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FARMING MATTERS

Rio+20 special edition of the AgriCultures Network magazines

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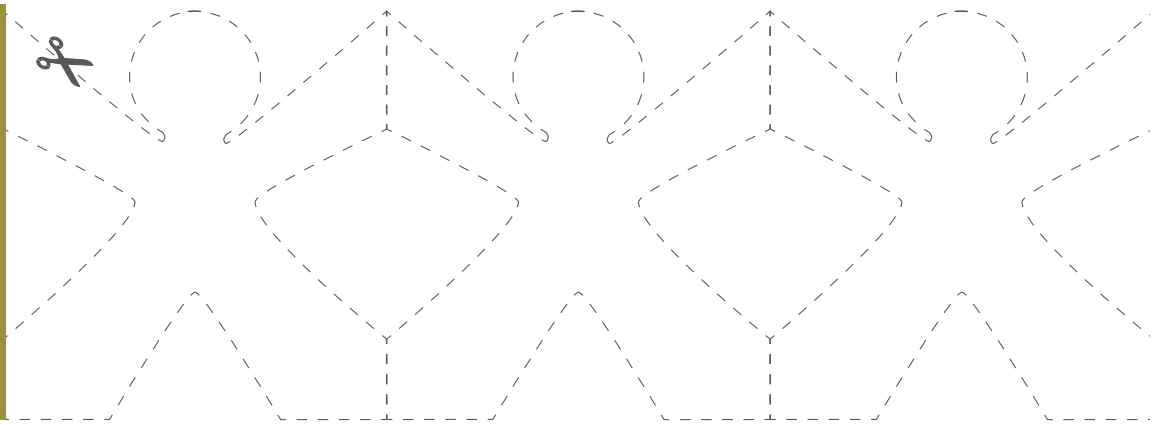


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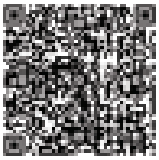

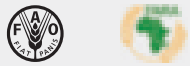

More than higher yields

Livestock has traditionally been an integral part of the farming systems in the Indian Himalayan region, but farmers regularly face an acute seasonal shortage of fodder, resulting in low milk yields, poor livestock health, women drudgery and forest degradation. Now, over 8,000 households in the hill districts of Uttarakhand are part of a programme of the Himmotthan Society to promote environmentally sustainable, integrated livestock management, and are growing a variety of fodder grasses. Many of the fodder grasses introduced by the programme are evergreen, while others provide sufficiently nutritious dry fodder to last the winter. The project has helped to preserve adjoining forests and increase soil moisture content. And it has not only promoted fodder cultivation, but also supported activities such as fodder preservation, better feeding practices, capacity building and community mobilisation. Today, over 1,500 farmers have established small fodder nurseries along the project area. In addition, Livestock Producer Groups have been formed in each village, enabling the communities to establish a savings and loan scheme and to develop micro-enterprises. Farmer families have increased their milk sales and have seen an increase in the livestock population. Yet, beyond yields and incomes, this is all having larger benefits: environmental issues are being discussed and tackled, families are taking up loans, and more children are going to school.

Text and photo: Vishal Singh / Centre for Ecology Development and Research

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This issue was produced with the support of the Food and Agriculture Organization of the United Nations, FAO, and of the International Food Security Network (IFSN).

Change

will come from the farms and the streets

We do not know yet what the outcome of Rio+20 will be. But the preparations have already triggered a tremendous stream of information about small-scale family farming and agro-ecology – even if this is coming mainly from the civil society side. More than ever before, evidence is piling up to support the claim that agro-ecological systems are productive, resilient and sustainable. Yet the inability to see the strengths of family farming continues to be widespread. As a result, the future of many farming communities around the world is under unprecedented threat. How do we cross the river? It is to be hoped that the discussions in Rio will focus on *how* we can promote the transition to more sustainable food systems, rather than on *whether* we should promote such systems. There is a widespread feeling that there is no time to lose, but we should be careful not to let this sense of urgency lure us into the trap of seeking technological quick fixes, often presented as the only option to feed the world by 2050.

Back in 1992 our magazine (then called the *ILEIA Newsletter*) featured articles about the very same issues that we are discussing today. Food sovereignty was a key theme. La Via Campesina had not yet coined the term, but the ideas were very much there, in the minds of farmers and the authors of the articles in our magazine. Holistic resource management, increased synergy between pastoralists and farmers, and the strengthening of local seed systems were advocated as crucial strategies to beat desertification. So what's new in our contributions to the climate change debate? The energy issue (which form of energy to use – fossil, human or bio?) was also squarely on the agenda and the expert knowledge of women farmers was acknowledged.

Twenty years later, there is an abundance of successful experiences, yet often these experiences have remained localised. Up-scaling has been a major challenge and continues to be so. One important reason for this is that agricultural policies continue to encourage farming that is dependent upon external inputs and technologies. But there are examples of sustainable farming approaches that have truly been up-scaled; think of the System of Rice Intensification, first developed in Madagascar in the 1980s. We published an article about it in 1999, and many positive reactions came from readers who tried it out for themselves. SRI is now practiced by millions of farmers in around 50 countries. There are well-documented claims that it leads to a doubling of yields and to a halving in the use of water. Yet, many rice scientists continue to question this method. Why?

There are profound changes happening that are barely visible, escaping our eyes. Let's open our eyes more widely and be perceptive to a myriad of changes that form part of a much bigger and unstoppable process. This process, triggered by family farmers and their organisations, represents a coherent response to the deep agrarian crisis generated by the agro-industrial model.

We dedicate this Rio+20 special edition to all those farmers around the world who have made the shift to ecologically sound agriculture, to those who are making the shift, and those who want to make it. This issue is a joint production of the *AgriCultures Network*: our editors from Brazil, Peru, Senegal, India and the Netherlands have tried to present the most inspiring stories from around the world. We hope you will enjoy reading them, in Rio and at home!

If you are not yet a subscriber to *Farming Matters* or to one of our regional editions, we look forward to welcoming you as a new subscriber. Do visit our website www.agriculturesnetwork.org

Edith van Walsum
Director, ILEIA

Twenty years later:

Where are we? Where are we going?

Twenty years after the first Earth Summit in 1992, Rio de Janeiro is hosting another major UN conference. This provides an opportunity to look at the progress achieved and to discuss the issues that have emerged in recent years.

Marta Dabrowska

This time, the underlying themes of the conference are a "green economy", in the context of sustainable development and poverty eradication, and the institutional framework needed for sustainable development. Since the conference was first announced, however, many people have been wondering if it makes sense to organise another Earth Summit as we still have not fulfilled the commitments of the previous two. Also, many fear that the focus on a "green economy" implies neglecting the multiple aspects of sustainable development. The doubts expressed by many "Rio pessimists" have been balanced by the statements of the "Rio optimists", like UN Secretary General Ban Ki-Moon, who see this as a "once-in-a-generation opportunity".

The Zero Draft of the outcome document of the conference was presented in January 2012, again provoking a backlash. Many were disappointed with the vagueness of the document, the lack of commitments for making radical changes and the omission of several important issues, including any reference to agro-ecology as a sustainable alternative to conventional agriculture. Family farmers' organisations were happy to see the inclusion of a proposal to remove harmful subsidies from conventional agriculture, but criticised the text for avoiding serious discussion about the major problems facing agricultural systems today.

Civil society organisations have been actively involved throughout the preparatory process leading up to the conference. However, as it became clear that the output document of the conference is not likely to deliver serious commitments, many organisations started to step out of the official process and sought alternative paths for promoting their agendas. Gradually, many actors have realised that it may be possible to achieve more by participating in the processes outside the official negotiations and have shifted their focus to the parallel side-events that will be organised and to building coalitions with other organisations with the aim of ensuring that the discussions will continue long after the conference is over. In particular, many organisations place their hopes in the process of contributing to defining the Sustainable Development Goals that are likely to replace the Millennium Development Goals after 2015.

Is it really green?

Just a few days before the conference, the meaning of a "green economy" is still being contested. UNEP describes a green economy as a system of economic activities related to the production, distribution and consumption of goods and services that result in improved human wellbeing over the long term, while not exposing future generations to significant environmental risks or ecological scarcities. However, this definition is open to many interpretations. National governments and the UN agencies tend to support modest changes within the existing economic systems, focusing on technological solutions and policies to promote "sustainable growth". Yet, many civil organisations call for more radical measures, and insist that a transformation of the entire economic system is necessary. They advocate a radical "paradigm shift" and new economic models that put the environmental and social dimensions of development at the centre. The main question, however, is if we need new ideas, or if we should rather look at solutions that are already

Do we need new ideas, or should we rather look at the solutions that are already in place? Photo: TREES

in place, and which recognise the potential of the alternative systems that have been developed over the years.

The debate over the future of agriculture illustrates this discussion well. There is a consensus that agriculture production has to become more sustainable, and that small-scale farmers, especially rural women, need to be acknowledged and receive more support. Yet, views on how to achieve sustainable production are strongly polarised. One model proposes "sustainable intensification" and looks to the development and dissemination of genetically modified seeds and farm mechanisation. The supporters of this model do not see any need for a major transformation of "conventional" agriculture system, which they claim just needs improving. Proponents of the alternative model call for a transition from conventional, input-based agriculture to agricultural practices based on agro-ecological approaches. This will require a change in the current way of thinking about food production which is based on a globalised food system and on large-scale, input-based farming practices. Instead of investing time and energy in "improving" conventional farming systems, we should explore the potential of an alternative model and adopt a more holistic approach to farm management.

Is this such a new idea? Many civil society organisations advocate scaling up agro-ecological approaches and often refer to the IAASTD report, arguing that this could provide a solution to many problems currently facing the world. The Time to Act Manifesto, signed by civil society organisations from all over the world, argues that agro-ecological agriculture can produce enough food to feed a growing human population and contribute to the creation of fairer, more equitable, social systems.

To many this might come as a surprise, or as "news". However, agricultural transitions towards more sustainable systems have been going on for a very long time. For more than 27 years, the organisations which make up the AgriCultures network have been collecting and sharing evidence that supports these claims. Our magazines regularly present concrete experiences of farm families and communities which show that agro-ecology and sustainable agriculture are at the centre of development. The benefits of agro-ecology are numerous: a holistic management leads to balanced farms systems that produce sufficient yields while taking care of the environment. Agro-ecological systems are less polluting and richer in terms of biodiversity. They maintain ecosystem services and preserve local resources. Moreover, they can contribute to poverty reduction. The vast majority of the world's farmers, the small-scale farmers who are the victims of the policies geared towards conventional agriculture, benefit the most from agro-ecology. The enormous amount of evidence that we have found over the years only strengthens our conviction that a healthy food production system is the basis for sustainable development.

In this issue of our magazines we look at how agricultural practices are linked with food security, climate change, energy and poverty. These are the four issues that the Zero Draft of the outcome document has identified as the priority areas. We make an attempt to picture the benefits of an agro-ecological farming system from these four perspectives, building on the extensive evidence gathered over more than 25 years. The articles in this issue show the need for scaling-up alternative approaches, and what could be the steps in the process. This idea is not new. Now is the time to make it happen!

Marta Dabrowska is a specialist in development and rural innovation. She has co-ordinated the Rio+20 preparatory process for ILEIA and the AgriCultures Network.
E-mail: m.i.dabrowska@gmail.com

FOOD SECURITY

Feeding the world in the twenty-first century

Over the last two decades of the 20th century, a global movement took shape with the aim of defending and promoting more sustainable forms of agricultural production. Resulting from a decentralised and diversified movement, and building on the work of millions of farmers all over the world, agro-ecology emphasises the development and maintenance of complex ecological processes. This has proved to have the potential to meet the food challenge in the 21st century.

Jean Marc von der Weid

The introduction of chemical fertilizers and the scientific genetic improvement of crop species in the final quarter of the 19th century heralded the possibility of surpassing the Malthusian limit, which predicted that the expansion of the world population would eventually be checked by the limited global capacity for food production. At the end of the 20th century this promise appeared fulfilled. Despite the rapid expansion of the world's population, the relative number of people suffering from hunger had fallen steadily to around 840 million.

This situation changed abruptly at the start of the 21st century. Just three years before the 2015 deadline established by the world community for halving the number of undernourished people in the world, the spectre of endemic hunger has come back to haunt us with a resurgence of problems with aggregate food production. Not only has the pledged reduction in the number of hungry people not occurred, but there has been an increase in the absolute number of hungry people to over one billion. This situation is even more alarming when we consider that food production will have to increase 100% by the mid 21st century, when the global population is predicted to stabilise at between 9 and 10 billion inhabitants.

The roots of the food production crisis

The modernised production system that was so successful in surpassing the Malthusian limit also contained, within itself, the seeds of the present crisis. Firstly, it engendered an enormous concentration of land in the hands of small numbers of producers, excluding hundreds of millions of family farmers from access to land. Because production is capital intensive, it also denied access to work for millions of agricultural workers. However, the greatest vulnerability of this system is its dependence on the unsustainable use of renewable and non-renewable natural resources.

This system has been depleting renewable resources for many years, and their loss is already being felt. Farming now occupies almost 30% of the global land area and has a bigger impact on natural ecosystems than any other human activity. Of the 8.7 billion hectares used for crop production, pasture and forests, 2 billion have been degraded since the end


As a result of the local innovation processes, agro-ecosystems have a high degree of local specificity. Photos: Thomas Bernet, Arno Maatman

of the Second World War. Farming consumes 70% of all water utilised by humans. Intensive irrigation systems, which are now widespread in many parts of the world, are exhausting the aquifers on which they rely. Estimates suggest that 75% of the world's agricultural biodiversity has become extinct over the last century. Much of this loss has occurred in the last 50 years with the replacement of traditional varieties and species by commercial genotypes, developed for large-scale use and making substantial profits for the companies that develop and sell them. This reduction in genetic variability makes farming more vulnerable to pests and diseases. And this steep decline in the genetic variability of cultivated species has been accompanied by changes in the agro-food system, which have further contributed to reducing the overall number of species consumed. Taken together, this narrowing of the food base and genetic variability is contributing decisively to the loss of food sovereignty and the increase in food and nutritional insecurity.

The accelerating degradation of non-renewable natural resources by conventional farming also poses a grave risk to the future capacity to feed the world's population. Conventional food production, rooted in the technical-scientific principles of the Green Revolution, depends on the intensive and systematic use of fossil fuels and natural sources of phosphates and potassium, resources that are now becoming scarce. Higher oil prices, caused by the growing depletion of the world's reserves, directly inflate food prices. This is a result of the importance of this energy source in the production of chemical fertilizers and pesticides, as well as in operating farm machinery and the processing, storage, refrigeration and long-distance transportation of farm produce.

Fertilizer prices rose substantially between 1999 and 2008 and, although they fell with the recent global economic crisis, they remain 3 times more expensive than at the start of the 21st century and are likely to continue to rise. Pesticide costs have also continued to escalate, pushed upwards by high oil prices. These inputs are also becoming less effective in controlling "undesirable" organisms. Despite the systematic increase in the volume of pesticides applied to crops, harvest loss rates have risen in recent decades. Since the start of the 1990s, the imbalance has worsened, particularly due to the growing resistance of pests and weeds to pesticides employed in protecting transgenic crops.

The agro-ecological alternative

Over the last two decades of the 20th century, a global movement took shape with the aim of defending and promoting more sustainable forms of agricultural production. The emergence of this movement has been completely decentralised and diversified, and employs a variety of names and concepts. Explicitly opposing the conventional pattern of agricultural development founded on the paradigm of the Green Revolution, the movement was initially described as an "alternative agriculture". From the 1990s onwards, and especially in Latin America, this vague term has been replaced by the term "agro-ecology". Defined as a science that applies ecological concepts and principles to the design of sustainable agro-ecosystems, agro-ecology emphasises the development and maintenance of complex ecological processes capable of enhancing soil fertility, as well as the productivity and health of crops and livestock. The degree to which agro-ecology represents a rupture from conventional systems can vary considerably: some approaches simply seek to reduce or replace the use of chemical fertilizers and pesticides; others involve completely restructuring the logic behind the technical and economic organisation of farming

systems. An agro-ecosystem designed in accordance with agro-ecological principles will establish a strong structural and functional correspondence with the natural ecosystems in which it is embedded.

Agro-ecosystems have a high degree of local specificity. This means that their development, which is along agro-ecological lines, requires much local innovation. This is in stark contrast to the diffusion of universal technical packages, the solution that is implicit in the Green Revolution paradigm.

Agro-ecological efficiency involves developing and maintaining agro-ecosystems with a wide diversity of livestock breeds and crops, the latter of which is achieved through crop combinations, rotations and successions. Managing the complexity inherent to this type of agricultural system sets limits on the size of the production units and the possibilities for mechanising farm work. For this reason, the system requires highly skilled and flexible labour that is attentive to detailed management issues, implying that labour in agro-ecological systems is highly involved in the management of the system. This is also in stark contrast to conventional systems, where much of the work is essentially mechanical and separated from the management process. Small- and medium-sized family units are well placed to indivisibly integrate work and management, a basic condition for managing the complexity inherent to agro-ecological systems. Even though agro-ecological principles can be employed by large private sector producers, the level of economic and ecological efficiency in these larger production units tends to be much lower than in small family-managed units. In summary: peasant family farming is the ideal socio-cultural base for promoting the agro-ecological alternative on a large scale.

The potential to meet the food challenge in the 21st century

According to a survey conducted by Jules Pretty, professor at the University of Sussex, more than 1.4 million farmers across the world have adopted agro-ecological approaches. His study identified average increases of 100% in the productivity of hundreds of projects after adoption of these principles with records of 400% increases in more advanced agro-ecological systems. As well as high productivity levels, the agro-ecological systems also showed other benefits, countering many of the factors responsible for the crisis in conventional farming: they have a positive energy balance and low fossil fuel energy use; they are economic in their use of water; they recuperate and conserve soil fertility without the use of external inputs, as well as being resistant to soil erosion; they function as "carbon sinks" and emit few greenhouse gases; they are functionally integrated with the natural vegetation, providing greater stability to local microclimates and they do not generate chemical or genetic contamination.

Taken as a whole, these positive effects indicate that promoting agro-ecology is a strategy that is consistent with providing a comprehensive structural response to the crisis in the conventional farming model, and specifically with meeting the challenge of feeding an expanding world population while respecting the constraints imposed by considerations of sustainability conditions. This potential was confirmed by the International Assessment of Agricultural Science and Technology for Development, an initiative financed by organisations linked to the United Nations. This research project combined the efforts of a group of 400 scientists from various different disciplines and countries from every continent in the world over a period of three years. More explicitly, the United Nations Special Rapporteur on the Human Right to Food issued a statement in 2010 in which he argues that agro-ecology can simultaneously increase agricultural productivity and food security, improve the incomes of family farmers and contain the genetic erosion created by industrial farming.

A political challenge

The main challenge to widespread adoption of the agro-ecological approach is not technical but political. It involves the need to overcome the political, economic and ideological might of the agribusiness sectors that drive the continued expansion of the industrial

Agro-ecology can simultaneously increase agricultural productivity and food security, increase incomes, and contain the genetic erosion created by industrial farming. Photos: Sofia Naranjo, Salibo Some, Kodjo Kondo/IFDC

farming model. Among the many well-documented negative effects of this approach, the expansion of the agribusiness model has been the main factor responsible for the disappearance of small-scale family farming worldwide. This disappearance not only means fewer family production units capable of making the much-needed agro-ecological transition, it also implies the loss of the traditional culture of rural peoples and communities, an essential element in the construction of agro-ecological knowledge that can be adapted to a wide variety of socio-environmental contexts.

The crisis engendered by the unsustainable nature of globalised agriculture based on industrialised monocrops has been masked by the constant rise in public subsidies for agribusiness. However, the permanent accentuation of this crisis, along with the continuing depletion of natural resources and the increase in global demand for food, are indisputable and inescapable facts. In the context of the Rio+20 Summit, it remains to be seen what, if any, concrete measures are taken to move humanity away from this destructive yet entirely avoidable trajectory.

In practice the question is: how do we create the conditions needed for agro-ecology to supersede the agribusiness model? An assessment conducted in the United States found that the country would need 40 million production units in order for U.S. agribusiness production to be supplanted by agro-ecological family farming. As the current number of farming units in the United States is around 2 million, this difference would have to be filled by "neo-peasants". The difficulties in incorporating so many people in farming activities would make this transition extremely difficult and painful for U.S. society.

Yet, despite its radical nature, such a change is not entirely inconceivable. We already have the example of Cuba, a country forced to create a new class of peasants after the abrupt cessation in the supply of inputs and energy subsidised by the Soviet Bloc. The initial difficulties encountered by these neo-peasants when learning the principles and practices of agro-ecology were partly responsible for the drop in the efficiency of the country's food production system for some years and the consequent supply deficit. The most serious social consequences of this were only averted by the government's capacity to distribute the available food among the entire population.

The Cuban experience should be taken as a planet-wide alert on the enormity of the challenges faced by humanity as a whole. Many countries still have peasant farmers with the knowledge needed for developing agro-ecology, especially if they are supported by adequate public policies. But, in many other regions, policies that will protect or re-establish peasant farming are urgently needed, for example through agrarian reforms and measures that guarantee territorial rights as well as other measures.

The sooner we implement measures for promoting agro-food systems based around agro-ecology peasant farming, the less painful the transition from an economy based on fossil fuel energy to an effectively sustainable economy will be.

Jean Marc von der Weid works as co-ordinator of the AS-PTA Public Policies Programme. E-mail: jean@aspta.org.br

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Home Gardens for enhancing food security in Sri Lanka

Dilrukshi Hashini Galhena, Gunasingham Mikunthan and Karim Maredia

Food security remains a major challenge in Sri Lanka, particularly in the northern region which has been ravaged by the long civil war. In 2007, the national government initiated a campaign called *Api wawamu rata nagamu* ("Let's grow and build the country") to promote the adoption of home gardens, already a tested and effective approach. During the past 2 years, different programmes have helped set up more than 300 home gardens in the war-affected areas. These programmes primarily target disadvantaged households, including the resource poor, resettled, and women-headed families. Home gardening is an age-old practice in Sri Lanka. Nowadays, these home gardens help to improve food and nutritional security and livelihoods in many different ways. Home gardens and livestock production provide easy access to food throughout the year at a fraction of the cost it takes to purchase them from the local market. They increase household's access to a diverse array of food stocks, including fresh vegetables, fruits, roots and tuber crops, and livestock products. In addition, some participating families have managed to start a domestic enterprise by selling their surplus produce. The adoption of simple value addition techniques such as processing and packaging can further enhance the marketability and net value of home garden products, helping families to earn extra revenue.

In addition to these core benefits, home gardens have other advantages. They demand fewer resources than commercial agriculture, they can be easily managed and have higher energy efficiency rates. The productivity of home gardens can be systematically increased through eco-friendly practices which also reduce some health and environmental issues commonly experienced in the northern region. Good household waste management can convert kitchen waste and animal manure into organic fertilizers and mulch for the home garden. Simple Integrated Pest Management (IPM) practices such as incorporating flowering plants, medicinal plants and herbs and diversifying crops, help to reduce pest and disease infestations, to conserve biodiversity and natural enemies and enhance ecosystem services.

The north of Sri Lanka has a long dry season and many marginal lands. The integration of organic material will increase nutrient levels and enrich soil quality and moisture. Simple technologies like "vertical gardening" have made home gardening possible both in urban and rural areas where there is a shortage of land. In the long run, such environmentally sound practices will not only result in sustainable food production, but also strengthen a number of ecosystem services. The home garden initiative also aims to strengthen local communities and help build peaceful communities. The long civil war was very detrimental to the welfare of the people in the north and home gardens may offer a viable platform to institute solidarity, social justice and equity, especially for the disadvantaged and vulnerable sections of the population.

D. Hashini Galhena Dissanayake is a Graduate Research Assistant (Food Production and Food Security) at the Department of Crop and Soil Sciences, Michigan State University, U.S.A. E-mail: galhenad@msu.edu. **Gunasingham Mikunthan** works as Professor and Head of Agricultural Biology, Faculty of Agriculture, University of Jaffna, Jaffna, Sri Lanka. **Karim M. Maredia** is Professor and Director of the World Technology Access Program (WorldTAP), College of Agriculture and Natural Resources Michigan State University, U.S.A.

Pólo de Borborema

Roberval Silva, Paula Almeida, Luciano Silveira and Marilene Melo

The Pólo Union of Borborema (Pólo) is a network of farmer organisations, including trade unions, associations, and informal groups from 16 municipalities in the interior of the state of Paraíba, in the north-east of Brazil. In December 2005, Pólo was working with around 4000 farm families in the region, helping them to improve their agricultural practices. Through an intensive process of experimentation and knowledge exchange, small-scale farmers rediscovered several traditional methods. These included: the use of local seed varieties; growing a mixture of crops together; organising community seed banks; developing vegetable and medicinal plant gardens; and testing and using a range of natural fertilizers and pesticides. To prevent food shortages during the dry season, they stored water and (processed) food from their farms.

To increase awareness of the concept of food security, and establish the connection between food security and the local reality, Pólo's Theatre Group acted out a play reflecting the situation of two very different realities: a family that improved their own food supply with very few resources by actively participating in agro-ecological innovation programmes, and the reality of those still living in a situation of extreme food insecurity. After seeing the facts of daily life acting out in front of them, the audiences were encouraged to take action.

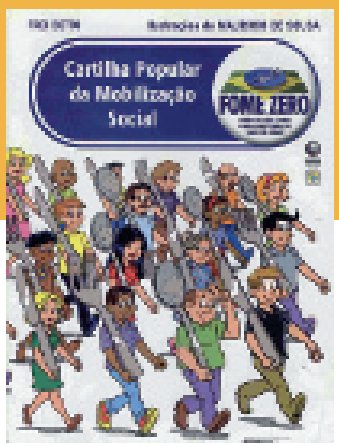
By actively participating in larger networks, like the Semi-arid Network of Paraíba State, and engaging in dialogue with governmental policy-making at the state and federal levels, Pólo has been successful in influencing public policies related to food and nutritional security and promoting agro-ecology. For example, Pólo and the Semi-arid Network of Paraíba State were invited

to participate in the process of drafting policy proposals for the State Conference on Food and Nutritional Security, where they also performed their play. In addition, the policy papers that were written in a meeting with union and community leaders, challenging the existing policy environment, were used in a government initiative aimed at combating hunger, misery and the roots of social exclusion. From the interior of Borborema, these farmers' ideas reached the whole of the state of Paraíba, to finally be heard by the entire semi-arid region of Brazil.

Pólo also joined the State Network of Seedbanks of the Semi-Arid Network of Paraíba State, where they established agreements with the state government of Paraíba for supplying the seedbanks with indigenous varieties. Through these banks, families are guaranteed quality seeds at the right time for planting, eliminating one of the causes of food insecurity, that of missing the best planting dates and sometimes losing the agricultural season.

This whole process has shown that the issues surrounding increased food security are not just technical, and that the policy environment can be influenced using the skill and creativity of individuals, groups and networks to contribute to the improvement of their own lives.

This article was published in *LEISA magazine*, vol. 21.4, December 2005. **Roberval Silva**, **Paula Almeida**, **Luciano Silveira** and **Marilene Melo** worked for the Paraiba programme of *Assessoria e Serviços a Projetos em Agricultura Alternativa* (AS-PTA) in Esperança, Paraíba, Brazil. E-mail: asptapb@aspta.org.br



Agro-ecological approaches to enhance resilience

The Green Revolution has performed well in well-endowed areas with a stable climate, adequate water supply and access to inputs and cheap energy. But the necessary fertilizers, pesticides, farm equipment and fuel are derived from dwindling and ever more expensive fossil fuels. At the same time, climatic extremes are becoming more frequent and intensive agricultural systems show a lower resistance and higher vulnerability to such fluctuations. Fortunately, there are alternatives that enhance resilience and ensure high yields.

Clara Ines Nicholls and Miguel A. Altieri

Little has been done to enhance the adaptability of industrial agriculture to changing and extreme weather events, except for a focus on "magic bullets" such as genetic modification, with crops that are expected to produce under stressful environments. Almost no work has been conducted on designing management practices that enhance the resilience of monocultures to climate change. But there is ample evidence that agro-ecological designs and practices contribute enormously to this. In fact, many studies reveal that small-scale farmers who follow agro-ecological practices cope with, and even prepare for, climate change, minimising crop failure. Results from various studies suggest that these practices provide a higher resistance to climate events, reduce vulnerability and make farms more sustainable in the long-term.

Based on this evidence, various experts have suggested that reviving traditional management systems, combined with the use of agro-ecologically principles, may represent the only viable and robust path to increasing the productivity, sustainability and resilience of agricultural production. In this paper we explore a number of ways in which these strategies can be implemented through the design and management of agro-ecosystems, allowing farmers to adopt a strategy that, in the end, provides more economic benefits.

Diverse farming systems

Detailed analyses of agricultural performance after extreme climatic events have revealed that resilience to climate disasters is closely linked to the level of on-farm biodiversity. A survey conducted in Central American hillsides after Hurricane Mitch showed that farmers using diversification practices (such as cover crops, intercropping and agroforestry) suffered less damage than their conventional monoculture neighbours. A survey of more than 1,800 neighbouring "sustainable" and "conventional" farms in Nicaragua, Honduras

and Guatemala, found that the "sustainable" plots had between 20 to 40% more topsoil, greater soil moisture and less erosion, and also experienced lower economic losses than their conventional neighbours. Similarly, those coffee farms in Mexico which exhibit high levels of complexity and plant diversity suffered less damage from Hurricane Stan. And forty days after Hurricane Ike hit Cuba in 2008, researchers found that diversified farms exhibited losses of 50%, compared to 90 or 100% in neighbouring monocultures. Likewise, agro-ecologically managed farms showed a faster recovery in their production than monoculture farms.

These are only a few examples that show how complex agro-ecosystems are able to adapt and resist the effects of climate change. Agroforestry systems have been shown to buffer crops from large fluctuations in temperature, thereby keeping the crops closer to their optimum conditions. More shaded coffee systems have shown to protect crops from low precipitation and reduced soil water availability. This is because the overstory reduces soil evaporation and the roots increase soil water infiltration. At the same time, intercropping enables farmers to produce various crops simultaneously and minimise risk. Polycultures exhibit greater yield stability and less productivity declines during drought. A study of the effect of drought (Natarajan and Willey, 1986) on polycultures showed that intercropping is enormously successful. Quite interestingly, the rate of over-yielding actually increased with water stress, showing that the relative differences in productivity between monocultures and polycultures increase with greater stress.

Another example is that of the intensive silvopastoral systems (ISS), which combine fodder shrubs planted at high densities, trees, palms, and pastures. High stocking levels are achieved through rotational grazing, which allows for the natural production of milk and meat in these systems. At the El Hatico farm, in Cauca, Colombia, a five story ISS composed of a layer of grasses, *leucaena* shrubs, medium-sized trees and a canopy of large trees has, over the past 18 years, increased its stocking rates to 4.3 dairy cows/ha and its milk production by 130%, as well as completely eliminating the use of chemical fertilizers. 2009 was the driest year in El Hatico's 40-year record, and the farmers saw a reduction of 25% in pasture biomass, yet the production of fodder remained constant throughout the year, neutralising the negative effects of drought on the whole system. In response to the extreme weather, the farm had to adjust its stocking rates. In spite of this, the farm's milk production for 2009 was the highest on record, with a surprising 10% increase compared to the previous four years. Meanwhile, farmers in other parts of the country reported severe animal weight loss and high mortality rates due to starvation and thirst.

The combined benefits of water regulation, a favourable microclimate, biodiversity, and carbon stocks in such diversified farming systems, not only provide environmental goods and services for producers, but also greater resilience to climate change.

Social organisation strategies are a key component of resilience. Photo: Paul Mapfumo

Enhancing soil organic matter

Crop productivity under dry land conditions is largely limited by the availability of water in the soil. The percentage of soil organic matter, or SOM content, is a reliable index of crop productivity in semiarid regions because SOM improves the soil's ability to store and transmit air and water.

Adding large quantities of organic materials on a regular basis is another key strategy used by many ago-ecological farmers. SOM management is at the heart of all efforts to create healthy soils with a high level of biological activity and good physical and chemical characteristics. Increasing the SOM enhances resilience by improving the soil's water retention capacity, enhancing tolerance to drought, improving infiltration, and reducing the loss of soil particles through erosion after intense rains. SOM also improves surface soil aggregation, holding the soil particles tightly, protecting them against rain or windstorms.

At the same time, organically-rich soils usually contain symbiotic mycorrhizal fungi, such as arbuscular mycorrhizal (AM) fungi, which are a key component of the microbial populations influencing plant growth and soil productivity. AM fungi are important as they improve plant-water interactions, and thus increase resistance to drought. Some specific

fungus-plant associations increase drought tolerance and are of great interest for areas affected by water deficits: AM fungi have been reported to increase nutrient uptake in water-stressed plants and to enable plants to use water more efficiently.

Managing soil cover Protecting the soil from erosion is also a fundamental strategy for enhancing resilience. Cover crop mulching and green manures offer many advantages. Stubble mulching protects the soil surface with residues and inhibits drying of the soil. Mulching can also reduce wind speed by up to 99%, thereby significantly reducing losses due to evaporation. In addition, cover crop and weed residues can improve water penetration and decrease water runoff losses by 2 to 6 fold.

Throughout Central America, CIDDICO, *Vecinos Mundiales* and other NGOs have promoted the use of grain legumes as green manures, an inexpensive source of organic fertilizer and a way of building up organic matter. Hundreds of farmers along the northern coast of Honduras are using velvet bean (*Mucuna pruriens*) with excellent results, including corn yields of about 3,000 kg/ha, more than double than national average. These beans produce nearly 30 tons/ha of biomass per year, adding about 90 to 100 kg of N/ha per year to the soil. The system diminishes drought stress, because the mulch layer left by *Mucuna* helps conserve water in the soil, making nutrients readily available in periods of major crop uptake.

Today, well over 125,000 farmers are using green manures and cover crops in Santa Catarina, Brazil. Hillside family farmers modified the conventional no-till system by leaving plant residues on the soil surface. They noticed a reduction in soil erosion levels, and also experienced lower fluctuations in soil moisture and temperature. Repeated applications of fresh biomass improved the soil quality, minimised erosion and weed growth and improved crop performance. These novel systems rely on mixtures for summer and winter cover cropping which leave a thick residue on which crops like corn, beans, wheat, onions or tomatoes are directly sown or planted, suffering very little weed interference during the growing season. During the 2008-2009 season, when there was a severe drought, conventional maize producers experienced an average yield loss of 50%, reaching productivity levels of 4,500 kilos per hectare. However the producers who had switched to no-till agro-ecological practices experienced a loss of only 20%, confirming the greater resilience of these systems.

Adding social resilience More diverse plant communities are more resistant to disturbance and more resilient to environmental perturbations derived from extreme climatic events.

REDAGRES

The *Red IberoAmericana de Agroecologia para el Desarrollo de Sistemas Agricolas Resilientes al Cambio Climatico*, REDAGRES, is a network of scientists and researchers spread across 8 countries. Its objectives are to promote the exchange of knowledge and information related to agriculture and climate change. In addition to analysing the impact of climate change on agricultural production, REDAGRES places special emphasis on exploring different adaptation strategies to extreme climatic events, and applying agro-ecological principles to the design and scaling-up of agro-ecosystems that are resilient to climate change.

A few months ago, REDAGRES launched a two year project involving a survey of small-scale farming systems in selected regions of Latin America. The aim is to identify those systems that have withstood climatic events (recently or in the past), and understand their main features. The emerging principles are being shared with family farmers in neighbouring communities and others in the region via field days, cross-visits, short seminars and courses. It is also being used to develop a farmer-friendly manual that will explain how to assess the level of resilience of a farm, showing what to do to enhance this.

Complex agro-ecosystems are able to adapt and resist the effects of climate change. Photos: Faris Ahmed, Mirjam Pulleman

Undoubtedly, crop diversification represents a viable long-term strategy for farmers experiencing erratic weather. The use of diversification within agricultural production systems can significantly reduce their vulnerability and protect their livelihoods. Farmers that use diversity as a crop management strategy usually add copious amounts of organic matter into their soils, further increasing water retention capacity. Managing cover crops and green manures improves the soil cover, protecting the soil from erosion, but also adds biomass, which in turn contributes to increased levels of SOM.

Such strategies to enhance the ecological resilience of farming systems are essential, but in themselves are not enough to achieve sustainability. Social resilience, defined as the ability of groups or communities to adapt to external social, political, or environmental stresses, must go hand in hand with ecological resilience. To be resilient, rural societies must have the ability to buffer disturbance with agro-ecological methods adopted and disseminated through self-organisation and collective action (Tompkins and Adger, 2004). Reducing social vulnerability through the extension and consolidation of social networks, both locally and at regional scales, can further increase the resilience of agro-ecosystems. The vulnerability of farming communities depends on the development of the natural and social capital that gives farmers and their systems resilience against climatic (and other) shocks. This adaptive capacity resides in a set of social and agro-ecological conditions that influence the ability of individuals or groups, and their farms, to respond to climate change in a resilient manner. This capacity to respond to changes in environmental conditions exists to different degrees within communities but the responses are not always sustainable. The challenge is to identify the responses that are sustainable and to upscale them, enhancing the reactive capacity of communities to deploy agro-ecological mechanisms that allow farmers to resist and recover from climatic events and reducing their vulnerability. Social organisation strategies (solidarity networks, exchange of food, etc.) used by farmers to cope with the difficult circumstances imposed by such events, are thus a key component of resilience.

Clara Ines Nicholls is the co-ordinator of REDEAGRES, the *Red IberoAmericana de Agroecología para el Desarrollo de Sistemas Agrícolas Resilientes al Cambio Climático*. E-mail: nicholls@berkeley.edu. **Miguel A. Altieri** is the president of SOCLA, *Sociedad Científica Latino Americana de Agroecología*. E-mail: agroeco3@berkeley.edu

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More information for better planning

Cynthia Brenda Awuor

The Sakai project, implemented in Kenya, shows the importance of weather and climate information when adapting to climate change. The pilot project was part of a regional project on "Integrating Vulnerability and Adaptation to Climate Change into Sustainable Development Policy Planning and Implementation in Southern and Eastern Africa" (ACCESA). The main objectives included increasing household food security, reducing poverty, and integrating climate change adaptation within disaster management and sustainable development policies in Kenya. Starting in 2006, this project was implemented in Sakai, in Kenya's most easterly province.

The villagers noted that traditional sources of weather information did not provide sufficient information to help them plan their activities. Because vulnerability is directly related to a lack of knowledge and information, the project decided to fill this gap and complement traditional weather information with scientific weather forecasts. The project team has been "downscaling" regional scientific weather forecasts for the locality, and communicating the implications of this information for agricultural practices. Community members were also trained in the use of seasonal weather information and agricultural and land management activities that are suitable for undertaking under different seasonal weather predictions. Villagers were regularly provided with information detailing the expected dates of the onset and cessation of rain, the duration and amount of expected rainfall, suitable crop and seed varieties, the expected climatic conditions in a given season and dates for land preparation and sowing.

The team used various channels of communication, including several meetings with the local administration or *"barazas"*, notices in local newspapers and radio programmes. A special activity was the preparation of "cropping calendars". These calendars incorporate traditional knowledge on weather and farming practices and outline suitable agricultural activities to undertake during the rainy and dry seasons. The project team also prepared guidelines on agricultural practices. All this information has been useful for farmers and the villagers agree that access to this information has contributed to improved yields during the last four cropping seasons.

Other project interventions have included training community members on appropriate agricultural and animal husbandry practices and training courses on the identification, retrieval, selection, bulking and storage of high-quality seeds, pest control, post-harvest storage and management. In addition to this, the project helped to build two sand dams to enhance year-round availability and accessibility of water. The project also strengthened small-scale microfinance institutions in the area to help diversify the community's economic base and increase access to credit.

The activities and results of the project were regularly updated on its website. The team has also prepared several papers based on the project's experience, presenting them at various national and international meetings. The project actively involved many authorities and decision makers, including representatives of the District Food Security Group and the District Environmental Committee.

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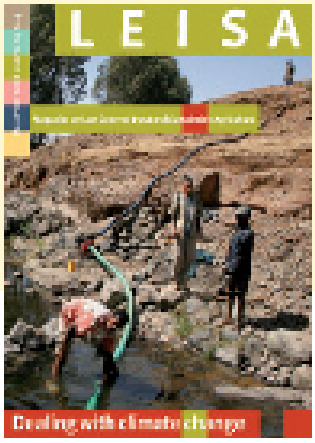
Cynthia Brenda Awuor was a Research Associate at the Stockholm Environment Institute – Oxford. Red Cross Road, Nairobi, Kenya. E-mail: cawuor@gmail.com

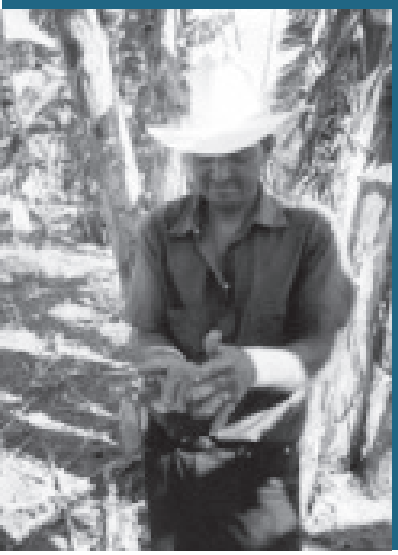


Measuring agro-ecological resistance against Hurricane Mitch

Eric Holt-Giménez

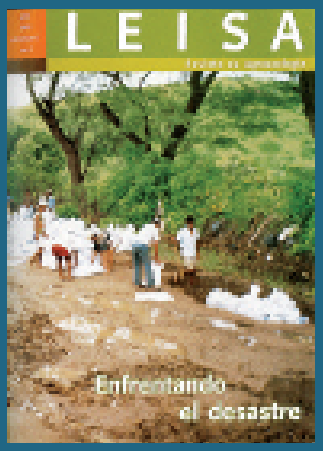
In October 1998, Hurricane Mitch, one of the five most powerful hurricanes to hit the Caribbean during the 20th century, seriously affected the agricultural sector of Nicaragua, Honduras and Guatemala. Most observers agree that the unprecedented magnitude of the disaster it provoked was the consequence of decades of deforestation, unsustainable agricultural practices and other actions that had degraded the resilience of the environment. This view was supported by *in situ* observations which revealed that farms where "sustainable" practices were applied suffered less than "conventional" farms. The Farmer to Farmer Movement, consisting of experimental farmers and technical experts, designed a research proposal to study the differences in agro-ecological resistance between these two types of farms. The purpose of the investigation was to show that sustainable agriculture is the most viable alternative and to encourage the farms that were hit by the hurricane to adopt this approach in their reconstruction strategy, which would be developed in a participative way.

The overall results showed that agro-ecological farms are more resistant to the ravages of nature. Workshops were held to share the information obtained in the field research, the results of which showed that agro-ecological farms have between 20% and 40% more topsoil than conventional farms. In the end, around 90% of those who attended the 15 workshops chose to adopt the sustainable agriculture model.



This successful experience of sharing information encouraged farmers to form alliances among themselves that also included local extension agents and technical experts. Together they described how they wanted their fields to be managed after ten years of applying the agro-ecological model. The most desired features were better soil and water conservation, reduced or no use of chemical inputs, cover crops, agroforestry, in-row tillage, organic fertilizers and pesticides and different forms of integrated pest management. This process encouraged farmers to analyse the obstacles to progress, undertake research initiatives relevant to their rural setting and establish participatory projects and policies to begin the long process of rehabilitating their plots. The Farmer to Farmer Movement managed to mobilise and empower the farming community, which goes to show that resilience involves more than technique but also has an important social dimension.

This article was first published in issue 17.1 of *LEISA revista de agroecología* (July 2001). **Eric Holt Gimenez** was then working at the Department of Environmental Studies, University of California at Santa Cruz, U.S.A. He is now Executive Director of Food First/ Institute for Food and Development Policy. E-mail: eholtgim@foodfirst.org



Crowd-sourcing organisational intelligence: Capturing the rich experiences of farmers' organisations

Although the 2012 UN International Year of Cooperatives is half-way through, it has already contributed much to showing the importance of farmers' organisations. Collective action by farmers is very much needed, especially when farms are (or will become) too small to be attractive to trading partners.

Giel Ton

Smallholder farmers are, by definition, scattered, and so they generally need to bulk their produce in order to access urban markets or the processing industry. This bulking has a strong logistical component, and requires working capital (trade finance) and a cost-efficient organisation that can control transactions. Successful collective marketing has built organisational assets that make their life easier. Farmers' organisations regularly fine-tune their internal management and aspects of their transactional relationships (with members and non-members), relating to pricing, payments and quantity or quality requirements. Through learning-by-doing processes, they have developed internal rules, contract conditions and control systems that have proven to be effective and feasible in the prevailing market conditions.

The ESFIM programme (Empowering Smallholder Farmers in Markets) tries to capture and share this knowledge through a website and database containing specific case-studies (www.collectivemarketing.org). This website provides crowd-sourced knowledge on internal organisational regulations that can make life easier, providing solutions to common challenges that groups face when developing their marketing activities. As these solutions will always be context-specific (depending on the product, the support of institutions, or the scale of the organisation), this crowd-sourcing is facilitated by a comparative framework that helps others to find solutions or lessons relevant to specific types of challenge.

Challenging the tensions that can break organisations

Collective marketing is characterised by a number of basic tensions. All organisations will be affected by some of these tensions, though they will not necessarily experience them as being problematic. Typically, a farmers' organisation will only become aware of them at times of change or crisis, when decisions have to be made to resolve problems, prevent damage, or to mediate conflicts – factors which force them to redefine their internal regulations. By organising their experiences according to the type of tension, we facilitate a process whereby users can find useful lessons on those aspects that are most relevant to them at that particular point in time. By searching for and double-clicking on an experience that seems interesting to them, more detailed information will appear, with the reference to the document or source describing the experience. These are not presented as "best practices", but as "inputs for learning".

The box (right) presents eight areas where the tensions between members and the organisation tend to be found and which, if badly handled, may even cause the disintegration of the group. Many organisations have found (often quite innovative) ways to overcome these threats to group cohesion: solutions that may inspire other organisations to implement similar approaches to resolve their specific challenges.

Many organisations have found innovative ways to overcome the threats to group cohesion.

ESFIM is looking for examples of this organisational intelligence to add to the www.collectivemarketing.org website. Many practitioners who work with farmers' organisations may already have such information at their disposal, as most project activities are internally documented. We ask you to share these stories with us. They can be sent to giel.ton@esfim.org. All quality submissions will be included on the website. The most relevant examples will be considered for inclusion in a planned hard-copy publication.

We welcome unstructured stories and will extract the relevant organisational solutions for the database and website. However, we would welcome even more stories that document how farmers' organisations have coped with these tensions, and which highlight the following features:

- The context: tell us about the group's activities and the problems that led them to come up with their solution.
- The mechanism: tell us about the organisational mechanisms used to resolve the tensions between group and individual interests.
- The outcome: what was the result of the introduction of the mechanism? How did it change the behaviour of the members, or affect the way that the group performed its functions and activities?
- An evaluation: would you recommend this solution to other farmers' organisations? Are there any preconditions to be met in order to introduce and use this mechanism? Or, can you suggest better ways to cope with similar problems?

Join and contribute to ESFIM by submitting your stories!

Giel Ton works as senior researcher at the Agricultural Research Institute (LEI), Wageningen, and is co-ordinator of the ESFIM programme (www.esfim.org).
E-mail: giel.ton@esfim.org

Fair pricing	The members expect that a fair price will be negotiated on their behalf by their organisation. The group's stronger bargaining position should translate into better terms than members could have negotiated on their own. This creates the need for a mechanism that creates transparency in price determination.
Quality assurance	When a deal is made, there is a need to control the quality that the organisation has promised. Individual members may try to deliver lower quality produce and the organisation needs a system to maintain minimum quality requirements.
Coping with working capital constraints	Many farmers face cash constraints and want fast payments, while the organisation needs time to finish transactions with the end buyer. This creates financial costs for the group as they need to have a working capital to pay farmers quickly.
Anticipating "side selling"	The organisation might provide a credit service or advance payment system to enable production. However, this entails a serious risk that farmers will "side sell" their produce to competing traders or processors, to whom they have no repayment obligation.
Distributing profits	When the organisation makes a profit, it will prefer to invest or increase its capital reserves, while the members will prefer shorter term benefits, e.g. better prices.
Differentiating services to members and non-members	Most economic organisations need contributions from members to achieve their business targets. However, members can sometimes be deterred from making such contributions if the benefits from the group's activities accrue to both investors and non-investors.
Task delegation and supervision of professional staff	Most farmers' organisations employ professional staff to support them. Board members need to have proper information to make good decisions. This means that staff must be transparent and willing to provide this information. At the same time, however, decisions about commercial transactions often need to be made quickly, and professional staff need to have sufficient autonomy to make these decisions.

Agricultural metabolism as a tool

Manuel Gonzalez de Molina Navarro works as Professor in the Department of Contemporary History at the University Pablo de Olavide (Seville), where he directs the *Laboratory of Agro-ecosystems History*. He proposes the use of "social metabolism" as a tool and perspective to describe and analyse the relationship between nature and the production processes – and to develop more sustainable food systems.

Interview: Paulo Petersen

Together with Victor Manuel Toledo, a researcher at the Autonomous University of Mexico, Dr Gonzalez de Molina recently published "*Metabolisms, nature and history: Towards a theory of socio-ecological transformations*", which presents the social metabolism approach and argues that it is a powerful tool for analysing the relationship between man and nature.

Studies on social metabolism have gained ground in the last decade. What new conceptual and methodological contributions do they represent? The theoretical and methodological proposal of social metabolism fills a major gap. We needed a conceptual tool that was common to the various disciplines that study the environment. In the same way that hybrid disciplines such as agro-ecology have arisen out of the marriage between different sciences, social metabolism is also a hybrid theory which combines the social and the natural sciences, including ecology, economics, history, sociology, thermodynamics, etc. For reasons of cognitive economy and to facilitate understanding among different specialists, transdisciplinarity requires common conceptual tools for examining the complexity of the interactions between society and nature.

In what ways can agricultural metabolism analysis be useful for redesigning food systems? The application of social metabolism to agro-ecosystems has given rise to the concept of "agricultural metabolism", which is an extremely useful tool for studying agricultural sustainability. With it you can integrate not only environmental and agronomic, but also economic and social aspects, that is, the institutional arrangements that facilitate or hinder the achievement of sustainability. The metabolic approach to farming also allows us to distinguish the different scales (crop, farm, local, national or global) at which action is needed to

achieve and maintain sustainability over time and especially to provide a perspective on ways to offset the environmental crisis in the countryside.

For example, in Spain we have applied this approach to the food system (see No. 10 of *Revista de Economía Crítica*: http://revistaeconomiacritica.org/) and the data are conclusive: agriculture is only responsible for one third of the primary energy used in feeding the Spanish. The remaining two thirds are used in the transportation, processing, storage and cooking required by a food chain in which there are huge distances between producers and consumers. Even within agriculture, the production of synthetic nitrogen, the use of concentrated feed made with raw materials that come from far away and fuel consumption, account for almost 90% of energy consumption.

The study revealed three important things for the design of a sustainable food system: first, the Spanish way of eating is very costly in environmental terms and is beyond our resources, so the first objective of an alternative proposal should be to drastically reduce the amount of energy consumed. Second, it is not only food production that is unsustainable, but also our consumption patterns, which require the investment of enormous amounts of energy and materials. And third, substituting organic inputs for chemical ones will not be enough to increase the sustainability of the system. If we want to substantially reduce the energy cost of feeding the Spanish we need a form of agro-ecological management that closes the cycles and uses local and renewable sources of energy.

From the point of view of socio-ecological metabolism, what analysis can be made of the ideas being proposed at the Rio +20 Conference? Many international organisations have promoted the so-called "green economy" as an attempt to respond to growing social demands for a more sustainable economy. Some states and large corporations have seen a great business opportunity in this "new economy". However, the implementation of this type of economy will not solve the ecological crisis. This green economy is based on the market-mediated replacement of dirty technologies by clean ones without making any profound socio-economic changes. The underlying idea is that the crisis will be overcome by successively increasing the efficiency of our use of energy and materials, which will be driven by relative prices and the self-regulated functioning of the markets.

It is unclear, however, whether this model supposes a reduction in the already high consumption of natural resources, especially in rich countries. As early as the nineteenth century Jevons warned us that successive gains in efficiency in the use of a resource could paradoxically lead to higher consumption of it. Sustainability cannot be achieved without a social change that puts a new economic model in place. This is clearly part of the agro-ecological approach, whose strong conception of sustainability not only proposes agronomic and technical solutions, but also economic and political changes. Indeed, without these changes there can be no guarantee that technological innovation will develop along the right track. For example, difficulties in reaching an agreement limiting the emission of greenhouse gases and thus mitigating climate change is not just a problem of the political will of governments, it is also a problem of the rules of the game. There is a lack of regulations and incentives that make it viable for economic operators to use the available sustainable technological alternatives or develop new ones. Without an institutional framework that encourages short channels of food distribution, for example, a sustainable food system is impossible. The way the food markets are currently regulated clearly favours long channels and an inequitable relationship between farmers and food distributors.

How can this analytical approach support the development of institutional arrangements favourable to a transition from agri-food systems towards an agro-ecological approach? The metabolic proposal is also an excellent political tool. By showing the critical points within the food system, it points out the main objectives of action to social movements and the orientation of public policies to governments. In fact, by integrating physical and biological aspects with social and economic rights, the theoretical and methodological approach of social metabolism becomes an ideal basis to provide the necessary political approach to agro-ecology.

For an institutional design to be favourable to food sustainability, it must be based on a rigorous analysis of reality, which is possible with the metabolic approach. While the ecological footprint is an educational tool that calculates the impact of the food system in ecological terms, the metabolic methodology is a powerful tool that helps to describe in physical terms all the processes taking place from the farm to the final consumer. This allows us to locate the sources of unsustainability within the food system and identify the economic agents who benefit from its current configuration. This will enable the design of rigorous and effective public policies to move us along the path towards sustainability.

Getting heard in Rio

Many organisations are bringing their agendas to the negotiation tables. In this section we present a short review of some of the documents that are already being discussed.

Call to action

La Via Campesina

In this short but powerful paper, La Via Campesina argues that the root cause of the current global crises is the predominance of "capitalistic ways of thinking". It argues that nothing has been done since the Earth Summit in 1992 to tackle the problems that the world faces, and the measures implemented so far have merely served as tools to institutionalise the capitalisation of natural systems. The concept of a "green economy" presented in the preparations for the Rio+20 conference is based on the same logic. Therefore they roundly reject the "green economy" ideas and call for a re-definition of the global economic system on the basis of ideas such as local food systems, food sovereignty and agro-ecological food production.
http://viacampesina.org/en

Rio+20: What are the options when "business as usual" is not an option?

Time to Act

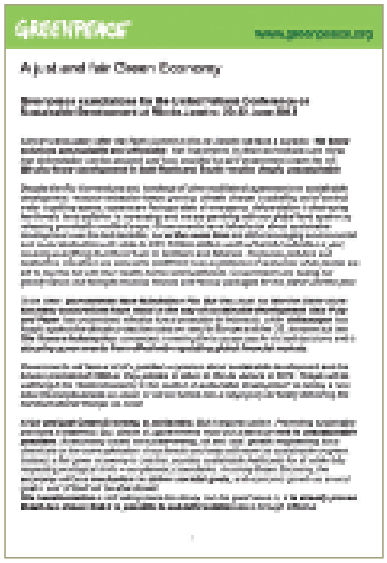
This document, signed by more than 30 civil society organisations from all over the world (including

AS-PTA and ILEIA) calls for a major paradigm shift in the global economic system. It proposes putting agriculture at the core of the Rio conference negotiations, arguing that this can be the main solution to the crises that we face today. The manifesto advocates a transformation of agriculture so that it is based on an agro-ecological approach and is rooted in the ideas of food sovereignty. The document offers a number of policy recommendations, including the removal of harmful incentives for industrial agriculture.
http://www.timetoactrio20.org

Introducing the big picture

The Green Economy Coalition

The Green Economy Coalition has prepared an on-line presentation explaining its position regarding the concept of a "green economy". The first part of the presentation analyses the current global crisis. The main symptoms of the crisis are the decline of the world's ecosystems and persistent global inequalities. These result from the prevalence of markets that do not account for externalities, and from "short term thinking" about the environment. The second part of the presentation offers a vision of the economic system needed for a better future. The core issues within it include: recognising the value of all natural resources and allocating these in an equitable manner.
http://www.greeneconomycoalition.org/big-picture



A just and fair Green Economy

Greenpeace

The position paper prepared by Greenpeace was submitted to the UNCSD committee as an input for the Zero Draft of the outcome document of the Rio+20 Conference. In the opening sentences, Greenpeace expresses its discontent with the slow progress in the implementation of the sustainable development agenda agreed in Rio de Janeiro in 1992, and puts the blame on governments. It calls for ending unsustainable practices, such as the use of nuclear energy and energy from oil and coal, and argues for a sustainable development agenda: reducing consumption, addressing corporate power and setting new Sustainable Development Goals. The report endorses the recommendations of the IIAASTD report and recommends implementing them.
http://www.greenpeace.org/international/PageFiles/358991/rio2012expectations.pdf

Nourish our people, nurture our planet

Swiss Agency for Development and Cooperation, Millenium Institute, Biovision, Stiftung Mercator Schweiz

This Declaration was prepared for the High Level Roundtable on Food and Nutrition Security and Sustainable Agriculture. It outlines the main problems with industrial agriculture, and proposes scaling-up resilient farming systems as an alternative. It concludes with policy recommendations, which include: establishing a Committee on World Food Security (to strategically lead the required changes in agriculture), providing economic incentives for scaling up alternative production systems, internalising the costs of conventional agriculture, the evaluation of the dominant production systems and the rigorous definition of indicators for sustainable agriculture.
http://www.sdc.admin.ch

The scaling up of agro-ecology: Spreading the hope for food sovereignty and resiliency

Sociedad Científica Latinoamericana de Agroecología (SOCLA)

This paper makes the case for agro-ecology as the way forward for sustainable agriculture. Its first part discusses the numerous, interconnected problems related to industrial agriculture, while the next paragraphs focus on agro-ecology as "the basis for the new XXI century agriculture". Its authors explain the concept of an agro-ecological system as an agricultural production system where external inputs are replaced by natural processes, presenting the main principles for the design and management of such systems. They also present numerous examples of studies that very positively assess the performance of agro-ecological projects in Africa, Asia and Latin America. Such projects result in increased food security, farm diversity, farmer's health and resiliency to climatic extremes. In response to the question of how can agro-ecology "be multiplied and scaled up" the authors underline the need for reforms in policies, institutions, and research and development agendas. However, they emphasize that scaling up local agro-ecological innovations cannot be left only to the political will of governments: everybody has a role to play.
http://agroeco.org/socla

Agricultural Transition: a different logic

The More and Better Network

This refreshing paper looks at what transition to a different and more sustainable agriculture is about. It is all about changing mindsets, not just those of other people and institutions, but first of all our own. The authors argue that the perpetuated idea of the poor small-scale farmer is wrong, and say that the biggest confusion has been to imagine that peasants function with the same logic as business entrepreneurs. They explore how fear and a *constructed emergency* ("we are in a hurry because we have to feed nine billion people in 2050") are in the way of seeing the real answers. And the answers are there... but we have to learn to see them. Instead of searching for new solutions, we should look at viable forms of farming that already exist in different parts of the world. The paper proposes the creation of a pro-peasant platform and a twelve step approach to trigger change in the perception of small-scale farmers resulting in transition to better food production systems.
http://www.moreandbetter.org/en/

People's sustainability treaties

Various authors

Drawing inspiration from the NGO Alternative Treaties, drawn at the Rio Earth Summit in 1992, a group of NGOs initiated the People's Sustainability Treaties (PST) project. PSTs are a series of independent collective agreements produced in parallel to the official 2012 UN Conference on Sustainable Development, and are intended to serve as collection of proposals for governments negotiating for official outcomes. The project management and secretariat is hosted by the Centre for Environment and Development (CED). With the contribution of many civil society actors, several treaties have been drafted including the Treaty on Equity, Treaty on Consumption and Production, Treaty on Sustainable Economies, Treaty on Radical Ecological Democracy, Treaty on Sustainable Development Governance, Treaty on Rights of Mother Earth, and the Treaty on Sustainable Development Goals.
http://sustainabilitytreaties.org/draft-treaties

Poverty alleviation: Dignity, ecological growth or just money?

While everybody is talking about a "green economy", we still seem to be missing a critique of the concept. However hard the term has tried to appear different, many people still feel uncomfortable with it. How can we ensure that the new "green economy" is not just a new "greed economy"?

P.V. Satheesh

Year: 2009; venue: Copenhagen. The Climate Summit is going on. One of the distinguished speakers invited by the United Nations to address the plenary is Arnold Schwarzenegger, the Governor of the North American state of California. Many of the participants (including myself) got a bit confused when he started speaking about his contribution to mitigating global warming, and he mentioned that (a) he has started heating his Olympic sized swimming pool with solar power instead of electric power, and (b) he converted his fleet of SUVs into "hybrids". Perhaps even more surprising was that the entire Assembly gave him a standing ovation.

Apart from the ridiculousness of inviting Mr Schwarzenegger to address the plenary, when no farmer or indigenous person was invited to speak, worse was the fact that no-one ever thought of questioning why a family of two uses an enormous swimming pool and so much energy (renewable or otherwise) for heating its 2,500,000 litres of water. No-one questioned why he needs to drive a fleet [half a dozen or more] of cars... It is this interpretation of what is "green and good" that baffles those who work with people who cannot even afford a bus fare, let alone a stable of cars. And to my mind the contribution they make in mitigating climate change and cooling, or feeding, our planet it, is far larger. It is the same apprehension I carry when the idea of a "green economy" is discussed, and which becomes especially relevant when thinking of the millions of people who live in very difficult conditions - and when we think that economists are supposed to help them overcome poverty.

Definitions

But how do we define poverty? I remember the schoolboy who, when asked to write about poverty, mentioned that "*I am poor, so I know about it. My driver is also poor. My cook is even poorer. My gardener is also poor.*" If the idea of a "green economy" is linked to the poverty of millions of persons, will we be forced to live with another farce such as that of Mr Schwarzenegger? Most definitions of poverty have a monetised interpretation. A typical example is that of the Indian Planning Commission, which put the poverty threshold at Rs. 27 per capita. This kind of calculation is always done on the basis of one's contribution to national GDP. But GDP is

"Looking carefully at the people we were working with, our own idea of what constitutes poverty changed".
Photos: P.V. Satheesh

in itself another hoax. As Devender Sharma says, *if a tree is standing, it does not contribute to GDP. But the moment it is cut and made into tradeable timber, it adds to GDP.*

So what contributes to what? In another UN conference, this time focusing on the concept of Gross National Happiness, the former Prime Minister of Bhutan, Lyonpo Jigmi Thinley, said that *"We have to think of human well-being in broader terms. Material well-being is only one component. That doesn't ensure that you're at peace with your environment and in harmony with each other... The GDP-led development model that compels boundless growth on a planet with limited resources no longer makes economic sense. It is the cause of our irresponsible, immoral and self-destructive actions."* Thinley added that *"The purpose of development must be to create enabling conditions through public policy for the pursuit of the ultimate goal of happiness by all citizens."*

"GNP (Gross National Product) by itself does not promote happiness," said Jeffrey Sachs, a prominent development economist at Columbia University in New York, and also author of the World Happiness Report. *"The U.S. has had a three fold increase of GNP per capita since 1960, but the happiness needle hasn't budged. Other countries have pursued other policies and achieved much greater gains of happiness, even at much lower levels of per capita income."* In other words, we should not let the new concept of a "green economy" just be confined to "business-as-usual".

A view from DDS

The Deccan Development Society, a grassroots organisation with which I have been associated with for the last 25 years, works in the Medak district of the southern state of Andhra Pradesh, right at the centre of semi-arid India. DDS works with about 5,000 very small-scale women farmers who primarily belong to the socially excluded groups. These are people who suffer multiple forms of marginalisation. In the urban-rural divide, as rural people, they are marginalised. Being poor, in the economic divide they are marginalised. Being *dalits*, in the social divide they are marginalised. And as women they face severe marginalisation in the gender divide. Working with this group has been a challenge.

A quarter of a century ago, our initial aim was simply put as "poverty alleviation". But as we started listening and looking carefully at the people we were working with, our own idea of what constitutes poverty changed. This transformation has led us to now look at poverty from a much broader perspective, moving away from monetary perspective towards a sovereignty perspective; from a "rights" perspective to an "autonomy" perspective. This has led us towards promoting autonomous and community-controlled food production systems; autonomous healthcare systems; autonomous markets; and an autonomous media.

How are these initiatives related to poverty? That is where I would like to revert back to the definition of poverty. In a rural area, if a woman from a *dalit* community is able to take care of her food needs and of her health needs in a satisfactory manner, and if she is able to be a member of an autonomous market set up by her group, and if she is able to air her views in a public space through the community radio station, and make her own films through initiatives like the Community Video Collective, should she be called a woman in poverty just because her monetary income is less than the classical US$ 2 per day? If she moved to earning US$ 3 per day but depended completely on an external market for her food, nutrition or

healthcare, and had no media space to air her views and opinions, would that woman be considered as having escaped poverty?

It is this analysis which makes me say that the small-scale farmers with whom we work have escaped poverty. In terms of food production and consumption, these are small-scale farmers with an average holding of about 2 acres. They have adopted biodiverse farming systems and are able to produce all the cereals, legumes and oilseeds they require for an entire year's consumption. Nowadays,

- the daily per capita consumption of an average DDS family stands at 500 g of cereals and 50 grams of pulses. According to the latest Economic Survey of India, these families are eating 20% more cereals and nearly 40% more of pulses than the rest of India.
- in terms of money spent, nearly 85% of these households spend less than Rs.100 per person per month on food (compared to the average Rs. 400 spent per capita by rural households in the state of Andhra Pradesh), since most of them are producing their own food. Thus, for every household of five, DDS families are saving Rs.1500. They also sell nearly 70% of the pulses produced on their farms and 60% of the fodder, earning an additional income.
- all DDS communities have established their own Public Distribution System. They grow nutritious millets which are culturally and agro-ecologically adapted to local conditions. Through this system, they not only take care of small and marginal farming families, but also of the landless people in their communities. A few years ago, they did a hunger mapping of their villages and identified the less fortunate among them, and started community food kitchens for them. From food receivers, they became food providers.

It can also be said that their agriculture does not rely on expensive fertilizers and pesticides. They use farmyard manure, biofertilizers produced at the household level and other family-made botanical formulations for plant care and plant growth. All the seeds are their own, saved year after year. Having no expenses at all in terms of seeds, fertilizers and pesticides, they save an average of Rs. 2,000 per acre per season. They use no external energy, produce no greenhouse gases, and keep a clean energy balance sheet.

In terms of their healthcare systems, each community has its own health worker, usually a volunteer. This person normally cures all minor illnesses in her community; and anyone can approach her. She charges nothing for the services she offers. She makes only herbal medicines. In the last decade, DDS health workers have saved their community of 50 villages, up to Rs. 7.5 million every year. In

Is someone poor just because her monetary income is less that US$ 2 per day? Photos: P.V. Satheesh

addition, communities have established 29 medicinal commons, with each commons having more than 50 plant species, all with a medicinal quality. Anyone in the community can access these commons and the plants to make their own formulations. No money is charged for them.

DDS communities also run their own market, the *Market of the Walkouts*. This is a co-operative market headed by a committee of 11 women. It makes all its decisions democratically, including those regarding the prices paid to the farmers who supply produce to them. Every member of this market is privileged to receive 10% more than the external market rate for every produce she sells to her market. She also gets a 10% discount for everything she purchases. Every year, the co-operative distributes dividends!

Nearly 80% of the DDS women are engaged in some form of "eco-enterprise", at the heart of which are the animals they raise. Each family has a goat or a buffalo, a bullock and at least half a dozen poultry (or a combination of all these). Their earnings through milk and meat averages close to Rs. 2,500 per month. In addition, cattle are also a great source of manure. Most families produce biofertilizers (an average of 1.5 tonnes per year, sold at nearly Rs. 6 per kg). The cattle produce nearly 6 tonnes of farmyard manure: a saving of up to Rs. 1500 per year. Finally, since 1990, DDS communities have planted over a million trees in about 35 locations raising neighbourhood forests (or "community commons"). These forests have more than 80 plant species in each, from which families can get fodder, fruits, fuelwood and timber.

A valid alternative

I am mentioning all these factors in order to underline the fact that DDS has chosen to go beyond the classical "income generation" model, striving to work in harmony with the ecological perceptions of a community. This has helped this district to become an agro-ecological oasis in the region, and it is now recognised as an Agrobiodiversity Heritage Site by the National Biodiversity Authority. In this process, our work has not just enhanced the food and nutritional security of these communities, but has also enabled them to live a life of dignity and honour, understanding and trusting the ecological role they are playing.

While I cannot recall any major crippling challenges, there are several reasons behind our success, starting with the fact that DDS kept a very low profile right from the beginning. DDS followed the agenda set by the women and never tried to set its own agenda. DDS never tried to "represent" the people it was working with. People represented themselves. Therefore, the struggles were fought by the community and won on their own strengths. What could have worked against the DDS was that it did not engage with the rich and powerful sections of the communities. But by the time these groups realised that the strength that the women were acquiring could work against them it was already too late. The women had empowered themselves.

To conclude, I would like to say that work has shown that it is possible to improve the well-being rural communities and overcome poverty without adopting monetised goals. As Nagamma, a 70 year old community elder from the village of Tekur says, the alleviation of poverty in rural areas *"has to be like a river. Other organisations are like monsoon streams who burst onto the scene flow forcefully and disappear within weeks. We flow full and calm, bringing life all around us."* Should this not be the goal of a truly "green economy"?

P.V. Satheesh is the Director of the Deccan Development Society, Andhra Pradesh, India. E-mail: satheeshperiyapatna@gmail.com

Sowing organic seeds

Sabyasachi Roy

There is a growing realisation that only the adoption of ecological and sustainable farming practices can reverse the declining trend in farm productivity in the state of West Bengal, India. A small farm of 3.8 acres run by Birendra Kumar Roy and Paromita Sarkar Roy in the village of Kamalakantapur, near Santiniketan, shows that excessive use of chemical inputs and land degradation is not the only option. Their SAKRIA (meaning "active" in Bengali) organic farm sustains the needs of the family, is profitable, and allows their child to grow up in an environment free of pollution, chemicals and pesticides.

The farm grows a variety of seasonal crops and vegetables, with special focus on traditional varieties, appropriate to the conditions and the climatic situation. The different varieties of organic fruits grown on the farm ensure proper nutrition, providing the necessary vitamins and tasty food to the family. A variety of fishes are grown in the farm pond, completing the family's nutritional requirements. Perennial trees are used as natural barriers against extreme weather conditions. Farm yard manure and mulched leaves are used to fertilise the soil. Leguminous pulse crops are intercropped in the orchards and grown on a rotational basis, ensuring soil nitrogen fixation and also green manuring. No chemical pesticides are used. The manual removal of weed goes hand in hand with the use of organic pesticide solutions and strategic intercropping (even though they face the serious problem of pests drifting onto their farm from other farm lands).

After meeting all the nutritional requirements of the family, the excess paddy, oilseeds, vegetables and pulses are either used for the preparation of value-added products or sold to small retailers and families in the vicinity. This source of income allows the family to employ four fulltime labourers and eight to ten seasonal labourers.

The farmers' consistent extension efforts in the last fifteen years have led to many neighbouring farmers cultivating more varieties of crops and intercropping them with legumes. The soil condition in the area surrounding the farm has improved. The population of earthworms has substantially increased on SAKRIA farm, resulting in soils with a higher water holding capacity. The variety and diversity of plants and trees has also resulted in noticeable changes in area's wildlife.

The SAKRIA organic farm may be a small family farm in a remote dry land area of West Bengal, but it demonstrates what can be achieved through love for the land and nature, self-determination, innovation and hard work. The success lies in the fact that the farmers have neatly interwoven their traditional knowledge with "modern" techniques. The main constraint they face is that customers are not ready to pay extra for their organic products, especially since organic certification services are lacking in the area. Most farmers feel that the organic certification processes are complex and expensive. There is thus a need to enhance facilities and the availability of services for organic certification, and to help small-scale farmers so that they better market their products. If the farmers could also achieve higher prices for their produce, the benefits seen in SAKRIA would be even greater.

Sabyasachi Roy works at the National Dairy Development Board, VIII Block, Koramangala, Bangalore, India. E-mail: sabyaroy@gmail.com

Innovating in rainwater harvesting

Hasrat Arjjumend

The response of both governments and scientists to the scarcity of water and the recurrence of droughts has frequently meant looking for solutions that are based on mega projects such as high-cost dams. But a much simpler solution, and surely a more effective and efficient one, can be found in the "catch the water where it falls" approach. In Rajkheta, a village in the Indian state of Chhattisgarh, the non-governmental organisation Sarguja Gramin Vikas Sanstham (SGVS) has been trying out different small-scale and innovative ideas in order to improve groundwater regimes, and thus support the livelihoods of the local people. These were part of a community-driven set of watershed activities focused on water management, soil conservation, agricultural development and ultimately on people's empowerment.

At the beginning of the project, participatory exercises were conducted to help people understand that water is not necessarily scarce, but untapped and mismanaged. In the next stage several technical interventions were tried. Soil conservation works, such as farm bunding and channel formation, improved soil conditions and the water regime. Over 100 hectares of fallow land became paddy fields. A wide crescent shaped channel helped reclaim about 50 hectares of sandy wasteland that were abandoned. Checkdams were built to decrease water run-off. Already in the first year, monsoon rains filled the reservoirs, and the flow of water was captured in the bunded cropfields. A stream which used to become empty after the monsoons, gradually evolved into a perennial stream.

To arrest soil erosion and help rainwater remain in the area, SGVS started to work in 65 hectares of forestland, collaborating with the local Forest Department. This involved community members in activities such as gully plugging, staggered trenches and contour bunding in the forest areas. In addition, a micro checkdam was build upstream of the Bajarmara *nala*. A culvert was also built to enable water harvesting, helping prevent the inundation of the link road. Finally, the renovation of the pond that was lying defunct in the village transformed it into a source of water for cattle drinking and aquaculture.

The impact of these activities was already seen within the first year of the programme. There was a rise in groundwater level and increased quantities of water are being harvested and stored. The farmers can now draw from the water for drinking and irrigation purposes. There was a considerable change in the cropping intensity of the region. Within the first 3 years, the net sown area increased to 50% of total land area. Cropping patterns in the village also changed. Along with food crops, farmers started growing vegetables. Simultaneously, crop yields increased, though no special efforts were directed towards that end.

A full version of this article was published in vol. 5, number 2, of *LEISA India* (June 2003). Based in Bhopal, India, **Hasrat Arjjumend** worked as a consultant. E-mail: prc_hasrat@sify.com

Enhancing the debate for a real transformation

Small-scale farmers depend on biodiversity for their livelihoods and survival, yet agriculture can also be the greatest destroyer of biodiversity. Hivos and Oxfam Novib have recently launched a programme that aims to generate insights and evidence about the role of biodiversity in agriculture, and how to change to agricultural systems that harness biodiversity. This programme will last for three years and includes action research, network development and the establishment of a platform for public debates.

Agricultural biodiversity is about many things: about the genes of the wide variety of plants and animals; about individuals and the systems of which they are part, about policies and practices. What does agrobiodiversity mean in practice? And how can the wide knowledge and experience that exists contribute to better policies and practices? Farmers, policy makers, financial institutions and businessmen need to know what the opportunities and possibilities are when talking about biodiversity in agriculture. We need to know how to enhance agricultural biodiversity and the existing (and potential) incentives and disincentives for doing so.

"Food security means that good quality seeds at affordable prices are made accessible to farmers at the time that they need them. The approach should be to build and strengthen seed supply sources locally as much as possible."
A.V. Balasubramanian, Centre for Indigenous Knowledge Systems (CIKS), India

Many organisations, governments and businesses have been dealing with this complex set of issues for some time, and have developed specific approaches to it. "Agricultural diversity includes the components of biological diversity that are essential for nourishing human populations and improving their quality of life," says Zachary Makanya of PELUM-Kenya. "Such diversity is the result of thousands of years of farmers' and breeders' activities, land and forest utilisation, combined with millions of years of natural selection. It is essential for our existence."

Understanding agricultural biodiversity

The organisations involved in the Agrobiodiversity@knowledged programme focus on different aspects of the concept of agricultural biodiversity. The Sustainable Land use Forum (SLUF) in Ethiopia, for example, has been advocating for an integrated approach to agriculture and land use for years. Tenaw Hailu Tedela says that agrobiodiversity gives us different benefits. "It provides the basis for the production of food. And an area's biodiversity also means organisms that contribute to many diverse ecosystem services, from pest and disease regulation to carbon sequestration. Time and again, farmers show that it is the basis for food security and a sustainable

"It is urgent to strengthen the indigenous systems for managing resources, and for the conservation of agricultural biodiversity, and that local farmers and farmers groups are encouraged to continue to conserve their time-tested local and indigenous seeds. Stop the introduction of GMOs since they destroy the local seeds systems and make farmers depend on corporations for their seeds."

Zachary Makanya, Country Coordinator PELUM-Kenya and Chairperson of the board of the Africa Biodiversity Network (ABN).

livelihood. This is our most important incentive to preserve it."

In India, the Centre for Indigenous Knowledge Systems (CIKS) aims to ensure that traditional knowledge on different species is used in contemporary agricultural systems. "Agrobiodiversity is very important: just think of the number of varieties that are resistant to droughts, pests, and diseases," says A.V. Balasubramanian. "Agrobiodiversity has helped us produce food in a way that is adapted to our local requirements, traditions and conditions. This does not only mean resistance to drought or pests – it also means higher yields."

Current initiatives

CIKS started a community seed bank project in Tamil Nadu. Lost biodiversity has been brought back at the community level, as more than 130 varieties of paddy and 50 vegetable varieties are being sown in farmers' fields and experimental farms. "Agrobiodiversity has to be locally conserved, and not only in cold storage rooms run by researchers", explains A.V. Balasubramanian. "By creating awareness in the communities about the diversity and importance of traditional seed varieties, communities can continue benefitting from them, and ensure that the future generations will do so too".

PELUM-Kenya and other like-minded organisations are currently rolling out the Ecological Organic Agriculture (EOA) Initiative. "PELUM-Kenya is co-ordinating this pilot initiative to promote ecological agriculture, and we will show that this is the kind of agriculture that will help solve Africa's perennial hunger and poverty," Zachary Makanya states. The aim is to mainstream organic agriculture into the national agricultural production systems by 2020 – by scaling-up best practices, increasing the visibility of ecologically grown food and through multi-institutional partnerships.

The next steps

All these organisations agree that we need to pay more attention to agrobiodiversity. "We need not only to acknowledge its importance, but also increase our understanding of how to transform agriculture or, in other words, scale up successful programmes" says Gine Zwart of Oxfam Novib. The idea of a "green" economy is now high on the agenda, but many questions remain. What does "green" really mean? Who will govern this green economy? Do we need more knowledge to shape new policies and practices? Many high level policy makers may feel that this knowledge is hidden. However, it is right there in front of us if only we take the time to look and listen carefully to those who work with nature on a daily basis: farmers, fisherfolk and livestock keepers.

The basis for food security and a sustainable livelihood. Photo: Emily Oakley

"Sustainable development can only be achieved by conserving and developing agricultural biodiversity, and through it enhancing food security, livelihoods and resilience in the face of climate change. Appropriate policies need to be put in place so that they lead to and support practical actions."

Tenaw Hailu Tedela, Executive Programme Officer for the Sustainable Land Use Forum (SLUF)

For more information please write to **Gine Zwart** (e-mail: gine.zwart@oxfamnovib.nl), **Willy Douma** (w.douma@hivos.nl) or to the participating organisations themselves: **A. V. Balasubramanian** at CIKS (info@ciks.org), **Zachary Makanya** at PELUM (makanya@pelum.net) or to **Tenaw Hailu Tedela** at SLUF (tenaw.hailu@gmail.com).

The energy dilemma

The access to and depletion of energy sources is an issue that is receiving more and more attention, especially in relation to agriculture and rural areas. Key aspects in this debate include how to use existing energy sources sustainably and how to develop more sustainable sources of energy. This leads to the questions of how agriculture can become more energy-efficient, and the potential (and risk) of alternative energy sources, such as bio-fuels.

Flemming Nielsen

At times, energy has been overlooked in the development debate, but recently it has again been receiving greater attention. Some people talk about "energy poverty" and point out that better access to energy by "energy-starved" people can significantly contribute to achieving the Millennium Development Goals (MDGs). Energy access can reduce extreme poverty (MDG 1) by enabling new income-generating activities, and reduce time spent on collecting firewood. Electricity makes it possible to study more (MDG2), watch TV and use mobile phones. Studies have shown that girls, in particular, take advantage of the extra study hours (MDG 3). Access to energy can reduce child mortality, improve maternal health, and help combat HIV/AIDS and other diseases (by, for example, providing clean water). Replacing firewood with biogas or electricity reduces respiratory diseases (MDGs 4, 5 and 6). And, better access to energy can improve environmental sustainability by reducing deforestation (MDG 7).

The link between energy and climate change is now widely recognised, but increased access to energy does not have to result in climate change. For a start, energy use does not have to be as wasteful as it has often been in industrial agriculture. Instead of treating energy as a consumable item, purchased from outside, we need to think in terms of energy flows, as we do with nutrients and water in agriculture. How can we reduce energy waste? How can we increase energy efficiency? How can we re-use energy? While conventional agricultural production systems rely heavily on fossil fuels, both for machinery and for the production of fertilizers, the majority of small-scale farms use a minimum of fossil-based inputs. The benefits of such an approach are many and include a minimal environmental impact, less money spent and increased resilience to fluctuations in fossil fuel prices.

Aiming at universal access? The burning of wood, dung and crop residues accounts for one third of the energy used in developing countries. Households, however, find it increasingly difficult to find wood or dung, so it is important to focus on other energy sources. Some alternative energy solutions such as biogas, micro-hydro dams and wind power have matured and are spreading fast. Modern solutions like photovoltaic (PV) solar panels have

dropped significantly in price over the last few years and are becoming competitive with other sources of energy. However, many of these technologies require heavy investments upfront. Many poor people who could benefit from these alternative forms of energy are not in a position, for example, to adopt PV solar panels - which can easily cost up to US$ 500 for one household. Even with less costly options, like the micro-hydropower systems seen in Nepal, the upfront costs are too high for communities to shoulder by themselves. At the same time, many countries have laws in place to protect national electricity suppliers by outlawing private micro-grids. At present the current level of investment in "soft" energy provision is only one-fifth of that required to provide access to electricity for all by 2030. The International Energy Agency (IEA) forecast that by 2030 there will still be 1.2 billion people without access to electricity unless policies change significantly.

Many people are afraid of what universal access to electricity would mean in terms of global warming. However, the provision of universal access to electricity by 2030 would only increase global demand for fossil fuels by 0.8% and increase CO_2 emissions by 0.7%. This is due to a combination of the low energy requirements among people who are currently off-grid and the expectations that many will be served by electricity generated from alternative energy sources.

Looking for alternatives

The majority of the poorer regions of the world are net importers of fossil fuel. At the same time they have abundant resources of untapped alternative energy. A lack of skills and capital, subsidies on fossil fuels and a lack of supportive policies have prevented significant development of alternative energy technologies in many countries. The major exceptions are Brazil, China and India. After decades of dedicated government support for research and development Brazil is one of the global leaders in bio-fuel production. The latter two countries are both leaders in decentralised renewable energy provision from wind, small hydro units, biogas, and solar water heating. Most other governments have taken little initiative in developing sources of alternative energy.

Biodiesel and plant oils can act as substitutes for diesel and ethanol as a substitute for gasoline. They can power existing vehicles. This is unlike other alternative fuels, such as electricity or hydrogen, which involve replacing existing vehicles with new ones. Even in rich countries, the adaptations required are prohibitively expensive. When fossil fuel prices went through the roof it seemed very attractive to get farmers to produce bio-fuels which would only require upstream investment to relatively simple processing facilities. It was a dream of a quick and easy switch to a fossil fuel free future, but was not rooted in reality.

The latest bio-fuel hype started around 2005 and saw many governments, together with NGOs and private investors, jump into large projects without doing the necessary homework. In particular, the production of *Jatropha curcas* was promoted in places where it cannot grow well and farmers were encouraged to produce in places where no markets existed. Information about the right agronomic practices was rarely provided, and nobody paid attention to the importance of creating valuable by-products from the press cake. Unsurprisingly, the yields have been poor and the resulting backlash has been just as large as the hype a few years ago.

Increased access to energy does not necessarily contribute to climate change.
Photos: Victor Berrueta / William Critchley

Several alternative energy sources are technically and economically viable. Photos: GERES India / RAAA

Today the bio-fuel sector is facing a tough time, both economically and politically.

Examples from different countries show that, as with all sources of energy, it is important to look at the social and economic consequences of every option, the environmental impacts of energy use, and take into account the entire process of distribution. Large-scale hydroelectricity plants, or the large scale production of bio-fuels, may have enormous social, economic and political costs such as displacing people living in an area. The "sustainability" of bio-fuels depends on the energy that is required to produce bio-fuel crops (for example, whether agrochemicals are used) and on what type of land the crops are grown: if it replaces carbon-rich land, such as natural forests, or other (food) crops, questions need to be asked about the net benefits.

Small-scale solutions

Fossil fuels have played a large role in agriculture, powering generators, pumps and vehicles, the production of artificial fertilizers and allowing supply chains to grow progressively longer. However, several alternative energy sources have emerged which are technically and economically viable and are currently being adopted at a large scale. Each technology has its advantages and disadvantages. For instance, wind power is cheap but intermittent, i.e. it only works when the wind blows. Small hydroelectric power stations can produce energy on demand but are too expensive for most communities. Bio-gas produces slurry that is a good fertilizer but is difficult to handle and transport. Photovoltaics are durable but can only power light loads. Bio-fuels can directly substitute fossil fuel, but can compete with other crops for labour and land. Solar water-heaters are relatively cheap but prone to clogging if dirty water is used.

Despite the great benefits offered by alternative energy sources, a focus on increasing access to energy can overlook the importance of the techniques and equipment used by many family farmers – and the real energy demand of agriculture. All over the world, farmers are experimenting with the many low-tech energy saving and energy providing technologies that are already available. Many examples have been documented in this magazine over the years. The kind of energy source used depends largely on availability and price, but also on tradition and personal preferences. Most importantly we should look not so much at the demand for energy, but more at the efficiency of its use. These examples show that small-scale farmers can not only achieve high yields: they are also more efficient than intensive farmers in terms of their energy use.

Based in the Netherlands, **Flemming Nielsen** works as an independent researcher at Banana Hill. E-mail: fnielsen@bananahill.net

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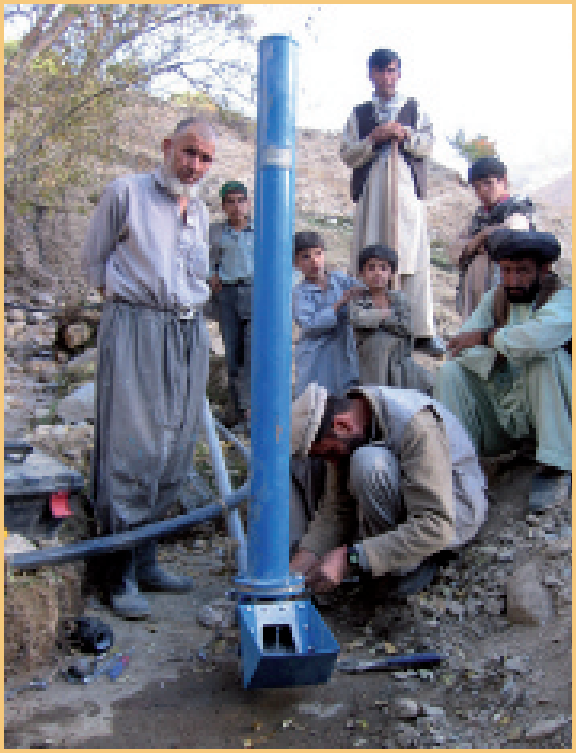
Running water uphill

Auke Idzenga

Gravity makes water run downhill, so people and communities living in mountainous areas often have more difficulties in accessing sufficient water. The Alternative Indigenous Development Foundation (AIDFI), a local NGO based in Bacolod City, on the island of Negros, in the Philippines, has been working with small-scale farmers for many years. Seeing and hearing about the recurrent water problems faced by many farmers, AIDFI decided to concentrate on addressing their basic need for water for drinking and irrigation. Since 1990 AIDFI has been working on different types of water pumps and now its flagship is the Hydraulic Ram Pump. A ram pump utilises the energy of flowing water to pump a portion of this water to a higher elevation. No electricity or fuel is needed. For every metre drop from the source to the ram, a ram can pump the water up to 30 times higher. The ram pump's enormous potential lies in its simplicity. The ram model designed by AIDFI uses ordinary door hinges (available anywhere in the world) and a check valve made from a piece of a car tire. Adopting the ram to other countries is easy: it just involves adapting it to the locally available door hinges.

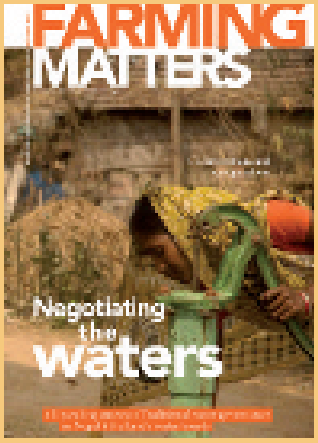


The installation of a ram pump starts with a demand for water. The next step is to set up a water association, which plays a key role, distributing roles and responsibilities and deciding who will be the contact point with AIDFI. The whole group also decides which villagers will be trained to become the local technicians and collects fees that are meant to cover repair costs, spare parts and the general maintenance of the pump.

One of the most common results of the installation of a ram pump is that villages never have enough water: the need for water seems to increase in line with its availability. This is why the association needs to develop strict regulations which ensure equal sharing among all. Irrigation is often the main water use and this water has to be shared and distributed evenly. Setting up irrigation schedules and internal regulations is one of the most important tasks of the water associations. AIDFI supports all the associations that ask for help in drafting these regulations, but does not interfere further.

Expanding production and installation of ram pumps now accounts for almost 90 percent of all of AIDFI work. The advantages of ram pumps have also been noticed abroad. This has led AIDFI to become active in Afghanistan, Colombia and Nepal.

This article was published in issue 26.3 of *Farming Matters*. **Auke Idzenga** is a marine engineer who has lived in the Philippines since 1985. In 1991 he helped found AIDFI. E-mail: aidfi@hotmail.org



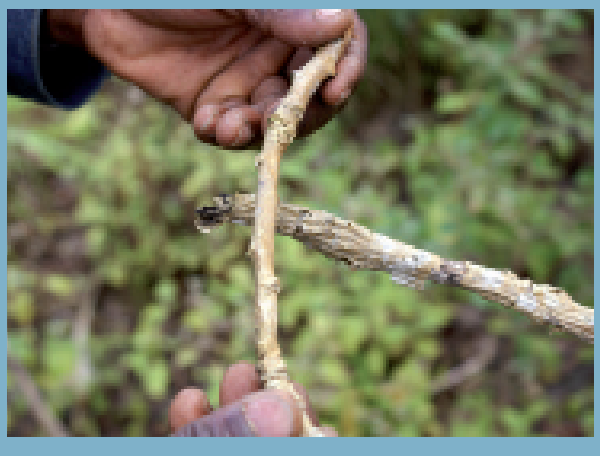
Lessons learned from Nhambita

Marc Schut, Annemarie van Paassen, Cees Leeuwis, Sandra Bos, Wilson Leonardo and Anna Lerner

In many developing countries, smallholder biofuel production and use is perceived as a promising economic opportunity to meet rural energy demands, and also as a catalyst for socio-economic development. An exploratory study in the Nhambita community in Mozambique, one of the first communities that planted *Jatropha curcas* at the Mozambican government's request, analysed the potential for biofuel production within three types of farm households.

The study found that farms with high or medium resource endowment need around 20% of their total land to achieve household food self-sufficiency. Farms with poor resource endowment need 80% of their total farm size to produce sufficient food for household consumption. Households with high resource endowment are more resilient; they have more household food reserves and find it much less difficult to feed their families throughout the year. Also, the high and medium resource endowed farm households have more access to labour as they often hire the labour of less endowed households for agricultural activities. The land and labour constraints faced by low resource endowed households make it very difficult for them to invest in jatropha production.

High resource endowed households that grew jatropha became discouraged and stopped actively managing their jatropha fields. This was not because of land or labour constraints, but because they found the benefits of managing jatropha were less than for other crops. As long as there are no organised markets or value chains for jatropha, it is unlikely that even this group of farmers will allocate resources to a single-purpose, non-food crop such as jatropha; the more so since they have little knowledge or experience with it and it only gives profitable yields after three to four years.



The way in which the Mozambican government promoted jatropha production in Nhambita led to disappointing results that negatively affected farmers' trust in the biofuel crop. Biofuel strategies for smallholders must take account of the specific context in which farming takes place, the complexity of different farming strategies and their synergies at community level. Furthermore, it is essential to create an enabling environment for experimentation and to provide institutional support for capacity building, sharing knowledge and experiences and market development. The study also revealed several opportunities: jatropha oil is suitable for manufacturing soap and for lighting – which are among the main expenditures for Nhambita households – and the jatropha press-cake and fruit coats can be used as an organic fertilizer. Ex-ante assessment tools should be used to strategically assess the potential and impact of agricultural policies and interventions before promoting them among smallholder farmers. This would prevent such interventions – whether for biofuel production or other green economy initiatives – from being a threat rather than an opportunity for smallholders.

Marc Schut (marc.schut@wur.nl) works as a post-doctoral researcher at the Department of Communication and Innovation Studies of Wageningen University and Research Centre (WUR), the Netherlands. **Annemarie van Paassen** and **Cees Leeuwis** work at the Department of Communication and Innovation Studies, WUR. **Sandra Bos** works for the FACT Foundation, Wageningen, **Wilson Leonardo** is doing PhD research with the Plant Production Systems Group at WUR and **Anna Lerner** is Energy and Climate Change Specialist, World Bank, Washington D.C., U.S.A.

Cuba's enforced learning experience

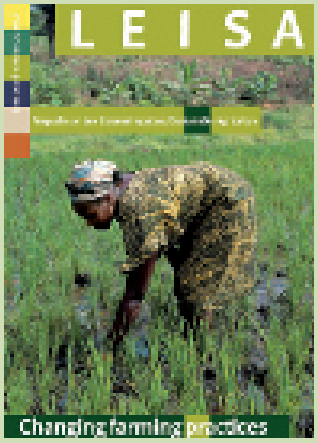
Julia Wright

Importing most of the inputs needed for agriculture, Cuba's farms were using more than 190 kg/ha of nitrogen fertilizer before the collapse of the Soviet bloc – higher rates than those in the U.S. By 1993, however, these imports were no longer available, and the nation was close to facing a huge food crisis. Yet, within a decade, the country recovered sufficiently so as to double agricultural production, increase calorific availability by 25 percent, and maintain a consistent and equitable social food programme, all without relying on the huge amounts of external inputs required before. At the end of that decade, Cuba held more sovereignty over its food system than at any time in its recent history, and this new production system showed exceptional resilience throughout the 1990s. Production and yields of staple foods doubled and continued to increase, while most importantly, food availability was restored to acceptable levels.

This was largely achieved through a focus on technologies based on local knowledge, skills and resources, instead of imported inputs. Many individual parts of an agro-ecological or organic production system were employed, although there was no explicit policy in this respect. These included: the development of production centres for biological pest control products, agro-ecological demonstration farms, ecological training courses, urban *organopónicos* (raised-bed gardens), and a social organic movement. The emerging evidence from Cuban projects and research suggests that ecological production is technically feasible and economically viable as a mainstream component of a nation's food security strategy.

However, the way in which farmers, groups and institutions in Cuba continued shows that the removal or absence of chemical inputs (or of private-sector agribusiness) does not necessarily imply an ecological production system: such a conversion requires a conscious decision. Other supporting mechanisms need to be in place, including strong policies to increase and mainstream agro-ecological production. The key factors can be classified into three groups: those relating to knowledge, those relating to access, to resources and technology and those relating to political and social factors.

In terms of knowledge, increasing "ecological literacy" and generating knowledge, with new research and providing support to innovators or "ecological pioneers", are essential. It is also important to increase the availability of and access to appropriate resources and technology. Also policy elements and social factors that work against agro-ecological approach need to be identified and tackled. In Cuba, the focus on local level organisations appeared to encourage the progress of ecological approaches, such as the integration of previously specialised farms and farm enterprises.



A complete version of this article was published in vol. 22.2 of the *LEISA Magazine* (June 2006). **Julia Wright** was then working at the International Programme of the Henry Doubleday Research Association, Ryton Organic Garden, Coventry, U.K.

"We can talk about

Rio+20 has sparked international attention to sustainable agricultural development, but this has been a point of attention for many people for years. An agricultural sociologist, Ann Waters-Bayer was for a long time involved in the production of the *ILEIA Newsletter* and the *LEISA Magazine*. She is now part of PROLINNOVA, a "Global Partnership Programme" under the umbrella of the Global Forum on Agricultural Research (GFAR) that aims to promote local innovation processes in ecologically oriented agriculture.

Interview: Laura Eggens and Marta Dabrowska

A lot has changed in the international development arena in the past 30 years. This will be visible at Rio+20 as well. "I imagine that in Rio there are going to be numerous farmer organisations and civil society organisations to voice their own demands," says Ann Waters-Bayer. "Since 1984, we have been trying to build a bridge between policy and practice, but back in 1984, most farmer organisations were not as strong as they are today."

What helped bring about the larger role these organisations have? I believe ILEIA and similar organisations played a role in that. They always tried to make the voices of smallholders heard – including pastoralists or landless farmers. I think we managed to bring more confidence to a number of organisations, who saw that they could make themselves heard outside their countries through these international means. Then they started sharing their experiences much more inside their own countries as well. Organisations that published in the *LEISA* magazines in the past now have their own publications. And there were more organisations like ILEIA doing this, focusing on smallholders and ecologically oriented agriculture, and trying to put information together and make it readable. This was before you could find everything on the web.

What triggered the interest in exchanging information? Probably the "Limits to growth" report that came out a few years earlier, and which warned about the direction the world would go if we would continue in the same way, especially regarding the use of natural resources. I think that this sparked off things in people's heads. Some of these people had experience with farmers that practised an alternative type of agriculture than what was being proposed as "the future" as part of the Green Revolution. The limits-to-growth thinking struck a bell with a lot of people, who started to look at local knowledge and its potential. The UN conference in Rio in 1992 gave some strength and confirmation to what these people were doing, but this wasn't a big turning point.

Many of the same warnings are coming out now. Is there a difference? In the last couple of years we've seen much more attention being given to

a paradigm shift"

ecologically oriented agriculture and to the "green aspects" of the world economy. I think that the food crisis, environmental damage, political uprisings, inequalities, the immense wastage of food in the North, and the climate change discussions, all contributed to this growing interest. Some ways of agriculture are damaging and other ways are less damaging, and are possibly more resilient. There has been much more evidence coming up on how productive ecologically-oriented agriculture is. And in the last two or three years, many people have started to question whether the high-external-input intensification of agriculture is the way to go. I think that the IAASTD report played a big role as well, because the influential people involved in that assessment really made a point of making the results widely known. For a lot of NGOs, here was a multi-stakeholder process that had come to conclusions that they had made years before. It gave a lot of impetus to the policy-lobbying work and brought people in organisations other than NGOs to think about the direction in which agriculture is going.

Do you think that the internet changed on how people share knowledge? In the beginning, when we were trying to put together something for a newsletter, we were working only within our network, looking for field-level information that was not in the double-refereed journals. Now a lot of local knowledge on best practices is just put on the web. Of course, you still have to judge the validity of the information that you find. A lot of high-level policymakers will not go around the internet to find local experiences; they need some kind of selection and valuation. I think that institutions like ILEIA or its partners can do that by collecting, validating and analysing experiences, and drawing out the key policy issues and findings, and making them known.

Also at a local level? I think that influencing policy at a local level should be done by local people. There can be a role in building capacities and participatory research to enable practitioners and local experts to gather the evidence that they need, but also in getting supportive evidence from other sources. And then putting this together, and thinking through strategies of how to bring this to policymakers at a local level. A documentation process can help local organisations do their own lobbying by providing evidence.

What is the role of Prolinnova in this process? Prolinnova is trying mainly to influence agricultural extension and research organisations. The network wants to raise awareness on the capacities that farmers have to develop their own technologies, systems and institutions, which they have been doing for ages. Research and extension activities can build on those existing initiatives. We would like to link much more with smallholder agriculture movements. All too often, statements about agriculture talk about the type of agriculture that should be promoted, but not about *how* it should be promoted. At the same time, I am amazed at how much more verbal attention is given to local innovation and supporting local initiatives, at least on paper. Even though the support for transfer-of-technology approaches did not disappear overnight, some documents do recognise the importance of local initiatives. This is a different approach.

Do you have any hope that Rio+20, or the changing attitudes, will lead to changes in policies? I don't like to put all of my cards on one event, but I think that an event like Rio+20 can make a big contribution. It allows various movements to come together. You can always use Rio+20 to get your message across, not only to people that are involved in the actual event, but also around the world. Supposedly, a lot of financial support will be made available now. But we have to make sure that the right message is heard. People should also see what has been happening for decades on the margins. International organisations, like FAO, the World Bank or the bilateral and multilateral donors, are now supporting more ecologically-oriented agricultural programmes, so we can talk about a paradigm shift in these organisations. But there is a very large group of smallholder farmers and supporting organisations that have been thinking like this for decades!

LEARNING ABOUT

A holistic approach to small-scale sustainable farming

Over the years, many readers of our network's magazines have asked for support material explaining the principles behind sustainable small-scale farming. The *Learning AgriCultures* series is ILEIA's response to these requests. The aim of this educational series is to have more and better trained agricultural educators and students who are able to analyse and promote sustainable family farming systems.

Learning AgriCultures aims to stimulate a culture of learning about sustainable small-scale farming, one that sees the farm as a system rather than made up of separate components. *Learning AgriCultures* is a learning resource particularly aimed at educators seeking support material for teaching about sustainable agriculture in their courses, at a university or college level, in special NGO training courses or other professional environments. This material will feed into and provoke discussions and deeper reflections about the important contributions that small-scale farming makes, and what sustainability means in different contexts. Courses in which this series could be useful include agriculture, rural development, environmental studies, research & extension, and agricultural policy-making. They are primarily, but not exclusively, aimed at educators and students working in developing countries.

The *Learning AgriCultures* series has seven modules, each focusing on a theme connected with sustainable family farm systems, such as soil, water, livestock, marketing and knowledge. These themes are explored from different angles, from the perspective of 1) the farm, 2) key issues in the wider context, and also 3) governance issues that affect farming sustainability. All the modules include thought-provoking questions, details of educational support materials: practical cases, exercises, games, photos, videos, checklists for farm visits as well as further references (free books and websites).

The series takes a global perspective with practical cases from all over the world. The different contexts in which small-scale farmers work mean that they face very different problems and opportunities: a family living in the Andean highlands farms in a different way from a family in the Sahel. Their regional or national governance systems can provide very diverse contexts in which family farmers have to survive. In spite of the tremendous diversity, small-scale farmers share some common characteristics. The *Learning AgriCultures* series focuses on these commonalities and highlights the differences, from which people all over the world can learn from.

Educators and university lecturers around the world are now using the *Learning AgriCultures* series: they build on the key concepts and draw inspiration from the practical exercises and case studies, adjusting them to their own context and target groups. They do this independently or in conjunction with ILEIA.

For more information, please go to www.agriculturesnetwrok.org/learning, or send us an e-mail: office@ileia.org

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Address
P.O. Box 90, 6700 AB, Wageningen, the Netherlands

Visitors address
Lawickse Allee 11, 6701 AN Wageningen, the Netherlands
Tel: +31 (0)33 467 38 70,
Fax: +31 (0)33 463 24 10
E-mail: ileia@ileia.org
www.agriculturesnetwork.org

Editorial team
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