

Turning the world upside down

Lakshmi is one of the lowest of the low – a dalit, or ‘untouchable’, at the very bottom of India’s hierarchy of castes. But one of the most influential agricultural scientists in the country, M. S. Swaminathan, a pioneer of hybrid rice and father of the ‘Green Revolution’, will soon be beating a path to her door in the tiny village of Humnapur in the state of Andhra Pradesh

It wasn't long ago that people from Lakshmi's background were seen by many in higher castes as sub-human, fit for only the most menial jobs and not even worthy of a name. Worse, she was abandoned by her husband, who took her son with him when he left. In many parts of India, women in any caste are considered inferior to men, and an abandoned woman the most contemptible of all.

But when Greenpeace visited her, Lakshmi set out on her modest front porch a cornucopia that may hold nothing less than a key to the future of farming if it is to be just and sustainable. From simple woven baskets and clay pots she brought out more than 80 varieties of seeds – part of one of the richest and most diverse agricultural heritages in the world.

When he drops by, Professor Swaminathan will see that this 'community gene bank' is part of a larger picture. Lakshmi manages the seeds for her *sangham* – a voluntary association of poor women. And her sangham is one of 75, each comprising around 60 families, in the Deccan Development Society (DDS) – an organisation which is turning ecologically-smart, people-centred agriculture into living reality, and demonstrating daily that high-technology, capital-intensive farming is unnecessary and inappropriate for hundreds of millions of the world's poorest people.

Along with the community gene banks, which they stock and control, the women of DDS have established their own food security systems, with grain stores in each village that they control and manage themselves. To support their efforts, a local farm science centre brings together and

organises traditional knowledge and helps develop fertilisers and pesticides from natural sources such as the neem tree.

DDS has also built a 'green school' where dalit children, who otherwise face a life of little more than bonded labour, learn practical, income-generating skills as well as academic subjects that allow them to enter 'mainstream' society should they want to do so. And DDS is training women in radio and video production so that they can tell their stories to the wider world. Some of these new video makers are travelling as far as Peru to share their knowledge of ecological agriculture, or 'permaculture', and to learn from others.

"The fact that dalit women, who are poor, illiterate and marginalised, can manage such complex projects is the strongest political statement of the decade" says P V Sathesh, the Director of DDS.

At first sight, there could be few less promising environments for a sustainable agricultural revolution. These villages – in the Medak district of the state of Andhra Pradesh – are on the Deccan, a raised plateau that rolls for hundreds of kilometres across southern India. Rainfall is sparse and uncertain. Most of the soil is poor – often only a few centimetres of dust and pulverized laterite rock which, in the dry season, gives the ground a rusty red colour. Similar dryland terrain covers some two thirds of India. So the success of DDS's work holds lessons for vast areas of the country, as well as for many other parts of the world.

The Deccan is a harsh, unforgiving land, but with care it can be made to bloom. As recently as 30 years ago more than 70 different crop varieties were grown in some fields. Half a century ago, mangos from this region were so prized that the Nazeem of Hyderabad, hereditary ruler in the district, sent armed guards to protect the caravan of bullock carts that brought the fruits to his palace.

As a small boy, Jayappa showed a gift for learning. Twice



Over 80 varieties of seeds are kept in Lakshmi's clay pots

his uncle had to drag him away from a local mission school: the family needed even the tiny amount of cash that a young child could bring working for landlords, and education was a luxury they thought they could not afford. When Jayappa was 11 his father died and a local large landowner illegally seized the family's tiny parcel of land. At 17 Jayappa borrowed some money, took the landlord to court and won, but spent nine years in wage labour to pay off the debt.

For another 20 years, Jayappa worked in different parts of Andhra Pradesh much of the time for landlords embracing high-tech agriculture, always for pitiful wages. "We, the wage labourers, saw the land being killed while we remained poor" he says. Then, in the 1980s Jayappa heard about the fledgling DDS: groups of the very poorest coming together, pooling their small savings, gradually achieving greater autonomy, and adopting environmentally friendly farming techniques.

Returning to his home village, Jayappa set up a sangham with DDS help. He started with other men but found that too many of them wanted loans from the community chest for extravagant and unrealistic purposes. Conflict threatened to tear the sangham apart. The solution, he says, was to turn to the women. They tended to make more modest and sensible decisions.

Beginning with savings of as little as 5 rupees a month (approx. 0.25 euros or £0.08) the women's sanghams in Algol and other DDS villages have gradually brought back into cultivation extremely marginal lands which before could barely yield more than 40-50kg per acre. Now, the rejuvenated lands yield 200-300kg of sorghum, 50kg of pigeon pea, 50kg of assorted pulses and amaranth, fibre crops, and enough fodder for two head of cattle per acre. Together, the DDS has generated the equivalent of thousands of new jobs over a decade, and earnings per acre increased up to 12 times. And all this, while eliminating the use of chemicals and increasing the biodiversity in the fields.

Initially, plants such as sun-hemp are used to improve the soil. Large quantities of cow manure are also added to increase soil fertility. Simple earthen banks and rock dams help retain soil moisture. Water retention benefits not only the small holders themselves, who are often on the higher

and poorer ground, but also their neighbours downstream, who find their wells fuller for a greater part of the year as a result.

Crops are used in combination to maintain soil health. Typically, these will include varieties of sorghum (known locally as jawar), a drought-tolerant crop which extracts nutrients, and leguminous crops like pigeon pea, which add nitrogen to the soil.

Walking across one of these fields one commonly sees a mix of a dozen or more species of food plants. Manemma, a sangham member in the village of Gangwar, has 22 different varieties growing on three acres. These include five varieties of jawar, black gram, green gram and horse gram, finger millet, pearl millet and two varieties of foxtail millet, sesame, three varieties of pigeon pea, cow pea, field bean and bindhi. There are also wild vegetables, which have been eliminated or made toxic on chemical intensive farms. Some wild plants are highly nutritious and are important for local food security throughout the year. Indian spinach, for example, is one of the richest sources of vitamin A precursor in the plant kingdom.

"None of this is our invention" says Suresh, chief scientist at KVK, the local farm science centre. "Almost all of what we teach are things that some local farmers have been doing in some form for centuries. All we have done is to put the knowledge together in easy-to-use form, and helped disseminate it more widely".

What is new is the way that the centre has collected and systematised best practice in indigenous knowledge. A good example is a non-pesticide management (NPM) system which KVK disseminates using a 'mandala' display of seeds and treatments. This lays out actions and interactions in time and space which the farmer needs to manage in order to protect their crops through the year without the use of artificial pesticides. It may sound complicated, but the mandala portrays complex information and relationships in a way that is easy for to literate and non-literate alike to understand. Along with community gene banks like Lakshmi's, DDS rates its most important achievement as the creation of village-based, community-owned and managed, public distribution systems (PDS). These stock essential food



Left: the 'green school' where 'untouchable' children learn practical skills. Right: the 'mandala' explains the methods of crop management to non-literate farmers

grains produced by the sangham members, ready for distribution at affordable prices during lean times of year.

The need arose because the government-owned PDS system has been a near disaster; it encouraged the purchase and consumption of rice imported into areas like the Medak district where it had never been a part of the staple diet.

“Eating rice became fashionable” says Satheesh. “Communities which had thrived on a highly nutritious diet based on sorghum and millet switched over to a staple that was alien to them. Their immune systems were compromised and they were laid bare to diseases”.

“Culture and food are inseparable” he adds. “Denial of indigenous food is a political act, and we must become conscious of it”. With a community-controlled PDS, traditional foods that were once almost forgotten have become common again in many households. Prices sometimes differ considerably from those in the regular markets. For example coarse millets that fetch very little outside in the ‘mainstream’, are given a high value in the women’s markets.

Even though the rains are poor this year, the women’s sangham in Eedulpally village will be able to feed their family three times a day without going into debt. But there is more to PDS than just having enough food to stay alive – it is a matter of human dignity. “We used to be very lonely” says Sundaramma, a leader of the sangham. “We would work all day and then we would be alone in our houses in the evening. Now we meet, work, talk and sing together. We share our burdens. Previously we didn’t even know what a bank was. Now we are talking with men and with people in

higher castes. We have become *ushar* (alert, intelligent).

When they started the sangham in Eedulpally, the women could not even afford a second good sari. Now they no longer have to stay indoors while their clothes are drying after a wash, and, in addition to the food bank, the

women of Eedulpally have been able to create a *balwadi* – a shady place for young children of sangham members to be cared for instead of having to sit out in the blazing sun all day while their mothers work in the fields.

Over in the village of Basantpur the sangham has created a medicinal garden that can meet many of the essential health needs of the community. On just 5 acres of rocky ground flourish 45 or more species of shrubs and trees. Santoshamma, a sangham member who looks after the garden, proudly displays some of its contents: gooseberries, grown for their high content of vitamin C; neem, whose leaves are used to treat scabies and for ailments affecting newborns and young mothers. Extracts from three plants in one part of the garden are combined to make an *ayurvedic* (traditional Indian medicine) treatment effective against



The DDS has generated thousands of new jobs. Earnings per acre have risen up to 12 times at the same time as eliminating the use of chemicals and increasing biodiversity

coughs, stomach pain and various skin diseases, while pomegranate is used for loose bowel motions and for dysentery. Bandagurja is applied to a snake bite, and will keep someone alive for long enough to get them to hospital even if they have been bitten by a king cobra – one of the world’s most deadly snakes.

Mahatma Gandhi called dalits the ‘people of God’. The women’s relationship to the land is about more than producing food: it is a religious commitment, expressed in daily acts and in festivals throughout the farming year. In Medak district, every season is interpreted as a state of the mother earth goddess. “When the streams and rivers flow full: mother is bellyful and flows in content” they say. “When land is replete with diverse crops: mother is heavily pregnant. When the ear-heads are forming: mother is in birth pangs. When seed formation is taking place: mother is breastfeeding her children”.

One of the greatest challenges is to equip the rising generation of children with the confidence and skills to defend their culture and also be capable of dealing with the modern world. To this end, DDS founded a ‘green school’ or *pacha saale* in 1993 to give a second chance to local dalit who either never had the chance to go for government schools or had to drop out because of poverty and other pressures.

Every aspect of the school – from its physical structure to its curriculum – reflects a philosophy of self-reliance and environmental protection. Its hive-like buildings were made with local rock and without precious resources like wood and cement. They cost less than half the average of new buildings in the area, and are cool even on the hottest day.

“We are questioning the construction of knowledge” says Satheesh, Director of DDS “The normal assumption is that it flows down from those with higher education. Here we see much of that reversed”.

Another crucial battle for DDS is with, and for, the media. In Andhra Pradesh, like in most of India, television and radio tend to reflect official policy in favour of ‘high-tech’

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Learning self-reliance

agriculture. In response, DDS has trained some sangham members in radio and video production skills so that they can make their own programmes. “With video we can express ourselves” says one determined young women, known to everybody as ‘General’. “When outsiders make films about us, they don’t understand what we’re saying. You film us selectively. We know our own stories”.

The women of DDS have shown they can produce more and healthier food from the land with fewer inputs than the methods touted by so-called modernisers. They have reversed the degradation of natural resources, increased their resilience to adverse events, and created, strong supportive local groups. Others are following their example without prompting, and they have won respect from scientists, economists and other professional elites.

So what will Lakshmi tell Professor Swaminathan?

“When we ate hybrids [‘green revolution’ crops] we found they made our skin itch terribly. The cattle did not relish the fodder from these crops, and did not thrive. Hybrid sorghum extracted too many nutrients from the soil, leaving it dead.

“With GE [genetically engineered] crops we would have to purchase many different inputs. The technology would come with many uncertainties and with hidden costs.

“This year the rain is scarce. But even without good rain we are still hopeful of a crop because our varieties can withstand drought, and, thanks to all the manure we add, the soil is full of life. Whenever rain comes, life will return, and some of our crops will pull through because we have such variety.

“I have no interest in or need for genetic engineering because in my hands I have all these seeds, which I can also share with others. These seeds give us good, nutritious food and excellent fodder for our animals. We know them very well. We know our land very well” ■

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YEAR-ROUND HARVEST IN THAILAND’S RICH GARDENS

Called simply ‘homegardens’, Thailand’s private smallholdings are really little paradises – miniature tropical forests containing a wealth of different plants. Productive and efficient, and often no bigger than just 2000m², the homegardens provide everything that a family needs for life. But these long-tended treasures are



threatened by migration to the cities and industrialised agriculture.

Like a canopy the leaves of the coconut palms sway above the garden. The palms offer shade as well as fruit and building material. Underneath, all kind of fruit trees like mango and papaya thrive. One level below, fast-growing banana plants mix with berry shrubs and maize.

On the ground floor wild spinach, root

vegetables such as yams or sweet potato and a range of herbs spring up. There’s something to harvest year round, beneficial insects keep away the pests, wilting leaves and dead plants provide a rich compost. The homegardens are complex ecosystems which secure a stable livelihood for many families in Thailand and other tropical countries. And for the environment they provide a precious gene pool due to their high biodiversity.

MAIZE *the gold of the Mayas*

Eaten on it’s own with butter, or processed to polenta or tortillas, maize tastes good, and it is no surprise that the crop – the “gold of the Mayas” – has spread far and wide from its Central American birthplace. Maize began its triumphal march across the globe just five centuries ago, and is now the world’s third most important food crop after wheat and rice. In 2000 almost 591m tonnes was produced. In Latin America about half of the total cereal production – almost 76m tonnes – is maize; Africa grows 34m tonnes – more than a third of cereal output. Three quarters of the global ‘zea mays’ harvest is used for animal feed.

There are 50,000 varieties of maize stored in the gene banks of the world – a tremendous genetic wealth of varieties to suit many climates and conditions. And the cobs are also genetically manipulated; in the USA the so-called Bt-maize that contains an insecticidal toxin is grown on more than 20m hectares.



**MORE THAN
COFFEE**
*help for Brazil's
smallholders*

Organic fertiliser made of milk, sugar beets, bone meal and cows manure; banana plants giving shade and providing the soil with nutrients after their leaves have been converted into compost – these are the tricks of sustainable agriculture that make APTA, a Brazilian NGO, popular among farmers in the Brazilian state of Espirito Santo.

There are more than 70,000 smallholders along this

part of the Atlantic coast whose main source of income is coffee. Because world market prices are extremely low farmers do not even reach a third of their already low average income. They are not even able to ask for better prices for organic coffee.

Because poverty and hunger are not only the result of bad harvests, APTA helps to increase harvests sustainably.

New sources of income like growing fruit and vegetables are proposed and the way the produce is marketed is being changed: rather than share the profit with middlemen, the smallholders from the region sell onions, fruit and vegetables on the market and earn double the income.

**TREASURES OF
THE FIELD**
*caring for the seed
in Ethiopia*

Stored within the countless tins and bags that line the shelves of the Institute for Biodiversity Conservation and Research (IBCR) in Ethiopia's capital Addis Ababa are the seeds of hundreds of varieties of food crops. These range from the long-forgotten to commonly used regional varieties.

Ethiopia is the cradle of many crops – and the IBCR is a veritable treasury. But conserving this rich genetic legacy requires more than just seed archiving. It is also necessary to conserve the knowledge of the farmers about local food-crop varieties, their breeding improvement and their conservation.

That's why the IBCR cooperates with about 200 farmers who preserve and propagate the traditional varieties. By so doing the researchers commonly discover that some varieties are better suited for difficult cultivation conditions than the

most recent hybrid high-yielding seeds which – being hybrids – cannot re-seed productively and have to be purchased anew year after year. Through a long process of adaptation, local varieties are productive with much less or even without the chemical means to dominate the agricultural-ecosystems. They are much more robust against diseases, pests or drought stress.



PHOTOS: OPP, THORSTEN FUTH, TOP SOPHIA EVANS, BELOW MATTIAS ZEIGLER

A remedy against moths and genetic engineering

Using all the resources at their disposal, the big agrochemical companies are trying to muscle genetically engineered maize into the Kenyan fields. Yet scientists in the East African country have developed a natural method of cultivation which achieves better yields for the farmers

One after another, the men from the vicinity rise to their feet from the benches Lawrence Odek has brought from the nearby church to provide a proper setting for the ‘field day’ – the agricultural information day being held at his farm. They praise their host’s pioneering spirit and gladly reveal what other improvements, in their view, the 48-year-old farmer might be able to make. And if jests, derision, or envy should mingle with the miscellaneous praise, Lawrence Odek knows how to respond: “It’s better to invite all the neighbours to the field day” he explains. “Much better than being pestered by people every day when they come to gape at my maize plantations – and trample down my harvest in the process.”

Two fields the size of tennis courts have turned the Odek farm into an agricultural attraction. One of them resembles the majority of maize-growing plots in the sun-scorched Lambwe Valley at the Kenyan shores of equatorial Lake Victoria: a square of barely hip-high, moth-eaten plants with ears as shrivelled as dried prunes. Purple St John’s wort sprouts amid the tangle of yellowing growth, a parasite that feeds on the roots of the already sickly plants. And in direct proximity to this agronomic disaster, a crop rises in unblemished green; healthy, and so high that not even the tallest of the field day visitors can reach the tops of the plants with outstretched arms. As the farmers stand assembled between the two plantations, no jokes or teasing interrupts Lawrence Odek’s explanation of this incredible contrast.

When, roughly a century ago, colonial farmers set up the first maize plantations, the crop imported from America soon

outstripped sorghum, the traditional staple. Corn was easier to grow, produced higher yields, and was tastier to boot. Unfortunately, it was also more susceptible to parasites from the alien African fauna and flora. For St John’s wort, in particular, it proved the ideal host – as it was for a half-inch, mud-brown moth called *chilo partellus*, which was imported accidentally from India in the 1920s, and whose caterpillars have been voraciously eating their way through East African corn fields ever since. Together the weeds and moths now destroy half of Kenya’s corn crop, at an annual cost of millions of dollars.

For the subsistence farmers of the Lambwe Valley, the damage is even more devastating. They lack the funds needed to buy the imported agrochemicals used by the big farms to curb their losses. They don’t even have money to finance their children’s education, so most of them pay school tuition in kind, that is, with maize. If the harvest is bad, the children have to drop out of school or else the family will go hungry; sometimes both these things happen at once. At the end of a semi-annual growing season, Lawrence Odek used to have a yield of rarely more than three sacks of corn, some 400 pounds – hardly sufficient for a family of ten to manage.

Then, two years ago, Lawrence and his brother travelled to the nearby provincial capital of Mbita. They had heard that a Doctor Khan there had devised a means of controlling the corn pests and was now looking for farmers willing to try it out in

St John’s wort, a parasite on the maize plants