One of the first volumes of what was then known as the ILEIA Newsletter described how farmers in Rwanda were working with new ideas and approaches to rice production, including some used by Asian farmers. Michael Loevinsohn showed how farmers, through their experimentation, had managed to cultivate rice at altitudes well above normal levels. Much has happened since that article was published, including the terrible events which began in April 1994 and which shocked the world. But the seasons of life continue. Some now speak of Rwanda's "renaissance" and the development of highland rice is part of that story.

Photo: Michael Loevinsohn

Harvesting the results of their efforts, back in 1989.

Rwanda's highland rice renaissance

In a short article included in vol. 6 of the ILEIA Newsletter, almost 20 years ago, Michael Loevinsohn described his work with Rwandan farmers in the country's Central Plateau. This was (and still is) a highly populated area, in Africa's most densely populated country. Michael, currently an independent consultant and researcher focusing on the links between livelihoods, food and health, was working as a visiting scientist at the *Institut des Sciences Agronomiques du Rwanda*, ISAR, and later in the Faculty of Medicine at the National University. His work with the farmers in the Butare prefecture was supported by the *Projet Rizicole de Butare*, under the Ministry of Agriculture. This project was supposed to produce rice for the urban market (and hopefully for export), but centrally-managed production at lower altitudes was encountering serious problems. It was therefore willing to support Michael's proposal to find ways of sustainably increasing rice and other food crop production in higher altitude valleys. As he put it, he was interested in "exploring a participatory approach to farming systems improvement adapted to a situation where, on the one hand, ecological conditions and farmers' concerns vary greatly, even over short distances, and, on the other, formal research faces important human and financial constraints". He and his colleagues sought to stimulate innovation by introducing ideas that had yet to be tried and explored by researchers.

A participatory analysis of the problems farmers were facing found lack of land to be the overriding concern. They were growing various crops in the valleys on raised beds, yet the land between was unused. "Why?", Michael asked. "Too wet, nothing will grow there", farmers answered. "Well, what about rice? Farmers in Java, Indonesia, combine rice with other crops in a similar way in a system known as '*sorjan*'" (see Box). Michael had heard about it earlier while doing research in Indonesia. While riding his motorcycle through the Rwandan valleys, he had been struck by the similarity between the two situations when he first arrived.

Many of the farmers were willing to try. Some had seen rice grown in valleys 200 m lower in paddies and thought that a better idea. None had ever grown the crop before. They were also willing to try out new ideas on fertilization, including green manures. Again, an example from elsewhere, Indian and Indonesian farmers' practice of planting fast-growing leguminous shrubs before rice, especially *Sesbania*, was helpful to ground the discussion. Two local species (*Sesbania sesban* and *S. macrantha*) were known and frequently used for fodder, but the idea of using green manures was totally new.

Many farmers were eager to experiment, trying out these and other ideas and adapting them to their realities. Rice yields in the first season were not spectacular (approximately 2 tonnes per hectare), but farmers rapidly improved on that. They overcame problems of cold sterility, devised water management systems and persevered to find ways of integrating *Sesbania*. They also found innovative ways

Photo: Michael Loevinsohn

As rice production increases, this is an image which has become increasingly common in Butare, as in other parts of Rwanda.

Rice practices from Java to Rwanda

Sorjan **is practised in the non-irrigated lowlands of Java, in particular on those farms found in hilly terrain (although not necessarily limited to steep slopes). It is a traditional way of combining the production of rice and vegetables or annual crops, especially when farms have a limited amount of water available. Farmers dig up the soil on one part of a field, lowering the surface, and use this soil to raise the surface on the adjoining area, forming terraces. The lower part, called** ***tabukan*****, is used to grow rice in the rainy season. The higher part, called** ***guludan*****, is used to grow vegetables or crops such as cassava.**

The size of the ***sorjan*** **fields depends on the labour available and on the availability of water. If water is available, the width of the** ***tabukan*** **can range between 5 and 15 m, while the** ***guludan*** **ranges between one and 6 m. If water is limited, farmers frequently plan for one part of** ***tabukan*** **for every two parts of** ***guludan*****. Equally important is to consider the properties of the soil: farmers prefer not to make a** ***sorjan*** **field if the soil will dry up easily, as rice production is then more difficult. Preferably, the** ***sorjan*** **fields are made at 90 degrees to the collector canal.**

of maintaining crop diversity to ensure food security and exploit market niches. What emerged reflected local constraints and opportunities, different in each valley and each group. The 1990 article showed the importance of group work: "By acting together, farmers realised several economies of scale… But the process of experimentation itself was strengthened in a group context."

Going through difficult times

Many difficult things happened since this article was published. In one of the world's most horrendous events, the country lost more than 15 percent of its population, thousands were detained, and at least 3 million became refugees. Infrastructure was destroyed, and production declined sharply. The consequences of these terrible events are still felt today.

Michael returned two years later, in 1996, and found the groups had survived – as had their rice-based systems. Other groups had emerged in the valleys and were also growing rice. By 2008, rice was being cultivated on kilometre after kilometre in these highland valleys, building on the pioneering efforts of those farmer groups.

Many Rwandans have experienced positive changes since the genocide and its aftermath. For several years, the country has seen sustained economic growth (with statistics showing annual growth rates of up to 10 percent), supported by a considerable increase in exports and a growing number of tourists visiting the country. Governmental policies have helped increase the number of children going to school, and at the same time increased the number of citizens covered by health insurance. More and more Rwandans have access to drinking water, helping reduce the infant mortality figures. Rwanda also boasts of having the highest number of female members of parliament in the world.

Responding to the government's interest in increasing agricultural production, many policies have favoured the cultivation of rice, and special programmes have been set up in this direction. Farmers and politicians agree on its many advantages: a relatively short growth span (especially when compared to, for example, cassava), the fact that it is easier to store, or that it provides useful by-products (animal feed, or even a source of energy). As a result, production is currently estimated at 50 000 tonnes, grown by more than 60 000 farmers on approximately 10 thousand hectares. These volumes mean that Rwanda produces 70 percent of the rice it consumes: a very important figure if we consider that rice has become a staple crop, eaten almost every day.

Rwanda's "Strategic Plan for the Transformation of Agriculture", implemented by the Ministry of Agriculture, envisions an important role for rice. Since 2006, there have been two trials of what is known as SRI, the System of Rice Intensification. This involves a number of novel practices: the use of seedlings not older than 15 days, wider spacing and natural fertilization. Importantly, healthy root development and soil micro-organisms are promoted by not flooding the fields permanently. Yields of up to 8 tonnes per hectare have been achieved in Rwanda.

Continuous innovation processes

But while average yields are often higher with SRI, experience elsewhere shows they are not uniform: some fields yield 10 t/ha, while some farmers do little better than those growing rice in "conventional" ways. According to Michael, these differences mean that further research is needed. "SRI involves a number of elements having to do with crop and water management. Not all are easy to apply in all situations and it is not clear which are the most important in which contexts. Figuring that out would seem to be ideally suited to the farmer-led research approach I described in 1990." Michael remembers how, back in 1990, one of the members of the Rujangari co-operative said he didn't believe that rice needed so much water. "Sorghum and maize don't, so why should rice?" He was interested in following that up, and for several months he took some of the steps towards what later came to be known as SRI. He experimented alone and ultimately did not succeed, but his effort showed, as in so many other cases, the important role that farmers can play as researchers. "At that time, making rice (and *Sesbania*) work required figuring out variety, planting date, cropping pattern and calendar, irrigation, fertility management, etc. The farmers brought to the problem their insights as farmers who knew the land and several other crops well. So the hypotheses they tested were well-founded and were refined through their discussions with each other, within and among the groups. Farmers maintained an impressive intensity of experimentation over several seasons." So why not repeat this approach? This is especially important when considering the differences in terms of topography, soil quality, or the economic orientation of farmers. "And when it comes to changing conditions, due to climatic or market variability, that local, engaged experimental drive is going to be vital to continuing adaptation."

Motivation drives innovation, "and that is still in plentiful supply"

Those visiting Rwanda are convinced that this approach is possible, and that it can be broadened so as to consider other important concerns as well (such as the apparent link between rice production and the incidence of malaria, a major health issue in this country). Farmer innovation remains, as the original article concluded, a neglected resource. The motivation that drove that innovation, Michael says, was stark necessity "and that is still in plentiful supply". (JCT) ■

Michael Loevinsohn can be contacted at Applied Ecology Associates, Ooststeeg 119, 6708 AT Wageningen, the Netherlands. E-mail: michael@insight.demon.nl

His article appeared in Vol. 6.1, March 1990. This is available on our website, both as a PDF and as an HTML file. A fuller description of the farmer-led research can be found in an article in vol. 46 of *Agricultural Systems* (1994). Additional information was provided by Olivier Briet (o.briet@gmail.com) and Widjoraras (rarastie@veco-indonesia.net), for which we are very grateful.