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Sustainable Agriculture Information Network

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# Sustainable agriculture

A pathway out of poverty for India's rural poor

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Federal Ministry  
for Economic Cooperation  
and Development



**NORWEGIAN MINISTRY  
OF FOREIGN AFFAIRS**

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# **SUSTAINABLE AGRICULTURE**

# **SUSTAINABLE AGRICULTURE**

**A PATHWAY OUT OF POVERTY  
FOR INDIA'S RURAL POOR**

Sustainet aims to systematically evaluate, communicate and disseminate successful approaches and concepts of sustainable agriculture in selected pilot regions. It works at various levels. Discussion between Sustainet's German NGO project partners on the poverty reduction impacts of different models and strategies, coupled with reflection and assessment in the pilot regions in close cooperation with local partners, contribute to harmonizing implementation strategies. Analysis and discussion of successful and promising dissemination strategies aims to influence funding priorities for agricultural and rural development. The exchange of information and networking between public, civil society and private partners on sustainable land use, as well as capacity building of private and public rural service providers, strengthens advocacy and the delivery potential of change agents.

Sustainet's goals are to:

- Highlight the significance of sustainable agriculture for global food security,
- Identify promising key promotion priorities in rural areas,
- Specify fields of action for agricultural policy, and
- Establish networks between local and international partners, thereby promoting the dissemination of successful concepts.

More information: [www.sustainet.org](http://www.sustainet.org)

Publisher: Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH, Postfach 5180, 65726 Eschborn, Germany, Tel. +49 6196 79-0, fax +49 6196 79-1115, email [info@gtz.de](mailto:info@gtz.de), internet [www.gtz.de](http://www.gtz.de)

Sector project: Sustainet, Sustainable Agriculture Information Network, [www.sustainet.org](http://www.sustainet.org)

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Correct citation: GTZ Sustainet. 2006. *Sustainable agriculture: A pathway out of poverty for India's rural poor*. Deutsche Gesellschaft für Technische Zusammenarbeit, Eschborn.

## Contents

List of figures	vii
List of boxes	viii
List of tables	ix
Foreword	x
Sustainet partners in Germany and India	xii
Locations of projects described in this book	xiii
Acknowledgements	xiv
List of participants	xv
<b>1 Introduction</b>	<b>1</b>
<i>Helga Stamm-Berg, Sustainet</i>	
Why agricultural and rural development?	1
Why small-scale agriculture?	2
Why sustainable agriculture?	3
Approaches to sustainable agriculture	6
How sustainable agriculture contributes to the Millennium Development Goals	8
The Sustainet project	10
The Sustainet process	12
How this book was prepared	13
Structure of this book	14
<b>2 Organic agriculture</b>	<b>17</b>
Organic farming in India	18
<i>Navdanya, Uttaranchal</i>	
Biodiversity-based sustainable agriculture	24
<i>Navdanya, Uttaranchal</i>	
The Pyalaram community gene fund	34
<i>Deccan Development Society, Andhra Pradesh</i>	
Redefining pest management in Pudukkula	40
<i>Centre for Sustainable Agriculture, Andhra Pradesh</i>	
Farming for self-reliance	50
<i>Chetana-Vikas, Maharashtra</i>	
Realizing the potential of organic agriculture	56

<b>3</b>	<b>Managing land and water</b>	<b>61</b>
	Why watershed management?	62
	<i>Aragamee, Orissa</i>	
	Empowering marginalized communities in Rayalaseema watershed	67
	<i>Krushbi, Andhra Pradesh</i>	
	Building on indigenous knowledge in watershed management	75
	<i>Aragamee, Orissa</i>	
	Forest home gardens in Raigad District	81
	<i>Rural Communes, Maharashtra</i>	
	Community-based watershed development in Bhipur	88
	<i>Cecoedecon, Rajasthan</i>	
	Landshaping for better livelihood for the Sundarbans	94
	<i>Ramakrishna Mission Asbama, West Bengal</i>	
	Working across levels in watershed management	100
	<i>Indo-German Bilateral Project</i>	
	Government–NGO collaboration in the Kinchumanda watershed	108
	<i>Vikasa, Andhra Pradesh</i>	
	Realizing the potential of land and water management	115
<b>4</b>	<b>New products, new markets</b>	<b>119</b>
	New market potential for small-scale farmers	120
	<i>Helga Stamm-Berg and Felix zu Knyphausen, Sustainet</i>	
	Linking tea farmers with markets	130
	<i>Peermade Development Society, Kerala</i>	
	Dryland sericulture	138
	<i>BAIF Institute for Rural Development, Karnataka</i>	
	The biofuel hype: Chance or challenge for sustainable agriculture?	144
	<i>BAIF Institute for Rural Development, Karnataka</i>	
	Realizing the potential of new products and markets	154
<b>5</b>	<b>Participants' profiles</b>	<b>157</b>

## Figures

1	DDS relies on the indigenous knowledge of local people to select healthy, viable seeds	36
2	Yields obtained by a sangham member before and after the project	38
3	Pesticides are supposed to solve pest problems – but in fact they lead to further pest problems, and to debt, poverty and despair	41
4	By getting rid of pesticides, the villagers avoided having to borrow money, boosted their yields, made more profit – and improved their health	45
5	Expenditure and income from 1 ha of land under self-reliance farming method, Wardha District, 1999–2005	53
6	Groups of farmers planned how to manage the watershed	69
7	Before the project: gullying and erosion on the slopes	76
8	After the project: checkdams on the river, with a pump to lift water to the fields	77
9	Aba's garden produces a wide range of fruit, vegetables, spices and wood	81
10	Lakshman Das can harvest a range of crops as well as fish from his landshaped farm	97
11	Compost making is an important part of maintaining soil fertility	111
12	Village institutions are key to sustainable development	112
13	Every year, more farmers in Idukki are converting to organic production	132
14	Structure of the Sahyadri Tea Farmers' Consortium	134
15	The Sahyadri Tea Farmers' Consortium processes and markets tea produced by farmers in Idukki District	136
16	The biomass-filled trench system	140
17	Sericulture generates employment and income for village women	141
18	Products of <i>Jatropha curcas</i> grown by small-scale farmers	147
19	Given the right conditions, <i>jatropha</i> could be a valuable new crop for small-scale farmers	150
20	Processing <i>jatropha</i> locally into oil and seedcake can boost farmers' profits	152

## **Boxes**

1	“Small farms are more efficient than large farms”	3
2	Definition of sustainable agriculture	6
3	Sustainable agriculture: A shifting interpretation	8
4	How do you know your agricultural practice is sustainable?	11
5	Breaking the vicious circle	25
6	Organic produce buys taxis	26
7	Neem victory	27
8	Factors hindering and fostering Navdanya’s work	33
9	Seed security for food security	35
10	Seeds in festivals	37
11	The price of debt	40
12	Organizations promoting non-pesticidal management	42
13	Transgenic Bt crops: No solution	46
14	Intercropping saves lives	51
15	Crops for cash and food	52
16	Rayalaseema	68
17	Mankadamundi at a glance	76
18	The Sundarbans	95
19	Landshaping: the technology	96
20	Indicators of success in the IGBP project	101
21	About Vikasa	109
22	Before and after the formation of the Sahyadri Tea Farmers’ Consortium	134
23	Biofuels	146



**Tables**

1	Forecast growth (%) for organic products in the Indian domestic market, 2002–7	22
2	Inputs and yields on Balbeer Singh's farm, Utircha village, Uttaranchal	25
3	Non-pesticidal and conventional management in cotton, 2001–2 (8 farmers in Pudukula)	44
4	Degree of self-reliance achieved from one hectare of rainfed dryland; average of three years (2004–6)	54
5	Before and after the project in Mankadamundi	78
6	Value of produce from Aba's forest garden	85
7	Yields of key crops in Bhipur, 1997 and 2004 (t/ha)	92
8	Changes to a typical farm after landshaping	98
9	Increase in yields due to soil and water conservation in watershed villages	113
10	Farm income before and after the introduction of sericulture	142
11	Estimated profit from selling unprocessed seeds from 500 jatropha plants	151
12	Estimated profit from processing seeds from 500 jatropha plants	151

## Foreword

*Josef Sayer*<sup>1</sup>

**W**E TEND TO THINK of “sustainability” as having three dimensions: ecological, economic and social. But these three dimensions are not separate: in reality they are intertwined. Plus, sustainability has an international perspective that we must consider.

Acting and behaving according to this concept of sustainability is a global task, and is a key question for humanity. In combating poverty, all three dimensions of sustainability have to be taken into account. In the ecological dimension, conserving a sound environment for future generations is closely related to the fight against poverty. Millennium Development Goal 8 aims at the economic dimension: it calls for a global development partnership which overcomes discrimination between poor and rich countries. Finally, there is a close connection between poverty and the social dimension. If people are starving, their health is at risk – this is especially true for the children of the poor – and combating diseases like HIV/AIDS, malaria or tuberculosis becomes very difficult.

How does Sustainet, as a “lighthouse project” of the German Council for Sustainable Development, meet the task of combating poverty while taking into account the concept of sustainability? A lighthouse project is supposed to have a big political impact. But we know that any project is able to make only a limited contribution to global challenges like combating poverty and assuring food security in rural areas. So, what are the interesting features of Sustainet? It focuses on two crucial aspects:

- On one hand, Sustainet creates awareness of errors in the so-called “Green Revolution”. With the Green Revolution it seemed possible to solve the problem of food insecurity worldwide. But as the principles of sustainability were not taken into account; the Green Revolution failed, and even worse, contributed to the impoverishment of small farmers by trapping them in debt.
- On the other hand, transnational companies pose a similar threat to sustainability through campaigns that promise to abolish hunger through “green gene” technology.

As a reaction to the Green Revolution, development cooperation – above all NGOs and churches – established practices taking into account the criteria of sustainability. Proofs were shown in Africa, Asia and Latin America that it is possible to increase yields by 100% through sustainable agriculture especially for small farmers. Sustainable agriculture actually combats hunger in rural areas and significantly enhances degraded soils.

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<sup>1</sup> Member of the German Council for Sustainable Development and Executive Director of Misereor. This Foreword is based on a speech presented at the Annual Conference of the German Council for Sustainable Development, Berlin, September 2005.

How can these experiences and models of “good agricultural practices” be disseminated? Why are such solutions limited to certain areas? What are the preconditions for a successful scaling up, and what factors hamper dissemination? As there are no systematic analyses to answer these questions, the lighthouse project aims to figure out how successful, sustainable approaches assuring food security could be spread. In this way, the project will present a real alternative to “green gene” technology, and will have a strong political impact.

The local approaches analysed by Sustainet deal with soil conservation, upgrading soil fertility, integrated animal husbandry, diversification of cultivated crops, protection of biodiversity, natural pest management, post-harvest improvements, marketing, and strengthening local institutions. These are diverse approaches; they all minimize the consequences of agricultural production but differ in the level of external resources used and in the type of tillage operations.

In conclusion, the main objectives of the lighthouse project are:

- To implement the three correlating dimensions of sustainability in the field of agriculture in developing countries.
- To show the effectiveness of networks between local and international partners and contribute to the dissemination of successful approaches of sustainable agriculture.
- To make policymakers increasingly aware of the significance of sustainable agriculture for rural economical growth and for fighting poverty.
- To identify promising strategies that should be promoted to meet the Millennium Development Goals and which can result in recommendations for agricultural development.

## Sustainet partners in Germany and India

<i>German organization</i>	<i>Indian organization*</i>
<b>Bread for the World</b> (Brot für die Welt) www.brot-fuer-die-welt.org	<b>Navdanya</b> (p. 24) www.navdanya.org <b>Chetana-Vikas</b> (p. 50) chetana_wda@sancharnet.in <b>Krushi Samstha</b> (p. 67) krushi_samstha@rediffmail.com
<b>Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ)</b> www.gtz.de	<b>Indo-German Bilateral Project</b> (p. 100) www.watershedindia.50megs.com <b>Vikasa</b> (p. 108) www.vikasaindia.org
<b>German Agro Action</b> (Deutsche Welthungerhilfe) www.welthungerhilfe.de	<b>Centre for Sustainable Agriculture</b> (p. 40) www.csa-india.org <b>Aragamee</b> (p. 62, 75) www.agragamee.org <b>Ramakrishna Mission Ashrama</b> (p. 94) rkmlpndp@cal.vsnl.net.in <b>BAIF Institute for Rural Development</b> (p. 138, 144) www.baif.com, www.birdk.org
<b>Misereor</b> www.misereor.org	<b>Deccan Development Society</b> (Permaculture Society) (p. 34) www.ddsindia.com <b>Rural Communes</b> (p. 81) ruralcommunes@gmail.com <b>Centre for Community Economics and Development Consultants Society</b> (Cecoedecon) (p. 88) www.cecoedecon.org <b>Peermade Development Society</b> (p. 130) www.pdspeermade.com

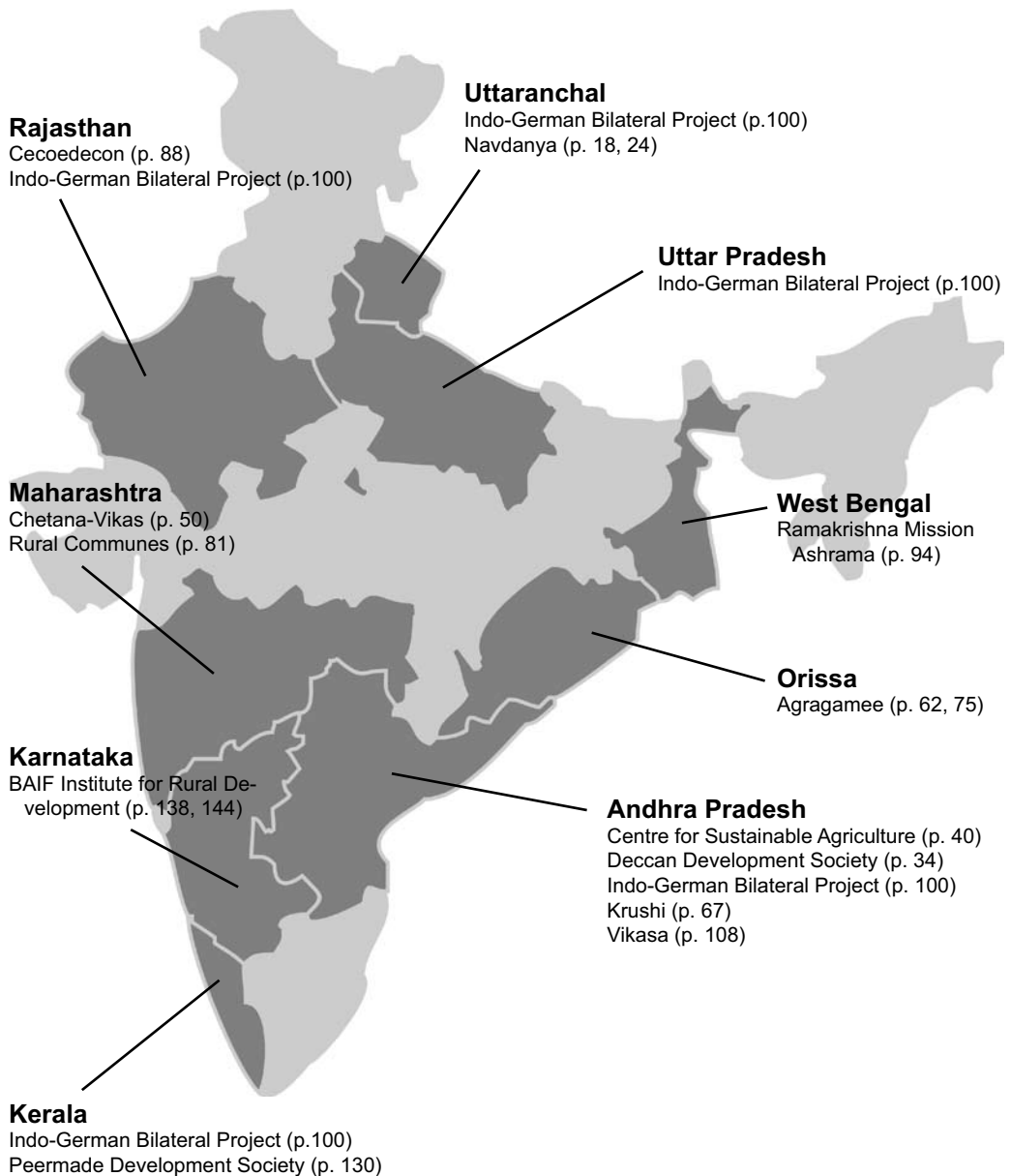
**German Council for Sustainable Development**, www.nachhaltigkeitsrat.de

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**Federal Ministry of Food, Agriculture and Consumer Protection (BMELV)**,  
www.verbraucherministerium.de

\*Recipients of current or past support

## Locations of projects described in this book



## Acknowledgements

The writeshop and production of this book were financed by the German Federal Ministry for Economic Cooperation and Development (BMZ) through the implementing body of Sustainet, a project of the Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) and supported by the German Federal Ministry of Food, Agriculture and Consumer Protection.

The production of this book was made possible by funding from the Norwegian Ministry of Foreign Affairs and the Sustainable Agriculture and Rural Development Initiative of the Food and Agriculture Organization of the United Nations (FAO-SARD Initiative).

Sincere thanks also to:

- The writeshop participants and staff who contributed to this publication through their valuable inputs and comments: see the *List of participants* (page xv) and *Participants' profiles* (page 157).
- The many farmers, staff of intermediary organizations and researchers, whose knowledge and experiences are reflected in this book.
- The projects which contributed with their staff and experiences to the Sustainet self-evaluation process.
- The team of GTZ Delhi for their organizational support.
- The management and staff of The Residency Towers, Chennai, where the writeshop to produce this book was held.
- The International Institute of Rural Reconstruction, for facilitating the writeshop.
- Our German partners from Misereor, German Agro Action and Bread for the World.
- The German Council for Sustainable Development, which initiated the Sustainet project, and especially to Prof Dr Josef Sayer, executive director of Misereor and member of the Council.
- The Leibniz Centre for Agricultural Landscape Research (ZALF), which is undertaking the analysis of the impacts and scaling up of the projects described in this book.

## List of participants

FOR FURTHER INFORMATION AND contact details, see the *Participants' profiles*, page 157.

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#### *Chetana-Vikas*

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#### *Deccan Development Society*

- Samuel Sundar Singh

#### *Krusha Samstha/RWDP*

- V Nandagopal

#### *Navdanya*

- Vinod Kumar Bhatt

#### *Peermade Development Society*

- Joseph Mathew
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- Vivek Gour-Broome

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#### *Leibniz Centre for Agricultural Landscape Research (ZALF)*

- Stefan Sieber

#### *GTZ Sustainet-Germany*

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- Mirco Gaul (freelance consultant)
- Charlotte Haeusler
- Felix zu Knyphausen
- Helga Stamm-Berg (coordinator)

#### *GTZ Sustainet-India*

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*Facilitation*

- Isaac Bekalo

*Illustrations*

- Tubuli Behera
- Bonaventure Nyotumba

*Logistics*

- Daniel Bhasker



# 1

## Introduction

*Helga Stamm-Berg, Sustained*

**S**USTAINABLE AGRICULTURE NEEDS TO be brought back into the development agenda! This book not only shows that sustainable agriculture works; it also outlines what should be done and how it can be done.

All the agricultural practices described in this book highlight in one or the other way how sustainable agriculture contributes directly to the United Nations' Millennium Development Goals (MDGs). They cover a whole range of improving sustainability: raising soil fertility, improving water storage capacity, increasing water quality, diversification, raising people's capability to cope with risks and withstand natural calamities, reducing energy consumption, minimizing risk, and so on.

It is impossible to achieve sustainable development without applying sustainable agriculture on a large scale. The relationship between agricultural production and eradication of extreme poverty and hunger is very strong: agriculture is the very basis for food security. Together with fisheries, it provides practically all of the world's food. So it is of critical importance for the achievement of **MDG 1, "eradicate extreme poverty and hunger"**.

Although agricultural production amounts to one-and-a-half times the global population's basic needs – and is growing constantly – there is still widespread hunger in the world.

So hunger is not simply a function of how much food is produced. Differences in purchasing power and access to land and resources are among the major causes of underdevelopment in rural areas. Agriculture can be sustainable when it not only produces a lot of high-quality food, but also generates income for poor people. That means rural development: improving transport, development of market facilities and linkages, improving (access to) information, participation of the rural poor in decision making, providing access to credit, and so on.

### **Why agricultural and rural development?**

The Indian government's commitment to agriculture is a global success story. Since Independence in 1947, India has succeeded in significantly reducing the number of people living in poverty.

In the early 1960s, India introduced "Green Revolution" technologies: high-yielding grain varieties, fertilizer, pesticides and irrigation. By the early 1990s, India was self-sufficient in food-grain production. But not everyone has enough access to the food produced, and India is still the country with the most poor people on our globe: of India's 1028 million people (in 2001), around 300 million people were classified as "poor", and the majority of

these live in rural areas. India's ability to reduce poverty will determine the overall success of achieving MDG 1.

Most people in rural India depend directly or indirectly on farming for their livelihood. Despite this, not enough attention has been given to agriculture to overcome poverty. The importance of agriculture to stimulate rural growth is generally accepted, but politicians have failed to establish the necessary frame conditions for rural economic growth.

It is widely accepted that agricultural growth and human development (in the fields of education, health and women's issues) are key factors for rural development. The World Bank, the Food and Agriculture Organization of the United Nations, the International Fund for Agricultural Development, as well as bilateral development agencies agree that investment in agricultural growth helps reduce poverty and ensure pro-poor growth more than any other form of intervention.

The agricultural sector has potential to create economic growth in rural areas. It generates job opportunities in adding value (as in the food processing industry), in bringing agricultural products to the consumer (market linkages), and in providing support (infrastructure, information, quality control and training).

Rising populations mean more demand for food. Improved standards of living in much of the world also mean greater demand for quality food (more meat, dairy products and organic food). If these demands are to be met, national farm outputs must rise, and farmers must produce different types of products. In addition, access to food must be improved for those who still cannot meet their basic needs, wherever they live – in remote rural areas, marginal areas or urban slums.

India is a vast, diverse country. The 28 States and seven Union Territories differ vastly in terms of their natural resources, administrative capacity and economic performance. The northern and northeastern states, especially, are still very poor. There is a wide range of scientific knowledge on how to practise sustainable agriculture; what is missing are the steps needed to implement these techniques on a much larger scale.

## **Why small-scale agriculture?**

A crucial challenge for India's development is to ensure that small-scale farmers participate in and contribute to agricultural and rural growth.

India is urbanizing fast, but some 73% of the population still lives in rural areas. India is still a land of small-scale farmers: about half of all farms are less than 1 ha in size, and another 20% are less than 2 ha. There are strong, direct relationships between agricultural productivity, hunger, and poverty. Most poverty is concentrated in rural areas, especially amongst small-scale farmers and landless families. The slow pace of poverty and hunger reduction points to an urgent need for strategies that better target the areas where poor people live and the activities on which their lives depend.

The international community has adopted the reduction of poverty and hunger eradication as overarching goals for development. At the 1996 World Food Summit in Rome, all nations committed themselves to halving the number of undernourished people from around 800 million to 400 million by 2015.

### Box 1 “Small farms are more efficient than large farms”<sup>1</sup>

“Not every agriculture will have significant impacts on poverty reduction. Both FAO and the Hunger Task Force are in favour of a small-holder focus:

- The bulk of poor people in rural areas of regions where poverty and hunger are high and resistant are: smallholders producing staple for own consumption or small surpluses for the local markets.
- There is significant potential for the expansion of staples production as population expands in the developing countries (for Africa, it is expected that traditional staples demand will double by 2015).
- Small farms are more efficient than large farms: land productivity is higher for small farms.
- Small farms employ more labour per hectare than large farms. This contributes to an increase in wages and rural employment.
- Producing for own consumption (subsistence) or for local markets reduces transaction costs associated with purchased foods and improved food access and nutrition.
- Expenditure patterns of smallholder households promote local growth.”

<sup>1</sup> Source: Kostas Stamoulis, Chief of Agricultural Sector in Economic Development Service, FAO, and member of the Hunger Task Force, in a Sustainet panel discussion, 6 September 2005, Berlin.

The most pressing questions are, what needs to be done to enable poor rural people to develop sustainable livelihood systems? And what is required to enable small farmers to adopt sustainable agriculture on a large scale?

FAO has formulated the following priority areas:

- Improve agricultural productivity in poor rural communities
- Develop and conserve natural resources
- Expand rural infrastructure and market access
- Strengthen capacity for knowledge generation.

Interventions towards sustainable agriculture will be viable in the long run only if they are economically viable. Economic viability will be achieved if the total costs of the intervention are significantly lower than the overall economic benefits achieved at the target group level. Policy interventions and investments that fulfil this criterion make sense.

Interventions which do not meet this condition might also be sensible in certain circumstances, for example to ease political unrest in specific areas, or to reduce the costs of subsidizing groups who are unable to survive on their own.

## Why sustainable agriculture?

We can compare three broad types of farming: traditional production systems, conventional modern agriculture (such as Green Revolution technologies), and sustainable agriculture. We can compare them across three dimensions: ecological, economic and social.

## ***Ecological sustainability***

Many traditional and most conventional farm practices are not ecologically sustainable: they overuse natural resources, reducing soil fertility, causing soil erosion, and contributing to global climatic change. Sustainable agriculture has several major advantages over both traditional and conventional practices:

**Soil fertility** A continuous fall in soil fertility is a major problem in many parts of India. Sustainable agriculture improves fertility and soil structure and prevents erosion, so would be an answer to this problem.

**Water** Irrigation is the biggest consumer of fresh water, and fertilizer and pesticides contaminate both surface- and groundwater. Sustainable agriculture increases the organic matter content of the topsoil, so raising its ability to retain and store water that falls as rain.

**Biodiversity** Sustainable agricultural practices frequently involve mixed cropping, so increasing the diversity of crops produced and raising the diversity of insects and other animals and plants in and around fields.

**Pollution** Pesticides are hazardous to human health as well as to the local ecology. Incorrect handling, storage and use of pesticides lead to health and pollution problems. Sustainable agriculture reduces or eliminates the use of hazardous chemicals; instead it controls pests with a variety of biological and agronomic measures and the use of natural substances.

**Landscape** Agriculture and forestry clothe the rural landscape. Inappropriate use causes erosion, landslides and flooding, clogs irrigation channels, and reduces the ability of the land to support the local population. Impoverished rural people flock into the cities in search of jobs, forming unsightly, insanitary slums that further destroy the landscape. Rehabilitating ecologically damaged areas needs huge investments that few countries can afford. Sustainable agriculture avoids these problems by improving productivity, conserving the soil, avoiding the expansion of farming into unsuitable areas, and preserving rural jobs.

**Climate** The way agriculture is practised contributes significantly to global climatic changes. Conventional agriculture contributes to the production of greenhouse gases in various ways: by reducing the amount of carbon stored in the soil and in vegetation, through the production of methane in irrigated fields, and through energy-intensive activities such as the production of artificial fertilizers. Adopting sustainable agriculture would reduce these impacts significantly.

## ***Economic sustainability***

Agriculture cannot be sustainable unless it is economically viable over the long term. Conventional agriculture poses greater long-term economic risks than “sustainable” alternatives.

**Export vs local orientation** Governments tend to view export-oriented production systems as more important than those that supply domestic demands. This is misguided. Focusing on exports alone involves hidden costs: in transport, in assuring local food security, etc. Policies should treat domestic demand and in particular food security (either by farmers producing food for themselves, or by selling produce for cash they can use to buy food) as equally important to the visible trade balance.

**Debt** The Green Revolution raised India's grain output significantly, but a vast number of small-scale farmers ran into a debt trap: they took out loans to raise their production, then found they could not pay the money back. About 40,000 were so desperate that they committed suicide.

**Risk** Concentrating on specific commodities seems to promise high economic returns. But market production implies certain risks: markets change quickly, and international agricultural prices are dropping. Cheap foreign food may sweep into the national market, leaving Indian farmers without a market. As a World Trade Organization signatory, the Indian government is under pressure to deregulate and open its economy to the world market, so cannot protect its farmers behind tariff walls.

**Niche markets** Organic agriculture is one of the strongest ways to farm in an environmentally sustainable way. The demand for certified organic products is increasing quickly, opening opportunities to expand sales of such products and to explore niche markets.

**Employment** Farming is the main source of employment for rural people. Trends towards specialization and mechanization may increase narrowly measured "efficiency", but they reduce employment on the land. The welfare costs of unemployment must be taken into account when designing national agricultural support programmes. Sustainable agriculture, with its emphasis on small-scale, labour-intensive activities, helps overcome these problems.

### *Social sustainability*

The social sustainability of farming techniques is related to the ideas of social acceptability and justice. Ignoring these issues risks losing valuable local knowledge and provoking political unrest.

**Inclusiveness** Development cannot be sustainable unless it reduces poverty for the broad masses of people in India. The government must find ways to enable the rural poor to benefit from agricultural development.

**Political unrest** Gaps between the "haves" and "have-nots" feed a feeling of social injustice among those who feel neglected and excluded from development opportunities, as well as from better-off sympathizers. The result is a climate favourable to political opposition and even violence.

**Local acceptance** Many new technologies fail because they are based on practices or assumptions from outside. Sustainable agricultural practices usually are based on local social customs, traditions, norms and taboos, so local people are more likely to accept them and adapt them to their own needs.

**Indigenous knowledge** Sustainable agricultural practices often rely on traditional know-how and local innovation. Local people have a wealth of knowledge about their environment, crops and livestock. They keep locally adapted breeds and crop varieties. They have social structures that manage and conserve common resources, help people in need, and maintain the social fabric. Rather than ignoring or replacing this knowledge, sustainable agricultural development seeks to build on it and enrich it with appropriate information from outside.

**Gender** In traditional agriculture, women traditionally bear the heaviest burdens in terms of labour. In modern conventional farming, too, men often benefit the most: they control

what is grown and how the resulting income is spent. Sustainable agriculture attempts to ensure that the burdens and benefits are shared more equitably between men and women.

**Food security** Traditional farming techniques often fail to produce enough food, or enough variety of food for a balanced diet. Conventional modern farming focuses on a few commodities, so people still do not have a balanced diet. Sustainable agriculture improves food security by improving the quality and nutritional value of the food, and by producing a bigger range of produce throughout the year.

**Participation** Traditional society in India is riven by wealth and caste distinctions. Introducing conventional farming innovations tends to exacerbate these: the rich and higher-caste tend to benefit, while the poor and lower-caste are left out. Sustainable agricultural interventions consciously target the less well-off, and empower them so they can organize and speak with their own “voice”, so promoting dialogue and democracy.

## Approaches to sustainable agriculture

Sustainable agriculture is a broad concept that covers a number of different approaches. All try in one way or other to achieve environmentally sound, economically profitable, ethically acceptable and socially responsible form of land husbandry. They have much in common with each other, and different people and organizations define them differently, so overlap is not unusual. The discussion below illustrates some of these approaches.

### Box 2 Definition of sustainable agriculture

At the 1992 Earth Summit in Rio de Janeiro, the UN Food and Agriculture Organization (FAO) defined “sustainable agriculture and rural development” as follows:

“Sustainable development is the management and conservation of the natural resource base and the orientation of technological and institutional change in such a manner as to ensure the attainment and continued satisfaction of human needs for present and future generations. Such sustainable development (in the agriculture, forestry, and fisheries sectors) conserves land, water, plant and animal genetic resources, is environmentally non-degrading, technically appropriate, economically viable and socially acceptable.”<sup>1</sup>

In 1995 FAO went on to define sustainable agriculture and rural development more specifically as a process that meets the following criteria:

- “Ensures that the basic nutritional requirements of present and future generations, qualitatively and quantitatively, are met while providing a number of other agricultural products.
- Provides durable employment, sufficient income, and decent living and working conditions for all those engaged in agricultural production.
- Maintains and, where possible, enhances the productive capacity of the natural resource base as a whole, and the regenerative capacity of renewable resources, without disrupting the functioning of basic ecological cycles and natural balances, destroying the socio-cultural attributes of rural communities, or causing contamination of the environment, and
- Reduces the vulnerability of the agricultural sector to adverse natural and socio-economic factors and other risks, and strengthens self-reliance.”<sup>2</sup>

1 [www.fao.org/docrep/W7541E/w7541e04.htm](http://www.fao.org/docrep/W7541E/w7541e04.htm)

2 [www.fao.org/wssd/Sard/index-en.htm](http://www.fao.org/wssd/Sard/index-en.htm)

**Organic agriculture** Organic agriculture was developed as a holistic, ecosystem-based approach, conceived as an alternative to what proponents see as the ecologically unsound practices of conventional agriculture.

It is necessary to distinguish between certified organic agriculture, and agriculture which is practised in an organic way but without certification.

Different countries (and international bodies such as the European Union) have introduced regulations determining what can be recognized and sold as “organic”, as well as procedures for inspection and certification. Many of these regulations are based on standards set by the International Federation of Organic Agriculture Movements (IFOAM), an international grouping of NGOs and groups of organic producers.

In India, the government’s National Programme for Organic Production accredits inspection and certification agencies.<sup>1</sup>

**Traditional organic practices** Many traditional agricultural practices around the world refrain from using chemical fertilizers and pesticides. They do this for various reasons: by tradition, because farmers cannot afford agrochemicals, they cannot buy them locally, or they do not know how to use them. This traditional form of organic agriculture is not necessarily sustainable, even if it has been adapted to local conditions over many generations. Population growth, declining prices, insecure land tenure and water-use rights, along with many other factors, have often led to overuse, loss of diversity, soil degradation and other environmental problems. In many instances, traditional forms of agriculture can no longer produce enough income and a secure livelihood. Hence then urgent need for more sustainable approaches. There are numerous modern attempts to update these traditional forms of land use. Some of them are described below.

**Site-appropriate agriculture, or ecofarming** This tries to cut down on costly inputs and minimize negative environmental impacts by making intelligent use of existing ecological factors. It developed as an alternative to the increasingly intensive use of irrigation and fertilizers, and tries to free farmers from constraining factors in the local natural environment.

**Low-external-input agriculture** This also aims to practise sustainable agriculture with minimal use of external inputs, but does not completely exclude the use of pesticides or synthetic fertilizers.

**Integrated pest management** This approach reduces the use of synthetic pesticides by integrating a range of ways to control pests and disease pathogens, from crop rotations to determining damage thresholds before applying plant protection products.

**Integrated nutrient management** This approach makes a special effort to minimize fertilizer inputs.

**Watershed management** The rehabilitation of degraded watershed areas has become a high priority. Watershed management aims to adapt land management practices in ecologically vulnerable hill and mountain regions to the natural carrying capacity by means of systematic management. Unlike the other methods mentioned above, it is not an agricultural production system. Rather, it is a process that plans and regulates the use of land, water and other resources within a watershed area, in ways that sustain these resources. It involves not just

<sup>1</sup> [www.apeda.com/organic/index.html](http://www.apeda.com/organic/index.html)



technologies, but also devising policies and usage guidelines. It emphasizes adapting technical solutions to the socio-economic circumstances of users, respecting the (often conflicting) needs of different resource users and attempting to reconcile their interests.

**Conservation agriculture and minimum tillage** This aims to conserve the soil structure and improve the water storage capacity of the soil. Introduced on a large farm level it is often combined with weed management through pesticides. Because it eliminates ploughing, conservation agriculture needs less labour, so is a viable option for areas with labour shortages. By using crop rotation and intercropping, it reduces risk through diversification.

## How sustainable agriculture contributes to the Millennium Development Goals

The application and distribution of sustainable agricultural practices on a large scale would contribute significantly to the achievement to all Millennium Development Goals. The following section highlights the connections and the possible contribution of sustainable agriculture to these goals.

### Box 3 Sustainable agriculture: A shifting interpretation

Since the Rio Earth Summit in 1992, a diverse range of scientists, state and non-governmental development bodies and private-sector organizations have taken their lead from the concept of “sustainable agriculture”. Various organizations and approaches put emphasis on different areas, but the underlying principles are the same: they all derive from a vision of sustainability. There appears to be a consensus, more or less in line with the FAO definition, that sustainable agriculture must be economically viable and socially responsible, and must conserve land, water, genetic and other resources for future generations.

The approaches certainly differ, however, in their details. Emerging as they do from disparate backgrounds and experiences, in some cases with a particular political or economic agenda, differences in interpretation are inevitable. Many approaches were originally developed as a means of turning away from conventional agricultural practices and as a countermovement to the Green Revolution. As a result, these approaches place the ecological dimension at the centre of their conception. Newer approaches emphasize the social dimension, and especially poverty reduction. The Task Force on Hunger, set up under the UN Millennium Project, described the priority intervention areas related to the three dimensions of sustainability. All the intervention areas need to be pursued simultaneously:

- Increasing agricultural productivity for food security (economic dimension of sustainable agriculture)
- Restoring and conserving natural resources for food security (ecological dimension)
- Promoting good governance, gender equality and development approaches focused on people and their needs (**social** dimension).

There is strong competition between these three different dimensions of sustainability. The challenge is to find an optimum balance between them. This takes place by negotiating in a spirit of partnership, in order to reconcile contradicting interests while shaping complex processes of social reform, transformation and development. The challenge is to respond adequately both to the immediate needs of the population and to the ecological conditions at a specific location, and to manage resources in a manner that safeguards them for the future. The goal is to optimize yields (by making optimum use of land and water resources) without causing adverse short-term or long-term impacts on nature, the environment or society.



## **MDG 1 Eradicate extreme poverty and hunger**

There is a close link between food and nutrition security and agricultural production: sufficient food supply is required to meet the food and nutrition demands of the population. But adequate production is not enough: everyone must also have access to the food produced.

Agriculture as a major source of income: four-fifths of all poor people in the world live in rural areas, where agriculture is the most important source of livelihood. It provides direct income for landowners, farming families and agriculture labourers, and generates income indirectly for a host of other poor people involved in processing, transport, food preparation and sale.

## **MDG 2 Achieve universal primary education**

Investments in agriculture contribute indirectly to this goal: poor families who earn more from farming can afford to send their children to school. Many poor families make extraordinary sacrifices to ensure their children are educated; improving farm production and rural incomes will enable them to do so more easily. Better nourished children also perform better at school.

## **MDG 3 Promote gender quality and empower women**

In India, as elsewhere, women provide the main source of agricultural labour. Introducing sustainable agricultural practices involves women's participation, and very often leads to the empowerment of women.

## **MDG 4 Reduce child mortality**

Crop diversification – growing a wider variety of crops – is a strong element of sustainable agriculture. Security of yield and income translates into food security in the farm household. This in turn reduces mother and child malnutrition, a major contributor to the child mortality rate.

## **MDG 5 Improve maternal health**

Agriculture contributes to this goal in the same way as the previous one.

## **MDG 6 Combat HIV/AIDS, malaria, and other diseases**

The relationship between this goal and agriculture is an inverse one: agriculture does not contribute directly to this goal, but where labour is scarce because of HIV/AIDS and other diseases, labour-saving approaches such as conservation agriculture enable farmers to continue to produce enough food for themselves and their families.

## **MDG 7 Ensure environmental sustainability**

Over and above the food supply, land management in rural areas has a major influence on the availability of clean water, on climate trends, and on biodiversity – the diversity of wild

plant and animal species as well as crop varieties and livestock breeds. Agricultural practice not only influences the working environment of farmers and the living environment of rural people, but also has a bearing on the global environment. Without sustainable agriculture it will not be possible to achieve this goal.

## **MDG 8 Develop a global partnership for development**

Agriculture involves partnerships on several different levels. Globally, international trade in agricultural products is huge: in 2004 it was worth US\$ 783 billion, or 8.8% by value of all merchandise trade. Facilitating this trade is a massive network linking input suppliers, farmers, traders, processors, transporters, brokers, wholesalers and retailers, supported by research, extension and regulatory agencies. Part of the challenge for sustainable agriculture is to link small-scale farmers into this network, especially as agricultural trade becomes freer. A World Bank paper nicely highlights why this remains a major challenge in India and for the rest of the world: “Smallholders may be uncompetitive and unable to participate in many of most profitable sub sectors under a wholly free-trade system. Establishing appropriate institutions is necessary to enable broad welfare gains to be achieved through trade”.<sup>1</sup>

Sustainable agriculture itself is the focus of a dynamic network of organizations involved in developing, testing and promoting alternative forms of agricultural production. These partners include thousands of farmers’ groups in India and around the world, community organizations, national and international NGOs, UN agencies, donors, policymakers and research organizations. The sustainable agriculture agenda has begun to find its way into mainstream activities. Once-fringe approaches such as participatory research and farmer-led extension, developed as part of sustainable agriculture, are now being taken seriously by government research and extension institutions.

How would ignoring the Millennium Development Goals affect agriculture? We can see some of the impacts already: climate change and large-scale changes in the groundwater level are environmental influences which can mean the difference between success and failure for farming. And it is usually the poorest of the poor – those who are the least responsible for climate change – who are most vulnerable to its effects.

## **The Sustainet project**

Combating world hunger through sustainable, adapted agriculture is one of the main goals of the German government’s Programme of Action 2015. To contribute towards achieving this goal, a supra-regional joint venture among German development cooperation organizations was initiated in December 2003 by the government’s Sustainability Council. The core idea behind this project, called “Sustainet”, is to demonstrate the benefits, viability and widespread applicability of sustainable, locally adapted land use as a strategic way to overcome hunger and poverty in the developing world.

Three major non-governmental development organizations – Bread for the World, German Agro-Action and Misereor – along with the German Agency for Technical Cooperation (GTZ) participate as equal partners in the joint venture. From May 2006, World Vision will

1 *Agriculture and achieving the Millennium Development Goals*. Agriculture and Rural Development Department, World Bank; Conference Edition, March 2005, chapter 2.9.: MDG 8, p.18.

## **Box 4 How do you know your agricultural practice is sustainable?**

### **Ecological dimension**

- Does it help conserve soil fertility?
- Does it conserve the quality and availability of water?
- Does it increase biodiversity?
- Does it spread hazardous substances?
- Does it affect the landscape (relief, vegetation cover, settlement structure)?
- How much energy would be required if this technology is scaled up?
- If it is scaled up, would there be a significant impact on the climate?

### **Economic dimension**

- Does the practice improve incomes?
- Does it lead towards food and income security?
- Does it enable farmers to accumulate their working capital?
- How would the nutritional situation and food availability change if the approach is applied on a large scale?
- Is it able to compete with other sectors?
- Is it possible to aggregate an economic gain to the national level?

### **Social and cultural dimensions**

- Are the rural poor involved in the approach?
- How does the approach draw on or affect social customs, traditions, norms and taboos?
- How is indigenous knowledge recognized within the approach?
- Does the approach ensure a more equitable division of labour and distribution of income between men and women? Poor and rich? Young and old? Different ethnic groups and castes? Participating farmers and non-participants?
- Will broad adoption improve the health situation of the people?
- Does the approach assure equitable access to assets, agricultural inputs such as land (secure land-use rights), water, capital (credit), skills and knowledge? Is it accessible to the poor?
- Is the technology safe for humans and animals?
- Do the beneficiaries gain opportunities for empowerment, access to social services, control and decision-making?
- Is the approach legally stable?

also participate in the project. At an international level, Sustainet cooperates closely with FAO, in particular with the Sustainable Agriculture and Rural Development Initiative and the conservation agriculture project. The programme secretariat, based at GTZ in Eschborn, near Frankfurt, manages coordination and networking activities. The programme is funded by the German Ministry of Economic Co-operation and is advised by the German Ministry of Consumer Protection, Food and Agriculture.

Sustainet is an acronym for “Sustainable Agriculture Information Network”. As the name suggests, the programme aims to establish networks between institutions involved at local, regional and international levels. Although various good examples of sustainable agriculture were developed with the assistance of German development agencies and their partner organizations, hardly any analyses on the possibilities of scaling up such successful concepts have been published. In response, Sustainet aims to systematically evaluate and communicate “good agricultural practices”: successful local to international approaches and strategies in sustainable agriculture. This will lead to a better understanding of the fostering and hampering factors relevant for the dissemination of sustainable agriculture models, identify locally adapted agriculture, define promising key priorities for promotion, and specify fields of action for agricultural policy.

Sustainet’s objectives go beyond analysis and evaluation: it also aims to promote the process of scaling up itself.

Sustainet currently concentrates on two pilot areas: India (the focus of this book), and Kenya and Tanzania. In 2006, activities will start in Latin America: in Peru and Bolivia. In each of these pilot areas, a number of projects were selected that have been especially successful. Among them are projects that apply the techniques of organic farming, integrated pest management, linking small farmers to markets, public-private partnerships, dryland agriculture, watershed management, protection of biodiversity and post-harvest improvement.

Sustainet has various audiences. It aims to help the local cooperating organizations to learn from each other. Through them, it hopes to help the poor rural population in the pilot regions. It also aims to contribute to political discussion on a national and international level. Through promotional activities and meetings, it highlights the significance of sustainable agriculture for the global food security to political institutions in the pilot countries and in Germany.

## **The Sustainet process**

During the initial project phase (December 2003 to November 2006), Sustainet covers three main activities: (1) systematically analysing successful examples of sustainable agriculture, (2) evaluating and documenting the impacts of local projects, and (3) determining possibilities for disseminating best practices.

To document established and tested good practices, Sustainet selected partners in the pilot areas which have been running successful projects for at least 5–10 years. These partners were chosen by the Sustainet steering group from a list drawn up by a team of consultants. Through regional workshops, Sustainet familiarized the local partners with the project idea and discussed future working relationships. Interested partners were then invited to join the

Sustainet activities. They agreed to undergo a self-assessment process and prepare a report of a selected “good agricultural practices”. Sustainet promised to promote and publish their experiences (this book is one of these outputs).

Sustainet has established regional information networks and international communication structures on sustainable agriculture. To document the selected projects in a way that would make it possible to compare and assess them (and so evaluate their potential for scaling up), the Centre for Advanced Training in Rural Development (SLE) at Humboldt University Berlin developed a set of self-assessment guidelines in cooperation with the partners in India. This self-assessment generates information on the techniques used (both on- and off-farm), the project approach, the support provided by the outside organizations, external conditions (local and national) and dissemination activities. Sustainet guides and assists the local partners during the self-assessment process.

The Leibniz Centre for Agricultural Landscape Research (ZALF) is analysing the data collected through the self-assessment, with funding from the German Federal Ministry of Consumer Protection, Food and Agriculture. The analysis pays particular attention to the degree to which local people have adopted the sustainable agriculture approaches after the end of the project, and how many people not directly linked to the project have copied them spontaneously. This assessment and analysis exercise will also estimate the impact of the improved practices on poverty reduction and on food and nutrition security.

The evaluation will generate information on factors that foster and hamper the dissemination of the approaches. This will enable Sustainet to identify factors relevant for successful scaling up of good practices. The results, case study reports and lessons will be published.

An important component of Sustainet is the exchange of experience and a strategic dialogue with key actors in partner countries and among German and international development agencies. This dialogue aims to generate recommendations for future agricultural funding strategies.

## **How this book was prepared**

This book was prepared through a 1-week intensive “writeshop” – an intensive, participatory workshop in which participants wrote, presented and revised the manuscripts that form the various chapters of the book. The 26 participants came from 12 Sustainet partners throughout India, Sustainet headquarters at GTZ, and the Leibniz Centre for Agricultural Landscape Research (ZALF) in Germany. They were supported by a facilitator, artists, an editor and logistics staff.

Before the writeshop, participants prepared manuscripts describing their project, following a set of guidelines provided by Sustainet.

During the writeshop, each participant presented his or her draft manuscript. The other participants commented, critiqued, asked questions, and suggested revisions. After each presentation, the presenter discussed the manuscript with an editor (the chief editor or one of the Sustainet-Germany staff), and they incorporated the audience’s comments and together restructured the manuscript so it would fit in the book. An artist drew illustrations to accompany the text. Meanwhile, other participants were also presenting their manuscripts

to the group. Each author worked in turn with the team of editors and artists to revise and illustrate the text.

Each participant then presented his or her revised draft to the group a second time. Again, the audience critiqued it and suggested revisions. After the presentation, the author, editor, and artist again revised the manuscript and developed a third draft. Towards the end of the writeshop, the third drafts of some manuscripts were made available to participants for final comments and revisions. These manuscripts form the bulk of Parts 2–4 of this book.

At several stages during the writeshop, small groups of participants discussed the constraints, potentials and actions needed to ensure that sustainable agriculture could be scaled up successfully in India. Each group then presented its findings to the plenary for further discussion. The results of these discussions form the sections on *Realizing potentials* in Parts 2–4.

Through this process, individual manuscripts were revised substantially, and the information they contained was combined with ideas from other sources and was distributed throughout the book. Each section in the book contains information provided by many different participants. This means it is not possible to label a particular section as the sole work of a particular participant. The “authors” of the book are thus the participants listed on page xv.

The writeshop process was developed by the International Institute of Rural Reconstruction (IIRR), which has used it to produce extension and information materials on a wide range of subjects. A senior IIRR staff member facilitated the writeshop for Sustainet.

## Structure of this book

The remainder of this book is divided into four parts.

Parts 2–4 each focus on a particular aspect of sustainable agriculture. Each Part contains several cases (listed below), each telling the story of a sustainable agriculture project in India supported by a German development agency. The cases describe the project, its results and impacts, and draws lessons from it that can be applied to other projects elsewhere.

Experience has show that sustainable agriculture will not happen by itself. The playing field is too sloped too steeply towards high-input, extractive agriculture – the sort of farming that causes so much ecological damage to India’s soils and natural resources, and that results in economic dislocation and despair among its farmers. At the end of each Part is a section describing the potentials and constraints facing that aspect of sustainable agriculture, and some recommendations for policy changes and actions needed to realize the potentials and overcome the constraints.

**Part 2, Organic agriculture**, focuses on producing food and other agricultural products without depleting the earth’s resources or polluting the environment. Like sustainable agriculture itself, this is a wide field with many different approaches. An introductory section describes the potential for organic farming in India. It is followed by case studies on four projects on various aspects of organic agriculture.

- The first describes **Navdanya’s** work to help farmers in Uttaranchal break the vicious circle of debt and dependency by switching to organic farming.

- The second case describes how the **Deccan Development Society** helps farmers in Andhra Pradesh assure their food security by producing, storing and exchanging their own seed.
- The third shows how, with the support of the **Centre for Sustainable Agriculture**, another village in Andhra Pradesh has managed to rid itself of expensive, ecologically damaging pesticides.
- The fourth case focuses on farming for self-reliance. It describes how **Chetana-Vikas** helps farmers in Maharashtra break their dangerous reliance on a single crop by diversifying their farms.

**Part 3, Managing land and water**, starts with an introduction to watershed management approaches in India. It also contains seven cases focusing on land and water management in various agro-ecological zones.

- The first case shows how **Krushni**, an NGO focusing on rights of marginalized communities, is combining a rights-based approach with watershed management techniques in a watershed in Andhra Pradesh.
- The second case describes how **Agramee** in Orissa bases watershed management work on local people's own knowledge.
- People will plant trees only if they see a direct benefit from them. The third case describes how **Rural Communes** promotes forest home gardens in Maharashtra.
- Rajasthan is India's driest state. **Cecoedecon** has helped farmers get organized so they can overcome problems of drought and erosion, shortage of food and fodder, and even polluted wells.
- The low-lying wetlands of the Sundarbans of West Bengal suffer from the opposite problem – too much water for much of the year. The **Ramakrishna Mission Ashrama** has developed a technique called “landshaping” that enables farmers to grow a variety of crops on raised or sunken beds.
- The final two cases focus on government–NGO collaboration in watershed management. The **Indo-German Bilateral Project (IGBP)** worked in four states at different levels: national, state and local, and was a pioneer in integrating the different approaches used by NGOs and government agencies to promote watershed development.
- **Vikasa** was one of the NGOs involved in the IGBP in Andhra Pradesh. The last case describes how it helped farmers in one watershed halt erosion and grow more food – and how it helped the villagers understand and collaborate in the work of the government agencies in the same watershed.

**Part 4, New products, new markets**, begins with an analysis of the role of sustainable agriculture in developing market potential for small-scale farmers. This is followed by three cases illustrating how sustainable agriculture approaches can be used to promote new crops or to develop markets for smallholders' products.

- The farmers of Idukki in Kerala have been able to establish a thriving organic tea industry, thanks to the work of the **Peermade Development Society** to promote organic technologies and build market linkages for their product.
- Silkworm raising is already a profitable industry in Karnataka. But so far it has been restricted to irrigated areas. The **BAIF Institute for Rural Development, Karnataka**,

has developed ways for small-scale farmers to grow mulberry trees without irrigation, so enabling them to raise silkworms.

- Finally, is it possible for small-scale farmers to benefit from the growing trend towards biofuels? The final case, also based on the work of the **BAIF Institute for Rural Development, Karnataka**, shows what needs to be done to make this a reality.

**Part 5, Participants' profiles**, provides contact addresses and profiles of the people who helped compile this book.



# 2

## Organic agriculture

Organic farming in India

*Navdanya, Uttarakhand*

Biodiversity-based sustainable agriculture

*Navdanya, Uttarakhand*

The Pyalaram community gene fund

*Deccan Development Society, Andhra Pradesh*

Redefining pest management in Punukula

*Centre for Sustainable Agriculture, Andhra Pradesh*

Farming for self-reliance

*Chetana-Vikas, Maharashtra*

Organic agriculture: Realizing potentials



## Organic farming in India<sup>1</sup>

*Navdanya, Uttarakhand*

ORGANIC FARMING FOLLOWS THE principles of nature, which are self-sustaining developing systems. It respects the environment's own systems for controlling pests and diseases in raising crops and livestock, and avoids the use of synthetic pesticides, herbicides, chemical fertilizers, growth hormones, antibiotics or gene manipulation.

Through its emphasis on high production, conventional agriculture has contributed to degrading soil and water and reducing biodiversity, which is the key element in assuring food security. Various forms of organic farming have arisen recently as a reaction to the industrial model of agriculture; they are variously referred to as “natural”, “organic”, “alternative”, “holistic”, “biodynamic”, and so on.

In the 1960s, the Green Revolution model of agriculture swept India. With its focus on high-yielding seed varieties and high external inputs, it resulted in monocrops and the chemicalization of agriculture. Much of the native agricultural biodiversity in irrigated zones was destroyed. The irrigated zones now have reached saturation, and further yield increases are unlikely. Green Revolution protagonists are now likely to turn to dryland areas, where farming practices are still largely “organic by default”.

### **Ecologically productive, financially viable**

“Productivity” is the output produced per unit input. Farming systems have many different outputs, while inputs include natural resources (land, biodiversity, water), human labour, energy, and in the case of chemical farming, synthetic pesticides and fertilizers. If all the outputs and all the inputs are taken into account, organic farming, which relies on internal inputs, has higher productivity than external-input chemical agriculture. When all the energy and chemical inputs are taken into account, the productivity of industrial agriculture is actually negative: it uses more resources as inputs than are produced as outputs.

If machinery and chemicals displace human labour, we normally think of this as increasing “productivity”. But what if labour is not the scarce input? In many places, land and water are the limiting factors. If instead of labour, we take into account use of energy, natural resources and external inputs, industrial agriculture is no more productive than ecological alternatives.

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<sup>1</sup> Based on a manuscript by Vandana Shiva, Director, Navdanya

## Low-yield organic farming: A myth

Small farms, everywhere in the world, almost always produce far more agricultural output per unit area than large farms.

A number of studies have shown that organic farming ensures better yield and fetches more income. For example, a study by Jules Pretty<sup>1</sup> showed how farmers in India, Kenya, Brazil, Guatemala and Honduras have doubled or tripled yields by switching to organic or semi-organic techniques.

Organic farming is economically viable because it reduces the use of external inputs and increases the use of on-farm organic inputs with the greatest potential to benefit the health of farmers and consumers. It raises productivity by incorporating natural processes such as nutrient cycles, nitrogen fixation and pest–predator relationships into agricultural production. It makes greater productive use of the biological and genetic potential of plants and animals. By improving the match between cropping patterns and the land's productive potential and physical limitations, it ensures that current production levels can be sustained in the long term. It enhances profit and efficiency by improving management and by conserving soil, water, energy and biological resources.

According to Dr Manggala Rai, Director General of the Indian Council of Agricultural Research, several studies have shown that under drought conditions, crops grown under organic agriculture produce sustainably higher yields than those in conventional systems, and may out-yield the conventional crops by up to 90%.<sup>2</sup>

## Potential of organic farming in India

Organic farming is practised in approximately 130 countries around the world. More than 26 million hectares are currently under organic farming worldwide,<sup>3</sup> and the area under organic management is continually growing. The area under certified production of organic crops is also rising. Despite this, the organic market is still a niche market, located mainly in developed countries, where it is possible to charge a premium price for certified products.

Certified organic farming has tremendous scope in India. In 2005, only around 30,000 ha of farmland were under certified agricultural production.<sup>4,5</sup> This certainly underestimates the total area where farming is free of pesticides and other non-organic production techniques. After all, poor farmers in many parts of India practise organic farming by default: they use traditional farming practices. Over 65% of the country's cultivated area is rainfed, where negligible amounts of chemical fertilizers and pesticides are used. Agrochemicals are rarely used in eastern and northeastern parts of the country: Uttaranchal in the Himalayas and three states in the Northeast (Sikkim, Nagaland and Meghalaya) have declared themselves

1 Pretty, J. 1995. *Regenerating agriculture: An alternative strategy for growth*. Earthscan, London

2 Rai, Manggala. 2005. Organic farming: Potentials and strategies. Millennium Guest Lecture, S.V. College, Tirupati, 3 June 2005. [www.icar.org.in/dgspmr/03062005.htm](http://www.icar.org.in/dgspmr/03062005.htm)

3 IFOAM, FiBL and SÖL. 2005. More than 26 million certified organic hectares worldwide. Press release, International Federation of Organic Agriculture Movements (IFOAM), Swiss Research Institute of Organic Agriculture (FiBL) and Foundation Ecology and Farming (SÖL), Germany. [www.ifoam.org/press/press/pdfs/pm-weltweit-englisch.pdf](http://www.ifoam.org/press/press/pdfs/pm-weltweit-englisch.pdf)

4 Nair, G.K. Tap domestic market potential for organic products. *Hindu Business Line*, 2 Feb 2005. [www.thehindubusinessline.com/2005/02/02/stories/2005020200921200.htm](http://www.thehindubusinessline.com/2005/02/02/stories/2005020200921200.htm)

5 Krishnakumar, Asha, 2004. Organic versus transgenic. *Frontline* 21(13), 2 Jul 2004. [www.frontlineonnet.com/fl2113/stories/20040702002709500.htm](http://www.frontlineonnet.com/fl2113/stories/20040702002709500.htm)

“organic-farming states”, while Madhya Pradesh has declared 3,300 villages as being under organic farming. And with all this low-input farming, India still produces enough food.

## Nutrient management

The term “organic” does not explicitly refer to the type of inputs used. Rather, it refers to the concept of farm as an organism. Nutrient management is key to this: organic farming uses management practices such as crop rotation, green manuring, recycling of residues, water management and so on, to ensure that available nutrients are used on the farm to grow crops and raise livestock. Conventional practices tend to ignore or waste these resources, and use artificial replacements instead: for example they rely on artificial fertilizer rather than manure and compost.

How much agricultural waste could be recycled in this way? Estimates vary widely, but the amount is huge: something like 1800 million tons of animal dung, 800 million tons of compost, and 400 million tons of crop residues a year. These “wastes” are rich in nutrients: well-rotted farmyard manure, for example, contains 0.5% nitrogen (N), 0.2% phosphorus ( $P_2O_5$ ) and 0.5% potassium ( $K_2O$ ).

Most of these valuable resources are not used properly.<sup>1</sup> For example, even if only one-third of the 1800 million tons of animal dung were used as manure, it would be equivalent to equivalent to 2.90 million tons of nitrogen, 2.75 million tons of  $P_2O_5$  and 1.89 million tons of  $K_2O$ .<sup>2</sup> The crop residues have the potential to supply another 7.3 million tons of NPK. According to one estimate, a quarter of the nutrient needs of Indian agriculture can be met by using various organic sources.<sup>3</sup>

## Vermicompost

Vermicompost (compost made by earthworms) is very rich in nutrients: it contains 1.5% nitrogen, 0.5% phosphorus and 0.8% potassium, as well as other micronutrients. Vermicompost can act as the single source of all nutrients the crop needs. It also contains 10% organic carbon, and continuous applications increase the soil’s organic matter content significantly. Earthworms can convert about 1,000 tons of moist organic waste into 300 tons of rich, dry vermicompost. They work hard: they can eat almost any type of organic matter, including bones and eggshells, and they consume their own weight of residue every day, converting it into nutrient-rich worm casts. In 45–60 days, one kg of earthworms (1000–1250 worms) can produce 10 kg of casts.<sup>4</sup>

1 Veeresh, G.K. 1998. Organic farming: Ecologically sound and economically sustainable. *Man and Development*, pp. 142-48 [http://csdngo.igc.org/agriculture/agr\\_organic\\_India.htm](http://csdngo.igc.org/agriculture/agr_organic_India.htm)

2 Ramaswami, P.P. 1999. Recycling of agricultural and agro-industry wastes for sustainable agricultural production. *Journal of the Indian Society of Soil Science* 47: 661–5, quoted in Ramesh, P., M. Singh and A. Subba Rao. 2005. Organic farming: Its relevance to the Indian context. *Current Science* 88 (4), 25 Feb 2005. [www.ias.ac.in/currsci/feb252005/561.pdf](http://www.ias.ac.in/currsci/feb252005/561.pdf).

3 Indiaagronet.com. *Integrated nutrient management in soils for improving crop productivity* [www.indiaagronet.com/indiaagronet/soil\\_management/Soil\\_mgmt.htm](http://www.indiaagronet.com/indiaagronet/soil_management/Soil_mgmt.htm)

4 Rangasamy, A., and C. Jayanthi. 2001. *Integrated farming systems – A boon to farming community*. [www.tnau.ac.in/scms/Agronomy/IFS.htm](http://www.tnau.ac.in/scms/Agronomy/IFS.htm)

## Biofertilizers

Biofertilizers are organisms that fix nitrogen from the air and make it available to the crop. They are applied to the seed before planting, or directly to the soil. Research shows that these biofertilizers can save around 20 kg of nitrogen per hectare, depending on the application rates and local conditions.<sup>1</sup>

*Rhizobium* bacteria that live in the root nodules of legumes fix nitrogen from the air and make it available to crops. Worldwide, these bacteria fix around 14 million tons of nitrogen a year – almost half the world's output of artificial nitrogen fertilizers. Many legume seeds have to be inoculated with the right type of rhizobium before they can fix nitrogen; India needs around 15,000 tons, while present production is only 800 tons. Using efficient strains of rhizobia would save half the nitrogen fertilizer farmers currently spread on their fields.

Blue-green algae also fix nitrogen: they can be cultured in shallow ponds, then harvested and used to inoculate rice fields. India needs about 400,000 tons of these algae to cover the entire rice area. Other nitrogen-fixing biofertilizers include preparations of *Azotobacter* and *Azospirillum* (two types of bacteria) and *Azolla* (a water fern).

## Legumes and green manure

Green manuring is a traditional way to improve soil fertility and supply part of the crop's nutrient needs. A green manure is a crop (usually a nitrogen-fixing legume) that is grown in a field, then cut and incorporated into the soil, or left on the surface to decompose. A 40–50 day-old green manure can supply up to 80–100 kg of N/ha.<sup>2</sup> So if (say) the following crop can use just half of this nitrogen, the green manure is equivalent to 50–60 kg/ha of nitrogen fertilizer.

Potential green manures include sesbania (*Sesbania aculeata*, *dbaincha*, *dbunchi*), sunn hemp (*Crotalaria juncea*), cowpea (*Vigna unguiculata*), mungbean (*Vigna radiata*), cluster bean (*Cyamopsis tetragonoloba*, *guar*), berseem clover (*Trifolium alexandrinum*), etc.

Leguminous green manures can fix a large quantity of nitrogen from the air. For example, sesbania, sunn hemp, mungbean and cluster bean grown during the *kharif* season (south-west monsoon, July–October) as green manure can contribute 8–21 tons of green matter and 42–95 kg of nitrogen/ha.<sup>2</sup> Similarly, grass pea (*Lathyrus sativus*, *kebesari*), cowpea and berseem grown during the *rabi* (winter) season can contribute 12–29 tons of green matter and 68 kg of nitrogen/ha.

## Domestic markets for organic products

The domestic market for organic products in India is still small, though the country has 2–3 million customers for such products, according to a Swiss expert.<sup>3</sup> The problem is the absence of marketing outlets. In developed countries, every supermarket has an array of shelves displaying certified organic products. Such a marketing network still has to be established in

1 NIRI-KVIC, [www.niri-kvic.org](http://www.niri-kvic.org)

2 Mishra, B.B., and K.C. Nayak. 2004. Organic farming for sustainable agriculture. *Orissa Review*, Oct 2004. <http://orissagov.nic.in/e-magazine/Orissareview/oct2004/englishPdf/organicfarming.pdf>

3 [www.thehindubusinessline.com/2005/02/02/stories/2005020200921200.htm](http://www.thehindubusinessline.com/2005/02/02/stories/2005020200921200.htm)

**Table 1 Forecast growth (%) for organic products in the Indian domestic market, 2002–7**

<b>Fruits</b>		<b>Oil crops</b>		<b>Others</b>	
Bananas	15	Oil seeds	5	Rice	10
Mangoes	5	Groundnuts	5	Herbal extracts	7
Oranges	5	Coconuts	5	Cotton	7
Pineapples	5			Honey	5
All fruits	8	<b>Spices</b>		Baby food	5
		Pepper	5		
<b>Beverages</b>		Turmeric	4.5		
Tea	13	All spices	14		
Coffee	5				

Source: ORG-MARG, 2002

India. It will be viable only when customers can buy the products they want in the shops. For that, a consistent supply chain is necessary.

Effective promotion is necessary for this to be successful. The sale of organic produce is generally restricted to major cities: Mumbai, Delhi, Kolkata, Chennai, Bangalore and Hyderabad. To a large extent, sales are based on the individual initiatives of farmers, NGOs and a few traders. Domestic demand for “green” products is mainly for fruits, vegetables, rice and wheat. Other products include tea, coffee and pulses. According to a 2002 survey by ORG-MARG (a market research agency now known as AC Nielsen), the prospects of other commodities, such as organic spices, fruits, herbs and cotton are fairly good: in the next 5 years it is projected that sales of organic spices could grow by 14%, fruits by 8% and herbs and cotton by 7%.

### **Nutritional qualities of organic food**

Organically produced foods have lower levels of pesticides than conventionally grown produce; they also have fewer medicinal and hormonal residues, and in many cases lower nitrate contents. Nitrates are significant contaminants of foods; they are generally associated with intensive use of nitrogen fertilizers. Organic food reportedly also stores better than conventional produce.

Organic produce is richer in minerals than conventional produce. One study in Chicago, USA, found that organic apples, potatoes, pears, wheat and sweet corn had 63% more calcium, 78% more chromium, 73% more iron, 118% more magnesium, 178% more molybdenum, 91% more phosphorus, 125% more potassium and 60% more zinc than comparable conventionally grown foods. The organic food also contained 29% less of the undesirable element mercury than the conventional produce.<sup>1</sup>

1 Smith, B.L. 1993. Organic foods vs supermarket foods: Element levels. *Journal of Applied Nutrition* 45(1):35–39. [www.soilandhealth.org/01aglibrary/Arun/Organic%20vs%20supermarket--element%20levels.pdf](http://www.soilandhealth.org/01aglibrary/Arun/Organic%20vs%20supermarket--element%20levels.pdf)

## **Policies to support organic farming**

Research is beginning to show the benefits of organic farming. Studies show it to be ecologically productive and financially viable, and producing more nutritious yields than vertically integrated production methods. It improves soil quality, is better for the environment, and achieves greater economic sustainability than conventional farming methods.

Here are some ways to promote and scale up organic agriculture.

- Develop appropriate extension services to inform small-scale farmers about organic farming and how to practise it.
- Develop strong linkages between growers and consumers, with minimum influence of middlemen.
- Reduce the costs of certification to make them accessible to small farmers, without diluting standards.
- Make biofertilizers, bioagents, biopesticides and other organic inputs available to small-holders in sufficient quantities and at reasonable prices.
- Encourage and develop the domestic market for organic products.
- Provide subsidies and other financial support to help small-scale growers cover the initial expenses of converting to certified organic farms. Ensure that organic farming gets a level playing field with industrial agriculture.
- Improve infrastructure such as roads, transportation, storage facilities, etc.
- Enhance linkages in the supply chain of organic products – forwards to processors, wholesalers and retailers, and backwards to suppliers of inputs such as seed and biofertilizers.
- Promote research on organic agronomic practices, biocontrol of diseases and pests, biofertilizers, etc.
- Take the positive externalities of organic farming into account when setting development policies.

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Based on a manuscript by Vandana Shiva, Navdanya, [www.navdanya.org](http://www.navdanya.org)



## Biodiversity-based sustainable agriculture

*Navdanya, Uttarakhand*



**B**ALBEER SINGH IS AN innovative man. He was quick to convert to “modern” farming when he first heard of it: he started using fertilizers, high-yielding varieties and pesticides on his small farm near Dehradun, the capital of Uttarakhand. He knew he would have to buy these inputs, but was confident he could pay for them because they would enable him to produce more.

The first few years were successful. But then his production started to decline. At the same time, the costs of inputs rose. At first he thought that bad weather was to blame for the poor yields. But his output continued to fall, and he noticed that his onions began to rot faster than they had before. He was forced to sell his crop soon after harvest, instead of storing them and waiting for a good price. What could he do?

### A glimmer of hope

One day Balbeer heard that a meeting about farming was to be held in his village, organized by Navdanya, an NGO working on organic agriculture. He went along. During this meeting, he and his neighbours described the problems they were struggling with: yields falling year after year, and crops such as potatoes and onions rotting before they could be sold.

The Navdanya staff explained how all the problems were related, and how they were caused by the type of farming the villagers practised. They told the villagers about organic agriculture, and Balbeer was interested enough to test the idea. Navdanya offered to compensate him if the yield was lower than expected.

Looking back, he says that this decision was a turning point in his life.

Together with six other farmers from different villages, Balbeer started growing onions on a small plot of land. They followed Navdanya’s instructions to stop using chemical fertilizers, and apply farmyard manure, ash and cow urine instead. All the farmers got a satisfactory yield. Navdanya asked them to hold on to the crop to see how long it could be stored. They found they could keep these onions much longer, so could sell them for a higher price later on.

Balbeer and colleagues’ success persuaded their neighbours to follow their example. They tried organic farming with other crops, and within 3 years, around 100 farmers had converted to organic agriculture. Some of the cooperative shops selling fertilizer had to close as demand fell. Farmers who had shifted to organic agriculture started to collect seeds from their harvest to plant the following year – as they had done in “the old days”. Traditional



### Box 5 Breaking the vicious circle

*“We knew that the chemicals are harmful for human beings, animals and environment, and hybrid seeds do not perform well. For few years we got higher yields, which slowly started declining. We had to increase the use of fertilizers every year and also the use of pesticides.*

*As we cannot use our grains to select the seeds for the next year we have to buy these fertilizers and agro-chemicals in the market. This needs a lot of money every year which we have to spend. By organic agriculture we can use compost and plant-based pesticides which we can make at home without much investment.”*

Balbeer Singh

farming practices were recalled, including how to store the yield and how to control pests. Half-forgotten old crop varieties and types of food were reintroduced. Now more than 45 villages in the region are totally free of chemicals, and are using eco-friendly traditional techniques – ancient techniques that have worked for centuries in India.

As one of the first farmers to successfully introduce organic farming in the area, Balbeer was appointed regional coordinator for the organic programme in 1995.

### From chemical to organic

The transition from chemical-based to organic farming means big changes in a farm. The cost of chemicals goes down as farmers phase these out and replace them with organic fertilizers. That may mean lower yields in the first few years, as Balbeer found (Table 2). But in the third year, his yields had recovered, and from then onwards he was able to produce as much as, or more than, with chemical fertilizers.

**Table 2 Inputs and yields on Balbeer Singh’s farm, Utircha village, Uttaranchal**

Year	Inputs		Yields	
	Cost of agro-chemicals (Rs/ha)	Cattle manure (t/ha)	Wheat (t/ha)	Rice (t/ha)
0 1994–95	3000	3	2.0	2.25
1 1995–96	1632	4.2	1.35	1.13
2 1996–97	788	25	1.23	1.15
3 1997–98	0	50	2.25	2.50
4 1998–99	0	25	2.75	3.13
...	...	...	...	...
10 2004–05	0	12.5	3.13	3.75

Source: Balbeer Singh, Utircha village and Navdanya records

Balbeer's production costs fell because he had to buy fewer external inputs. At first, he had to put in a lot more work to apply manure and control weeds. But his fields now need less work because the soil fertility is restored and weeds are under control.

Balbeer found that he could grow a greater variety of crops in his fields. For example, he was able to grow pulses in his ricefields. His black gram yields had fallen when he applied chemical fertilizers, but have risen again since he adopted organic farming. The various crops in the field reduce the risk of one crop failing, and the nutritional value of their food has risen.

Balbeer and his wife's lives have improved significantly since they started organic agriculture. The couple has been able to save money by selling their surplus produce. They getting good yields, and their output no longer goes up and down unpredictably.

## Navdanya's approach

Unlike many other Indian NGOs working on sustainable agriculture, Navdanya operates at three different levels:

- Its field programme identifies specific agricultural problems that farmers face, and helps the farmers analyse and solve them. The stories of Balbeer Singh (above) and Yogambar Singh (Box 6) are typical of this level. Navdanya uses these experiences as a basis to scale up organic agriculture approaches to more farmers.
- Navdanya has a strong research component: it studies the problems that farmers identify, and develops and tests solutions to them. The most urgent and typical problems are chosen for research, so the solutions are highly relevant for many farmers.

### Box 6 Organic produce buys taxis

"Although I am illiterate, I know how to do farming", says Yogambar Singh. "For some years I used chemicals in my fields, but the soil fertility as well as the soil texture deteriorated. Initially when I shifted to chemical farming, I got very good yields, but slowly they started going down. I was not getting pulses and oilseeds, which I was growing earlier. Now I am happy with organic farming. Crop yields are stabilized, and I am able to grow pulses and oilseeds also". I am saving by not using any type of input purchased from the market."

Yogambar is a 65-year-old farmer in Pulinda village, in the Dhar area of Uttaranchal. He joined a Navdanya-supported group in 1995. Like other farmers in the area, he had used chemicals on his farm. But for the last 9 years, he has used only organic practices on his 1.28 ha farm. Yogambar and his family work their fields themselves, though they will hire outside labourers for emergency field maintenance.

Organic farming gives good results on both irrigated and non-irrigated land. Yogambar compared two small fields: one irrigated field covering 250 m<sup>2</sup>, and a rainfed plot of 167 m<sup>2</sup>. In 2004–5, he earned Rs 1745 net from the irrigated plot (equivalent to Rs 69,800 per ha); the rainfed plot was actually more productive: it earned him Rs 1523 (equivalent to Rs 91,380 per ha).

Yogambar now earns more than Rs 70,000 a year net, and spends almost nothing on inputs. He has been able to save enough from his sales of organic produce to buy two taxis for his sons. Today he is convinced that only hard work and organic farming bring high returns.

### **Box 7    Neem victory**

On 8 May 2005, the European Patent Office in Munich upheld a decision to revoke in its entirety a patent of W.R. Grace Company on a fungicidal property of neem, a tree indigenous to the Indian subcontinent. This decision resulted from a legal challenge mounted ten years before by Navdanya in cooperation with Greens in the European Parliament and the International Federation of Organic Agriculture Movements (IFOAM). Navdanya collected millions of signatures to support the case against biopiracy.

The challengers showed that the fungicidal properties of neem tree had been public knowledge in India for many centuries. Indian farmers use neem to treat various ailments, as well as to control pests in their crops.

This patent exemplifies how international law has been misused to transfer biological wealth from the South into few hands in the North. Revoking it was a victory for Indian farmers and their knowledge in the fight against biopiracy.

- Navdanya recognizes that organic agriculture is closely related to larger institutional and policy questions. It campaigns to build awareness and change policies on issues such as “biopiracy” (outsiders stealing local knowledge or varieties and claiming them as their own), genetically modified crops, and the preservation of indigenous crop varieties. For example, it has campaigned successfully to revoke claims by outside companies on centuries-old Indian intellectual property such as basmati rice and neem (Box 7).

Navdanya is based in Dehradun, Uttaranchal. Headed by internationally renowned scientist and environmental advocate Vandana Shiva, Navdanya now has more than 100,000 farmer members in 16 states of India. It works directly in about 2000 villages. Navdanya has trained more than 250,000 farmers, students, government officials and staff of national and international NGOs on biodiversity conservation and organic farming.

Navdanya uses the following approach in its working areas.

#### *Identifying the key problem*

Navdanya begins work in an area by identifying the most burning problem in agricultural production there. It uses participatory methods to help farmers identify the problems they face: pests, seed problems, storage difficulties, and so on. Staff visit each farmer to identify the scope and severity of these problems, using survey forms where possible. They also consult resource persons such as knowledgeable local individuals, members of the *gram panchayat* (village councils), and women’s and youth groups. Because the villagers have profound local knowledge, they are often able to suggest the best solutions themselves.

Navdanya uses a holistic philosophy of biodiversity conservation and sustainable agriculture. So the question in a new intervention is “where to start?” rather than “where to go?” Ultimately, in all project areas, Navdanya introduces biodiverse organic farming, seed sovereignty and food sovereignty. Navdanya believes that a partial intervention will not address all the problems that small-scale, marginal farmers face.

### ***Building awareness and advocating change***

Navdanya staff, and farmers who are Navdanya members, begin to build the local farmers' awareness of the issues and mobilizing them to change. They invite the farmers to village meetings, hold rallies and make door-to-door visits to mobilize people on the following issues:

- Seed sovereignty and biodiversity
- Sustainability and food sovereignty
- Household food and nutrition security
- High costs and hazards of industrial farming
- Environmental degradation, pollution, eroding biodiversity and increasing health problems.

The erosion of genetic diversity and the extinction of seed varieties are now recognized as major threats to peoples' food security and survival. Farmers across India are committing suicide because they are so much in debt after buying expensive seeds and chemicals.

Navdanya's farmer members are important in persuading their fellow farmers to consider adopting organic methods. They do this work on a voluntary basis in their own villages and other places they visit.

The organization raises awareness about the policy issues by organizing protest marches, rallies, seminars, workshops, signature campaigns and public hearings. It submits memoranda to government at various levels: district, state or federal. If this does not work, Navdanya may even file a "public interest litigation" in the Supreme Court. It filed one such case to fight the biopiracy of basmati rice by Ricetec, an American firm. It has filed another to challenge a patent by Monsanto, a multinational seed firm, for a wheat variety based on a traditional Indian variety.

Navdanya uses fairs, seed rallies and protest marches to encourage farmers to conserve their own seeds and adopt sustainable practices.

### ***Selecting and empowering innovative farmers***

Navdanya works with a few innovative farmers to start the programme. These farmers are trained in different techniques of organic farming, composting techniques, pest and disease management using local plants, selection of seeds, and post-harvest management. Navdanya invites older farmers to act as resource persons during the training and to share their experiences.

Navdanya staff regularly check how the farmers are progressing in using organic techniques, and suggest solutions to problems they encounter at each stage of cultivation. The farmers are advised to start on a small plot, so they can learn and gain confidence before converting more of their land to organic production.

### *Planning, implementation, and follow-up*

Navdanya uses participatory approaches in every phase of its activities, from planning to implementation. Staff follow up regularly to check on the impact of their work; this builds the confidence of both farmers and Navdanya's own field workers. Regional meetings of village coordinators are held every month, where the villages' participatory plans are synthesized into a collective plan to be implemented in the following month. These monthly meetings also allow Navdanya to follow up on progress in each village. The regional coordinator, subject specialists and senior staff also visit the project areas regularly. Regular visits by the specialists to the farmers' fields in the initial stage of the project also help the farmers solve their problems during the transition phase.

### *Exit policy*

Navdanya works in an area for an initial 3 years. Then, depending on the local situation and on outside support, it may extend its support for 3 more years. When the local institutions and communities are self-reliant, Navdanya moves on to new programmes and activities.

### **Impacts**

Before Navdanya's interventions, cropping patterns in the villages were shifting to chemically produced cash crops, leading to debt and nutritional deficiency. Local diets were shifting away from millets and pulses, to white rice and wheat. Through biodiversity conservation, seed saving and organic farming, families now use more vegetables, greens and millets, thus improving their household food security.

Industrial farming was eroding biodiversity, and farmers were losing control over and access to seed. Navdanya's intervention reverses these trends. With chemical farming of cash crops, food insecurity was growing; biodiversity-based organic farming assures food security throughout the year. More nutritious foods are also available for sale. Landless and daily wage labourers have more job opportunities in organic farming.

Farmers have minimized their dependency on external inputs. They conserve their own seeds, make their own compost and their own pesticides. They grow plants to use as fodder, control pests and make compost, so cutting the cost of cultivation. They have also started again using herbal medicines, so spend less on health care.

The farmers' purchasing power has improved: many now have telephones, television and gas stoves. Some have been able to buy their own vehicles.

The farmers' confidence in organic production rose when they found that it was a viable alternative to chemical farming. Their yields had been declining and input costs rising every year. Organic farming reversed the situation in just 3 years, returning their farms to profitability and cutting costs to negligible levels.

## **Income**

Farmers' incomes have risen many times in the areas where Navdanya works. Sri Rajender Singh, a farmer in Pulinda village, is an example. By multiple cropping his 400 m<sup>2</sup> field, he was able to earn Rs 3060 from this patch of land in 2004–5, or Rs 76,500 per ha.

In adverse conditions, farmers who practise biodiverse agriculture get good yields – something impossible in chemical farming. Bharat Singh, another farmer in Pulinda, says that unusually heavy rains in the *kharif* (July–October) season of 1998 cut his yields of pulses, but the high yield of millets and rice compensated for these losses. In 2003, a dry year, he got 20% less rice but a very good yield of pulses. Bharat and his family are quite happy with organic practices, and he says he will never again use chemicals.

## **Time required for conversion**

It is always better to reduce inputs (especially of fertilizers) step by step rather than suddenly. In the first 2 years of transition, yield often falls by 15–20%, or in the worst case by 40%, but in most cases the loss in yield is compensated by the money saved on inputs. Another option is to convert one field at a time, so the farmer can avoid facing an unacceptable loss in any one year.

## **Women's work and income**

As elsewhere, Uttaranchal's women do much of the farm work. Navdanya found that in the Dhar area of Garhwal district, women worked an average of 14–18 hours a day, depending on the season. Navdanya's intervention reduced their working hours significantly.

*Mabila anna swaraj* (initiative for income generation) groups are formed to make the local women self-reliant. Typically, rural women in Uttaranchal work at home as well as in the fields, but the men sell the produce and spend the money. The *mabila anna swaraj* groups enable women to earn money by adding value to local products – money that they can choose how to spend.

## **Sustainable agricultural practices and biodiversity**

Promoting traditional multiple cropping systems by encouraging farmers to grow more crops together instead of a monoculture results in greater biodiversity. Farmers are now growing up to 40 crops a year in one field. Greater biodiversity in the field means more income for farmers. This is just the opposite of what advocates of conventional farming tell farmers when they promote single crops.

When farmers see the benefits of multiple cropping, they are encouraged to grow more crops in their own fields. The pressure on the forest has also decreased in some areas because people have been able to start collecting animal feed from fodder plants growing in their fields.

## Promoting good practices

### *Documenting good practices and indigenous knowledge*

Documenting the farmers' knowledge is vital so it can be preserved and shared with other farmers. Navdanya documents local people's wisdom by interviewing groups of farmers, members of local institutions, and elderly farmers. Farmers also share their knowledge during training sessions. Navdanya's field and regional coordinators also document practices of innovative farmers. The field coordinators produce monthly reports documenting activities, field experiences, good practices and challenges.

The local communities document their biodiversity-based knowledge in "community biodiversity registers". These collect and document the local indigenous knowledge on insects, plants, animals living in the area (including wild animals). Information considered relevant is written down; examples include characteristics and behaviour, use of the species (for food, medicine, pest control), and the environmental conditions it needs. The best items are also published in the form of books or booklets, or in *Krisshi Samachar*, an agricultural newsletter published by Navdanya.

### *Community seed banks*

Conserving traditional varieties is an important aspect of Navdanya's work. It believes that conserving the valuable biodiversity represented by these traditional varieties is possible only through organic farming.

Navdanya encourages farmers to select and store different varieties of crops they grow in their own villages. Some traditional varieties, such as traditional millets and pseudo-cereals have almost disappeared. They have high nutritional value and are adapted to local conditions. Reintroducing these varieties is important.

Navdanya itself has conserved more than 2,500 rice varieties in different parts of India, as well as more than 1000 other crops and multipurpose plant varieties at its biodiversity conservation farm at Ramgarh, Uttaranchal. The conserved seeds include cereals, millets, pulses, oilseeds, medicinal plants, fodder plants and other multipurpose plants. The organization has also established about 40 seed banks across the country; many of these now run independently.

### *Promoting local resources and techniques*

Navdanya encourages farmers to use resources available locally. Examples are plant extracts, cow urine, buttermilk, etc., used to control pests and diseases, as well as traditional tools and utensils for farm production, crop storage, and other aspects of daily life.

Installing water mills is another example: instead of taking their grain to the miller, local people can now make flour themselves. They give a small amount of flour to the mill's caretaker in return for using it.

## **Exposure tours**

The best way to convince people is to show them how things work and what the benefits are. Exposure tours are a useful way of introducing other farmers to organic ideas. Navdanya arranges visits to successful farmers' fields and encourages the visitors to start experimenting with organic methods on their own land.

## **Other activities**

Navdanya supports various other activities in the villages where it works, including fair trade marketing initiatives for organic products, and an education programme to teach schoolchildren about biodiversity and food. It has formed *Jaiw Panchayat* (living democracy) councils in several villages to strengthen the relationship between plants, animals and human beings and encourage farmers to conserve biodiversity.

## **Scaling up**

Navdanya has trained other organizations in organic farming. These include women's organizations such as Mahila Samakhya in Uttaranchal, and Chinmaya Trust in Himachal Pradesh. These organizations each work in about 300 villages with more than 6000 farmers. Navdanya has also trained groups from Yuvacharya of Art of Living, an NGO working in about 5000 Indian villages. This organization aims to convert about 200,000 hectares of land to organic production within 3 years. Navdanya has also trained secretaries and extension officers of the Tibetan government-in-exile, and their settlements across the country are converting to organic production.

The Uttaranchal state government's declaration to make the state organic was a major success, and greatly supports Navdanya's efforts.

## **Challenges and opportunities**

Two groups of people are difficult to convince of the benefits of organic farming: people trained by agricultural colleges (which teach only conventional farming), and large-scale farmers who have practised conventional farming for a long time. The latter are worried by the decline of yields during the 2–3 year transition period, and by the higher labour costs of organic farming.

It is important to build on the knowledge of elderly people: they are the ones who remember how things used to be done, but their knowledge is in danger of dying with them.

Some people oppose Navdanya because it promotes "un-modern" concepts such as biodiversity conservation and traditional crops. Navdanya members and staff are sometimes seen as narrow-minded and old-fashioned. It is difficult to deal with this widespread perception.

It is important to train organic farming trainers in a sound way to ensure that their recommendations will lead to success. Otherwise they will lose farmers' trust, and the message of organic farming will be less persuasive.



## Box 8 Factors hindering and fostering Navdanya's work

### Hindering factors

- It is difficult to convince farmers in a new area to consider organic farming if they already use chemicals extensively
- Government agencies, firms and development projects distribute free seeds, agrochemicals and financial support to farmers
- Trade liberalization lowers prices of agricultural products
- Markets are lacking for large quantities of organic produce
- Corporations control many aspects of farming and promote their agrochemicals and genetically modified crops
- Government policies support corporate farming – for example, a seed bill (now struck down) to restrict the exchange of seeds by farmers.

### Fostering factors

- Farmers see how successful organic farming is, and copy it spontaneously
- Organic farming produces more income – which other farmers can clearly see
- Farmers who understand the value of organic farming press government agencies to stop distributing hybrid seeds and agrochemicals in their area
- Navdanya markets organic produce in some areas
- Seeds are available locally or through Navdanya's seed banks
- There is great potential to add value to produce, so improving farmers' incomes
- The debt burden of small-scale farmers, the poor quality of water and health problems caused by agrochemicals force farmers to seek other options.

Demonstration centres play a major role in promoting the speedy adoption of sustainable practices. Farmers want to see something before they adopt it themselves. If they see another farmer growing the same crop without using chemicals, they often do not hesitate to adopt the same practices.

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Navdanya's work is supported by Bread for the World and the Evangelischer Entwicklungsdienst (EED).

[www.brot-fuer-die-welt.org](http://www.brot-fuer-die-welt.org)

[www.eed.de](http://www.eed.de)

## The Pyalaram community gene fund

*Deccan Development Society, Andhra Pradesh*



“**M**RS GENE BANK” is a well-known figure in the village of Pyalaram, in Medak District, Andhra Pradesh. Farmers from far and wide come to her small farm to fetch seeds they cannot find anywhere else: a local type of grain specially suited for nursing mothers, or traditional varieties that cannot be found in the market and that are close to dying out.

Balamma (Mrs Gene Bank’s real name) is the seed collector and multiplier in the area. She collects seeds and grows them on her own 1-ha plot of land. She is now proud owner of more than 70 traditional varieties; at any time she might have 150–175 kg of good quality seeds stored in her house. She gives some to friends and neighbours, and loans the rest to other villages in return for more seeds, or for grain to eat or to sell. People repay their loans with double the amount after harvest, so creating a robust gene bank as well as providing Balamma and her family with food and income.

Balamma belongs to the lowest caste in Indian society. She used to be very poor, and most people just ignored her. Now she is well respected, and earns a good income from her seed conservation efforts. Other women have copied the idea, and now 60 of them also collect and store seeds.

The above illustrates how Balamma and other women could overcome the acute seed crisis, which led to food and nutrition insecurity in the area. Farmers in Pyalaram no longer have to rely on unreliable seed sources in the market.

### **Pyalaram**

Many rural villages of Andhra Pradesh are poor, and subsistence farming is a mainstay. In Pyalaram, conditions are particularly difficult: prolonged drought mean that villagers have been forced to rely on government welfare for over 15 years. Traditional seed varieties had all but disappeared from the area. When rain does fall, farmers often had no seeds to plant: they cannot afford the high price of hybrid seeds. These seeds are anyway unreliable: they germinate poorly, need large amounts of water, and require lots of chemical fertilizers and pesticides, which poor Pyalaramans cannot afford.

In the government relief programme, rice and wheat were the only source of food. Serious malnutrition was the inevitable result, especially in children, women and elderly people. Most of the men went elsewhere in search of jobs, forcing the women and old people to fend for themselves. The severe drought between 1994 and 2000 made the conditions worse: farmers had no drought-resistant seeds.

## Box 9 Seed security for food security

Seeds are **the** critical component in farming. The entire crop depends on how good the seeds are: the variety, whether it is suited to the area, and how well it germinates and stands up to challenges such as drought, pests and diseases. Besides seed quality, sowing at the right time plays a pivotal role in how the crop performs.

With the introduction of high-yielding hybrids and genetically modified varieties, production of seeds has become a technology-intensive activity. Farmers have become ever more dependent on outside sources of seeds. That is risky: the seeds they buy are not adapted to the particular soils, climate, pests and diseases in their area; they are expensive; they produce bland, tasteless yield that is low in nutrition and has poor storage qualities. Planting a single variety over a wide area lowers the biodiversity, making it easier for pests and diseases to attack.

It does not have to be so: Balamma and her friends show that a small group of poor but determined women can regain control over this crucial resource.

A group of 34 women farmers from Pyalaram asked the Deccan Development Society (DDS) for help. They wanted seeds so they could grow their own food instead depending on government handouts. DDS has considerable experience in sustainable agriculture in the region. It helped them start community gene banks so they could store seeds of locally adapted varieties, so assuring a steady supply of quality seeds. DDS advised each farmer to plant a range of traditional crops on her land, so building a robust seed bank for the community. It also helped the farmers bring back some neglected land into cultivation. As a result, the 34 families converted around 20 ha of fallow land into organic farming, allowing them to grow a whole range of crops and so improve their diets.

DDS has done similar work in some 75 villages, and has helped establish more than 65 community gene funds.

### DDS and its approach

The DDS is a grassroots-level organization, some 20 years old, which has a vision of consolidating self-help and community-based organizations into vibrant organs of primary local governance and federating them into strong pressure lobby for women, the poor and marginalized. DDS has organized 75 *sanghams* (voluntary village-level associations) for economic and social empowerment. These groups are organized around health, natural resources management, community seed banks, creches, media, and other social and economic themes.

DDS bases its work in a village on the farmers' own understanding and practices. The organization respects and recognizes the importance of this knowledge for the villagers' own self-development, and acts merely as a catalyst and facilitator.

In Pyalaram, DDS brought all the women who were interested together and helped them form a *sangham*. The main aim of forming such a group is to empower the members to develop and maintain their own network of seed groups, both within and outside the village. DDS believes that a well-maintained seed bank can effectively counter the market by ensuring access to seed, and also revives the range of traditional crops and varieties, so ensuring food and nutritional security.



Figure 1 DDS relies on the indigenous knowledge of local people to select healthy, viable seeds

DDS and the *sangham* women identified villagers who kept seed and who knew about traditional seeds and storage methods. DDS conducted several participatory exercises with the group to ask them about the availability of seed varieties in the village and any gaps in supply. For crop varieties that were not available locally, DDS provided initial packages of seeds. People who received these packages had to repay double the amount of seed to the village *sangham* group at harvest time. These are then passed on to other *sangham* members, or are loaned to other farmers. The farmers who receive such seed loans also have to repay double the amount when they harvest their crop. And so the process continues.

### Seed selection and collection

DDS does not introduce new ways of selecting, propagating or storing seeds. It relies solely on the knowledge of indigenous seed collectors. Traditional seed keepers have a good knowledge of how to select healthy, viable seeds. They know which seeds are free of wrinkles and fungus. They collect bigger, good-looking seeds from stronger stalks before harvesting for home consumption or for sale. They collect seeds from drought-tolerant crops such as millets, sorghum, beans, pearl millet (*bajra*), sorghum (*jowar*), cowpea, grams, cereals and other rare, local varieties.

Apart from drought tolerance, these varieties have other important characteristics: they are nutritious, local people like their taste, and they produce livestock fodder – unlike the government relief programme's wheat and rice. These varieties survive and perform well even

### Box 10 Seeds in festivals

Seeds play an important role in traditional festivals in the Deccan region.

Dasara is the most important festival in the monsoon season. By this time most crops are ready for harvest, and the farmers are relaxed. Dasara also marks the end of one season and the beginning of another. Preparations are on for sowing the winter crops.

During the festival, women perform a fascinating ritual, focusing on the goddess and on seeds. The five most important seeds for the winter crop (wheat, winter sorghum, grass pea (*Lathyrus sativus*), chickpea, and linseed) are mixed with soil. All crops these crops need relatively little water, which is scarce in area. Local people reason that any crop that can grow without water should be worshipped.

The seeds for this ritual are brought from the village seed keepers. When the seeds sprout, village women visit each others' houses and check the seeds to see how well they have grown. They can see whose seeds germinate best, so they can get their seed supplies from that seed keeper.

During Endlagatte Punnami, a festival before the winter crops are harvested, women offer newly cut ears of grain to the village deity. They adorn the front of each house with a string of ears tied above the door. The villagers believe that the more types of grain displayed, the more their farm will produce.

DDS is reviving these traditions to focus interest on seeds as a source of prosperity.

without a lot of inputs, so they involve little risk in case of drought. Farmers grow many crops in the same field, using techniques such as companion cropping and intercropping. This minimizes the risk of total failure in case of drought or disease, guarantees food security, and ensures a balanced diet.

### Seed storage

Farmers have themselves developed methods of selecting and storing seed over millennia. They use local materials such as earthen pots, gunny bags and baskets smeared with cattle dung and red earth to hold seeds, and use ash and neem leaves to repel insects. They dry the seed thoroughly in the sun, then mix it with ash. Farmers who store small amounts of seeds may keep several types of seed in the same container. They put some ash on top of each layer, then spread a cloth on top to separate the seeds apart from the next layer of seed. A typical farmer may keep 15–20 varieties of seeds, but the village seed keeper may have 70–80 varieties. The seed can be stored for 2–3 years, but must be turned and exposed to sunlight every 5–6 months during storage. Seed stored for longer is kept underground in pits.

### Achievements and lessons

- The women's groups have demonstrated that once they organized and empowered, even the poorest farmers can feed themselves and their dependants, and conserve their environment, with a minimum of outside support.
- Keeping seed has a long tradition, so the women did not see it as a new thing to do. It just needed to be revived. The women eventually re-established their control and leadership over their own knowledge about seeds and varieties.

- It is possible to enable people to pull themselves off the government welfare system by encouraging and supporting groups like the Pyalaram women.
- Even in the most degraded areas, people do not need to rely on genetically modified seeds or multinational corporations to feed themselves.
- By storing seed, farmers were able to avoid unnecessary expenses and effort to search for seed. They were able to sow at the right time, which translated into better returns.
- The families' food and nutritional needs are now adequately met. They have a broader diet, fewer people are forced to migrate in search of work, and more fodder is available.
- Since seeds are in the women's own hands, they can now choose what to grow and when to grow it.
- The women have been transformed from seed borrowers to seed lenders. Their pride has risen and they are viewed with respect by people in neighbouring villages.
- A large amount of previously fallow land has been brought under cultivation. Diversifying cropping has boosted productivity, conserved soil fertility and improved the soil's biological and physical properties.
- Traditional festivals have been revived.
- The *sangham* enables the women to work together as a group.

Figure 2 shows how one member of the *sangham* benefited from the seed banking. She planted more crops, and got higher yields from her field because she was able to sow on time, applied silt from the village tank, manure and vermicompost to her field, and weeded on time.

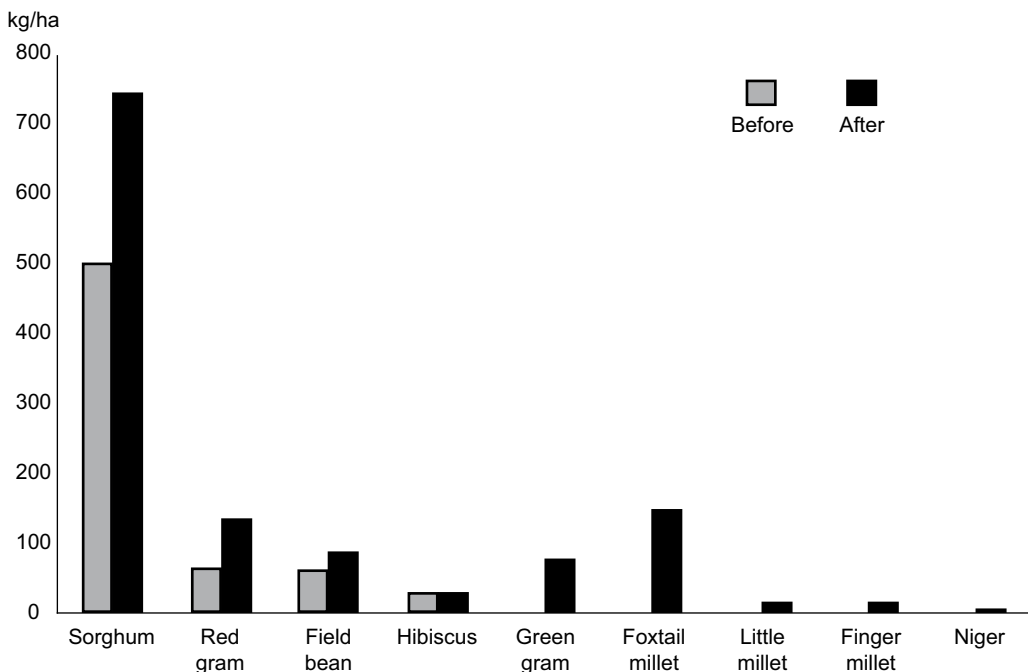


Figure 2 Yields obtained by a *sangham* member before and after the project

## **Challenges**

The biggest challenge is to persuade the government to appreciate and support traditional crops that can enable the villagers to grow enough food to feed themselves instead of remaining as victims of market forces and continuing to rely on welfare handouts.

As the village now produces and stores its own seeds, demand for seeds has fallen. Some farmers may not continue to produce seeds.

Young people are attracted by modern agricultural practices. It is difficult to change their mindset so they appreciate the value of traditional practices and promote them to others.

Farmers may be tempted to grow commercial crops because these offer high returns. But they are risky: farmers must secure their own food supply first. It is easy for them to be attracted by advertisements for new crops and the farm chemicals, so abandoning organic production.

Farmyard manure is valuable as a fertilizer and to improve the physical and biological properties of the soil. It is necessary to keep enough animals to produce enough manure to support crop production.

Farmers want to sell surplus produce so they can earn money. It is necessary to ensure that markets exist for the local varieties they grow.

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The work of the Deccan Development Society is supported by Misereor.

[www.misereor.org](http://www.misereor.org)

## Redefining pest management in Punukula

*Centre for Sustainable Agriculture, Andhra Pradesh*



**T**HIS IS THE STORY of how a village in Andhra Pradesh managed to rid itself completely of pesticides. Today, the villagers do not use any chemical pesticides at all. And they are inspiring other farmers all over the state to do the same.

Cotton has for many years been the major crop in Punukula, a small village 12 km from Kothagudem, Khammam district. It used to be grown as a monoculture, and farmers used a lot of chemical pesticides to protect their crops. Some sprayed their fields when they saw that there were a lot of pests on their plants. Others did not even check the crops for pests: they just sprayed anyway. But frequent spraying has two serious side-effects. It does not kill all the pests, and those that survive are more likely to develop resistance to the chemicals used. So the sprays become less and less effective over time. Plus, the sprays kill all the insects – including beneficial insects like ladybirds and dragonflies, as well as spiders that eat the pests. Without any of these natural enemies to keep pests in check, the numbers of pests can rocket soon after the farmer sprays a field.

So the chemicals worked less and less well. What could the farmers do? They increased the amount of chemical in the spray, and sprayed their crops more and more often. That only made the problem worse – and they had to spend huge amounts of money just to buy chemicals.

The pesticides also caused health problems. There were many cases of acute poisoning, killing people or leaving them permanently disabled and saddled with enormous medical bills. Mr Madhu, the Registered Medical Practitioner of Punukula, says there were at least 50–60 poisoning cases per season before 2000.

### **Box 11 The price of debt**

Five years ago, Payakari Nageswar Rao, a farmer in Punukula, decided to take his own life. He drank the very pesticides that were supposed to assure him a high yield of cotton – the pesticides that were supposed to secure his income and livelihood.

But these chemicals had become like a stone around his neck – one that got heavier and heavier. They cost so much that he found himself deeply in debt. And they did not even control the pests on his crops. Threatened by moneylenders, and seeing no way out of his predicament, Payakari Nageswar Rao committed suicide.

Mr Rao's widow now leases out the couple's land. It is still in cotton production. And she still cannot repay her husband's debts.



Farmers also had to borrow money so they could buy pesticides. They would get credit from local “all-in-one” dealers who sold them seeds, fertilizers and pesticides. The dealers would sell these items on credit, then charge interest rates of 3–5% per month. The farmers were in no position to repay these loans, so would have to agree to sell their produce to the dealer. The dealer in turn would fix the price lower than the market value of the crop. The farmers had no choice but to accept this price, in the hope that the dealer would again support next year’s investments. They were trapped in a vicious cycle of high costs, low produce prices and unpaid debts. They had no way out. They were truly on a pesticide treadmill.

People in Punukula recall with horror the clutches of the all-in-one dealer. The social stigma of indebtedness – especially when the moneylender put pressure for repayment, was unbearable for many.

### Identifying the problem

In 1999, staff of a local non-government organization known as SECURE (Socio-Economic and Cultural Upliftment in Rural Environment) met with the villagers of Punukula to discuss problems they faced. The villagers complained about a lack of support for investment, the higher expenses each year, the lack of marketing support, indebtedness, and so on.



Figure 3 Pesticides are supposed to solve pest problems – but in fact they lead to further pest problems, and to debt, poverty and despair

The SECURE staff realized that cotton pesticides were the cause of many of these problems. So the organization decided to work on growing crops without pesticides in the village. Its work was supported technically and financially by the Hyderabad-based Centre for World Solidarity's Sustainable Agriculture wing (now called the Centre for Sustainable Agriculture).

## Non-pesticidal management

Replacing chemicals with biological products would not alone solve the problem. A fundamental change in thinking about pest management was needed. The answer was “non-pesticidal management”: an approach that rests on several major principles:

- A natural ecological balance will ensure that pests do not reach such critical numbers that they endanger the yield.
- Nature can restore such a balance if it is not meddled with too much – hence no chemical pesticides are used at all.
- Understanding the behaviour and life cycle of pests is important to manage them. It is not enough to spray in reaction to a pest outbreak.
- Prevention rather than control of reaction is the key element to non-pesticidal management.
- Crop diversity and soil health play an important role in pest management.
- Pest management is possible using local, natural materials.

Integrated pest management is a similar approach, but it still can use pesticides as a last resort. Non-pesticidal management, by contrast, gets rid of pesticides altogether.

Non-pesticidal management relies on the farmers' knowledge, skills and labour, and their work together as a community. It looks at the pest complex as a whole, rather than at individual insects. Farmers have to understand the many factors that influence pest numbers in their fields: the life cycle of the insects, the incidence of pests and diseases, predator–prey relationships among different creatures, the relationship between growing monocrops and the pest population, and the management of soil fertility.

### Box 12 Organizations promoting non-pesticidal management

The Centre for Sustainable Agriculture (CSA, [www.csa-india.org](http://www.csa-india.org)) is a Hyderabad-based agency working to promote local resource based sustainable agriculture. CSA used to be part of the Centre for World Solidarity (CWS), which has for 20 years promoted rights-based approaches to livelihoods.

Founded in 1991, SECURE is based in Polvancha, Khammam district ([www.aea-india.org/secure.htm](http://www.aea-india.org/secure.htm)). It promotes sustainable tribal development through interventions focused on child development, women's empowerment, alternative income sources, preventive healthcare, and collective action through self-help groups.

The project was financially supported by Hivos, Netherlands ([www.hivos.nl](http://www.hivos.nl)), and Action for World Solidarity (ASW), Germany ([www.en.aswnet.de](http://www.en.aswnet.de)).

The Society for Elimination of Rural Poverty (SERP, [www.velugu.org](http://www.velugu.org)) is an Andhra Pradesh State Government initiative which coordinates women's self help groups. It is also known as Indira Kranthi Patham.

Farmers who employ non-pesticidal management use different practices to keep numbers below the level where they would reduce the yield significantly. They try to stop the pests from reaching the stage where they can damage the crop. They use natural and locally available resources.

Non-pesticidal management uses many different practices, including the following:

- Deep ploughing in the summer to expose the insect pupas so they dry in the sun.
- Using light traps and bonfires to attract moths.
- Placing yellow and white sticky boards in the field to attract insects that suck out the plant's juices.
- Hand-removing leaves on which many insect eggs have been laid.
- Setting pheromone traps (which use substances that attract insects) to check on the numbers of pests in the field.
- Using biological pesticides such as neem seed-kernel extracts and chilli-garlic extracts to control bollworms and sucking insects. There are also other locally available plants to make biological pesticides.
- Using an extract made from cow dung and urine to control aphids and leafhoppers (this extract also acts as a fertilizer!).
- Planting trap crops such as castor and marigold. Insects are likely to lay their eggs on these plants, where they can be picked off easily.

## Starting slowly

The farmers were sceptical about the non-pesticidal technology at first. They were targets of persuasive marketing from the pesticide industry, so their doubts are entirely understandable. “How can I believe that the insects that aren't killed by highly poisonous pesticides can be controlled using neem – which I use to brush my teeth every day?” asked Hemla Nayak, one of the villagers.

But CWS and SECURE persisted. Many farmers were completely fed up with the situation that they were in. They were ready to check the alternatives. CWS and SECURE organized training for them.

In 2000, with a great deal of persuasion by SECURE, a group of farmers agreed to try out non-pesticide management. Two SECURE extension workers (a man and a woman) went into the fields to show the farmers how to use the non-pesticide technologies. They made neem and chilli-garlic extracts in front of the farmers, and then showed how to apply them. The women farmers were especially interested: they saw how easy it was to make the extracts. The farmers tried using these extracts, replacing the pesticides completely. To their delight, they found that they could even control cotton bollworm.

## Demonstrating impact

By the end of the first year, the positive results from the new approach were apparent. In 2001–2, eight farmers in Pudukula tried non-pesticide management on 6.4 hectares of cotton,

**Table 3 Non-pesticidal and conventional management in cotton, 2001–2 (8 farmers in Punukula)**

	Average yield (t/ha)	Cost of plant protection (Rs/ha)	Net income (Rs/ha)
<b>Non-pesticidal management</b>	1.56	4301	3420
<b>Conventional management</b>	1.47	8596	–5201

and another three farmers tested it on another 7 ha of pigeonpea. Farmers who had used conventional pesticides lost money, but the non-pesticide farmers made a profit (Table 3).

In the second year, more farmers who had seen these results first hand joined in. The NGOs arranged for farmers to go on exposure visits to other districts. There were more training workshops in the village. Slowly, word spread. Along with it spread the conviction that getting rid of chemical pesticides was the only way out.

By 2002–3, the farmers were trying out non-pesticide management on rice, pigeonpea, cotton and chilli. The number of participating farmers rose to 59, cultivating an area of 58 hectares. The farmers were happy when they found their incomes rising.

In 2003–4, the area under non-pesticide cotton went up to 480 ha in Punukula and the neighbouring village of Pullaigudem, and covered all the cotton area of Punukula. The average yield was 3 t/ha. Cultivation costs per hectare amounted to about Rs 21,400, leaving farmers with nearly Rs 52,600 in net income.

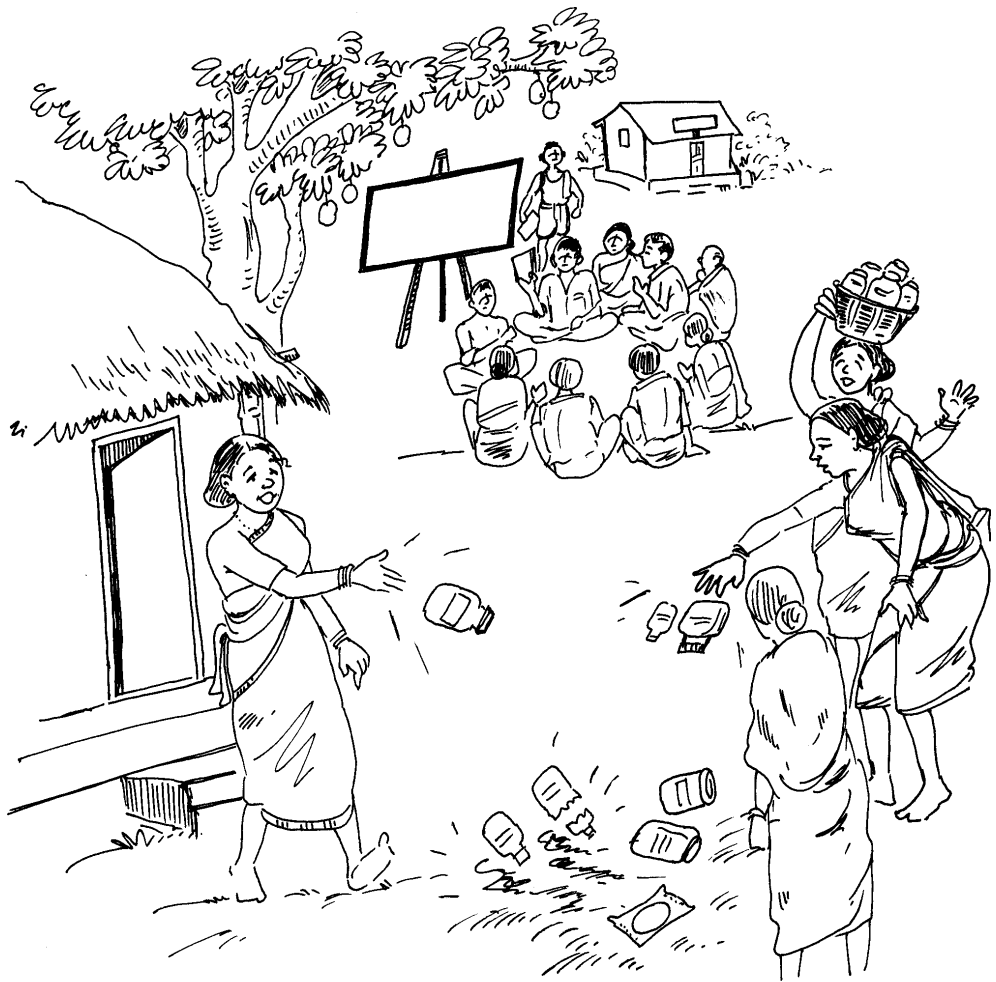
Cutting out pesticides also meant a great improvement in the quality of the chilli crop, so the produce fetched higher prices in the market.

## Impacts

In 2004–5, for the second year in a row, nobody in the village went anywhere near a pesticide dealer. The village *panchayat* council passed a resolution stating that the village was pesticide-free, and would continue to be so. The *panchayat* requested pesticide dealers not to come into their village and market their products.

The village farmers were able to get rid of past debts in a couple of years. With no debt burden, they are now willing to try out more and more ecological approaches, on more crops. One farmer, Eerla Dhanamma, has bought two more acres (0.8 ha) of land after switching to non-pesticide management. Hemla Nayak says he has repaid his debts. Man Singh has been able to rent 2 acres of land so he can grow cotton without pesticides. SECURE field staff point out the various changes – including housing – in the village after pesticides have been removed from their agriculture.

The ecological balance in the fields has been restored. There are many more insects in the fields, but none reaching a “pest” stage of threat. Mr Dhanamma talks about spiders, wasps and beetles returning to their fields. Birds are returning to the village, the villagers report.



**Figure 4** By getting rid of pesticides, the villagers avoided having to borrow money, boosted their yields, made more profit – and improved their health

The health of the farmers has improved too. There are no more any cases of acute poisoning from the village.

For the farm labourers also, things have improved on many fronts. Wages have gone up from Rs 25 to Rs 30 during this time. The workers are no longer exposed to pesticides, and have no medical expenses for pesticide-related illnesses. Some say there is even more work for the labourers – collecting neem seed, making powders and pastes, and so on. Farmers are renting in land and growing crops over a larger area, creating jobs for farm workers in the village.

In 2004, the women’s groups in Pudukula bought a machine to crush neem seed. They bought this through the *panchayat* with the help of a grant from the Centre for World Solidarity. Two women are employed full-time to run this machine.

## Spreading the approach

One hundred and seventy-four farmers in Punukula, and another 120 from Pullaigudem, soon became experts in the new pest-management approach. They can explain to others the principles behind the approach and about how they benefit. Word has spread both in sporadic ways and in an organized manner. Punukula farmers themselves decided to go out to spread the message to nearby villages. Everyone who visits the village gets to hear about the transformation. Similarly, when Punukula farmers go to other places, they make a point of telling their story.

The Centre for Sustainable Agriculture/Centre for World Solidarity support various other organizations like SECURE to promote non-pesticide management in 92 villages (in 2003–4), spread across six districts in Andhra Pradesh. More than 5000 farmers participate in this programme, and use the non-pesticide approach on about 2400 ha. The farmers from these villages act as resource persons in training programmes organized by NGOs and government agencies.

The state Minister for Agriculture, Raghuveera Reddy, visited Punukula and was convinced about the approach. As a result of such activities, the state-run Society for Elimination of Rural Poverty decided to scale up non-pesticide management in 11 districts in Andhra Pradesh from 2005–6 onwards. It is collaborating with the Centre for Sustainable Agriculture and its partner NGOs in this programme. The programme is the first massive effort to wean people from pesticides and to promote non-chemical, environmentally friendly, local-resource-based approaches to farming.

The SERP/CSA programme includes various aspects:

- **Mass campaign** A state-level campaign on the problems of pesticides and alternatives to them uses posters, films and *kalajathas* (traditional folk media).
- **Establishing field experience** The *mandal* (block) is the local management unit for the programme. Three to five villages in each *mandal*, and around 30–35 farmers in each village, are covered in the initial year. Interested farmers pay a registration fee of Rs 20. They sign an agreement stating they will collect at least 60 kg of neem seed, attend all the training programmes, maintain a farm observation book, pay for input costs either directly or as a loan – and that they will not apply any synthetic pesticides at all.

In each district, experienced NGOs have been identified and are associated with the

### Box 13 Transgenic Bt crops: No solution

As the problems of chemical pesticides are becoming evident, the industry has come out with another technology in the form of insect-resistant genetically engineered crops such as “Bt cotton”. These are portrayed as a panacea for controlling pests.

But the last four years (2002–5) of commercial cultivation of the Bt cotton in India, especially in Andhra Pradesh, show the devastating effects such technologies can have on farming communities. Bt cotton seed is four times the price of conventional seeds, and Bt crops often are not even completely resistant to the pests they are designed to combat. Plus, other pests still attack the crop, so chemicals are still needed. The first three commercial Bt hybrids released in Andhra Pradesh were withdrawn from commercial cultivation after reports of large-scale failures.

*Continued...*

*Box 13 (continued)*

Bt crops are genetically engineered to produce a toxin that affects insects feeding on the plant. The research on the production of this toxin has been done under carefully controlled conditions – not in the real-life conditions of farmers' fields. In real fields, the toxin production of the crop is extremely uneven.

The idea of Bt crops conflicts with the basic principles of rational pest management. The key points of rational pest management are:

- Management rather than control
- No pesticide use until the pest reaches the economic threshold level (non-pesticide management even avoids using artificial pesticides altogether)
- Judicious mix of all available control measures.

Major pest management strategies are designed to prolong the life of pest control measures by ensuring that insects do not rapidly develop resistance to the chemicals used to control the pests. Insect populations develop resistance to toxins through two major mechanisms:

- **Selection for resistance** Even if the majority are susceptible, a number of individuals within an insect population are likely to be naturally resistant to a given chemical. When chemical pesticides are sprayed, the susceptible insects will die, while resistant insects (and those that escape the spray) survive. Successive sprays amplify this effect. The resistant individuals are more likely to reproduce, and their offspring are more likely to share their parents' resistance to the chemical. In this way, chemical sprays (and plant-produced toxins) select insects for genetic resistance.
- **Induced selection** Even if the insect population contains no naturally resistant insects, high doses of a particular chemical are likely to encourage genetic mutations. Some of these mutations may confer resistance to the chemical. These resistant insects go on to multiply and spread.

These processes are well-documented for chemical pesticides. Transgenic Bt plants, which produce their own insecticidal toxins, have the similar effect. However, there is one key difference: unlike sprays, which become inactive after a short time, transgenic Bt plants are engineered to maintain constant levels of toxin for an extended period, regardless of whether the pest population is at economically damaging levels. The selection pressure with transgenic Bt crops will therefore be much more intense.

To prevent (or at least, retard) the emergence of insect resistance, pest management strategies aim to avoid the use of pesticides altogether, unless the pest population reaches the economic threshold. Secondly, pest management should ensure that pesticides are applied in optimum doses, depending on how severe the pest outbreak is.

The "indiscriminate" use (frequent, high doses) of pesticides has been held responsible for major "pest disasters", such as the many suicides of farmers in Andhra Pradesh in 1997–98). If this is indiscriminate, how about the application of high doses of toxins for extended periods, irrespective of the presence of insects? Is this not also "indiscriminate"?

The implications are uncertain, but we can expect these transgenic crops will help to create "super pests". They violate the scientific principles of sound pest management. Despite the claims of seed companies that transgenic Bt crops are a component of integrated pest management, Bt cotton and other similar transgenic crops have no place in rational pest management strategies.

The non-pesticide management approach shows anyway that sustainable agricultural practices can produce significantly better results, and that they also offer a range of social, environmental, economic and health benefits.



programme. Where there are no NGOs with experience in non-pesticide management, other NGOs that work on organic farming or natural resource management have been recruited.

- **Institutional arrangements** At the village level, farmer field schools (or similar bodies) have been set up with interested farmers. These have been given intensive support by village activists and *mandal*-level resource teams set up for the purpose. District-level monitoring teams and a state-level support team oversee the programme.
- **Equity concerns** While selecting farmers, it is mandatory that 90% should be small-scale and marginal farmers. Only around 10% may be others (mostly for strategic reasons, such as to spread the approach further). The majority of the participants must be women.
- **Training** Intensive orientation, training, monitoring and communication activities take place at different stages during the crop's growth. Suitable communication materials are being developed. A cadre of resource persons is being developed in each district; nearly 400 were trained in 2005. CSA is planning a 3-month certificate course on non-pesticide management for all farmer resource persons in the villages.

## Initial results

While this scaling-up effort is still in its infancy, the results of the initial stages are encouraging. Non-pesticide management has been successfully established in all 11 districts. These districts include major pesticide users such as Guntur, Warangal, Kurnool, Khammam and Karimnagar. The technical capacities of 62 *mandal*-level resource teams and 11 district-level monitoring teams have been built.

Over 450 farmer field schools composed of interested farmers have been set up. These groups can take up other agriculture-related issues at a later stage. Up to 21,000 farmers have participated in these field schools; they have learned about pest management and changed their views on it.

A cadre of at least 200 farmer resource persons has been trained. These are practising farmers; their task is to facilitate farmer-to-farmer training and extension.

Farm-level data was recorded for all participating farmers, and a picture of the outcome will be analysed at the end of the season in terms of crop economics and performance. Such analysis is valuable for scaling up efforts elsewhere.

The state-level campaign has created widespread awareness about the ill effects of pesticides and the potential alternatives. A range of communication materials have been created and distributed.

Each participating farmer has saved Rs 2500–5000 per acre (Rs 6200–12,400 per hectare), averaged across crops and across districts on pest management expenses. The ecological and other benefits promise to be enormous. Initial estimates indicate that in the first year alone, farmers have already saved Rs 60 million on pesticides – equivalent to the amount spent on the project. With larger areas and more farmers coming into the programme, savings will be higher.



Self-help groups have set up nearly 30 village enterprises to make neem seed powder, and another 15 have established units to produce NPV (nuclear polyhedrosis virus, a biopesticide used to control bollworm).

Farmers have come to understand clearly the role of beneficial insects, and to manage pests without resorting to chemical pesticides. Neighbouring farmers who still use chemical pesticides and genetically modified crops continue to invest a great deal and get low net returns.

The initiative was planned to focus on pest management as chemical pesticides are a serious problem. Plans are to incorporate other initiatives gradually, such as organic nutrient management, seed management and so on.

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The work of the Centre for Sustainable Agriculture is supported by German Agro Action.  
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## Farming for self-reliance

### *Chetana-Vikas, Maharashtra*



**M**ANY FARMERS IN INDIA are doubly exploited: once when they buy the inputs they need to plant their crops, and again when they come to sell their yield. At the beginning of the season, farmers pay through the nose for seeds, fertilizers and other chemicals. They take loans to pay for these inputs – loans that often carry exorbitant interest rates. If the rains fail – or if there is too much rain – the first planting may fail, and the farmers have to reach even deeper into their pockets to buy more seed.

Yet at harvest time, the farmers get low prices when they come to sell their crops – often to the same traders who have charged so much for the inputs. And the yields are often low: farming is anyway dependent on fickle weather, and repeated applications of artificial fertilizer and continuous growing of the same crops have depleted the soil, making it ever harder to produce enough.

The result: farmers are driven deeper and deeper into debt. Their families do not have enough to eat, and thousands commit suicide in desperation.

### Escaping from the vicious circle

Chetana-Vikas, an NGO working in central India, is helping farmers find a way out of this deadly trap. It promotes an approach called “self-reliant farming”. This differs from conventional high-external-input agriculture in two key ways:

- It uses resources from the farm itself rather than relying on purchased inputs.
- It aims to produce enough food for the family (plus a surplus to sell), even if the weather is bad, rather than growing crops mainly for cash.

In development-speak, self-reliant farming has “low external inputs, but high internal regeneration of inputs”, and emphasizes “food sovereignty and nutrition security, and a resilient agro system with inbuilt insurance against seasonal adversities”.

Self-reliant farming was developed by Chetana-Vikas’s Alternative Agriculture Resource Centre in Wardha District, Maharashtra. This area consists mainly of rainfed dryland with gentle slopes. Almost all the 800–1000 mm of rain falls between June and September. May is the hottest month: the mercury can climb to 47°C for 1–2 weeks.

Farmers in the district typically own only 1–2 ha of land. The soil is average fertility, and the fields are not irrigated. The farmers have few tools or equipment, few cattle, limited labour and skills, and very little capital to invest. Any technology has to work given these stringent conditions.

### **Box 14 Intercropping saves lives**

Janardhan's father had planted nothing but cotton on his 2.4 ha of dryland. That had landed him in debt. After his father committed suicide, it took Janardhan 10 years to repay the debt. But how could Janardhan avoid his father's fate?

The 2004–5 cropping season started out promisingly enough. The rains came on time, and Janardhan and other farmers in his village sowed his seeds. Then, a couple of weeks later, the rain stopped. Parched, the young plants withered and died. The farmers had to get more seed and sow again. Again the rain failed, so the farmers had to sow a third time. Certified seed ran short, and a black market sprang up. Many farmers could not afford to buy more seed, so killed themselves.

Janardhan was lucky. Advised by Chetana-Vikas, he had sown many different types of food crops in between the rows of cotton. When cotton failed to grow, he had to go to buy more seeds, like all his neighbours. The drought killed the young food plants too, but that was less of a problem: he had enough seeds at home to sow again – and again when the rains failed the second time.

The erratic rain and planting delays meant that all the farmers got low cotton yields. But Janardhan still had his food crops – he had planted 24 different types in all. His family had enough food, and he even managed to earn some money.

His conclusion: "If I had not been farming for self reliance then may be even I would had committed suicide this year".

What were the possibilities? Growing crops purely for cash is too risky – as so many farmers have discovered to their cost. Growing crops entirely for subsistence is also unrealistic, as it is not possible in a 6–8 month growing season to produce enough to feed a family throughout the year. Going for more sophisticated types of organic farming would also be inappropriate, at least to begin with, as the farmers had no knowledge or experience with this type of farming.

Combining food crops and cash crops seemed to be the best option. The food crops would provide the family with enough to eat for much of the year. The farmers could make enough money from the cash crop to buy food to tide them over the remaining months.

But which crops? And how should they be grown?

### **Developing farming technology**

Chetana-Vikas asked a sample of small-scale farmers and their families in 10 villages what they ate each day, and what they spent on food and other items. The NGO staff were then able to calculate the amount and types of food a family needed each month and each year, as well as the money they needed to pay for things like clothes, education, medicine and travel.

The average family's budget amounted to about Rs 25,000 a year. Half of this was for food. The families named several dozen different crops, four-fifths of which the farmers could grow themselves without irrigation. These included cereals, pulses, vegetables and spices (Box 15).

To this list, Chetana-Vikas added cotton, soybean and pigeonpea (to be grown for cash) plus a few other crops such as sunn hemp (for fibre) and fodder crops. The NGO staff then

designed a cropping system – a combination of intercropping and rotation – that would enable the farmers to grow all of these crops. They decided to rely as far as possible on selected local and improved varieties so that the farmers would not be dependent on commercial seed suppliers.

The only outside input that was needed was farmyard manure to improve the soil structure and organic matter content. Farmers did not have enough cattle to produce sufficient manure, so they would have to buy it from other farmers. How much could they afford? They used to buy 125 kg of chemical fertilizer for a hectare of cotton, costing Rs 1500 a year. If they no longer needed fertilizer for their cotton, they could presumably use this money to buy manure. So the Chetana-Vikas staff developed and tested a cropping system that used Rs 1500 worth of manure a year.

Chetana-Vikas also field-tested various traditional seed varieties for yield, resistance to pests and diseases, and taste. The NGO ran demonstrations to introduce farmers to these varieties, and distributed seeds of the varieties they chose so they could multiply them.

The final element in the technology was contour bunds – low ridges made of soil, built across the slope. These bunds stop water from running off and causing erosion; the water pools up behind the bunds instead, so has time to sink into the ground. A barefoot “village engineer”, trained by Chetana-Vikas, advised the farmers where to build bunds and gully plugs. The farmers could make the bunds easily by hand or using simple, locally made equipment pulled by rented bullocks. With the bunds in place, a crop can easily survive a dry spell of 35–40 days without damage.

## Introducing the technology

Chetana-Vikas began research and development of the technology in the 1999–2000 season. The first tests were done at the Chetana-Vikas Centre, deliberately incorporating all the constraints that the farmers face: marginal land, no bullocks for ploughing or manure for use as fertilizer, and limited labour.

Starting in 2002–3, the NGO began to introduce the interventions on the farmers’ own fields. It used various methods to introduce the technology: awareness raising, visit to dem-

### Box 15 Crops for cash and food

<b>Cash crops</b> (3)	Cotton, soybean, pigeonpea.
<b>Cereals</b> (5)	Sorghum, rice, grain amaranth, pearl millet, maize.
<b>Pulses</b> (7)	Pigeonpea, green gram, black gram, rice bean, moth bean ( <i>Phaseolus aconitifolius</i> ), cowpea (2 varieties), chickpea.
<b>Vegetables</b> (15)	Cucumber, ridge gourd, bottle gourd, bitter melon, ladies’ finger, cluster bean, tomatoes, chillies, eggplant, beans (2 varieties), pumpkin, cowpea, yam, hibiscus (2 species for leaves and flowers).
<b>Spices</b> (5)	Turmeric, fennel, coriander, chillies, mustard.
<b>Others</b> (7)	Sesame, groundnut, linseed, sunn hemp, two fodder species, marigold.

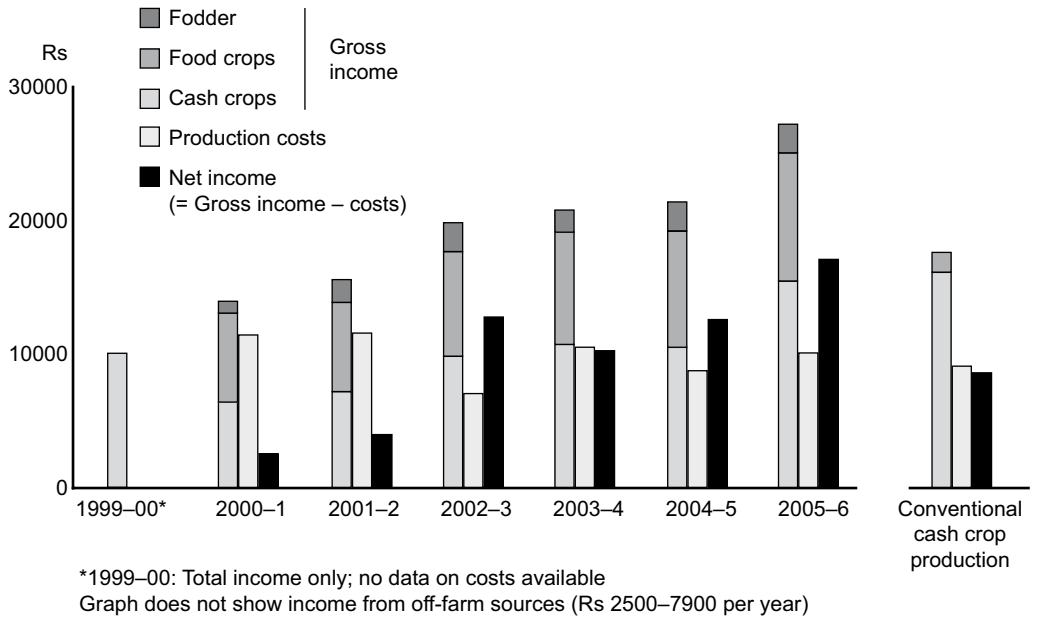


Figure 5 Expenditure and income from 1 ha of land under self-reliance farming method, Wardha District, 1999–2005

onstration sites, and 4–5 days of training for farmers who said they were willing to give the new approach a try. Chetana-Vikas provided these farmers with starter packs of seeds at a reasonable cost. Staff made one or two follow-up visits, and arranged for groups of farmers to evaluate each others' fields and discuss their experiences. No separate financial support to the farmers was provided.

### Reaching self-reliance

Figure 5 shows that the farmers' incomes have risen steadily since the project began in 1999–2000. Production costs (expenditure on seeds, manure, hired labour and cultivation operations with bullocks) have fluctuated over the last five years and have declined slightly overall to about Rs 10,000 in 2005–6. Income from cash, food and fodder crops rose from under Rs 14,000 in 2000–1, to nearly Rs 27,000 in 2005–6. That gives a net income of around Rs 17,000: more than the Rs 7,500–9,500 earned by farmers growing cotton and pigeonpea using conventional chemical inputs.

The self-reliant farmers do not just get higher yields and incomes. They grow most of what they and their families eat (Table 4). That means they need to buy less from outside. This home-grown food is diverse, and provides a rich and varied diet throughout the year. The farm families are less likely to go hungry at any time during the year, and are less at risk from rising input costs or from fluctuating market prices of cash crops.

Of course, the self-reliant farmers cannot grow everything they need. Crops like wheat, potatoes, garlic and off-season vegetables cannot be grown in the area without irrigation.

**Table 4 Degree of self-reliance achieved from one hectare of rainfed dryland; average of three years (2004–6)**

	Family needs per year*	Production from one hectare	Self-reliance achieved (%)
<b>Cereals</b> (excluding wheat)	302 kg	245 kg	81
<b>Pulses</b>	80 kg	300 kg	374
<b>Spices</b>	27 kg	9 kg	33
<b>Vegetables</b> (for 3.5 months)	50 kg	63 kg	127
<b>Oil seed</b> (for 50 litres of oil)	120 kg	120 kg	100
<b>Other food</b>	10 kg	18 kg	183
<b>Cash crops</b> (cotton, soybean, pigeonpea)		700 kg	
<b>Cash</b> (from sale of cash crops and fodder, plus external wages)	Rs 12,263	Rs 11,789	96

\*These figures reflect current living standards rather than an ideal situation. They do not include income from outside the farm.

The chemical-based farmers, on the other hand, grow little of their own food, so have to spend much of what they earn on basic foodstuffs. They achieve high yields only by depleting their soil fertility.

Conventional, chemical-based cotton farmers earn extra money from outside work. So do the self-reliant farmers: between Rs 2,500 and 7,900 per year during the seven years of the trial – about the same as for the chemical farmers.

The self-reliant farmers have not eliminated all external inputs. They still need to buy manure and hire bullocks for ploughing. Some who have their own draught animals have found that their costs are lower and profits higher than shown in Figure 5.

Figure 5 also shows that production and income have risen over time, as the soil fertility has increased and as farmers improve their management practices. The soil has become more porous, with more earthworms and fewer hard clods. There is less waterlogging in the wet season and less cracking afterwards. The soil retains moisture longer during dry spells. These should allow farmers to grow more (non-wheat) cereals and spices, making it possible for them to become completely self-reliant in these items.

Various practices have reduced attacks by pests and diseases, so reducing the need for chemical pesticides. These practices include the use of indigenous varieties of seeds, intercropping of different companion species, and crop rotations. Intercropping means that the plants cover the soil surface better, so are able to convert more sunlight into food and fibre.

Several more farmers in Wardha District have started practising this model of self-reliance. They have tried out different combinations of crops – from six to 25 in the first year. They are attracted by the low expenses, by the fact that they do not need to take out loans to pay

for expensive seeds, fertilizers or pesticides, and by the secure supply of food from the new model.

Finally, using weather forecasts has enabled the farmers to avoid crop losses by timing activities such as planting better.

### **Looking to the future**

The self-reliance model can be improved further as farmers gain experience with it. For example, they could increase the amount of organic matter they use – by applying more manure or by recycling biomass. Such improvements may make it possible to increase the output of both food and cash crops. It becomes possible to eliminate artificial chemical completely, so going completely organic.

The self-reliance model offers millions of dryland farmers a real chance to escape from the debt trap, feed themselves and their families, while continuing to produce significant quantities of commercial crops.

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The work of the Chetana-Vikas is supported by Bread for the World.

[www.brot-fuer-die-welt.org](http://www.brot-fuer-die-welt.org)

## Realizing the potential of organic agriculture

**O**RGANIC AGRICULTURE HAS HUGE potential in India. But it also faces many constraints. This section lists these potentials and constraints, and suggests changes needed if the potentials are to be achieved.

### Potentials

The following points are ranked in order of importance (most important first).

- **Potential organic producers** All farmers in India have the potential to go organic. With full government support to promoting organic farming and assistance to help farmers bridge the 2–3 year transition period, it is estimated that about 25% of Indian farmers would change to organic agriculture within 5 years.
- **Organic by default** Many areas in India are farmed in a traditional way, untouched by chemical farming, so are organic by default. Most are subsistence farms in remote and marginal areas. They should be covered by a specific programme concentrating on organic agriculture to help farmers make themselves self-sufficient on a sustainable basis. By improving their livelihoods in this way, such a support programme would alleviate the need for social welfare programmes serving the same groups.
- **Research on traditional varieties** As most agricultural research has concentrated on high-yielding varieties of wheat, rice and other staples, traditional food crops have been neglected. Almost no attention has been given to local varieties of rice, wheat, millets, pulses and other cereals, while only 8–10 varieties are cultivated in 80% of all rice fields. Traditional varieties should be identified, improved and promoted.
- **Links to markets** Many smallholder farmers still have very weak links with markets for their produce. Specific emphasis on strengthening and improving such links would make it attractive for farmers and rural enterprises to improve the quality of their products. This would create new employment opportunities for local people. Many local products are produced with little capital investment but high inputs of labour, which is plentiful in India.
- **Certified organic agriculture** This is a niche market which offers premium prices to producers. For small-scale farmers to tap this potential, they must be connected to the potential markets. This will require improved organization (e.g., organizing as cooperatives or farmer associations), training, quality control, market information and facilitation (e.g., certification), and specific requirements for each commodity (e.g., storage).



- **National organic certification** At the moment it is still very difficult and costly for Indian farmer groups to organize certification for the national Indian market. Farmers wanting to sell their produce on the national market have to undergo a complicated, expensive process to comply with international standards. Creating a national certification standard, specifically designed and adapted to local conditions, would reduce the cost of this process and increase the number of smallholders who could take advantage of it.
- **Protecting farmers from foreign competition** Liberalizing trade rules creates new opportunities for Indian farmers to export. But it also creates the risk that cheap foreign food will sweep into the Indian market, cutting food prices drastically and pushing smallholder farmers out of business. While complying with the international agreements it has signed, India must also find ways to protect its many smallholder farmers from losing their only source of income.
- **Rising input prices** If the prices for energy and agricultural inputs for conventional farming continue to rise, labour-intensive agriculture will become more attractive even for larger-scale farmers.
- **Reducing risks through diversification** Organic agriculture has great potential to reduce farmers' risks. A single organically grown crop might yield less than if it were grown conventionally, but the total value of all the organic crops, in combination with drastically reduced input costs, gives farmers a similar (or even somewhat higher) profits. The organic farmer also is cushioned from price fluctuations of individual crops, bad weather and environmental degradation.
- **Traditional foods** Organic agriculture emphasizes traditional foods which have declined in popularity due to the shift to wheat and rice. Many of these traditional foods are highly nutritious, as well as being adapted to the local ecology and contributing to a diverse farm system. New markets could be created by developing delicious recipes based on traditional ingredients.
- **Rehabilitating watersheds** Both conventional high-input agriculture and unsustainable traditional types of farming seriously damage the environment, lowering soil fertility and causing erosion. This damage, and the high costs of rehabilitation, are not reflected in the costs of production. Sustainable organic agriculture would avoid these costs. It would be well worth supporting farmers to produce in a sustainable manner.

Successful experiences suggest that a framework for sustainable agriculture should be based on the following:

- **Integration of natural and regenerative principles** (nutrient cycling, nitrogen fixation, soil regeneration and natural enemies) into crop production. This can produce stable yields around the same level as from conventional farming. Because input costs are much lower, farmers make more money and are less likely to go into debt. With further measures, such as the use of beneficial insects that prey on or parasitize pests, the selection of seeds and the improved recycling of biomass, yields from organic agriculture even can exceed those from conventional farming.
- **Using local inputs, management skills and labour** instead of external inputs. Making productive use of the people's capacities to work together helps solve common management problems related to pests, watershed management, irrigation and forest

management. This can be further enhanced by training and on-farm research to improve the already available knowledge and techniques.

- **Adopting multifunctional technologies** that conserve and regenerate resources, such as composting and water conservation. This will improve several components of the farming system at the same time.
- **Providing credit on the basis of land**, rather than for particular crops. Farmers can now get credit for single crops such as cotton or sugarcane. They should also be able to get credit for a farm under biodiverse cropping systems. The system should allow for rolling loans with long gestation periods.

## Constraints

There are many constraints to the spread of organic agriculture in India. Here are the main ones (in rough order of importance).

- **Bias towards chemical farming** Existing policies, research and extension activities all support high-external-input farming. Little attention is given to organic agriculture, and no resource materials are available.
- **Misappropriation of local varieties** There is a danger that local seed varieties will be patented by multinational companies. The Indian government should recognize the rich heritage which is the property of India and its local people. This property should be protected by law.
- **Hazardous chemicals** The government should ensure that hazardous substances which are banned internationally do not reach Indian farmers. Such chemicals are dangerous to people and the environment. Laws already regulate them, but they are not properly enforced.
- **Certification of organic farming** Policy support for organic agriculture is arriving, but it caters to big organic enterprises. The procedures and requirements are not suited to small-scale farmers.
- **Bias in incentives** The government provides many different incentives for high input agriculture. Equal attention should be given to sustainable agricultural practices.
- **Lack of research and extension support** to organic farming and on various aspects like traditional varieties.
- **Poor marketing** There is a lack of organized, appropriate marketing structures for small-scale organic farming.
- **Misinformation and market power** The pesticide industry provides misleading or false information to farmers. Its well-established marketing structures feed India's farmers with persuasive messages promoting high-input farming.
- **Lack of awareness** Farmers and consumers are still not awakened to the dangers of chemical farming and the continuing depletion of natural resources.

## Changes needed to achieve the potentials of organic agriculture

Many changes are needed if India is to overcome these constraints and achieve its rich potential in organic agriculture.

- **Research and extension** Research is needed to improve the yield of local crop varieties. Research and extension systems should place more emphasis on developing indigenous crops and livestock.
- **Supporting small-scale organic farming** Specific attention should be given to improving local agricultural production by marginal farmers and smallholders who are still “organic by default” and frequently depend on public welfare programmes.
- **Protect livelihoods of rural poor** The deregulation of national food markets has been agreed on an international level. Within this framework, agricultural policy should develop new strategies to prevent small-scale farmers from being pushed out of the market and off their land into poverty.
- **Local control of land** Large areas of wasteland and forest land located close to villages should be supervised by village committees. This would increase their ability to rehabilitate and use these lands in a sustainable way.
- **Local enterprises** Village-level, farm-based enterprises need to be promoted, strengthened and linked to potential markets. This requires support structures that are rarely in place. The government should provide guidelines and support to improve transport facilities, access to information, training, local marketing systems, etc.
- **Education** Organic agriculture should become part of the agricultural curriculum. Professional degrees in organic agriculture should be offered at universities to meet the demand for qualified specialists.





## **Biodiversity-based sustainable agriculture**

*Navdanya, Uttarakhand (p. 24)*

*Rajender Singh's biodiverse field in the village of Pulinda*



*Bija Devi in a mixed cropping field*



## **The Pyalaram community gene fund**

*Deccan Development Society, Andhra Pradesh (p. 34)*

*Balamma, "Mrs Gene Bank", harvesting millet*



*Traditional grain storage*



*A rich spectrum of local seed varieties*



### **Redefining pest management in Punukula**

*Centre for Sustainable Agriculture,  
Andhra Pradesh (p. 40)*

*The effect of pesticides: this man mixed pesticides with his hands*



*Drying chilli: a cheap, safe, natural alternative to artificial pesticides*



*A healthy field of cotton – grown without pesticides*



### **Farming for self-reliance**

*Chetana-Vikas, Maharashtra (p. 50)*

*Six different crops growing in the same field*





*Short-duration intercrops enrich the soil, produce food, and make way for long-duration cash crops*



### **Empowering marginalized communities in Rayalaseema watershed**

*Krushi, Andhra Pradesh (p. 67)*

*A water absorption trench dug by the community in Rayalaseema*



*A low-cost percolation tank to recharge drinking water tubewells*



*The watershed association general body reviews its activities every four months*



### **Building on indigenous knowledge in watershed management**

*Aragamee, Orissa (p. 75)*

*Contour bunding on a hill slope in Mankadamundi*



A former gully developed for cultivation



High-value off-season vegetable cropping in Mankadamundi



A map of the Mankadamundi watershed on the wall of the village training hall, showing the locations of various watershed treatments



Watershed villagers harvesting jafra, a valuable natural dye and food colourant





## **Forest home gardens in Raigad District**

*Rural Communes, Maharashtra (p. 81)*

*“Aba” Krishnaji Narsingrao More in his forest home garden*



*Staggered trenches dug by local people in a future forest homegarden*



## **Community-based watershed development in Bhipur**

*Cecoedecon, Rajasthan (p. 88)*

*A gully plug, or “anicut”, to control erosion*



*Conserving soil and water raises the level of water in wells*



## **Landshaping for better livelihood for the Sundarbans**

*Ramakrishna Mission Ashrama, West Bengal (p. 94)*

*After landshaping: a pond, upland bund and highland, with straw stacked for future use*



*A pond (larger than normal) has been excavated as part of a community landshaping activity*



## **Working across levels in watershed management**

*Indo-German Bilateral Project (p. 100), and*

## **Government–NGO collaboration in the Kinchumanda watershed**

*Vikasa, Andhra Pradesh (p. 108)*

*This spring has been developed to provide drinking water to local people*



*Newly constructed bunds to conserve soil and water*



*Mixed stand of cabbages, chilies and mango*



*Farmers harvesting pumpkin*



### **Linking tea farmers with markets**

*Peermade Development Society,  
Kerala (p. 130)*

*A member of the farmers' consortium delivering  
tea leaves to the factory*



*Various tea products from Peermade. Leaf tea  
has the highest quality, powdered tea the low-  
est*





## Dryland sericulture

*BAIF Institute for Rural  
Development, Karnataka (p. 138)*

*Feeding leaves to silkworms inside the rearing  
shed*



*Moisture-retention trenches across the slope.  
New trenches (left); being filled with biomass  
(right)*



## The biofuel hype: Chance or challenge for sustainable agriculture?

*BAIF Institute for Rural  
Development, Karnataka (p. 144)*

*Five-year-old jatropa plants growing on mar-  
ginal land*



*Immature jatropa fruit and empty fruit hulls (left)  
and seeds (right)*

# 3

## Managing land and water

Why watershed management?

*Agramee, Orissa*

Empowering marginalized communities in Rayalaseema watershed

*Krusi, Andhra Pradesh*

Building on indigenous knowledge in watershed management

*Agramee, Orissa*

Forest home gardens in Raigad District

*Rural Communes, Maharashtra*

Community-based watershed development in Bhipur

*Cecoedoon, Rajasthan*

Landshaping for better livelihood for the Sundarbans

*Ramakrishna Mission Ashrama, West Bengal*

Working across levels in watershed management

*Indo-German Bilateral Project*

Government-NGO collaboration in the Kinchumanda watershed

*Vikasa, Andhra Pradesh*

Managing land and water: Realizing potentials



## Why watershed management?<sup>1</sup>

### *Agramee, Orissa*

MUCH OF INDIA'S FARMLAND is rainfed and prone to drought. And it is fragile. About 175 million hectares, nearly half the country's land area, suffers from varying degrees of degradation: erosion by wind and water, ravines, salinity, waterlogging, shifting cultivation and degraded forests. The tree cover has been depleted, soil erosion and damage have increased, the water table has gone down, droughts are becoming more severe, and ecological degradation of drylands has risen.

**Watershed management:** a participatory, equitable and sustainable approach for judicious use of natural resources for sustainable development

Less than 30% of the country's arable land has assured irrigation. And the rapid depletion of groundwater on one hand, together with waterlogging and salinity on the other, could shut down "thirsty", water-intensive farm practices in the coming decades. This environmental degradation translates directly into poverty, malnutrition and food insecurity.

India's national and state governments have spent large sums on fighting poverty. While these efforts have had some success, they have not been as effective as they should have been. In part this is due to the multitude of programmes and scheme that have been implemented, leading to overlaps and poor coordination among the various ministries and agencies responsible. The programmes fail to provide enough inputs, their operations are poorly matched to the needs, and they are implemented without the full participation of the people affected.

This has led to the concept of "community convergence". While the government can provide the funds and some of the expertise needed combat poverty, only the local people can convert these into activities which will raise their standard of living in a sustainable way. Voluntary agencies can be of immense assistance. But massive efforts, including a national campaign and strong policy advocacy are needed to achieve visible impact within a reasonable time.

Rural development is highly complex, though. A simple campaign would not work. Rather, changes in operational mechanisms are needed. The following are essential elements:

- All land, water and vegetation management components should be planned and implemented on a watershed basis, with coordination among the agencies involved.
- Programme implementation should be entrusted to the beneficiaries along with the implementation agency. Resources should be made available directly to the beneficiaries.

We are all part of nature and are dependent on it. To ensure sustainable development, we must ensure that we consider not only the needs of the current generation. We must also conserve our natural resources and use them wisely so they are available also for future generations.

<sup>1</sup> Based on a manuscript by Achyut Das, Director, Agramee

## Why a livelihoods approach?

Unlike the conventional approach to watershed development, a “livelihoods approach” is based on a consideration of people’s livelihoods. It tries to identify and build on people’s strengths or “capitals”: their financial, physical, human, political, natural and social capitals. It starts with the intended beneficiaries. It focuses on the causes of poverty, provides an understanding from the people’s perspective, and seeks ways to improve the livelihood basis they depend on. This approach invites more people’s participation, involvement and contribution, and improves the chances of long-term sustainability.

## Major issues in watershed development

### *Technological interventions*

The watershed approach aims to augment and stabilize farm production and productivity, minimize ecological degradation, reduce regional disparities, and open employment opportunities for poor people in rainfed areas. A similar approach has been adopted in other resource-poor areas, such as drought-prone areas, deserts and wastelands. Appropriate technologies in things like water harvesting, soil conservation, crop production, and so on, are key to the effective management of watersheds. These technologies may include a combination of modern techniques with traditional skills and indigenous knowledge. In many instances, it is better to adapt traditional technologies rather than trying to introduce complex, expensive new solutions.

### *Water-harvesting structures*

Water is vital to India’s food production and rural economic development. But massive deforestation and increasing population pressure are depleting the nation’s water resources in an alarming way.

Not surprisingly, water conservation, development and use have become the main intervention in natural resource management. Such interventions aim not only to conserve natural resources; they also strive to improve the socio-economic life of the people and to secure their livelihoods. If they are to solve local problems, they should be based on the needs felt by the local landholders and villagers. These people may prefer certain types of water-harvesting structures for various reasons. Traditional structures are often more appropriate because they are cheap, easy to build and maintain, and benefit resource-poor families.

Water can be conserved and harvested in various ways and places: on the surface, through sub-surface water harvesting, as groundwater, and in the form of soil moisture. A wide range of engineering techniques exist: subsurface dams, gully plugs, pits, silt traps, mini-percolation tanks and water harvesting structures on drainage lines, as well as the more common contour trenches and contour bunds.

### ***Strengthening linkages between conservation and production/livelihood systems***

Enhancing rural incomes and long-term sustainability can only be ensured by developing natural resources. That means the natural resources in a watershed should be developed in accordance with their realizable potential and from the ridge down to the valley below.

At the same time, production and development activities must be undertaken on the treated lands using appropriate technologies. Soil and water conservation measures must be followed by appropriate farm production systems. Numerous crop-production techniques also conserve moisture; they include ploughing and planting along the contour, grass strips, mulching, cover crops, agroforestry, intercropping, planting crops that require little moisture, and so on. Various irrigation approaches also conserve water.

Both conservation and development measures should be implemented in accordance with a watershed plan. This plan must reflect the needs of individual farmers for private lands, user groups and the community as a whole for common lands and water sources, and the scientific input of subject-matter specialists.

### ***Choice of technology***

Rainfed areas are very diverse in terms of their geography and geology, socio-economic and agro-ecological conditions. That means the choice of technologies for conservation and production must be very flexible. The watershed users must be able to choose from a menu of technology options agreed by the implementing and funding agencies and the watershed users themselves. The implementing agency may have to add options, including low-cost, indigenous technologies, based upon specific local requirements. Production technologies should be evolved through a participatory technology development process involving implementing agencies and NGOs, innovative farmers, research and development institutions. It is important that mainstream production technologies be downsized and made easier and cheaper to use.

### ***Convergence between watershed projects and crop production and rural development programmes***

Watershed projects cannot hope to cover all the needs the people in a community identify. It is necessary to link with the regular production programmes of line departments – agriculture, horticulture, livestock, fisheries, energy and forestry – as well as with the rural development programmes of local government (*panchayati raj*) institutions. The watershed committee, water users' association and implementing agency should coordinate with these organizations (and vice-versa) to coordinate activities. In practice this is often not possible due to poor inter-departmental coordination, legal constraints, and a lack of political will and commitment of government officers. Government flexibility to enable such coordination is a crucial issue to be addressed and advocated at the policy level.



### ***Marginal lands and legal issues***

The areas treated and developed through a watershed approach often are marginal and have problem soils. Such lands are usually owned by poorer people. Developing such areas will enhance these people's production and productivity and improve their social equity.

Other land-ownership issues include land leased or proposed for mining, encroachment by rich and powerful people, and outdated land records.

To tackle these issues, cooperation and coordination are necessary among various agencies, which are controlled by different departments and governed by various laws and regulations.

### ***Post-project maintenance of community assets and accountability***

Watershed projects result in the creation of various community assets: water-harvesting structures, tree nurseries, *vikas kuteer* (training and meeting halls for the watershed users' associations), etc. Local people contribute money to a fund used to maintain these assets after the project is over. Here are some guidelines for maintaining these assets after the project finishes.

- Formally transfer all community assets created under the project to the watershed users' association.
- The association should use the watershed maintenance fund to maintain and upgrade the assets.
- The barefoot engineers trained during the project should look after the equipment. They may need refresher training after the project ends.
- During the project, it is important to generate a feeling of ownership and responsibility among local people for the community assets, to ensure that they maintain the conservation efforts and appropriate production techniques introduced during the project.

### ***Transparency in project management***

Transparency is important in managing a watershed project. Efforts to ensure this include:

- Preparing a watershed action plan in a participatory manner, bearing in mind local people's technical and economic capabilities, as well as the social acceptability of the measures and the degree of risk that the users are able to bear.
- Holding open meetings of the watershed users' association and community to approve the plan, the cost norms and ways to share the benefits.
- Posting the approved plan and a map showing the watershed after the treatment on a notice board at office of the watershed users' association. A prominent painting on the wall of the community hall can also remind local people what has been planned and agreed on.
- Reviewing the physical and financial progress of work through monthly meetings and periodic (quarterly) social audits during the project implementation.

### ***Productive role of women***

In conventional watershed development modes, women are organized into self-help micro-credit and savings groups. They are seldom involved in production and processing activities.

It is better to involve women in micro-enterprise activities, both in on- and off-farm production and in processing. They can so generate jobs and earn more money. Women are often the best people to manage grain banks, nurseries, kitchen gardens and vegetable cultivation, post-harvest handling of crops, the storage of food grain, etc. Such areas deserve further promotion and development.

### ***Documenting and drawing on indigenous knowledge***

Local people know a great deal about the area where they live, what works and what does not. They use a wide range of practices to conserve soil and water, manage forests and other natural resources, maintain biodiversity, manage social institutions, and so on. Many of these practices form a firm basis for future development. They should be documented systematically using a participatory approach involving farmers, scientists and NGO staff. Promising practices should be validated scientifically and published widely to allow them to be replicated and scaled up – of course taking account any intellectual property rights issues that may arise.

### ***Education, advocacy and stewardship***

There is a massive shortage of people who are aware of watershed issues and trained in watershed management techniques. Education must be a priority: in schools and colleges, as well as in training centres for barefoot watershed managers and engineers.

Because water is the key scarce resource in India's rainfed areas, watersheds should be the unit of development for all line departments and local governments, including the forest development agency. The inclusion of micro-watershed management in national and state water policies is essential to make them pro-poor.

### ***Watershed-plus activities***

Activities after a watershed project is over can help ensure that its objectives are achieved and are sustainable. These "watershed-plus" activities should include improvements to sanitation and drinking water supplies, rooftop water harvesting, and energy installations such as solar power units, gassifiers and micro-hydro electricity projects.

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## Empowering marginalized communities in Rayalaseema watershed

*Krushi, Andhra Pradesh*



MANY OF INDIA'S MARGINALIZED communities – *dalits*, tribals, low castes or landless – have struggled during the last decades for empowerment and participation in the economic and social life of the larger society. Land rights are a major issue in this struggle: access to land is essential if the benefits of rural development and poverty alleviation measures are to reach marginalized communities. Without land rights, sustainable agriculture is an empty vision. Farmers who are not sure they will be able to farm their fields for many years are unlikely to invest in sustainable management. But assured rights on their own cannot alleviate poverty. They must be accompanied by measures as capacity building, access to other resources such as water and capital, and so on. Watershed area development projects provide an opportunity to combine large allocations of government funds to develop water and manage soil and natural resources with equity concerns.

Since 1991, Krushi, an NGO specializing in land rights, has worked in Chittoor district, one of four districts in the Rayalaseema region in southern Andhra Pradesh. Krushi has succeeded in getting land rights to marginalized communities in the district.

Small-scale, marginal farmers make up 80% of the marginalized communities in the area. Each family has an average of 0.5–1 ha of land. But without capital, they have not been able to invest in their land, so large areas are undeveloped and lack proper measures to conserve soil and water.

Krushi realized that land rights alone are not enough. Communities can benefit only if they can making their land productive. So Krushi searched for ways the farmers could improve their income. About ten years ago, several Krushi staff attended workshops and exposure visits on sustainable agriculture and development organized by Bread for the World, a German NGO. After this, Krushi started identifying areas for intervention and prepared plans with the local community to develop their land and adapt their farming techniques. It also began the search for funding to support this work.

### The Rayalaseema Watershed Area Development Programme

At the same time, the Rayalaseema Watershed Area Development Programme (RWDP) evolved with support of a consortium of four donors: Bread for the World, Christian Aid UK, Oxfam (India) Trust, and the Hyderabad-based Centre for World Solidarity. RWDP approached Krushi and several other organizations working in Chittoor district to implement the project. There was a good match between Krushi's and RWDP's aims, and Krushi became an RWDP partner working in the Gerigelavanka watershed.

### **Box 16 Rayalaseema**

The Rayalaseema region has an average rainfall of 820 mm and suffers from frequent droughts. It has broken hilly terrain with an uneven landscape. The soil varies from place to place, and includes red loam, sandy, black cotton and gravel soils.

Most people are disadvantaged, marginalized and poor. Most farmers have small parcels of land, usually 0.5–1 ha. Four-fifths of the land is rainfed. The major crop is groundnut, and sorghum (*bajra*), finger millet (*ragi*), field beans, red gram and green gram are grown as intercrops.

The land is eroded and overgrazed, and people have rooted out trees and plants for fuel. Rising population has increased the pressure on the land; even steep slopes have been brought under cultivation, further increasing erosion and reducing the protective cover of vegetation. In turn that means that people – especially women – find it harder to collect fodder and fuelwood.

The most marginalized people farm the poorest land on the upper slopes. These require a lot of investment to make them cultivable. Land in the many small valleys is controlled by dominant groups. There are number of streams and small rivers, but all are seasonal. Irrigation water comes largely from tanks, open shallow wells and tube wells.

This was Krushi's first experience in a watershed project. RWDP trained Krushi staff in watershed management, and the organization learned a lot while implementing the project. Krushi managed to combine its approach emphasizing rights and empowerment of marginalized communities with the technical aspects of the watershed project. This combination may be a model of how marginalized people can be empowered under a watershed project.

### **Participatory rural appraisal**

Krushi conducted a participatory appraisal in each of the watershed's six hamlets, as well as one covering the entire watershed. The problems identified included:

- Scarcity of water in open shallow wells for irrigation: 24 of 54 wells totally dry.
- Migration of landless and marginal farmers to towns and cities for work; not enough work available in the village.
- Women paid less than men; no women's groups; women burdened with 16–18 hours of (mostly domestic) work per day.
- Low wages for farm work; no access to credit.
- Lack of sanitation and hygiene, causing health problems.
- Problems of families headed by single women.

### **Individual level planning**

The farmers identified the boundaries of the watershed, and divided it into three mini-watersheds. They also identified 10–12 ha micro-watersheds, each cultivated by 10–15 farmers. Krushi team members visited each family to discuss their farm's individual needs and to help them prepare farm plans. These plans included these types of activities:

- De-silt open wells, prevent them from silting up again, and recharge them with water.
- Construct bunds to control runoff and erosion on fields.

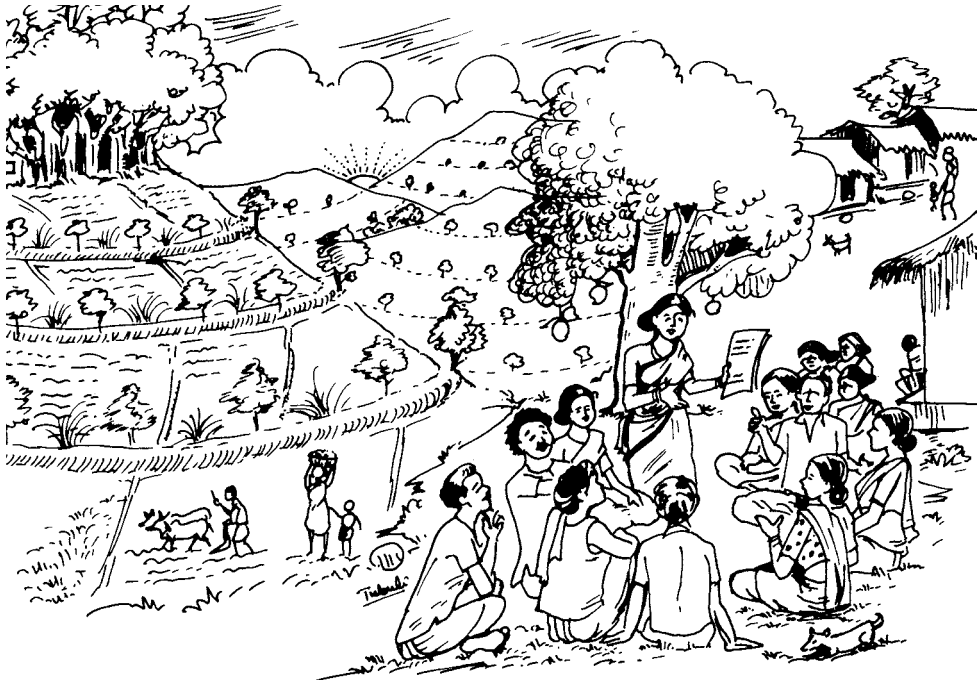


Figure 6 Groups of farmers planned how to manage the watershed

- Plant fruits trees such as *jamun* (*Eugenia jambolana*), mango, custard apple, sapota (*Manilkara zapota*) and papaya.
- Plant trees for fuel and timber.
- Plant fodder crops such as gliricidia, leucaena (*subabul*), stylo grass (*Stylosanthes hamata*), and local maize.
- Dig low-cost percolation tanks, farm ponds, sunken pits and other structures to structures to harvest and conserve water and increase the amount of moisture in the soil.
- Construct diversion channels, gully plugs, contour trenches, earthen bunds and weirs to combat soil erosion.

### Community level planning

Krushi also organized a series of meetings with all the families in each hamlet. These meetings consolidated the individual farmers' plans, allowed the total costs to be estimated, and decided on community-level works such as:

- Building water-control and conservation structures on a stream to raise the water table in open wells and tubewells.
- Building a water percolation tank upslope to feed the wells.
- Planning the use of community-owned waste lands: planting them with trees to yield timber, fodder, fuel and fruit.
- Constructing percolation tanks to recharge open shallow wells for irrigation.

The meetings discussed with each of micro-watershed groups about how to solve their common problems, for example, by controlling erosion, digging channels to divert water, or treat streams.

The plans for all six hamlets were consolidated at the central level with representatives from each hamlet.

## **Community motivation and capacity building**

Krushu held training courses for men and women in the community on the concept of watersheds and on the skills needed to manage them. It also organized exposure visits to successful watersheds assisted by Myrada, an NGO operating in Karnataka. A drama group focusing on watershed gave performances in the villages. Narayana Reddy, an organic farmer from Karnataka, visited the villages and organized discussions in the field. The Krushi team used every opportunity to strengthen the knowledge of both the farmers and of the team itself. Since this was a new venture for Krushi, the organization involved all its staff members from time to time to familiarize them with the process that was followed.

## **Institution building**

Krushu has put a lot of emphasis on building watershed institutions at hamlet and central levels to ensure that marginalized people are represented and take on leadership roles. A series of meetings in each hamlet discussed the status of the watershed's natural resources, the causes for the current situation, and related issues and problems. These meetings discussed how a watershed approach could resolve these problems. All the families in the hamlet elected a committee of 3 men and 3 women to manage and implement the watershed activities.

At the central level, a watershed association was constituted. Its general body included one woman and one man from each family in the watershed hamlets. A central committee was elected, along with office bearers to execute the watershed activities. This association is registered as a society. RWDP funds were transferred to this association for it to use in implementing the activities.

## **Working groups**

Local people identified unemployment and migration as crucial problems. Various watershed activities, such as constructing soil and water conservation works, are labour intensive, so help combat the unemployment problem. It was decided to form ten working groups to deal with these. These working groups had a total of 128 members, both men and women: landless farm workers, migrants and small-scale farmers. Their task was to construct the works. Krushi trained them how to build gully plugs, earthen bunds, weirs and other structures. The working groups could negotiate with the watershed association about their pay. Krushi informed them about the government's standard rates, the minimum wage, and the issue of unequal wages.

## Women's savings groups

Discrimination against women is a major social problem in the area. There were no women's groups, and women were barred from participating in the village *panchayati* meetings (held to resolve local disputes). Women's problems were even dealt with by men at such meetings, with the women looking on as mere spectators.

Krusha has promoted 12 women's self-help groups, with over 180 members. The groups run savings-and-credit funds. Members have gained an opportunity to discuss issues among the groups, and have challenged problems such as discrimination and violence against women. They have been able to increase their access to credit by tapping their own group savings, a watershed revolving fund to support the livelihoods of landless and single headed families, the Mutually Aided Women Savings and Credit Cooperative Society, and banks. They have received this credit using social collateral (other group members ensure that an individual repays a loan).

## People's contribution

In accordance with an agreement with RWDP, farmers have contributed half of the cost of work done on individual land. The watershed association decided to collect only half this amount from households headed by single women. Contributions could be in the form of labour or cash. In the case of community works, the user groups and farmers who benefited contributed one-quarter of the cost. All the structures were built by hand from earth or stones: no machines, cement or steel was used. The farmers relied on their own skills and knowledge; very few techniques were introduced from outside.

AFPRO (Action for Food Production), a Hyderabad-based technical service organization, helped build water-recharge structures, borewell mechanisms and low-cost latrines, and did water auditing.

The watershed association managed the maintenance of the works. It fined anybody breaking the rules – for example, people who ploughed bunds, broke gully plugs, or grazed cattle on planted areas. There were very few such cases: individuals and the community as whole have taken responsibility to maintain all the works.

The watershed association also manages a tree nursery. Farmers chose what types of seedlings to raise, collected seeds, contributed manure and labour, and in return got seedlings free of cost. They paid half the cost of fruit trees bought from the market. This nursery was at first maintained by two tribal women, who were trained in nursery maintenance. After the project was closed, the nursery was taken over by an 8-member women's group (including these original caretakers) as a way to earn money.

Krusha and AFPRO have trained a paraveterinary worker to treat cattle, sheep, goats and chickens. This paravet charges for his services.

Farmers make compost and vermicompost, and apply green manure and tank silt as fertilizer.



## Leadership

*Dalits* and marginalized groups hold important positions in the watershed association and have played a major role in decision making. They have faced various difficulties in establishing this position because of political machinations by the dominant castes. The process of mobilization and motivation in each hamlet, the practice of ensuring representation of each hamlet, and the equal representation of women in leadership roles, meant that marginalized communities gained power in the watershed institutions. People from the dominant caste did not feel comfortable with this, and they were not interested in participating.

But Krushi kept the process open and transparent. After a year, small-scale and marginal farmers from the dominant communities also started coming to the meetings and joined in the activities. By this time, leaders from the marginalized community had established their influence and authority in the association. Since the dominant community is in a majority in the area, one association post was allocated to them. The people chose a good, cooperative individual to fill this position. A pattern of good cooperation among the communities was slowly established in implementing the project.

Although the project officially closed in 2003, local people continue to run the association on their own, under the leadership of the marginalized communities. The working committee meets regularly and follows up its decisions diligently. The association's fund contains Rs 280,000, which is used to support the livelihood development of association members and to maintain the watershed structures.

## Linkages

The local women have been linked to the women's forum at the *mandal* (cluster of villages) level, which works against the violation of women's rights, atrocities and domestic violence against women. The members of the working groups, farm workers and marginal farmers are linked to the *mandal* agricultural workers' union, which is registered under the Trade Union Act and promotes rights and economic development of its members through negotiation and advocacy with government and other agencies.

## Impact

Through the project, the villagers treated 100% of the marginal land with soil and water conservation measures. All 54 shallow wells now have water for irrigation; the water table has risen and the wells contain water throughout the year. There was no drinking water problem even in the 5 continuous drought years between 1998 and 2003.

The villagers can collect fodder and fuelwood close by, from the bunds on their farms and from community-owned lands. They are spared the time and drudgery of fetching them from far way. Crop production has risen: for example, production of groundnuts rose from 675 kg/ha to 1375 kg/ha. More intercropping produced more pulses, a greater variety of food, and better nutrition.

Small-scale and marginal farmers have brought an extra 16.4 ha into irrigated cultivation. They lift water to their fields with pumps and scoops. They have also brought 36 ha of fallow land



back into cultivation after treating it with proper soil and water conservation measures. The farmers consumed most of the grain they produced, but grew vegetables and fruits to sell.

People have stopped migrating in search of work. They can find enough work in the village itself, for example in brick making, construction work, or farming land as tenants.

Discrimination against women has fallen. Women have formed self-help groups, have engaged in income-generating activities as groups, and now earn equal wages. Their workload has fallen because there is more vegetation to use as fodder or fuel, and they can fetch water from close by. Men help out more with domestic chores. Women have joined village decision-making groups such as mothers' committees and education committees, and have taken leadership roles such as ward member in the village *panchayat* council.

The number of livestock has risen, and the animals are in better health. For example the number of Jersey cows has gone up from 14 to 63, sheep and goats from 530 to 1560, and chickens from 201 to 2560. A trained paravet visits the farms to attend to the animals' health.

One hundred watershed associations from four districts have formed into a federation named Rayalaseema Watershed Associations Samakya. This federation aims to expand watershed approaches to more areas and to focus on issues of water and rainfed farming.

## Lessons

Krushi's combination of a rights-based approach with watershed management has led to several useful insights.

- Marginalized people should have control and leadership in watershed institutions if they are to benefit from the project.
- Links to other organizations and networks such as farm worker unions, women's forums, cooperatives and watershed association federations provide solidarity, support and confidence for landless farm workers, small-scale and marginal farmers and women to realize their rights. These links give access to information, knowledge, resources and capacity building. They also help sustain the local organizations and avoid capture by elite groups.
- Addressing equity issues increases the involvement of marginalized people and their ownership of the project. This supports the democratic functioning of the institutions, transparency, accountability and sustainability of work done.
- Watershed development, used as a tool to address equity issues, has changed the lives of marginalized communities: it has increased their sense of identity, promoted their leadership, fostered women's leadership, and enabled these groups to appropriate 100% of the benefits from the project. The empowered community has been able to resolve many social issues. Such an approach can also be used in other natural resource development projects.
- Links to various government departments are essential to ensure that government resources converge for the holistic development of the people in the watershed.

## Scaling up

All the RWDP partner NGOs, along with representatives from the local community, shared and reviewed their experiences in implementing the watershed project every 6 months. The heads of relevant government units were invited to these review meetings. As a result, the Chittoor District Water Management Association chose Krushi to implement 12 further watershed projects. The National Bank for Agriculture and Rural Development also selected Krushi to implement another four projects.

A major factor in this success was Krushi's emphasis on ensuring that marginalized communities played the leading roles in the watershed associations. This was possible because representation in the association was based on the number of households in each community. Some 80% of the households were marginalized, while the remaining 20% of dominant groups normally occupied the most important positions and controlled all the community institutions. Krushi managed to reverse this: in all 16 watersheds currently managed by Krushi, marginalized communities account for 76% of representation in the committees and 74% of the office bearers.

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The work of Krushi is supported by Bread for the World.

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