Seedling

Biodiversity, Rights and Livelihood

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GRAIN

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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In this issue...

The concept of food sovereignty continues to gain momentum among the people with whom we work. In this issue of Seedling we look at several experiences in different parts of the world to maintain – or wrest back – control over the cultivation and preparation of our foods.

For many people in Africa and Asia, sorghum – a crop virtually unknown in Europe and Latin America – lies at the heart of their daily lives. It is eaten as a staple, made into an ingredient of both *injera* (a kind of bread) and beer, and used as a construction material. Farmers meet regularly to exchange its seeds. In all, sorghum is part of the fabric of community life. Once scorned by the food industry for being a crop of low nutritional value consumed by the poor, sorghum is now attracting great attention, largely because of its extraordinary versatility, which makes it a prime candidate for development by the biofuels industry. Some analysts are even saying that sorghum could become the key agricultural crop of the 21st century. Despite resistance from many communities, the biotech companies are developing genetically modified sorghum, even though it would almost inevitably contaminate wild varieties (of which there are hundreds in Ethiopia alone) and cause serious and irreversible genetic erosion. It is shocking that, in the name of progress and development, so many official and private institutions (including the Bill and Melinda Gates Foundation) are funding this onslaught against the age-old rural communities whose knowledge will prove invaluable as the planet struggles to adapt to climate change.

In Europe bread has long been regarded as "the staff of life". Over the last 50 years global food companies have taken over the bakery sector and, in the name of efficiency, have set up huge factories where tasteless industrial bread, deliberately denuded of much of its nutritional value, comes off the production line at breakneck speed. It is perhaps not surprising that it is France, the home of so much good food, that is leading the struggle to regain control over bread-making. In various regions of the country, groups of *paysans boulangers* (peasant bakers) are tracking down traditional varieties of wheat, some of which have not been grown for decades, and rediscovering old methods of bread-making that produce healthy and tasty bread.

It is necessary to develop global organisations that bring together the myriad local struggles. One step in this direction was the staging in Mali in February 2007 of the Nyéléni Forum on Food Sovereignty. The forum brought together a tremendous diversity of people and a wealth of experiences and perspectives on food sovereignty. Participants worked in seven thematic working groups for two days, had discussions within their sectors, met in regional contexts, and got together in a plenary session to pull things together. It was quite a challenge to construct a meaningful consensus out of such diversity, but the participants managed to come up with a clear declaration* highlighting what the struggle for food sovereignty is about. It stressed that: "Food sovereignty puts those who produce, distribute and need wholesome, local food at the heart of food systems and policies, rather than the demands of markets and corporations that reduce food to internationally tradable commodities and components. It offers a strategy to resist and dismantle this inequitable and unsustainable system that perversely results in both chronic malnutrition and rapidly rising obesity."

The Forum agreed on a plan of action, now being finalised, which specifies what the movements will do to further the struggle for food sovereignty. The challenge now is to maintain the momentum created at the Forum.

** The declaration can be downloaded from the Nyéléni website, where you can also find a wealth of other documents and experiences that were shared at the Forum – http://www.nyeleni2007.org*

The Nyéléni forum in Mali in February 2007 *Photo: GRAIN*

When maize withers and rice shrivels, people in many parts of the world depend on sorghum. Apart from eating the grain, farmers can make beer and use the stalks to build houses and fences, as well as produce animal feed and medicine.They have nurtured and adapted sorghum for 5,000 years, and it has spread along trade routes from its origin in Ethiopia. GRAIN reports on Ethiopian wheat and sorghum farmers who recovered from famine and on Indian farmers who came through the Green Revolution to restore their food sovereignty. Their stories contrast starkly with biotechnologists' plans to turn yet another food crop into an export commodity.

Sorghum

a crop to feed the world or to profit the industry?

GRAIN

Great millet, or "Jowar", as sorghum is called in India, is the country's third most important grain.[1] In the Medak District of Andhra Pradesh, the poorest and most marginalised members of the communities manage not only to achieve food security but also to assert food sovereignty, with sorghum and millet as the cornerstones of their strategy. These farmers are marginalised in two important ways: they are women and they are dalit, the lowest caste in India. In addition, they grow their food on the Deccan Plateau, in some of the poorest soils and driest areas of India; this exacerbates their marginalisation. They achieve independence and food security by applying one basic principle: local control over seeds and food. The movement is based on a few practical pillars: recovery of traditional seeds, productivity without ecological compromise, nutritious food and feed, productivity, food security, independence from government handouts, increased household diversity, and the empowering of women.

The people of Andhra Pradesh went through the painful experience of the Green Revolution. During the 1960's the Indian government and international scientists pushed the communities into growing new rice and wheat varieties and provided credit for farmers so that they could afford the fertilisers and pesticides. This approach devalued traditional crops by promoting so-called high-yielding varieties of rice, and in this way also devalued the traditional food culture.

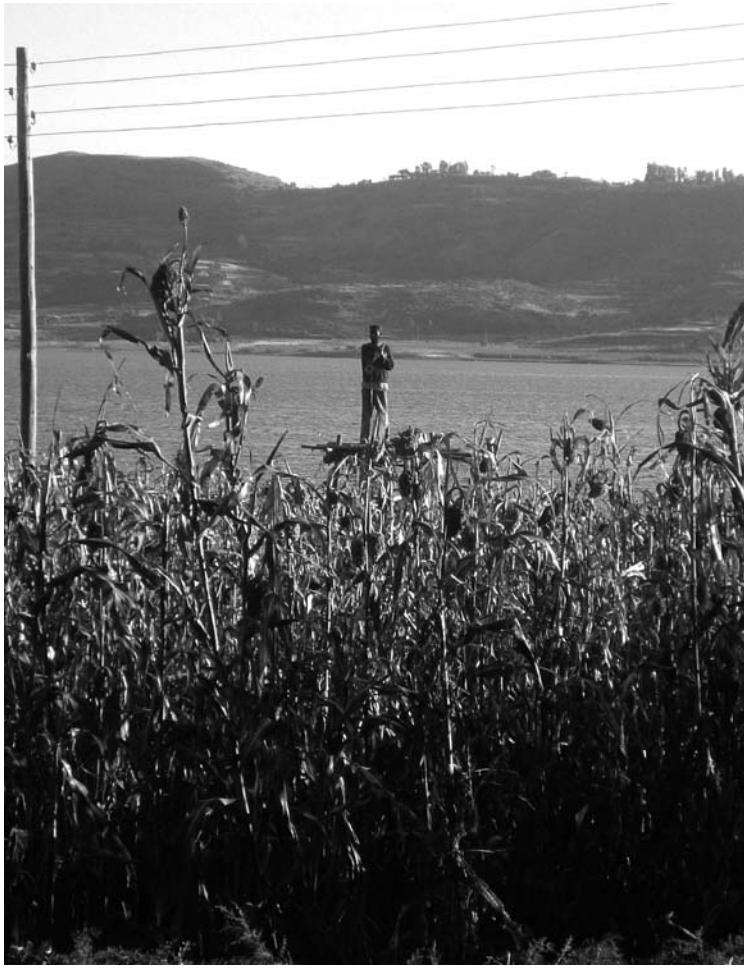
It was the failure of this top-down approach and the terrible poverty and suffering that it caused that spurred the NGO the Deccan Development Society (DDS) to work with the local communities in the recuperation of their seeds and the food culture it supports. They regenerated depleted soils and encouraged crop diversity, thus improving nutrition and eliminating extreme poverty and malnutrition. Every year, an annual biodiversity festival is held in the region to celebrate their wealth. In the words of one of the women, Anjamma from Gangwar Village, "…today we are

1 All data and quotes in this section are from www.ddsindia.com and from personal communications with PV Satheesh of DDS.

able to bring back the lost seeds. What we have is being disseminated, and we are able to exchange seeds, sell excess seeds, and use the money for future purchases of seed material." Many farmers in India have not been as fortunate as these women: it is estimated that every year thousands drink pesticides and end their life to escape from the debt trap in which they and their families have been caught as a result of failed crops.

Traditional farming systems, such as the ones that the DDS promotes, also allow for the use of wild foods and the cultivation of a variety of greens, pulses and other grains that complement sorghum, giving a nutritionally complete diet. Susheelamma from Raipally village in Andhra Pradesh says: "If we use many crops, our health and our children's health will be good; because even if a few crops fail we would still have others to stay well-nourished. The soil also will get enriched with a variety of replenishments from different crops." Others have reported in depth about the value and extensive use of uncultivated foods in traditional diets.[2]

The farmers of Andhra Pradesh are very clear about what is important to them. To quote one of them: "Today, if I look back, I can sense a sea-change in my life. And what is so exhilarating about it is the feeling of control that we are experiencing. Earlier, we were like drift-logs being swept here and there by external forces. We had to work for others on lands alien to us. We did not feel that anything belonged to us. We were just being used. But now, thanks to the Sangham [community coming together], we are shaping our life in a way that we have chosen on our own."



Chasing birds in a sorghum field, Ethiopia

The Ethiopian food crisis

Ethiopia brings to mind images of starving children, and these very same images are extensively used by the genetic engineering (GE) industry to justify why Africa needs to embrace genetically modified organisms (GMOs), including GM sorghum. The severe drought and famine of the 1980s left many destitute and dying. At the time, food aid poured into the country. At the beginning of the 1990s, soon after the military government was ousted, the IMF and World Bank moved in to help Ethiopia to deal with foreign debt, and they enforced their usual programmes of structural adjustment and privatisation.[3] Campaigns were organised to get farmers to use chemical fertilisers and high-yielding varieties through subsidised fertilisers and credit schemes. Pioneer Hi-Bred International, then the world's major seed company, assisted in "reforming" the informal seed exchange system, with the establishment of a seed industry in which the Ethiopian Seed Enterprise (ESE) supplied seeds replacing farmers' varieties.

USAID "donated" fertilisers in exchange for reforms in the fertiliser and seed markets. But in 1998 the farmers were hit by a double whammy: the US government withdrew subsidies on chemical fertilisers, and the price went up; at the same time, the world maize price dropped.[4] When drought struck in 2002, farmers were heavily indebted and had to withdraw from the fertiliser schemes. The government had to request food aid for more than 14 million people.

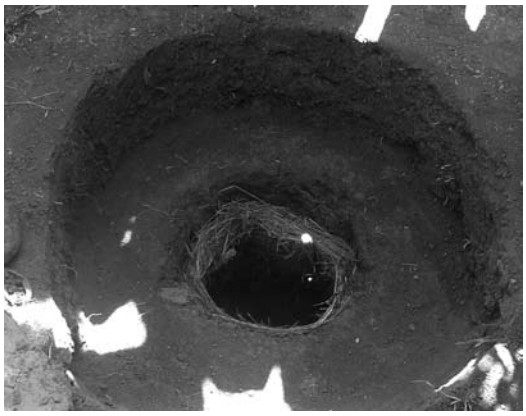
This crisis enabled US agrochemical companies to exploit the situation and to further replace local seed systems with hybrid seeds, to import fertilisers and to dump surplus GM food from the US as food aid. It is clear that the crisis was not caused by drought alone, and this example is a good illustration of how Green Revolution initiatives, combined with structural adjustment programmes, have created the conditions for famine all over Africa.[5]

2 Ian Scoones, Mary Melnyk and Jules Pretty (eds.), *Hidden Harvest: Wild Foods and Agricultural Systems. A Literature Review and Annotated Bibliography*. London, IIED, 1992. See also: Janet Bell, "The Hidden Harvest", GRAIN, *Seedling*, October 1995. grain.org/seedling/?id=157

3 M. Chossudovsky, "The Real Cause of Famine in Ethiopia – Statistical Data Included", *Ecologist*, September 2000.

4 R. Thurow, "Behind the Famine in Ethiopia: Glut and Aid Policies Gone Bad", *Wall Street Journal*, 1 July 2003.

5 B. Smith, "IMF/World Bank policies pave way for continuing famine in Africa", 5 February 2003.



Traditional storage for seeds

Farmers from north-east Ethiopia, Tigray, Eritrea, and northern Wello were forced to eat their seeds during the severe famine of the 1980s, and so a huge erosion of farmers' varieties and genetic diversity occurred. During the famine, some farmers were more strategic than others and kept seeds underground in seed storage holes known only to one family member.

In response to the crisis, Ethiopian scientists such as Dr Melaku Worede, then Director of the Ethiopian Plant Genetic Resources Centre (later the Ethiopian Biodiversity Institute), in partnership with the Canadian NGO USC Canada, started the Seeds of Survival (SoS) programme in 1989. Dr Melaku had a very different vision from most other plant breeders as he valued farmers' knowledge and their seeds and wanted to work with their resilience and capacity, rather than against it.[6]

His approach combined farmers' knowledge with scientific and government support. Rather than bringing seed from outside, they helped farmers to find seed from other farmers in the region and neighbouring regions. Farmers were given access to 130 varieties that were preserved in the Ethiopian Gene Bank, but in the end only 10 per cent of the recovered seeds came from the Gene Bank, as most were below the viable threshold.[7] About 90 per cent of the recovered seeds came from farmers in the region. Farmers selected what they wanted to use and multiplied the recovered seed. They then spread it among other farmers, as they had always done, and biodiversity increased once again.

Sorghum: a golden harvest in Wello

In November 2006, GRAIN participated in a meeting held in Ethiopia and hosted by USC Canada and the Ethio-Organic Seed Action (EOSA). We visited local sorghum and wheat farmers. Although the situation in the Ethiopian countryside is challenging, the farmers' stories and strong belief in their own knowledge and seeds are heartwarming. When we visited Harbu, in south Wello province, the harvest stood densely as far as the eye could see, with the sorghum's jewel-like white, yellow, red and bronze heads showing off their abundance. This seemed clear evidence that sorghum diversification and better production had improved farmers' livelihoods, and they testified to this. A farmer near Kombolcha told this story: "The new structures [systems of production] are foreign, (but we don't use them as) we have our own system

Wheat and teff, Ethiopia

6 See a description of this work and its impact in M. Worede *et al.*, "Keeping diversity alive: an Ethiopian Perspective", in S. Brush (Ed.), *Genes in the Field. On-Farm Conservation of Crop Diversity*, IDRC/IPGRI/Lewis Publishers, 2000.

7 Dr Melaku Worede, personal communication, November 2006.

It's all in a name: the Ethiopian farmers and their sorghum

As long as communities have a use for crops, they will conserve them. The names farmers in Ethiopia give to sorghum varieties says a lot about the way they use and value them. Ethiopian farmers nurture a huge variety of species and some have very poetic names. A local saying goes: "You do not disregard your relatives or your crops", which shows that crops are considered to be as valuable as relatives, and provide equally strong social ties.

One farmer, called Said, liked most the "Gorad" variety, because in his experience it has a higher yield (3 tons /ha) than wheat. Gorad describes the shape of the panicle; the same word is used to describe someone with a round head and short nose. Among its many applications, people use it to make injera (bread) and beer, and roast it to eat. Mohamed Yemer, on the other hand, preferred "Wegere", because the head or panicle is compact, making it bird- and insect-resistant, as well as giving it a long shelf life. Ahmed, who grows 7 different varieties, said "Cherekit", meaning "as shiny as the moon", is a quick-maturing, drought- and striga-tolerant variety, was best. However, "Cherekit" is susceptible to weevils and must be used quickly. Amina, whose fields we visited south of Kombolcha, farms 10 varieties on just one hectare. She has sorghum for many different uses, including one which is sweet and good for eating and "Gorag" with its high yield. She mixes the seeds together, saying that she is giving herself a safety net planting in this way, as the seeds have different levels of adaptation. Her yields vary from about 3t/ha in a good season to about 2t/ha in a bad season. She also plants other grains such as maize, barley, finger millet and wheat. Sorghum is popular because it requires less labour than teff or maize and needs fewer inputs.

Other varieties grown by farmers include: "Merabete", a local variety that is striga- resistant; "wetet be gunche" ("milk in my mouth"), which is a variety rich in lysine, used by lactating mothers and as a weaning food; "Ganseber" ("pot-breaker") because it makes such a good beer, sometimes breaking the pot during fermentation; and "Sende lemene" ("why bother with wheat"), because it is as good as wheat for making a local bread. The variety is also high-yielding and has a high market value.

of selection and exchange. I go with my wife to select the seed, and then we hang it over the fire in the smoke. Every Friday, I put the seeds outside. Once they are dry, we put them in a container where there is no humidity. When the time comes to sow, I talk to my wife. If I do not have seed, I get some from my neighbour or a relative." For these farmers the bonds between culture, knowledge and diversity are strongly associated. "On certain days, I look at the sun and the moon and decide what to do with the seeds. Some days we dry the seed, and we use plants and ashes to preserve the seed. Each farmer does not have everything, but at weddings and funerals we can exchange seeds."

This is biodiversity-based farming: farmers decide for themselves how they select seed and what varieties they plant when and where; and then they grow sorghum varieties in a mixed way so as to encourage the continuous exchange of genes and the maintenance of a dynamic system.[8] These farmers also make use of the undergrowth in sorghum fields, especially during the dry season in July and August. There are 7–8 varieties of uncultivated companion plants that they use for food and fodder.

In talking to the Harbu farmers, it becomes clear that seed exchange has many functions, and performs a very important social function, because it affirms interdependency among neighbours and the value of social relationships. They do not sell traditional seeds, but exchange them and keep them for friends and family. These days the farmers along the highway are losing this tradition, because the markets along the road influence them, breaking cultural and ethnic barriers and eroding culture and knowledge. They also noted that the weather and seasons were changing, forcing them to plant at different times from their forefathers.

Sorghum diversity under threat

Ethiopia is the heartland for sorghum worldwide, with hundreds of varieties under cultivation, but genetic erosion is still continuing for a number of reasons. The farmers say that the trend is moving away from their varieties, because the Minister of Agriculture condemns them and, along with the aid agencies, promotes high-yielding varieties. But these varieties, the farmers say, "do not meet the standards we learnt from our mothers", and farmers who resist these pressures do better: "Those that rely on the Minister have lost."[9] The farmers are left vulnerable, they say: sometimes they may have very high yields but at other times they lose everything. Many of the agricultural extension workers who introduced improved sorghum varieties in Ethiopia now acknowledge that they have failed. The reasons

8 Dr Awegechew Teshome in his research came across one farmer who had 24 varieties of sorghum on 1 ha of land. Personal communication, November 2006

9 Harbu farmers, personal communication, November 2006.

Chaletu Degefa, wheat farmer, Ethiopia

they cite include their focus on short plant height, which attracts birds, lower yields and the failure to adapt the varieties to the agro-climatic conditions of the area.[10]

Land ownership is another big problem for these farmers: under the current system they have a contract with government and ownership is not secure. This, together with population pressure leading to decreasing farm sizes, has a huge impact on how land and resources, including biodiversity, are managed.[11] During a meeting with farmers in Harbu, it seemed as if this might be the issue causing them most anxiety.

Dr Awegechew Teshome says that it is absolutely critical for farmers to have a range of choices, so that they can make their own decisions. "Heterogeneity is an asset – they need quality not uniformity. They need different materials for different environments. The changes in soil, climate, socio-economic demands are huge, and farmers adapt by growing diversity, and staggering their crops. The biggest threat to genetic erosion and dependency is when farmers do not have their own seeds. It is not sustainable to bring foreign seed in, they will lose their own seed supply, lose independence and eventually no longer farm. Seed is the linchpin of farming."[12]

The "Super Sorghum" Project

Important as sorghum is for the livelihoods of local communities, it has now also become the target of the biotechnology industry, largely because of its genetic potential, but also because it is seen as the perfect crop for a public relations offensive. The industry has won the support of powerful backers. Even before the Bill & Melinda Gates and the Rockefeller Foundations announced in September 2006 that they were funding a new Green Revolution for Africa, they had already put big money into the so-called "African Biofortified Sorghum" (ABS) project, for the development of GE sorghum for Africa.

The ABS is widely known as the "super sorghum" project. It has a long list of collaborators, including the University of Pretoria, South Africa's Agriculture Research Council (ARC) and Council for Scientific and Industrial Research (CSIR), the Forum for Agriculture Research in Africa (FARA) and various universities in the USA. It is led by the "Africa Harvest Biotechnology Foundation International", headed by Florence Wambugu. Wambugu is one of the leading defenders of genetic engineering in Africa. She claims that this is, for once, a wholly "Africa-owned project", but forgets that the technology belongs to Pioneer/Du Pont. She makes a multitude of claims for "super sorghum": it will fight HIV/AIDS, increase farmers' productivity and in the process "mentally empower" farmers.

As the scientific leader of the project, Du Pont Crop Genetics Research (Pioneer) "donated" technology to Africa that was valued (by Du Pont) at US$4.8 million in unclaimed intellectual property rights (IPR) earnings. The material they have supplied include IPR-free GM sorghum, engineered to contain 50 per cent more lysine (an amino acid found in proteins said to be beneficial to human health). The African Agricultural Technology Foundation (AATF) manages the intellectual property and license negotiations between the "collaborators": Pioneer itself, CSIR, and the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT). This, of course, turns the whole project into a "win–win" situation for Pioneer (which sits on the Board of AATF). But despite the rhetoric, feeding people is not really on the radar of the super sorghum pushers. In the vision of Dr William Dar, the Director General

10 T. Hunduma, "Local Crop Genetic Resource Utilisation and Management in Gindeberet, west-central Ethiopia", thesis submitted to the Norwegian University of Life Sciences, May 2006, p. 49.

11 J. Eberlee, "Long-Term Sustainability of Ethiopian Landraces at Risk", August 2001, http://tinyurl.com/336aug

12 Dr Awegechew Teshome, personal communication, November 2006.

The "super sorghum" pushers keep on pushing

The ABS Consortium wanted to use biotech-friendly South Africa to launch their GM sorghum in Africa and, with the CSIR and ARC on board, applied for a permit to carry out experiments. Even though sorghum is not as important in South Africa as in most of the rest of Africa, the pro-biotech South African government still found the threat of contamination serious enough to reject in June 2006 the application for experimental planting of Pioneer's GM sorghum. The CSIR re-applied on behalf of the ABS Consortium, and South Africa's regulatory body again rejected the application on 30 January 2007. The advocates have indicated that they will not give up and said in the media that they were confident that, by putting continued pressure on the South African government, they would eventually break down its resistance.[1] One would have thought that the propaganda put out by the ABS Consortium could be believed only by the most naive of politicians. But late in February, at an ABS Open Day, the South African Minister of Agriculture, Lulama Xingwana, said that the government would support the ABS project.

1 O. Ogodo, "South Africa halts 'super' sorghum study", SciDev.Net, 20 July 2006.

of ICRISAT, what is important is to get the poor communities in the drylands to contribute to a glorious African future based on biofuels.[13]

The Bill and Melinda Gates Foundation have contributed US$16.9 million to the project, as it fits in perfectly with their vision of a new Green Revolution for Africa aimed at breeding new seeds and getting Africa's small farmers to use them.[14]

Undermining sorghum's diversity base

While a very important staple food crop in Africa and Asia, sorghum is also widely grown in Central America, the US and Australia, mainly for animal feed and increasingly for biofuels. The annual global production of sorghum now fluctuates around 60 million tons. The protein in most sorghum varieties is considered inadequate, with a low lysine value, and not very digestible. Traditionally, farmers have known how to deal with this: sorghum is often fermented to make essential nutrients available to the human digestive system. In addition, African farmers have developed their own sorghum varieties, high in lysine, which farmers grow when needed. Moreover, the thousands of sorghum varieties grown all over Africa are locally adapted to agro-ecological zones and cultural uses, and this is just one of the reasons why the uniform approach of the Green Revolution did not and will not work in Africa.

There is also a wide variety of wild relatives of sorghum, some considered weeds and others used by farmers, with which the cultivated crops readily exchange genes, and it is very important for the farmers that these continue to be a future source of genes.[15] In west-central Ethiopia's Gindeberet region alone, six wild varieties of sorghum have been found; three are in the process of being domesticated.[16] In fact, there are wild relatives in most sorghum-growing areas. If these plants are contaminated with GM sorghum, serious and irreversible problems will be caused. For instance, Johnson grass (*Sorghum halepense*), with which sorghum can backcross, is considered one of the world's most noxious weeds.[17] If it is contaminated by the GM variety, it could turn into a super-weed and be extremely difficult to control. Moreover, GM sorghum will almost certainly contaminate farmers' varieties and cause further genetic erosion.[18] Contamination will also transfer the patented genes to farmers' varieties and, as Africa is rushing to implement legislation to protect corporate seed breeders, the corporations will inevitably raise questions about ownership,

The background to all this is that hybrid sorghum has already failed in Africa. In a 4-year on-farm trial in the early 1980s it was demonstrated that, in villages, none of the varieties carefully bred in research trials could outperform local types in any environment.[19] In a 1996 USAID report assessing extension support to sorghum and cowpea research in northern Cameroon, it was shown that the return on investment was extremely low.[20] Moreover, this study did not take into account (as these assessments seldom do), the opportunity cost of developing non-hybrid varieties. Despite the worldwide sorghum breeding done to date, less than 10 per cent of Africa's sorghum area is being planted with improved varieties from research stations.[21] In

13 ICRISAT formed a partnership with Rusni Distilleries in India to distribute hybrid sorghum seed and then buy the stalks from the farmers for biofuel production, *What ICRISAT thinks*, September 2006, http://tinyurl.com/ypw85t

14 GRAIN, "Another Silver Bullet for Africa?", September 2006, grain.org/articles?id=19

15 S. Edwards, "Crops with Wild Relatives Found in Ethiopia", in J.M.M. Engles *et al.* (eds.), *Plant Genetic Resources of Ethiopia*, Cambridge University Press, 1991.

16 T. Hunduma, "Local Crop Genetic Resource Utilisation and Management in Gindeberet, west-central Ethiopia", thesis submitted to the Norwegian University of Life Sciences, May 2006, p. 71.

17 M. Schmidt and G. Bothma, "Risk Assessment for Transgenic Sorghum in Africa: Crop-to-Crop Gene Flow in *Sorghum bicolour* (L.) Moench", *Crop Science* 46, 2006: 790–98.

18 See the objection against the sorghum application by the African Centre for Biosafety, http://www.biosafetyafrica.net.

19 S.J. Carr, "Technology for Small-scale Farmers in sub-Saharan Africa", Technical Paper No. 109, World Bank, Washington, D.C., 1989, p. 106, in *Lost Crops of Africa: Volume I: Grains*, Board on Science and Technology for International Development, 1996, p. 149.

20 J.A. Sterns and R.H. Bernsten, "Assessing the impact of cowpea research and extension in northern Cameroon", *International Development Working Paper No. 43*, Michigan State University, 1996, http://tinyurl.com/2rl42c

21 *Lost Crops of Africa: Volume I: Grains*, Board on Science and Technology for International Development, 1996, p. 149.

Finding solutions for self-created problems

Over the last 25 years the CGIAR has spent over 40 per cent of its budget in Africa, but it failed to bring about a Green Revolution. All this money poured into research and extension has not made much difference to farmers in Africa, but the continent has, on the other hand, contributed hugely to crop improvement in the rest of the world. Through public research institutions, genetic material has continued to flow from Africa and India to private seed companies. According to a 1994 RAFI study, sorghum from Ethiopia alone was worth US$12 million a year to US growers, a figure that has undoubtedly increased since then.[1] India's CGIAR Research Centre, ICRISAT, is considered to be the world centre for improving sorghum and holds over 35,000 accessions of sorghum.[2] The USDA also holds a large selection of accessions, and uses them for the benefit of the US sorghum industry. Paradoxically, much research at these institutions focuses on eliminating problems that were in the first case created by hybrid sorghum varieties. For example, two key difficulties – grey mould, which is found in improved varieties that have a short duration or growing season; and sorghum ergot, a very serious disease that is spreading very rapidly – are encountered exclusively in hybrid varieties.[3]

1 RAFI, "The Benefits of Biodiversity", *Occasional Paper Series*, Vol. 1, No. 1, March 1994, http://www.etcgroup.org/upload/publication/490/01/occ_vol1_1.pdf

2 For more information, see CGIAR website, http://www.cgiar.org/impact/research/sorghum.html

3 Pandyopadhyay *et al.*, "Ergot: A new Disease Threat to Sorghum in the Americas and Australia", *Plant Disease* Vol. 82, No. 4, pp. 356–67. See also: "Focus on Crops of the Semi-arid Tropics", *New Agriculturalist* online, http://www.new-ag.info/98-1/focuson.html

these circumstances it makes absolutely no sense to introduce GM sorghum with more risks and even less acceptability.

Sorghum for food or for export?

Sorghum is a critical food crop for millions of Africans and Asians. In Africa sorghum is fermented to make beer, porridge, injera (a kind of bread) and other products, in a process that makes available the much-needed proteins it contains. If sorghum is processed in the right way and cultivated in a mixed farming system, it can form the basis of a varied and balanced diet, where foods complement each other. As Dr Awegechew Teshome pointed out, "The solution to hunger lies within these communities. They must leave the system alone because it works for farmers. There must be a faithful relationship between farmers and scientists, where scientists enhance the knowledge of farmers, and support and empower them to value their own seed."[22]

But sorghum is also becoming an increasingly attractive commodity to the industry. There is now a rush to find alternatives to maize, which cannot grow in marginal conditions. There is the market for animal feed, and now for biofuels. Sorghum is clearly a crop with huge potential for the agro-chemical industry, with a large untapped earning potential.

All over the world we have seen the same pattern of action for creating markets for multinational agrochemical companies: first, the dismantling of government support for farmers and the weakening of local control over biodiversity and land; then, when hardship strikes, the moving in with hybrid seed, fertilisers, and GM seed, often in philanthropic guise. All these initiatives operate on the arrogant assumption that the people behind them know better than farmers and that crops developed in labs are better for farmers than their own varieties. These people refuse to acknowledge that such interventions have failed time after time, and that they have caused untold misery. By refusing to acknowledge and respect the innovations made by farmers over millennia, they devalue traditional crops and cultures in order to strengthen the seed and chemical industry, which sells seeds back to farmers at a premium, and thereby contributes to the devastating erosion of livelihoods.

22 Dr Awegechew Teshome, personal communication, November 2006.

In October 2006 the Turkish Grand National Assembly (parliament) passed a far-reaching law on seeds which, if it is fully implemented, will erode the farming practices of all those who work on the land: more than 35 per cent of Turkey's population.[1] The new law is part of a drive to bring the country's legislation into line with the European Union, which Turkey's government hopes eventually to join.

Turkey's new seed law

New controls, old struggles

GRAIN

Turkey's Law No. 5553 is generally referred to as the seed law, but this is misleading, for its scope is far broader. The new legislation will regulate seeds, not only of field crops and vineyard and garden plants, but also of forest plant species and all propagation materials. Moreover, the law introduces a new and highly pernicious distinction between "genetic resources" and "plant varieties". "Genetic resources"[2] are defined as both naturally found wild species and those developed by farmers from which plant breeders and scientists can extract genes with "important characteristics". In other words, the assumption is that the original farmers, who have developed and improved seeds over millennia, are no more than suppliers of the raw material from which official breeders can produce "improved" seeds, which are considered "plant varieties" and which can then be sold (*see* table).

This mindset permeates the whole law: Article 1 states that the main objective behind the new legislation is to improve the quality of plant production and to restructure the seed sector. Just as in many other countries in the world that are going through similar processes, farmers' varieties are not considered to be of good enough quality to be sold on the market – where both "good" and "quality" are defined by industrial criteria of "high productivity". For the government, quality control in seed supply means ensuring the availability of planting material that is standard and displays constant characteristics. This leaves no room for variablity and adaptability; both of these qualities, possessed by traditional varieties, are extremely positive for farmers, yet they are turned into negatives by the government. This mentality is leading to the loss of farmers' rich diversity of landraces and their replacement by company-developed hybrid or transgenic varieties. Already

1 An English translation of the legal text is available on the GRAIN website: http://www.grain.org/brl/?docid=277&lawid=2886

2 Article 3(9) of the new law.

Table: How "Genetic Resources" and "Plant Varieties" are differentiated

GENETIC RESOURCES	PLANT VARIETIES
Naturally present	Bred
Selected by farmers	Developed by breeders and scientists
Landraces, local varieties	Hybrids, transgenics, etc.
To be listed in a log	List of registered seed varieties to be maintained
Criteria of registration to be specified	VCU & DUS criteria[1]
No sale	Sale allowed after registration and certification
Exchange among farmers allowed for personal use, as long as there is no commercial activity with the seeds	Exchange among farmers allowed for personal use, as long as there is no commercial activity with the seeds
Dominated by the unorganised sector made up of small farmers	Dominated by the formal seed sector of companies and unions

1 All varieties submitted to be registered need to be tested for DUS (distinctiveness, uniformity and stability) and, for some crops, VCU (value for cultivation and use) over a minimum two-year period.

those companies represented by TURK-TED – the seed industry association of Turkey – have a commanding position in seed production.

The law is patterned on European Union (EU) seed laws, and this segregation of Turkey's seed supply into two – one considered to be an economically viable industrial activity, while the other, made up of informal exchange among peasants under prescribed restrictions, is merely tolerated by the law – is in line with the rest of Europe. The European Commission (EC) has approved a special directive[3] to cover the second category: for "conservation varieties" – these lie outside the official seed catalogue, and will be governed by less strict marketing conditions to allow for their conservation *in situ* on the farm. It is clearly in the interest of the seed industry to keep these varieties alive, for they might be useful in the future.

The new law replaces the old seed law[4] and makes it compulsory for the first time to both register and certify seeds before they can be sold. The detailed criteria to be used in registration will only be known later, when the implementation rules are announced, but the general lines of the system are already clear. To be registered, a seed will have to be recorded in an official log book. The Variety Registration and Certification Centre of the Ministry of Agriculture and Rural Affairs (MARA) will conduct the variety registration trials (DUS/VCU) and provide the seed and sapling certification services, as well as cooperate with ISTA,[5] OECD[6] and UPOV.[7]

It is also proposed that a new body – the Turkish Union of Seed Producers – be set up. It will be independent of the government and will advise MARA over key questions, such as the import and export of seeds. Under the new law MARA may assign any of its powers to this seed association or to an agricultural university or to any other public institution. Many observers are afraid that this will lead in practice to the outsourcing of the state's regulatory roles to the private sector, with the authorities washing their hands of the responsibility to control the latter in the interest of small farmers.

The certification, which will become mandatory under the new law for all seedlings before they can be sold, implies field testing, laboratory controls and compliance with seedling standards, including those governing packing and labelling. There is also to be a "recommended list", which will name the regions suitable for seed production. Anyone found growing their own crops inside the designated seedling production areas will be fined 3,000 Turkish Liras[8] (about US$2,000). No compensation will be paid to farmers for this prohibition. Instead, any illegal plantings will be uprooted at the cost of the growers. So, in practice, the government will not only determine what is to be sold – only registered and certified seed – but also where it is to be grown.

The law will also allow ministry officials to inspect farms, though it does not specify which farms and why. There are grounds for concern, for in India there has been a furore over the wide-ranging powers that will be given to seed inspectors to search and seize farmers' premises under that country's new Seed Bill.[9] Another worrying aspect of the new law is the failure to spell out corporate liability for non-performance of company seeds, except that those firms causing loss will be "responsible for recompensing joint damages".[10] Individual farmers will also have to pay fees to

3 Directive 98/95/EC

4 Law No. 308 of 1963

5 International Seed Testing Association, which establishes the procedures for sampling and testing seeds, and promotes the uniform application of these procedures for seeds being traded internationally. http://www.seedtest.org

6 Organisation for Economic Co-operation and Development, which represents the world's most developed countries. http://www.oecd.org

7 The International Union for the Protection of New Varieties of Plants, which encourages the development of new varieties of plants by granting breeders an intellectual property right on the basis of a set of clearly defined principles. http://www.upov.int

8 Article 12 on Penalties.

9 For more on India's draft Seed Bill, see http://www.grain.org/seedling/?id=338

10 Article 11.

comply with registration requirements, for only unions and sub-unions set up as co-operatives will be eligible for fee exemptions, as set out in the law on co-operatives.[11] In the only article in the text which explicitly mentions Europe, it is stated that the seedling sector is allowed support as decided by the Ministry in order to improve the sector in compliance with European Union standards.[12]

Transgenic seeds

Turkey's civil society is firmly against the genetic modification (GM) industry that threatens Turkish genetic resources, and has organised a "No to GMOs" platform.[13] It is asking why a country that is almost self-sufficient in food needs GMOs, and firmly believes in the wealth of the country's natural richness to provide for all the needs of its people. The platform is a voice against agricultural policies based on ecologically and nutritionally deficient principles that merely play to the market. Even so, it seems only a question of time before GM seeds are legally sold in Turkey. Monsanto and Pioneer have already conducted field trials of GM varieties. The country's General Directorate of Agricultural Research (TAGEM),[14] which has itself been involved in testing GMOs, is leading the development of a National Biosafety Framework.[15] Once the biosafety structure is in place and pending field applications are cleared, GMOs in agriculture will be authorised. But the new seed law makes no mention of GM seeds (although an earlier draft did). So it is not at all clear how GM seeds will be treated or how this new law will relate to biosafety regulations.

"Freedom" for Farmers?

Many Turkish landraces are alive and in use today, thanks to small landholdings, mountainous terrains and Turkey's location within a centre of diversity. Farmers have maintained and developed their seeds for centuries, with no support from the government. Turkey's farmers have far more diversity to defend than private seed producers will ever be able to "manufacture". Yet all this is threatened by the new seed law. When it was under discussion, farmer groups, non-governmental organisations (NGOs) and supportive academics came together to warn legislators against passing a new "slavery" law that would make farmers dependent on the private sector for seed.

As in other farming cultures, farmers in Turkey have traditionally bartered planting material. Indeed, their success in surviving and adapting to their environment depends, to no little extent, on their freedom to control their own seeds. If they become dependent on either the state or private producers for their seeds, they will lose the power to decide what is to be sown, where, why and with what inputs. As the Turkish Confederative Platform of the Farmers' Union put it, "the state should work to ensure that farmers – not firms – control the entire food chain".

Under the new law, farmers will be able to continue to save seeds for their own use and to exchange with other farmers without having to register them. But any activity on their part which hints of "trade" will invoke penalties. The monitoring of farmers' activities is likely to be intense, for the private sector views farm-saved seed as competition. Already Turkey's Plant Variety Act,[16] in force since 2004, has begun to erode the rights of small farmers by stipulating that, if they plant protected varieties of 21 species that come under the plant variety protection (PVP) laws, they cannot exchange the seeds with other farmers.[17]

Not surprisingly, many farmers are extremely suspicious of the new law. In an open letter to parliamentarians, groups of Turkish farmers' unions reiterated the rights that peasant communities ought to enjoy, including the right to use native seeds. They disapproved of the draft law in its totality, insisting that mere amendments would not improve it. They have the support of European small farmers' groups.[18]

Global pressures

Before the 1980s the seed trade was heavily regulated by the public sector, but then the Turkish government began to adopt the economic liberalisation policies in vogue worldwide, and to make concessions to the private sector in its seeds policy. The World Bank-sponsored reforms under the Agricultural Reform Implementation Project (2001–2005) also marked a radical change towards a more market-driven food and farm sector, one more in line with the EU.

There is no doubt that Turkey's wish to join the EU has strengthened the move towards market economics. This is not the first law related to agriculture to be copied from the EU in an attempt to become more acceptable. The organic farming law[19] and the PVP law[20] are other examples.

Most Turkish farmers are deeply concerned about the prospect of their farms being turned into Europe's kitchen garden. They fear that the stronger this trend, the stronger the pressures will

11 Law 1163 of 1969.

12 Article 5 on Seedling Production.

13 From Arca Atay in communication with GRAIN, February 2007.

14 http://www.tagem.gov.tr/

15 The Cartagena Protocol on Biosafety was adopted by the Turkish Parliament on 17 June 2003.

16 Article 17, on Derogation for Farmers.

17 In the PVP Law a "small farmer" is one who grows a maximum of 92 tonnes of wheat or comparable quantities in respect of the 21 plant species listed therein. An "own holding" is defined as the land s/he actually uses for plant growing.

18 For more on this, see grain.org/bio-ipr/?id=494

19 Turkey's Regulation on the principles of organic farming and their implementation, dated June 2005, amended October 2006.

20 Law No. 5042 of 2004, http://tinyurl.com/2fwan2

become to provide only what the market demands, and that those who argue for the preservation of local varieties for local people will progressively lose clout.

What next?

If this law goes ahead, Turkey will be restricting still further the space for farm seed varieties and traditional crops. As a result of this, many farmers, who do not fit in with "modern" agriculture, may be forced off the land.[21] It is a daunting thought and one that is encouraging farmers and community organisers to sustain their resistance, even though public protests failed to stop the seed law from being passed by parliament. These groups are now considering multi-pronged approaches. As farmers' leader Abdullah Aysu explains, "Farmers' groups will need to think globally, but organise locally in order to go on farming in the way they want." He says that to maintain space for their seeds, farmers will need to "shorten the distance between the grower and the consumer, and the only way to do this is to find ways in which farmers can bring their own produce to the final consumers." As well as direct marketing, direct action is also contemplated. Farmers and consumer groups, with the support of other organisations, are also challenging the seed law in Turkey's supreme court.

The new law will not compel registration immediately, as a transition period is envisaged. Groups of farmers and consumers are planning to use this time to mobilise more effectively and to devise new strategies of resistance. The struggle to save farm seed and those who sow it continues.

21 See the World Bank's report on Turkey's Agricultural Reform Implementation Programme (ARIP): "The second initiative under the programme will encourage farmers to stop producing crops which are currently heavily over-produced by offering one-off payments to cover the cost of switching to alternative activities." http://tinyurl.com/2op37n Also read http://tinyurl.com/3x3fdz

In their effort to improve the taste and nutritional value of their bread, a group of French *paysans boulangers* (peasant bakers) are seeking out old varieties of wheat, many of which had not been planted for more than half a century. Experimenting with them, they are discovering that some have unexpected advantages, such as provoking a much lower level of gluten intolerance among consumers than industrialised bread.

Bread of Life

HÉLÈNE ZAHARIA

Like so many good things in life, it all happened because people began to think for themselves. In different parts of France, small groups of mainly organic wheat farmers have for many years been bucking the trend and continuing to produce good, nutritious bread, despite the growing dominance of the industrial bakeries.

Hélène Zaharia is from Réseau Semences Paysannes

Using old-fashioned millstones, they have been grinding the wheat they grow in their fields and, using natural yeast, they have been making their own bread, baking it in traditional ovens. The bread tastes good, so people in the neighbourhood have gone on buying, even when the mass-produced bread has been cheaper.

But recently the paysans boulangers (peasant bakers), as they are called, began to realise that modern varieties of wheat, which was all they

Touselle takes off

Henri is an organic farmer in the south of France. In 1997 he was carrying out research into farming practice in the Gare region when he discovered Touselle wheat. It is an early wheat, without whiskers, with a soft grain, very suitable for bread-making. It was once cultivated quite widely in Languedoc and Provence and was appreciated for its good yields, even when it was grown on poor soil in a difficult, dry environment. But by the time Henri became interested in it, it had been widely abandoned in favour of modern varieties.

Henri decided to try it out for himself and obtained a few seeds of four of the 13 varieties of Touselle held in the Department of Genetic Resources at INRA in Clermont-Ferrand. For the first two years, he cultivated the Touselle in his garden and then he decided to try it out in his fields. Gradually, he learnt more about it – how densely the seed had to be planted, how long it took to ripen, how resistant it was to heavy rain, and so on – and his experiments became well-known in the region.

Other farmers began to copy him, and by 2004 Touselle was being grown experimentally on a fairly large number of peasant farms in the south of France. In 2005 the Syndicat de Promotion de la Touselle was founded, with the idea of promoting the production of bread made from Touselle. Eager to back the initiative, consumers set up support groups. Henri then devoted an area of his farm to experiments with other varieties of Touselle brought in by other farmers. Together, they started crossing varieties and developing new strains. All the time Henri was recommending caution, saying that some of the varieties they were using had not been cultivated for many decades and would perhaps require special treatment.

could find on the seed market, didn't really suit their needs. For decades wheat has been bred by the seed companies to respond to the needs of the big wheat farmers and the big industrial bakeries. What these groups want is wheat that has a high yield and a high protein content, and that grows fast by capturing as much soluble nitrogen as possible from the chemical fertilisers added to the soil. But these are not the qualities that the peasant bakers want: they need varieties of wheat that are healthy and disease-resistant; that stand up to different kinds of weather; that are suitable for old-fashioned bread-making techniques; and, last but by no means least, produce tasty and nutritious bread.

Seeking out the old varieties

It was in this way that peasant bakers, generally independently of each other, began to seek out the old varieties. It wasn't easy because these varieties have been neglected for well over half a century. The bakers had to find varieties that had last been widely grown in the early years of the 20th century or even in the 19th century. And there were other problems too. When farmers are looking for old varieties of fruit or vegetables, they can often find amateur gardeners who have conserved them down the decades. But people don't grow wheat in their back gardens. The peasant bakers had to seek out the handful of old farmers who still had the ancient varieties, and look in the seed banks owned by INRA (National Institute of Agricultural Research) in Paris.

Moreover, finding the seeds was only part of the problem. Once they had located a few varieties, the peasant bakers had to breed from them. Some of the farmers simply multiplied the seeds, while others were more ambitious. They began developing the varieties so that they would be appropriate not only for different regions, climates and types of farming but also for the use that would be made of the wheat at the end. It is precisely this ability to choose and develop the old varieties for a wide range of applications that makes them so attractive to the peasant bakers, but it takes far more work to do this rather than to buy seeds directly from a big manufacturer. The bakers have been working for several years now and there is much more to be done.

New networks

Yet another challenge has been the distribution network for the seeds, wheat and bread. It is evident that farmers who are producing wheat for the big firms, with their vast networks, will not want to plant traditional varieties, which have lower yields and lower protein content. Only a few peasant

Sampling the wheat

bakers will be interested in the seeds, and only a few specialised millers and some traditional bakers will want the wheat. So it has been necessary to build new networks, created around diversity and local needs. But the results are promising: the first networks, bringing together peasant bakers, consumers and the medical profession, have made it clear that there is a huge potential for developing this market in the future.

The life blood of the new networks has been the exchange of seeds between peasant bakers from different parts of the country, but technically these transactions are illegal. In making an exchange (which in the regulations is classified as a sale), farmers should use seeds produced only from varieties that have been registered in the official catalogue of seeds and plants. But it is extremely expensive to register a variety in this catalogue (about €6,700, equivalent to US$8,800), which puts it out of the reach of peasant farmers. In addition to the cost, the criteria for registration also pose a problem. These criteria were devised for industrial seeds and are completely inappropriate for traditional seeds, which do not maintain fixed characteristics but evolve over the years. It is precisely their capacity to adapt to changing circumstances that makes them so useful to the peasant farmers, but none of this has been taken into consideration by those drawing up the rules. So it seems that, just like old varieties of vegetables and fruit, traditional varieties of wheat seem set to remain unclassified and thus vulnerable to theft by the big corporations.

For a while, it seemed that a way might be found to resolve this impasse. After protests from many sectors of French society that the rigid regulations around registration represented a threat to the biodiversity of cultivated plants, a new guideline (Directive 98/95) was created by the European Commission in 1998 that allowed for the creation

The dynamic collective of Tripolème

Since 2003 ASPAARI (the Support Association for Innovative Agricultural Projects and Rural Activities), which was one of the founding members of the Réseau Semences Paysannes, has been encouraging farmers to undertake a wide range of activities to conserve and multiply peasant seeds (wheat, barley, oats, buckwheat and others). The work has had the backing of researchers and doctors. Out of this cauldron of activities a new association, called Triptolème, has been born, which will promote the exchange of seeds and the production of peasant bread.

This new association brings together players from right across the spectrum – living links of solidarity between peasants, artisans, consumers, researchers and doctors. They are all anxious to exchange knowledge and resources in the areas of farming, biodiversity and health. The driving force behind the new organisation are five peasants: Florent Mercier, Nicolas Supiot, James Restoux, Vincent Chesneau and Bastien Moisan, each of whom has collected hundreds of peasant seeds. Triptolème organises visits to peasants' farms and arranges meetings where seeds and farming experiences can be exchanged. With its encouragement, about 20 peasants are multiplying old varieties of wheat so that soon they will be self-sufficient in seeds and able to produce flour and bread.

Multiplying the Seed

Jean-François is a peasant baker who, for many years, used to cultivate two old varieties of wheat (Rouge de Bordeaux and Talisman), alongside several modern varieties. Little by little his interest in the old varieties has grown. He spent three years testing other old varieties, getting seeds from INRA and from old peasant farmers, and became more and more convinced of their excellent qualities. So finally he decided that he would put his energy into building his 'living collection' of old seeds.

Today he has:

- 80 varieties, sown in 4–10 metre lines (which he himself multiplied from a few seeds) in his back garden;
- 200 mini-plots (each 7 square metres), with 160 varieties, in a half-hectare plot:
- 15 varieties, multiplied separately, which he uses for experimental bread-making and to supply to 5 or 6 organic farmers in the region, on a 1-hectare plot. Some of the varieties, such as Bon Fermier, Richelle, Rallet, Blé du Lot and Bladette, date from the last century.

His idea is to multiply the use of these old varieties throughout the region by supplying seeds to organic farmers, who will test them on their own farms and then supply them to other farmers. He believes that the seeds can be improved by the farmers themselves, who will then be able to furnish a regular supply of good wheat to the peasant bakers. The work, he says, will take at least five years.

of a kind of annexe in which 'conservation varieties' would be listed. Unfortunately, the seed companies saw this as a loophole in the extremely concentrated and controlled seed system and began to lobby systematically against it. The Commission is still supposed to be drawing up a concrete definition of a 'conservation variety' but, as a consensus cannot be reached among the different parties, this work has been repeatedly postponed.

The French experience is still small-scale. In all, there are about 100 peasant bakers, working in different ways with traditional varieties (see boxes). Almost all of them have their own millstones, so they are able to sell flour or bread, but in Brittany some traditional millers have started to buy the traditional varieties, which means that poorer farmers, who don't have their own millstone, have been able to start growing the old varieties too. There is even talk of setting up small factories, though care must be taken not to get sucked up into harmful industrial processes.

Growing public demand is also a crucial part of the mix. People enjoy the taste of the bread and realise that it is better for their health. Although there has not yet been a proper scientific investigation, there is much anecdotal evidence that bread made from traditional varieties can be eaten without an allergic reaction from the growing number of people who suffer from gluten intolerance. No one knows why this is the case: is it something in the wheat itself? Or in the way it is cultivated? Or in the methods used to prepare the bread, without the addition of chemicals?

The peasant bakers themselves are cautious, fearful that their bread could become the latest passing health fad. Even so, if the claim is scientifically substantiated, it will be further evidence of the harm that industrialised bread is doing to the population's health and of the benefits that come from the natural product. But that is something that the baker-farmers – and those who eat their bread – already know in their bones.

While the *paysans boulangers* have been baking nutritious bread from old varieties of wheat in France (see page 12), a company in the north of England has been producing bread using recipes gathered from various parts of Europe. The Village Bakery was founded in 1976 by Andrew Whitley. Here he traces the history and diagnoses the ills of the industrialised bread produced in the United Kingdom.

The bread we eat

ANDREW WHITLEY

"What an odd way" said the visitor, "to get your daily bread. First of all, you pay a miller to strip most of the good bits from wheat to make fine white flour. The bran and the wheat germ, you tell me, are full of vitamins and minerals, so the miller sells them to feed animals, because farmers know exactly what they should give their stock to keep them healthy. Your very white bread doesn't have many of these good things in it any more, so you buy them back as pills in a little bottle from a 'health food' shop at many times their original cost.

"There are some people who don't have much money and they eat a lot of this white bread, so your government tells the miller to put back some of the good bits, just to be on the safe side. He does this, not by using the original grain but by adding some chalk, some iron and two 'synthetic' vitamins. This doesn't replace everything the animals have been given, but, as you say, it's better than nothing.

"The miller sells his flour to the factory baker who adds some other things – flour treatment agents, emulsifiers, oxidants, preservatives and enzymes – not because they are good to eat, but to make his job easier, or to make the loaves bigger, whiter and lighter, or to make them stay soft after they've been baked. How odd to put things in your daily food which aren't meant to nourish you!

Andrew Whitley is the author of Bread Matters: the state of modern bread and a definitive guide to baking your own, *London: Fourth Estate, 2006. Available worldwide from http://www.breadmatters.com*

"Your bakers certainly make bread fast. You said that, in the old days, it might take the best part of a day from start to finish. But now bread can go from raw flour to baked loaf in 90 minutes. The bakers put in loads more yeast to get it to rise quickly, because in your culture 'time is money'. In the TV adverts bread always seems to make people healthy and happy, but lots of people now seem to be 'intolerant' to yeast and some can't eat this bread at all because it gives them indigestion.

"So you give the best part of the flour to animals, you put all sorts of things in the bread not to nourish but to deceive, and you make it so fast that lots of people feel unwell when they eat it. And yet you call this 'the staff of life'."

It would be easy to dismiss this view of modern mass-produced bread as an oversimplification. Most people in the industrialised world are happy with the bread they buy, aren't they? Well, not exactly.

Whenever anyone questions the nutritional or other qualities of standard (white sliced) bread, the industrial millers and bakers respond with well-practised affront. White bread is what people want, they recite, it's cheap, all bread is good for you and, anyway, we make "healthy eating" breads, too. Bread consumption has been falling heavily in Europe and North America. Long before fads like the Atkins diet (which severely limits the intake of carbohydrates), people were abandoning bread, and not only because they were better off and could afford other things. "Cotton wool" bread may have started as the butt of foodie ridicule but the joke turned sour for those who fell prey to bloating, irritable bowel syndrome, wheat and yeast

intolerance, candida infections and a whole host of previously unheard-of conditions whose only remedy was to stop eating ordinary bread. Bakers responded not with self-criticism but with civil war. Small bakers were driven out or swallowed up by large chains, and the newly powerful supermarkets accelerated the downward pressure on prices and quality.

Despite product innovation, some of which has attempted to address health issues, modern bread still commands little respect. The ingredients – most of them – are listed on the packaging by law in some countries. But in the case of some of these substances, who knows what they are or what they do? To whom, for instance, do the words "mono- and di-glycerides of fatty acids" say anything meaningful about food? Using such terms (compliant with current UK legislation though they may be) is rather like chanting the Latin mass: it communicates little beyond some generalised portentousness while keeping all the key information in the hands of the priesthood.

Static sales and murky marketing are one thing; but the bread industry's malaise is systemic. Through a combination of greed, ignorance, misplaced technological zeal, manipulation and inverted snobbery, modern bread is no longer fit to feed us. How come?

- intensive breeding of wheat to produce higher yields with heavy applications of chemical fertilisers, herbicides and pesticides has made our bread less nutritious

- plant breeders select wheat varieties to produce, among other things, lighter loaves, but nutritional quality isn't on their agenda; older wheat varieties contain significantly higher amounts of key micro-nutrients

- modern milling removes many important nutrients from white flour, of which only four are replaced – in synthetic form; even "wholemeal" flour from modern roller mills is robbed of its vital vitamin E

- modern bread is made ultra-fast, with several times as much yeast as in earlier times

- additives and processing aids are widely used to make loaves bigger and stay softer for longer. Some of these chemicals are not declared on the label and some may be derived from animal parts. New research suggests that one such undeclared additive can actually generate the protein that triggers coeliac disease in susceptible people

- making bread very fast prevents the development in the dough of certain naturally occurring bacteria that help to make nutrients more available and the bread more digestible.

Each one of these changes may seem insignificant, especially for people who have a varied diet. But they add up to a major deterioration in the quality of bread. Ironically, just as technology finds ever more ingenious ways to adulterate our bread, so science is revealing the havoc this may be causing to public health.

This is your loaf

Exhibit "A" is a loaf of white (or brown) sliced bread. Place of origin: Chorleywood, England. This modest township not far from London hardly qualifies in the European super-league of gastronomic indications – Parma, Champagne, Stilton, Bordeaux, Roquefort and so on. But it has given its name to a process that has affected the quality of mass-produced bread in Britain and many other countries for more than 40 years. In 1961, the British Baking Industries Research Association in Chorleywood introduced a bread-making method, using lower-protein (and largely UK-grown) wheat, intense energy, an assortment of additives and no time for a first rise. A massive involuntary dietary experiment on the British public began. Over 80 per cent of all UK bread is made using this method and most of the rest uses a process called "Activated Dough Development" which uses a similar range of additives.

The Chorleywood Bread Process (CBP) produces bread of phenomenal volume and lightness, with great labour efficiency and at low apparent cost. It isn't promoted with the cachet of an *appellation contrôlée*. You won't see it mentioned on any bread labels. But you can't miss it. From the clammy sides of a chilled wedge sandwich to the flabby roll astride every franchised burger, the CBP is there. If bread forms a ball that sticks to the roof of your mouth as you chew, thank the CBP – but don't dwell on what it will shortly be doing to your insides. The CBP produces a soft squishy texture which lasts for many days until the preservatives can hold back the mould no longer.

This is industrial bread: a technological marvel combining production efficiency with a compelling appeal to the lowest common denominator of taste. It is the very embodiment of the modern age.

"How do they do it?" is the crowd's ambivalent question. To which one might add: "Why do they do it?"

Here is a breakdown of a typical CBP loaf.[1] Not all CBP loaves and rolls will contain all the ingredients and additives listed below, but most will contain a fair number. To put the CBP in context, only the first four ingredients in the table – flour, water, yeast and salt – are essential to make bread in traditional systems. In fact, even yeast (as an added industrial ingredient) is unnecessary for breads made with natural leavens or sourdoughs. There are bakers who find a ready market for bread made with flour, water and salt – and nothing else. So it is not unreasonable to ask: is everything else, in fact, unnecessary? And if so, why is it in our bread?

Read on and judge for yourself. The ingredients are as follows:

Flour Source of carbohydrate, protein, fat, minerals, vitamins and other micro-nutrients.

Water Necessary to make flour into dough.

Salt Adds flavour; strengthens gluten network in the dough; helps to stop the bread going mouldy (as a water-attractant and a partial mould inhibitor).

Yeast Aerates bread; makes it light in texture; and may contribute to bread flavour.

Fat Hard fats improve loaf volume, crumb softness and keeping quality. Not essential in traditional bread-making, though often used. Hard to do without some fat in CBP.

Flour treatment agent L-ascorbic acid (E300). Can be added to flour by the miller or at the baking stage. Acts as an oxidant which helps retain gas in the dough, making the loaf rise more. Not permitted in wholemeal flour, but permitted in wholemeal bread.

Bleach Chlorine dioxide gas to make flour whiter, used by millers for decades until banned in the UK in 1999. Still allowed in some countries, such as the USA. Chlorine is a potent biocide and greenhouse gas.

Reducing agent L-cysteine hydrochloride (E920). Cysteine is a naturally occurring amino-acid. Used in baking to create more stretchy doughs, especially for burger buns and French sticks. May be derived from animal hair and feathers.

Soya flour Widely used in bread "improvers". Has a bleaching effect on flour, assists "machinability" of dough and volume and softness of bread. Enables more water to be added to the dough mix. Increasingly likely to be derived from genetically modified soya beans.

Emulsifiers Widely used in bread "improvers" to control the size of gas bubbles, to enable the dough to hold more gas and therefore grow bigger, to make the crumb softer and to reduce the rate of staling. These are the main emulsifiers used:

Diacetylated tartaric acid esters of mono- and diglycerides of fatty acids (DATEM, DATA esters)

Sodium steoryl-2-lactylate (SSL)

Glycerol mono-stearate (GMS)

Lecithins

Preservatives Calcium propionate (CP) widely used. Vinegar (acetic acid) is also used, though less effective. Added preservatives are only necessary for prolonged shelf-life. CP may be a carcinogen.

Enzymes Came to the rescue of industrial bread-makers when additives like azodicarbonamide and potassium bromate were banned. No requirement to be included on ingredient declarations, because they are currently treated as "processing aids". Even if European Union law is amended, the single word "enzymes" will be all that is required on labels, leaving consumers in the dark about the origin of the particular enzymes used. They are often produced by genetic engineering, though this is unlikely to be stated on consumer product labels. Some enzymes are potential allergens, notably alpha-amylase. Bakery workers can become sensitised to enzymes from bread improvers.

Bread enzymes fall into various categories. The main ones are: amylase, maltogenic amylase (usually made from a genetically modified bacterial source), oxidase, protease, peptidase, lipase, phospholipase (may be derived from the pancreas of pigs, which would make it unacceptable to vegans, Muslims and Jews), hemicellulase, xylanase and transglutaminase.[2]

Assured, but not reassured

Readers unnerved by all the ominous chemical names may be assured that the ingredients and additives listed above have received appropriate regulatory approval. But they are not reassured.

1 Constituents of Chorleywood Bread Process loaf: S. Cauvain and L. Young, *Baking Problems Solved*, Cambridge: Woodhead, 2000. National Association of Master Bakers, *The Master Bakers' Book of Breadmaking*, Ware: NAMB, 1996.

2 For information on enzymes in Bread, see: R. Rastall (ed.), *LFRA Ingredients Handbook: Enzymes*, Leatherhead: Leatherhead Food Research Association, 1999, pp. 41–77. Some general concerns about the use of enzymes, especially novel ones being developed by genetic engineering, are mentioned in G.A. Tucker and L.F.J. Woods, *Enzymes in Food Processing*, London: Blackie Academic and Professional, 1995.

The same could have been said twenty or fifty years ago, when the list would have contained chemicals that have subsequently been banned. Safety assurance has, it seems, a fairly short shelf-life. Indeed the development of modern emulsifiers and especially of the newer bakery enzymes was given considerable impetus by the withdrawal of the oxidising "improver" potassium bromate, which after many years' use was discovered to have carcinogenic potential. (It is still used in some countries.)

Moreover, there is a wider concern that makes it hard to accept today's scientific consensus on food additives. New chemicals are evaluated on a primarily toxicological basis: feed a great deal of your chosen substance to laboratory rats for a limited period, and if they don't keel over and die it can be presumed safe for humans. However valuable such procedures can be – and I don't deny their role in protecting us from many hazards – they clearly do not catch the effects of long-term low-level exposure to novel compounds or altered processes, not to mention the "cocktail" effect of combinations of active agents that may be too numerous or unpredictable to model in the laboratory.

Much of this would be irrelevant if we were all enjoying our daily bread. But many of us in the UK and the US are not. To put it bluntly, quite a few people find that eating ordinary bread makes them unwell. If this were just a faddy minority, we might be tempted to dismiss their claims and look elsewhere than at our daily bread for the causes of bloating, indigestion, inflammatory bowel disease, constipation, diverticulitis and so on. But, though both the statistics and the diagnoses are contentious issues, there is no doubt that something is going on. Why else would hundreds of thousands of people stop eating bread and eliminate wheat from their diet?

The UK's leading allergy expert, Jonathan Brostoff, estimates that between 10 and 25 per cent of people show signs of adverse or allergic reactions to food.[3] A recent US study which measured sensitivity to wheat in a relatively large unselected population of volunteer blood donors found antibodies in 3.6 per cent of cases.[4]

How our bread has changed

When it hit the baking industry in the 1960s, the CBP was both the culmination of a long process of change and a radical departure from all previous ways of making bread. It was not so much that additives (or even adulterants) hadn't been used before, but rather that a particular confluence of economic pressure and technological innovation enabled bakers to transcend limits that had hitherto seemed to be ordained by nature.

The political–economic context in which the CBP emerged was one where millers' and bakers' margins were squeezed by residual post-Second World War price controls on bread and import tariffs on the North American wheat that was preferred by the industry. In the aftermath of wartime food shortages, European countries were determined to become more self-sufficient, and price support was one way of protecting cereal farmers from lower-cost producers in Canada, the USA, Argentina and Australia. The import duty on high-protein wheat made it economically attractive for millers to use more of the European crop. But bakers struggled to make it into the kind of bread to which the public had become accustomed. The solution – the CBP – involved changes to every aspect of the way bread was made: the wheat, the yeast, the additives and the speed of production.

Forty years on, we are beginning to realise – not for the first time in the history of technology – that long-term consequences may follow from a process of change that seems, at first, to offer nothing but benefit. After all, who could deny the economic logic of using more home-grown wheat, of speeding up the baking process and of making bread stay "fresh" for longer? True, only the latter point could be presented as a direct benefit to consumers, but if the millers and bakers also gained by cutting costs, the net result would be cheaper, whiter bread – and wasn't that what the public had always demanded?

But to make this cheap white bread, every aspect of the baking process had to be changed:

- wheat was bred to make flour that suited industrial baking methods
- millers separated the whole wheat more completely into its constituent parts and added enzymes to make it more consistent
- bakers massively increased the amount of yeast to make the dough rise quickly
- time was squeezed out of the baking process, and with it flavour and vital nutritional benefits
- freshness was redefined and artificially induced by means of undeclared additives

3 J. Brostoff and L. Gamlin, *The Complete Guide to Food Allergy & Intolerance*, London: Bloomsbury, 1998, pp. 19, 91.

4 US wheat sensitivity study: R.E. Biagini, B.A. MacKenzie, D.L. Sammons, J.P. Smith, C.A. Striley, S.K. Robertson and J.E. Snawder, "Evaluation of the prevalence of anti-wheat, anti-flour dust, and anti-alpha-amylase specific IgE antibodies in US blood donors", *Ann Allergy Asthma Immunol.*, 92 (6): 649–53, June 2004.

A technological and commercial triumph turned into a nutritional disaster.

Wheat

Ever since early wheat species emerged from North West India and Ethiopia over 10,000 years ago, the nature of the plant has been evolving. Climate and soil were the main determinants, and for most of history farmers could do little more than choose from variations that occurred through environmental pressure and chance mutations. Mendelian genetics and industrialisation eventually changed plant breeding in two respects.

First, breeders developed more aggressive methods to force mutations or create crosses and hybrids. Second, wheat varieties were selected according to radically new criteria – to fit an agriculture that relied increasingly on chemical rather than biological fertilisation and plant protection.

At the end of the Second World War, explosives manufacturers experienced a distinct decline in sales but found a ready outlet for their chemicals in the intensive agriculture that was seen as the only way to feed rapidly growing urban populations.[5] Wheat and maize varieties were bred to respond to heavy applications of soluble nitrogen, potash and phosphorus fertilisers. But such a regime produces flabby straw that falls over in wind or rain. So wheats with short straw were developed.

Once hooked on soluble chemicals, the new varieties showed signs of succumbing more than previously to fungal and pest attack. So new strains were bred for built-in resistance. Shorter stem length means less canopy to suppress weeds, so the new varieties also had to be able to thrive in the presence of herbicides. The millers wanted their say, too, so the breeding programme was adjusted to produce wheats with more and better protein for bread baking. And each year, yields must go on rising.

Yield, short straw, disease resistance, milling quality – the plant breeders have obliged. They have done so, to date, without recourse to GM technology, though that is in the wings.

What is striking in all of this – for those of us who think that farming has something to do with feeding healthy people – is that nutritional quality doesn't get a look in. No one seems to be asking whether, as variety succeeds variety with bewildering speed, wheat is getting better or worse to eat, more or less nutritious, more or less digestible.

Golden oldies

It is known that the precursors to modern bread wheats – einkorn, emmer and spelt – all contain more nutrients than their commercial successors.[6] Research at the International Maize and Wheat Improvement Center (CIMMYT) in Mexico revealed that the best traditional wheat varieties had about twice the iron and zinc of popular modern varieties; and their wild relatives had another half as much again. In Europe, the French National Institute for Agricultural Research (INRA) has shown that the mineral content of current French wheats is 30–40 per cent below that of older varieties.[7]

Milling methods

Until the invention of roller milling, all flour was produced by crushing wheat between revolving stones. All parts of the wheat – bran, germ and starchy endosperm – were pulverised and mixed together into what we know as wholemeal or whole wheat flour. If you wanted whiter flour, you had to sift the wholemeal through wire sieves or "bolting cloths" made from cotton, linen or silk. The roller milling system was quite different. It passed the wheat between pairs of steel cylinders which gradually stripped the layers off the grain, sifting the material thus produced into a series of streams, each containing a different fraction of the flour. These could be taken off and bagged separately or recombined to make "patent" flours for various baking purposes.

One of the consequences of the roller milling was to remove the wheat-germ oil that the stones had formerly dispersed throughout the flour. This contained virtually all the valuable vitamin E of the wheat. Its removal, though a nutritional disaster, was a great benefit to the millers. The wheat germ oil tended to oxidise and go rancid within a few weeks. Without it, white flour could last for several months – exactly what was needed as milling companies became larger and more concentrated, with ever longer distribution chains along expanding networks of railways and roads. Not for the last time, nutritional integrity was a casualty of the commercial need for "shelf life".

The advantages of stone-milling

A recent French study[8] set out to quantify the differences in the nutritional content of wheat milled between stones and rollers. The researchers took the opportunity to run their tests with samples of three varieties of wheat, each from

5 Development of chemical agriculture: see C. Tudge, *So Shall We Reap*, London: Allen Lane, 2003, pp. 266–8.

6 Nutrients in older varieties of wheat: R.D. Graham, R.M. Welch and H.E. Bouis, "Addressing micronutrient malnutrition through enhancing the nutritional quality of staple foods: principles, perspectives and knowledge gaps", *Advances in Agronomy*, 70: 77–142, 2001.

7 Mineral content of French wheats: INRA, *The nutritional value of bread can be much improved*, 2002. http://tinyurl.com/2lvmsc

8 French comparison of organic/conventional and stone-ground/roller-milled flours: M. Chaurand *et al.*, "Influence du type de mouture (cylindres vs meules) sur les teneurs en minéraux des différentes fractions du grain de blé en cultures conventionelles et biologiques", *Industries des Céréales*, 142, 2005.

conventional and organic agriculture. The results are fascinating. The organic wheat, before milling, had larger amounts of calcium, magnesium, zinc and potassium, though there was slightly less iron in the organic samples for reasons that were not explained. Stoneground flour produced higher values than roller-milled flour for both organic and conventional wheats. Milling organic wheat through stones rather than rollers compounded the effects in a remarkable way, so that stoneground organic flour was shown to have 50 per cent more magnesium and 46 per cent more zinc than the roller-milled conventional flour. This effect, it should be emphasised, was observed not in wholemeal but in flours that appear to have been milled to a finer extraction rate of around 80–85 per cent. Magnesium is deficient in many diets, and the role of zinc in good health is well established. It would not be unreasonable to expect the same benefits from organic growing and stone milling to apply to other important micronutrients in flour.

So here we have clear evidence of the nutritional advantages of organic growing and stone milling.

Photo: Jeff Cottenden

Cheesebread

Yeast

Ever since our ancestors, thousands of years ago, noticed that a flour and water paste, if left for some hours, begins to aerate, people in wheat- and rye-growing areas have eaten leavened bread. During fermentation, enzymes break carbohydrates down into sugars on which yeasts feed, producing carbon dioxide (the gas which raises the bread) and alcohol. This process was fully understood only after Pasteur's discovery in 1857 of the micro-organisms involved. It eventually became possible to identify and culture pure strains of yeast which gave fast and predictable results for bread-makers. Of the 160 or so known strains of yeast, the one commonly used for baker's yeast is *Saccharomyces cerevisiae*. Other strains are involved in natural leavens and sourdoughs.

Before the development of commercial yeast in the late 19th century, bakers had to make their own, either with a "wild" sourdough culture or by making a "barm" which may have been seeded with yeast residue from a brewery. Either way, the process took time because the number of viable yeast cells in a sourdough or barm was relatively small. When commercial yeast became available, it contained much larger populations of cells and worked quickly. But it was expensive, and the thrifty baker could make it go further by using a small quantity in a preliminary "sponge" consisting of a proportion of the flour and water to be used in the bread. This was allowed to ferment for 12–24 hours, multiplying the yeast cells in the congenial conditions of warmth, water and food. On the following day, fresh flour and water (and occasionally some fat) would be added to make the final dough.

Even when, in the 20th century, commercial yeast became accessible to all bakers, the "sponge-and-dough" method remained a favoured way of breadmaking. In a typical overnight recipe from a famous 1907 manual, the yeast quantity is less than 0.1 per cent of the final dough weight.[9] By the second half of the 20th century, yeast amounts had gone through the roof. The CBP uses over 23 times as much initial yeast as Kirkland's and Banfield's sponge-and-dough systems.[10] As this rather staggering statistic sinks in, two points should be made. First, yeast is, in theory, destroyed by the heat of baking; and second, yeast is anyway a good source of B vitamins. There should therefore be little cause for concern. And yet, if, after several decades in which most bread has been made with increased amounts of yeast, significant numbers of people develop an intolerance or allergy to yeast, it seems quite reasonable to wonder whether there is any link.

And there is another thing. Yeast, like the other raw materials of baking, has not remained the same. It,

9 Yeast dosage in traditional breads: J. Kirkland, *The Modern Baker, Confectioner and Caterer. New & Revised Edition*, London: The Gresham Publishing Company, 1927 (1907) Vol. I, pp. 115–16; W. Banfield, *Manna: a comprehensive treatise on bread manufacture*, London: Maclaren, 1947, pp. 227–33.

10 Yeast dosage in CBP bread: National Association of Master Bakers, *The Master Bakers' Book of Breadmaking*, Ware: NAMB, 1996, pp. 145, 147, 169.

too, needed a makeover if it was to be fit for the brave new world of Chorleywood. The old strain was simply not up to the job.

About time too

Throughout almost all of baking history, bread had taken a long time to rise. Bakers' barms or sourdoughs contained relatively sparse populations of mixed strains of "wild" yeasts. Whatever they were and wherever they came from, the one thing they had in common was that they worked slowly. Starting with a piece of dough from the previous day's baking, or a scoop of froth if you were within reach of a brewery, it took many hours and additions of fresh flour and water to build up sufficient yeast cells to raise a loaf of bread. The whole process from starter dough to finished product could take 24 hours or more.

As the price of yeast came down and productivity pressures grew, fermentation times shortened. With the invention of the CBP, the goal of "instant" dough was now attainable. With new machinery, ingenious chemistry and a terrific blast of (ever so slightly modified) yeast, bread needed no fermentation at all. Three or four minutes of violent mixing in a high-speed mixer and your dough was ready. Straight into the divider to cut it into equal pieces. Ten minutes for the gluten in the dough to relax before being moulded and dropped into tins. Forty to sixty minutes in a warm, humid proving room and into the oven for less than thirty minutes. From flour to bread in about an hour and a half. Chorleywood had conquered time.

It was good for business, of course, and costs to the manufacturer could be contained or reduced. Everyone could now afford the whitest, softest bread they had ever known, though curiously consumption kept on falling. "No-time" bread-making spread from the large automated factories to medium-sized independent bakers and out across the world: a very modern fairy tale, complete with advanced technology, improved productivity and good news on the export front.

Messing with time has had consequences, of course. Here is just one example from the field of food safety. In 2002, Swedish scientists reported unexpectedly high levels of the carcinogen acrylamide in foods such as crisps, chips, coffee, biscuits and bread. Acrylamide appears to form when foods, especially those high in carbohydrate and low in protein, are subjected to high temperatures during cooking, baking or roasting. A recent study revealed that fermenting dough made with wholemeal wheat or rye flour for 6 hours as opposed to 30 minutes reduced acrylamide levels by 87 per cent and 77 per cent.[11] The reason is that, as it ferments, yeast uses up free sources of the amino acid asparagines, which is the precursor to acrylamide formation. To perform this unexpected but vital task, yeast needs time.

Good times, bad times

Traditional bakers know that the longer you ferment dough, the better the bread keeps. Time invested in the making is repaid in the eating. Modern bakers and retailers have destroyed this elegant balance. They have stolen time from the production process, a theft which they try to disguise in contradictory ways. In the case of standard sliced and wrapped bread, they use additives to keep the crumb soft (or "fresh", as they would say) for a week or more. With the unwrapped bread, on the other hand, time is distorted in a rather different way

The baskets of apparently fresh, crusty loaves that issue from the supermarket's in-store "bakery" are very likely to have been part-baked in a distant factory to be warmed up at the point of sale. This interruption in processing has more to do with the economies of large-scale centralised production and the de-skilling of the baker's job than any real benefit to the consumer. The claimed advantages of "hot bread", whose name implies absolute freshness, are exposed in all their dubiousness when your twice-baked loaf turns to dusty crumbs within hours.

Supermarkets and their suppliers have to resort to a variety of technical fixes, some of them very ingenious, to slow down the natural process of aging which affects all living things. The more elaborate their strategies for "preserving freshness" (an oxymoron straight from the Peter Pan school of language), the shriller their claims. Perhaps they fear that if they stop telling us just how fresh everything is, we might wake up to the fact that a lot of it is actually rather old. In this way, freshness itself is turned into a commodity. Instead of being simply the end result of a short food-supply chain, it is now engineered with food additives and temperature control. And, in the twinkling of an eye, someone is "adding value" and selling us a bogus freshness, beguilingly decked out in the trappings of that other presumed benefit – convenience.

11 H. Fredriksson *et al.*, "Fermentation reduces free asparagine in dough and acrylamide content in bread", *Cereal Chem.* 81 (5): 650–53, 2004.

Bushmen's victory

GRAIN

The court ruling was greeted with jubilation, tinged with sadness, by the Bushmen waiting outside the court room. Members of the First People of the Kalahari, one of the Bushmen's main organisations, said: "We are all laughing and dancing. We are so happy that finally we can be set free to go back to our beloved land, the land of our ancestors." A Bushmen spokesman, Roy Sesana, said: "We have been crying for so long but today we are crying with happiness. Finally we have been set free. The evictions have been very, very painful for my people. I hope that now we can go home to our land." The Bushmen who were forced out of the reserve and the tiny group that remained on the land against the odds all suffered greatly during the years of struggle. Of the original 239 Bushmen who first filed the case in 2002, 29 died before the ruling was made. Others suffered persecution, beatings and arbitrary arrests.

Diamonds

By the time the case was heard, another 135 adults had added their names which, with their children, made a total of about 1,000 people involved in the case. Most of them, along with others who only now, after the court victory, are beginning to believe that they might win the right to their land and their way of life, will try to return to the reserve. But even now, armed with the court ruling, they will not find it easy. Having lost the case, the Botswana government is in no hurry to implement the ruling: it has not yet issued hunting licences and, while permitting those involved directly in the case (the so-called "applicants") to return, it has issued only temporary visas to non-applicants. Moreover, the judges specifically exempted the Botswana government from the obligation to provide services to the Bushmen in the reserve, even though they will need help to reactivate the wells and boreholes, many of which were filled in during the years of exile. The ruling also said nothing about the Bushmen being allowed to take livestock into the reserve, even though today they need to rear animals, particularly goats, to supplement the food they get through hunting and gathering. Yet for all the problems that lie ahead, the court ruling was hugely important for the Bushmen. It is the most important victory they have ever won against the Botswana authorities and it will give them at least a chance of physical and cultural survival.

The Bushmen (known as Basarwa in Tswana, the national language of Botswana, and San in Nama, another widely spoken southern African language) have lived for thousands of years in the Kalahari Desert, an arid area that extends across 900,000 sq. kms., covering much of Botswana and parts of Namibia and South Africa. Genetic evidence shows that they are one of the oldest peoples in the world, possibly the very oldest – a "genetic Adam and Eve" from which all the world's ethnic groups can trace their genetic heritage. They were originally a hunter–gatherer people who roamed over a vast territory but, as white farmers moved on to their land, their old way of life was disrupted. In 1961 the Central Kalahari Game Reserve (CKGR) was created to protect the 5,000 Bushmen living there, and the national constitution later gave them the right to live there in perpetuity. Even so, problems continued. A major upheaval occurred in 1965 when a fence was built along the Namibia–Botswana border, dividing into two the formerly continuous Kalahari foraging lands. Huge numbers of dead animals died piled up along the fence, after trying in vain to cross it in order to reach food and water. Partly as a result, many groups of Bushmen were forced to abandon their wandering life-style and to raise animals in semi-permanent villages. But despite the continuous onslaught on their way of life, it seemed that, at the very least, the Bushmen would be allowed to go on living in the reserve.

That, however, was before diamonds were discovered. A diamond deposit was found at Gope in the south-east of the CKGR in the early 1980s. The area of Gope – which the Bushmen, themselves call Ghagho – is important to the Bushmen because it contains ancestral graves and because family groups visit it at certain times of the year to collect wild fruit, especially monkey oranges. Segope, one of the Bushmen leaders, recalls the arrival of the first prospectors. "When the mine started, we used to see planes, which frightened us. Then we saw lots of cars. This whole area, including the spot where the mine shaft is, was inhabited by Bushmen, who fled." Tlhalefang, a Bushman woman from Gope,

Photo: Survival International

Bushmen celebrate their court victory in Botswana

Testimony of Mogetse Kaboikanyo

In February 2002 Mogetse Kaboikanyo was forcibly evicted from the Central Kalahari Game Reserve and relocated to a camp outside the reserve. He died just four months later. This is his testimony, given to Survival International before he was thrown off his land.

"Gugama, the creator, made us. That was a long time ago – so long ago that I can't know when it happened. That is the past, but our future comes from the lives of our children, our future is rooted in the hunt, and in the fruits which grow in this place. When we hunt, we are dancing. And when the rain comes it fills us with joy. This is our place, and here everything gives us life.

"God made us, and He made the animals for us. Why does the government think they are more important than the people? The government just wants to take all our good things. The government is like a poor fellow who sees a rich man and is jealous and wants to take what he has. Now we must live in the shadow of being thrown off our land. There can no longer be any rest.

"I was born in this place and I have been here for a very long time. Now this relocation thing has come, but I don't have the full truth about it. They come and say that I have to move, that this place is for animals. But why must I move and leave the animals? I was born with them and I must stay with them. I have that right.

"I was born in this place, with the eland. And we have to stay together. My strength is the force in the animals which my father once hunted and my mother cooked. They gave me everything you see here. This is my birthright: here where my father's body lies in the sand. Who are they who want to chase me from my life which was given to me by God? My father's spirit warned me that this would come. They have already taken my relatives. My brother has been taken and I am here alone. But I am not going to leave. If they want to kill me, why don't they just do it? They will kill me for my land. When they come I say, "I don't want you to come here, but if you must, then leave your guns behind. If you come with your guns – ready for war – you will have to kill me. I won't do what you want.

"Now I am pleased because Survival is noting my words and I think that you will shout them out so that many people will learn my story. I am harassed by the government of Botswana. We are chased off our birthright, our place. I think that God cannot accept that: Gugama created the things here so that we can use them for our survival. The officials bully people and move them without even asking them. They say, "Tear down your houses, and we'll load them on the trucks, and we'll load you as well." When they went to the community at Gope there was an old woman who was very, very sick. They put her on the truck anyway, and so she died there, on the way to the relocation camp. Another woman died as well, but the officials don't even respect that a person has to be buried.

"These things are done to us because we are Bushman people. This is not the way for anyone to behave. You should ask people what it is they want, and then wait and listen to them. The officials who come here never even try to respect me. I have to explain that I am a human being, and then they stare at me, up and down!

"The government of Botswana calls itself a democracy. But it isn't so here. We are oppressed until we die, and soon there will be no one left. It seems that there is a great distance between us and the government; when we went to try and meet a minister, he didn't even recognise us. That was very rude.

"We are just like pieces of rubbish flying off when the wind comes, or like insects running in the sand. They sweep us off our land and dump us on the rubbish pile, far from our animals and plants and spirits of the ancestors. That is what you do to rubbish, but not to people. Once the officials came and said someone had hunted an eland, so they killed one of us and castrated another. That is not what you do to human beings. They say we cannot hunt, but I have children and women to feed. I used to give them meat, now it's just roots and fruits. Life is harder and harder.

The government talks about development. Let it help us with water, then leave us to our own place. We can think for ourselves; we can think about what we need. Our future comes from the lives of our children. They have to have their ancestral land."

says that their way of life was immediately affected. "We used to have a water hole on the other side of the shaft, but the people from the mine pumped stuff into it and now it is filled in. We used to have monkey oranges but we haven't seen any since the shaft has been there. This land belonged to our great-grandparents – they are buried there."

The initial prospecting was carried out by a company called Debswana (DeBeers + Botswana), which is owned half by the Botswana government and half by De Beers, the colossus of the diamond world, which controls about 40 per cent of the global diamond market. The President of Botswana, Festus Mogae, once said: "The partnership between De Beers and Botswana has been likened to a marriage. I sometimes wonder whether a better analogy might not be that of Siamese twins". The Gope find was originally described by industry sources as being very significant, but it is difficult to find out what De Beers plans for the future. De Beers is not a public company and operates in great secrecy. No mining is currently occurring within the CKGR but this may be no more than a tactical move by DeBeers, part of its global strategy of drip-feeding diamonds on to the market to keep prices high.

Evictions

What is certain is that, in the wake of the discovery of diamonds, the Botswana government began, for the first time ever, to try to move the Bushmen out of the reserve. In 1986 it announced the relocation of all Bushmen out of the CKGR, saying that it was for their own good, as it was only by grouping them together in resettlement camps that it could provide them with essential public services, such as water, education and health care. But it was not until 1997, more than a decade later and shortly after the completion of a formal evaluation of the mining potential of the region, that the evictions began. The first community to be removed was Xade. Even though it had fairly recently been equipped with a school, a clinic, an airstrip and a borehole for water, everyone was relocated to the resettlement camp of New Xade, located outside the CKGR. This was only the beginning. Over the next five years about 1,500 people were evicted, while another 700 stubbornly refused to move. In an attempt to force the latter out, the government cut off the water in January 2002. By the end of February 2002, most of the remaining Bushmen reluctantly agreed to leave. But not all: even though their homes were dismantled, their school and health post closed down and their water supply cut off, a few dozen refused to go.

With the assistance of Survival International, the non-governmental organisation (NGO) that works with tribal people, the Bushmen began a court action in 2002, claiming that the evictions had been unconstitutional. It all took time, for the first evidence was not heard until 2004, and in the meantime many of the Bushmen became bored and depressed in the resettlement camps. Some turned to alcohol, while others became infected with serious illnesses, such as tuberculosis and HIV/AIDS. In 2005 the authorities became determined to get rid of the few families that were still inside the reserve and began to set up blockades to starve them out. A post-mortem report on a deceased Bushman woman, Qoroxloo Duxee, carried out in November 2005, confirmed that she had died of dehydration, starvation and shock after a three-month blockade in which armed guards had prevented the Bushmen from hunting, gathering or obtaining water. Earlier that year Qoroxloo Duxee had told the British Broadcasting Corporation (BBC): "When I was young, the men hunted and we got our water from the roots of plants. We lived well and people died only of old age."

Resistance never stopped

Desperate to preserve their cultural and physical identity, many Bushmen continued to visit their old home, if only on short hunting trips, and at least 72 were arrested for illegally killing animals. In July 2006 five Bushmen were arrested for hunting a duikers (a small antelope) and were taken to the notorious wildlife guards' camp, where torture routinely occurs. One of those arrested, Mararama, had been interviewed earlier by the First People of the Kalahari when they had been canvassing the Bushmen's views on life in the resettlement camp of Kaudawane. "I don't want to live here. People are harassing me, arresting me for nothing, torturing me for nothing, trying to finish my life", he had said. "I want to go back to my homeland. This 'development' is torturing me for nothing. I hope I can go back as quickly as possible."

For these Bushmen their court victory was quite unexpected, because they had given up hope of achieving justice from the Botswana authorities. Some of them attribute their success to the help they received from Survival International and a British barrister, Gordon Bennett. Gabo Sediswe, a woman from the Gugama community in CKGR and one of the few who resisted eviction to the very end, was keen to express her gratitude: "If it were not for the fact that Mr Gordon is tall and strong and big, we would carry him on our backs and sing and rejoice with him, because now we have our land back." But, as Gabo Sediswe also made clear, victory would not have been possible without the bravery and determination of the Bushmen themselves: "We also want to pay tribute to the First People of the Kalahari and their work – they never stopped." It was the courage and bravery of the Bushmen themselves that made it possible for people from outside to help them to mount a legal challenge to the evictions.

For more information on the Bushmen and to keep informed on new developments, visit http://www.survival-international.org/

Luiz Geraldo de Oliveira Moura lives in Ceará in the semi-arid north-east of Brazil. Having seen for himself the damaging impact of the "green revolution", he began working with peasant families and consumers on an alternative. At his instigation, families in the towns and families in the rural areas have been collaborating for more than a decade in a project geared to regenerating degraded land and to improving living standards for the rural poor. What has emerged is a strong "Social Alliance" that is transforming social relations.

Luiz Oliveira

Tell us a bit about yourself, Luiz?

I'm from Ceará, I was born in Fortaleza. My mother was brought up on a family farm in the Boa Viagem sertão (dry hinterland). She was the daughter of poor peasants, and one of nine children. They had only a very small plot of land, so planted crops on large properties owned by neighbouring farmers. They had no irrigation so they planted in the rainy season, from March to June. My mother, Letícia, was the oldest child and always liked to teach. So she spent a lot of time travelling around the region teaching the children of landowners how to read and write. She spent months at a time at some of these estates, teaching the children.

Every time they had a child, my grandfather, Zeca Pompílio, and grandmother, Francisquinha, would buy a goat to help feed that child. As the child grew up, it learned to look after the goat and its kids. This allowed the children, over the years, to earn money through selling the kids, which they used to cover the cost of basic necessities, such as clothes, shoes, travel, and so on. The goats were tied up in the rainy season and allowed to wander free in the summer, although they were brought back to the farmhouse at night. They made an important contribution – milk, kids and manure.

When she grew up, my mother went to live in Fortaleza, where she married and where I was born, in November 1943. I never knew my father, who died in an accident. But I did know my stepfather, Moura, who helped my mother to educate me and allowed me to become the person I am today. We were poor and lived on the outskirts of the city, where my parents built their own house and worked hard to send me to the state school when I was 13. My mother still lives there but my stepfather died 10 years ago. Until I was 16, I was always in close touch with my grandparents, my great-grandmother, Manuela, who is now 100 years old, and my aunts and uncles in Boa Viagem. I used to go and stay with them for a few days every year, so I was able to experience the local culture and their way of life, see how they treated each other and the ethical basis of these relationships. None of this was written down, but was completely natural to them, all the time, with family, friends and strangers alike. I also spent time with many of my grandparents' neighbours. I learned a lot from both old and young, in an atmosphere of mutual respect and discovery. My grandfather, who was illiterate, used to tell me that his signature was "a hair from his moustache". They all treated both wild and domestic animals, the land, plants and water and their crops with great respect and reverence. They did not see them as "inputs" but as a source of life characterised by dignity, co-operation and solidarity.

Then I went down to the south of Brazil to carry on with my education. My parents sacrificed a lot so that I could complete a three-year science course in São Paulo. I went on to study electronic engineering, thanks to a scholarship, and completed that in 1968. Then I worked for a multinational, Ericsson, for 20 years, all over Brazil. I was married for 15 years and have three children and five grandchildren.

How did you get interested in agro-ecology?

As you can see from what I have already said, I always valued the knowledge that local people had. When I left Ericsson and came back to Ceará, I bought 60 hectares of land in the municipality of Baturité. There was nothing growing on that land but it is now really productive. It was a great experience from the environmental, economic and social points of view. But, what really encouraged me to turn to turn to agro-ecology was seeing the impact of the Green Revolution. Family agriculture is based on intuition and ecological principles, crop diversification and subsistence

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Benny Haerlin
Carlos Correa
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Francisca Rodriguez
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Hope Shand

agriculture. It produces plentiful harvests that ensure there is enough to eat throughout the year. It provides full employment but leaves time to do other things between the harvests. Instead of all this, the Green Revolution promoted the harmful agricultural practice of monoculture, ignored local knowledge that had been passed down from generation to generation, and glorified technical, scientific and academic knowledge. It imagined this would increase production and productivity every year on the same land and that it would create employment, income and food supply for all the people. In practice, it increased the concentration of land ownership in the hands of a few people and increased the concentration of poverty and misery among the many. It also did a lot of environmental damage, by causing physical, chemical and microbiological pollution, as well as increasing genetic erosion. So we decided that we had to come up with an alternative and to promote family agriculture.

What did you think you could do?

I realised that we had to try and change the way society regarded family farmers. For as long as I can remember, people think family agriculture in Brazil is of marginal importance to capitalist society. People think that family farmers are not very bright, are incapable of taking decisions and unable to manage their land efficiently. The children of family farmers do not want to continue working on the farm. Since the Green Revolution, governments have had no policies to promote this sector of society, and see it as a burden rather than as a participant in national development. The government marginalised family agriculture until very recently, in terms of technical assistance, rural extension services, research and credit.

But family agriculture is crucially important. Around 85 per cent of all rural properties are family farms, with more than 13 million people, and they are responsible for producing much of the food consumed in Brazil, including staples. Moreover, it has the very important social and economic role of narrowing the gap between rich and poor and promoting social justice. So we decided to try and change attitudes and to help family farmers, and in 1996 we set up the Centre for Learning and Applied Studies (NEPA) in Fortaleza, and started work with our Social Alliance.

What is the Social Alliance?

The Social Alliance is a project that encourages society to get actively involved in a process of social, economic and environmental change. We bring together urban consumers and rural producers in a scheme that benefits both groups. Consumers give rural families financial support so that they can cultivate crops in a healthy and environmentally friendly way; in return, they get food that they know is free of chemicals and good for their families. But it's not just an economic relation of mutual benefit. It's more than that. It's a relationship that helps people change the way they live. It's the seed of a new society, a new way of relating.

Let me be more precise. In Brazil we have basically two kinds of rural families – peasant families, who own their land, and meeiros (share-croppers) who rent the land and have to give the landowner a large share of their production. We have to work with both groups. Essentially, in a town we form a núcleo (small group) of people who are willing to provide some funding – be it R$100 (R$2 = US$1) or R$50 or R$25. This núcleo uses this money to bring one rural family into the network. The people in the núcleo visit the rural family, talk about crops, commit themselves to buying part of the family's produce and discuss how they can help in the recovery of the land. We make sure each time that we plant at least 70 trees, some fruit trees and other native species. Everything happens quite quickly. After 90–120 days the family can harvest its crops and deliver them, in vegetable and fruit boxes, to the families in the towns. Each time the urban families visit their partners in the countryside, they can see for themselves that the landscape is changing and that the families' way of life is being transformed. After six months, we start charging a small fee so that we can raise money for the scheme to be extended.

What are main difficulties?

They usually occur at the beginning, because the scheme means breaking old habits and forming new paradigms. The families take time to believe in the process. For the rural families it seems too good to be true. They are so used to exploitation, they think there must be a catch. But when they start applying the principles of agroecology, using their own knowledge and translating it into practical action, then there is no holding them back. They see the landscape change. Their self-esteem grows. They acquire new experiences. All this happens after about 30 days and then there is no going back. For the urban families it takes a bit longer, about 60–90 days, for them to get really involved in the process. It's then that they start to leave behind the passive and anonymous market relation of selling and buying and to engage in an ethical, respectful relationship in which they express solidarity with the whole process of transformation.

Sharif Omar is a farmers' leader in Jayyus, a small Palestinian village in the West Bank. Jayyus is not far from the green line – the border between Israel and the West Bank established in 1948. When the Israeli government began to build a concrete wall to separate Israel from land in the Occupied Territories that might eventually become a Palestinian state, they did not follow the green line. They routed it in such a way as to embrace the illegal Israeli settlements, and in the process hived off a good deal of Palestinian farmland. Jayyus is one of the villages that the wall has cut off from its people's farms.

Sharif Omar

It is impossible to say how long we have lived in Jayyus. The farms have been handed down for generations, and there are huge extended families. The farms next to my land belong to my cousins, and the land beyond that to more distant cousins. Jayyus is an old village. Archaeologists have found stones from Roman times and clay and glass pots from Roman or even Greek times. Some of my olive trees are thought to be more than 1,000 years old. So we feel that we've always been here. Now, coming forward into my lifetime, as you know, in 1947 UN Resolution 181 gave the Palestinians 51 per cent of historic Palestine, and the Jewish settlers 49 per cent. Palestinians refused this because they possessed 92 per cent of the land at that time and the settlers possessed only 8 per cent. There were 600,000 settlers and 2.5 million Palestinians. The Palestinians were deceived when the Arab armies, led by Glubb Pasha, ordered them to put down their guns, saying they would fight on their behalf. There wasn't really a battle, and the Israelis got 78 per cent of Palestine and left us 22 per cent. And now, if the Israelis achieve their plans with the wall, they will leave us approximately 13 per cent of Palestine, and it will not be in one place, it will be in five compartments. And Gaza will be separate, so I don't believe that we will have a state if we have this wall.

What sort of farming have Palestinians been doing in this region over the centuries?

Well, let me tell you about my land as an example. It's a paradise: I have more than 3,600 trees. Over 1,000 olive trees – I personally have planted 600 or 700, and I am planning another 600 – and fruit trees: pomegranate, avocado, mango, pears, figs, almonds, grapes, 12 kinds of citrus – oranges, lemons, grapefruit, clementine, mandarin, navel orange, Valencia orange and so on. Oh, and loquat. That is very tasty.

Do you use chemicals, or is it organic?

Of my six farms, one is organic. Our olives are organic, but I may have to stop that, because people unfortunately don't recognise what is organic and what is not; they want cheap fruit, and if you compare the size of organic fruit with those grown with fertilisers and chemicals, they are small. I can't get the same income. I know it's not healthy, but I need to earn money.

When did the problems begin of getting access to your land? Was it with the building of the wall?

They began uprooting olive trees in Jayyus in September 2002; you won't believe the story. One day a farmer was returning to the village, when he saw a piece of paper hanging on an olive branch. Out of curiosity, he went to look at it. And he found, in badly handwritten Arabic: "People of Jayyus. You must come here on Thursday. The military commander will be there. We will show you the planned route of the wall, so you can move anything that might be in the way", or words to that effect. As I was the farmers' representative, he brought this paper to me. I was shocked. What if no one had spotted this notice? Well, we had no choice really but to go there on Thursday and to meet the commander, and we followed him round. Everyone was astounded. We thought the wall would be 100–150 metres to the east of the green line. No one expected that it would intrude 6 kilometres into Jayyus's land! This is crazy. It is not a matter of security, as they claim in the media, that because of the wall suicide bombings go down. Even if that were the case (and I know that there are many other reasons why suicide bombings are going down), the same result would be achieved if it was built on the green line. This is no reason for coming 6 km into our land. In some places it is

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20 km. Are these 20 km for security? No. It is only to seize the land.

And so now, to be able to farm your land, you have to pass through the wall?

Yes, through the correct gate, with my permit. None of my three sons has been given a permit yet. One of them has a master's degree from Italy in agricultural engineering, and I need him. We've applied at least 20 times but so far we have failed. There are 118 farmers in Jayyus without permits.

Out of how many?

Well, not everyone is a farmer; but at the same time, you can't say that anyone is not a farmer. Jayyus has 550 families, of which about 300 depend completely on agriculture. Others may depend partly on agriculture: there's a teacher who teaches in the mornings; there are some who work as policemen with the Palestinian Authority for four days a week, and on the land for three, if they can. To have a permit to go through the gate, you must prove that you own land on the other side of the wall. The workers who used to work on my land can't now because they can't show that they own any land. So now my workers are farmers who have a little land, and this was a problem for me this season. This season was the richest olive harvest of my life. But the smaller farmers first gathered their own olives, and I waited until they had finished, and then some came to work with me. What's the result? They could sell their olive oil, and because I was the last farmer in Jayyus to finish harvesting, I sold only half of mine. I've still got more than 1,200 kg in my house.

So you are still managing to get to the olive trees and make some olive oil?

Yes, but I don't have help, and the system of permits creates all sorts of difficulties, and then it's difficult to sell the olive oil even when we can produce it. We are not allowed to export it to Jordan. We can export it to Saudi Arabia, Kuwait, Abu Dhabi, the Emirates, but in all these cases you need a friend or relative to sell it for you and send you the money. If I tell you who bought my olive oil you will be surprised. I have Israeli friends, anarchists, people who participate in our demonstrations. A lot of Israeli groups do it, refuseniks, women against house demolitions, Jews against the Occupation, and so on. They are too few so far to have any large influence on the wider Israeli community, but they are active. We need their help especially on the farms surrounded by settlements. The settlers are extremists: they stop Palestinians harvesting their olives, and sometimes they steal the crop. But when we have Israelis with us, showing solidarity – they don't even have to work with us all day – the settlers see that other Israelis are there, watching the situation. Then the Palestinian farmers can work and we are grateful and have great respect for them. They buy a lot of our olive oil, and I hope they continue. The people who used to work for me can't any more.

What about your fruit? Can you export that?

No. And we are not allowed to sell it in Israel; we can't even sell it in Nablus. Nablus is the largest city in the West Bank and the closest to the village. Because of the system of the gates, the merchants who used to come to buy our produce stopped, because their permits allow them to pass through their gate; they can't use two gates, so they can't come through our gate. If we send a truck to Nablus, it has to pass the checkpoint, where the soldiers make the driver unload all the boxes. We could be talking about five tons. It takes two or three hours, and then the soldiers have to check the boxes, and two or three more hours to reload. The day is lost. No trader can wait later than midday, because he wants to sell. The next day he can only sell at half price, because the goods are not fresh. So we don't do that. Where do we sell? Villages are small markets, and unfortunately the villagers don't pay a lot of money, so we sell cheaply. You know two of my sons and one of my daughters live in Nablus. They eat Israeli produce, not my produce, because the Israeli trucks, which are easily recognised by their number plates, pass the checkpoints without stopping. When I ask my daughter or my sons about cucumbers or tomatoes, for example, they tell me that the price of one kilo there is the nett price of one box here, which is fifteen kilos. It's economic war. They want to persuade us that our land is useless. Just south of Jayyus, they are planning to build an industrial area. The message is clear: those who can't work on their farms can work there. Now, if a farmer neglects his land for three years, the Israelis will take it, according to an old Ottoman law that the Israelis use: if you don't plant your land three years continuously, it becomes state land. This is actually Islamic law. According to Islam, ten per cent of your income must be given to the poor. In the last days of the Turkish occupation, the government wanted that ten per cent, and they issued this law to oblige farmers to plant yearly. The farmer who didn't plant lost his land to the state. The Israelis kept a version of this law, so Israel is now an Islamic state. They take two aerial photographs each year, the first in May and the second in November, and if it is after harvest in May, or before ploughing in November, how can you prove that it was planted? Many, many farmers have lost their land this way.