March 2009 volume 25 no.1

LEISA

25 YEARS

Magazine on Low External Input and Sustainable Agriculture

Farming diversity

CONTENTS

LEISA
Magazine on Low External Input and Sustainable Agriculture
March 2009 Volume 25 No. 1

LEISA Magazine is published quarterly by ILEIA

Address:
P.O. Box 2067, 3800 CB Amersfoort, the Netherlands
Visitors address:
Zuidsingel 16, 3811 HA Amersfoort
Tel: +31 (0)33 467 38 70, Fax: +31 (0)33 463 24 10
E-mail: ileia@ileia.nl

Editorial team
This issue has been compiled by: Jorge Chavez-Tafur, Karen Hampson, Petra Rooijakkers, Mundie Salm, Frank van Schoubroeck and Edith van Walsum.

Regional editions
LEISA Revista de Agroecología
The Latin American edition in Spanish can be ordered from Asociación ETC Andes, Apartado Postal 18-0745, Lima 18, Peru. Contact: Teresa Gianella-Estrems. E-mail: base-leisa@etcandes.com.pe
LEISA India
The Indian edition in English can be ordered from AME Foundation, 204, 100 Feet Ring Road, 3rd Phase, Banashankari 2nd Block, 3rd stage, Bangalore - 560 085, India. Contact: K.V.S. Prasad. E-mail: amebang@giasbg01.vsnl.net.in
SALAM Majalah Pertanian Berkelanjutan
The Indonesian edition in Bahasa Indonesia can be ordered from VECO Indonesia, Jl Kerta Dalem no.7, Sidakarya, Denpasar 80224 Bali, Indonesia. Contact: Shintia Dian Arwida. E-mail: shintia@veco-indonesia.net.
AGRIDAPE
The West African edition in French can be ordered from IED Afrique, P.O.Box 5579, Dakar, Senegal. Contact: Awa Faly Ba. E-mail: agridape@sentoo.sn
Agriculturas, Experiências em Agroecologia
The Brazilian edition in Portuguese can be ordered from AS-PTA, Rua de Candelária, No. 9, 6° andar, Rio de Janeiro, RJ Brazil CEP: 20.091-020. Contact: Paulo Petersen. E-mail: paulo@aspta.org.br
可持续农业
The Chinese edition can be ordered from CBIK, 3rd Floor, Building A, Zhonghuandasha, Yanjiadi, Kunming, Yunnan 650034, People's Republic of China. Contact: Ren Jian. E-mail: renjian@cbik.ac.cn

Administration
Lila Felipie, Ellen Hofmann, Natasha Leetion and Wilma Roem.

Subscriptions
Subscription rate for one year (4 issues): northern institutions and international organisations: €45, others €25. Local organisations and individuals in the South can receive the magazine free of charge on request. To subscribe, write to ILEIA or send an e-mail to: subscriptions@ileia.nl. Back issues are available on the ILEIA website or can be requested from ILEIA.

ILEIA website
http://www.leisa.info

Design & layout
Jan Hiensch, Leusden.

Printing
Koninklijke BDU Grafisch Bedrijf B.V., Barneveld.

Funding
The ILEIA programme is funded by Sida and DGIS.

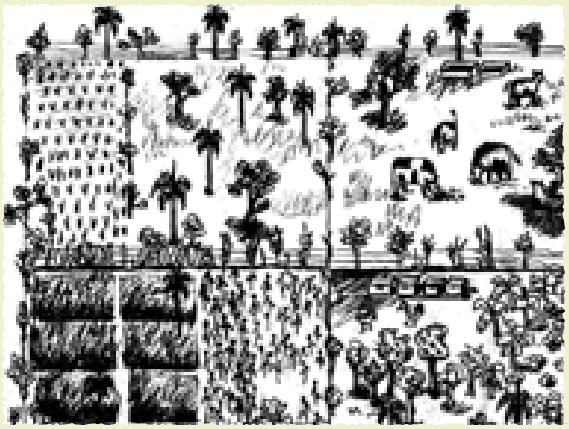
Cover photo
Burton Caliz is an award-winning organic farmer in Toledo District, Belize. He has established a school garden programme in his community of Mafridi, supported by Sustainable Harvest International-Belize.
Photo: Sarah Kennedy/Sustainable Harvest International

Correction: The cover photo from the December 2008 issue should have been credited as Petterik Wiggers/PANOS

The editors have taken every care to ensure that the contents of this magazine are as accurate as possible. The authors have ultimate responsibility, however, for the content of individual articles.

ISSN: 1569-8424

9 Diversity and efficiency: The elements of ecologically intensive agriculture



Fernando Funes-Monzote, Santiago López-Ridaura and Pablo Tittonell

There is plenty to learn from traditional production systems, particularly in terms of productivity, reliability and efficiency, and the role that diversity plays. Some of these lessons are being taken up in Cuba, resulting in a considerable number of farmers enjoying the benefits of mixed farming systems. This is having a positive impact in this country's agricultural production and self-sufficiency: approximately 65% of the food produced and marketed locally nowadays comes from small-scale and diverse farms. On the basis of a thorough evaluation, this article shows some of the issues to consider when designing and managing diverse farming systems.

16 Seeds, knowledge and diversity in the hands of small-scale farmers in Honduras

Faris Ahmed

People often think of bananas and pineapples when thinking about Honduras. Fruit exports are an important part of the country's economy; this production depends on the use of chemical inputs and specific "improved" varieties. However, there is also a large group of family farmers in Honduras who take a different approach to agriculture. Seventy-one farmer research committees (called CIALs) throughout the country are finding local solutions for making their farms more resilient. Through community seed and gene banks, and participatory breeding programmes, farmers have developed hardier varieties of maize and beans that are well adapted to their local conditions, while also increasing productivity.

LEISA Magazine informs practitioners, researchers, farmers and policy makers about the latest developments in small-scale, sustainable agriculture. It offers readers around the globe an opportunity to share knowledge, information and opinions. In this way, LEISA Magazine hopes to contribute to improving the sustainability of small-scale farmers' livelihoods.

LEISA stands for Low External Input and Sustainable Agriculture. It is about inspiring farmers to use local resources, natural processes and their knowledge, culture and values to improve productivity and income in an ecologically sound way. LEISA is an umbrella approach, and a political message, seeking to influence policy formulation to support small-scale farmers.

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

5 Editorial – Celebrating diversity

6 Theme overview – Small-scale farmers: The key to preserving diversity

9 Diversity and efficiency: The elements of ecologically intensive agriculture
Fernando Funes-Monzote, Santiago López-Ridaura and Pablo Tittonell

11 Making the most of underutilised crops
Hannah Jaenicke and Nick Pasiecznik

12 Improving livelihoods with underutilised trees
Abhay Gandhe and Arun Dolke

16 Seeds, knowledge and diversity in the hands of small-scale farmers in Honduras
Faris Ahmed

20 Living the sustainable life: Managing a dryland family farm
Aspen Edge

23 Sharing knowledge on agrodiversity for conservation and livelihood improvement
Luohui Liang and Harold Brookfield

26 Diversity the world over: From silkworms to travelling potatoes

28 Successfully preserving national heritage in Japan
Kazumi Yamaoka

30 Two views: How sustainable is organic agriculture?

32 Spate irrigation: Good for people, livestock and crops
Frank van Steenbergen and Abraham Haile Mehari

36 "Hot issues" help preserve traditional agricultural systems
Frank van Schoubroeck, Luohui Liang and Arend-Jan van Bodegom

38 Call for articles: Women and food sovereignty

39 Field Note: Mr Bairwa's diverse farm
Veena Vidyadharan and M.K. Tiwari

40 Sources

42 Networking

43 New Books

44 Sustainable agriculture in the news

20 Living the sustainable life: Managing a dryland family farm

Aspen Edge

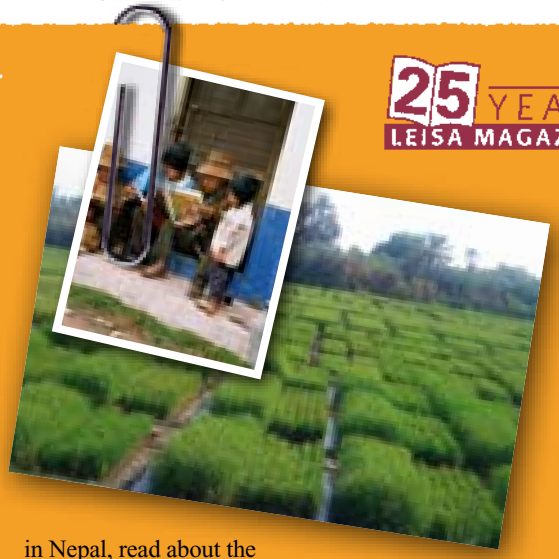
Wanting to live a more sustainable life, the author and her family invested their time, energy and enthusiasm in revitalising a farm in southern Spain. As the farm had not been operational for twenty years, they faced many challenges in developing a viable sustainable farming system, whilst restoring and conserving the natural resources. The farm is in the dryland areas, which posed particular challenges. This is their story of creating a management plan, and their experiences in using diversity (such as locally adapted crops and shrubs, using sheep to reverse degradation, and ensuring internal recycling) to contribute to long-term plans.

28 Successfully preserving national heritage in Japan

Kazumi Yamaoka

Rice terraces are part of Japan's cultural heritage. Since the 1960s, however, the terraces' existence has been under threat. Support for preserving the rice terraces has been growing since the mid-1990s. There have been a variety of government programmes aimed at valuing these landscapes. Society in general has begun to realise their worth as recreational and educational areas. This article describes the various initiatives that have been implemented to conserve these areas, and promote their potential cultural and natural roles.

JUBILEE PAGES



25 YEARS LEISA MAGAZINE

4 Agriculture the world over

14 Celebrating our jubilee with you

Our special jubilee pages keep you updated on our activities celebrating the 25th birthday of LEISA Magazine. They also offer two special jubilee sections: In "How I stay informed", readers tell us about where they get their information on sustainable agriculture from, and in "After publication..." a reader tells us what happened after she had an article published in LEISA Magazine.

18 Inspired by....

Sometimes articles in LEISA Magazine have consequences you would not have imagined. Rajendra Uprety, an agricultural extension officer in Nepal, read about the System of Rice Intensification (SRI) in one of our editions. It gave his life quite a turn.

34 Update from the field

What happens to those promising projects and clever ideas people have shared with us through the magazine? In "Update from the field", Rezaul Haq and Wadud Nawaz from Bangladesh update us on their activities in continuing to implement a type of agriculture that does not need soil.

Photo: Rik Thijssen

AGRICULTURE THE WORLD OVER

From sheep owners to sheep breeders

At an altitude of 3000 to 4500 metres, the climate and the geography of the high Andes make vegetable growing difficult. In the Cusco region, Peru, farmers depend on extensive livestock keeping as a source of income. They are now discovering that the breeds they have been taking care of for generations, have a large untapped potential. Well-equipped for this rugged terrain, these breeds are now even better suited to the needs of the local population. Farmers are changing from being sheep owners to sheep breeders, and with that the capacity of the sheep for giving milk is increasing, as is their weight and life expectancy. (PR)

Celebrating diversity

You may have noticed it already: LEISA Magazine has entered its 25th year. We think that deserves celebrating. In all of this year's issues, you will find special jubilee sections. Most of them highlight you, our reader. After all, it is you who have made LEISA Magazine into what it is today: a magazine that reaches people interested in small-scale family farming in no less than 154 countries!

You will find we have made a few changes to the magazine. Our latest readers' survey showed us you very much appreciate background information on the theme we choose for every issue. We have therefore introduced the Theme Overview. From now on, the first article of every issue will go into the why and the how of the theme, putting it in a broader, global context, in a way that is even more in depth than before. As a result, we have cut our editorial to one page.

We have chosen *The Future of Family Farming* as the common thread running through all four themes for this jubilee year. We believe that this is the time to reflect on what family farming has to offer to the world. In each issue we will explore one particular dimension of this larger theme. On page 14 you will find an overview of our jubilee sections and activities. Join us in these explorations!

Making a case for diversity

This first jubilee issue deals with a theme that is at the heart of small farmer logic: diversity. It expresses itself in many ways. There are diverse landscapes and ecosystems, diverse ways of life, diverse crops and agricultural systems. Small farms have been naturally benefiting from the diversity in their natural environment.

In a recent publication*, Miguel Altieri, Professor of Agroecology at the University of California, makes a clear case for diverse small-scale farming systems. He argues that small farms that combine stable and diverse production, that generate and sustain their own inputs and that have favourable energy ratios and good links to markets, comprise an effective approach to achieving food security, income generation, and environmental conservation.

Articles in this issue all illustrate the above. In Honduras, for example, farmers have taken seed supply systems into their own hands, through initiatives such as shared seed banks (see page 16), and an extensive study in Cuba shows how mixed farms are more productive, more energy-efficient, and show better nutrient management than those specialised in dairy products or a certain crop (see page 8).

Small versus big

If diversity is so visibly present, and there is so much evidence that it forms the basis of sound farming strategies in an increasingly unpredictable environment, then why is diversity under threat? In the Theme Overview, Coen Reijntjes tries to find an answer to this question while he explores the logic of diversity-based small-scale farming in the present global context. He zooms in on the debate about small and diverse farming systems versus big specialised farms. He discusses how the dominant ways of thinking about development are vested in a belief that specialisation and economies of scale are the way to development. Diverse small farms are considered as backward and unproductive. Small farmers either should "modernise" or they should move out of farming, is the logic. The consequences of this logic, for small farmers, for local and national level food security, for biodiversity and for the future of our planet, are enormous.

It is time to reflect on what family farming means to the world

Global economic crisis

Members of the global LEISA Network in Peru, Indonesia, India and Senegal sent us reports about the consequences of the unfolding economic crisis in their countries (see our website). They all observe that the crisis is already leading to increasing problems for many rural households: migrant labourers return to their homes after losing their jobs, while prices of food, inputs and other commodities continue to increase. This situation underlines the significance of diverse farming systems.

Photo: BBC World Service

Small-scale farming families, like this one in Brong-Ahafo, Ghana, have a lot to gain from diversity in their natural environment.

Families that have a range of strategies towards ensuring food security and a stable income, are better prepared to deal with economic and environmental shocks. On-farm biodiversity forms a logical and necessary part of such diverse farming strategies. ■

*For Miguel Altieri's publication, "Small farms as a planetary ecological asset: Five key reasons why we should support the revitalisation of small farms in the global south", see http://www.agroeco.org/doc/smallfarmes-ecolasset.pdf.
For an interesting discussion on the scale of farming in relation to the food crisis, see the debate on http://www.future-agricultures.org: "Big farms or small farms: how to respond to the food crisis?"

Small-scale farmers: The key to

The small farm sector is of tremendous importance for developing countries. It merits much more support than it has received in recent decades, especially in this time of growing economic and ecological crisis. Research, and the cases in this issue of LEISA Magazine, demonstrates the importance of ecological, economic and social diversity for the improvement of small-scale farming. There are different categories of small farmers, each with their own needs, opportunities and logic. Different strategies are required when supporting them. Recommendations on how to do this have been formulated, but international "crisis managers" still do not listen.

Coen Reijntjes

> *"In many developing countries underinvestment in the agricultural sector, the dismantling of public support programs and the impacts of trade liberalization have undermined the small farm sector and national food production capacity, leaving these countries even more vulnerable to price volatility. Investment in the agricultural sector has focused largely on export crops to generate foreign exchange, forcing countries to rely on continued low international food prices to meet national food demand. That strategy has failed." (IAASTD, 2009)*

Last year's soaring food prices and the food riots which followed have made it clear that long-term neglect of the agricultural sector is no longer an option. Statistics (Hazell, 2007; World Bank, 2008) show that of the 3 billion rural people in the developing world, 2.5 billion are in households involved in agriculture. Of these, 1.5 billion are producing on about 404 million small (less than 2 ha) and marginal (less than 1 ha) farms. In contrast, the number of larger mechanised market-orientated farms in developing countries is only 20 million.

Despite recurrent predictions that small farms will soon disappear, they prove to be remarkably persistent, and the total area of arable land occupied by small farms continues to grow. But small farmers live in relative poverty as most of them earn less than US$ 2 per day, and 400 million live with the constant threat of hunger.

In the policy debate on agriculture, the future of small farms is being challenged. The conventional opinion is that small farms are backward and unproductive. Why should they be supported? History shows that in growing economies, many farmers, especially the youth, leave farming for better paying job opportunities. In many places there are no successors for the ageing farming population. By enhancing this process of economic transition, the rural poor can climb out of poverty and the larger farms get the opportunity to grow in size and income. In times of economic growth, this position may be attractive to governments. But is this the right approach in times of economic and ecological crisis as presently is the case?

Strengths of small farms

In times of economic decline, people stay on the farm or even return to the land as jobs outside agriculture evaporate. From the viewpoint of employment and poverty reduction alone it is important to support small farming. But there are many more reasons.

Besides being largely self-supplying in food, fuel, fibres, fodder, nutrients and herbal medicines, small farms also feed an important part of the urban population. For example, in Latin America, small farms produce 51% of the maize, 77% of the beans, and 61% of the potatoes for domestic consumption (Altieri, 2008).

Pretty and Hine (2001) report on the largest ever study of environmentally and socially responsible farming, covering projects involving 12.6 million farmers in 57 countries. It explores how small farmers can increase output using low-cost, diversity enhancing technologies. Results show that in the 286 sustainable agriculture projects studied, average crop yields have increased by 79% since the early-to-mid 1990s. The evaluation also found that relative yield increases are greatest in rainfed crops at lower yields, indicating greater benefits for poorer farmers. Maize, millet and sorghum, potatoes and legumes all showed yield increases of around 100%.

Several studies have shown that polyculture-based small farms can be more productive than monoculture-based large farms if total output is considered rather than yield from a single crop (Altieri, 2008). On most of the complex and fragile lands, which are remote from markets, only ecologically diverse, (traditional) low external input farming is possible (Jodha, 2001). Communities surrounded by populous small farms have healthier economies than communities surrounded by depopulated large mechanised farms. Strong rural economies based on efficient small farming also allow workers to remain with their families instead of migrating.

By depending more on family labour, recycling and ecological processes, instead of on modern external inputs, mechanisation and fossil energy, diversity-based small farms have fewer costs and are more resource-conserving than conventional large farms. For example, maize yields in traditional Mexican cropping systems are about 1950 kg per hectare. When agrochemicals and mechanisation are used, yields may increase to 8000 kg per hectare but for this higher production an energy equivalent of about 1000 litres fuel per hectare are needed (Pimentel *et al.*, 2007). Energy efficiency is an increasingly important argument in these times when fossil fuel energy will become scarcer and climate change is increasing (to which the use of fossil energy strongly contributes). The strong contribution of conventional agriculture to climate change is not only due to the high use of fossil energy but also to the enormous loss of biomass above and in the soil. By promoting diversity-based small farming, especially agroforestry, high amounts of carbon dioxide can be tied up in soil organic matter, mulch layer and trees. Besides, research in Central America (Holt-Gimenez, 2001) has shown that these farms are more resilient to climate-related hazards like drought, floods and storms, now occurring more often due to climate change. Hence, it can be concluded that supporting diversity-based small farming will strengthen the economic, social and ecological functions of agriculture.

preserving diversity

Different categories of small farmers

There are many categories of small-scale farmers. Small farmers, men and women, are working in all ecological conditions in agriculture-based, transforming and urbanised economies, as full- and part-time farmers, herders or gatherers. Of these, 10 - 15% are traditional farmers (Altieri and Koohafkan, 2008). These farmers have different visions on life and farming and use traditional practices to enhance productivity, resiliency and adaptability. Traditional subsistence agriculture provides promising models for sustainable small farming that promote biodiversity and thrive without agrochemicals.

There are also many small farmers who operate more or less successfully in the market as simple commodity producers or small entrepreneurs. Market-orientated farming has a different logic than traditional farming. Instead of depending on internal ecological mechanisms, farmers producing for markets use external inputs for nutrient, pest and water management, to gain maximum benefit from the advantages of modern fossil energy based technology. On the market they have to compete with other farmers, by increasing efficiency or providing better quality, for example. If unsuccessful they will be marginalised.

More and more farmers producing for markets try to benefit from the growing demand for organic and speciality products to get higher prices. In and around cities many people find employment in urban agriculture based on waste recycling.

The majority of small farmers are "peasants" who also have to gain income from other on- or off-farm activities to satisfy family needs year round. The word "peasant" is not liked by many people because of its negative connotation. But, presently it is increasingly being used as a name of honour by the network of *La Vía Campesina*, among others. Peasant farming can be subsistence or be combined with selling products, both in space or time. Low-cost practices are typically used which can be traditional as well as modern, depending on what is best in their circumstances. In many places, modern technology is not available, too expensive or culturally not acceptable for peasants. Resilience and autonomy are highly valued to reduce risk and vulnerability. Flexible strategies make it possible for peasant farmers to benefit from the market economy in good times and to fall back on subsistence production in bad times.

A differentiated approach is needed

It cannot be assumed, notwithstanding all development efforts, that subsistence, peasant and traditional agriculture soon will belong to the past. As also stated by Madeley *et al.* (2007), a differentiated approach is needed to support small farmers: "The objective to halve hunger by 2015 will not be achieved unless the needs of the people who live in hunger are recognized and they will receive the right kind of support. A new, comprehensive approach is needed to combat poverty and hunger, which includes subsistence agriculture. Academic studies and donor policies towards small farmers often fail to differentiate between marginal farmers and those who produce regularly for the market. Yet these are two groups of people with very different lives, circumstances and needs. A one-size-fits-all policy for small farmers marginalizes the poorest. Understanding the vulnerabilities and constraints faced by small farmers will help better address their needs".

Photo: Karen Hampson

Many subsistence farmers, like this man in Yunnan province, China, also make the most of surrounding natural resources. During the mushroom season he goes into the forests to collect many types of wild mushrooms to sell in urban areas.

But what would such a differentiated approach look like? *La Vía Campesina* and the recent IAASTD report have both formulated recommendations on how to support small farmers.

The vision of a peasant organisation

The international peasant movement *La Vía Campesina*, which claims to represent millions of small farmers, formulated its vision on the future of agriculture in 2002. Food sovereignty is the central theme in this vision. The approach is now being supported by many NGOs and CSOs.

By food sovereignty, *La Vía Campesina* means the right of each nation to maintain and develop its own capacity to produce its basic foods, while respecting cultural and productive diversity. The organisation believes that being able to produce food in their own territories, is farmers' right. Food sovereignty is a precondition to genuine food security. Peasants and small farmers should also have direct input into formulating agricultural policies at all levels, they say. Rural women, in particular, must be granted direct and active decision-making on food and rural issues.

When it comes to food prices in domestic and international markets, *La Vía Campesina* is of the opinion that these must be regulated and reflect the true costs of sustainably producing that food. This would ensure that farmer families have adequate incomes.

In general, agricultural research should be resource-oriented and not input-oriented. This research should be farmer- and consumer-driven as opposed to the current industry-driven

Photo: Rik Thijssen

While many households in Tanzania have one or two goats, some farmers have made goat-rearing into a small business, successfully raising animals to sell the young, or the meat in local markets.

model. It should start from the local production system, trying to improve it, respecting the objectives of the people that depend on it. When it comes to training and educational programmes, *La Vía Campesina* feels they are nearly exclusively focused on the promotion of industrial agriculture, and do not respect the knowledge of farmers themselves. Education often does not support efforts to maintain or improve the sustainability of family farm based production models.

The vision of 400 experts

Last year, an unprecedented study was finalised to assess what kind of agricultural science, technologies and policies are needed to address the issues of hunger, poverty and livelihoods in the light of the breakdown of the global ecological system. This study was sponsored by the United Nations, the World Bank and the Global Environmental Facility.

Two of the many issues raised in this report are particularly relevant to mention here. First, to improve food security, the 400 experts who carried out the study suggest to strengthen the small farm sector. Second, to enhance sustainability, development of multifunctional agriculture is seen as a key strategy. The concept of multifunctionality recognises the social, environmental and economic functions of agriculture that is producing not only commodities, but also non-commodities such as environmental services, landscape and cultural heritage. For this, integrated approaches are needed, such as agroecology, integrated natural resource management, organic agriculture, conservation agriculture and agroforestry.

Winds of change, genuine solutions far away

There seem to be important points of agreement between peasant farmers and experts. Does this mean that diversity-based small farming will now be embraced generally? Clearly winds of change are blowing. But, in the vision of *La Vía Campesina* "the major impediment to achieving sustainable ways of producing food is not the lack of appropriate technologies or the lack of knowledge of people working the land. The biggest obstacle is the way in which international and national policies, as well as the agro-industry, are interfering in the food production system. This is forcing farmers to adopt unsustainable methods of production through a model of competition and ongoing industrialisation".

La Vía Campesina delegates at the High Level Meeting on Food Security in Madrid, on 26th and 27th of January 2009, observed that this meeting was dominated by the World Bank, the International Monetary Fund and the World Trade Organisation, as well as by transnational companies such as Monsanto. In their opinion, the meeting did not sufficiently tackle the crucial question of how to solve the dramatic food crisis, but rather focused on how to spend the money. The small farmers only got a few minutes on the floor to give their position. The results: "business as usual", more fertilizer, more hybrid seeds and more agrochemicals for those farmers who can afford to buy. ■

Coen Reijntjes was an editor of LEISA Magazine from 1984 to 2003, and of Compas, Magazine on Endogenous Development, from 2003 to 2008. He is currently helping ILEIA with an assessment of the information generated and disseminated throughout the years. E-mail: coen.reijntjes@planet.nl.

References

-Altieri, M.A., 2008. **Small farms as a planetary ecological asset: Five key reasons why we should support the revitalisation of small farms in the global South.** Third World Network, Penang, Malaysia.
-Altieri, M.A., and P. Koohafkan, 2008. **Enduring farms: Climate change, smallholders and traditional farming communities.** Third World Network, Penang, Malaysia.
-Hazell P. *et al.*, 2007. **The future of small farms for poverty reduction and growth.** International Food Policy Research Institute, Washington, DC, U.S.A.
-Holt-Gimenez, E., 2001. **Measuring farms agroecological resistence to hurricane Mitch.** *LEISA Magazine* Vol.17, No.1, pp 18-20.
-Jodha, N.S, 2001. **Life on the edge: sustaining agriculture and community resources in fragil environments.** Oxford University Press, Oxford, U.K.
-Madeley, A. *et al.*, 2007. **Unheard voices: the case for supporting marginal farmers.** Concern Worldwide, London, U.K.
- McIntyre *et al.*, 2009. **Agriculture at a Crossroads: The IAASTD Global Report.** IAASTD and Island Press, Washington DC, U.S.A.
-Pimentel, D., and M.H. Pimentel, 2007. **Food, energy and society.** CRC Press, Boca Raton, Florida, U.S.A.
-Pretty, J. and R. Hine, 2001. **Reducing food poverty with sustainable agriculture: A summary of new evidence.** Centre for Environmental Studies, University of Essex, U.K.
-The World Bank World Development Report 2008. **Agriculture for Development.** World Bank, Washington DC, U.S.A.
-Van der Ploeg, J.D., 2008. **The new peasantries: Struggles for autonomy and sustainability in an era of empire and globalization.** Earthscan, London, U.K.

Diversity and efficiency: The elements of ecologically intensive agriculture

A six-year study in Cuba has shown that increasing a farm's diversity, for example with a mixed crop-livestock system, increases its overall productivity, energy efficiency and nutrient management. Equally important, it reduces risks, in particular when compared to simplified and homogeneous systems. Mixed systems draw various ideas and lessons from traditional farming systems found in many parts of the world. The Cuban case, at the same time, provides many lessons, especially when regarding the design and management of diverse systems.

Fernando Funes-Monzote, Santiago López-Ridaura and Pablo Tittonell

Whether we look at small-scale farming or at large commercial enterprises, designing a sustainable and equitable agricultural system poses continuous challenges. The farming model most commonly promoted throughout the world, based on simple and homogeneous systems, has notoriously failed in terms of sustainability and equity. Where it hasn't failed, but has increased total agricultural production in some countries, it is because this production has been subsidised in one or more ways. Subsidies, whether monetary, or in terms of over-exploitation of resources, absorb the costs of reducing the agroecosystem diversity. At the same time, aspects like environmental pollution, land degradation or rural poverty are disregarded.

Small-scale family farmers have not benefited much from this model. Attempts to improve the performance of small-scale agriculture based on simplified, homogeneous and subsidised systems have often failed due to, among other reasons, limitations of scale. Small-scale farming, therefore, still comprises a diversity of livelihood strategies, diverse land use, management and marketing strategies, the integration of different types of activities (e.g. crop-livestock interactions), intercropping and rotating crops and crop cultivars, or the maintenance of agro-diversity on the farm. Efficient use of the natural, economic and social resources –which goes beyond the efficient use of only a certain input– relies on one or more of these diversification strategies.

There is plenty to learn from small-scale production systems, particularly in terms of the role that diversity plays in making them more productive, reliable and efficient (see Box). Some of these lessons are being taken up in Cuba, where the agricultural sector has been moving in a "different" direction for almost two decades. This change in direction was initiated by the sudden disappearance of subsidies after 1990. After that, a severe energy crisis created the conditions for coming up with a new model of agriculture that relies heavily on agrodiversity. This emerging model may contribute to the design of sustainable systems around the world.

Cuba's path towards diversity

The economic crisis that started in 1990 in Cuba had a big impact on agriculture. Various alternative systems were proposed in order to tackle the difficulties which agricultural production was facing. However, they all showed a common characteristic: they followed an input substitution scheme, in which high-input industrial practices were substituted with organic inputs. These early attempts then led to a new approach, based on the systems seen in Mexico and elsewhere: converting specialised (monoculture) and often centrally-managed farming systems into mixed, diversified (and small-scale) farming systems.

Mixed farming systems are now presented as an effective step towards implementing sustainable practices in Cuba. They aim to maximise the systems' diversity, emphasise soil fertility conservation and management, optimise the use of energy and the locally available resources, and are highly resilient. In short, they are based on three main principles: (a) diversification, by including crops, trees and animal species, (b) integration, considering the dynamic exchange and recycling of energy and nutrients among the different components of each system, and (c) self-sufficiency, referring to the extent to which the system is able to satisfy its own needs without requiring considerable external inputs.

A six-year study followed the transition from "conventional" farming systems to mixed systems, looking at the opportunities for improving productivity while at the same time enhancing sustainability and equity. This started at the Pastures and Forage Research Institute in western Havana, where two prototype mixed farms of one hectare each were established within a 15 ha dairy farm, with 25% and 50% of the total area devoted to crops. The study used different indicators to assess aspects

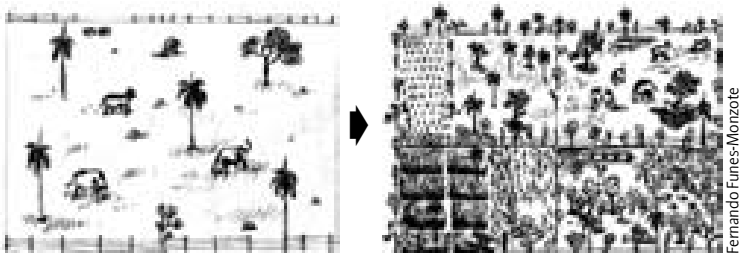
Lessons from elsewhere

As in many other countries, policies and development programmes in Mexico have encouraged the simplification of agricultural systems. Nevertheless, diverse farming systems are very common, and they contribute to the livelihood of the rural population and to the country's overall food production. For example, in the highlands of Michoacan, the Purhepecha people have relied on diverse agro-silvo-pastoral schemes for thousands of years. Each household has a diverse herd, including horses, chicken and dual purpose cattle. Livestock is partially fed with crop residues and, in return, manure is used in the fields where crops are grown, to restore soil nutrients and organic matter. The cropping sub-system is normally based on two fields, of about 3 to 4 hectares each, with alternating fallow. In the fallow field, cattle graze maize stubble after harvest during the dry season and, in the cropped field, a mixture of maize varieties, beans and squash are grown together in a mixed cropping pattern known as *milpa*.

When evaluated, these traditional systems display many advantages, especially when compared to "simplified" systems. They require few external inputs (occasionally some fertilizer and labour for specific tasks such as maize harvest). Although the production of maize, milk, meat and wood might be slightly lower than on specialised farms, resources such as land, labour and inputs are more efficiently used. Nutrient cycles are more efficient, allowing their capture and assimilation by different components of the system and in different forms. Just as important, a diverse system provides the household with various goods for consumption or market, ensuring food self-sufficiency and a reliable and resilient production of cash income in the long term.

such as biodiversity, productivity, energy use or financial performance. While all measurements showed clear results (a more intensive use of the available resources through diversified systems contributes to food self-sufficiency and to the efficient production of marketable products), we wanted to see if similar results could be attained on real farms. So we looked at 93 farms, varying in size, proportion of area allocated to arable crops, and in the stage of "conversion" to mixed farming. These farms were found in five different provinces, representing the country's major agro-ecological zones.

A thorough evaluation showed that mixed farms are more productive, more energy-efficient, and manage nutrients better, than farms specialising in dairy products or a certain crop. There were, however, many differences between these cases, mostly depending on the percentage of the area used for crop production in each farm. The farms with the highest proportion of land under crops achieved the highest values of productivity in terms of milk yield per unit forage area, energy output and protein output. Farms with more land under crops demanded three times more human labour, but the overall energy cost of protein production was lower, energy use efficiency was higher, and a more intense use of organic fertilizers was needed. This was mainly due to including crops in systems which were previously pasture-based, which was a precondition to further increases of energy outputs.



Fernando Funes-Monzote

The conversion from a specialised farming system into a mixed farming system follows three principles: diversification (by including crop, tree and animal species), integration (by dynamic exchange and recycling of energy and nutrients among systems components) and the achievement of food self-sufficiency.

Higher proportions of farmland dedicated to cash crops also resulted in higher values for the agrodiversity indicators (such as "diversity of production" or "reforestation index"). Under the conditions of low inputs and high uncertainty in which these farms have to operate, this higher diversity greatly contributed to reducing risk and increasing productivity. Both internal and scarce external resources were used more efficiently in the mixed farms than in the specialised ones, and the diversified farms were more efficient in the use of energy, lowering the energy costs of protein production.

These results showed that when comparing different systems, the issue is not only one of high or low inputs, specialisation or diversification. Equally important is how the specific characteristics of each farming system, the necessary inputs and its agro-diversity are interrelated and managed – in particular, by farmers themselves. In deciding on the proportion of the farm area to be used for crop production, for example, farmers considered factors such as land availability, stocking rate and animal feed balance on the one hand, and soil characteristics, productivity of forages and availability of crop residues, on the other. Market constraints, sales contracts with the state, as well as other socio-economic factors also played a role in deciding the degree of conversion from specialised to diverse farming systems. Managing higher levels of agrodiversity also required design skills and more dynamic decision-making, which led to the empowerment of farmers. In addition, the better allocation of feeds and labour throughout the year contributed to improved resource use efficiency.

Lessons of global relevance

Optimal use of resources for both crop and animal production helps to achieve food self-sufficiency while at the same time yielding marketable products that contribute to household income – without degrading the environment. After only a few years, these highly diverse, heterogeneous and complex small farms are already proving to be substantially more productive and efficient than specialised crop or livestock systems. About 65% of the food produced and marketed locally is grown nowadays by small-scale farmers who cultivate half of the total land in use by agriculture in Cuba.

The many forms and scales of diversity associated with family agriculture play an important role in sustaining rural livelihoods. A quick examination of the many different traditional farming systems shows how agrodiversity is always inherent, and contributes importantly to their sustainability. It guarantees a more efficient use of the local resources, reduces dependence on external inputs while conserving biological resources, and reduces risks. Agrodiversity also plays an important role in the preservation of local knowledge and empowerment of farmers, as diverse agricultural systems are knowledge-intensive and require complex, dynamic and adaptive decision making. These systems need to be thoroughly analysed for their potential to provide services of global relevance, such as carbon sequestration or biodiversity conservation, or for preserving our cultural heritage. Mixed farming systems should be the primary target for protection and subsidies.

But the potential benefits of agrodiversity are not only limited to traditional, smallholder family agriculture. The lessons learnt from the conversion of Cuban agriculture show the opportunities that diversity offers in the design of more sustainable agricultural systems at a much broader scale. The unique position of the Cuban agricultural sector, both nationally and internationally, provides lessons that are highly relevant to the rest of the world. The instability of oil prices, climate change, or the ever-increasing prices of food in the international markets, combined with national awareness of the necessity to substitute food imports for nationally-grown food, opens up a wide spectrum of possibilities for disseminating alternative systems at a nation-wide scale. Diversification, decentralisation, and the movement towards food self-sufficiency, are the response of Cuban agriculture to the current local, international and global context: the very same context that threatens agriculture and food security worldwide today. ■

Fernando R. Funes-Monzote. "Indio Hatuey" Research Station, University of Matanzas, Central España Republicana, Perico, Matanzas, Cuba. E-mail: mgahonam@enet.cu

Santiago López-Ridaura. INRA, Agrocampus Rennes, UMR 1069, Sol Agronomie Spatialisation, F-35000 Rennes, France. E-mail: ridaura@supagro.inra.fr

Pablo Tittonell. Centre de coopération internationale en recherche agronomique pour le développement CIRAD, Persyst, TA B 102/02, Avenue Agropolis, 34398, Montpellier cedex - 5, France. E-mail: ptittonell@gmail.com

Making the most of underutilised crops

Spreading risk is an essential means to reduce vulnerability, especially for already vulnerable people. Increasing the use of underutilised crops is one of the better buffers to help farmers diversify, and sustain, nutritional, environmental and financial security in times of change.

Hannah Jaenicke and Nick Pasiecznik

Whereas it would seem common sense to "not put all your eggs into one basket", we have witnessed the absolute opposite in recent decades: agricultural intensification. Although net food production has increased, over 50% of the carbohydrate and protein needs of the world's human population are met by only three plants: maize, rice and wheat. This has also triggered an ever-increasing reliance on external inputs to keep up with pest and disease outbreaks. Similarly, improved crop varieties need increased water and fertilizer. These problems are being aggravated by climate change, with significant effects on rural livelihoods. Droughts and floods will increase in frequency and intensity. Changing temperatures will allow pests, diseases and other invasive species to thrive in new areas.

One means to achieve increased resilience to shocks and change is by increasing the production, use and marketing of underutilised species on farms. Of special importance are indigenous plants with traditional uses and cultural links with local people. By diversifying farming systems, the food, medicines, fibres, fodder or other products they yield offset demands for imported, unavailable or unaffordable alternatives.

People are already using a number of coping strategies to alleviate periodic hunger. A look at these can teach us where positive impacts will most likely occur. For example, farmers grow or use crops which are more tolerant to environmental extremes, use a variety of plants for balanced nutrition and to spread the harvesting times of cultivated or wild-harvested plants, and make use of important, keystone tree species which provide a range of products. The three strategies summarised here were presented during an international symposium in early 2008.

Photo: L.Englberger, IFCP

Enjoying a pandanus fruit.

1. Use more tolerant species

Bambara groundnut (*Vigna subterranea*) is a drought tolerant legume from West and Central Africa. It used to be grown extensively in sub-Saharan Africa as a nutritional complement to cereals, before the cultivation of peanuts took over traditional growing areas. Farmers had problems with low and/or unpredictable yields, the long time needed for processing and cooking, and the cultural perception that it was a "woman's crop". All these factors limited its production and use. Using a multi-partner, multi-location system, a team led by the University of Nottingham is using an array of approaches to test the suitability of bambara groundnut in new environments. In addition, they are establishing a breeding programme to develop better-yielding cultivars. The programme, which started in 1988, is seeing results. Bambara groundnut is regaining acceptance in sub-Saharan Africa, as well as being accepted and integrated in farming systems in drought-prone areas of India.

Breadfruit (*Artocarpus altilis*) is a staple in the Pacific. It is eaten occasionally elsewhere where it grows, and it compares well with rice for a range of nutrients from calcium to vitamin C. On most Pacific islands, plants have to be adapted to the thin calcareous soils and must be tolerant to frequent exposure to salt spray. Although breadfruit is a key resource, its productivity and even its survival, is limited by conditions of drought and increasing salinity. In contrast, plants specifically adapted to such conditions are pandanus (*Pandanus tectorius*), giant swamp taro (*Cyrtosperma merkusii*) and coconut (*Cocos nucifera*). Pandanus fruits contain high levels of beta-carotene, and normal consumption of especially the orange-fleshed varieties can satisfy a person's vitamin A requirements. Giant swamp taro has a beta-carotene content so high that a normal daily intake of four cups a day provides more than half of the estimated vitamin A requirement. Zinc and calcium contents are high enough to satisfy 50-100% of the recommended daily intakes of these nutrients. In addition, iron content is twice as high as that of banana or breadfruit.

2. Spread the harvest

In rural Kenya, 60-80% of the population lacks adequate amounts of food for two to five months a year. Whereas experts recommend a daily intake of about 200 g of fruit, in Kenya this can be as low as 20 g per day, even though the country has many indigenous plants producing fruit. A recent study identified 57 indigenous fruit species in Mwingi District and showed that wild fruits form a very important safety net for rural Kenyans during the months of food shortage. In particular, children consumed significant amounts of fruit – far more than adults. Efforts are now being taken to encourage families to grow some of these wild species within their home gardens. This will increase the availability of fresh fruits and improve the family's nutritional security.

Fruiting calendars show when particular crops are available, and when there is need for supplemental nutrition. In Nepal, over 60% of fruits consumed are produced in family home gardens. Although there is a lot of diversity in these systems,

often containing 30-40 species, nutritional intake may still be inadequate during some months. However, targeted "diversity kits" have been developed and made available to farmers. They contain seeds, planting material and information about selected complementary species. These kits help to ensure that the home gardens can provide sufficient nutritional balance throughout the year.

3. Make more from keystone tree species

The Gruni people in northern Ghana have developed a way to deal with hunger, based around the baobab tree (*Adansonia digitata*). From January to June the availability of staple crops (sorghum, millets and groundnut) is limited, due to floods and droughts. Important ceremonies often have to be cancelled due to food shortages. During this time, apart from seeking labour in the cities, people rely on wild baobab trees. Its leaves, flowers, fruit pulp and seed are the most important products, used primarily for home consumption, but also for sale and barter. Women play a major role in collecting and processing baobab products. They consider the dry pulp in particular as a good source of household food. However, the Gruni have witnessed a marked decline in the number of baobab trees over the past 70 years. They attribute this to increased human population pressure and consequently, overharvesting. People are now being encouraged to start planting baobab trees and to develop modern processing methods to increase efficiency and reduce wastage.

Supporting the spread of underutilised species

These examples show that many people have developed and use various coping or buffering strategies. They are using several "baskets" to carry their "eggs" – or fruits and other food as the case may be. Since we know that hunger periods will occur more often and become more severe in the future, what is needed now is to encourage increased use of more underutilised species, and the planting of hitherto "wild" productive species in or near the farms. There is need to develop stronger seed supply systems and mother tree orchards. It is also necessary to support the development of processing strategies to increase shelf life and thus availability of produce through the hungry periods. Successful marketing of underutilised crop products also requires support and mentoring in business practices and the availability of credit systems.

Overall, underutilised crops provide a better buffer to reduce nutritional, environmental and financial vulnerability, and their increased use should be promoted. ■

Hannah Jaenicke and **Nick Pasiecznik.** International Centre for Underutilised Crops (ICUC), P.O. Box 2075, Colombo, Sri Lanka. E-mails: h.jaenicke@cgiar.org ; n.pasiecznik@cgiar.org ; http://www.icuc-iwmi.org

References

-Jaenicke H., J. Ganry, I. Höschle-Zeledon and R. Kahane (eds.), 2009. **Underutilised plants for food security, nutrition, income and sustainable development**. Proceedings of International Symposium held in Arusha, Tanzania, 3-7 March 2008. *Acta Horticulturae* 806. International Society for Horticultural Science. Leuven, Belgium. The case studies presented here are taken from papers by: Englberger, L. and A. Lorens; Gautam, R. *et al.*; Kranjac-Berisavljevich, G. *et al.*; Mayes, S. *et al.*; Taylor, M. *et al.* and Simitu, P. *et al.*

-Jaenicke H. and I. Höschle-Zeledon (eds.), 2006. **Strategic framework for underutilised plant species research and development with special reference to Asia and the Pacific, and to sub-Saharan Africa.** International Centre for Underutilised Crops, Colombo, Sri Lanka and the Global Facilitation Unit for Underutilised Species, Rome, Italy.

-various authors, 2004. **Valuing crop diversity**. *LEISA Magazine*, 20.1. March 2004.

The International Centre for Underutilised Crops (ICUC) has recently merged with the Global Facilitation Unit for Underutilised Species (GFU) and operates as Crops for the Future. The mandate of Crops for the Future is the support, collection, synthesis and promotion of knowledge on neglected and underutilised species for the benefit of the poor and the environment.

Photo: Abhay Gandhe

As an example of the principles described in the previous article, tribal farmers in India are being encouraged to plant underutilised indigenous wild trees on their land. This is in response to the fact that, in recent times, farming systems in central India have become less diversified and natural resources are becoming scarcer. Tribal communities living in remote areas are especially affected. While forest products were previously a major source of income, they are now being overexploited. Promotion of underutilised species can diversify farms, preserve forests and provide opportunities for income.

Abhay Gandhe and Arun Dolke

The two main crops grown in central India are rice and cotton. While other minor millets, pulses and oilseeds are also grown, many farms have evolved to now operate as monocultures. Farming systems have become less diversified, soil and water resources have become poorer, and growing populations are putting more pressure on limited land resources. If a main crop fails, farmers suffer as they have few options to fall back on. With systems becoming more unsustainable, communities are increasingly using natural resources from surrounding forests. This can result in overexploitation and the loss of biodiversity. Farmers need additional opportunities within their existing farming systems. This is especially true for tribal farmers who inhabit more remote and marginal areas.

BAIF Development Research Foundation, in Pune, India, has established a Resource Centre for Tribal Development (RCTD) to identify and develop potential new interventions for tribal communities. Tribal farmers are indigenous communities generally living in forest fringed remote areas and practising subsistence farming on small land holdings. Collection and sale of a variety of non-timber forest products (NTFP) constitutes a major source of livelihood for tribal farmers. However, widespread poverty, degrading agriculture and the vague tenure status of wild NTFP trees is leading to their overexploitation. Crop diversification has been identified as a key measure for countering the threats of degrading farming systems. However, BAIF and RCTD realise that there are limitations to developing

offer hope for tribal communities

Learning to cultivate and harvest lac has offered a new income opportunity and a more diverse farming system for this tribal farmer.

the existing agricultural situation in marginal locations in tribal areas. Therefore, an alternative strategy has been proposed: domesticating non-timber forest products as a major effort towards diversifying farming systems. The innovativeness in this approach is to focus on underutilised indigenous wild trees which have economic potential.

Promising but underutilised trees

Wild underutilised NTFP trees are domesticated by integrating them into existing farming systems. All NTFP trees are highly stress tolerant. They are hardy and establish well, with minimum care, on the neglected areas of farms. With technical advisory support and a strong sense of ownership for the trees planted on the farm, the farmers are expected to harvest the trees sustainably, thus ensuring long-term additional livelihood support. In the long run, there should be a gradual shift towards harvesting of NTFP from privately owned trees, resulting in reduced harvesting pressure on forests.

The BAIF field teams and the participating farmers together identify promising trees for domestication. The following attributes are given special attention:

- high tolerance to drought and high summer temperatures;
- ability to survive on marginal soils;
- suitability for direct seed sowing or simple nursery techniques;
- resistance to browsing by stray cattle and goats;
- highly threatened status in natural forests due to overexploitation;
- the local population is familiar with the trees and their use, so that adoption is easy.

Three of the trees selected as priorities for domestication are described here:

The gum karaya tree, *Sterculia urens*

The karaya is found in tropical dry deciduous forests in India. It prefers unusual and stress prone habitats, occupying hilltops, rocky crevices, or eroded slopes. It needs very little water, and will grow on the poorest of stony soils. The karaya tree yields a valuable gum – tapping these trees was a major livelihood activity for tribal communities in central India. At present, it is one of the most threatened NTFP trees in India due to overexploitation. It is nearly extinct in many areas where it was abundant in the past. Recently, several Indian states have banned trading this gum, in an attempt to halt the rapidly declining number of natural stands. However, in the process they are depriving traditional gum collectors of a source of livelihood.

The strong resilience capacity of this tree can be used to the farmer's advantage. A well developed tree can generate about 500 rupees (around US$ 10) annually from gum harvesting from the tenth year onwards. With about 25 mature karaya trees per hectare on his farm, a farmer has access to an additional income of about 12 500 rupees (around US$ 255) which is hardly influenced by an adverse climate. BAIF started propagating the tree through stem cuttings, but there are few large trees surviving locally. So we shifted to seed propagation. The fresh seed, harvested in April, germinates well and is fit for direct sowing. The radicle of the emerging seed quickly swells into a tuber and gives the fresh seedling strong drought tolerance.

In the July 2008 season, about 75 000 karaya seedlings were established on the farm bunds of tribal farmers. This number will increase in 2009. After about 10 years, the privately owned trees will be harvested by non-destructive methods of harvesting to ensure sustainability of production.

The flame of the forest tree, *Butea monosperma*

This is another exceptionally hardy tree which grows naturally in secondary forests and on neglected areas. It is extremely drought tolerant and resistant to grazing by all animals. Its compact size and tolerance to frequent heavy pruning makes it an ideal tree for agroforestry. The tree is best propagated through direct seed sowing of single seeded pods which are available in abundance in April. If planted in a single dense line along farm bunds, it is effective as a host tree for cultivation of the Indian lac insect, *Laccifer lacca*. Lac is the resinous secretion of a tiny insect that grows on a variety of trees known as lac host plants. Harvesting of natural lac is a traditional livelihood activity of the tribal communities, but is now overexploited and threatened. Cultivating lac needs technical but simple skills. The RCTD is ensuring that new lac farmers have these skills, through on-farm trainings. Five to six years after planting, the tree is ready for inoculation by lac insects, and needs very little maintenance till the gestation period. A grown tree can yield lac worth 50 rupees (approximately one US dollar) in a year. BAIF suggests planting at a density of about 300 trees on the bunds of one hectare. Domesticating this wild tree has the potential to generate additional annual income of about 15 000 rupees, or just over US$ 300.

This tree needs little labour and is a truly multipurpose tree yielding firewood, manure, commercial lac and gum. The *Butea* plantation programme started on a trial scale in July 2007. It was possible to quickly scale it up in July 2008 to ensure the planting of about 120 000 seedlings across central India. Due to its easy establishment, the programme is expected to grow and spread quite fast in the near future.

The bauhinia tree, *Bauhinia purpuria*

This tree is occasionally found in the urban areas of South Asia as an ornamental tree. In the remote tribal areas, its leaves are a popular green vegetable. In the forests, it occurs as a scattered tree. However, compared to the demand for vegetables, the trees are few and overexploited. In April, the tree puts forth fresh leaves that are plucked as vegetables. Removing too many leaves weakens the tree. Every tribal family is being encouraged to plant two or three *Bauhinia* trees in their own backyard gardens. During July 2008, about 5000 seedlings were raised in nurseries and given to about 5000 families. This small initiative will be scaled up in 2009. It is expected that the newly planted family-owned trees will be ready for use as a vegetable after about five years. The trees have a special role in human nutrition as the green vegetable is available during the dry summer season when other cultivated vegetables are not available in rural markets.

In addition to generating livelihoods and building resilience back into degraded farming systems, this BAIF initiative will also encourage *ex situ* conservation of many threatened Indian tree species. ■

Abhay Gandhe. Advisor, agriculture, MITTRA- BAIF Resource Centre for Tribal Development, Nagpur, India. E-mail: gandheam@gmail.com

Arun Dolke. Deputy programme organisor, MITTRA- BAIF Resource Centre for Tribal Development, Nagpur, India. E-mail: arundolke@gmail.com

LEISA Magazine: 25 years


Photo: Ken Weimar

LEISA Magazine is celebrating its 25th birthday this year. We want you to celebrate with us. To celebrate our jubilee year, we have chosen a special theme, which we will highlight throughout the year: The Future of Family Farming. We will have special jubilee features in our four issues. On page 4 we highlight different agricultural landscapes. Our special jubilee page (that you are reading now) will inform you about our jubilee activities. It also features two sections highlighting our readers. In "How I stay informed", a reader talks about his or her source of information on sustainable agriculture. In "After publication...", people who have written an article published in LEISA Magazine, tells us what happened after other readers contacted them.

We always hope articles in LEISA Magazine are inspiring to our readers, but we don't always hear to what extent ideas are picked up. That's why we introduced a section called "Inspired by...", where a reader tells us about how reading an article in LEISA Magazine made him or her follow it up, and what happened as a consequence. In this issue, this story is on page 18. In a similar way, the new section "Update from the field" (page 34) contacts previous authors and looks at how a project or experience has developed since it was published in LEISA Magazine.

If you want to feature in one of these sections, by all means let us know. Write to jubilee@ileia.nl, mention the section you would like to feature in and tell us your story.

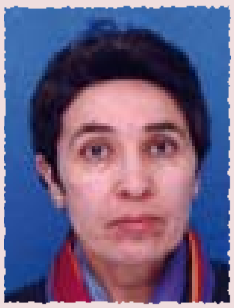
Throughout the year, this page will keep you updated on all our jubilee activities. So watch out for the next issue of LEISA Magazine, and check our website for other news: http://ileia.leisa.info.

Photo contest: Win a netbook – and more

When it comes to The Future of Family Farming, what do you think this future will look like? What changes do you expect to happen when it comes to families and farming? What changes have already happened? Do you for example see people in your region leaving their farms and moving to the city? Or are they maybe coming back because the city didn't offer what they thought it would? Are children all going to school now? Is it becoming less likely that they will follow in their parents' footsteps and become farmers? Perhaps you see cell phones all around you these days, or other new technologies. Which technologies do you think people around you will use in the future? And how will this change your and your families' lives?

Photograph your ideas about family farmers and change and send them to us. It doesn't have to be an actual situation, you can also envisage your ideas of change and photograph that. Digital photos can be sent to jubilee@ileia.nl (mention "contest" in the subject heading) and should be a minimum size of 1 MB. Printed photographs can be sent by regular mail to the address on page 2 (if you mention your address, we will return them afterwards). The closing date for this contest is September 1st, 2009. Winners will be announced in our December issue.

The prize for the best picture –which will be chosen by the editors– is a beautiful netbook– a compact laptop which has all the features you may need, and is easy to travel with. The second prize is a lightweight digital camera, and the third prize is a radio with 9 extra funcions. We will also give away ten USB-sticks. The best entries will be published in LEISA Magazine next year, and will feature on our website. See http://ileia.leisa.info for more details.



HOW I STAY INFORMED

Name: Elcy Corrales Roa
Position: Professor in Rural and Regional Development Studies
Country: Colombia, South America
Subscribed for: 14 years

What do you do?
"I have been working at the Javeriana University in the capital city of Colombia for over twenty years. Although I am officially a sociologist, I teach and conduct research on rural studies and in practice my work covers many disciplines: biology, ecology, economics, sociology and policy. Besides teaching students, I am working towards a PhD in geography, focusing on recent environmental history of tropical agricultural systems."

How important is information exchange to your work?
"There are two aspects to information exchange in my work: first, I need to find good information for my courses. I am interested in students gaining a realistic idea about the wider ecosystems context of farming, and the importance of understanding social issues alongside ecological ones. For instance, we look at finding practical solutions to ecological problems they encounter on specific farms. Also, students need to get a better understanding of how farming practices do not need to lead to environmental pollution.

"Second, I find it important to work with farmers in rural areas to get a good idea of their reality, as well as getting a better understanding of their local knowledge. For the last ten years, my department has had an MSc programme in Sustainable Development Studies, for which students work with rural farmers on participatory research projects on their farms."

How do you use information from LEISA Magazine in your work?
"It is the integrated 'ecosystems approach' that I particularly appreciate about LEISA Magazine, that I can use in my courses. Besides my subscription to the global edition, I also have a subscription to the Spanish edition. I like to combine both as they cover different areas and problems in the world. Sometimes, I even translate English articles into Spanish for my students."

You and LEISA Magazine

Did you know LEISA Magazine has subscribers in 154 countries? We thought it would be great if we could show this great diversity of readers together on a poster. So we are asking you to send in a photo of yourself (or of your family or friends), reading LEISA Magazine. If the photo gives away something of your country of origin, so much the better. We will make a poster out of your entries, and use the photos on our website and blog, and maybe for next year's calendar. If your picture is selected for the poster, you will receive a copy. The best photo will be published in LEISA Magazine.

Digital photos can be sent to jubilee@ileia.nl (mention "poster" in the subject heading) and should be a minimum size of 1 MB. Printed photographs can be sent by regular mail to the address on page 2. The closing date for this contest is September 1st, 2009. Pictures which arrive with us by April 1st, may appear in the next issue of LEISA Magazine.

Photo: Anita Ingevall

What kinds of information challenges do you encounter in your work?
"Our greatest challenge has been the violence that has disrupted rural areas in Colombia for many years. However, in spite of this, we are inspired by how small-scale farmers keep working productively. Remarkably, more than 50% of Colombia's food needs are supplied by small-scale farmers in rural areas. So if the farmers can keep going on with their work, we at the university can as well!"

What kind of information do you still need/desire?
"I would very much like to see LEISA Magazine devote an issue to scaling up: how can you connect conservation at the farm level with conservation at the ecosystem level?"

Contact Details
Pontificia Universidad Javeriana, Transversal 4 No. 42-00, Edificio Rafael Arboleda, piso 8, Bogotá, Colombia. E-mail: ecorrale@javeriana.edu.co

(Editors' note: the December 2009 issue of LEISA Magazine will be covering the topic of scaling up.)

AFTER PUBLICATION...

Photos: Javier Santiago Pinto

Using LEISA Magazine to promote farmer exchange networks

While reading an article in LEISA Magazine about farmers moving towards more ecological production in Mexico, Emily Oakley was drawn to the authors' observation that farmers often feel isolated during this process. As she has been trying to develop a farmer exchange network, she wanted to know how the authors had linked farmers together to improve information sharing. So, she wrote to Teresita Santiago, one of the authors, to find out more. Teresita, pictured, tells us what happened next.

Emily Oakley and Mike Appel are organic vegetable farmers from Three Springs Farm Oklahoma, U.S.A. Late in 2008, they contacted us about the possibility of visiting us. Through a series of e-mails and phone calls, it became clear that they, like us, had a strong interest in developing a farmer exchange network. In December 2008 Emily and Mike travelled to Mexico to meet with us and the farmers we work alongside.

Emily and Mike explained that they have spent the past several years trying to develop a means of connecting the customers at the farmers' market in Oklahoma with agricultural systems in other areas of the world. They wanted to encourage people to think about how what they buy can affect farmers in a place like Chiapas.

Their visit made us very aware of our role as promoters of local seeds. Emily and Mike exchanged over a dozen heirloom tomato and maize varieties with us, crops their farmers' market customers in Oklahoma have created a strong demand for. Meeting with farmers in our communities and contrasting how little access they have to open-pollinated seeds, compared with the farmers from the United States, made clear the local loss of biodiversity in maize and tomatoes. Considering that Mexico is a centre of origin for both crops, this increased our commitment to search for conservation strategies. How can we prevent their disappearance of local maize and tomato varieties? We also want to explore how consumer preferences affect agrobiodiversity. Preserving biodiversity through production and marketing by family farming systems can have a global impact on food security and conservation of local varieties.

After the exchange visit, Mike and Emily told us that they will create an information display at their farmers' market stand, highlighting some of the crops grown in Chiapas and their relationships to U.S. consumers. They will share their experiences with the story behind fair trade and organic coffee, the challenges to and importance of traditional maize cultivation, and developing alternative direct marketing efforts.

We all agree that while we have differences in language, cultural backgrounds, and interests, this exchange made us realise we share a common goal of building better agricultural systems from the ground up. The outcomes for us all were unique but complementary and demonstrate the positive results that intercultural farmer exchanges can yield.

Teresita Santiago and **Max Garcia**. Naturaleza Para Todos, Calle Central #135-B, La Trinitaria, Chiapas, Mexico. E-mail: naturalezaparatodos@gmail.com

The article Emily was reading which led to this visit was "The transition process to ecological agriculture in Chiapas, Mexico", published in LEISA Magazine, June 2006.

Seeds, knowledge and diversity in the

Farmers in the Yoro and Otoro regions of Honduras have organised themselves into agricultural research teams to improve the diversity and resilience of their farms. Supported by local and international organisations, these farmers have diversified their plant genetic resources and developed hardier varieties that grow well on their soils. Their success in producing improved varieties of maize and beans, and running local seed and gene banks has earned them national and international recognition.

Faris Ahmed

Honduras was the original "banana republic". This ecologically diverse country located in Central America experienced more than a century of industrial agriculture. Beginning in the late 1800s, transnational fruit companies acquired control of much of the country's arable land, producing pineapples, bananas and other fruits for export. Even today, the country's flattest land is reserved for plantation agriculture. Commercial farms supply fruits to transnational corporations for export. These farms practise intensive monoculture with significant use of chemical inputs such as fertilizers and pesticides. Farming in Honduras has now largely become dependent on "improved" seeds from companies, undermining the resilience that small-scale farmers had built up through local knowledge and biodiversity. Large companies now control the market, largely unregulated by the government.

Photo: Faris Ahmed

Seed banks such as this one in Otoro district are run by farmers themselves, safeguarding their control over local seeds and genetic resources .

The other Honduras

The less accessible mountainous regions of Honduras, forsaken by plantations, transnationals and governments alike, are where many of the country's rural poor live and cultivate their crops. These farmers would like to be recognised not as banana republicans but rather as heading up a different approach. For the sake of their own survival, these small-scale farmers are building on their time-tested knowledge of traditional crops to maintain resilient food and seed supply systems in their communities.

Resilience is a term often used to refer to farms being stable in the long term. FIPAH (*Fundación para Investigaciones Participativas con Agricultores de Honduras* – Foundation for Participatory Research with Honduran Farmers) is a non-governmental organisation supporting these small scale farmers' efforts. According to them, farms are resilient when they meet three conditions:

1. high biological diversity, which on the one hand reduces risks on farms, while offering options for adapting to changes;
2. looking to local knowledge and innovation, as well as other approaches when solving agricultural problems; and
3. mutual reliance and trust within strong social networks in the community.

Farmer research teams

With these aims in mind, FIPAH supports these communities through local agricultural research teams known as CIALs (*Comités de Investigación Agricola Local* - Local Agricultural Research Committees). These research teams involve women, men and youth in all aspects of the work. Operating as farmer co-operatives, they carry out a variety of activities: maintaining community-run seed and gene banks, participatory research and selection, cultivation, and community outreach. The results are impressive: farmers' access to diverse, locally adapted quality seeds has improved, genetic resources are being preserved and farmer knowledge and experience with these seeds has been enhanced. Establishing youth CIALs is especially encouraged, to give young people the inspiration and knowledge to sustain their farm livelihoods, and to stem the tide of migration to cities. Currently, 60 CIALs and 11 youth CIALs are operating through 850 members in five districts of Honduras. They directly reach about 12 000 people in various communities through seed exchanges and access to grain stocks.

Community seed and gene banks serve as on-site seed collections, or "bank accounts" for biodiversity, income and food. Managed by farmers, they are critical to maintaining the community's ability to deal with shocks that can lead to sudden losses of seed or food supplies. Also, they are a source of genetic materials for conserving and growing biodiversity. Finally, as seed banks are run by farmers themselves, they ensure that seeds and genetic resources remain in farmers' hands. CIAL members meet regularly to deal with issues related to seed sharing and selection, as well as maintenance issues such as pest management and storage.

Participatory breeding

Small-scale farmers have been largely ignored by government and agricultural scientists, and so they have had to find solutions to the problems they encounter themselves. Through the CIALs, farmer researchers test crops according to different factors relating to yield, market and local environmental conditions. The farmers experiment with indigenous varieties, adapting them to

hands of small-scale farmers in Honduras

Photo: Faris Ahmed

One of the agricultural experts who develop new maize varieties is Simeona Perez, a farmer from Santa Cruz.

suit their emerging needs. They select not only for productivity, but also for higher nutrition, for better cooking and storage traits, and the plant's ability to adapt to changing growing conditions. In the research teams, women play a leading role in selecting for traits, as they are the keepers of seeds, possessing a more intimate knowledge of plant characteristics and how they might perform in different conditions.

One example of a successful farmer research programme resulted from the need to develop maize varieties that could withstand the annual bouts of heavy rain and wind. Since hurricane Mitch in 1998 (which heralded the start of constant signs of climate change in the region), fields of maize have frequently been flattened by storms, resulting in crop failures. In October 2006, the Santa Cruz CIAL team in the mountainous Yoro region released two varieties of maize they had developed. These were based on a local variety or "landrace" that produces large cobs, but whose height had become a problem in a region increasingly vulnerable to hurricanes. Large cobs are linked genetically to tall stalks, which became taller and taller over time. These varieties are beneficial for animal fodder but run the risk of being knocked over by strong winds.

Through a participatory breeding process, farmers were able to produce two improved varieties, '*Santa Cruz'* and '*Capulín Mejorado'*, that are shorter, with a higher yield and still adapted to high altitude conditions. Farmers collected seeds for the community seed bank to secure a healthy seed supply. The release of this maize coincided with one of the heaviest hurricane seasons on record. Simeona Perez, one of the farmers (see photo), said: "This year, because of the enormous amount of rain, many people had almost nothing to harvest, and will have no decent seed to sow in May. But because of the quality of our seed, combined with conservation practices, we were hardly affected." Farmers and officials across Honduras have applauded their success, and have received '*Capulín Mejorado'* seeds for their own communities.

Increased capacity to adapt to change

Farmers in Yoro and Otoro are justifiably proud of their accomplishments which have earned them national and international recognition. Their success has also strengthened their food and livelihood security, based on local genetic and ecological resources. With the increasing occurrence of extreme weather such as hurricanes, farmers continuously have to adapt and be prepared. They are doing this by paying more attention to crop protection, as well as seed storage in the seed banks. This case shows that farmers are able to manage their local genetic resources through their own knowledge and through farmer-scientist collaboration. These farmers enhanced the productivity of local maize (by 20-30%) as well as bean varieties, while making these varieties hardier and more adaptable to climate change. Because of their intimate connection to seeds, FIPAH also supports strengthening the role of women in the research programmes.

The 60 CIALs across Honduras are collaborating to ensure that their successes go well beyond their own communities. Regional and national associations of CIALs are working together to share knowledge, research and seeds, spreading innovation and biodiversity across the country. Community leaders like Luis Alonso Pacheco have shared the experiences of Yoro's farmers with agriculture specialists at international seminars in Ethiopia and Germany. "To us," says Mr Pacheco, "resilience means that we are increasing the adaptive capacity of people and their ecosystems to cope with uncertainty and change."

■

Faris Ahmed. Director of Canadian Programmes, USC Canada, 56 Sparks Street, Ottawa K1P 5B1 Canada. E-mail: fahmed@usc-canada.org ; http://www.usc-canada.org

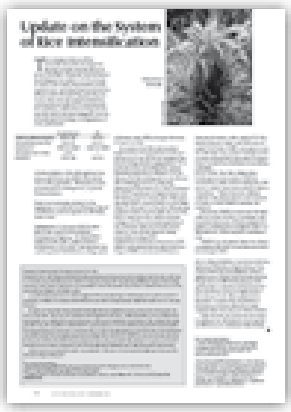
USC supports FIPAH through its "Seeds of Survival" programme.

Rajendra Uprety, an agriculture extension officer in Nepal, came across an article in LEISA Magazine on SRI, the System of Rice Intensification. It was new to him and made him curious. He contacted the author for more information, and then decided to try it out. The results were amazing. Now, eight years later, he has successfully introduced SRI in the region where he works, much to the benefit of the farmers he works with. He was also encouraged to write two articles for LEISA Magazine himself, and to participate in a World Bank competition, which he won!

The large impact of a small article

Rajendra Uprety

One February afternoon, almost eight years ago, I was going through a copy of the LEISA Magazine, looking for a good story to read. A photo of a rice plant, that seemed unusually big, attracted me to read one of



The article that inspired Mr. Uprety. It was called "Update on the System of Rice Intensification" and appeared in LEISA Magazine, Vol. 16.4, December 2000.

the articles. That short story, written by Norman Uphoff and his colleagues at the Cornell International Institute for Food, Agriculture, and Development (CIIFAD), was surprising and particularly interesting to me. I was especially attracted to the possibility of obtaining higher rice yields by using regular varieties, without increasing the use of chemical fertilizers, or without additional investments. While rice is the main food crop in Nepal, and the single largest contributor to the national GDP, the yields in my country are low, and most districts are not able to produce sufficient food for their people. At the time, the price of chemical fertilizers had risen again and was by then too costly for most small and marginal farmers. We were therefore very interested in a low cost technology which could help us increase rice yields.

The article did not include a detailed description of the SRI method, the System of Rice Intensification. But at the bottom of it I found the e-mail address of Norman Uphoff. I did not have much experience in writing to foreigners, so I was unsure and thought about it quite a bit, before deciding to write a short e-mail to request more information about the SRI method. I was very surprised when I got a quick response from Mr Uphoff. He sent a lot of detailed information, and also described the experiences seen in other countries. The article, together with his e-mail, was my first source of information about SRI.

At that time I had just returned home after completing my Master of Science degree, and I was looking for a new job. I was initially planning to go to the capital city, Kathmandu, but the SRI information I had found made me think of trying it out somewhere in the field. So I asked the secretary of the Agriculture and Cooperatives Ministry if I could start working at the District Agriculture Development Office (DADO) in Morang. He was happy to hear my ideas, and

Photo: DADO Morang

Rajendra Uprety (left) shows the results of using SRI (System of Rice Intensification) to technicians and farmers.

Photo: Norman Uphoff

A comparison of SRI vs. conventional rice production in the Al-Mishkhab Rice Research Station near Najaf, Iraq.

transferred me to the Morang office.

Although Morang is my home district, I had never met most of the farmers there. I wanted to start trying SRI with a few innovative farmers, but even I had little confidence in such an unbelievable story. At last one farmer accepted to try it in a small plot (100 m^2), and we grew seedlings out of a handful of Radha-12 rice seeds. When we transplanted the 10-day seedlings, at a 30 x 30 cm distance, the field looked empty and sad. After two weeks of regular farm management practices (such as weeding) the whole field started to look better: all plants were looking healthy and attractive. The plants' development seemed amazing, and by the end we had a very attractive rice field. We harvested the equivalent of more than 7 t/ha, more than double that of the surrounding rice fields.

That small trial gave me a lot of confidence, and encouraged me and other DADO staff to keep on trying SRI, in even bigger plots. In the second season our trials produced more than 9 t/ha. I then prepared a short report, detailing our work and our results, and sent it to Norman Uphoff and other interested people. One of the directors of the Department of Agriculture and Cooperatives visited our SRI fields and then invited me to make a presentation at a national agronomist's workshop in Nepal. Mr Uphoff liked the report I sent, and suggested that I elaborate it and send it to the LEISA Magazine, where it was published. Seeing it in print made me feel that I was capable of writing something in English, and sharing it with a wider audience. I was very happy to receive several e-mails and letters from different countries. The magazine served as a great networking tool for people from around the world to be in contact.

The positive results we found, together with my increased confidence, encouraged me to enter the "Development Market Place 2005 Award" competition organised by the World Bank. We won the top prize, and the money we received helped us disseminate SRI in other parts of the country. We published a booklet and also a poster, and circulated both all through Nepal. Those publications motivated individuals and other organisations to try out SRI in different areas. One of these, for example, was CARE, an international NGO; another one was Surya Nepal, a large scale industrial conglomerate. Responding to this growing interest, the International Centre for Integrated Mountain Development (ICIMOD) organised a one-day experience sharing workshop in Kathmandu (December 2005). My office, together with several governmental and non-governmental organisations, participated in it, and presented the results seen until then. This was a very effective way of disseminating information on SRI, reaching wider areas and farmers and professionals of all sorts. Our office produces a monthly newsletter and a weekly radio programme, with information on SRI and other extension topics. In this way, we are very happy to continue exchanging information and experiences. This is still spreading around the world!

■

Rajendra Uprety. Agriculture Extension Officer, District Agriculture Development Office, Biratnagar, Morang, Nepal. E-mail: upretyr@yahoo.com

Mr. Uprety himself later wrote an article in LEISA Magazine, "Performance of SRI in Nepal", which was published as a Field Note in Vol. 21.2, June 2005. His second article, "SRI takes root in Nepal", was published in Vol. 22.4 of the magazine, December 2006. All articles are freely available through http://ileia.leisa.info

SRI today

SRI is a method of rice cultivation developed more than 20 years ago in Madagascar. It is based on a set of practices which enhance plant growth and development, and increase yields. It does not increase the use of inputs, but rather reduces their use. The main principles include using younger seedlings (8-12 days old) and wider spacing (one seedling per hill, with 25 x 25 cm as a starting distance). Another principle is to avoid continuous flooding, to encourage the healthy growth of roots and soil micro-organisms.

This method is increasingly being supported by donors and governments. The World Bank has a major project in Tamil Nadu, the southernmost state of India, with a goal of 250 000 hectares over 5 years, while the state government itself has set a target of 750 000 hectares for 2008/2009 season (and has already reported 466 000 hectares last December). This is the most extensive uptake, although the province of Sichuan in China reports 204 000 hectares for the 2008/2009 season, and Zhejiang province reports over 130 000 hectares. This has grown since three years ago, when the number of farmers practising SRI was estimated at 100 000, and the total area covered under 50 000 hectares.

Estimates of this sort need to consider the difficulties in determining who is practising SRI. According to Norman Uphoff, "SRI is a matter of degree –how many of the recommended practices are being used, and how well– rather than kind". So while the number of farmers who are using SRI practices to some extent is probably twice as high as those who are fully engaged in it, "I feel comfortable saying that there are by now over 1 million farmers using the methods in a verifiable way, and on over 1 million hectares". These numbers are expected to increase further in the coming years. (JCT)

Photo: Chutiporn

Do you have a similar story to tell?

We are looking for interesting experiences to feature in this section. Tell us about an article you have read in LEISA Magazine, and how it inspired you to try a new idea, or test out a technology – and then what happened next. We would like to hear about why we should feature you or your community. Send us a 300 word outline about your work to jubilee@ileia.nl clearly marked "Inspired by".

Living the sustainable life: Managing

In 1999, Aspen and David Edge bought *Semilla Besada*, a 12 hectare farm in southern Spain, with the intention of re-establishing its family farming tradition. They faced various challenges: the dryland environment, lack of markets and little social support. However, through using various management and design tools, encouraging diversity on the land and sustainably managing the grazing animals, the family is increasingly able to sustain itself.

Aspen Edge

Although it had previously fed a family of 10, by 1999 *Semilla Besada* had not been farmed for 20 years. With irrigation, the previous family had grown vetch, alfalfa, wheat, rye, lentils and chick peas, and a wide range of vegetables. They also had three sheep, chickens, two pigs, beehives and a cow. When we took the farm over in 1999, it no longer provided a living. The stone terraces that created the space on which to grow food had collapsed. The mountainside that had once been home to some 50 families, now only supported three: all of these were goat farmers. The remainder had either left for work in the cities, or joined the lucrative, but unsustainable, greenhouse vegetable production system on the eastern coast of the country.

Together with my husband and son, I live and work at *Semilla Besada*, a 12 hectare family farm set at an altitude of 1300 m in the Sierra Nevada mountains, in the province of Granada, southern Spain. The landscape is characterised by short-lived woody perennial shrubs and indigenous oaks. Temperatures can fall to -15°C and rise to 40°C, with an average of 540 mm of annual rain. Although there are four distinct seasons, there is low year-round humidity and a summer drought which can last for six months. This combination of climatic factors classifies it as a brittle or dryland area. The property has a 1½ hour weekly irrigation water right.

Inherited challenges

Apart from the climatic difficulties, *Semilla Besada* faced the following challenges:

- Increasing degradation of the landscape encouraged by agricultural subsidies that resulted in overstocking;
- A minimally productive landscape, resulting from lack of management and loss of fertility;
- No source of sustainably managed seed;
- Lack of local markets, due to inability to compete with production farming prices and the non-existence of niche markets;
- Poor social support due to the collapse of family farming in the area; and
- Hardship caused by inappropriate government regulation of food production on small-scale family farms.

Photo: Aspen Edge

Volunteers come to learn about dryland management while making a valuable contribution to the farm.

We bought the farm in 1999, intending to re-establish its family farming tradition. For many years, we had recognised a desire to lead a different way of life; one that represented a better balance between the environment and human needs. We realised that while the West had enjoyed an unparalleled boom in terms of wealth, material goods and choice, part of the price being paid was the increasing depletion of the earth's natural resources. Our lifetimes' experience of both business and the environment convinced us of several significant factors:

- The dubious merits of the existing conventional economic model;
- The need to design sustainable economic models;
- The absolute necessity to prioritise restoration and conservation of natural resources; and
- The need for individual action, rather than reliance on governments or government agencies to lead the way, due to the urgency of the situation.

We felt that by purchasing our own land, we would be in a much better position to address the above challenges. We would also be able to live a more sustainable life, whilst restoring and conserving the natural resources upon which that life depended.

Holistic Management

This a decision-making framework that helps people create the quality of life that they want, whilst ensuring social, economic and environmental sustainability. It has a track record in three continents of using grazing animals in a way that not only does not degrade the landscape, but actually reverses desertification.

For further information: Holistic Management International, 1010 Tijeras Ave. NW, Albuquerque, NM 87102, U.S.A. http://www.holisticmanagement.org

a dryland family farm

The first four years

We brought with us a lifetime's experience of growing our own food, as well as four years' permaculture design experience within both a northern temperate and a tropical climate. We used 40% of our capital to buy the land, leaving 60% for its development. This included enough to support our family of three for a 10 year period – the time we believed it would take to develop a sustainable living from the farm.

After a year of observation to determine existing plant infrastructure, climatic conditions, soil fertility and design parameters, we began to initiate the classic multi-layered, perennial food production system beloved of permaculture designers. However, after four years, we had to acknowledge that we were beaten! The landscape was not responding as we had expected: there was less plant diversity and more bare soil than when we arrived, and definitely no sustainable livelihood.

It was then that we came across the work of Allan Savory. Through that we realised that we were missing a crucial piece of knowledge: the difference between brittle and non-brittle environments, and how that affected farm design and management. I undertook training in Holistic Management, the name of the framework that had evolved from Savory's work. I discovered that it offered much more than environmental insights: it would enable David and I to make personal, land management and financial decisions that would have a positive impact on land health and productivity. The framework also provided skills to develop plans and activities in a way that would move consistently towards social, economic and environmental sustainability, as well as providing effective techniques for reversing desertification in the area.

Whole farm planning, monitoring and controlling

We created a management plan to cater for the short, medium and long-term sustainable development of *Semilla Besada*. We drafted a statement of what quality of life we wanted, what we needed to do to achieve it, and how that could be sustained indefinitely. This statement included social, economic and environmental aspirations for the project as a whole. It also provided the foundation for drafting the policies, strategies and objectives for each year. We created a whole-farm financial plan which outlined where resources would be allocated, ensured that expenses were capped, profit was planned and that no debt arose.

Having outlined the parameters of the farm management, it was then possible to begin designing the landscape. The insights of Holistic Management were crucial here, as they explained why dryland environments performed as they did, and how grazing animals could be used sustainably. The design drew on the following permaculture principles, in addition to those that underpinned the Holistic Management framework:

- whole systems view
- elimination of waste
- building diversity
- use of sensitive solutions
- design from the big picture to the detail
- use of renewable resources and services
- integrate human psychology.

Photo: Aspen Edge

The brittle landscape poses many new challenges in designing and managing a sustainable system.

The farm was then designed to ensure that the areas that were worked most often were nearest to the farmhouse, that all water was recycled for irrigation, that all human and animal waste was used to build soil fertility, that solar and wind power were installed to provide for energy to run office and household equipment, that solar ovens were installed to mitigate the use of bottled gas, and that a tree-planting plan was initiated to provide firewood for heating in the future.

Holistic Management offered tools to ensure that we stayed on track, and could deal with problems in a timely way. It also provided a system for monitoring what was happening on the land to ensure that the health of the ecosystem was not compromised, and if it was, what needed to be done to change that. It also ensured that every decision was leading towards social, economic and environmental (known as "triple-bottom-line") sustainability.

Tangible results

After 10 years, we have built an infrastructure of vines and mixed fruit and nut trees which currently comprises 50 fodder trees, 105 fruiting shrubs, 200 fruiting plants, 90 perennial vegetables, 100 grape vines, 100 mixed fruit and nut trees, six vegetable growing areas, beehives, a warren of 20 mixed-breed rabbits, a flock of 30 local rare-breed Andalusian Blue chickens, and nine mixed-breed Milking/Awassi sheep. The farm supports a group of four, consisting of myself and David, our son, Samuel, and a year-round volunteer or intern.

Photo: Aspen Edge

Getting down to it – planting vegetables to contribute to diversity, sustainability and income.

In addition, we have addressed the challenges we inherited by:

- using holistically-managed sheep. This has reversed the degradation of the existing perennial grasses within a 2 hectare fenced area, which is in stark contrast to the unmanaged area beyond;
- increasing food security. Through improved soil fertility and structure, growing diverse dryland-adapted species of trees, shrubs, plants and vegetables, and saving locally-adapted heritage seeds;
- developing contacts with conservation agencies: especially those that already work with grazing animals to mitigate bushfire hazards in order to foster the possibility of *Semilla Besada* becoming a funded research site;
- developing educational opportunities in Holistic Management and dryland design and management. We also want to allow greater public access to *Semilla Besada* as a model of what is possible in a dryland environment;
- developing the future potential to respond to arising niche markets. This will be through creating solar drying facilities to produce organic dried fruit, herbs and vegetables; a milking breed of sheep to produce organic yoghurt and cheese; and a plant nursery for generating dryland-adapted trees, shrubs, plants and vegetables;
- publishing material highlighting the fact that grazing animals can be used in a managed way to restore and improve perennial grasslands, which is of pivotal importance to existing goat farmers;
- developing contacts with local ex-farming families to safeguard traditional knowledge and skills as well as heritage seeds; and
- creating a network of direct farm clients who are prepared to support the work of *Semilla Besada*. We have also initiated a seed library to encourage exchange of dryland-adapted heirloom seeds.

Added to this has been the generation of a sustainable livelihood which is comprised of:

- 80% production of its own organic food, with a market value of €2000
- 95% production of its own energy, with a market value of €2500
- 97% generation of its own organic seeds, with a market value of €400
- 11% income from direct donations from the public
- 57% income from educational seminars
- 5% income from educational publications
- 25% income from sustainable walking tourism (to be phased out in 3 years, in favour of the more sustainable option of education).

Safeguarding the future

With the encouragement of production farming, and 90% of Granada's income coming from tourism, the management of this area continues to exacerbate environmental degradation. Family farm initiatives, such as *Semilla Besada*, play an essential role in modelling a way forward which enhances environmental health and provides food security and a sustainable livelihood. When priority is given to sustainability, then it is possible to build a stable local infrastructure which is not at the mercy of fluctuating global scenarios, and can support a family for generations to come.

■

Aspen Edge. Apto de Correos 19, 18420 Lanjarón, Granada, Spain.
E-mail: aspen@holisticdecisions.com

Sharing knowledge on agrodiversity for conservation and livelihood improvement

Supporters of small-scale farming claim that it provides livelihoods, and it can also conserve agrodiversity. In an attempt to show this, an international network of scientists joined hands with farmer communities to document agrodiversity. By sharing this knowledge with other farming communities, they showed how it is possible to achieve the twin goals of biodiversity conservation and improving local livelihoods.

Luohui Liang and Harold Brookfield

Photo: L. Liang, PLEC

Farmer meets scientist. People from different walks of life got to know each other while studying specialised local knowledge and crops.

Agricultural systems are a dynamic patchwork of different land uses such as annual cropping, orchards, agroforests, fallows, or home gardens. They are home to a great diversity of plant species and genetic varieties. Such systems are threatened by widely promoted monocultural practices of "conventional agriculture". Many organisations have been defending agrodiversity for decades now, supporting the 1.6 billion or so small farmers who experiment with their old practices to keep them alive. You cannot conserve agrodiversity by throwing up a fence around an area to keep "modern" ways out. You have to encourage farmers to keep practising and developing farming.

The "new ecology" in the 1980s held the view that biodiversity can be sustained in agricultural landscapes. Few ecosystems are in balance, and some disturbance to these systems may best promote biodiversity. Farmers' management may be just such a positive disturbance that can sustain biodiversity. This article explains how a global network of researchers showed that small-

Examples of how farmers all over the world maintain diversity

In **Tanzania**, an expert farmer conserved a woodlot with the greatest diversity of trees, shrubs and grasses in the whole community. Most of the trees are natural but some were collected from other places to enrich the economic and social values of the woodlot. Some of the added tree species were among those considered by the farmer to be endangered due to excessive use. Through farmer field days and meetings, he was able to convince some of his neighbours (including those who had been stealing from his woodlot) to plant and conserve their own woodlots. The woodlot also serves as an example for the community to prepare and plant tree seedlings on degraded land.

The team in **Brazil** encouraged community actions for establishing lake and forest reserves with over-exploited or rare wildlife, birds and plant species. Expert farmers there taught others about enriching fallow stages. For example, farmers made small openings in their fallows for planting semi-perennial species such as bananas, and for transplanting seedlings of desirable species.

Photo: Stephen Buchan

In a site with yam, the cluster in **Papua New Guinea** organised a field day to show farmers the richness of yam diversity in their possession. More than 30 cultivars of *Dioscorea esculenta* and 20 cultivars of *Dioscorea alata* were displayed. A number of very large *D. esculenta* tubers were arranged in a container like in customary exchanges.

Edge management received particular attention. One expert farmer in **Thailand** made more money through different crops cultivated in field edges, than from monoculture of cabbage or lychee. He also maintained medicinal herbs, wild vegetables and fruits on the edge of the agroforest. In the Fouta Djallon of Guinea, dead wood fences consume scarce wood and require much labour to repair. Using local examples, PLEC-Guinea demonstrated techniques for using live fences as an agroforest edge. In addition to saving wood and labour, live fences provide firewood, construction wood, fruit, medicines, mulch, or fodder. They also have ecological uses such as wind-breaks, soil fertility improvement, shelter for small wildlife; all with conservation value.

On the integration of plants and animals in a seasonally flooded habitat, PLEC-**Peru** identified tree species that produce fruits, which several fish species feed on and disperse, helping to restore part of the tree cover. These efforts demonstrated a way to achieve complementary integration of plants and animals in an agricultural system.

scale agriculture, besides providing livelihood to farmers, indeed "produces" biodiversity as well. The project tried to figure out how farmers could be supported to sustain such diversity well into the 21st century.

Farmers and scientists work together

Since the early 1990s, the United Nations University (UNU) project on People, Land Management and Environmental Change (PLEC), has been developing models of biodiversity conservation in agricultural systems in developing countries. PLEC operated through a global network of groups in Africa (Ghana, Guinea, Kenya, Tanzania, Uganda), Asia-Pacific (China, Thailand, Papua New Guinea), and Latin America (Brazil, Jamaica, Peru, Mexico). Scientists from Australia, United States, Britain, and Japan also participated. Each cluster was multidisciplinary, involving different institutions. UNU and the United Nations Environment Programme (UNEP) jointly implemented the programme.

Although farmers' practices may be broadly similar over quite wide areas, there are always differences in detail. These can include differences between the practices of richer and poorer households, households of different ages and gender composition, and sometimes between whole communities or sub-communities. Other differences arise between the better skilled and the run-of-the-mill farmers. Agrodiversity can therefore never be understood except at a local level, through long-term observation and familiarity with the farming people. To research such diversity, PLEC created groups ("clusters") of scientists working in close contact with the farmers of quite small areas, usually one or two villages. The scientists had to become familiar with the farming systems, and the variation within them. They identified "expert farmers", those who farmed better, conserved better, and often made more profit than their neighbours. Site selection was based on regional biodiversity importance, threats to biodiversity and ecosystems, known examples of agrodiversity, existing partnerships with communities, and availability of historical information. Some sites chosen were those where project members had worked before. They developed into demonstration sites where farmers could show their skilled management.

Identifying agrodiversity research sites

It took quite a while to understand how demonstration sites should be set up. Before early 1999 some clusters carried out reconnaissance work along large transects, extending over many kilometres and several agro-ecological zones. This made it difficult for scientists to develop genuine coalitions with farmers, and other local stakeholders on the ground. In some sites, scientists developed closer links to farmers, and such sites became gradually hotspots of exchanges between scientists, farmers, local communities and other interested people. Basic guidelines for data collection were developed in 1998.

All sites chosen were in agricultural areas with significant biodiversity, often close to parks or reserves. Two of the three sites in China were next to state natural reserves. Several others were close to natural areas reserved by custom rather than law. The first site developed in Ghana was set up at the invitation of a chief who sought help in protecting a sacred grove. Twenty-seven demonstration sites eventually became operational in areas of international biodiversity importance or near "biodiversity hotspots". As demonstration sites, people from much wider areas could see them. The more energetic research groups organised publicity for the sites and their work.

Generally, surveys were made at each site to identify the different land use stages, and within them, field and fallow types. Scientists then sampled households and plots. Farmers showed plant species and management practices on the sampled plots and household economy, which scientists recorded for analysis. With this information, PLEC clusters could compare between land use stages and among households and communities, to discover expert farmers and understand their expertise. Biodiversity was also assessed at this stage. Thus, the project could show that farmers are not destroyers of biodiversity but rather conservers. For example, in Mazagão, Brazil, farmer-managed fallows were more diverse than abandoned fallows. The PLEC teams then figured out what practices and incentives led to this increase of diversity in the farmer's fallow, and whether this enrichment would also lead to an increase in biodiversity at a landscape and regional level.

In **China**, an expert farmer experimented with domesticating a rare and locally preferred timber species found in the forest, *Phoebe puwenensis.* Within two years he had succeeded in growing viable seedlings (not known to plant breeders). He then converted 0.13 ha of sloping land into a tree plantation, which generates income and conserves soil. Through PLEC-China he helped another 95 farmers in his village to adopt the same technology. This activity helped to enrich the monoculture plantation of *Cunninghamia lanceolata* which had been promoted by the government extension system. It also reduced the potential threat of illegal logging of *Phoebe puwenensis* in the natural reserve near the village.

One group of women farmers in **Ghana** compared the characteristics of 12 indigenous varieties of African rice, *Oryza glaberrima*. In contrast, male farmers had switched to "improved" rice and had largely forgotten even the names of indigenous varieties. On-farm trials showed that two of the indigenous varieties had high yield potential and

Photo: L. Liang, PLEC

compared well with the introduced varieties. Some indigenous varieties had properties that women prefer, such as being a good baby food, cooking easily, and keeping well overnight. As the normal seed exchange system does not provide enough of the indigenous varieties, the womens' group was encouraged to set up a community seed plot. In this way they could multiply seed of the indigenous varieties they prefer. They also worked to improve storage facilities.

Moko disease has largely destroyed the banana monoculture of Amapá, **Brazil**. Local expert farmers experimented and learned that leaving some *Heliconia* spp. (and other understory species) scattered among bananas trees, could mitigate the Moko disease. This is called the banana *emcapoeirada* agroforest system, which they taught to others. This system is helping farmers regain profitable banana production by managing the Moko disease, increasing biodiversity and also adding a number of products from plant species other than banana.

On inter-species diversity, the team in **Guinea** worked with village women on the revival of an ancient trade of dyeing cotton cloth with local plants of the *Fabaceae* family. For the women, this became an activity with a significant income. Because of increased pressure on the trees, assistance in planting the principal species used in dyeing became a part of PLEC demonstration activity, and the women started growing cotton.

Sharing farmers knowledge

The next step was to promote expert farmers' technologies and knowledge. Farmers often obtain new ideas and technologies through exchanges with other farmers, and observation. They prefer to see concrete results. Therefore, the expert farmers demonstrated their practices to fellow farmers and extension staff. The elements of diversity management were broad. Farmers explained about diversity within species, between species, at landscape levels, about the associated diversity for soil fertility, pollination and pest regulation, and the integration of plants and animals.

Contrary to a commonly held view that agriculture is a threat to biological diversity, PLEC has demonstrated globally how farmers in fact enhance the conservation of local biodiversity. They achieve this while attempting to make a living, and improving their own livelihoods. The concepts, methodology and examples developed during the PLEC project contribute to the global efforts to achieve the twin goals of biodiversity conservation and improving local livelihoods. ■

Luohui Liang. United Nations University, 53-70, Jingumae 5-chome, Shibuya-ku, Tokyo 150-8925, Japan. E-mail: liang@hq.unu.edu

Harold Brookfield. Australian National University, Canberra, ACT 0200, Australia. E-mail: harold.brookfield@anu.edu.au

References

-Alcorn, J.B., 2003. **People, Land management and Environmental Change (PLEC): Final desk evaluation.** UNEP, Nairobi, Kenya

-Almekinders, C.J.M., L.O. Fresco and P. Struik, 1995. **The need to study and manage variation in agro-ecosystems.** *Netherlands Journal of Agricultural Science* 43 (2), 127-142.

-Brookfield, H., C. Padoch, H. Parsons and M. Stocking (eds.), 2002. **Cultivating biodiversity: Understanding, analysing and using agricultural diversity.** ITDG Publishing, London, U.K.

-Brookfield, H., H. Parsons and M. Brookfield (eds.), 2003. **Agrodiversity: Learning from farmers across the world.** UNU Press, Tokyo, Japan.

-Gyasi, E.A., G. Kranjac-Berisavljevic, E. T. Blay and W.Oduro (eds.), 2004. **Managing agrodiversity the traditional way: Lessons from West Africa in sustainable use of biodiversity and related natural resources.** UNU Press, Tokyo, Japan.

Photo: L. Liang, PLEC

Many clusters knew about biodiversity for soil conservation, pollination and pest regulation. PLEC-**Ghana** facilitated some revival of *oprowka*, a traditional no-burn farming practice that involves mulching by leaving slashed vegetation to decompose *in situ*. The practice maintains soil fertility by conserving soil microbes and by humus addition through the decomposing vegetation, and conserves plant propagules, including those in the soil, by the avoidance of fire. In Uganda an expert farmer taught others how to enrich banana gardens with other plant species for apiculture.

LEISA's Farm: A blog about sustainable family farming

Our new blog (short for weblog) has been running for a few months now, and we would like to invite you to join us!

A blog is another way of linking up with each other. Blogs can follow, comment on and discuss news and current issues immediately. Blogs deliver fresh content in a fast way. They are also a place where new ideas can be presented, and experiences shared in an interactive way.

As you can imagine, the entries on our blog cover many topics, but they are all related to sustainable family farming. Our blog is an accessible way of exchanging information that we think readers would find useful or interesting. There is a new entry every few days, meaning we can cover more news items, events and hot topics than possible in a quarterly magazine. For example, there was a recent entry about a new project which has started putting audiofiles (or podcasts) with agricultural information on the internet, for local radio stations to download and broadcast to farmers in remote areas in northern Peru. There have been updates from international conferences, as well as practical suggestions, like how to purify water using transparent plastic bottles and the energy of the sun. Most posts have links to further information and websites. You can also add your own comments, suggestions or experiences. We hope this serves as another way of inspiring you in your work and daily life, and gives you another opportunity to exchange your ideas with others.

Visit LEISA's Farm at www.familyfarming.typepad.com

To keep in touch more easily, you can sign up to receive an e-mail each time we add a new post, or you can use RSS. To access both, you need to visit the site. If you have any questions, or have something you would like us to share with the world, send an email to: leisasfarm@gmail.com and we will add some of your ideas to the blog too. ■

From silkworms to travelling

We received many more articles about diversity and farming systems than we had space to publish. As we want to draw attention to the range of farming systems found in the world, we have decided to summarise some of the systems, practices and experiences that we found most interesting, and which were not covered in the rest of the magazine. The selection highlights different aspects of diversity: effective use of local biodiversity, a transition process to greater diversity, or simply a unique and interesting system!

Bangladesh

Photo: Kamrul Alam

Nigeria

Photo: Michael Musa

Growing betel leaf in hill forests

Chewing betel leaf is part of Bangladesh's cultural heritage. The *Khasia*, an indigenous group living in the hill forests of northeastern Bangladesh, cultivate betel leaves in the naturally growing forest trees. They cut stems of old betel leaf plants, and plant them in pits under the supporting trees. Two years after planting, leaf plucking starts. Within 45 days, new leaves emerge and betel leaf can be plucked again. According to the farmers, watering and fertilizing is not essential because of the regular rainfall and soil fertility in the area. The trees supporting the betel leaf plants are pruned to allow water to reach the soil, and provide the betel leaf with sufficient light. All prunings are used as mulch to conserve soil moisture and to provide nutrients.

This agroforestry system not only leaves the natural environment intact, it also provides the *Khasia* community with a continuous supply of betel leaf and other products, including betel nut, fruit, fuel and timber. For the *Khasia*, it is their chief occupation and major economic activity. But they are not the ones who profit the most, in terms of money. Middlemen have a firm hold on the sector. The lack of a storage system for betel leaf also means that farmers have to sell them on a daily basis. If the farmers had transportation facilities, and better knowledge of market prices, they would see more returns from their production system. (KH)

Want to read the full article?
Contact **Mahabuhul Alam**, United Graduate School of Agriculture Sciences, Japan, at: malam.ku@gmail.com

Indigenous resource management

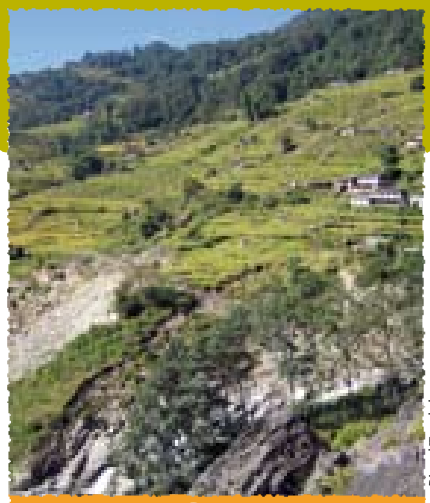
Farm families in rural areas of Nigeria show surprising resilience in adapting their farming systems to the adverse effects of poverty. Not only do they have to deal with declining soil fertility, desert encroachment, and unreliable rains, but also with external pressures such as inconsistent national policies, and changes in local market conditions due to cuts in subsidies and rises in food prices.

The farming systems are mixed crop and livestock systems. Some crops are sold in local markets. Seeds are stored and exchanged, and most tools are locally made. Livestock (sheep, cattle or poultry) provide income, as well as manure, transport and labour. Farm families assess soils for texture, moisture content and colour, then classify and use them accordingly. With difficulties in supply of chemical fertilizers, more farm families are using cattle and poultry manure, often through arrangements with pastoralists and poultry farmers.

In the Hausa culture, agricultural knowledge is rooted in the interactions between natural resources and the community. For example, resource ownership and use revolves around religious beliefs, closely associated with community morals. A shared understanding of societal norms and beliefs fosters harmony, crucial when it comes to effective decision-making and problem-solving in these complex situations. Inheritance plans, where sons take partnership and then ownership of the farm, enable good long-term farm management. This is recognised as a key contribution to a balanced way of life, crucial to sustaining both biodiversity and their own existence. (KH)

Want to read the full article?
Contact **Michael W. Musa**, Department of Agricultural Economics & Rural Sociology, Ahmadu Bello University, Kaduna State, Nigeria, at: musamike@yahoo.com

potatoes

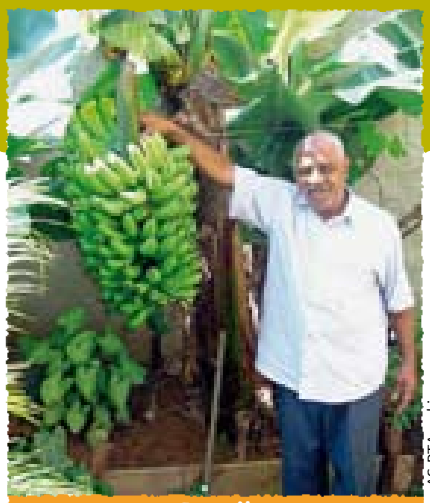


Peru

Photo: Binod Tandukar

China

Photo: Ren Jian



Brazil

Photo: AS-PTA archive

Travelling potatoes increase diversity

In the Andes, around Lake Titicaca, at an altitude of 3800 metres, an organisation called Chuyma Aru is working on a crop breeding system that is based on traditional knowledge and genetic resources. The system does not involve crossbreeding or human selection.

Because inbreeding can weaken plants, the people at Chuyma Aru do exactly the opposite. Instead of selecting genes from a crop to create more homogeneity within a variety, they create a pool of as many varieties as possible, including landraces and modern varieties. These varieties are then exchanged, amongst villages surrounding Lake Titicaca. This way, a pool of potato varieties "travels" around the lake. They are planted at ever increasing altitudes in the region. Potato plants with the highest frost resistance remain. The chance that a pest or disease destroys the whole harvest is minimised by cultivating a mix of varieties in the same plot.

As a result, farm families in the area now have an average of one hundred potato varieties per family at their disposal. This diversity allows the potato to be cultivated under a wide range of circumstances, from high up in the mountains, to areas with very little rainfall. The use of pesticides and fertilizer has decreased, and there is much less crop failure experienced.

For mountainous areas this method of breeding by passing on pools of crop varieties may become very advantageous. Plans to set up a pilot project in Nepal in the coming years are being developed. (PR)

Want to read the full article?
Contact **Ineke Kroes**, director of the Newa Foundation, an organisation with projects on education, clean drinking water and agriculture, at i.kroes@taharo.nl.

Using silkworms to prevent floods

As early as the 15th century, people in the Pearl River Delta in China found a way to survive floods. They dug ponds to accommodate floodwater and used the silt used as dykes to reduce flood damage, and as fertilizer for mulberry trees. Silkworms – with the silk industry then growing rapidly – relied on mulberry leaves as food, and silkworm excrement was used as a fish feedstuff. Because an increasing number of farmers planted mulberry and reared silkworm, the daily volume of silkworm excrement, for fish feed, was high. This contributed to the development of freshwater fisheries. The resulting cycle proved beneficial: "The better the mulberry, the stronger the silkworm, the fatter the fish, the better the soil and the better the mulberry".

Recently however, the mulberry-silk-pond system has been in decline. Urbanisation has reduced farm land, while the silk industry has shrunk. Farmers now raise livestock, as this is more cost effective. In addition, the fresh water supplies have been polluted, through un-purified urban waste and the overuse of chemicals for agriculture. Crops now rely on chemical fertilizer as they no longer get nutrients from silt.

The mulberry-silk-pond system plays an important role in preventing flooding in the Pearl River Delta. It should be developed further. It could be adapted by raising the kinds of fish and tree crops customers would buy. The water could become clean again, and land use management could be improved, to make the system even more efficient. Both economic and ecological interests would then be served. (KH)

Want to read the full article?
Contact **Zhang Shubin** or **Ren Jian** at the Center for Biodiversity and Indigenous Knowledge (CBIK) in China: zhangshubin@cbik.ac.cn, renjian@cbik.ac.cn.

Urban agriculture improves slum life

From plants in old cans on windowsills, to church gardens; in Rio de Janeiro, Brazil, all kinds of urban agriculture are found. It is mostly slum-dwellers who practise it, to be able to eat a variety of healthy food, or to grow medicinal plants, or to reduce spending and increase their own food security.

Dona Leda cultivates more than 100 plant species in her garden. Some of the medicinal plants she grows are not common in local markets. Her garden is a real agroforest in the city. She knows each plant and its use well, whether it is for food, medicine or as part of a balanced ecosystem. Seu Adão also cultivates a beautiful garden. He saw an abandoned area full of rubbish, infested with rats and mosquitoes near by his home. Remembering his father's garden he took it over and now it is full of bananas, sweet potato, okra, cabbage and medicinal plants.

Urban gardens improve the livelihoods and diets of many poor families. Swapping seeds and products helps people to conserve and increase the biodiversity in their communities, while at the same time strengthening social ties. With social and environmental problems in large cities increasing, agriculture should be considered for its potential within urban landscapes. Based on the experience of countless urban farmers, an alternative vision for urban development –especially for slum-dwellers– could arise. (KH)

Want to read the full article?
Contact **Severin Johannes Baptist Halder** at the Eberhard Karls Universität in Germany: severinhalder@gmail.com.

Successfully preserving national heritage in Japan

Photo: Eisuke Imai

The curved lines of the earth and the water in rice terraces are ideal material for sketching. This group of artists enjoys the view in Hata, Takashima city, Shiga prefecture.

Rice in Japan has traditionally been grown on terraces built into volcanic slopes. With Green Revolution technology, however, rice fields in the plains became so productive that the terraced systems were threatened. When the Japanese people realised they were losing a valuable natural and cultural resource, farmers gained the support of the local and national governments in joint efforts to preserve the rice terraces as their spiritual home.

Kazumi Yamaoka

People compare the grandeur and beauty of the rice terraces in Japan to the pyramids in Egypt. Rice terraces, however, are alive with farmers, crops, cultures, and rituals which are handed over and evolving from generation to generation. They are not simply a tourist attraction or a device for producing rice. Rice terraces make people aware of their relationships with their ancestors, families, colleagues and nature.

Terraced rice cultivation in Japan, however, has been under threat. The decline started in the late 1960s. At that time, there was a surplus of rice in Japan, which resulted in a policy to set aside paddy fields. The relatively high cost of production associated with rice terraces made this type of farming difficult. As a result, the next generation of terrace farmers left for the cities. Surveys in 1993 and 2005 revealed that the area under rice terraces had gone down from 220 to 138 thousand hectares during that period. In 2007, the average age of the 3.12 million people active in agriculture in Japan was 64 years. The average age of people working in rice terraces was estimated as even older!

Since the 1960s, the rural landscape has completely changed. Larger and squarer fields have been formed from joining together smaller paddy fields in the plains. These larger areas can easily be equipped with modern canals and farm roads for farm machinery.

Rice terraces, on the other hand, have been left behind in this wave of development. Their lower productivity has never improved. However, the rapid change seen in rural landscapes has increased the value of the rice terraces as unique scenery and examples of rural atmosphere. In mountainous areas, terraced paddy fields form beautiful curves, reminding Japanese people of their tradition. Rice terraces are also places for experimental education in food, life and environment. Abandoning the terraces would have serious consequences, because of their water and biodiversity functions. They are "products" that are not for sale, but are yet consumed publicly. In 2001, the Science Council of Japan estimated annual values

of arable farming in Japan at 3499 billion yen (US$ 39 billion) as flood damage relief and 2376 billion yen (US$ 26 billion) for their recreational and relaxing functions.

Support from all walks of life

A development project was planned for the *Shiro-yone sen-maida* rice terraces, near the city of Wajima, on the Noto peninsula facing the Japan Sea, in 1970. However, instead of going ahead with the project, the local government decided to pay out subsidies to support farming in rice terraces for prolonged periods. The rice terraces were then designated as a place of scenic beauty under the Cultural Properties Protection Law in 2001. It covers an area of 1.81 ha and consists of 1004 paddy plots. The plots have an average size of less than $20m^2$, meaning that all work must be done by hand. Local governments appreciate the conventional rice farming and its scenic beauty as a significant resource for tourism.

Public support for preservation of rice terraces has increased since the mid-1990s. Some urban people have launched programmes, like community supported agriculture, with annual contracts to lease rice terraces. Municipalities, for example, established the National Rice Terraces Liaison Council. This Council organised the 14th National Rice Terrace Summit Meeting in 2008, close to Nagasaki city. More than 2000 politicians, farmers and members of the general public attended the event, which was covered by the media. At the same time, committed individuals organised a "*Tanada* network" that supports preserving the rice terraces (see Box). Activities include schools in rice terraces for learning about farming hands-on, provision of information through websites and bulletins, and promoting collaborative programmes with private companies and rice terrace farmers, to develop public opinion and values. In 1999, the "Rice Terraces Research Association" was established to promote research into rice terraces. It has members from all walks of life like researchers and artists, but also administrative officials, farmers, office workers, housewives, photographers and retirees. It organises national and international field trips (such as to Bali in Indonesia, Yunnan in China and Nanhe in Korea), and surveys rice terraces as required.

Rice terraces in the Japanese landscape

Japan is an island country, with a population of 127 million. It was formed by hundreds of volcanoes, of which 108 are still active. Topography is steep, and rainwater quickly runs out through narrow rivers into the sea. People in Japan traditionally eat rice and sea foods. Through history, the Japanese people have built and developed rice terraces in the steep volcanic landscape. The sulphur in volcanic ash makes soil acid, which is harmful to many crops, but with irrigation it makes rice grow well.

Paddy rice cultivation started on the continent –now China– some 7000 years ago, and was introduced to Japan about 2500 years ago. Rice terraces are referred to as *tanada* in Japanese. The word *tanada* originates in a land register recorded in 1338. It came about as the result of investigating the area and the yield of its rice paddy fields. Up to this day, rice terraces are a unique natural feature, a complex mix of human activities, society and the natural environment, and are seen as the peoples' spiritual home. Water in paddy fields and the irrigation and drainage system serves as a network of wetlands and waterways that represent a human-made natural environment with a rich flora and fauna. Birds such as cranes, egrets and white storks prey on aquatic bugs, frogs and fish. Furthermore, the network also recharges groundwater, reduces peak flood flows, and provides recreational areas, all important for downstream cities.

National and local policy development

In 1992, the Ministry of Agriculture, Forestry and Fisheries established a policy referring to the multi-functionality of agriculture for the first time. In 1993, 1997 and 1998, it approved projects to preserve soil and water, and for restoring abandoned arable lands for the different functions of rice terraces. 1998 was the first time the word *tanada* was mentioned in the national budget, and about US$ 600 million was appointed for a three-year project period. These projects supported farmers in restoring abandoned paddy plots. A land owners' system was also introduced, for citizens who want to enjoy farming there, for instance in the city of Chikuma in Nagano prefecture.

In 1999, a new "Food, Agriculture and Rural Village Basic Law" was enacted, with four pillars: to ensure stable food supply, present the multifunctional roles of agriculture, establish sustainable development of agriculture, and promote rural villages. The old basic law aimed at reducing income gaps between agriculture and other industries; the new one aims to improve people's life and sound development of national economy. In 2000, the government launched a "Mountainous and Intermediate Areas Direct Payment System". In this system, farmers make a community agreement and engage in collective actions. These actions can be aimed at preventing the abandonment of arable lands, promoting multifunctional agriculture, or collaborating with schools and encouraging community action. By 2007, farmers cultivating almost 700 thousand hectares of farmland in over a thousand municipalities were participating in this system.

In 1999, the Minister of Agriculture authorised a project entitled "The best rice terrace areas in Japan", approving 134 terraced areas as ones with scenic beauty and sustainable, multi-functional agriculture. This did not involve subsidies, but the areas received merits as valuable sightseeing spots and places for producing good quality rice. Local people became proud of their home village, and established many organisations for preserving rice terraces. In 1999, the Cultural Properties Protection Law allowed the designation of Obasute in Koshoku city as the first agricultural place of scenic beauty; others followed. The Agency for Cultural Affairs established a system of appointing areas for cultural scenery preservation in 2004. This allowed for the Scenery Law to regulate land use and economic activities so as to preserve scenery in rice terraces based on the agreement of local dwellers and municipalities.

The survival of the rice terraces in Japan and other Asian monsoon regions will enable people to taste the advantages of the slow life, and to realise the value of what they have inherited from their ancestors. Such places may have a lesser economic role in modern society; but they have a cultural and natural role far beyond the grains that they produce. ■

Kazumi Yamaoka. Visiting Associate Professor, Department of Biological and Environmental Engineering, Graduate School of Agricultural and Life Sciences, The University of Tokyo, Japan. E-mail: ayamaoka@mail.ecc.u-tokyo.ac.jp

References

-Yamaoka, K., 2005. **Multifunctionality of paddy field irrigation for a basin scale water cycle and bio-diversity in Japan.** Proceedings of the International Workshop on Multiple Roles and Diversity of Irrigation Water, Beijing, China on 14 September 2005, International Commission on Irrigation and Drainage (ICID), New Delhi, India.

-Senga, Y., 2006. **Development process of policies and activities supporting preservation of rice terraces since 1990**, *Journal of Rice Terraces Research Association,* 7.

-Yamaoka, K., T. Tomosho, M. Mizoguchi and M. Sugiura, 2008. **Social capital accumulation through public policy systems implementing paddy irrigation and rural development projects.** *Paddy and Water Environment*, 6(1).

Photo: Idleformat

How sustainable is

"Organic food production is beginning to resemble conventional food production."

Vanaja Ramprasad, board member of IFOAM (International Federation of Organic Agriculture Movements) and managing trustee of the GREEN Foundation.

"Organic farming is more than just farming without chemicals. Apart from safe and healthy products, it also takes into account the health of the soil, safety to other fauna and flora, and friendliness to the environment. So organic farming is a good thing, yes. But there is such a large demand for organic agriculture, that business has started to hijack the organic principles. More and more organic farms are appearing that are large-scale, industrial monocultures. They contradict the organic tenet of crop diversity. It might be that these farms have to meet with certain demands in order to be qualified as organic, but they cannot really be considered high in biodiversity. They also contribute to a centralised food production system that sees food products shipped over increasingly large distances. This raises concerns about the paradox of using millions of gallons of fossil fuel for shipping organic products across countries and continents.

"You may wonder whether organic is still synonymous with sustainable, as organic food production begins to emulate conventional food production. It would be a shame if organic agriculture should become a victim of its own success. Also, today's concerns have gone beyond providing food that is clean and safe. We need to understand the larger issues, such as reducing the trade-offs among food security, climate change and ecosystem degradation. I would like to see 'organic' be interpreted a little wider than is being done at the moment. Now it simply relates to inputs. We should look at the impact as well. I would welcome a standard that looks at these larger issues. That's why I really appreciate an initiative like that of the ISEAL Alliance, that strives to connect ecological sustainability to social justice.

Demand for organic products continues to grow and outstrip the supply. How organic are these products, when they have to be transported over many miles to reach consumers? And how sustainable is organic produce, when it is grown on large farms, leaving less and less room for biodiversity? Questions like these add another dimension to a debate that has been going on for many years: do we need a new standard? One that doesn't just look at inputs, but looks at impact on the environment as well?

Join the debate at http://ileia.leisa.info →

organic farming?

"At the moment, 'organic' in India basically means 'for export'. It's not that I am against a farmer exporting his Basmati rice, but there is enough of a market within the country itself. I would prefer it if organic farming would be considered mostly as an opportunity for small-scale farmers for self-provisioning, and not to exclusively reach the market. Organic agriculture can be beneficial to small-scale farmers without trying to produce for export markets. It could help their sustenance.

"For one thing, farming organically is cheaper than farming the conventional way. There are people who say that small farms are not viable, and that therefore we should do away with them. But in India alone, 60% of the farms are small. What are these farmers to do? Migrate to the city? That doesn't seem a feasible option, and it also wouldn't do much for biodiversity. Because when it comes to that, small farmers have a lot more to offer than large scale organic farms."

The GREEN Foundation, for which Vanaja Ramprasad (earthbuddy@gmail.com) is a managing trustee, works with disadvantaged groups of, among others, small and marginal farmers, in south India.

"From an environmental point of view, a new standard is a good idea."

Miguel Gamboa, producer co-ordinator at Utz Certified, a certification programme for "environmentally responsible" products – products that are not necessarily organic, but that do take into account social and environmental responsibility.

"Is organic agriculture beginning to approach conventional agriculture in the sense that produce is grown in such large areas that biodiversity suffers? I work in the coffee business, and there things are a little different from other sectors. Organic coffee is still a niche product when compared to products like vegetables or dairy, it doesn't involve huge areas yet. And of course, with coffee not being grown in Europe, there are food miles involved. But 95% of coffee gets exported by ship. This also puts a claim on the environment, but less so than if it would travel by plane.

"Where organic agriculture does start to resemble conventional agriculture, is that it is becoming a business like conventional agriculture. To grow organically, you need products that aren't necessarily cheap, at least not when you want to comply with the regulations. I was once able to help out a group of farmers who aimed to start growing organic products in an exemplary way, and they found that the organic fertilizer and other materials they needed were very expensive. Of course, you can use chicken manure or something, but that is not always good enough. Say the nitrogen/phosphorus/potassium ratio you need, to be able to comply with the demands of soils and plants, is 17/8/17. Chicken manure will give you no more than 1.5/0.8/1. So you would need a lot of it, and you still end up spending quite a bit of money. A standard for sustainable agriculture that wouldn't just look at input but at impact as well, could make organic products even more expensive. Consumers might not want to pay the extra price, and then producers would suffer. But from an environmental point of view a new standard is a good idea.

"A higher demand for organic products in the countries where these products are grown would mean a huge opportunity in terms of market. But people in these countries are not so much aware of the added value of organic produce. Their main selection criterion is price, they go for the cheaper option. People in these countries are not so much looking for better things to eat, but simply for things to eat at the cheapest price. And because farming organically is not necessarily cheaper, organic produce wouldn't be their first choice. There is a task for governments here to inform people about the benefits of organic agriculture."

As a producer co-ordinator, Miguel Gamboa (miguel.gamboa@utzcertified.org) supports producers in Latin America in complying with certification demands and in implementing programs to meet with certification demands.

Our digital newsletter, E-LEISA, contains a summary of the previous discussion on livestock and climate change. To subscribe to this newsletter, go to E-LEISA on the homepage of LEISA Magazine.

Spate irrigation: Good for people, livestock and crops

Spate irrigation is an ancient form of water harvesting. It is a method of managing unpredictable and potentially destructive flash floods for crop and livestock production. By making water available, it can contribute to increasing the diversity of farming systems where it is found. It is the major source of livelihood for many communities in west Asia, the Middle East and Africa. Despite being the oldest type of irrigation, it is still the least studied, understood and documented.

Frank van Steenbergen and Abraham Haile Mehari

Spate irrigation water management systems are among the most spectacular and complicated social organisations around. While spate irrigation has the potential to contribute to poverty alleviation and food security, it is often neglected and forgotten in agricultural investment programmes. The area under this type of irrigation is more than 2.5 million hectares worldwide, with about 2.1 million households depending on spate irrigation systems. It is found in west Asia (Pakistan, Iran, Afghanistan), the Middle East (Yemen, Saudi Arabia), North Africa (Morocco, Algeria, Tunesia) and the Horn of Africa (Ethiopia, Eritrea, Sudan, Somalia) and more sporadically in other parts of Africa, South America and Central Asia. The largest area is in Pakistan and Iran. In the Horn of Africa spate irrigation is on the increase.

This water management system requires the local construction of bunds and canals that are able to withstand flash floods. They must be designed to gently guide large volumes of water over large areas, slowing down their erosive power. Soil bunds, as they are in use in Pakistan and Eritrea, can stretch over several kilometres. This requires much ingenuity in their construction. Factors which need to be considered include: the location, the angle to the river bed, the distance from the new diversion bund, the soil from which they are made, the compaction and use of (brushwood) reinforcements. The amount of collective work needed is huge. This requires strong local co-operation and agreement on how to distribute a common good that is uncertain and uneven. In many cases the number of people working on the common structures is so large that it is in the benefit of upstream farmers to give a fair deal to downstream land users. This is the only way to mobilise enough people to carry out the repair works.

Higher production, fewer chemicals

Spate irrigation systems sustain highly productive low input agricultural systems. One example is the Eastern Lowlands in Eritrea, where sorghum yields of 3750 kg/ha are often achieved. On occasion, yields reach 6000 kg/ha, thanks to a sophisticated system of moisture management. The secret is a refined system of water management – in which the land is ploughed prior to the irrigation season to "open up the soil". After the fields are watered they are carefully ploughed and mulched – and the sooner this takes place after irrigation, the more moisture is stored. In the Eastern Lowlands the command area is also kept relatively compact. Because of this, it is possible to have two or even three spates on the land, and to store sufficient moisture in the soil to last throughout the season.

In most spate irrigation schemes, farmers prefer to use local cultivars as they are well adapted to the local agro-climatic conditions. There is minimal use of chemical and organic fertilizers as most farmers believe that their soils are naturally fertilized by the fine sediments that are deposited during each irrigation. The use of pesticides and insecticides is also rare. High costs, limited availability and risk aversion are other factors that have limited the use of agro-chemicals. Most spate-irrigating farmers cannot take the risk of losing their entire crop in a dry year by changing to higher yielding varieties that are less tolerant to drought and require fertilizers and other agro-chemicals.

Zero-grazing

Livestock is an integral and important component of the livelihoods of the resident households in most spate-irrigated areas. Access to sufficient fodder is therefore crucial. The main

How it works

Spate irrigation is a type of water management that makes use of water from "spates", short duration floods. Spates – lasting from a few hours to a few days – are diverted from normally dry riverbeds and spread gently over agricultural land. After the land is inundated crops are sometimes sown immediately. Often the moisture is stored in the soil profile and used later. The spate irrigation systems support low economic value farming systems, usually cereals (sorghum, wheat, barley), oilseeds (mustard, castor, rapeseed), pulses (chickpea, clusterbean), but also cotton, cucurbits and even vegetables. Besides providing irrigation, spates recharge shallow groundwater (especially in river bed), they fill (cattle) ponds and they are used to spread water for pasture or forest land in some places.

Photo: Spate Irrigation Network

Simple infrastructure development can help people to manage flash floods and spread water over land – the working procedure of "spate irrigation".

source of fodder is crop residues and rainfed grazing lands. A second source is the cultivation of spate-irrigated fodder crops, such as (green) sorghum. In Eritrea and Sudan, ratooned sorghum is an important feed for livestock as well. Weeds cut from the fields and along the canals are another source of forage, as are leaves from trees in and around the spate-irrigated fields. For instance, households in the Sheeb area in Eritrea practice "zero-grazing" from October to May. In this system, the animals are fed with cut grass from the fields. This prevents livestock from causing damage to standing crops, and economises on the scarce animal feed. Farmers in the northern part of Amhara State (Ethiopia) also indicated that spate irrigation boosted the availability of animal feed due to a significant increase in biomass production. The improved availability of animal feed has improved household income generated from livestock products.

Spate irrigation systems generate important benefits. In the first place, obviously, spate irrigation makes it possible to grow crops in hot arid and semi-arid regions where evapotranspiration (the loss of water from soils and plants) greatly exceeds annual rainfall. In addition, spate irrigation systems may also have one or more of the following benefits for the households living in and around the command areas of these schemes: (improved) access to animal feed; recharge of groundwater aquifers; (improved) access to water for humans and livestock; and (improved) access to forest products.

Efforts to support spate irrigation farmers

In general, the provision of agricultural extension services to farmers in the usually remote spate-irrigated areas is poor, whereas any available services often do not meet the specific needs and demands of spate-irrigating farmers. The entire range of Green Revolution techniques, for instance, is not applicable.

For a long time, attention to spate irrigation has focused very much on civil works improvements. These have in many cases disturbed the balance and the sustainability of the system. Typically, an ingenious system of independent structures able to manage the high floods and high sediment loads, was replaced by a single concrete diversion structure. This was the pattern followed in the so-called modernisation era in Yemen and Pakistan. The net result has either been the rising of the command area, water rights conflicts (as a many independent systems were replaced with a single off-take) or interference with the subsurface flow feeding the local aquifers. Moreover, attention to improving the diversion of river water from such modernised systems was in retrospect uncalled for in some areas, as most water was diverted from the dry river beds anyhow and no water was left unused.

Many small things make magic

There are several ways of improving spate irrigation beyond focusing on diversion works only. This is best described as the magic of many small things. Promising activities include:

- Improving water productivity and soil moisture management. Field-to-field structures (inlets and overflow structures) can be improved, allowing more regulated inflows and outflows during the hectic times of spate irrigation. Another strategy is to ensure that animal traction power is adequate for ploughing and mulching, so as to conserve soil moisture after irrigation. A final strategy is to consider concentrating flows towards a relatively compact command area, so as to increase the probability of land being irrigated. This makes it less risky for farmers to prepare their land prior to irrigation. More compact command areas also increase the chances of a second and third irrigation, taking crops out of the "stress zone", as practised in Eritrea.
- Introducing new crops – vegetables, cucurbits, pulses, oilseeds. What is common and popular in one area often has not spread to the next area.
- Making more of wild crops. In most spate areas there is a large variety of wild vegetables, fodder plants and mushrooms (including truffles). Seeds of these are collected from a large catchment and dumped during the floods into the favourable moisture conditions of the spate systems.
- Investing in post-harvest technology, such as seed cleaning and improved storage, which in Pakistan for instance, reduced grain losses from 7% to zero.
- Enhancing the productivity of livestock. This would include improved access to animal feed, watering points and veterinary services, as well as the processing and marketing of livestock products.
- Promoting local agroforestry, particularly of indigenous trees that serve to stabilise surrounding areas and provide fuel and timber, medicinal products or bee forage. Sometimes this has to be accompanied by improvement in the governance of local forestry.
- Controlling invasive species. In spate irrigated areas in Sudan and Yemen, an invasive weed has blocked river beds and grown over canals. Innovative ways of reusing this weed (for charcoal for instance) could turn it into a resource.
- Improving drinking water facilities in the spate areas. These are often inadequate and unreliable, such as unprotected open ponds. A range of technical and institutional measures are available to improve drinking water supply.
- Developing complementary uses of groundwater and spate water, including promoting recharge with small structures and special water allocation rules. The combination of spate and groundwater can sustain production systems that are among the most productive anywhere.

■

Frank van Steenbergen and **Abraham Haile Mehari**. Spate Irrigation Network, Paardskerkhofweg 14, 5223 AJ, 's-Hertogenbosch, the Netherlands. E-mails: fvansteenbergen@metameta.nl ; ahaile@metameta.nl ; http://www.spate-irrigation.org

A few years ago, we published an article written by Rezaul Haq, Tapan Kumar and Pritam Ghosh, called "Cultivating wetlands in Bangladesh". This article looked at the work of a small NGO promoting "soil-less floating agriculture" in the south-western region of Bangladesh. This method was described as being highly productive and ecologically sound, especially considering that large areas of Bangladesh are continuously flooded. Due to the many advantages presented, we decided to ask the authors how their project is doing now.

Photo: T.K. Ghosal

Soil-less agriculture gains ground

Back in 2004, Rezaul Haq, Tapan Kumar and Pritam Ghosh reported on their attempts to revive an old Bangladeshi farming system: soil-less floating agriculture. This is a smart method of growing food in flooded areas. The system is particularly useful in their country, as many parts of it are continuously flooded. For hundreds of years, villagers have been using locally available paddy straw, water hyacinths and other invasive aquatic plants for making beds. These beds become "floating islands of organic material", on which different crops are grown (to understand more about how to do this, see Box). Their article described the implementation of the "Reducing vulnerability to climate change" project in Chandra, a village on the bank of the river Kopotaksha. This project ran from 2003 to 2005 with the support of the Canadian International Development Agency.

Benefits of cultivating wetlands

Through extensive e-mail contact, Rezaul Haq and Wadud Nawaz let us know that their activities had continued and developed. "Our initial objective was to familiarise all villagers with soil-less farming, analyse its potential, and actively involve farmers in producing crops. The implementation of this 3-year project clearly showed us the advantages of this approach." Among the many benefits, the authors highlighted the fact that agricultural production is fully organic, while yields are as high (and in some cases even higher) as those reported for "conventional" agriculture in the area.

The work of their organisation, the Wetland Resource Development Society, together with the farmers' efforts, showed that soil-less agriculture can help the country's wetlands become highly productive without altering the natural environment. "Our analysis showed that the context was favourable for further disseminating the method: materials for producing the beds are easily available, there is a large unemployed labour force, and a growing local and national market for organic vegetables." The 2003-2005 experience was then seen as the first phase of a process which had to continue.

Photo: Rezaul Haq

Multiple advantages: floating beds create more areas for agricultural production while also controlling the invasive plants which obstruct navigation and fish breeding.

What happened since the article was published?

"We continued with a second phase supported by ActionAid. This was framed as a project called 'Adapting to waterlogging situation through the promotion of floating gardens', running between 2007 and 2008." This project worked with four unions: Nehalpur, Hariduskaty, Chalisa and Shundoli, all of them in the Jessore district, an area well known to their organisation. And although the project lasted for a relatively short time, it had immediate results. The farmers in Chalisa, for example, were able to grow onions and sell them at a high price (having been produced off-season). The farmers of Shundoli grew and sold papaya seedlings. When the whole region was hit by hurricane Sidr, the participating farmers saw no negative impact on plant growth (in spite of seven days of continuous rainfall). They were then also able to get a higher price for their products.

As Rezaul Haq and Wadud Nawa told us, "the work in these unions showed four major advantages in soil-less agriculture. The first is that this system enhances agricultural production and food security: every inch of space can be used for growing crops. A second point is that soil-less agriculture helps keep the wetlands alive, conserving their biodiversity. It can also help control the aquatic invasive plants that obstruct

Constructing floating beds

Making a floating bed requires bamboo poles, a boat and a simple tool to cut the weeds. The bed is built with layers of aquatic weeds, most commonly water hyacinths (*Eichhornia crassipes*). Organic materials like paddy stubs, straw and coconut husk are also added. Construction starts at the beginning of the monsoon season (June-July) when the aquatic weeds are collected, and it continues up to late autumn. Farmers put a long bamboo pole (as long as they want the bed to be) over a collected mass of fully matured water hyacinths. To build one bed, water hyacinths growing in an area roughly five times larger than the bed itself are required. Mature water hyacinths are preferred because they decompose slower than immature plants. The first layer of water hyacinths acts as the base of the floating bed and maintains the stability, buoyancy and thickness of the bed. A man then stands on the bamboo pole lying over the water hyacinths and starts to pull water hyacinths together from both sides of the bamboo. He proceeds towards the end of the bamboo and compacts the accumulated hyacinths under his feet. This process is continued until the desired height and length of the bed is obtained. When the construction of the bed is complete, the bamboo is removed. After 7 - 10 days a second round of water hyacinths are dumped on the bed. The bed is then left to decompose before being planted. The top of the floating bed needs 15 - 20 days to decompose before sowing seed or planting seedlings. To further improve conditions for the young seedlings, the seeds are sometimes placed inside a ball made of composted manure and aquatic creepers (locally called tema), before being planted on the floating bed. This method ensures smooth germination and sufficient nutrients for the plant to establish itself. There are no fixed rules about the size and shape of the floating beds, but generally the villagers construct beds that are 4 ft x 3 ft x 30 ft.

navigation and the breeding of fish. A third point is that soil-less agriculture can help farmers adapt to climate change: soil-less farming is an 'energy saving agriculture' (even if labour intensive). Floating beds also provide shelter during flood. People can use floating mats to some extent, to save their dwellings and household assets. Farmers are also able to produce –and sell– large quantities of compost, resulting in extra income. Finally, the experience has shown that soil-less agriculture enhances social equity: as flooded lands are treated as a common property, it provides opportunities for landless people to produce crops."

Into the future

Although Bangladeshis are used to living with water, waterlogging is an increasingly serious problem. To an extent, this is one of the results of the large scale infrastructure projects in the 1960s. They aimed to turn the seasonally flooded coastal wetlands of Bangladesh into reclaimed land for permanent agricultural production. As the authors told us in their original article, these projects "ignored the agro-ecological system of the south-west region and disrupted the ecologically complex and highly productive coastal wetland ecosystem. The reclaimed land is now isolated from the river and does not receive any silt to improve its fertility. The silt load is instead deposited in the river, blocking the drainage of the area and leading to permanent waterlogging". Since then, this problem has only been getting worse. Estimates from the government's Water Development Board report that 4000 hectares become permanently waterlogged every year. The Jessore, Khulna and Satkhira districts have seen the total waterlogged area rise from 28 000 hectares in 2004 to more than 200 000 today. This is having serious consequences, as human settlements and crop fields are all inundated.

This difficult context has convinced the Wetland Resource Development Society to continue promoting the soil-less model. They realise that, at the same time, they must tackle a challenge they had not thought of at first. "One of the most important lessons of our work has been that the success of soil-less agriculture as a sustainable and environment friendly farming system, lies in organising small-scale and poor farmers at grass-root level, and building up their capacity as small-scale entrepreneurs." The positive results seen during the second phase of their work showed that the high profitability of soil-less farming encourages rich entrepreneurs to try it out, invest time and resources and obtain profits. "Without a doubt, this is a good sign, but at the same time it is a threat, as poor farmers could lose the possibility of participating – and benefiting.

Soil-less floating agriculture uses invasive plants to make Bangladesh's wetlands become highly productive

"Without the development of farmer organisations it is difficult to sustain poor farmers' rights to common property and ownership of technology. There are plenty of water bodies, infested with invasive aquatic plants like water hyacinth, which are treated as common property. However, these are likely to be grabbed by the upper levels of the rural and urban society, if extensive and persistent advocacy is not considered by the NGOs." Approximately half of Bangladesh is covered with wetlands, and remains non-productive. In addition, aquatic invasive plants are a great menace to biodiversity and agriculture. There is potential for enormous productivity if wetland resources can be developed by NGOs and research institutes working together with farmers. Farmers may also need support such as for capacity building and establishing farmers' organisations. This would help them to benefit more in the future, building on what they have already achieved. These are the core elements of the Wetland Resource Development Society's third phase project, which they hope to start soon. (JCT) ■

A.H.M. Rezaul Haq and **K. Wadud Nawaz** can be contacted at the Wetland Resource Development Society (WRDS), 21 Hazi Mohsin Road, Khulna, Bangladesh. E-mail: wetlandbd@gmail.com

The article written by Rezaul Haq, Tapan Kumar and Pritam Ghosh appeared in Vol. 20.4, December 2004, of the LEISA Magazine. As all other articles, this one is available through http://ileia.leisa.info

Would your story fit in this section?

We are looking for interesting experiences to feature here. Tell us what has happened to you, your organisation or community, since we published your article in LEISA Magazine, and why we should feature your work. Send us a 300 word outline of updates about your experience or project, to jubilee@ileia.nl clearly marked "Update from the field".

Photo: Henry Smiles

"Hot issues" help preserve traditional agricultural systems

Photo: Frank van Schoubroeck

The traditional Gafsa oasis system has three layers of crops: 50-100 year-old palm trees, 5-10 year-old fruit trees, and annual crops.

Researchers and local policy makers acknowledge the values of traditional agricultural systems. But how can these systems be preserved? What kind of support do farmers need to keep developing their systems? Identifying "hot issues" that farmers face in their everyday working lives is a starting point. These can be addressed through governance mechanisms, designed to link politicians with people.

Frank van Schoubroeck, Luohui Liang and Arend-Jan van Bodegom

The world has hundreds of amazing farming systems in the most unlikely places. On steep mountain sides, rice terraces were carved out and ingenious irrigation systems were developed. In the Sahara, farmers use every drop of water to grow rare species of dates and apricots. Latin American farmers grow over a hundred potato varieties. Each country has areas where generations of farmers used local opportunities to develop complex farming systems. Such systems have always emerged and disappeared, and agricultural landscapes have always adapted to technological and social developments. Yet, international studies show that the development and existence of many traditional systems are now threatened more than ever. Firstly, government policies usually result in subsidies and regulations to realise cheap food production for cities. Soil and biodiversity conservation in older farming systems is poorly acknowledged, let alone paid for. Secondly, over 90% of agricultural research is paid for by companies whose objective is to sell agro-chemicals and seeds to farmers and governments; even public research often supports the same. The result is that farmers face many difficulties in developing a decent living based on traditional systems: farmers' children migrate to the cities, while immigrants often do not get (land) rights to continue developing ingenious farming systems.

Efforts to conserve agricultural systems

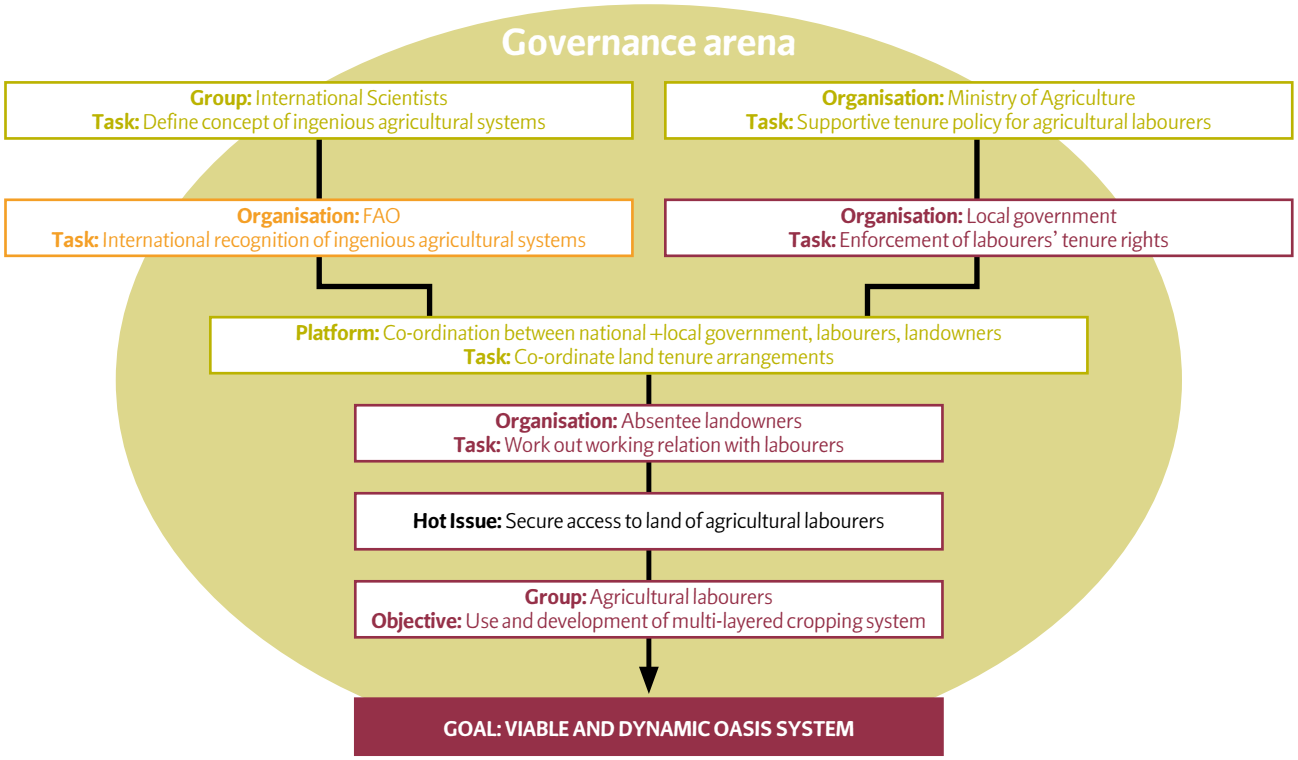
Global organisations that stress the importance of conserving traditional agriculture systems, have been set up. UNESCO has a cultural landscape conservation programme, and the FAO Globally Important Agricultural Heritage Systems programme identified 200 such systems worldwide. Yet, how do you conserve these agricultural systems? The FAO developed the idea of "dynamically conserving" the systems: they should develop into modernity, so that they will survive well into the 21st century. The authors of this article were involved in planning for the conservation of some traditional agricultural systems. Field experiences showed two important points:

1. On the ground, people were passionate about conserving and developing the system: many organisations started carrying out activities which they thought relevant, and with their own means.
2. There was no planning tool to help organisations co-ordinate such initiatives. Unco-ordinated implementation meant that initiatives did not lead to conserving agricultural heritage. Available tools (such as the Logical Framework) created confusion and stifled enthusiasm.

We concluded that despite the widely shared goal of conserving agricultural systems, there was no way to connect all the different organisations' initiatives so as to streamline development concepts, policies, rights, support services and economic activities.

"Hot issues" in farming systems

Farmers in the field pointed out some important difficulties or opportunities, that we called "urgent" or "hot issues". Hot issues attract attention, often conflict, or make people work day and night to realise a potential. There is energy in hot issues, and a chance for success. The context determines local hot issues. For example, in China, farmers started selling salted dried fish, but



This diagram represents a governance mechanism of the hot issue "access to land by agricultural immigrant labourers". Conditions in red and orange are not or partly fulfilled; conditions in green are well in place. The platform in the middle is to be established.

they could not meet the demand. There were vacant areas which could be used productively (where some people had left the village), but the farmers had little access to this.

Grouping stakeholders around hot issues

Farmers can rarely solve such issues alone. They need support such as recognition, capacity building, increased rights, or law enforcement. Outsiders cannot tell farmers what to do – but they can provide the conditions for which farmers can develop their system. Outsiders can help to map out the organisations involved in each issue, and the roles they should take up. For example, the farmers in China could sell fish as "traditionally grown and smoked fish" – but alone, they could not implement a system which guaranteed that customers got what the label promised. For that they needed an outside organisation. Stakeholders working on a hot issue together can jointly visit farmers in the field and see the problem with their own eyes. Through workshops, they can then define the stakeholders' roles and co-ordination mechanisms. Organisations may disagree about many issues, and yet work together to address a hot issue in support of the agricultural system.

For example, as programme planners, we visited the Gafsa oasis, in mid-western Tunisia. There we saw a typical scenario of how a traditional agriculture system can break down (see Box). This programme planners' visit to the oasis, combined with interviews with farmers and officials, revealed a few hot issues: the water table is going down, agricultural labourers only have one-season contracts, people build illegal houses, urban waste is dumped, the oasis could be a park for the town, oasis products could be marketed better. In the oasis itself, some people pressed us visitors: "Please make sure that illegal building gets stopped!" or "We cannot improve anything if there is not more water". All this shows that issues are indeed "hot" and that addressing a few of them would help in revitalising the oasis system.

One of the issues in the oasis was that immigrant labourers did not get long-term rights to land. For them, there was little incentive to invest in the palm trees (with a 50-100 year cycle) and in fruit trees (5-10 years). Thus they did not maintain trees, and they planted annual crops. An "awareness raising programme" by the Department of Agriculture was unlikely

Threats to the Gafsa oasis agricultural system

The Gafsa oasis is a green island in a dry rocky region on the fringe of the Sahara in mid-west Tunisia. Gafsa town developed on the side of a hill, with the 700 ha traditional oasis at the bottom. With the use of water pumps, the oasis has been expanded to 3500 hectares over the last few decades. Because of uncontrolled water pumping, the water table is steadily going down: after 20 centuries of providing refreshment, the naturally fed Roman bath in the old town has been dry for a few years. The oasis does not look fresh. People remember that they used to go for picnics – now urban waste is thrown on the ground, and trees to provide shade have been cut. It is illegal to build houses on agricultural land, but the local government cannot control influential landowners: farmers urged the outside visitors to report this illegal building to the President. Farmer labourers do not maintain the traditional three-layer cropping system (palm trees, fruit trees and annual crops). Most of them have short-term contracts of one or two years, and they do not get the rewards from palm and fruit tree management. Moreover, at the time fruit matures, prices collapse, and they do not avail of storage and packing systems to send fruits to markets. Tunisian urban centres are growing, and Tunisia has access to the EU market – where certified oasis products can be sold at good prices. Some entrepreneurs started open-air restaurants with pleasant shade, where they serve local drinks and food. City dwellers like to go out and have drinks or dinner in these restaurants. The most important opportunity for improving this situation is the sense of urgency felt by the Gafsa population: people feel very sad about the sorry state of their old oasis, and any action to conserve the system gets support from the general public and officials.

to help labourers to maintain the trees. They needed long-term access to land; and landowners were afraid they would lose their land rights. The diagram on the previous page shows a governance mechanism to address the issue. Different organisations carry out tasks that create conditions for others to play their role in the mechanism. Note that such a map is never final. While working on the issue, you will find that some conditions are already in place (so they can be scrapped from the map), or others are needed (so they can be added). The map is a tool to aid in achieving co-operation among organisations for a common goal (in this case: oasis development).

Use of the GO-frame

In a workshop with various organisations in Gafsa, different stakeholders first aired their frustration with the degradation of the oasis. It took some effort to change the focus to look at hot issues which could be addressed, and to think of their governance mechanisms. After a day or so, stakeholders listed key organisations for the particular issue, and the tasks they needed to carry out to enable other stakeholders to eventually maintain the agricultural system. For some activities no external funds were needed: most organisations had their own mandate and budget. Extra funds would be needed to co-ordinate among organisations. After the workshop, some organisations joined hands to start cleaning rubbish from the oasis and carry out radio programmes for awareness raising.

We found that organisations building a programme around hot issues identified the same goal, but had different objectives than a donor or a national ministry. Outsiders' issues were "poverty reduction", "biodiversity conservation", or "niche market development". They partly overlapped with the locally identified issues, but the starting points to address them were very different.

We called this method of planning the "governance-outcome framework" (or "GO-frame"). It can help to structure multi-stakeholder processes. The tool been used in action research in Cameroon, and in assessing the role of advocacy NGOs in Indonesia, among others. Further experimenting must be done to amend and adapt the method to make sure it indeed helps stakeholders to link policy, the work of government agencies and NGOs, and farmers' practice. ■

Photo: Frank van Schoubroeck

Absent landowners put guardians in their land who maintain annual crops only, replacing the traditional dense vegetation. Compare with photo on page 36, where vegetation is abundant.

Frank H.J. van Schoubroeck. Policy analyst, ILEIA, P.O. Box 2067, 3800 CB Amersfoort, the Netherlands. E-mail: f.van.schoubroeck@ileia.nl

Luohui Liang. Researcher, United Nations University, 5–53–70 Jingumae, Shibuya-ku, Tokyo 150-8925, Japan. E-mail: luohui.liang@gmail.com

Arend-Jan van Bodegom. Forestry governance expert, Wageningen International, P.O. Box 88, 6700 AB Wageningen, the Netherlands. E-mail: arendjan.vanbodegom@wur.nl

References

-Wageningen International, 2006. Portal for multi-stakeholder processes: http://portals.wi.wur.nl/msp

-McIntyre, B., H. Herren, J. Wakhungu and R. Watson (eds.), 2009. **Agriculture at a crossroads: The global report.** International Assessment of Agricultural Knowledge, Science, and Technology (IAASTD). Island Press, 1718 Connecticut Avenue, NW, Suite 300, Washington, DC 20009, U.S.A.

Call for articles

September 2009, Vol 25.3
Women and food sovereignty

Food sovereignty is about the right of producers to define their own food, agriculture, livestock and fisheries systems – as opposed to having them defined by international market forces. For small-scale farmers this means having the right to land and resources, and being able to participate in decision-making about resources in their countries – to ensure that their families and communities have enough food, before their produce enters long-distance trade. Food sovereignty is a relatively new concept, introduced by *La Vía Campesina* in 1996. It is a response to the dominant thinking in development that farmers need to be modernised, by stimulating them to enter into commercial globalised trade.

What does food sovereignty mean in the day-to-day lives of small-scale farm families? And more particularly, what does it mean for women – being the main providers of food? We are interested to learn about how they perceive the global changes in agriculture, and how they respond to them.

How do these changes affect their roles as food producers, as mothers and feeders of the family? Do they have the rights of access to land, water, and forest products essential for securing nutritious food? How do women and their families balance between production for the market and for home consumption, between the need for money and the need for food?

At a time when a global economic crisis is unfolding, what is the scope for food self-sufficiency – at household, local and national level? What innovative strategies have farmers and their organisations developed towards gaining food sovereignty? What initiatives are being undertaken to support women and men farmers in achieving this goal? Many farmers are still a long way from true food sovereignty – what are the bigger challenges yet to be addressed?

Dear readers, we look forward to your contributions to this extremely important theme!

Please submit articles by June 1st, 2009, to Jorge Chavez-Tafur, editor, at j.chavez-tafur@ileia.nl

Mr Bairwa's diverse farm

Though the green revolution enabled India to attain food security, the technologies, subsidies and public support systems failed to address the problems of small-scale dryland agriculture. Diversified farming, being more economically and ecologically resilient, can reduce risk. Integrating livestock, growing a variety of crops and recycling farm produce as Mr Bairwa does, reduces the chance of crop failure. It also makes him less susceptible to price fluctuations.

Veena Vidyadharan and M.K. Tiwari

Mr Babulal Bairwa is a small-scale farmer who lives in Sajia Village, Gram Panchayat Chanani, Rajasthan (in northern India). He owns about 1.5 ha land where he and his family practise agriculture, horticulture, livestock and poultry raising and have a flour mill. In 1996, the land was almost barren with only a few *babool* trees (*Acacia nelotica*). He cleared and levelled the area and made it suitable for cultivation. He planted about 45 trees along the farm boundary for fodder, fuel, shade and as a wind break. For irrigation and drinking he dug a well. Every other year he adds fertile top soil to the land.

Mr Bairwa has attended various exchange visits to research institutions and farmer's fields. He has also obtained loans for purchasing accessories like hose-pipes, sieves, fencing and a vermicompost unit through CECOEDECON (Centre for Community Economics and Development Consultants Society), a local NGO. This NGO promotes sustainable agriculture practices and organic farming in rural areas of Rajasthan. They emphasise the farmer-led approach and organise exposure visits and trainings for farmers like Mr Bairwa.

Sustainable agricultural practices

As well as having a diverse farm, making the best use of all products within his farm is key to Mr Bairwa's success. During the rainy season, Mr Bairwa grows pearl millet, sorghum, corn, sesame and cowpea. In winter he grows wheat, barley, mustard, and chickpea. He has a small kitchen garden where he grows vegetables, and he has planted about 300 fruit plants of which 275 are well established. He practises intercropping and raises crops in between the fruit plants, but believes that mixed cropping makes harvesting difficult. He purchases seeds of improved varieties which can be used for up to three years. He practises mulching and crop rotation, noticing that crop rotation reduces the incidence of pests and weeds. He finds that mulching reduces soil temperature, increases infiltration and adds organic matter to the soil.

He irrigates the field crops and fruit crops. He can predict a frost and remembers the advantages of irrigation and smoking in reducing the effect of frost. The lower portion of the field is kept fallow during the rainy season. This impounds rain water which improves the soil moisture for growing winter crops, and recharges the ground water.

Mr Bairwa prepares a bio-pesticide by mixing cattle urine with neem, *Dhatura* and *Calotropis* leaves and allowing it to ferment for 15 days. It is later filtered, diluted 10 times and sprayed on plants. According to Mr Bairwa, this keeps down the pest population and enhances plant growth. If the infestation is severe he resorts to chemical pesticides.

Mr Bairwa owns two buffaloes and two calves. He bought the buffaloes under a government scheme in 2005, when he got a subsidy. He grows lucerne for fodder, and feeds the livestock on green fodder, wheat straw, and oil cakes. The dung is used for manuring trees and preparing vermicompost. He prepares vermicompost in a shed during summer when there are no farm activities. Besides cattle manure, he uses tree leaves, kitchen waste and crop waste to prepare compost. By the rainy season, the compost will be ready and it is applied to crops, after which he uses the same shed for poultry. His buffaloes and poultry are both local breeds.

Photo: CECOEDECON

Mr Bairwa believes that growing a variety of crops can reduce the risk of crop failure, and provide a rich and varied diet.

Farm based enterprises

He gets 10 litres of milk per day from the buffaloes, of which three litres is used in the household. The rest is sold to the dairy co-operative society. He realises that the eggs and meat of local hens fetch higher prices in the market. He applies poultry manure to vegetables and observes that it performs even better than vermicompost. Mr Bairwa also owns a flour mill which is an additional source of income for his family. The waste from the mill is used as a feed for buffaloes. He obtains an average of 1.5 kg of waste per day while cleaning the mill. These are some of the ways he recycles farm produce within his farm. Since labour is not available in the locality his family members assist him in all the farm activities.

Secure livelihoods with diversified farming

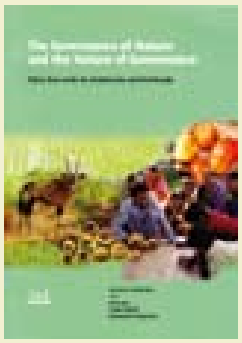
Mr Bairwa shows how it is possible for a small farmer to efficiently use his limited resources through diversified farming and make a good profit. By combining livestock with crops, he recycles farm produce. Despite frequent droughts and crop failure in the dry lands of Rajasthan, farmers are able to earn a steady income through livestock. Feeding and marketing are flexible in animal production systems. This can cushion farmers against trade and price fluctuations and, in conjunction with cropping operations, make more efficient use of farm labour. ■

Veena Vidyadharan. Programme coordinator, Natural Resource Management Unit, CECOEDECON, Jaipur, Rajasthan, India.

Manoj Kumar Tiwari. Unit Head, Natural Resource Management Programme, CECOEDECON, Jaipur, Rajasthan, India. E-mail: sharad_jp1@bsnl.in

Towards food sovereignty: Reclaiming autonomous food systems by Michel Pimbert, 2009. IIED, Endsleigh Street, London WC1H 0DD, U.K. E-mail: info@iied.org Downloadable at http://www.iied.org/natural-resources/publications/towards-food-sovereignty-reclaiming-autonomous-food-systems

This book is based on the premise that while half of the world's working population is made up of farmers (most of them small-scale, producing for local markets), they are increasingly under pressure from large-scale corporations and unfavourable economic policies. This is an online book which is still under development. The first two parts are now available - Part I: Another world is possible for food and agriculture, and Part II: Local organisations at the heart of food sovereignty. These first parts therefore discuss diversity and the ecological basis of food and agriculture, the social and environmental costs of modern food systems, and the policy reversals needed to "democratise" food systems. It is colourful and very attractively presented, complete with links to video and audio material from farmers, fisherfolk, food workers and many others working to promote food sovereignty. It is freely downloadable; and further chapters will be posted on the website in 2009.



The governance of nature and the nature of governance: Policy that works for biodiversity and livelihoods by Krystyna Swiderska, Dilys Roe, Linda Siegele and Maryanne Grieg-Gran. IIED, International Institute for Environment and Development, 3 Endsleigh Street, London WC1H 0DD, U.K.

By looking in detail at the situation in Peru, India and Tanzania, the authors show the main reasons why the world is losing its biodiversity, and why, during the past 50 years, its ecosystem services have been significantly degraded. Their analysis focuses on these countries' governing systems, both at a local level and at a national level, pointing also at the ineffectiveness of the international governance framework. Not just highlighting difficulties and limitations, each chapter presents detailed recommendations, among which the authors include the need to improve policymaking processes, the importance of local rights, or the need to look at policy coherence.

Agricultural biodiversity in smallholder farms of East Africa by Fidelis Kaihura and Michael Stocking (eds.), 2003, ISBN 978-92-808-1088-2. United Nations University Press, Jingumae 5–53–70, Shibuya-ku, Tokyo 150-8925, Japan. E-mail: press@hq.unu.edu

Aimed at a range of development practitioners, this book highlights the role of smallholder farmers as guardians and beneficiaries of agrobiodiversity. Its introductory chapters define agrodiversity and its management, and are followed by sections looking at the components of agricultural biodiversity. Examples include chapters from Tanzania, Uganda and Kenya covering livestock, botanical knowledge, soils and vegetables and fruits. By publishing chapters written by farmers, the book highlights how they play their part in the global agenda for the sustainable use and equitable sharing of the benefits of biodiversity. It also links practice to policy by basing recommendations on tried and tested ways of managing complex agricultural systems. Outlined in the final section, these include technical and policy recommendations ranging from increased use of drought tolerant crops to increasing government recognition for smallholders, through by-laws or national biodiversity databases.

Biodiversity and agriculture: Safeguarding biodiversity and securing food for the world by Secretariat of the Convention on Biological Diversity 2008. ISBN 978-92-9225-111-6. Convention on Biological Diversity, World Trade Centre, 413 St. Jacques Street, Suite 800, Montreal, Quebec, H2Y 1N9 Canada. Downloadable from http://www.cbd.int/doc/bioday/2008/ibd-2008-booklet-en.pdf

Produced in 2008 as part of celebrations for the annual International Day for Biological Diversity, this is a colourful 60-page booklet. The theme chosen this time was "Biodiversity and Agriculture" aiming at raising awareness of the importance of sustainable agriculture not only to preserve biodiversity, but also to feed the world, maintain sustainable agricultural livelihoods, and enhance human well-being. There are sections which clearly define biodiversity and agricultural biodiversity, going on to state the links between the two and why biodiversity is the "foundation" of agriculture. It continues by looking at current challenges and possible responses. The final chapter includes a list of suggestions for what individuals can do - specifically farmers, policy-makers and consumers. It is aimed at a wide audience as it is very clearly expressed, concise and well-organised, with many sub-headings and boxes for easy reference and reading.

Biodiversity conservation and agricultural sustainability: Towards a new paradigm of "ecoagriculture" landscapes by Sara J. Scherr and Jeffrey McNeely, 2008, Philosophical Transactions of the Royal Society 363, 477-494. Ecoagriculture Partners, 7301 11th Street N.W., Suite 301, Washington, D.C. 20001 U.S.A., and IUCN – The World Conservation Union, Rue Mauverny 28,Gland 1196, Switzerland. Downloadable from http://www.ecoagriculture.org/publication_details.php?publicationID=7

This fully-referenced 19-page research publication outlines the need for designing "ecoagricultural" landscapes which can host wild biodiversity and benefit production, biodiversity and local people. Arguing that agricultural production can be reconciled with healthy ecosystems, the authors go on to define approaches for doing this, looking at the current state of knowledge and practice and then identifying strategic actions required to mobilise ecoagriculture initiatives on a meaningful scale. Such actions include more research attention from international institutes in developing production systems that meet biodiversity objectives, conservation organisations need to accept farmers as partners, and the marketing and food industry needs a shift in focus, to take ecoagriculture into account. While the paper is academic in tone, it is written in accessible language and therefore provides a useful starting point for understanding the concept and how to work towards it.

Conserving and valuing ecosystem services and biodiversity: Economic, institutional and social challenges by K. N. Ninan (ed.), 2008. ISBN 978-184-407651-2. Earthscan, Dunstan House, 14a St. Cross Street, London EC1N 8XA, U.K. E-mail: earthinfo@earthscan.co.uk ; http://www.earthscan.co.uk

This new book offers a comprehensive look at the difficulties faced in conserving biodiversity. It also covers valuation of ecosystem services, which has become a hot topic in development and environmental economics. Addressing economic, social and institutional issues in biodiversity conservation, chapters written by leading contributors refer to ecosystems including tropical forests, marine areas, wetlands and agricultural landscapes. Case studies drawn from the U.K., U.S.A., Europe and Australia, as well as from India, Africa and South America, cover issues such as governance, intellectual property rights and protection of traditional knowledge. This wide-ranging book will be interesting to those working in agricultural development, biodiversity conservation, as well as researchers, policy-makers or practitioners.

Farming systems and poverty: Improving farmers' livelihoods in a changing world by John Dixon, Aidan Gulliver and David Gibbon, 2001.
ISBN 978-92-5-104627-2. FAO, Viale della Terme di Caracalla, 00100, Rome, Italy and World Bank, 1818 H Street, N.W., Washington, D.C., 20433, U.S.A. The book is downloadable from: http://www.fao.org/farmingsystems
While some would say that the farming systems approach has been surpassed with new developments in thinking (such as the sustainable livelihoods approach), the basic concepts behind it are useful and still hold. The authors argue that analysis of farming systems can assist in identifying priorities for reducing poverty and hunger, so forming the basis for creating dynamic rural communities. The book begins with an overview of the concept of farming systems and its future relevance. It then outlines and analyses the main farming systems of six major developing regions of the world. Twenty-five systems are described, including, for example, tree-crop farming systems in sub-Saharan Africa and high altitude mixed farming systems in Latin America. It concludes with chapters looking at the challenges and crosscutting priorities, such as the greater emphasis needed on sustainable resource management, enhancement of agricultural information and supporting small rural enterprises.

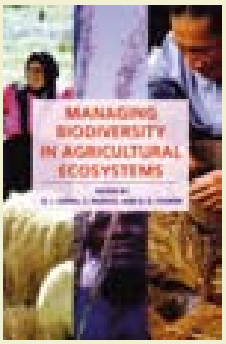
Conservation and sustainable use of agricultural biodiversity: A sourcebook by CIP-UPWARD, 2003. ISBN 978-971-614-021-7. International Potato Center, Users' Perspectives with Agricultural Research and Development, c/o IRRI DAPO Box 7777, Metro Manila, Philippines. E-mail: cip-manila@cgiar.org
The main objective of this sourcebook is to encourage the management of agricultural biodiversity resources within existing landscapes and ecosystems, in support of the livelihoods of farmers, fishers and livestock keepers. It is organised in three volumes, with over 75 articles in total. The articles were written by practitioners, researchers, and academics from all over the world, using clear and easily understandable language, with many illustrations. This is a useful tool for rural development practitioners and local administrators, as well as for trainers and educationalists. Free use of the material is encouraged, provided the source and authors are duly acknowledged.

Small farms as a planetary ecological asset: Five key reasons why we should support the revitalisation of small farms in the global South by Miguel A. Altieri, 2008. ISBN 978-983-2729-56-3. TWN Environment & Development Series no. 7, Third World Network, 131 Jalan Macalister, 10400 Penang, Malaysia. E-mail: twnet@po.jaring.my
In a clear language, Miguel Altieri outlines here five reasons why he believes small, biodiverse, agroecologically managed farms in the global South are the only viable form of agriculture that will feed the world. Against a backdrop of rising production costs and food prices, he writes in favour of maintaining and revitalising small-scale farms and farming families. The conservation and promotion of agricultural biodiversity forms the basis for some of his arguments, which are backed up with a variety of research and data. The booklet gives food for thought to all working in small scale agricultural development.

Affirming life and diversity: Rural images and voices on food sovereignty in south India by Community Media Trust, PV Satheesh and Michel Pimbert, 2008, ISBN 978-1-84369-674-2. IIED, 3 Endsleigh Street, London WC1H 0DD, U.K., and Deccan Development Society, 101, Kishan Residency, Road No 5, Begumpet, Hyderabad - 500 016, Andhra Pradesh, India. E-mail: hyd1_ddshyd@sancharnet.in
Downloadable at http://www.iied.org/pubs/pdfs/14556IIED.pdf
Together with IIED, the Community Media Trust (CMT) of the Deccan Development Society, India, co-facilitated a group of non-literate women in Andhra Pradesh to produce twelve videos covering their perceptions on food systems, food sovereignty, seeds, agriculture and local markets. These films are summarised in this book and included on a set of four DVDs. The book also describes the research process behind making these participatory films, as well as the research ethics agreed. The videos serve to highlight the voices and priorities of women who often do not get heard. The publication also shows the women's ability in presenting their ideas and situation through video. The videos in particular are insightful and offer many lessons to scientists, policy-makers and development practitioners.

Linking conservation and poverty reduction: Landscapes, people and power by Robert Fisher, Stewart Maginnis, William Jackson, Edmund Barrow and Sally Jeanrenaud with Andrew Ingles, Richard Friend, Rati Mehrotra, Taghi Farvar, Michelle Laurie and Gonzalo Oviedo, 2008, ISBN 978-184-407636-9. IUCN – The World Conservation Union, Rue Mauverny 28, Gland 1196, Switzerland, and Earthscan, Dunstan House, 14a St. Cross Street, London EC1N 8XA, U.K. E-mail: earthinfo@earthscan.co.uk ; http://www.earthscan.co.uk
This is a fully updated and revised edition of "Poverty and conservation: Landscapes, people and power", published by IUCN in 2005. It includes recent developments in theory and practice, with case studies from Francophone Africa and Latin America. It links poverty to conservation, showing how livelihoods of the rural poor are so closely related to sustainable use of biological diversity, that the two issues should be tackled together, through an integrated approach. The authors call for "the reinvigoration of sustainable development", focusing on the complex links between poverty reduction, economic development and biodiversity conservation. The final section presents a summary of the integrated approach and identifies some of the challenges involved in efforts to combine conservation and poverty reduction.

Managing biodiversity in agricultural ecosystems by Devra I. Jarvis, Christine Padoch and H. David Cooper, 2006. ISBN 978-0-231-13648-8. Bioversity International / Columbia University Press, New York, U.S.A.
With chapters contributed by a vast array of experts, this book looks at how farmers manage, maintain, and benefit from biodiversity. It presents the most recent research and developments in the maintenance of local diversity at the genetic, species, and ecosystem levels. The chapters are detailed and well-referenced, covering farmer management practices for crop, livestock, aquatic, and associated diversity (such as pollinators and soil micro-organisms) in agricultural ecosystems. Combining the thinking of social and biological scientists, the authors examine the potential role of diversity in minimising pests and diseases. The many case studies show how farmers have used alternative approaches to managing biodiversity to enhance the stability, resilience, and productivity of their farms. These point the way towards improved biodiversity on a global scale.



The INFONET-BioVision Farmer Information Platform

http://www.infonet-biovision.org

This large website provides a wealth of information on organic agriculture and crop husbandry, ecological prevention and the control of plant, human and animal pests and diseases. Focusing on ecological agriculture, it describes simple and environmentally safe technologies to improve your life and generate income while at the same time protecting the environment and the natural resources. For example, the site describes 44 common crops in detail, and for each crop gives agronomic information, descriptions of pests and diseases, and a list of links to other sources of information. Contributions come from farmer groups, local experts and international scientists. With a major emphasis on Africa, the site aims to make this information available through other means as well (so an "offline version" can be easily downloaded). This is a useful resource for those seeking practical information about ecological development in Africa.

Globally Important Agricultural Heritage Systems

http://www.fao.org/sd/giahs

FAO, Viale della Terme di Caracalla, 00100, Rome, Italy.
E-mail: giahs-secretariat@fao.org

This is the homepage of the Globally Important Agricultural Heritage Systems (GIAHS) project, currently being implemented by FAO in different countries. This project aims to establish the basis for the global recognition, conservation and sustainable management of such systems and their associated landscapes, biodiversity, knowledge systems and cultures. This website contains clear descriptions of some of the systems identified in different parts of the world, such as rice/fish agriculture in China and the oases of Tunisia, Algeria and Morocco. It also has many project documents available, links to other sites and lots of background information, making it an interesting place for anyone wanting to learn about such agricultural systems.

Agroecology.org

http://www.agroecology.org

Presented as an information resource for developing sustainable food systems, this site is put together by the Agroecology Research Group at UCSC, the University of California at Santa Cruz. This is a group of graduate and undergraduate students, research associates and postdoctoral researchers guided by Stephen Gliessman. The site includes a large collection of case studies from all over the world, together with a series of pages with theoretical content (which includes a section presenting an "ecological definition of sustainable agriculture", a list of principles of agroecology and sustainability, and a complete glossary). It has links to many other organisations, and also information about the events organised by the group, such as the upcoming course "Participatory Action Research in agroecology to support sustainable food systems", to be held in Vermont, U.S.A., in June 2009.

The Coalition to Diversify Income from Underused Crops (CoDI)

http://codi-asia.net

c/o International Centre for Underutilised Crops, P.O. Box 2075, Colombo, Sri Lanka

CoDI is a group of organisations in India and Vietnam led by the International Centre for Underutilised Crops. This website describes their activities, all of which are aimed at increasing diversity on farms, linking small farmers to markets and improving processing, packaging and marketing skills. The coalition will provide community services to help disadvantaged people in India and Vietnam generate sustainable incomes. Their activities include "Food Processing Parks", "Village Crop Fairs" and "Knowledge Fairs". It also contains useful information about underused crops in the region, and project descriptions and analyses.

Planet Diversity - World Congress on the Future of Food and Agriculture

http://www.planet-diversity.org/storiesandvideos.html

The Planet Diversity Congress was held in May 2008, and attended by over 700 people from 100 nations. Summaries of all the workshops held are available online, as well as PDF files and videos of many of the presentations and speeches. This specific section has additional stories from all over the world, covering many topics. They are often quite practical, describing experiences and activities. With so many documents available, this website is a very comprehensive source of up-to-date information about diversity, coming from researchers, farmers, practitioners and academics alike.

Sustaining local food systems, agricultural biodiversity and livelihoods

http://www.diversefoodsystems.org

IIED, 3 Endsleigh Street, London WC1H 0DD, U.K.

This is the site of a research project carried out by the International Institute for Environment and Development. As a result of the project following "an international, action-oriented, interdisciplinary and case study approach", the site has a lot of information about key concepts in local food systems, biodiversity and livelihoods. It also describes its work in India, Indonesia, Peru and Iran, with cases than analyse the linkages between social, economic and ecological systems. Links to publications, background documents and other sections of IIED are also given.

Agricultural Biodiversity Weblog

http://agro.biodiver.se

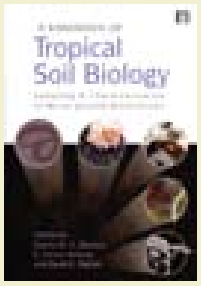
Run by Luigi Guarino and Jeremy Cherfas, the aim of this weblog is to collect information from the internet that relates to agricultural biodiversity. As this is a broad topic, the two bloggers have much to choose from. Topics covered include nutrition, genetic diversity, livestock and many more. Blog entries range from news items, newspaper articles, and random thoughts, to updates from organisations working with and promoting biodiversity. Readers are encouraged to comment on blog entries, and also to contribute entries. There are many links to related websites and readers can subscribe to the blog with RSS or email. It is written in a very informal manner, and is peppered with humour, which makes it enjoyable to read and return to.

Convention on Biological Diversity

http://www.cbd.int

The website of the Convention on Biological Diversity is a large resource, containing information about the convention itself and the Protocol on Biosafety. It describes various programmes, including Agricultural Biodiversity, Island Biodiversity and Mountain Biodiversity for example, each complete with updates, background information, activities and links. From the homepage you can sign up to receive various e-newsletters, and there is also a link to The Green Wave (http://greenwave.cbd.int), a global biodiversity campaign to educate children and youth about biodiversity.

NEW BOOKS



A handbook of tropical soil biology: Sampling and characterization of below-ground biodiversity by Fatima M.S. Moreira, E. Jeroen Huising and David E. Bignall, 2008. ISBN 978-1-84407-593-5. Earthscan, Dunstan House, 14a St. Cross Street, London EC1N 8XA, U.K. E-mail: earthinfo@earthscan.co.uk ; http://www.earthscan.co.uk

This practical manual describes the most up-to-date methods for assessing soil biodiversity. It is an outcome of a project implemented in seven countries, with the objective of generating information and knowledge to better manage and conserve below-ground biodiversity in tropical agricultural landscapes. It describes various sampling and laboratory assessment methods for the biodiversity of soil organisms, from invertebrates to bacteria. It is intended, in the long term, to help identify opportunities for improved sustainable land management. It will be a useful reference and teaching guide for soil scientists, research institutions, students and soil conservation practitioners.

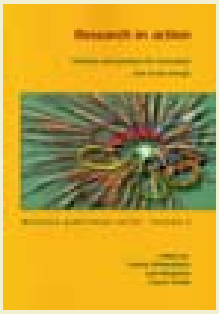
Protected landscapes and agrobiodiversity values by Thora Amend, Jessica Broan, Ashish Kothari, Adrian Phillips and Sue Stolton (eds.), 2008. ISBN 978-3-92506448-7. IUCN – The World Conservation Union, Rue Mauverny 28, Gland 1196, Switzerland, and GTZ, Postfach 5180, 65726 Eschborn, Germany.

As a collaborative effort between IUCN and GTZ, this is the first volume in a new series entitled "Values of protected landscapes and seascapes". The series will document the environmental, economic, social and cultural values of landscapes where communities thrive. This volume addresses agrobiodiversity through twelve case studies from around the world. It also provides a thorough overview of landscapes and biodiversity: their significance, current trends and threats, and actions which are now emerging to conserve diversity. Case studies focus on how protected landscapes contribute to conserving agrobiodiversity and related knowledge and practices. It is practical and easy-to-read. By presenting and discussing cases from different continents and contexts it shows the principles and variety of efforts in this field.

Farmers, seeds and varieties: Supporting informal seed supply in Ethiopia by Marja H. Thijssen, Zewdie Bishaw, Abdurahman Beshir and Walter S. de Boef (eds.), 2008. ISBN 978-90-8585-215-5. Wageningen International, Programme for Capacity Development and Institutional Change, P.O. Box 88, 6700 AA Wageningen, the Netherlands. Downloadable from: http://www.cdic.wur.nl/UK/publications

While this book was developed in response to issues identified within Ethiopia, the variety of topics and experiences presented in it are also relevant for other regions of the world. It is therefore of interest to people working in the seed sector, development agents and NGOs working to develop farmer-based seed production within and beyond Ethiopia. The papers were written by the trainers, resource persons and participants of a training programme on the improvement of farmer-based seed production and revitalisation of the informal seed supply of local crops and varieties in Ethiopia. As such it is a thorough and practical reference and resource book.

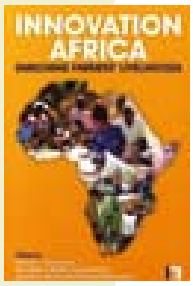
Research in action: Theories and practices for innovation and social change by Connie Almekinders, Leni Beukema and Coyan Tromp (eds.), 2009. ISBN 978-90-8686-087-6. Mansholt publication series, vol. 6. Wageningen Academic Publishers, P.O. Box 220, 6700 AE Wageningen, the Netherlands.



Does research only contribute to scientific knowledge? Or does it contribute to innovation and social change? Aimed at scholars, this book addresses the issues which determine the impact of research, and thus effectively contribute to change. With chapters describing and analysing practical cases from the Netherlands, South Africa and Mexico, the authors look at the possibilities and difficulties researchers face when trying to perform *research in action*. Put together, these cases show that *research in action* is both a dynamic research strategy and a scientific paradigm.

Responding to the global food crisis: Three perspectives by Joachim von Braun, Josette Sheeran and Namanga Ngongi, 2008. IFPRI 2007-2008 Annual Report Essays, International Food Policy Research Institute, 2033 K Street, NW Washington, DC 20006-1002, U.S.A. Downloadable from http://www.ifpri.org/pubs/books/ar2007/ar2007_essay.asp

These three essays, published as a collection in late 2008, provide different perspectives on the causes, as well as potential responses to the food crisis. Together they give a good overview of the recent global situation and are of interest to readers wanting a fuller and balanced picture of the food crisis. Full of examples from around the world, they discuss the effects of the crisis, how the situation has been tackled, and what more needs to be done in the future.



Innovation Africa: Enriching farmers' livelihoods by Pascal C. Sanginga, Ann Waters-Bayer, Susan Kaaria, Jemimah Njuki and Chesha Wettasinha (eds.), 2008. ISBN 978-1-84407-672-7. Earthscan, Dunstan House, 14a St. Cross Street, London EC1N 8XA, U.K. E-mail: earthinfo@earthscan.co.uk ; http://www.earthscan.co.uk

This long-awaited book is an outcome of the Innovation Africa Symposium, held in Uganda in 2006, where researchers and development practitioners gathered to present and discuss current thinking, experiences and lessons in innovation systems in agriculture. The chapters explore concepts of innovation and innovation systems, market-led innovation, and also social capital. Written by field practitioners, the different chapters show how such approaches provide opportunities for a more interactive style of research and extension in development. This book is aimed at researchers, practitioners and policymakers, and will also be useful reading for students.

Revolutions in development inquiry by Robert Chambers, 2008, ISBN 978-184407-6-253, Earthscan, Dunstan House, 14a St. Cross Street, London EC1N 8XA, U.K. E-mail: earthinfo@earthscan.co.uk ; http://www.earthscan.co.uk

Robert Chambers brings together some previously published texts with new material, which as a whole form a comprehensive review of development inquiry, spanning nearly 40 years. It is a look back over the changes in the approaches and methods used to find out about field conditions and community realities, while also looking forward at ideas such as participatory mapping and GIS, and the potential they have. Written in an informal style, it is also quite a personal account of experiencing these developments, focusing on the family of approaches including agroecosystem analysis, RRA, PRA and PLA. It is useful to have much of this material in one place, and will be an important reference for all categories of development practitioners.

European ban on pesticides opens door to alternative approaches

The European Parliament voted to ban 22 pesticides to protect the health of consumers and farmers. Besides pesticide companies, large-scale farmers in Europe are protesting against the ban because they fear their yields and incomes will fall. Others see it as an important stimulus to develop alternative pest management methods, building on thousands of years of farming experience.

Industry representatives and some farmers in Europe responded negatively to the decision of the European Parliament because they fear that the yields and quality of their major vegetable and fruit commodities will go down. However, according to Stephen Sherwood, an organic farmer who works for the NGO World Neighbors, and who has worked on these issues in Latin America for over 20 years, history does not back up this concern: "I have heard those same arguments for two decades. The agrochemical industry likes to promote the myth that their products are essential for food security. I know of no examples where removal of a (pesticide) product from the market led to production declines. In all cases, farmers adapted and found new alternatives, including non-chemical alternatives. We should remember that in most parts of the world, chemical-free farming outlives the industry's products by millenia." Sherwood considers the most dramatic example of this to be when the Indonesian government reduced subsidies on pesticides as well as banning 57 pesticides in 1986. According to research on the government's wider strategy of integrated pest management (IPM) conducted by Peter Kenmore (Deputy Director of the FAO's Plant Production and Protection Division), rice production actually increased by 12 percent within a few years of pesticide reduction.

European farmers also worry that they will not be able to compete with lower-priced imports from countries outside the EU, where farmers can still use the pesticides. This fear is negated on the EU website, however, as: "food imports are already checked by the EU for pesticide residue levels," which would now include the new pesticides as well.

Room for alternatives in the EU...

Those supporting the ban point to the opportunity that this new law will bring to the research community to develop safer alternatives. The EU actually promotes integrated pest management within a directive on the sustainable use of pesticides (that accompanies the proposed legislation), as a viable way of maintaining production and controlling pests through agroecological and cultural methods. However, some may find the EU ruling too soft as it gives pesticide manufacturers five years to adjust their products; also, if no alternative product exists in 2013, farmers may continue to use them for another five years.

Photo: S. Jayaraj

Cotton farmers in India studying about insects as part of a course on IPM, an alternative approach to pest control promoted by the EU in its directive accompanying the ban.

...and abroad

"It's about time this ban takes place!" says Fábio Kessler Dal Soglio, from the department of Rural Studies at the Federal University of Río Grande do Sul in Brazil. Dal Soglio is not only a professor, but he also leads the development of a network working to eliminate pesticide use in Brazil, *Rede Brasileira contra os Agrotóxicos*. Composed of health, consumer, environmental and agroecological farmer groups, this network will officially be launched at the same time as a national meeting called by the National Health Surveillance Agency on pesticide use in March. According to Dal Soglio, "The EU vote has finally convinced the Brazilian government to re-evaluate pesticide use in Brazil, including these same 22 pesticides – even while pesticide companies have tried to block this move." Dal Soglio is not worried that lower yields will result. "New solutions will be offered through the use of agroecological methods." (MS) ■

The EU proposal

The European Parliament voted in January 2009 to tighten the use of pesticides in agriculture. All of the EU's 27 member states are expected to support the decision. The proposed legislation is directed at 22 chemicals that are considered most hazardous to human health, including links to cancer, damage to the reproductive and nervous systems, and disruption to hormones. It restricts the spraying of crops –banning wholesale aerial crop-spraying– and bans the use of pesticides near schools, parks and hospitals. Buffer zones would also be mandatory to protect aquatic environments and drinking water from pesticides. The tighter rules aim to halve toxic substances on plants by 2013.
See more at: http://www.europarl.europa.eu