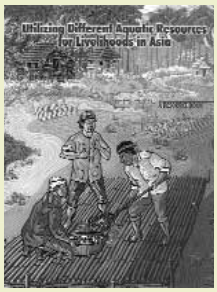
Capitalising on experience in Indo-Swiss cooperation in livestock development in India 2000. 50 p. free. Capitalisation of Experiences in Livestock Production an Dairying (LPD) in India project(CAPEX), Intercooperation, PO Box 6724, CH-3001 Berne, Switzerland / intercooperation@intercoop.ch; Swiss Agency for Development and Cooperation (SDC)/IC NRM Programme, Chandragupta Marg, Chanakyapuri, New Delhi 110021, India.

The main findings of the project Capitalisation of Experiences in Livestock Production and Dairying (LPD) in India -CAPEX- are presented in this booklet. This project reviewed the experiences of the Indo-Swiss Programme LPD in India, from its inception in 1963 to date, and formulated future priorities. LPD involved 8 projects spread throughout India. It also included support to developing a national livestock policy. Considering the wealth of experiences available after such a lengthy and large programme, the CAPEX-team choose 2 topics to focus on: 1. the evolution of a comprehensive LPD programme out of single projects and 2. selected technical issues in livestock breeding. The project is a nice example of the value of reflection on experiences! This booklet is a summary of a full version, also available at Intercooperation, as technical report no. 15. (IHG)

Politics, property and production in the west African Sahel : understanding natural resources management by Benjaminsen TA, Lund C (eds.). 2001. 335 p. ISBN 91 7106 476 1 GBP 18.95. Nordiska Afrikainstitutet, Uppsala, Sweden.

This collection of studies about Burkina Faso, Mali, Niger, Nigeria and Senegal presents natural resource management (NRM) for cropping, livestock husbandry and fishing in the context of political, economic and sociocultural processes. It shows that NRM is, above all, about relationships between people. It gives a glimpse into what is happening at local level while development agencies herald new programmes of decentralisation, democratisation, combatting desertification and participatory multi-stakeholder decision-making. Keen attention is paid to details of how local people decide about production and access to natural resources with a view to more than official policies, and often despite these. The studies reveal the need to look not only at the rules of the game but also at what people actually do. The book should not discourage interventionists trying to strengthen the rights of the marginalised, but does encourage them to become better aware of the tactics of the powerful.Nevertheless, the evidence of production by smallholders in the midst of environmental uncertainty, official and actual changes in property regimes, and political manoeuvring contradicts the alarmist cries of crisis in the Sahel. The book creates a modest optimism that people have a capacity for change and development with the right political environment, yet makes clear that there is no policy blueprint.

It is striking that only one of the 14 authors is African. Are African academics such a marginalised group? (AWB)



Utilizing different aquatic resources for livelihoods in Asia : a resource book 2001. 416 p. ISBN 1 930261 02 0. International Institute for Rural Reconstruction, Y.C.James Yen Center, Silang Cavite, Philippines / jelmontoya@hotmail.com IDRC, FAO, NACA and ICLARM.

Natural resources, especially water resources, continue to be available to poor families in many parts of the world and poor families have demonstrated that they can utilise these resources in a sustainable manner.This resource book is a compilation of proven experiences from Asia that are totally field-derived, and is the result of a participatory workshop conducted in 2000 at the IIRR. With clear descriptions and nice illustrations, this book provides extremely useful information on aquatic resource management. Participatory approaches and extension strategies, community managed aquatic resources, freshwater systems, lake and reservoir-based systems and brackishwater and marine systems are the chapters dealt with.

The materials of the book can be used freely in advocacy, training and planning. The authors realise the value and need for upscaling their efforts in small-scale aquaculture. Especially recommended for development practitioners, local government officials and academic institutions.(WR)

Corrections: LEISA Magazine Vol. 17 No. 4 - GM not the only option

The caption to the photo on page 27 should read, "P.V.Satheesh from the AP coalition in defence of diversity gives evidence to the jury. Photo: Agroindia"

The letter published on the back cover, "Using the poverty of the south to justify GM food to the north" was an initiative of Tewolde Berhan Gebre Egziabher of Ethiopia. He was awarded the "Alternative Nobel Prize" (Right Livelihood Award) for his international negotiations on behalf of the South.

Milk south-north (Lait sud-nord) by World Herders Council (Conseil Mondial des Eleveurs), 2000. B.P.2453, 6002 Lucerne, Switzerland
http://www.condial.org/francais/fspublications.htm
The World Herders Council is an initiative of traditional herders of the Sahel. It is an international network of herders who are determined to stay and who have a concept of cattle breeding which includes a respectful attitude towards nature, towards animals and towards people. Their dossier Milk south-north, is a reflection on ethics for herding dedicated to milk, in which the discussion between herders from "the South" and European stockbreeders is paramount. The printed version of the dossier is in French and English and can be ordered via this web site.

Impact of changing agropastoral systems on agrobiodiversity: A case study of the Qinghai-Tibetan Plateau
an article by Wu Ning, 1998.
http://www.icimod.org.sg/focus/agriculture/agribio_bk/agrobio4.htm
This study describes the daily lifestyle of the pastoralists and discusses the economic progress and resultant pressure on the environment, particularly on the rangeland ecosystem and its biodiversity.

International Centre for Integrated Mountain Development (ICIMOD)
4/80 Jawalakhel, G. P.O. Box 3226, Kathmandu, Nepal.
icimod@icimod.org.np
http://www.icimod.org.sg/
ICIMOD's mission is to help promote the development of an economically and environmentally-sound mountain ecosystem and to improve the living standards of mountain populations in the Hindu Kush-Himalayan Region.

Farming Systems by International Institute of Tropical Agriculture (IITA), c/o Lambourn (UK) Limited, Carolyn House 26 Dingwall Rd., Croydon, CR9 3EE, UK . IITA@cgiar.org
http://www.iita.org/crop/farmsys.htm
IITA's mission is to enhance the food security, income and wellbeing of resource-poor people, primarily in the humid and sub humid zones of sub-Saharan Africa. It conducts research and related activities to increase agricultural production, improve food systems, and sustainably manage natural resources, in partnership with national and international stakeholders. Information on sustainable crop-livestock systems is available on this page. IITA also provides publications free of charge.

Integrated Crop-Livestock production for the slopelands of Asia, 1998, informative article to introduce a workshop on this topic.
http://www.agnet.org/library/article/ac1998d.html
Combining livestock with crops is a sustainable and profitable system of production for low-income slopeland farmers in Asia.

Low-cost livestock technology development by farmers, 1998.
http://www.agnet.org/library/article/ac1997f.html
This survey undertaken by the FFTC (food and fertiliser technology center) aimed at collecting and disseminating low-cost indigenous farming technologies related to livestock production. These technologies are described in the paper.

A knowledge link on livestock and rangeland systems, Work in progress 2002-1st edition. International Fund for Agricultural Development (IFAD), Via del Serafico, 107, 00142 Rome, Italy / livestockadvisory@ifad.org
This CD-Rom contains all the html available on the livestock and rangeland knowledge subsite of the IFAD website: **http://www.ifad.org/lrkm/index.htm**. It is based on case studies of a range of IFAD projects that support livestock production among pastoralists, agro-pastoralists and smallholders.

The Real Green Revolution
www.farmingsolutions.org
Farmingsolutions is a website jointly created by Greenpeace, Oxfam and ILEIA. The aim of the website is to bring forward successful experiences of ecologically-sound, socially responsible and economically-viable farming practices, and to demonstrate that this kind of agriculture can be successful in fighting hunger and malnutrition.

The website argues for a fundamental shift in agricultural production; from the present resource degrading, chemical-dependent, industrial agriculture controlled by corporations, to an agriculture suitable for small farmers and adapted to local conditions.

The web site is easy to navigate and has a lot of information on world hunger, agricultural production and successful agro-ecological approaches.

You are invited to contribute your own experiences and opinions to the site, please do!

www.farmingsolutions.org

Ethnovetweb, Evelyn Mathias, Weizenfeld 4, 51467 Bergisch Gladbach, Germany. evelynmathias@netcologne.de
http://www.ethnovetweb.com/
This website is about ethnoveterinary medicine, or how people around the world keep their animals healthy and productive, and how development can build on this information. The site provides information resources and publications, some in full text. A strong part of the website is the page with links and descriptions of other web sites on ethnoveterinary medicine and livestock development.

Livestock, Environment and Development Initiative (LEAD)
is an inter-institutional project with the secretariat in FAO, Rome.
http://www.virtualcentre.org/selector.htm
The work of the LEAD Initiative targets at the protection and enhancement of natural resources as affected by livestock production while alleviating poverty. The website provides information in English, Spanish and French, about electronic conferences, online discussion forums, research and development and electronic newsletters on livestock production.

Centre for research on sustainable agricultural production systems - CIPAV, Cali, Colombia / lrrd@cipav.org.co
http://www.cipav.org.co/index.html
The CIPAV Foundation is a Colombian NGO founded in1986. The projects and programmes on which it focuses are alternative agricultural production systems. These systems promote the efficient and sustainable utilisation of the available human and natural resources, in harmony with the environment. Their experience in a wide array of ecosystems and social conditions can be summarised in a strategy for sustainable farming systems in tropical humid America. The site provides information on livestock research, the electronic journal Livestock Research and Development, conferences, publication lists etc., in Spanish and in English.

Animal production and health page of FAO, Rome Italy
http://www.fao.org/WAICENT/FAOINFO/AGRICULT/AGA/index_en.htm
Global livestock production is growing more dynamically than any other agricultural sector. Livestock are already the world's largest land user, and the livestock sector is predicted to become the most important agricultural sector in terms of added value by 2020. On this page FAO provides recent information on livestock production. A lot of publications are mentioned. Of particular interest is a series of practical publications especially meant for farmers.

International Livestock Research Institute (ILRI). ILRI-Kenya
P.O. Box 30709, Nairobi, KENYA / ILRI-Kenya@cgiar.org
http://www.cgiar.org/ilri/research/prod-con.cfm
The International Livestock Research Institute works to improve the wellbeing of people in developing countries by enhancing the diverse and essential contributions that livestock make to smallholder farming. On this research page of ILRI, information on the production-to-consumption systems approach is to be found. Research to improve livestock productivity and sustainability in market-oriented smallholder systems will help ensure affordable balanced diets for the urban poor while reducing poverty and building assets for the rural poor. More information can be obtained from the newsletter of the Crop-animal Systems Research Network (CASREN) which is available in pdf format on the ILRI site.

Food and Fertilizer Technology Center: An international information center for farmers in the Asia Pacific Region fftc@agnet.org
http://www.agnet.org/
Asian countries are densely populated, and farms are small. The articles available on the site cover a wide range of policies, programmes and problems in Asian agriculture. Also information on FFTC seminars, workshops, training courses and special projects to collect and disseminate information about agricultural technology for small farms in Asia is provided. Free publications and other technical information, including low-cost technology for resource poor farmers is given.

http://www.icimod.org.sg/publications/imd/imd98-5.htm
The paper "Livestock Development in Mixed Crop Farming Systems 98/5" is found on this page. This paper reviews and analyses: 1) the temporal changes that took place over the past years in terms of livestock population and composition and 2) the institutional programmes for developing the livestock sector. Finally, it draws implications of these experiences for livestock planners and policy-makers and raises several research issues related to livestock sector development.

Primary Animal Health Care in the 21st Century: Shaping the Rules, Policies and Institutions

Mombasa, Kenya, 15-18th October 2002

From the 15th to 18th October 2002, the Community-based Animal Health and Participatory Epidemiology (CAPE) Unit of PACE/OAU-IBAR is organising an international conference in Mombasa, Kenya. The objectives of the conference are to:

- review progress with the formulation of supporting policies and legislation for primary-level animal health workers
- identify key lessons learned and make recommendations regarding future policy and legislative needs

The conference, funded by DFID and CTA, will take the form of keynote presentations, submitted papers and posters and facilitated group discussions to arrive at recommendations regarding future policy and legislative needs.

Papers and posters are invited on the five themes listed below:

1. General policy, legislation and institutional issues
2. Financial sustainability and privatisation
3. Policies and Animal Health Research
4. Policy on training and learning issues
5. Policy on community-based surveillance

The venue for the conference is the Whitesands Hotel, Mombasa, Kenya. Accommodation will be available at the special conference rate of US$60 per single room on a full board basis. Sponsorship will be available for limited numbers of selected participants to cover the costs of travel and accommodation.

For more information and to register please contact: Dr Keith Sones, c/o CAPE Unit, PACE Programme, OAU/IBAR, P.O. Box 30786, 00100 Nairobi, Kenya. Fax: 254 2 212289 e-mail: ksones@net2000ke.com

BOOKS

The role of smallholder farmers in seed production systems report and recommendations of a study visit organised by the technical centre for agricultural and rural cooperation, Zimbabwe, 1999. 2000. 94 p. ISBN 92 9081 2176. Technical Centre for Agricultural and Rural Co-operation (CTA), PO Box 380, 6700 AJ Wageningen, The Netherlands / cta@cta.nl CTA number 965. 10 credit points.
This book reports about the CTA study visit to 19 seed supply projects in Zimbabwe by 16 seed supply experts from sub Saharan Africa. The visits focused on work with smallholder farmers and on small grain and other indigenous crops. The report details the visits, outlines the seed supply situation in participants' home countries, and explains the follow-up work upon returning home. The report provides a lot of technical information but also encompasses socioeconomic aspects in management decision making.

The availability of improved seeds holds a key to enhanced farm productivity and increased income generation. The formal seed sector has had an impact on the productivity of high-value crops. But high quality seed supply for smallholder farmers has often been neglected, though indigenous crops grown by small farmers largely contribute to household and national food security in most countries. It is the informal seed sector that supplies 90% of the seeds of these indigenous crops. This report provides recommendations to improve the informal seed sector. The participants in the study agreed that when the informal seed sector is given the resources it needs to generate high-quality seeds for the nearly 90% of farmers in Zimbabwe and neighbouring countries who presently rely on this source, it will have a huge impact on national food stocks and food security. (WR)

Global development : an experiment in rural development in Bolivia 2001. 83 p. Centre of Studies on Social and Economic Reality (CERES), Cochabamba, Bolivia. Simon I. Patino Foundation, 8, rue Giovanni-Gambini, 1206 Geneva, Switzerland.
From 1990 to 1995, the Simon I. Patino Foundation undertook an integrated development project in a peasant community near Cochabamba (Bolivia) with the objective of improving the quality of life of the population and halting the process of emigration, severely affecting the region at that time. The book describes the experiment from its inception, the handing over of responsibility to the community and the relative continuance of activities. In the first part of the book the agricultural site with its drought problems is discussed and the start-up of the project together with the organisation and the activities undertaken. The last part deals with relations within the community, the handing over of the project to the community and the causes and consequences of the interruption of most of the project activities. The text concludes with a more general reflection on the subject of development, for which the experiment under consideration serves as a starting point. (WR)

From indigenous knowledge to participatory technology development : soil and water conservation by Michael YG, Herweg K. 2000. 52 p. Centre for Development and Environment, University of Berne, Institute of Geography, Hallerstrasse 12, 3012 Berne, Switserland / cde@giub.unibe.ch. Dr. Yohannes Gebre Michael, P.O.Box 33569, Addis Abeba, Ethiopia / Fax: +251 1 518977.
This booklet on extension in soil and water conservation contains extracts from the detailed case studies Yohannes Gebre Michael carried out on different sites in Ethiopia, as part of his PhD. It is targetted at Development Agents of the agricultural extension service. The booklet helps the user to understand and respond to the diverse rural communities and landscapes, to see the needs and understand how indigenous soil and water practices work, to consider these indigenous practices as options for participatory technology development, and to integrate both indigenous and introduced know-how and practices for a more sustainable land management.

This booklet illustrates a procedure on how to learn about the prevailing natural and human settings in a rural area. It shows how to make best use of existing know-how through discussions with farmers, women, elders and leaders. Land users have most knowledge of their area, and development agents and experts should not attempt to do the farmers' job on behalf of them. Recommended. (WR)

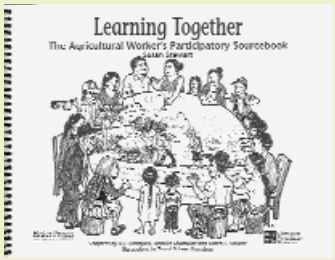
New ways of developing agricultural technologies : the Zanzibar experience with participatory integrated pest management by Bruin GCA, Zeeman F. 2001. 167 p. ISBN 90 6754 624 0. Wageningen University and Research Centre, Technical Centre for Agricultural and Rural Cooperation (CTA), PO Box 380, 6700 AJ Wageningen, The Netherlands / cta@cta.nl.
This book tells the story of an international collaboration in crop protection that evolved over sixteen years in Zanzibar. The project developed from a top-down activity focussing on the strengthening of a governemental plant protection organisation, to a successful process of bottom-up development in subsistence agriculture.

Experiences are decribed with the Farmer Field School (FFS) development on the islands of Zanzibar. The results in five different cropping systems are described, and general lessons are drawn from the successes and failures. Lessons include necessary adaptations of the FFS model, originally developed in rice agriculture in Southeast Asia, to the typical agro-ecological and socio-economic conditions of small-scale farmers in East Africa. By doing so the book addresses biological, ecological, social, economic, bureaucratic, and political dimensions of agricultural development.

The conclusions of this work show that FFS can work in an East African context if certain conditions are met. These conditions include raising awareness, creating mutual trust, developing new partnerships in research and extension, promoting conducive policies for FFS development, and mobilizing funds to make this happen. The good news is that the FFS way of working is capable of effectively mobilising people to collaborate in new and productive ways. However, this will not happen overnight and requires commitment of many stakeholders.

The international seminar on non-timber forest product : China Yunnan, Laos, Vietnam 2001. 187 p. ISBN 7 81068 271 7 RMB 40.-. Sino-Dutch Cooperation Forest Conservation and Community Development Project Office / hepikun@public.km.Yn.cn Yunnan University Press, 8 Jiaolin Road, Kunming, Yunnan 650031, P.R. of China.
This seminar aimed at increasing understanding about the role of Non Timber Forest Products (NTFP) in conservation and development in three countries - China, Vietnam and Laos. The report contains all the papers presented and summaries of the plenary discussions. Besides the plenary discussions, three parallel working group discussions tackled specific practical problems, in order to share and discuss experiences and lessons learnt. The three working groups were: NTFPs and forest conservation, NTFPs and community development, and NTFPs and marketing and processing. Papers addressing these topics with a lot of case studies and recommendations for sustainable use and management, participatory

methods to determine the role of NTFPs in community's life, and marketing information are compiled in the proceedings. Useful information on forest conservation and sustainable development.(WR)



Learning together: the agricultural worker's participatory sourcebook
by Stewart S. 1998. 350 p.
ISBN 1 886532 10 9. Heifer project International, PO Box 808, 1015 Louisiana Street, Little Rock, AR 72202-2815 USA / www.heifer.org
Triops, Hindenburgstrasse 33, D-64295 Darmstadt, Germany / triops@net-library.de ; www.net-library.de.
Christian Veterinary Mission, 19303 Freemont Ave.N., Seatle, WA 98133 USA / www.vetmission.org. CTA no. 1045, 80 creditpoints
Learning together is a very rich resource book of excellent quality, meant for trainers in the field of agricultural and livestock development. It focuses mainly on trainers (both professionals or farmers) who are or will be training farmers in a participatory way. It is written by a variety of people working in agricultural development connected to a range of organisations. Drawing on the training experiences of practitioners from over 25 countries on 5 continents makes the book extremely practical. It offers a wealth of useful participatory methods, tools, techniques, games, energizers, etc. that can be used to improve on the quality of agricultural training.

It is designed primarily as a reference book. Users can pick out ideas from the sections related to the activity they want to undertake. The book is very comprehensive and includes all relevant topics, which are covered in a very practical way. The source book contains four sections: (1) How adults learn and effective learning techniques, (2) The steps in a training cycle, (3) Issues in agricultural and livestock training (gender, communication and IK) and (4) Reference section.

The book is rich in illustrations and the text is easy to understand. The approach to learning is very refreshing. Instead of the traditional form of theory followed by exercises, this book gives a lot of exercises through which reflection on the theory is stimulated. In short, this is certainly a book that will be frequently used and highly appreciated by every agricultural trainer who seeks to improve his or her training/facilitation skills. (WvW)

Urban Agriculture 2001. 45 min VHS PAL. ETC Netherlands/Resource Centre on Urban Agriculture and Forestry (RUAF), PO Box 64, 3830 AB Leusden, The Netherlands / www.ruaf.org ; ruaf@etcnl.nl.
This video on urban agriculture has been produced to facilitate a greater understanding of urban agriculture among policy-makers, urban planners, NGOs, sectoral organisations and other people who can make a contribution to the integration of urban agriculture into urban policies, plans and development programmes. It can be used in meetings, seminars, workshops, staff-training sessions, and initial phases of projects. The first part of the video shows the potential contribution of urban agriculture to enhancing urban food security, to poverty alleviation and to sustainable urban management. The second part of the video presents two examples of local processes of situation analysis, planning and action regarding urban agriculture - one example in Dar es Salaam, Tanzania, and the other in Cuenda, Ecuador. The video is also available in French and Spanish.

Ethical consumers and ethical trade : a review of current literature
by Tallontire A, [et al]. 2001. 34 p. ISBN 0 85954 527 X GBP 5.-. Natural Resources Institute (NRI), University of greenwich, Chatham, UK
DFID. (Policy series ; EP 12). NRI Catalogue Services, CAB International, Wallingford, Oxon OX10 8DE, UK.
This review examines both the nature of ethical consumerism and the characteristics of consumers themselves. The motivations of ethical consumers are varied, as is their willingness to pay an ethical premium on consumer goods. Ethical consumerism is a complex phenomenon and the experiences obtained within the fair-trade and organic movements are reviewed in an attempt to clarify issues determining its future potential. These conclusions are important both to the commercial sector and to development agencies concerned with trade with developing countries.

On-farm seed priming - a key technology to improve the livelihoods of resource-poor farmers in marginal environments by Harris D., 2001. 15 p. DFID plant Sciences Research Programme, Centre fro Arid Zone Studies, University of Wales, Bangor, Gwynedd ll57 2UW, United Kingdom.
Soaking seeds before sowing, or priming, is a technique that has been used by farmers for generations. However, it has been done mainly in times of drought to "catch up " on time lost, and the duration of soaking has been highly variable. This booklet documents the findings of participatory research undertaken by researchers of the Centre for Arid Zone Studies of the University of Wales and farmers in several countries in Asia, Africa and Latin America on seed priming as a regular practice. The findings prove that seed priming is a low-cost, low-risk technology ideally suited to the needs of resource-poor farmers in marginal areas of the semi-arid tropics. The booklet contains a lot of practical information on a range of crops that can be tried out and adapted by farmers. More information can be found on the web site www.seedpriming.org (CW)

The meat business : devouring a hungry planet by Tansey G, D'Silva_J (eds.). 1999. 249 p.
ISBN 1 85383 603 6 GBP 12.99. Earthscan, 120 pentonville Road, London, N1 9JN UK / orders@lbsltd.co.uk ; www.earthscan.co.uk.
This book tackles a fundamental global concern: how can we feed ourselves in the coming centuries, in a way that provides healthy and plentiful food for all people and yet is gentle on animals and on the environment? The papers of Compassion in World Farming's conference on Agriculture for the new millennium- Animal welfare, poverty and globalisation have been transformed into this book. The book is very informative and provides ethical consumers and campaining citizens with practical advice on how to achieve urgently needed reforms in agricultural practices. The exploitation of animals in factory farming is criticized. It says that cheap meat takes food from the mouths of the poor and creates degradation and pollution of the environment. The book contributes to the discussions on the need for a more sustainable agricultural system both in developed and in developing countries.(WR)

Networking for family poultry development

E. Fallou Guèye and K. van 't Hooft

Mr. Subramanium actively promotes indigenous chicken breeds. Photo: Bertus Haverkort

Around 80% of the world's poultry is managed in traditional poultry systems, consisting of chickens, guinea fowls, turkeys, ducks, pigeons etc. These animals, of a wide variety of indigenous breeds, play an important role in the family: as a small asset, as a source of food or for social and spiritual obligations. The importance of poultry as a tool for poverty alleviation has been long identified. Many projects have attempted to replace the local poultry breeds with exotic or cross breeds specialised in egg or meat production, whilst introducing the standardised conditions of more intensive systems. Success, however, has been limited. In the past few decades, family poultry projects based on local knowledge and the improvement of indigenous breeds of different fowl species under local circumstances have been developed. In this process, high mortality due to infectious diseases (especially Newcastle disease) as well as predators, theft, and seasonal lack of feed, had to be dealt with - a tough task under local conditions and policies.

Several networks have been established to exchange experiences and research results between people engaged in family poultry keeping in developing countries. Examples are the FAO programme to support family poultry production that works through the International Network for Family Poultry Development (INFPD) (www.fao.org/ag/aga/agap/lpa/fampo1/fampo.htm); the Network for Smallholder Poultry Development of the Royal Veterinary and Agricultural University in Frederiksberg, Denmark (www.poultry.kvl.dk); Fowls for Africa of the Agricultural Research Council of South Africa (www.arc.agric.za); and the Improvement in Rural Poultry in Developing Countries of the University of Queensland, Australia (www.vsap.uq.edu.au/ruralpoultry).

One issue that these networks have focused on is the development and testing of thermo-stable vaccines for the control of Newcastle disease under rural family conditions. Newcastle disease is capable of causing a 50 - 100% mortality in unprotected chicken flocks, and the impact and unpredictability of the outbreaks in rural communities have discouraged many families from investing in new animals. Vaccination is the only way of controlling this disease, both in industrialised and extensive systems. The commercial vaccines commonly available (La Sota, Hitchner B1 and Clone 30) are adapted to large-scale chicken farms; these require constant refrigeration and once opened need to be used on a large number of individual animals within a short time. These multi-dose vials of vaccine (minimum 1000 doses) are not suitable for village poultry systems.

The INFPD and the Australian Centre for International Agricultural Research (ACIAR) have supported projects in the development of vaccines suitable for use in village poultry systems. These do not require continuous refrigeration and give optimal effect when administered as eye drops, but can also be given as a food additive to animals that cannot be caught. The first of these vaccines (NDV4-HR), was successfully tested in Asia and Africa, and is now produced commercially. Another thermostable vaccine (I-2) developed later is free of commercial ownership. (for more information contact: Dr. John W. Copland copland@aciar.gov.au) It is available at no cost to countries that wish to produce their own vaccine; the simple techniques required for producing and testing the vaccine can be learnt in short workshops. It is now being produced in Vietnam, while it is currently being tested in several African countries. The outcome of this effort shows the potential and the importance of networking and research in optimising low-input livestock systems. ■

Theme for issue 18.4, December 2002

Feminisation of agriculture needs appropriate responses

The feminisation of small and marginal agriculture is increasing rapidly in many parts of the world due to processes such as labour migration, part-time farming, urban life focused education and HIV/AIDS. This has an enormous impact on women, their households, rural communities and farming. Supporting women in their role as farmers requires many changes and adaptations. These relate to property rights, access to productive resources as well as to adaptations, i.e. decision making, labour division, crop management, animal husbandry and production of tools. Also research, extension, information management, input supply, financing and marketing etc. have to become more women-focused and have to develop methodologies and procedures adapted to the specific conditions and needs of women. Often, women as the main managers of change have to cope with ecological degradation. What specific needs do women in such conditions have and what adaptations have been developed by women to cope with these processes? What are the experiences of participatory programmes that have been supporting women to cope with change? What are good examples of technologies and methodologies suited for use by and with women? We invite you to share your experiences on these and other relevant questions with other readers of the LEISA Magazine. First deadline for contributions 1st of September 2002.

You are invited to contribute to these issues with articles (about 800, 1600 or 2400 words + 2-3 illustrations and references), suggest possible authors, and send us information about publications, training courses, meetings and websites. Editorial support is provided by ILEIA. Authors of published articles are entitled to a standard fee.