



Girona 25, pral., Barcelona E-08010, Spain
Tel: +34 933 011 381
Fax: +34 933 011 627
Email: seedling@grain.org
Web: www.grain.org

GRAIN is an international non-profit organisation which promotes the sustainable management and use of agricultural biodiversity based on people's control over genetic resources and local knowledge. To find out more about GRAIN, visit www.grain.org.

Seedling

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Front cover picture China: The famous Yuanyang rice terraces carved out of the mountains.

Back cover picture Chinese rice farmer: "Traditional varieties are more resistant to pests and diseases, and they taste better than hybrids."

In this issue...

Every day the biotechnology companies bombard us with their publicity. We are told that eight million farmers throughout the world are already enjoying higher yields and lower production costs because of the benefits of genetically modified crops. And forever dangled before us is the carrot of far greater improvements in the future. We are promised that within a decade the biotech companies will have designed crops that will deal with drought, salinisation and all the other problems that we are likely to be facing as the result of global warming and climate change.

But how true are these claims? Have hybrids and GM crops really reduced costs and increased yields? And is this kind of farming sustainable? It is often difficult to probe behind the hype of the biotech companies and to find out what is happening on the ground. In this edition, we have an extensive first-hand report from China about the real impact of hybrid rice, which now covers well over half of the area under rice cultivation in this vast country. Another article brings together reports from many different countries – Burkina Faso, China, India, Indonesia, South Africa and the USA – about the impact of Monsanto's genetically modified Bt cotton, which has now been on the market for a decade. The reports uncover profound concerns among the farmers and a worrying lack of transparency among the advocates of the new technologies. In both cases, it is clear that, even if the new crops bring short-term benefits (and this is not always the case), these can soon be outweighed by serious long-term problems in both the financial and agronomic viability of the new varieties.

The biotech companies' response to the plethora of problems is to come up with another round of

technical fixes. We are already hearing about the second – and even third – generation of GM crops engineered to deal with the problems created by the first generation. And so it will continue.... Not surprisingly, many farmers throughout the world are increasingly sceptical and are returning to the tried-and-tested practices of agro-ecological farming. Support is growing for the concept of food sovereignty – the idea that communities have the right to define their own agricultural, pastoral, labour, fishing, food and land policies, in accordance with their own ecological, social, economic and cultural circumstances.

In this edition, we talk to two different proponents of food sovereignty, one in Africa, one in India. Not surprisingly, their strategies are different, for they come from very different parts of the world, but they agree on one essential point – the need for local farmers to be the ones who decide which crops they cultivate, what farming methods they use and how their produce should be marketed. In February advocates of food sovereignty from the five continents will be meeting in Mali for the Forum for Food Sovereignty.

We are planning in 2007 a special issue on biofuels, the new craze that is sweeping through the world. The biotechnology companies are moving quickly to produce genetically modified crops especially tailored for the manufacture of ethanol and other biofuels. We would like to receive any comments or information that you, the readers, have on this topic. We plan to publish a list of the ten most useful documents on biofuels, and would welcome suggestions.

The editor



From this issue onwards, Seedling is edited and produced jointly by two new members of GRAIN staff. Sue Branford (left) is a journalist with extensive experience of radio and print media, making programmes for the BBC World Service and publishing articles in several UK newspapers and magazines. She is co-author of Cutting the Wire: the story of the landless movement in Brazil, The Last Frontier: fighting over land in the Amazon, and The Debt Squads: the US, the banks and Latin America, among other books. Ralph Smith (right) is an editor of many years' standing who has worked for magazines, including the radical UK magazine Red Pepper, and for several book publishers. He was for ten years a production editor and director at the London publishers Zed Books.



Well over half of China's total rice-growing area of some 15 million hectares is planted with rice hybrids, making the country by far the world's largest producer of the crop. But little is known about the impact of the switch to hybrids. Are yields higher? Are farmers better off? Is the country losing its traditional rice varieties? Are farmers becoming dependent on the seed companies? GRAIN talked to rice farmers in the Chinese provinces of Yunnan and Sichuan to find out.

Hybrid rice in China

A great yield forward?



GRAIN

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In a remote village in Yuanyang, one of the twelve counties in the Honghe (Red River) Prefecture in the south of Yunnan province, an old man in a tattered suit wearing the trademark peasant shoes stood by the roadside. He seemed to be marvelling at the wide expanse of centuries-old rice terraces below him. The village, situated about 2,500 metres above sea level, overlooks a valley of more than 3,000 terraced patches, which contain more than 11,000 hectares of paddy fields, with strands of food and fodder crops growing in between the rice. It's a famous destination and tourists flock to the area for the breathtaking view, which, especially at sunset, is magnificent. But the old man, who lives nearby and has been farming for the last forty

years, was pondering neither the wonder that he and his ancestors had carved out of the mountains nor the sunset. He was considering, rather, another disappearance: how the culture embedded in the rice terraces was slipping away in the face of a new technological wonder that claims to have solved the age-old riddle of how to maximise rice production. At the heart of the solution is a classic "one-size-fits-all" prescription: grow hybrid rice.

For countless generations, farmers in Yuanyang chose from a huge variety of traditional rice, suited to their local ecology and cultures. Farmers would select and save seeds for the following cropping season, and lend them to, or exchange them with, other farmers in the village. Over the past 20 years,

however, the Chinese government has encouraged farmers to adopt hybrid rice. Seeds from hybrids cannot be saved, as they lose their vigour (see box, page 6). So the farmers have to buy new seeds from the seed dealers every year. Apart from the financial cost, rice ceases to have its old social and cultural functions. The hybrids also fit poorly into the local ecology. Instead of switching to a different traditional variety to deal with new pests and diseases, as they would have done in the past, farmers began using chemical pesticides, along with chemical fertilisers, to try and reach hybrid rice's promised yields. For those who have made the switch to hybrids, growing rice has become merely a matter of production, with the farmers' energy channelled exclusively into achieving the much hyped "great yields".

Early beginnings

In 1971 China's top scientists were brought together for the country's first conference on hybrid rice. They were supporters of the theory of heterosis (which states that crossing two distant genetic lines results in superior first generation offspring), and were enthused by the apparent success of hybrid maize in North America. They decided to embark on the arduous task of developing the first rice hybrids. Their efforts were successful, and in 1974 China had its first variety, developed by the 'father of hybrid rice', Yuan Longping.

The government and its scientists were anxious to get the new technology into farmers' fields as quickly as possible because, according to one of the pioneering hybrid rice scientists, they "needed to catch up with the growing population"¹ and, in their eyes, the best way to increase production was to get as many farmers as possible to introduce the hybrids into their paddy fields. The Chinese communist state was well organised for the task. The 'local work units', as the collective agriculture bodies set up by the government were called, were charged with getting farmers to abandon their traditional varieties and adopt hybrids. This they did, in much the same way as many units in the 1960s had disseminated the high-yielding varieties of other crops during China's Green Revolution. The state also provided large-scale subsidies to help cover the initial investments.

Subsidised farming

Yuanyang got its first hybrid varieties (Sayou 63 and Diyou 63) in 1979. To kick-start the programme, the government provided the seeds for free and gave farmers trying them a 50 per cent discount

on chemical fertilisers.² Even so, three quarters of the farmers in the area turned down that first offer; most were sceptical of the promised high yield. Moreover, many of the farmers whom we talked to who had opted for hybrids had stopped growing them after bad experiences. Some suspect that the hybrids are ill-adapted to their climate, while others, including the local extension officer, believe them to be unsuited to the high altitude. The richer farmers in the irrigated areas are now the only ones consistently growing hybrid rice. Nevertheless, the state keeps promoting new hybrids from other provinces to the poor farmers on the terraces, luring them into trying out the new varieties with seed subsidies and more promises of high yields.

According to the chief of the Plant Protection Centre in Yuanyang, seed subsidy is central: "It's what encourages them to adopt hybrid rice", he says.³ But the farmers we spoke to in Yuanyang and other areas of Yunnan and Sichuan think otherwise. They say that the seed subsidy is small and has little influence over their decision to grow hybrid rice; after all, the Chinese government's seed subsidy varies greatly between different locations, and depends largely on the discretion of local seed dealers and village administrators. Indeed, the discounts range from about US\$2 per kilogram of seeds to nothing at all. So why do farmers continue to grow these hybrids? The lack of options is one factor: as the official admits, "we haven't tried introducing other varieties except hybrids".



The trademark "peasant shoes" – a symbol of hard work. With the widening gap between the urban and rural populations, they have also come to symbolise poverty.

1 Conversation with Professor Jiang Yongning of Yunnan Academy of Agricultural Sciences, 5 September 2006.

2 Conversation with Mr Long, head of the Plant Protection Centre in Yuanyang, Honghe, Yunnan, 8 September 2006.

3 Ibid.





The famous Yuanyang rice terraces carved out of the mountains. The entire valley contains about 3,000 terraces of about 11,000 hectares of paddy fields – planted with both hybrid and traditional varieties of rice – with strands of food and fodder crops growing in between.

Yield guarantee

By the side of the public market in Yuanyang is an inconspicuous store that sells hybrid rice seeds. On its walls are posters of long rice panicles full of burly grains. Each shows a hybrid variety, and carries a Chinese name and four numerical characters. The posters are produced by Sichuan Longping High Tech Seeds Company. The local seed dealer says the farmers are assured of high yields with these varieties (though the guarantee does not apply if the weather is bad). From the same dealer one can also purchase chemical fertilisers and pesticides recommended for these hybrids – a “package” not so different from the one offered during the Green Revolution era of high-yielding varieties. The yields may be “guaranteed”, but only if the farmers irrigate and fertilise the soil, protect the crops from damaging pests, and pray successfully for good weather!

Most farmers try to find the money for this technology package and gamble with hybrid rice, even though the results have often been poor. The hybrid ‘yield advantage’, achieved by most farmers in Yuanyang and the other areas of Yunnan that we visited, was generally modest. On average their yield was only 500–1,000 kg per hectare more than it would have been with conventional or traditional varieties. This was similar to the experiences of the farmers we spoke to in China’s second major hybrid rice growing region, Sichuan. In the village of Wenxiang, one farmer said that his annual income from growing hybrid rice was only about 80 RMB (US\$10) more than he was earning two years ago, when he was still using traditional

varieties (*Zhenzhuai* and *Guipigu*). This falls far short of the additional cost of the hybrid seeds. Yet such is the lure of modernisation that, for many farmers, traditional varieties are now synonymous with low yields, and few express regret about their disappearance. Over the years that Chinese farmers have shifted to hybrid rice, there has been a 46-fold reduction in local rice varieties.⁴ All for the sake of inconsistent high yields.

Even when the farmers we met had increased their yields by growing hybrid rice, they had not consistently exceeded the national average of seven tonnes per hectare.⁵ For the yields vary greatly, depending on location and conditions, making the high-yield “guarantee” almost meaningless. Interestingly, the farmers we talked to who had long experience of growing hybrid rice said that, despite the claims made for them, the yields of the current hybrid varieties do not seem to be any higher than those of the first hybrids. So it seems that two decades of research – and the experience of planting 15 million hectares with different hybrid varieties – have achieved very little. Some farmers said that they had experienced no change at all in yields when changing from traditional varieties to hybrids, while others claimed that their yields had fallen.

Just as in other countries where hybrid rice is grown, these Chinese farmers’ experiences reflect not only the risk of relying on just a few varieties from the commercial seed supply chain, but also – and more importantly – the inherent uncertainty of hybrid yields. As well as being a top-down affair dominated by scientists and agricultural

⁴ GRAIN, *Fiasco In the Field: an update on hybrid rice in Asia*, March 2005. grain.org/briefings/?id=190

⁵ The figure is supplied by the ‘father of hybrid rice’ himself, Yuan Longping, “Hybrid Rice for Food Security” (2004). <http://tinyurl.com/ygb3kh>



researchers, hybrid seed development is a rigid procedure that tends to ignore, rather than to address, the gap between the yields achieved in experiments and those experienced by farmers in the field. Hybrids are far from being dependable and, to judge from the very different experiences of farmers in the field, not designed for all conditions. Yet the Chinese authorities continue to promote hybrid rice, promising ever higher yields as each new variety pops out of the seemingly inexhaustible Longping production line.

It is interesting to consider what could have been achieved if the state had supported farmer-led research instead. Would it have produced entirely different lines of better-performing farmers' varieties attuned to China's diverse agro-climatic conditions? There seems to be little space for anything "farmer-led" at the moment, especially in the area of research. A local seed expert we spoke to said: "Farmers have no research capabilities. Research is very much tied up to resources, and resources mainly come from the state. It's not likely here that farmers will receive support from the government and be able to carry out research."⁶

Chemical dependence

Yield is not the only concern among the farmers we met. The general consensus is that hybrids are more susceptible to pests and diseases than the traditional varieties. Yet the state, despite its eagerness to persuade the farmers to grow hybrids,



"I've heard that other farmers in the village have had half-filled grains from their hybrid rice varieties. So I won't try them. I'm content with my traditional variety (Huagu), which I would even recommend to other farmers."

provides them with very little technical support. After they have bought the seeds, farmers are left to their own devices. The farmers identified stem borer, leaf hopper and folder, rice blast, sheath blight, rhizoctonia rot and rice smut as the major problems afflicting hybrid rice. Typically, they use chemical pesticides to deal with these problems, a practice they have adopted only since they began growing the crop.

In the far flung villages of Yuanyang, farmers have no memory of ever being visited by government extension agents, either to explain hybrid rice or to share knowledge about effective ways of dealing with pests and diseases. In the villages of Kunshan and Huangshui in Sichuan, farmers say no agricultural extension officers or local rice scientists from the public research station have ever visited them to ask about their farming problems. Most of their "visitors" came either to introduce something (such as a new seed) or to pass on an order (such as the need to participate in a field experiment). But no one has bothered to ask them about their experiences, much less attempted to understand their situation in order to address their basic problems.

Not surprisingly in these circumstances, farmers over the last half century have not fundamentally changed the way they till the land nor noted any great changes in village life. But these days pests



One of the many hybrid rice posters adorning the walls of a small seed shop in Yuanyang in Honghe Prefecture, Yunnan. From panicle length to seed density, everything from this variety looks tempting.



⁶ Conversation with Professor Jiang Yongning of Yunnan Academy of Agricultural Sciences, 5 September 2006.

“Hybrid vigour”: reality or myth?

Hybrids are produced by crossing two inbred varieties of a particular crop. Breeders begin by selecting a number of crop lines with desired characteristics, and self-pollinating them for several generations, thus creating inbred “pure lines”: plants that are homozygous and produce exact clones of themselves. The theory is that if you cross two distinct inbred pure-line parents, the offspring will be “superior”, particularly in terms of yield. This is called the “heterosis effect”, or hybrid vigour.

However, the heterosis effect disappears after the first generation, so it is pointless for farmers to save seeds produced from a hybrid crop. This makes it very profitable for seed companies, since farmers need to purchase new seeds every season to get the heterosis effect each time.

Scientists have yet to explain how heterosis works and some, such as Jean-Pierre Berlan, of the Institut National de la Recherche Agronomique in France, believe that it is actually a myth. Berlan maintains that while hybrid seeds may demonstrate some hybrid vigour, they appear to produce high yields because they out-perform by a significant margin the parental lines they were crossed from. This is only to be expected, because the yields from the parental lines are depressed by the many backcrosses that breeders must make for them to be stable. Thus, hybridisation does not necessarily produce improved varieties; it only improves upon the parental lines.

While the scientific theory of heterosis remains unexplained, the economic impact does not. The costs of hybrid rice seeds are very high: up to 15 times higher than seeds from conventionally bred varieties. The major problem is that, in the hybrid seed production process, seed yields are very low, making it costly for companies to produce large quantities of hybrid seed.

Some farmers call hybridisation “the scam of the century”. Why? If you compare the recent history of two contrasting crops in a country like France – wheat, which is self-pollinated like rice, and maize, which cross-pollinates and can easily be hybridised – the picture is shocking. Wheat and maize were both grown from local populations until hybrid maize took off 40 years ago. Since then, the public research sector has continued to work on improving non-hybrid wheat, while the private sector has taken control of maize breeding, which has become entirely devoted to hybrids. The result for the farmer is clear. Between the early 1960s and late 1990s, wheat and maize yields both doubled, with wheat performing slightly better than maize. But with seed prices the picture is very different: by the late 1990s a kilo of wheat seeds cost the farmer three times more than he received for a kilo of wheat at harvest time, whereas for maize the ratio was a colossal 30 times. For hybrid maize, then, the yield increase has been somewhat lower than for non-hybrid wheat while the price increase has been spectacular. Research to improve the performance of open-pollinated maize varieties – which the private sector is not interested in, since farmers can save the seeds – might have provided much more productive and sustainable options than hybrids.

Adapted from: “Hybrid rice in Asia: an unfolding threat”, GRAIN et al., March 2000 <http://grain.org/briefings/?id=136>



and diseases are more prevalent and virulent, and pesticide use has increased to an alarming degree, giving rise to incidences of pesticide poisoning and cycles of pest resistance. A few farmers had also observed an increase in both the volume and the variety of pesticides now on the market to deal with the new pests and diseases.

But pesticide use is not the only input on the rise with hybrids. Farmers have also noticed an increase in their fertiliser usage. A local seed expert in Kunming with 40 years' experience in rice development confirmed this.⁷ “Farmers growing hybrid rice need to use more fertilisers”, he said. A researcher with the Society of Hani Culture in Honghe has a fitting way of describing what is happening.⁸ “It is as if the paddy field has got addicted to heroin”, said Li Qibo. “The more rice output you want from it, the more chemicals you have to give it.”

Meanwhile, the old man by the roadside of the Yuanyang rice terraces has no time for hybrids. He is sticking to the traditional red rice varieties that he has grown all his life, in rotating 3-year cycles, on his 3-*mu* rice field (1 hectare = 15 *mu*). He says his varieties taste better and command a better price than white rice. They are also resistant to pest and diseases, so he has never used any chemical pesticide or fertiliser. The yield is enough for the family's consumption – about 750–1000 kg from his rice field, or 5 tonnes per hectare. He has no desire to grow hybrid rice, as he has seen several other farmers in the village face misfortune because of it. Once in a while he misses his children, who have all moved away, preferring to take their chance in the city rather than to put up with the poverty in the countryside. The old man doesn't blame them, but wonders, in the face of continuing rural exodus, what will happen to his farm and the traditional varieties once his own generation has died.

7 Conversation with Professor Jiang Yongning, of Yunnan Academy of Agricultural Sciences, 5 September 2006.

8 Quoted in GRAIN, “Fiasco In the Field: an update on hybrid rice in Asia”, March 2005. grain.org/briefings/?id=190

Rice as cash crop

In Yangjiazhai village, an hour's drive from Gejiu city, a woman farmer carries, on two ends of a bamboo stick perched on her left shoulder, bundles of sweet potato cuttings collected from a neighbour's field. These are fed to her hog. This year she has no rice crop because some local officials decided to use her land for a tomato experiment. Growing rice has long been her family's main source of income, their primary cash crop. Last year, before the tomato experiment, she tried a new hybrid rice variety that she bought from a private seed company on the advice of a friend who works at a seed shop in the city. The hybrid was badly damaged by pests and diseases and her yields were very low. Next year, if she gets her field back, she will probably plant hybrids again, because she has few other options. With the hybrid invasion, the old practice of seed exchange is breaking down, making it almost impossible for farmers to obtain the traditional varieties. With money so tight, she wishes farmers could save hybrid seeds from year to year.

Like her, most of the rice farmers around Gejiu are growing crops for the market. Their focus is on yield and prices, and they grow primarily hybrid rice.

The hybrids are private sector varieties, generally sold by the local state seed companies, although some private dealers are now entering the market. Hybrid rice was introduced in this area in the early 1980s through pilot experiments organised by the local bureau of the Ministry of Agriculture. Two villages were selected for the experiment and all farmers were obliged to participate.⁹ After one season, the experiment was declared a success and the local government immediately began a major campaign to convert as many rice farms as possible to the production of hybrid rice.

According to one retired local seed specialist, the government invested heavily in the promotion of hybrid rice during those early years. They even guaranteed compensation should farmers fail to get yields of more than 400 kg/mu.¹⁰ Formerly, farmers grew over 70 local varieties of rice, none of which exists today. Once in a while a farmer would say to us, in a tone of resignation, "we have no choice today but grow hybrid rice", and most of the farmers we met – but few of the scientists and government employees – had fond memories of the distinct taste of certain traditional varieties, as compared with the bland flavour of the hybrids. They also pointed out that some old varieties were much better for specific uses, such as preparing

Farmers in Yuanyang threshing rice grains. It is a highly social process.



⁹ Conversation with local extension officer in Gejiu, 7 September 2006

¹⁰ Conversation with a former seed department head of the plant protection centre in Gejiu city, 6 September 2006.



rice noodles. But all of that has disappeared. They are left now with a vague hope that the scientists, whom they never see, will improve the yield, flavour and pest resistance of the hybrids.

A sad fact about growing hybrid rice as a cash crop is that farmers can produce only one harvest a year. This, together with the expense of having to buy seeds every year, means that the families have a very low income and do not have the assurance, as in the past when they grew rice primarily for their own consumption, that they will never go hungry. In fact, some farmers told us that they do not always make enough from the sale of their rice to cover the costs of their family's rice consumption for the year. Thus farmers regularly shift out of rice cultivation into crops such as sugar cane or vegetables, which can potentially bring in more money. In Gejiu, about one third of farmers grow sugar cane under contract with a local sugar factory. They normally get returns of about US\$250 per mu – a lot better than the US\$100 they earn from hybrid rice. But because the price of sugar fluctuates greatly, they do not grow cane on a regular basis. Some grow vegetables after harvesting their rice. Carrots, they say, need few inputs and give good returns. Still, there were very few well-off farmers in the villages we visited, and the objective of most crop diversification was merely to make ends meet. A common feeling was that they would rather be growing something other than hybrid rice – if only they had the choice.

A captive market

With hybrid rice grown in over half of China's rice lands, private seed companies are positioning themselves to cash in on this big captive market. Origin Agritech, a foreign-based seed company and one of the biggest in China, with a subsidiary in Beijing, recently bought about 95 per cent of Denong Zhengcheng Seed Company, which operates mostly in south-west China and owns the rights to 10 hybrid rice lines. It paid about US\$6.2 million in cash.¹¹ This take-over is accelerating the liberalisation of China's seed industry and introducing the dynamics of competition into a formerly state-controlled seed market. Indeed, foreign companies are beginning to move in. The German-based chemical company Bayer – responsible for the genetically modified rice Liberty Link, which contaminated farms in the United States – has announced plans to expand its operation in China. According to its South-East Asia manager, they plan to collaborate with a local seed company in a joint venture.¹²

Most of the farmers we visited were apprehensive about these developments. Some worry about the seed subsidy being scrapped, once private companies take control of China's seed sector. Others fear that the new companies may raise the price of seeds once they dominate the market. A number worried about the quality of the seeds, saying that some private companies had provided 'fake seeds'. They or their neighbours had bought hybrid rice seeds, advertised by the companies as high-yielding, to find at harvest time that the grains were only half filled. Some had experienced crop segregation (that is, inconsistent height and maturity), while others said that their seeds had failed to germinate. A woman farmer said she did not want to buy seeds from private companies. "Seeds are very important. If the seeds prove to be fakes, we will be in a very dangerous situation."

The state has introduced some safeguards. It has set limits on foreign ownership and established a cap on the price the seed dealers can charge.¹³ The state seed companies also provide some protection. The Geiju Seed Company, for example, selects what it thinks are the best two or three hybrid varieties every year and sells only these varieties, thus providing farmers with some reassurance about quality. According to one farmer in Sichuan, "if too many private companies enter the market, they will sell so many different seeds that farmers will find it difficult to choose between them. We might end up planting bad seeds, because private companies do not provide a guarantee."

This farmer's comments highlight the dangers facing China's peasants. Few had any idea about the slow but sure liberalisation of the country's seed sector, and none knew anything at all about the pressures coming from abroad. They have no experience of dealing with the transnational seed corporations, which are set to pounce with their hybrid and genetically modified rice, once the gates are open. Perhaps most alarmingly of all, they retain a deep trust in their public scientists and do not realise that these people are already colluding with the private companies, with some scientists getting rich on the sales of hybrid rice seeds.

A leading Chinese researcher dismissed these concerns about the future. "I am not worried about private companies controlling the hybrid rice seed market. There's too much competition from the public sector," said Professor Jiang of the Yunnan Academy of Agricultural Sciences.¹⁴ But it's increasingly hard to separate the public from the private with hybrid rice in China. For instance, Yuan Longping, China's leading hybrid

11 "Origin Agritech Purchases Additional 42.42% Interest In Denong Zhengcheng", <http://tinyurl.com/wy9us>.

12 "Bayer CropScience Plans To Expand Global Rice Hybrid Opportunities", <http://tinyurl.com/y34ur3>.

13 Interview with Ms Xia, a pest and disease expert in Gejiu, 6 September 2006.

14 Conversation, 5 September 2006.

Do hybrids make a difference? The case of Canadian maize

It is easy to see why seed companies are so interested in hybrid crops: farmers can't save seeds from them. In the words of the late Don Duvick, one of the seed industry's most important hybrid maize breeders: "Private firms are attracted to the hybrid seed business because of the built-in plant variety protection of hybrids." Another hybrid crop breeder, Jeanne Crannell of Japan-based Sakata, the world's seventh largest seed company, puts it this way. "All of our focus is on hybrids," she says. "It's what you can control and keep ownership of."

The seed industry is not usually so candid about its interests in hybrids. More often it talks about hybrids' great yield advantage. In Canada, for instance, seed companies regularly point to the increase in maize yields after the introduction of hybrids in the 1930s and 1940s to justify their focus. But the real story is not so simple.

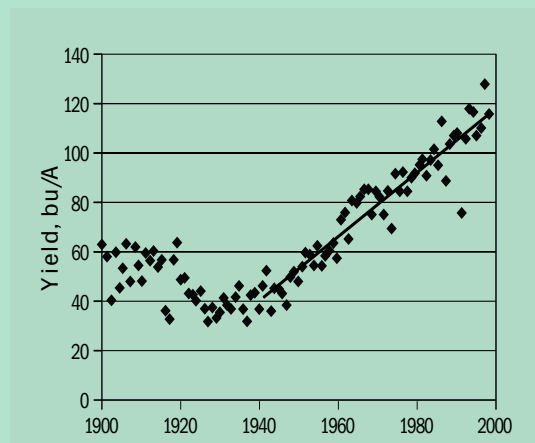
In the 1930s, just prior to the widespread adoption of hybrid varieties, yields of maize in Canada were at an historic low. Plant breeders had stopped working on maize a couple of decades earlier because maize, a plant which easily cross-pollinates, was not compatible with the new Mendelian genetics-based breeding systems. Overall production of maize had also bottomed out. There wasn't much of a market for the crop at the time and the traditional maize culture of Canada's indigenous peoples was all but wiped out.

When you go back a little further in the historical records, you see that the average yields of maize in 1930 were only half of what they had been in 1900. It wasn't until the mid-1960s, 40 years after Canada launched its hybrid maize breeding programmes, that yields returned to the levels that many farmers were getting with open-pollinated varieties at the beginning of the 20th century, without pesticides or chemical fertilizers (see Figure 1).

It was only in the 1950s that average maize yields began rising significantly, but hybrid breeding techniques by themselves have had little to do with these increases. The main factor was the changing production environment, especially the move to increasingly dense planting and the heavy use of chemical fertilizers and machinery, which began in the 1950s.

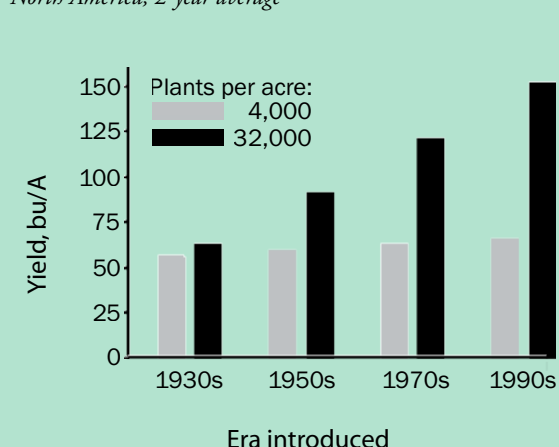
Recent studies show that, under low-stress environments, there are actually no significant yield differences between the maize hybrids grown in North America in the 1930s and those from the 1990s (see Figure 2). But there are big differences under high-stress environments, where plants are sown close together. The ability of today's maize hybrids to give higher yields under these dense conditions has nothing to do with "hybrid vigour". According to one recent study, "These changes in stress tolerance are likely the by-product of plant breeders selecting for yield at high plant populations and over a wide range of growing environments." In other words, the yield increases are really due to the old method of selection or population breeding, which farmers have relied on since agriculture began.

Figure 1. Maize yield averages in Canada during the 20th century



Source: Statistics Canada, as cited in T.W. Bruulsema, M. Tollenaar and J.R. Heckman (2000) "Boosting crop yields in the Next Century". *Better Crops*, 84 (1): 9-13: <http://tinyurl.com/ygl257>.

Figure 2. Maize grain yield response to low and high plant populations for hybrids from four eras of plant breeding in North America, 2-year average



Source: Pioneer Hi-Bred: <http://tinyurl.com/yzxcj4a>




rice scientist, is a shareholder in a hybrid rice seed company named after him. Moreover, the whole idea of “public” is blurred by the fact that hybrid rice is increasingly part of China’s empire-building strategy. China has been wooing African countries, where it wants access to energy and mineral resources, through a number of hybrid rice technology transfer projects, most recently in Sierra Leone, Guinea and Mozambique. In Asia, it signed a similar technical cooperation agreement with East Timor in which it committed itself to providing assistance in the production of hybrid rice. Projects to develop Chinese hybrid rice are also under way in Malaysia, the Philippines, Bangladesh, Indonesia, and Pakistan.

Sad truth

The great Chinese philosopher Lao Tzu once said “the people are hungry: it is because those in authority eat up too much in taxes”. In rural China today, farmers are celebrating the abolition of the agricultural tax, in force for almost half a century. The tax was enacted in 1958 during Mao Zedong’s “Great Leap Forward” and was finally abolished by parliament in January 2006. Farmers are saying that scrapping this tax has encouraged more farmers to grow rice, and has already improved

their standard of living. If this is true, there is a sad irony in it: during the last three decades the Chinese government has invested heavily in hybrid rice, with the declared objective of improving the living standards of farmers, something which it has largely failed to achieve; yet the simple abolition of an old law, achieved with the flourish of a pen, has brought about the wished-for benefits to the farmers in less than a year.

Most of the farmers who opted for hybrid rice depend on farming for their livelihoods and accepted the new variety because they were told, time and again, that it would bring them a higher income. Yet almost three decades of growing and improving hybrid rice have brought few benefits. The cost of farming is increasing, while real incomes remain stagnant. Most rice farmers remain poor and are becoming ever more dependent on chemical fertilisers and pesticides. The only improvements experienced by the farmers we spoke to came from the money that their children, working in the cities, had sent to supplement the family income. But they also said that their kids missed the countryside and would rather be back home, if only the poverty were not so desperate. Just like the Great Leap Forward, the promised “Great Yield” has failed to deliver. 

Farmers in Gejiu thresh rice grains at the roadside. The rice is spread on the road to dry in the sun.



Reclaiming livestock keepers' rights

Patrick Mulvany and Susanne Gura

At an intergovernmental conference organised by FAO later this year, pastoralists and small-scale livestock keepers will have an opportunity to challenge governments about the perilous situation of their livelihoods, their reduced access to resources and the resulting losses to their livestock breeds. Without their efforts in their grazing territories and on their farms, the world's precious diversity of livestock breeds will disappear. The conference on sustaining livestock breed diversity – similar to the 1996 Leipzig conference on the conservation of crop seed diversity – will be held in Interlaken, Switzerland, 1–7 September 2007.¹

There is real cause for concern.² About 20 per cent of farm animal breeds have been brought to the brink of extinction as world agriculture narrows its focus to those that yield well on high-protein and concentrated energy feeds. One breed is being lost each month, and the globalisation of livestock markets is the biggest single factor hitting farm animal diversity, according to FAO.

Corporations have dramatically increased their control over the livestock industry in recent years. Only two companies now dominate the global supply of day-old chicks for industrial egg production, and four companies supply hatching eggs for broiler production.³ Consolidation is also occurring between feed suppliers and animal breeding corporations.⁴ Those that control livestock genetics are all headquartered in OECD countries.

Hybrid breeding and other closed systems have become standard in poultry and pig breeding, and they are now emerging in sheep and cattle breeding. These trends have the effect of "locking up" genetic resources in the hands of a small number of global players. Corporations are also using patent law to exert control. Monsanto is seeking patents in 160 countries, not only on methods of breeding pigs but also on pig herds and their offspring.⁵ Pastoralists and small-scale livestock farmers are already excluded from industrial livestock production, and they are now losing control over their breeds. There is also increasing development of transgenic animals containing patented genes for pharmaceutical and other purposes. In December 2006, the EU agreed a new seven-year 55-billion-euro

research programme, much of which will be on biotechnology and animal genetics.

The result is a food system that is dangerously dependent on a few corporations and a vulnerable, narrowing genetic base, while the broad range of diverse livestock breeds, which have been selected for every production challenge by knowledgeable livestock keepers over millennia, is fast disappearing. There is an urgent need for pastoralists and other livestock keepers to reclaim their rights.

FAO has asked the IPC for food sovereignty (which is a global network of civil societies and social movements concerned with food sovereignty) to facilitate a civil society process with organisations of pastoralists, small-scale livestock keepers and wider civil society in preparation for the Interlaken conference. At the conference they will have a chance to call for recognition of their right to produce their diverse livestock breeds and for measures to protect their food sovereignty. This process will build on work initiated in 2002 at the Forum for Food Sovereignty and further developed at meetings, organised by the League for Pastoral Peoples and others, which resulted in the Karen Commitment to indigenous/pastoralist livestock keepers' rights (2003) and the Bellagio Brief (2006).

In 2007, civil society organisations and social movements will be able to raise these issues at the World Social Forum in Nairobi in January, the Nyéléni World Forum on Food Sovereignty in February, the FAO Commission on Genetic Resources for Food and Agriculture (4–8 June), and at a meeting of pastoralists in Spain later that month. They have a chance to call for the implementation of Livestock Keepers' Rights – a bundle of rights that includes rights to grazing, water, markets and participation in policy decision making as well as rights to the genetic resources of their animals.

However, at the recent meeting of the FAO intergovernmental technical working group on animal genetic resources in December, which was preparing the Interlaken conference, FAO member states missed a major opportunity to agree on steps to secure livestock keepers' rights. In their reviews of the state of animal

genetic resources, many countries had noted that globalisation and perverse incentives promoting industrial livestock production were the main economic reasons for the loss of breeds and a few governments voiced these concerns. For example, some suggested text that would prohibit the patenting of animal genes.

But most of the debate was dominated by the US, Canada, and Australia, countries that have few indigenous breeds, and the EU. They are all represented in a committee of about a dozen countries, chaired by the US, which will redraft a paper on strategic priorities for action. This paper will be negotiated by the FAO Commission on Genetic Resources for Food and Agriculture in June, before being submitted to the Interlaken conference for agreement.

Unless governments challenge the power imbalance in production in favour of pastoralists and small-scale livestock keepers, livestock breeds will continue to be lost at an alarming rate.

For further details, contact:
Maryam Rahmadian, CENESTA
maryam@cenesta.org
Susanne Gura, League for Pastoral Peoples,
gura@dinse.net
and see
www.pastoralpeoples.org
and
www.ukabc.org
patrickmulvany@clara.co.uk

1 In preparation, FAO will publish the "State of the World's Animal Genetic Resources for Food and Agriculture" and, at the conference, governments will agree "Strategic Priorities for Action". First drafts on the FAO website. See:

<http://tinyurl.com/y35n6u>
<http://tinyurl.com/y47bkg>
<http://tinyurl.com/y3zfzg>

2 For more in depth analysis of the issues see: S. Gura (2003) *Losing livestock, losing livelihoods*.
<http://www.grain.org/seedling/?id=220>

3 I. Koehler-Rollefson (2006) "Concentration in the poultry sector".
<http://tinyurl.com/ydczcs>

4 Nutreco, based in the Netherlands, is Europe's largest animal compound feed and fish feed producer and it also has a breeding division, Euribrid, which comprises Hypor, the world's second largest pig breeding company, Hybrid, the world's second largest turkey breeding company, and Hybro, the world's fourth largest broiler breeder. See: S. Gura (2006) "Concentration in the livestock breeding industry", <http://tinyurl.com/t6fg2>

5 Greenpeace (2005) *Monsanto files patent for new invention: the pig*.
<http://tinyurl.com/yynrgx>



“Food Sovereignty is the right of peoples, communities, and countries to define their own agricultural, pastoral, labour, fishing, food and land policies which are ecologically, socially, economically and culturally appropriate to their unique circumstances. It includes the true right to food and to produce food, which means that all people have the right to safe, nutritious and culturally appropriate food and to food-producing resources and the ability to sustain themselves and their societies.”

From: *Food Sovereignty: A Right For All*, Political Statement of the NGO/CSO Forum for Food Sovereignty. Rome, June 2002

Nyéléni – for food sovereignty

GRAIN



Nyéléni 2007 – World Forum on Food Sovereignty will be held in Mali on 23–27 February 2007. The meeting will bring together 600 delegates from five continents to reaffirm the right to food sovereignty and to begin an international drive to reverse the worldwide decline in local community production of food. The forum has been organised by an alliance of social movements – including Friends of the Earth International, Via Campesina, the World March of Women, the Network of Farmers’ and Producers’ Organisations of West Africa (ROPFA), the World Forum of Fish Harvesters and Fish Workers (WFF) and the World Forum of Fisher Peoples (WFFP) – who took a deliberate decision to hold it in Africa (<http://nyeleni2007.org/>).

Rural Africa has been devastated by three decades of free trade and anti-peasant policies imposed on the continent’s governments by the World Bank, the International Monetary Fund, the World Trade

Organisation (WTO), the United States and the European Union. Today thousands of rural and urban families suffer from hunger, despite the continent’s abundance of natural resources. But the fightback has begun. Mali, where the conference is to be held, is one of the first countries in the world to have made food sovereignty a national policy priority.

As becomes clear in our interviews with two leading activists – Mamadou Goïta from Mali, and P.V. Satheesh from India – different strategies are being adopted in different parts of the world in the fight for food sovereignty. Yet campaigners worldwide are united by the common goal of recovering for local people the right to decide what food they should cultivate and what methods they should use. Even though the way food sovereignty is implemented may vary widely, its successful practice is easy to identify (see boxes on Bangladesh and Peru on pages 16 and 17).

Nyéléni – the woman who put men to shame

Nyéléni is a symbol in West Africa. Her story is well-known and there are many songs in the region about her feats. She is famous because, in the masculine world of farming, she was a champion. Living many decades ago, she was an excellent farmer, an inspiring speaker and, most important of all, she railed against the male-dominated system that excluded women from key farming processes and allowed men to impose their will on the rest of the family. Not surprisingly, she became a symbol of women's resistance.

Nyéléni took part in the annual weeding contest, a competition from which women until then had been excluded. Lasting several days, it pitted the fittest men in the 16–45 age group against each other to find out who, using the traditional daba, could weed a field most quickly while doing the job to the highest standard. Nyéléni entered and won, carrying off the trophy, known as the ciwara. It was a great victory for women.

Mamadou Goïta

Mamadou Goïta, a social economist, is executive director of the Institute for Research and the Promotion of Alternatives in Development (IPAR) in Mali, West Africa.

When was the term 'food sovereignty' first coined?

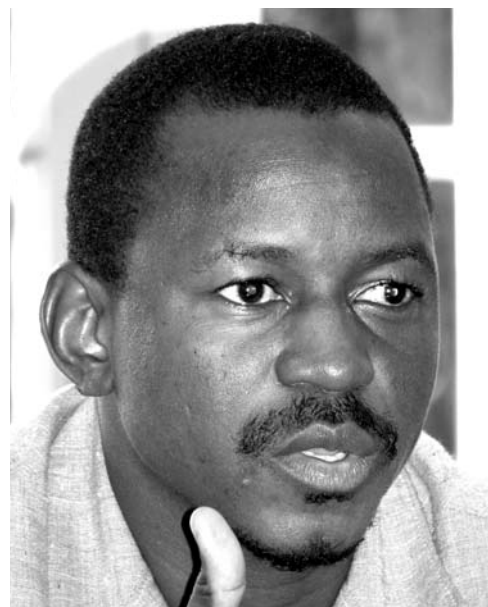
It has been used since 1996, when people for the first time realised they needed a new concept. We became aware that the term "food security", which we had used until then, was not adequate and that the international community was manipulating the term to fool us. We realised that the giant food corporations were taking advantage of the WTO negotiations on trade in food, and of all the talk about food aid, to gain control over food production worldwide and to make everyone dependent on them for food. In Mali we realised that the food we were eating was starting to come from all over the world – from western countries, from India, and so on. We realised that we were being hoodwinked, that we were being told that, just because we had enough food to eat, we had food security. But this was not the case. Corporations might even make food cheaper, but this did not mean that we had real food security. If there were to be a dispute with the country that was supplying us with food, the trade could stop. What would happen then? Our population could even go hungry. There is also the term "food sufficiency". We use this to describe a country that is self-sufficient in the production of food. But this term is not what we need either, for it isn't precise: it doesn't tell us whether the food is available to all the population or what kind of food is being produced.

Food security and self-sufficiency are technical terms. Small farmers felt they needed a broader concept that brought a political dimension to the discussion about food.

So how do you define food sovereignty?

Food sovereignty has two elements. First, it means the right of every person, of every group, of every nation, to choose what it eats. This is very important. To allow the population, on the basis of its cultural, spiritual and ethnic heritage, to choose what it wants to eat. And second it means that people have the right to decide freely how they will produce what they want to eat, without being influenced by other nations or outside institutions. They have the right to decide, according to their culture and their beliefs, with whom and in what way they will produce their food. And when I say food, I mean all the food we eat, both crops and animals. So food sovereignty enshrines our right to eat what we want to eat, to produce what we want to produce, and to do it in the way we want to do it. It is a deeply political concept and it has many dimensions.

The first dimension is the seed issue, which is related to research in our countries. In Africa the national research institutes belong today to multinational corporations or to bilateral bodies funded by multinational corporations. This means that we don't have any sovereignty over the type of research that is carried out. We can only do research into things that they want us to do research into, so seed research is not happening in areas we consider important. This has to change. The second



Mamadou Goïta



dimension is the question of land tenure, access to land. You cannot talk about food sovereignty unless those who produce food are involved in managing the land they work. They have to be fully involved in it, to build the fertility of their land. So the question of land tenure has to be settled in the process of constructing food sovereignty in a country. A third dimension is financial: how we are funding our farming in terms of access to credit and to other means of production? For farmers to be able to produce in a sustainable way – and sustainability is an integral aspect of food sovereignty – they need access to certain types of funds. Adequate funding is essential to food sovereignty.

All this is very important for a country like Mali, where more than 80 per cent of the population lives in the rural areas. Nearly all of this population lives from the land – cattle-rearing, fishing, crop farming and so on – and more than 97 per cent of these are small-scale farmers. So it is very important to be very clear about the kind of farming we are defending. Are we talking about small-scale production or industrial production? If it's the latter, we are excluding almost all the population. The second criterion is: who are we producing for? Are we producing export crops? This is what is happening in most countries in West Africa. Farmers are producing cash crops to have money in their pockets and no one cares about producing food for the local population. Take Benin, Burkina Faso, even Chad. In these countries the best-organised crop is cotton. The decision-makers are not putting money into staple foods such as maize, sorghum and millet. This is a choice they have made and this choice is against food sovereignty. It is giving priority not to food but to money-making.

Saving seeds, Indian style



Is it different in Mali?

In Mali it used to be like that but we are getting the government to change. Now our policy is being increasingly conducted by farmers' organisations. It's a process and we have a dialogue. Sometimes the government does what we want but at other times it refuses. If the government behaves wrongly, we denounce it. But if the government behaves well, we support it. Little by little the government is beginning to understand that it is important to listen to what we are saying. In this sense our democratic process is a success. It's not enough, for the process has to be strengthened, but at least we have made progress. Our strong card is to tell the government that it cannot construct a successful agricultural policy without involving farmers.

Are the farmers well organised?

Yes. The National Coordination of Farmers' Organisations (CNP) is strong. This is composed of all the main farmers' organisations in the country and it has a few people, like myself, who provide technical support, analysis and training. This allows the CNP to debate with the government on an informed basis and to come up with concrete proposals. So, at times, the government says, "OK, just tell us what you want to do, the methodology you want to use." So we help the Coordination to develop their methodology, particularly in the process of getting issues debated throughout the country.

We have done this on the recent farm policy law. We held debates throughout the country on land tenure issues, agricultural research, rural investment, credit schemes for rural areas, and so on. People debated everything at grass-roots level. All the ideas that came out of the debate were brought to regional level. We have eight regions in Mali. And then the issues were taken to national level. There they were debated with other groups in civil society. Then we prepared the first draft of the new law and a memorandum for farmers. We put in the memorandum the key things that we wanted to defend in law, and that is how the issue of food sovereignty was raised. It was decided that food sovereignty would be the key principle of our agricultural policy. I facilitated the workshop that decided this.

We gave the document we had prepared to the government but we didn't end the process there. We had allies in the National Assembly, who monitored what was happening. And, in fact, the government did not present to the Assembly the document we

had given them. They had taken out some things and put in others. Some deputies came to the CNP and asked for our original document and checked it against the Bill the government had presented, which we called the “genetically modified” copy of our document. In three days they found more than 300 alterations. They restored the original version and it was this document that was debated in the assembly. When the bill was put to the vote in mid-2006, over 100 farmers’ representatives from different regions went to the assembly, and the Bill was approved. Now we are working on the implementation of the new law.

Why was it decided to hold the conference on food sovereignty in Mali?

The decision was taken at international level.

There were many reasons. First of all, it is the first time a country has decided to put food sovereignty at the centre of its agricultural policy. We have a commitment from decision-makers to do this. We have shown that dialogue is possible. People are saying that they want to go to Mali and see how we have managed to do this. Second, Mali is an important space to debate Bt cotton, because the resistance is in this country. If you take all the West African countries, the main resistance is in Mali and, to a lesser extent, Benin. Mali is pushing the government to take a position against GMOs and it was in Mali that we held an international tribunal to debate the pros and cons of GMOs. We also organised the World Social Forum, where we hosted 21,000 people. So we have some capacity for holding meetings, though Nyéléni should be far smaller.

P.V. Satheesh

P.V. Satheesh is director of the Deccan Development Society, Andhra Pradesh, southern India.

How is food sovereignty different from food security?

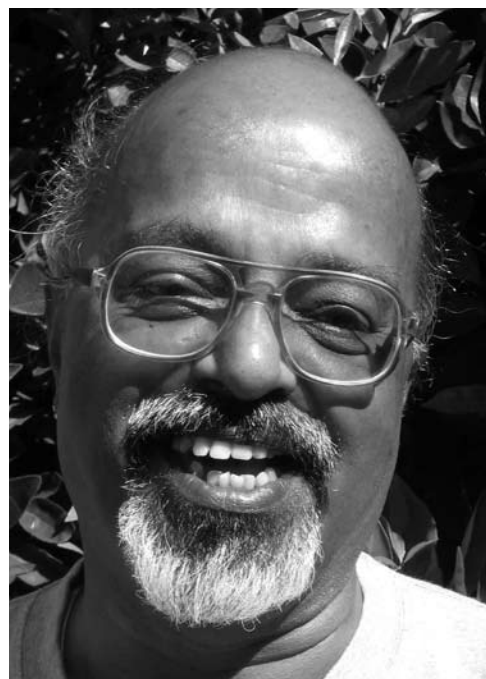
The whole of civil society was obsessed with food security for a very long time. It was a good obsession, because everybody knows that the poor are deprived of food and that they must have access to food. But, with this obsession, people forgot to ask how the food was produced and how they would have access to it. The food industry, the big corporations, realised that this oversight gave them an opening. But it was only in 1996, at the World Food Summit in Rome, when it was declared that trade could be a tool of food security, that alarm bells began ringing. We realised that we had made a great mistake and that we had allowed the food giants to hijack the term. This was not what we wanted. We needed a new term. So Via Campesina – I think it was them – coined the term ‘food sovereignty’.

Now for peasant communities, rural communities and indigenous communities, food sovereignty means the right to produce their own food, and not to obtain it from the big agro-giants in the supermarkets. It means asserting their right to their culture. To deny people their food is a political act. That is the way you suppress and subvert cultures, because food is an integral part of a people’s culture. So, if you don’t eat the food you are used to, and you are fed another kind of food just to fill

your belly, it’s an insult to your civilisation. I come from south Asia. We have a millennial history of producing our own food. And, if the United States, which is only a few centuries old, comes and tells us that we are inefficient in producing food, that they should produce it for us and that we should just produce cash crops, like cotton, tobacco, sugar cane and so on, then they are insulting our whole civilisation. And they are defending a false idea of efficiency, for transporting food over thousands of miles is a profoundly inefficient act, if you look at the real costs. If in the past century oil was the tool of neo-colonialism, then in this century food and seeds are its tools. So, considering all these aspects, food sovereignty has become the dominant issue for us today.

So families in India that you work with are practising food sovereignty, even if they don’t call it by that name?

It is in their genes to produce all the food they need. They never look for food outside their communities. I know hundreds of women who



P.V. Satheesh



Autonomous Research and Learning Networks in Bangladesh

Nayakrishi Andolan is a peasant movement in Bangladesh that includes more than 100,000 farmers supported by UBINIG (Policy Research for Development Institute, based in Dhaka). UBINIG and Nayakrishi Andolan are committed to building a Peasant World University, an institution capable of generating new, inclusive learning on agrarian livelihoods through horizontal networks that build on marginalised expressions of living knowledge. This living knowledge is located in farming practices, products, fields, landscapes, and in the villages made up of men and women, old and young, potters and farmers, artisans and healers, fishers and hunters, leaders and priests, storytellers and musicians.

Nayakrishi Andolan and UBINIG have combined to put into practice the art and science of learning by doing through a variety of interrelated knowledge-producing activities. These include systematic rethinking of agriculture as the art of generating and managing both cultivated and uncultivated ground, with innovative practices that go beyond the creation of new technology to include the discovery of complex ecological interactions embedded in everyday language and rural livelihoods. Rural people's living knowledge cannot be harnessed by the powers of writing and conventional thinking alone. Nayakrishi Andolan thus promotes innovation in language that captures the dynamics of oral culture as the medium of living knowledge. This approach has made it possible for the Nayakrishi Andolan to collect and preserve seeds of biodiversity, using oral culture to secure the collective memory of not only the properties of plants (edible wild plants, medicinals, crop varieties, and so on), but also the combinations of plants and other life forms that can contribute to ecological farming.

The institutional and organisational ramifications of learning innovations of this kind have been far-reaching. They include the creation of Nayakrishi Seed Networks, regional Natural Resource Auditing Committees, and also a network of Birth Attendants and Medicine Women. These are strong networks that contribute directly to biodiversity-based farming practices, which are steadily expanding because of their productive capacity and ability to meet various household needs. Seed huts act as spaces for the exchange of seed and knowledge and as living monographs of particular farming strategies. Field experiments based on these seed collections are organised by UBINIG Centres located in all the major ecological zones of Bangladesh, in cooperation with national scientists and plant breeders. These experiments allow farmers directly to test claims of the Green Revolution regarding the inherent inferiority of local seeds in comparison with the few varieties that make up the commercial seed system. They enhance the capacity of farmers to resist the monoculture imposed by techno-scientific and commercial paradigms of food production. The findings of these and other experiments are celebrated nationally and locally in biodiversity festivals linking the act of seed-saving to the spiritual practices of Bengal through poetry, song, and the living knowledge of wandering musicians. Last, the knowledge generated by the farmers of Nayakrishi Andolan and UBINIG is contributing to the development of a national discourse on ecological agriculture, and is informing debates on global issues from the perspective of peasants.

Source: Mazhar et al, 2006; <http://membres.lycos.fr/ubinig/about2.htm>

This is an edited extract from Michel Pimbert, "Transforming Knowledge and Ways of Knowing for Food Sovereignty and Bio-cultural Diversity", paper for Conference on Endogenous Development and Bio-Cultural Diversity, Geneva, Switzerland, 3-6 October 2006.



have never in their entire lives gone to the market to buy food. Take the village-level women's groups, or sanghams, that we have in the Medak district of Andhra Pradesh. They practise biodiversity-based agriculture, which emphasises the cultivation of coarse grains, such as sorghum and various kinds of millet, that have been grown in this region for centuries. As the land is rain-fed and extremely dry, these crops have adapted over generations to flourish in local conditions, without irrigation or chemical fertilisers, pesticides or herbicides. They are much more nutritious than polished white rice. These crops also provide a variety of materials to meet people's needs, such as stalks and husks to feed animals, dry systems to build fences, straw to thatch their huts and fibres to make ropes. These sangham women also use inter-cropping and rotation techniques to grow other crops – pulses, vegetables, fruit and medicinal plants. They are not

only preserving biodiversity but also enhancing it. As they don't use chemicals, there is also abundant "uncultivated food", such as plant greens, tubers and small animals. In fact, during times of duress, these uncultivated foods can provide between 40 and 90 per cent of people's food. But now there is an attempt to subvert this culture and make these people dependent on food from the market. It is this that communities are resisting.

Last year the world changed from being a predominantly rural society to a predominantly urban one. There are billions of people in the cities who need to be fed. Can these ecological systems of farming produce enough to feed all these people?

This is a question I'm always being asked: can we feed the world without the so-called benefits of the Green Revolution? Well, let's be clear. The

movement of people from rural to urban areas has destroyed rural systems and produced millions of deprived, brutalised people. The food sovereignty movement wants to reverse this and take people back to rural areas. Besides this, there is mounting evidence that yields under our systems are higher, sometimes 30–40 per cent higher, than under modern production systems. I have first-hand experience of what our communities have done in recent years. They have brought marginal land back into cultivation. They have produced food not only for themselves but also for the landless, the artisans, the people who are not cultivators in their communities. Very recently they have started doing what we call “hunger mapping”, and found out who are the really destitute in their communities and have started food kitchens for them. It’s not rich people who are doing this, but people with very low cash incomes who have gained enormous confidence through the food sovereignty process and believe that they can take care of everybody. The ecological production of food provides other

important benefits. It gives people health security, nutritional security, livelihood security. People’s knowledge plays an enormous role here. Take the Aztec kingdom. They classified their soil in 28 different ways, whereas modern science uses only 4–5 classifications. Traditional systems are very complex, very knowledge-based. Modern knowledge systems are simplistic in comparison. So we have a system that provides people with multiple security, as against this Green Revolution, which gives you neither health nor nutrition and destroys livelihoods. There are other advantages to our system too. If a community produces food in an ecological way, it doesn’t need to fight with anyone else, for it has multiple security. There are already conflicts over water between India and its neighbours, between different provinces and communities. So the moment you reject water-intensive, energy-intensive food production systems and come back to ecological modes of production, you are promoting peace. And peace itself solves a lot of other problems.



Barter markets in the Peruvian Andes

The valley of Lares–Yanatile in Cusco, Peru, is rich in biodiversity. It contains three different agro-ecological zones, at altitudes between 1,000 and 4,850 metres. Andean tubers and potatoes are grown in the highest zone, which is called the puna. Maize, legumes and vegetables occupy the middle area, known as the quechua. Fruit trees, coffee, coca and yucca grow in the lowest zone, the yunga. Every week a barter market is held in the quechua, where nearly 50 tonnes of goods are traded each market day – ten times the volume of food distributed by the National Programme of Food Assistance. Anyone can participate, and can trade any amount of any crop.

Women are key players in this non-monetary market, which is vital in ensuring that their families have enough food to eat, and that they have a balanced diet. The rainforest supplies vitamin C, potassium and sodium through fruit, such as citrus and bananas, that do not exist in the quechua and puna zones. These zones supply starches, mainly potatoes and corn, which provide desperately needed carbohydrates for the yunga. Principles of reciprocity and solidarity guide the economic exchange of a diversity of foods, ensuring that important needs of people and the land are met in culturally unique ways. Indeed, recent research has generated new evidence on the importance of Andean barter markets for:

- access to food security and nutrition by some of the poorest social groups in the Andes;
- conservation of agricultural biodiversity (genetic, species and ecosystem) through continued use and exchange of food crops in barter markets;
- maintenance of ecosystem services and landscape features in different agro-ecological belts along altitudinal gradients and at multiple scales;
- local, autonomous control of production and consumption – and, more specifically, control by women over key decisions that affect both local livelihoods and ecological processes.

A polycentric web of local organisations operating at different scales (from household to whole landscape) governs these forms of economic exchange and contributes to the adaptive management of environmental processes and natural resources. In addition to contributing to the food security of the poorest of the poor, this decentralised web of local organisations also enhances cultural, social and ecological resilience in the face of risk and uncertainty.

SOURCES: N. Marti (2005), “La multidimensionalidad de los sistemas de alimentación en los Andes peruanos: los chalayplasa del valle de Lares (Cusco)”, doctoral thesis, Universidad Autónoma de Barcelona; and www.diversefoodsystems.org

This is an edited extract from Michel Pimbert, “Transforming Knowledge and Ways of Knowing for Food Sovereignty and Bio-cultural Diversity”, paper for Conference on Endogenous Development and Bio-Cultural Diversity, Geneva, Switzerland, 3–6 October 2006.



It has been over ten years now since genetically modified Bt cotton was first commercialised. Since then it has been introduced or tested in more than twenty countries. The crop is a clear success for Monsanto, the leading Bt cotton company. But what has it meant for farmers? Today, a more complete picture is finally emerging of what is happening on the farm in many countries throughout the world.

Bt cotton

the facts behind the hype

**GRAIN**

18

At the beginning of November 2006, Burkina Faso's national agricultural research institute invited a group of journalists, scientists and farmers to a Bt cotton test site in the town of Boni. They were shown two small parcels of land on a farm belonging to SOFITEX, the country's largest cotton company. One was planted with genetically modified Bt cotton and the other with a conventional variety. It wasn't hard to see the difference: the Bt cotton field had better yields and had sustained less damage from pests, even though, according to the researchers, the Bt cotton had

been sprayed only twice with pesticides, while the conventional crop had been sprayed six times.

The display was enough to convince many of the visiting farmers. "I believe that we can now go ahead with the cultivation of GM cotton, given the results of the experiments in Boni," said Sessouma Amadou, a cotton farmer from the region of Kénédougou. "Now my concern is only with how to acquire the seeds and how to get them at a good price." The early results from the small field trials were also proof enough for Burkina's government, which took the opportunity to tell

the press that it intended to push forward with the commercialisation of Bt cotton for the following season, two years before its biosafety research was scheduled for completion.¹

A month earlier, in another part of the country, the cotton fields of a very different project – to reduce the use of pesticides – were also on display, albeit with less attention from the government and the media. Here, farmers showed the results of the second year of an integrated pest management project, based on a farmer field-school model, where farmers develop pest management practices by sharing knowledge and using local resources. In this case, the farmers had completely eliminated the use of chemical pesticides on their cotton fields without reducing their yields.² Farmers in neighbouring Mali have had similar successes, where their project, known as *Projet de Gestion Intégrée de la Production et des Déprédateurs* (Integrated Pest and Production Management – GIPD), is now in its fourth year. In the 2006 season, 1,140 cotton farmers participated in the programme. Their average yield was significantly higher than that of the farmers in the same areas using conventional pesticide methods (1,240 kilograms per hectare as opposed to 1,020 kg/ha), even though the GIPD farmers did not use chemical pesticides.³ One agronomist from Benin visiting GIPD fields in Mali during the 2005–6 season remarked: “It is almost impossible to believe what we saw. Fields that were unscathed by pests and with cotton plants full of undamaged bolls; you would have thought we were in fields sprayed with pesticides.”

One big advantage of the GIPD programme over Bt cotton is that it does not depend on expensive technologies from transnational corporations like Monsanto or Syngenta. Another plus, which is becoming increasingly important, is that its viability is proven in farmers’ fields, whereas the Bt cotton tests are handled exclusively by scientists in the artificial environment of research stations. Today, ten years after Bt cotton was first introduced, it is becoming painfully evident that there can be a dramatic difference between what these scientists report and what actually happens on the farm, especially over the long term. In countries where Bt cotton has been growing for several years, the transnationals’ great hype over their new wonder crop is drowning in a sea of farmers’ debt and pest and disease problems.

These bolls are half-empty

In 2000, with a fanfare comparable to that in Burkina Faso today, Monsanto and its Indian



Cotton bolls ready for harvest

subsidiary, Mahyco, were in their first year of country-wide field tests of Bt cotton in India. The results from the field trials, which would form the basis of the commercial approval of Bt cotton in India, showed a major decrease in the use of pesticides and an increase in yields, as compared to non-Bt varieties.⁴

India was certainly ripe for such a product. The introduction of the hybrids and pesticides of the Green Revolution of the 1960s and 1970s had set the country’s 17 million cotton farmers on a vicious treadmill. Yields had at times increased, but so too had the susceptibility of their cotton crops to pests and diseases, which evolved faster than scientists could churn out new products to combat them. In the face of growing pest problems, farmers, who had become completely dependent on the advice and technologies of outside “experts”, had been encouraged to spray more often, with increasingly toxic pesticide mixtures. It was not uncommon for cotton farmers in India to spray their fields up to 30 times in a single season. The escalating use of pesticides had driven up production costs which, combined with the falling price for raw cotton, had generated severe debt and the annual suicide of hundreds if not thousands of Indian cotton farmers.⁵ India’s cotton farmers were thus desperate for a new techno-fix and, if one believed the results from the field trials, Monsanto’s Bt cotton appeared to be just the thing.

Bt cotton was actually already on the Indian market as early as 1998, well before it was approved for commercial introduction in March 2002. In a story reminiscent of GM contamination scandals in other countries, Monsanto’s Bt gene somehow escaped from the company’s “contained” field-trials

1 V La CV-OGM/BF, “Vulgarisation du coton biologique, le Burkina respecte-t-il le principe de précaution?” Sidwaya (Ouagadougou), 23 November 2006:

<http://tinyurl.com/t8axl>

2 Personal communication from Souleymane Nacro, Director of GIPD programme Burkina Faso, 30 November 2006.

3 Personal communication from Souleymane Coulibaly, Director of GIPD programme Mali, 18 December 2006.

4 R. Ramachandran, “Green signal for Bt-cotton,” *Frontline*, 18:8, 13–26 April 2002: <http://tinyurl.com/w379h>

5 Esha Shah, “Local and Global Elites Join Hands: Development and Diffusion of Bt Cotton Technology in Gujarat,” *Economic and Political Weekly*, 22 October 2005: <http://tinyurl.com/yxreec>



and ended up in a cotton variety known as N-151, which was sold in the state of Gujarat by the Indian seed company Navbharat. Monsanto took samples of the N-151 crop in 2001 after reports that the variety had withstood a major bollworm outbreak in Gujarat that year.⁶ When the tests showed the presence of Monsanto's Bt gene, the company immediately went public with the information and pressed charges against Navbharat. Confusion ensued: the Indian government threatened to destroy and confiscate the entire "illegal" N-151 crop, an impossible task given that the seeds had already spread from farmer to farmer throughout the state and the country; and Gujarat's cotton farmers took to the streets to defend their right to grow the miracle cotton. In the melee, Navbharat was forced to stop producing its N-151 variety, due to supposed biosafety concerns, while Monsanto's three Bt varieties were hurried through a spectacularly incompetent regulatory process and approved for commercial cultivation for the following season.⁷

It was a great public relations coup for Monsanto. In its first year of sales in 2002, Mahyco-Monsanto sold its entire seed stock, with Bt cotton planted on nearly 45,000 hectares. By 2005, on the back of an aggressive marketing campaign, Bt cotton hybrids were planted on more than 500,000 hectares.⁸ Not surprisingly, proponents of Bt cotton have seized upon these figures to tout Bt cotton's success in India, but the real story unfolding on the ground is very different.

In Gujarat, home of the N-151 variety, Mahyco-Monsanto's Bt varieties performed miserably during the first year of planting. An official monitoring committee set up by the state government reported that farmers in Gujarat "suffered a huge economic loss in the cultivation of Bt cotton" during the 2002 season, which the committee attributed to the crop's susceptibility to wilt and sucking pests. These observations were echoed by the state-level monitoring committees set up that year in other Bt cotton producing states, such as Andhra Pradesh, Karnataka, Madhya Pradesh and Maharashtra.⁹ Although some dismissed these initial difficulties as a problem with the quality of the varieties that had been modified, not with the Bt technology itself, the headaches with Bt cotton have not gone away, even though new varieties have since entered the market.

Scientists Abdul Qayum and Kiran Sakhari have studied farmer experiences with Bt cotton in Andhra Pradesh since these hybrids were introduced in 2002. In their assessment of Bt cotton's first three

years in the state, they found that, on average, non-Bt farmers earned 60 per cent more than Bt farmers. Contrary to Monsanto's advertisements and the results from its field trials, Qayum and Sakhari report that farmers growing Bt hybrids were unable to reduce their use of pesticides or increase yields. In the subsequent season, 2005-6, following a ban on the Monsanto-Mahyco Bt hybrids, Qayum and Sakhari returned to the fields to see how farmers were faring with other, new Bt cotton hybrids. Once again, they found that the pest management costs were higher for Bt than for non-Bt cotton farmers, largely because of growing problems with secondary pests.

This time Qayum and Sakhari included a comparison with cotton farmers using non-pesticidal methods (NPM) to control pests. These farmers achieved the highest net returns among all of the farmers surveyed, higher than the non-Bt farmers using chemical pesticides and much higher than the farmers growing Bt cotton. Their study also echoed earlier reports, which had found Bt cotton susceptible to wilt, and the researchers warned that its widespread cultivation was setting the stage for an epidemic.¹⁰

Wilt has indeed turned into a devastating problem, and not only in Andhra Pradesh. In October 2005 an 11-member fact-finding team of farmers, social activists and agricultural scientists went to three

6 Douglas McGray, "An agricultural mystery in India has set off concerns over a growing underground trade in genetically engineered seeds," IRP, Spring 2002: <http://tinyurl.com/y48gjk>

7 T.V. Padma, "Indian GM research 'lacks focus and transparency'," SciDev.Net, 22 June 2005: <http://tinyurl.com/y6ozmt>

8 Greenpeace India and the Centre for Sustainable Agriculture, "Marketing of Bt Cotton in India - Aggressive, Unscrupulous and False", September 2005: <http://tinyurl.com/yxsbbh>; and Ashok Sharma, "It's a blind run for Bt cotton hybrids," Financial Express, 5 June 2006: <http://tinyurl.com/yxa3nv>

9 Bt cotton performance reports: <http://tinyurl.com/y7anj8>

10 Both studies by Abdul Qayum and Kiran Sakhari, "Did Bt cotton fail AP again in 2003-2004? A season-long study of Bt Cotton in Andhra Pradesh" (AP Coalition In Defence of Diversity, 2003); "False hopes, festering failures: Bt cotton in Andhra Pradesh 2005-2006" (AP Coalition In Defence of Diversity, 2006) available at: <http://www.grain.org/research/btcotton.cfm?links>



A Greenpeace (India) poster

Empire building

The Monsanto corporation of the United States dominates the global Bt cotton seed market. At least two thirds of the Bt cotton sold in the world is sold under licence to Monsanto or sold directly by Monsanto and its subsidiaries.¹ Monsanto's recent acquisition of Emergent Genetics (which operates the third largest cotton seed companies in the US and India) and Delta and Pine Land (formerly the world's largest cotton seed company and the owner/inventor of the notorious Terminator technology) will, if the Delta and Pine Land buy-out is approved by the US Department of Justice, make Monsanto the world's largest cotton seed company. Moreover, in taking over Delta and Pine Land, Monsanto also acquires the rights to the global cotton germplasm collection of its most important Bt cotton competitor, Syngenta. Beyond Syngenta and DowAgrosciences, the two other transnational corporations that have recently commercialised Bt crops, Monsanto's main competition comes from a Chinese company called Biocentury, which was formed with strong support from the Chinese state and has agreements with companies in India and Vietnam for the development of Bt cotton.² Recently, however, 34 per cent of Biocentury's shares were purchased by Origin Agritech, a company based in the British Virgin Islands that is rapidly building up its position in the Chinese seed market.³

1 ETC Group, "Oligopoly, Inc 2005," 16 December 2005: <http://tinyurl.com/yk3smq>

2 James Keeley, "The biotech developmental state? Investigating the Chinese gene revolution", IDS Working Paper 207, September 2003: <http://tinyurl.com/ybnmbx>

3 For more information on Origin Agritech see the entry for 23 January 2006 in the GRAIN hybrid rice blog at: <http://www.grain.org/research/hybridrice.cfm?blog&row=11>

villages in the Badwani district in the neighbouring state of Madhya Pradesh to investigate the widespread reports of wilt in Bt cotton fields. The team found that damage from wilt was, indeed, pervasive and was much more severe in all the various Bt cotton hybrids than in conventional varieties. The team assessed all the possible variables and concluded that "wilt is a phenomenon affecting Bt cotton" and ruled out the possibility that the wilt was a "result of an abiotic stress or a shortcoming in the farmers' practices with Bt cotton". According to the team, the wilt problems seemed to be "a reflection of the unpredictable results expectable from the transgenic technology used in Bt cotton and the increased vulnerability of transgenic plants to new diseases and pests".

The story of the first four years of Bt cotton farming in India was neatly summarised by P.V. Sathesh, Convenor of the Andhra Pradesh Coalition in Defence of Diversity:

"In the first year (2002), Bt cotton was a disaster, yielding 35 per cent less than the non-Bt cotton, even while costing four times more than the non-Bt cotton. In the third year, new diseases spread through the soils and the plant. Cattle which grazed Bt cotton plants started dying. And this year [2006], Bt plants have started wilting, forcing farmers to harden their hearts and uproot them. In the village of Mustyalapally, in the Bhongir mandal of Nalgonda, farmers have uprooted Bt cotton from 41 out of the 51 acres planted. The disease has spread to nearby villages, spreading panic among farmers. Farmers complain that the plants are slowly dying one after another because the root system is severely decomposed, without

*any secondary and tertiary roots on the main root system. Even the bolls formed on these wilted plants did not bear any seeds."*¹¹

Some farmers responded in anger with violent street protests and the burning of seed outlets. In one instance, farmers seeking compensation took a Mahyco-Monsanto representative hostage. Many others, however, have left their farms or taken their own lives. In the cotton belt of Vidarbha, where Bt cotton is widespread, the suicide rate among cotton farmers is spiralling out of control, with reports of more than 100 cotton farmers a month committing suicide in 2006.¹²

There are signs that even more severe problems lie ahead. Reports are coming in that bollworms, the main target pests of Bt cotton, are already developing resistance to Bt cotton. "Pockets near Vadodara (Gujarat) are the cause of immediate concern," said Dr K R Kranthi from the Nagpur-based Central Institute of Cotton Research. "As for the rest of the country, it's only a question of time."¹³ More than 55 per cent of all pesticides used in India are now used in cotton production, even though the crop occupies only 5 per cent of the country's agricultural land.

Spinning the cotton treadmill

"Through the development of GM cotton, we can reduce the use of pesticides by more than 80 per cent ... and can reduce pesticide poisoning cases by 90 per cent."

Professor Guo Sandui, Chinese Academy of Sciences and inventor of Chinese GM cotton.¹⁴



11 Press release of the AP Coalition In Defence of Diversity, 8 September 2006: <http://tinyurl.com/yntwb5>

12 "A hundred farm suicides a month in Vidarbha", RxPG News Service, 29 November 2006: <http://tinyurl.com/yynywrg>

13 Kalyan Ray, "Bt cotton bubble set to burst," Deccan Herald, 14 November 2006: <http://tinyurl.com/ylejmn>

14 "Bt cotton bubble set to burst", Deccan Herald, 14 November 2006: <http://tinyurl.com/yamxu5>

India is not the first country to experience problems with Bt cotton. In Indonesia, during an initial planting in 2001, crops of Monsanto's Bollgard cotton were devastated by pests, while other cotton crops suffered insignificant damage. Angry Indonesian cotton farmers, who had paid big money for the Bt seeds, burned their fields in protest and forced Monsanto to withdraw Bt cotton from the country after only two seasons on the market.¹⁵

In China and the US, two countries with a long experience of growing the crop, Bt cotton initially brought down the use of pesticides. But before long, pests not controlled by the Bt plants, which had once been of minor importance, started to cause serious crop damage, and farmers were soon back to their former levels of pesticide use. In a recent study of 481 cotton farmers in five provinces of China, researchers from Cornell University found that the early income gains that Chinese cotton farmers had achieved with Bt cotton during the 2000–2001 season had completely disappeared three years later. What had happened was that, in the initial years, with Bt cotton controlling bollworms, the area's major pest, farmers cut back on their use of broad-spectrum pesticides, thereby reducing their costs and improving their incomes. But with the Bt cotton providing no control over secondary pests, these soon took the place of bollworms. According to the Cornell researchers, "a majority of the Bt cotton farmers cited the fact that they must spray 15–20 times more than previously to kill secondary pests, Mirids, which did not require any pesticide in the early years of Bt adoption." In fact, by 2004, Bt cotton farmers were spending as much on pesticides as non-Bt farmers ... and at least 2–3 times more on seeds.¹⁶

Similar reports are coming in from the US, where damage from secondary pests, such as stink bugs and plant bugs, has increased dramatically since the introduction of Bt cotton, known as Bollgard.¹⁷ As in China, the costs of pesticides to control these secondary pests can add up to more than what US farmers typically spend on pesticides for conventional varieties, particularly if you factor in the high costs of the Bt seeds. "Secondary pests – plant bugs and stink bugs – are eating our lunch," says Bruce Bond, a cotton farmer from Arkansas. "I probably have \$90 an acre in insecticide costs on Bt cotton. I think that's too much, especially when I pay \$32 right up front. Next year, I'd like to bump the non-Bt cotton acreage up a bit. I planted my refuge cotton [non-Bt cotton] on the worst ground I have, and one 23-acre field of it was some of the best cotton I picked this year."¹⁸

An added financial limitation that US cotton farmers are finding with Bt cotton is that they cannot vary the application rate of the toxin according to the level of pest pressure. They have to pay the full price for the Bt seeds whether or not bollworms end up being a serious problem on their fields. In some parts of Arkansas, for instance, farmers are protesting against a state measure forcing them to grow Bt cotton as part of a state-wide boll weevil eradication programme. They say that the level of boll weevil pressure on their farms is too low to justify the costs of the Bt seeds.¹⁹ Moreover, the US experience shows that, when bollworm pressure is high, Bt cotton does not always maintain its resistance and farmers end up using pesticides anyway. "There are now pockets in the Southeast, including 100,000-plus acres [40,000 hectares] in Georgia, where bollworms could not be controlled by over-spraying Bt cotton," says entomologist Smith. "If you get enough escapes, they can do a lot of damage. They were getting up to 15-plus per cent boll damage in Bollgard cotton in Georgia due to sheer numbers. Three pyrethroid sprays in five days didn't do the job."²⁰ To resolve these growing pest problems, Monsanto and Syngenta have introduced new Bt cotton varieties in the US and elsewhere that are supposed to provide enhanced pest resistance – at a higher price, of course. In India, where Monsanto's Bollgard now sells for around US\$17 per 450g pack of seeds, seeds of the company's new Bollgard II variety will sell for around US\$30 per 450g pack in the 2006–7 season.²¹ And so the treadmill continues.

No magic bullet

For Monsanto and other transnational pesticide companies, Bt crops are essentially an ingenious way to expand their profits in the face of increasing competition from generic producers of off-patent insecticides. Instead of selling a chemical pesticide that farmers spray, Monsanto sells the pesticide by way of the seeds. And there is another advantage for the companies: farmers growing Bt crops still rely on pesticides, and, when the costs of the Bt technology fees are factored in, they generally end up spending more overall to manage pests – which is good for the pesticide makers' bottom line.

In India, with cotton farmers killing themselves or leaving their farms in record numbers to escape financial ruin, Monsanto made over US\$17 million in royalties in the first three years of Bt cotton sales. The situation for farmers was so bad that in April 2006, India's Monopolies and Restrictive Trade Practices Commission stepped in to order Monsanto to charge "reasonable

15 Tan Cheng Li, "Farmer's bane," *The Star*, Malaysia, 2 March 2004: <http://tinyurl.com/w4o3i>; and Pennapa Hongthong, "GMO Crops: A Cautionary Tale," *The Nation* (Jakarta), 27 September 2004: <http://tinyurl.com/yg85pd>

16 Shenghui Wang, David R. Just, and Per Pinstrup-Andersen, "Tarnishing Silver Bullets: Bt Technology Adoption, Bounded Rationality and the Outbreak of Secondary Pest Infestations in China," Selected Paper prepared for presentation at the American Agricultural Economics Association Annual Meeting Long Beach, CA, 22–26 July 2006.

17 Paul L. Hollis, "Stink bugs continue to dominate in Southeast cotton," *Southeast Farm Press*, 13 March 2006.

18 Bruce Bond: High Cotton Winner (Elton Robinson, *Delta Farm Press*, January 2005): <http://tinyurl.com/y9a97g>

19 Pat Ivey, "Farmers lash out at 'half truths'," *Blytheville Courier News*, 30 July 2004 <http://tinyurl.com/y3nlx4>

20 Paul L. Hollis, "Stink bugs continue to dominate in Southeast cotton," *Southeast Farm Press*, 13 March 2006.

21 K.V. Kurmanath, "AP puts on hold nod for sale of Bollgard-II," *The Hindu*, 8 November 2006: <http://tinyurl.com/yzwemd>



Table: Bt cotton takes root across the world

Argentina	Approved in 2001. By 2005–6 sown on around 13% of the total cotton area.
Australia	Introduced in 1996. By 2002–3 accounts for around 30% of total cotton crop. This increases to 80% in 2004–5 with the release of Monsanto's Bollgard II variety.
Brazil	Field trials approved in March 2005. Smuggling of Bt cotton seeds from Argentina and Paraguay is widespread. At least 5% of the 1.3 million tons produced in the 2005–6 season comes from "black market" Bt varieties.
Burkina Faso	Field trials begin in 2003. Commercial release expected in 2007.
China	Released in 1997. Now planted on well over half of the national cotton area.
Colombia	Imported by Monsanto in 2002, without environmental clearance. Legal action results in the suspension of the authorisation.
Costa Rica	Monsanto began field trials without regulatory oversight in 1992. By 2004, 638 ha were planted, mainly for the export of seeds.
Egypt	Commercial introduction approved in 2006.
Guatemala	Field trials.
India	Commercial introduction in 2002. In 2006–7, Monsanto begins sales of Bollgard II.
Indonesia	Introduced in South Sulawesi province in 2001. Two years later it is withdrawn after its failure to perform triggers farmer protests.
Kenya	Field trials.
Mexico	Approved in 1996.
Pakistan	In May 2005 the Pakistan Atomic Energy Commission provides 40,000 kg of Bt cotton seed to farmers in the Punjab.
Paraguay	Approved in 2005.
Philippines	Field trials.
Senegal	Irregular field trials later abandoned.
South Africa	Approved in 1997.
Thailand	Field tests in 1997. Abandoned after mass protests.
USA	Approved in 1996. Currently covers about 40% of the cotton area.
Vietnam	Field trials.
Zimbabwe	Planted by Monsanto in 1998 without official permission. Crop was burnt when discovered by authorities.

For more information, visit <http://grain.org/go/btcotton>, a resource centre on Bt cotton around the world, providing relevant news, links and documents.

prices" for Bt cotton seeds. Monsanto responded by lowering its technology fee by an insignificant 20 rupees, making no major impact on Bt cotton seed prices, which continued to be sold by the company and its licensees for between Rs1,200 to Rs1,300 per 450g pack. The state governments of Andhra Pradesh, Tamil Nadu, and Karnataka then filed suits at the Supreme Court demanding that the price of Bt cotton seeds be reduced to at least Rs750 per 450g pack.²² Under pressure from these state governments and with new, much cheaper Bt cotton hybrids using Bt technology from the Chinese company Biocentury entering the market, Monsanto and its licensees slashed their Bt cotton seed prices by upwards of 70 per cent in the 2006–7 season and launched a full-out marketing blitz. The area under Bt cotton cultivation surged

across India. Even in the Warangal district of Andhra Pradesh, where the failure of Bt cotton in the initial years was so well documented, the area planted to Bt hybrids shot up to more than 80 per cent of the total cotton area. Of course, the same problems persist – wilt, secondary pests, bollworm resistance, farmer debt – only now on a larger scale. None of this is of too much concern to Monsanto. The company has a ready-made market for its next techno-fix: its Bollgard II cotton, which will be sold at twice the price.

Debt and dependency

The Bt cotton experience has been particularly hard on small farmers. With the global price for raw cotton at historic lows, the general situation for

²² "Andhra Pradesh files case against Bt cotton in MRTPC," *WebIndia* 123, 2 January 2006: grain.org/bio-ipr/?id=462



small cotton farmers in the South is one of debt and dependency. They are thus extremely vulnerable to the promises of outside technologies to resolve the fundamental problems that they face, which are largely political. In South Africa, for instance, Bt cotton was taken up by small farmers in KwaZulu Natal's Makhathini Flats, one of the poorest areas of the country and a last refuge for small-scale cotton production. A recent study of Bt cotton adoption in the area, based on comprehensive interviews with local farmers, dismissed agronomic factors like yield increases or reductions in the use of pesticides as factors explaining the adoption of Bt cotton. The researchers found that most farmers in the area started growing Bt cotton in 1998 because of the lack of alternatives:

"In a context in which many farmers feel abandoned by the provincial department of agriculture and by government extension services and credit services, it is only through cotton that farmers gain access to seed, credit and support. Above all else, and repeatedly throughout our discussions, dryland farmers in the Makhathini area made it clear that they had few alternatives to cotton. The absence of alternatives at a crop level is replicated at the level of seed purchasing or seed supply. Choices are already limited by the fact that Cotton South Africa [the cotton farmers' organisation] puts forward an annual short list of three recommended seed varieties to ensure consistency in the processed fibre. Farmers report and employees at the Makhathini Cotton Company (MCC) confirm that conventionally improved cotton seed is not being grown anywhere on the Makhathini Flats. While Delta Opel, an improved non-GM variety, is available for sale at the official Wenkem outlet situated adjacent to the MCC gin, it is only sold in quantities of 25kg, as opposed to the Bollgard™ NuCOTN 37-B seed which is marketed in an 'Ecombi' 5kg package, an ideal size for the small acreage farmers that prevail within the Flats. Even more prohibitively, the MCC gin only purchases cotton packed in wooolsacks that the MCC provides. These wooolsacks are allocated to farmers at the beginning of the season based on information derived from lists provided to MCC by Wenkem of those licensed to

*grow Bt seed. Thus, MCC excludes the potential of non-GM growers by only allowing Bt cotton to pass through its gin."*²³

The introduction of Bt cotton in the area immediately exacerbated debt problems for local farmers. Farmers purchased the seeds on credit, and within one year, with revenues from Bt cotton insufficient for farmers to meet their repayment schedules, the local Land Bank was forced to foreclose 1,447 out of the 1,648 loans it had provided. The Land Bank stopped lending in Makhathini in 2004, with over US\$3 million outstanding in defaulted loans. "GM is best understood as the latest in a long series of technocratic interventions that have consistently failed to transform Makhathini into a hotbed of commodity production, but have instead been guided by a technocratic will to make cotton a lucrative cash crop, regardless of local conditions, needs or ecology," concludes the report.²⁴ Makhathini was once the biotech industry's showcase for how GM can help small farmers.

If Bt cotton failed to improve the lives of the small cotton farmers in Makhathini, it is even less likely to help farmers in West Africa, where the industry is now focusing much of its attention. Farmers in West Africa have a long history of cotton production, and one of the lowest rates of pesticide use for cotton in the world. Their woes have little to do with the cotton varieties they use.²⁵ The main problem, as the region's farmers' organisations keep saying time and again, is the structure of the global market and subsidised surplus production in the United States and Europe. The last thing West African farmers need is a new cycle of dependence brought by switching to the high-priced seeds of powerful foreign corporations. Bt cotton in West Africa, as in the rest of the world, will not benefit small farmers. It is merely a device by which corporations can extract more profit in the short term and distract people away from pursuing more promising methods for reducing the use of pesticides. The reality is that only deep structural change can turn cotton into a viable crop for the many millions of small farmers that produce it every year.



23 Harald Witt, Rajeev Patel and Matthew Schnurr, "Can the Poor Help GM Crops? Technology, Representation and Cotton in the Makhathini Flats, South Africa," *Review of African Political Economy* (109), 2006, pp. 497–513.

24 *Ibid.*

25 GRAIN, "GM cotton set to invade West Africa: Time to act!" June 2004. grain.org/briefings/?id=184

Is food different?

review by GRAIN

"I am 56 years old, a farmer from South Korea. I have mostly failed, as many other farm leaders elsewhere have failed. We cannot seem to do anything to stop the waves that have destroyed our communities, where we have been settled for hundreds of years. I have tried to find the real reason and the real force behind those waves. And I have reached the conclusion, here in front of the WTO.

Our fears became reality in the marketplace. We soon realised that, despite our best efforts, we could never match the prices of cheap imports. We became aware that our farm size, 1.3 hectares on average, is a mere one-hundredth of the farms in the large exporting countries. Since massive importing began, we small farmers have never been paid as much as our production costs. Sometimes prices would drop fourfold, all of a sudden.

The farmers who gave up early went to urban slums. Others who tried to escape from the vicious cycle have met with bankruptcy due to accumulated debts. For me, I couldn't do anything but look around at the vacant houses in the village, old and decaying. Once I went to a house where a farmer took his life by drinking a toxic chemical because of his uncontrollable debts. I could do nothing but listen to the howling of his wife."

This is an edited version of the statement distributed by Lee Kyung Hae shortly before he took his own life on 16 September 2003 in Cancún, Mexico, in the mass protests against the World Trade Organisation (WTO) talks. In the early 1990s, after the Korean government had dismantled trade barriers and the market had been flooded with very cheap imported food, millions of farmers lost their farms. For many, the shame brought by losing their ancestral land was unbearable. Peter M. Rossett dedicates this book* to Lee Kyung Hae.

Rossett, a food rights activist and rural development specialist, has written a clear and extremely accessible account of the impact of trade liberalisation on farming and, more particularly, on small farmers throughout the world. Much of the material is well known, but Rossett provides flashes of insight. For instance, he questions the widely held assumption that it is the high level of subsidies that the US and the European community pay to their farmers that makes their produce so cheap. It might seem logical, he says, to blame subsidies, when you see very cheap American maize flooding the Mexican market, but it is wrong: it mistakes cause for effect. Subsidies are triggered by weak commodity prices, not vice versa.

The main cause of the low prices, he says, is the power of the agri-food conglomerates. These have a vested interest in paying as little as possible for their raw materials (crops and livestock) and they use their huge influence within state bureaucracies

to stop governments applying effective policies as in the past to regulate supply and demand. As a result, commodity prices continue to drop, often way below production costs, even in the industrialised countries. Thousands of small farmers are put out of business and the governments have to subsidise the big farmers to keep them producing.

Rossett, who lives in Chiapas, Mexico, has an interesting section on the North American Free Trade Area (NAFTA). Because of the cheap US maize pouring into Mexico as a result of NAFTA, Mexican peasant farmers cannot sell their produce. Yet, he says, almost three million mostly poor farmers stubbornly continue to grow maize. How is this possible? Quoting a Mexican study, Rossett says that it happens only because of the remittances sent by migrants in the US, who are in effect subsidising Mexican production. Their action, he says, reflects the peasants' deep cultural resistance to the dislocation and destruction caused by the 'free trade' model.

The section of the book concerning the 'uniqueness' of food, which leads to the book's title, is the least convincing. Food is not just any merchandise or commodity, say Rossett; it "means rural livelihoods, traditions and cultures and it means preserving, or destroying, rural landscapes". Because it is special, he says, food should not be covered by WTO agreements. But is food so different? Isn't it just as damaging for a country to have its industry and its culture destroyed by cheap imported goods? It is the free trade model as a whole that needs to be rethought, not only its application to farming.

* Peter M. Rossett, *Food is different – why we must get the WTO out of agriculture*, 2006, joint publication:

Canada: Fernwood Publishing; India: Books for Change; Malaysia: SIRD; Southern Africa: David Philip; Rest of the World: Zed Books



Free trade overload

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Ndiogou Fall is President of the Executive Committee of ROPPA (Réseau des Organisations Paysannes et de Producteurs Agricoles de l'Afrique de l'Ouest/Network of Farmers and Peasant Organisations in West Africa – <http://www.roppa.info>), the main umbrella group for peasant farmers in West Africa. Here we provide a summary of a longer, unpublished interview about ROPPA and some of its political thinking.

Ndiogou Fall



Tell us something about ROPPA

ROPPA was founded in 2000, but peasants in this region were already well organised. The great drought in the 1970s was a brutal awakening: it showed us that we needed far greater solidarity and that we could achieve this only by organising ourselves. This led to the establishment of national peasant associations, and it is these that are brought together in ROPPA.

So why was it decided to create ROPPA?

For two reasons. First, the regional integration process, which included agriculture, was gaining momentum and international negotiations were occurring. We favour regional integration, but of a kind that protects our interests. So we realised that we had to come together in a regional body that would act as a kind of interface. Second, we realised that all the peasant organisations in the region had the same objectives and the same concerns, and that we would benefit from exchanging experiences and increasing solidarity.

What are ROPPA's objectives?

The first is to defend small family farmers. West African agriculture is essentially rooted in small family farms. The families work on the land first to feed themselves and then to sell their produce. This kind of farming is considered archaic by some, but this is what we have. It provides employment and food and reduces dependency. The second is to defend our interests in regional and international negotiations. More and more decisions are being taken in Abuja [Nigeria] in the case of ECOWAS, Ouagadougou [Burkina Faso] in the case of WAEMU, and in Geneva [Switzerland] in the case of the WTO.* These negotiations are leading to more and more trade liberalisation. We must defend our interests in these talks, as no one else will do it for us.

At the organisational level our objective is to support peasant organisations in each country to ensure that they have the capacity to formulate proposals and

to mobilise. Another objective is to form alliances. In agriculture there are big farmers, manufacturers and retailers. We need to talk to them. Of course, we have our own political thinking but we need to talk directly with these other sectors. It is the same at the international level, where we are very open to developing alliances with other organisations. We do all this but we are also careful to retain our autonomy, with our own reflections and our own actions.

How important are peasant seeds to ROPPA?

Very important. We are aware of the increasing concentration of the seed industry in transnational corporations. This is very dangerous, because having our own seeds is important for the autonomy of our farmers. ROPPA is trying to mobilise on a regional level around this issue. ECOWAS is drawing up regional legislation on genetic resources and we lobbied strongly in defence of our interests at its ministerial meeting on the management of genetic resources. We are also involved in the development of an inventory of potentially useful genetic resources, although we're not taking the lead here. It is only really at the political lobbying level that we have the capacity to do very much. We're finding it difficult to get going on other initiatives, such as seed banks. We know that the transnationals are advancing very quickly at the regional level, and yet we have very few concrete plans on how to stop this.

Can you imagine ROPPA organising an information campaign on this subject?

We have an important campaign called "Afrique Nourricière" [Africa can feed itself] which shows that Africa, and in particular West Africa, is able to feed itself with its current natural and farmer resources. This is an educational campaign which also describes the threats to our natural resources and questions why these resources are not being used to develop Africa. This is a voluntary initiative at country level in which social groups ask ROPPA for technical assistance. For example, a group of women may ask for help in organising

Farida
Akhtar

Benny
Haerlin

Carlos
Correa

David
Quist

Johnson
Kpeme

Francisca
Rodriguez

German
Velez

Hope
Shand



demonstrations around food issues as part of a campaign to generate public discussion with governments. Another example is our campaign to find volunteers to feed their families only on African food for one week. We bring them together to talk about the problems they encounter in doing this, such as not being able to find an African food item that their family wanted. We invite politicians, researchers and farmers to discuss how they can help households to eat African food.

What does ROPPA feel about the upcoming EU-ACP agreement? [see box]

ROPPA is well known for being radically against the agreement, and is fighting tooth and nail to ensure that these agreements do not get approved. We have good reasons for taking this position. These agreements will be a catastrophe. I think the EU knows this very well. We really don't know why the EU persists with these negotiations, because it doesn't gain anything commercially and risks losing a great deal of credibility. We are not against agreements, but they must be based on development; this has always been the intention – to work together for development and to fight poverty. This was what sustained Europe's credibility for years. But ever since negotiations have really got started, they've replaced "development" and "fighting poverty" with the economy. Everything that is now being negotiated is to enhance trade.

The EU is imposing "democracy" on us, but Europe needs to be democratic too. Important

legislation is being adopted without either the elected members of parliament or the people being involved. It's just a few civil servants who come and decide in Europe's interests. This is a problem. It is discrediting democracy. Europe can't make announcements like this [about democracy] and then, behind the scenes, develop [decision-making] systems that go completely against this.

What does ROPPA think about Nyéléni as a process for farmers and what does ROPPA hope for after Nyéléni?

We are very much involved in organising the conference as it is taking place in a part of Africa where we are very active and well known. What can it do for the sub-region? Through exchanging information, people in the region will realise that the situation we face is not peculiar to Africa, and that we should form international alliances with those who are victims of the same system. In addition, the authorities in our area will realise that this is an international debate. This will help our social movements. After Nyéléni, we will hope to be more effective in the fight against trade liberalisation.



* ECOWAS: Economic Community of West African States

WAEMU: West African Economic and Monetary Union

WTO: World Trade Organisation

EU-ACP Economic Partnership Agreements

In 2000, the European Union (EU) and the African, Caribbean and Pacific Group of States (ACP), which are all former colonies, adopted the Cotonou Agreement, which is a framework trade, aid and political co-operation treaty. It replaced the previous Lomé Convention and provides for a general set of privileged relations between the EU and the ACP countries in matters of market access, technical assistance and other issues. The objective is to facilitate the economic and political integration of the ACP countries into a liberalised world market over the next 20 years.

Under the Cotonou Agreement, the parties agreed to negotiate a separate set of individual bilateral treaties between the EU and the participating ACP countries. Those individual arrangements will provide specific rights and obligations tailored to each ACP region (West Africa, Eastern and Southern Africa, and so on). They are called "Economic Partnership Agreements" (EPAs). While there are 78 ACP countries, only 76 will be subjected to EPAs. (South Africa and Cuba have, or will have, separate arrangements with the EU.)

The first and very general phase of the EPA negotiations ran from September 2002 to September 2003. In October 2003, the second phase started. By October 2008, all negotiations should be completed and the EPAs should be in force.

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Kloppenburger

K Joseph
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Fall



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Biopiracy: a system of appropriation

review by GRAIN

In this well-documented book,* Ikechi Mgbeoji, professor of law at York University, Toronto, launches a closely argued attack on the way the industrialised countries, working in collusion with multinational corporations, are using an array of weapons to appropriate and privatise the extraordinary wealth of knowledge about the use of plants built up over centuries by traditional people in the developing world. The objective of the industrialised countries, he says, is not only to plunder this knowledge for their own financial benefit, but also – and this is even more important – to build up their own stores of genetic material so that they can usurp the developing world's position as the genetic centre of the world.

Mgbeoji uses the term “biopiracy” to describe the process. There are, he says, three main ways in which it operates:

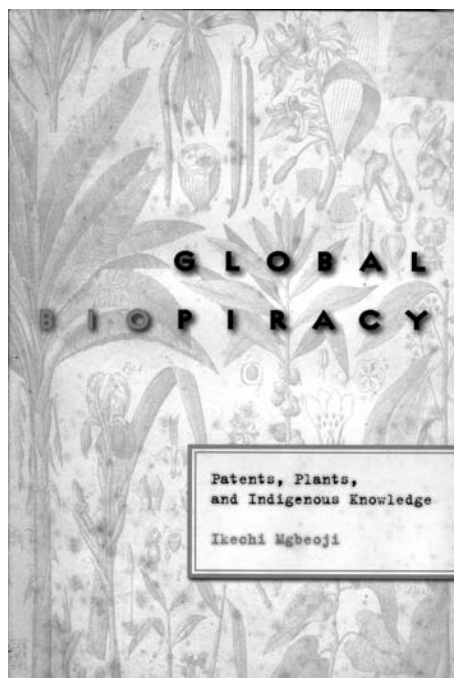
- a) The first is socio-cultural. It refers to the constant “denigration and denial of the intellectual input of traditional farmers and breeders, particularly women, in the improvement of plants and the creation of TKUP [traditional knowledge of the use of plants]”.
- b) The second is institutional. It concerns the systematic collecting of plant materials from the South (long sponsored by the US and UK governments, for example) and the setting up of an international system of genebanks. Since the 1960s,

Northern-sponsored international agricultural research centres have been strategically located in centres of genetic diversity in the South, to collect precious traditional varieties of major crops. These seed collections have been massively transferred to the gene-poor North.

c) The third is legal, through the patenting of plants and TKUP. This has been made possible “by a deliberate lowering of the threshold for patentability and several other forms of judicial and legislative intervention in the patent law system that have resulted in serving the ever-expanding appetite and interests of Western corporate seed merchants and pharmaceutical and biotechnological companies”.

Mgbeoji has a detailed section on the history of the patent system. It originated in Florence in 1421 when the architect Filippo Brunelleschi, who became famous for designing and constructing the Santa Maria del Fiore cathedral in Florence, needed some way of transporting huge blocks of marble up the River Arno from Pisa. He designed an enormous boat for the task but, before building it, he demanded and achieved something quite unprecedented – that the city of Florence should grant him sole rights over the design of the craft. The boat sank on its first voyage – and along with it a sizable chunk of Brunelleschi's wealth – but the patent system was born. With some setbacks, it spread first to Europe and then to the rest of the world.

Until relatively recently, patent systems were almost entirely restricted to mechanical inventions and artifices, while food, medicines and life forms, including plants, were explicitly debarred. It is interesting to note that in the 18th and 19th centuries the United States, in vigorous defence of its interests as a developing nation, was, as Mgbeoji puts it, “a notorious pirate of foreign technology, flouting patent norms in defiance of the then technologically superior European states”. But as the USA emerged in the 20th century as the world's dominant industrial nation, it became uncomfortably aware that, even though it was the world's major food producer, it was heavily reliant on foreign germplasm – potatoes from Latin America, maize from Central America, soya bean and rice from China, wheat from Syria, and so on. In fact, for crop diversity, North America is 85 per cent dependent on the South. To reduce its vulnerability, it began to design “an array of cultural institutions, legal norms and mechanisms ... to relocate the genetic centre of the world and to extract surplus profit by inserting the appropriated plant life forms into the stream of commerce as commodities of trade”.



US seed merchants and commercial plant breeders realised fairly early in the century that their most effective weapon would be the expansion of the concept of patentability. However, according to Mgbeoji, they deliberately decided against a big, public campaign: "Although the initial plan was to have patents on seeds and plants of agricultural importance, the industry sensed that such a bold proposition would be drowned in public outrage and indignation." Instead, he says, they decided on a gradual, piecemeal strategy: the first legislative proposal was to allow a seemingly benign group – rose breeders and horticulturalists – to be permitted patents on the plants they bred. Using careful language and quoting from an array of treaties, laws and agreements, Mgbeoji then painstakingly traces the expansion of the patent system as it spreads across the world.

The book adds up to a damning exposition of the systematic appropriation of traditional knowledge by the powerful states and corporations of the North. It becomes clear that biopiracy is not something that arises from abuse of, or glitches in, the system. Rather, it is the patent system itself, which deliberately denigrates the worth of traditional and indigenous peoples, especially local women farmers, and seeks to disenfranchise them. Working together, Mgbeoji says, the patent system and gene-banks are allowing the increasingly integrated food corporates and biotechnology companies to tighten their control over the world's food and farming sectors.

The book is less incisive on the question of where we go from here. Not surprisingly perhaps, given that Mgbeoji is a law professor, he does not believe that traditional communities should reject legal process. "It would be unrealistic for the world to continue to pretend that they [local farmers and traditional communities] do not need to be legally protected from the predatory practices of appropriators." Mgbeoji believes that, as a first step, the patent system must be radically reformulated. At the very least, he says, the same strict criteria should be adapted for plants and TKUP as are used

for mechanical inventions. "Unless this happens, the patent system, especially in its application to plants and TKUP, will remain an engine of mischief and deception and society will continue to pay rent for undeserving 'inventions'."

But how is patent law to be reformulated? Mgbeoji is vague. He believes that "gene-rich but politically/economically weak states" in the South should form regional alliances to push through a new policy, perhaps looking at the EU as some kind of model. But he seems to harbour little hope that this might happen. On several occasions he is scathing in his criticism of governments in the South: "While it might be fashionable to highlight the inequities of the global legal and economic order, particularly in the context of the North-South divide, it is equally true that domestic factors have wreaked as much, if not more, havoc on marginalised people and cultures. The oppression and domination of indigenous peoples and other marginalised cultures seems far more acute in their domestic jurisdictions, in both North and South, than any conceivable hardships they may experience within the context of the notorious North-South divide." Mgbeoji does not explain why indigenous peoples should expect support from such governments in their struggle to protect their biodiversity and their knowledge.

It is only on the very last page of the book that he starts to discuss the involvement in policy-making of local communities, something which he says is essential for an effective strategy. That has been a professed goal of many governments, NGOs, intergovernmental fora and treaties for over 20 years, yet little has been achieved. Mgbeoji gives a comprehensive exposition of the problem but leaves us as far as ever from a solution.

* Ikechi Mgbeoji, *Global Biopiracy – Patents, Plants and Indigenous Knowledge*, Cornell University Press/UBC Press, New York, 2006, US\$22.95, paperback, ISBN: 978 0 8014 7311 1



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